Intensive Care Medicine
Supplement 2, Volume 39
October 2013

Abstracts

ESICM LIVES 2013
26th Annual Congress

Paris, France
5–9 October

This supplement issue of the official ESICM/ESPNIC journal *Intensive Care Medicine* contains abstracts of scientific papers presented at the 26th Annual Congress of the European Society of Intensive Care Medicine.

The abstracts appear in order of presentation from Monday 7 October to Wednesday 9 October 2013.
The same abstract numbering is used in the Congress Final Programme.

This supplement was not sponsored by outside commercial interests; it was funded entirely by the society's own resources.

DOI:10.1007/s00134-013-3095-5

Springer

TO BE CONTINUED →

The intensive connection to...

A growing network of members_

BECOME AN ESICM MEMBER

Working to promote the highest standards of multidisciplinary care of critically ill patients through education, research and professional development.

12 GOOD REASONS_

1 Discounts on registration fees at our Annual Congress and at international meetings endorsed by ESICM

2 Free access to the ESICM Flash-Conferences (lectures of the scientific sessions held during ESICM congresses & meetings)

3 Annual subscription to Intensive Care Medicine electronic version of the Journal (printed version optional)

4 Apply for research grants through the ECCRN (European Critical Care Research Network)

5 50% discount on the article processing charges of the ICM experimental newspaper (electronic version).

6 Free access to the web-based 2nd Edition of the PACT Programme

7 Participation in ESICM's scientific activities, including positions in Sections and Working groups, Annual Congress, joint international meetings, etc...

8 Access to information about the development of intensive care medicine in Europe through our interactive website, monthly newsletter, and position statements

9 Participation in ESICM educational and training activities: post-graduate courses, training courses & workshops, CoBaTrice, etc...

10 Reduced fees as you apply for the EDIC (European Diploma in Intensive Care)

11 Possibility of dual membership with many national societies & with ESPNIC (Joint membership)

12 Come to our booth and find out !

JOIN US_

Apply online at
www.esicm.org

ESICM
EUROPEAN SOCIETY OF INTENSIVE CARE MEDICINE
The Intensive Connection

www.esicm.org

The intensive connection for...

Cutting-edge Research_

ECCRN
EUROPEAN CAITICAL CARE RESEARCH NETWORK

RESEARCH AT ESICM A JOINT EFFORT!

ESICM aims to foster collaborative research among its members and to promote European Intensive Care Research

- We establish networks of investigators and research teams
- We provide forums for discussion of research projects
- We develop and implement clinical trials
- We provide access to methodological help (e.g. meta-analysis group - SRG)
- We offer opportunities for education and collegial support for emerging investigators
- We foster communication within the ICU research community
- We provide several awards to support research projects

GET INVOLVED!

Join our Trials Group and give more visibility to your research projects

Join on-going research projects or submit proposals for collaborative studies

JOIN US_

To learn more, go to www.esicm.org and visit the Research section

ESICM
EUROPEAN SOCIETY OF INTENSIVE CARE MEDICINE
The Intensive Connection

www.esicm.org

ECCRN
EUROPEAN CRITICAL CARE RESEARCH NETWORK

THE EUROPEAN CRITICAL CARE RESEARCH NETWORK

ECCRN offers you, researcher in the field of ICM, the opportunity to develop your studies and to increase knowledge about how to improve care for critically ill patients.

ECCRN: Connecting you to Research !

HOW ?_

APPLY FOR ECCRN ENDORSEMENT

- **For surveys at national or international level**
  Endorsed surveys can be distributed to over 8000 intensive care professionals
- **For studies conducted by individual centres or by research groups**

APPLY FOR ENDORSEMENT OR SUPPORT US!

JOIN US_

For more information, please visit our website **www.esicm.org** or write to **research@esicm.org**

ESICM & industry research awards 2014

Share your ideas and promote your own research!

APPLICATION FOR THE 2014 AWARDS WILL BE OPEN ON FEBRUARY 1ST

→ ALL MEMBERS ARE WELCOME TO APPLY.

→ MORE DETAILS AVAILABLE ON **WWW.ESICM.ORG**

Congress committee

Chairman
Giuseppe Citerio, Monza, Italy

Acute kidney injury
Michael Joannidis, Innsbruck, Austria

Acute respiratory failure
Antonio Pesenti, Monza, Italy

Cardiovascular dynamics
Maurizio Cecconi, London, United Kingdom

Ethics
Jozef Kesecioglu, Utrecht, Netherlands

Health services research and outcomes
Andreas Valentin, Vienna, Austria

Infection
Jean-François Timsit, Grenoble, France

Metabolism, endocrinology & Nutrition
Michael Hiesmayr, Vienna, Austria

Neuro-intensive care
Pedro Navarrete Navarro, Granada, Spain

Peri-operative intensive care
Rupert Pearse, London, United Kingdom

System inflammation and sepsis
Claude Martin, Marseille, France

Trauma & emergency medicine
Jacques Duranteau, Kremlin-Bicêtre, France

Nurses and allied healthcare professionals
Stijn Blot, Gent, Belgium

Research Committee

Chairman
Richard Beale, London, United Kingdom

Education and Training Committee

chairman
Marco Maggiorini, Zurich, Switzerland

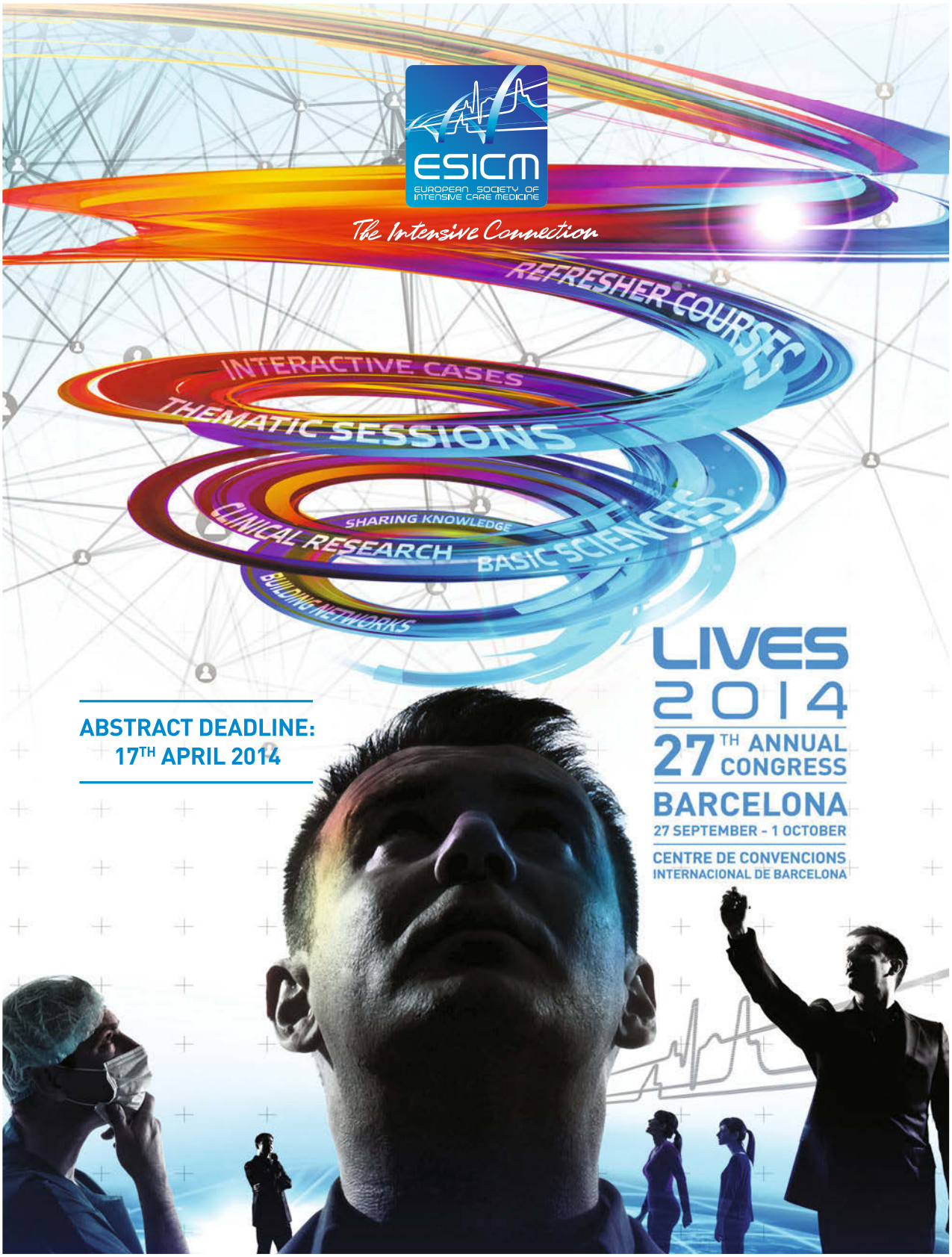

ESICM
EUROPEAN SOCIETY OF INTENSIVE CARE MEDICINE
The Intensive Connection
REFRESHER COURSES
INTERACTIVE CASES
THEMATIC SESSIONS
SHARING KNOWLEDGE
CLINICAL RESEARCH
BASIC SCIENCES
BUILDING NETWORKS
ABSTRACT DEADLINE:
17TH APRIL 2014
LIVES
2014
27TH ANNUAL CONGRESS
BARCELONA
27 SEPTEMBER - 1 OCTOBER
CENTRE DE CONVENCIONS
INTERNACIONAL DE BARCELONA

Table of Contents

Monday 07 October 2013

Tuesday 08 October 2013

Wednesday 09 October 2013

Oral Sessions

Poster Sessions

Author Index

ECCRN EUROPEAN CRITICAL CARE RESEARCH NETWORK

Abstract submitted and selected under label ECCRN. Displayed as e-poster on dedicated screen at ESICM booth for whole duration of congress (ICC, Lobby Level).

Abstract selected for the Abstract Award Winning Session.

Monday 07 October 2013

Oral Sessions
Non-invasive ventilation: indication, optimization, outcome: 0001–0005

0001
UNDERSTANDING NONINVASIVE MECHANICAL VENTILATION SUCCESS IN FRENCH AND BELGIAN ICUS

A. Demoule[1], S. Chevret[2], A. Kouatchet[3], S. Jaber[4], F. Meziani[5], M. Schmitt[6], D. Schnell[2], C. Clergue[7], J. Aboab[8], A. Rabbat[9], D. Lambert[10], C. Guérin[11], H. Georges[12], B. Zuber[13], J. Dellamonica[14], P. Depuydt[15], L. Brochard[16], É. Azoulay[2], The oVNI Study Group

[1]Groupe Hospitalier Pitié-Salpêtrière, Pneumolgie et Réanimation Médicale, Paris, France, [2]Hôpital Saint-Louis, Paris, France, [3]CHRU, Angers, France, [4]Hôpital Saint-Eloi, Montpellier, France, [5]Hôpital Civil, Strasbourg, France, [6]Groupe Hospitalier Pitié-Salpêtrière, Paris, France, [7]Centre Hospitalier, Evry, France, [8]Hôpital Raymond Poincaré, Garches, France, [9]Hôtel Dieu, Paris, France, [10]Hopital La Timone, Marseille, France, [11]Hôpital de la Croix Rousse, Lyon, France, [12]Centre Hospitalier, Tourcoing, France, [13]Hôpital Cochin, Paris, France, [14]Centre Hospitalier, Nice, France, [15]University Hospital, Ghent, Belgium, [16]Hôpitaux Universitaires, Genève, Switzerland

INTRODUCTION. Over the last two decades, non-invasive ventilation (NIV) has become the cornerstone therapy of acute respiratory failure (ARF) in the intensive care unit (ICU). Two prospective French surveys performed in 1997 and 2002 have shown a steady rate of NIV success.

OBJECTIVES. We performed a survey to reevaluate NIV tolerance, success rate and risk factors for NIV failure.

METHODS. Over a 2 months period (2010–2011), 54 ICUs in France and Belgium participated to the oVNI study. A case-report form was completed for all patients requiring any form of ventilatory support, until ICU discharge. Demographics, clinical history, institution of mechanical ventilation, and follow-up were recorded.

RESULTS. 2,367 patients receiving either NIV (n = 582) or EIT (n = 1,785) were prospectively included. The conditions precipitating ARF (and corresponding NIV prevalence) were: acute on chronic respiratory failure in 21 % (NIV 68 %), non-hyperbaric coma in 30 % (no NIV), cardiogenic pulmonary edema in 8 % (NIV 53 %), and "de novo" ARF in 41 % (NIV 16 %). NIV was first attempted in 23 % of all patients. Overall, nurses reported poor NIV tolerance in 29 % of patients. Patients self-reported on anxiety in 24 % of the cases, and 9 % complained of an important nose and mouth dryness. Conjunctivitis, nose skin ulcerations or gastric distension were found in 6 % of patients. Nurses ranked sleep quality as poor in 32 % of patients. NIV success was 69 % overall (95 % CI 65–73 %), showing significant increased as compared to 2002 (56 %, 95 % CI 50–62 %, p = 0.0003). Multivariate analysis identified that independent risk factors for NIV success were "de novo" ARF as the precipitating factor (OR = 0.43, 95 % CI 0.23–0.84), severity of organ dysfunction defined as an elevated SOFA (OR = 0.82, 95 % CI 0.71–0.95), severity upon admission defined as an elevated SAPS II (OR = 0.97, 95 % CI 0.94–1.00) and a short sleep time assessed by nurses (OR = 1.30, 95 % CI 1.13–1.48). In the IRA-IRC subset, SOFA (OR = 0.74, 95 % CI 0.61–0.90) and sleep time (OR = 1.32, 95 % CI 1.07–1.62) were jointly associated with NIV success. In the subset of de novo ARF patients, only SOFA was retained in the multivariable model (OR = 0.75, 95 % CI 0.66–0.85).

CONCLUSIONS. In this prospective multicentre study recruiting 2,367 patients from 54 ICUS, NIV was used in more than half the COPD or cardiac patients and in only 16 % of those with "de novo" ARF depicting ongoing controversies. NIV side effects affected up to one third of the patients. Compared to 1997 and 2002, NIV success rate increased significantly. Organ dysfunction, physiological severity upon ICU admission, "de novo" ARF and a short total sleep time were predictors of NIV failure. The impact of NIV failure on subsequent long term survival and health-related quality of life are being analyzed in each subgroup of comorbidities.

0002
NON-INVASIVE MECHANICAL VENTILATION IN PATIENTS WITH ACUTE RESPIRATORY FAILURE: TRENDS IN USE AND OUTCOMES

D. Schnell[1], J.-F. Timsit[2,3], M. Darmon[4], A. Vesin[3], D. Goldgran-Toledano[5], A.-S. Dumenil[6], M. Garrouste-Orgeas[3,7], C. Adrie[8], L. Bouadma[9], B. Planquette[10], Y. Cohen[11], C. Schwebel[2], L. Soufir[7], S. Jamali[12], B. Souweine[13], E. Azoulay[1,3]

[1]Saint Louis University Hospital, Paris, France, [2]CHU de Grenoble, Grenoble, France, [3]Integrated Research Center U823-Albert Bonniot Institute, Team 11: Outcome of Respiratory Cancers and Mechanically Ventilated Patients, La Tronche, France, [4]CHU de Saint-Etienne, Saint Priest en Jarez, France, [5]CHG de Gonesse, Gonesse, France, [6]CHU Antoine Beclère, Clamart, France, [7]Groupe Hospitalier St Joseph, Paris, France, [8]Hôpital de Saint Denis, Saint Denis, France, [9]CHU Bichat, Paris, France, [10]Hôpital André Mignot, Le Chesnay, France, [11]CHU Avicenne, Bobigny, France, [12]Centre Hospitalier Simone Veil, Eaubonne, France, [13]CHU Gabriel Montpied, Clermont-Ferrand, France

INTRODUCTION. Benefits from non-invasive mechanical ventilation (NIV) have been reported from clinical trials in selected patients admitted to centers with extensive experience [1]. Whether these benefits are generalizable is an important issue to assess.

OBJECTIVES. This multicenter longitudinal study was designed to assess the trends in use and success of NIV over a 15-year period in 14 French intensive care units (ICUs). Also, the net impact of NIV on mortality in a pseudo-population mimicking randomisation was assessed.

METHODS. Critically ill patients admitted for acute respiratory failure (ARF) from 1997 to 2011 and requiring ventilatory support were included. The first-line ventilatory support modality was recorded. Acute respiratory failure etiologies were classified into three groups: acute on chronic respiratory failure, cardiogenic pulmonary oedema, and de novo respiratory failure (i.e. hypoxemic ARF in patients immunocompromised or not). The trends in use of and outcomes associated with NIV were examined in the whole study cohort and for each study group. The impact of first-line NIV on mortality was evaluated by a marginal structural model for longitudinal data [2]. Follow-up was censored at day 60.

RESULTS. Among the 3,163 ARF patients, 1,232 (39 %) patients received NIV. Over the study period, NIV use and success rate increased from 29 to 42 %, and from 69 to 84 %, respectively. By the marginal structural model analysis, NIV was shown to decrease mortality (adjusted HR 0.83, 95 % CI [0.75–0.92]; $p = 0.0004$). This protective effect was observed in patients with acute on chronic respiratory failure (adjusted HR 0.7, 95 % CI [0.56–0.88]; $p = 0.003$) and in immunocompromised patients with hypoxemic ARF (adjusted HR 0.76, 95 % CI [0.6–0.97]; $p = 0.026$), but not in patients with cardiogenic pulmonary oedema (adjusted HR 1.11, 95 % CI [0.93–1.33]; $p = 0.25$) and in non-immunocompromised patients with de novo ARF (adjusted HR 1.28, 95 % CI [0.96–1.7]; $p = 0.095$). Non-invasive mechanical ventilation failure was an independent time-dependent risk factor of mortality (adjusted HR 4.4, 95 % CI [2.9–6.6]; $p < 0.0001$).

CONCLUSIONS. The use of NIV increased steadily over the last 15 years and resulted in reduced mortality. Survival benefits from NIV are obvious in patients with chronic respiratory failure and those who are immunocompromised. However, no benefit could be identified in other subset of patients. Moreover, NIV failure remained an independent risk factor of hospital mortality. Further studies are warranted to better understand early predictors of NIV failure that should guide timely intubation.

REFERENCES. 1. Brochard L. Noninvasive ventilation for acute respiratory failure. JAMA. 2002;288(8):932–5. 2. Cole SR, Hernan MA. Constructing inverse probability weights for marginal structural models. Am J Epidemiol. 2008;168(6):656–64.

GRANT ACKNOWLEDGMENT. This study received no financial support.

0003
IS IMMUNOSUPPRESSION A RISK FACTOR OF MORTALITY FOR ACUTE RESPIRATORY FAILURE PATIENTS RECEIVING NON INVASIVE VENTILATION (NIV)?

A. Kouatchet[1], S. Chevret[2], A. Demoule[3], S. Jaber[4], A. Rabbat[5], F. Meziani[6], D. Schnell[6], S. Mortaza[7], E. Guerot[8], J. Mayaux[9], S. Legriel[10], L. Papazian[11], A.-P. Meert[12], L. Brochard[13], A. Mercat[7], E. Azoulay[14]

[1]CHU d'Angers, Angers, France, [2]CHU Saint Louis, Département de Biostatistique et Informatique Médicale, Paris, France, [3]CHU Pitie Salpétrière, Service de Pneumologie et Réanimation Médicale, Paris, France, [4]CHU Saint-Eloi, Département d'Anesthésie et Réanimation, Montpellier, France, [5]CHU Hotel Dieu, Service de Pneumologie et Réanimation, Paris, France, [6]CHU de Strasbourg, Hôpital Civil, Service de Réanimation Médicale, Strasbourg, France, [7]CHU d'Angers, Service de Réanimation Médicale et Médecine Hyperbare, Angers, France, [8]Hôpital Européen Georges Pompidou (HEGP), Service de Réanimation Médicale, Paris, France, [9]CHU La Pitié-Salpêtrière, Service de Pneumologie et Réanimation, Paris, France, [10]CH de Versailles, Site André Mignot, Service de Réanimation Médico-Chirurgicale, Le Chesnay Cedex, France, [11]CHU de Marseille, Hôpital Nord, Service de Réanimation des Détresses Respiratoires et Infections Sévères, Marseille, France, [12]Institut Jules Bordet, Bruxelles, Belgium, [13]Hôpitaux Universitaires de Genève, Service de Soins Intensifs, Genève, Switzerland, [14]CHU Saint Louis, Service de Réanimation Médicale, Paris, France

INTRODUCTION. Several cohort studies underlined the profit of NIV for immunosuppressed patients (ID) admitted for hypoxemic acute respiratory failure (ARF). Elements explaining this profit hold in the frequent complications and the greater mortality of the invasive ventilation in this indication. Today, in immunosuppressed ARF patients, NIV is the object of international recommendations. In the present study, we estimated the impact of ID on mortality of the patients admitted in intensive care unit for hypoxemic ARF and treated with NIV.

METHODS. It is a secondary analysis of the "oVNI" cohort having included 1450 acute respiratory patients among which 780 received NIV. We realized a study exposed/non-exposed in ID. A comparison of the ID and Non-id was realized after exclusion of COPD, cardiac failure but also patients with therapeutic limitation. The exposed group includes the ID patients (malignant hemopathies, long-term steroids or immunosuppressive treatment) treated by NIV. The unexposed group includes Non-ID patients treated by VNI. The closest neighbour method is used for the matching of exposed and unexposed. Assessment criteria were the rate of success of the VNI and the hospital mortality. Finally, the analysis of the effect of ID on the mortality was adjusted on a propensity score to be immunosuppressed.

RESULTS. Among the 1450 ARF patients admitted in ICU, 191 ID and 494 Non-ID received NIV. The ID patients were younger (p = 0.0007), the less frequently with cardiac insufficiency (p = 0.002), patients with arterial hypertension (p = 0.005) and the more frequently carrier of systemic disease (p = 0.0001). Their admission in ICU was delayed in as compared to that of the others (p = 0.0003), and their severity score and SOFA and IGS II were higher (respectively p = 0.014; p = 0.010).

We thus derived a propensity score of being immunosuppressed, based on the following 11 variables: age, cardiac failure, HTA, COPD, systemic disease, renal failure, SOFA, $PaCO_2$, pH, and time from hospital admission to intensive care unit. We also introduced severe hepatitis (trend towards prognostic effect), as well as mechanical ventilation.

Based on the score, 102 (84 %) patients with ID were matched to a control. A multivariate analysis of factors associated to the hospital mortality, adjusted on the propensity score to be ID, was realized. In an interesting way, this analysis does not identify the immunosuppression as a factor of mortality for patients with hypoxemic ARF receiving NIV (OR = 1.26 (95 % CI 0.58–2.71); p = 0.56).

CONCLUSIONS. For patients admitted in ICU for hypoxemic acute respiratory failure and receiving NIV, the immunosuppression is not a risk factor of hospital mortality.

0004
IMMEDIATE INTUBATION VS. INTUBATION DELAYED BY A NON-INVASIVE VENTILATION TRIAL IN COPD PATIENTS WITH ACUTE RESPIRATORY FAILURE: A NATIONWIDE OBSERVATIONAL COHORT STUDY OF LONG TERM SURVIVAL

J. von Walter[1], J. Berkius[2,3], C.-J. Wickerts[4], S.M. Walther[2], on behalf of the Swedish Intensive Care Registry

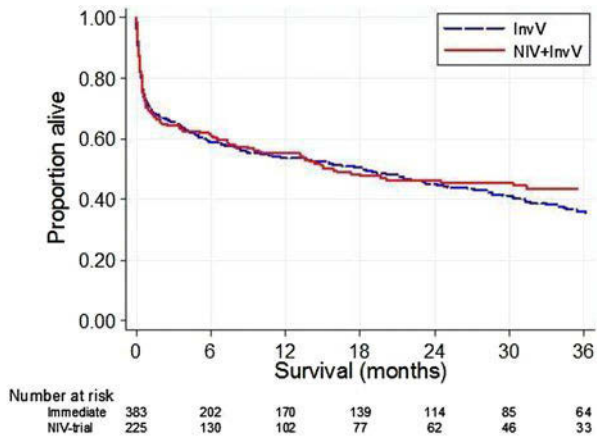
[1]Nyköping Hospital, Dept of Anaesthesia and Intensive Care, Nyköping, Sweden, [2]Linköping University, Dept of Medicine and Health, Div of Cardiovascular Medicine, Linköping, Sweden, [3]Västervik Hospital, Dept of Anaesthesia and Intensive Care, Västervik, Sweden, [4]Danderyd Hospital and Karolinska Institutet, Div of Anaesthesia and Intensive Care and Dept of Clinical Sciences, Stockholm, Sweden

INTRODUCTION. Non-invasive ventilation (NIV) is a first line treatment in the care of COPD patients with an acute exacerbation (AECOPD). Many opportunities to use NIV are missed; some probably of concern that a trial of NIV followed by delayed intubation would increase the risk of death.

OBJECTIVES. To compare long-term survival after immediate and delayed intubation in patients with AECOPD.

METHODS. Admissions in the Swedish Intensive Care Registry (http://www.icuregswe.org) during 2008–2012 were examined. Patients admitted with AECOPD were identified by the principal diagnosis at discharge from ICU. Age, gender, illness severity (SAPS3) and length of ICU-stay were analyzed per treatment group (immediate vs. NIV-trial groups). Survival was examined using Cox's proportional hazards regression.

RESULTS. We identified 2,628 admissions with AECOPD, 483 were intubated immediately while 264 were intubated after an NIV-trial, the remainder were managed by NIV alone (N = 1,881). Median time to intubation after admission to ICU was in the immediate group 0.25 (iqr 0–1.5) h and in the NIV-trial group 6.5 (iqr 3.1–13.7) h, P < 0.001 for difference. The immediate group had higher SAPS3 probabilities (P < 0.05) and shorter stay in the ICU (P < 0.001). Survival adjusted for age, gender and SAPS3-probabilities was (after excluding 139 readmissions), not significantly different with an NIV trial compared to immediate intubation (hazard ratio 0.92, 95 % CI 0.72–1.17). The result was similar when 273 patients with an initial arterial pH < 7.25 were analyzed (hazard ratio 1.04.



[Long-term survival (readmissions excluded)]

CONCLUSIONS. In patients with AECOPD an initial NIV trial in the ICU is justified and does not appear to compromise patient survival although the length of stay in the ICU is prolonged.

GRANT ACKNOWLEDGMENT. The Swedish Intensive Care Registry is partly funded by grants from the Executive Committee of Swedish Quality Registries.

0005

A SONOGRAPHIC STUDY ON THE EFFECTS OF PEEP ON DIAPHRAGMATIC KINETICS IN HEALTHY VOLUNTEERS

E. Soilemezi[1], A. Kalakonas[1], I. Schiza[1], A. Pitsoulis[1], E. Kotco[1], D. Matamis[1]

[1]Papageorgiou General Hospital, ICU, Thessaloniki, Greece

INTRODUCTION. Diaphragmatic sonography has recently gained interest in ICU patients. However, there is limited knowledge in diaphragmatic kinetics studied by sonography. There are no data on the diaphragmatic kinetics in healthy individuals and in ICU patients, when diaphragm is passively displaced from the FRC towards the TLC with the application of PEEP.

OBJECTIVES. To investigate the effect of different levels of PEEP on diaphragmatic kinetics, breathing pattern and respiratory muscle metabolism in healthy volunteers.

METHODS. Diaphragmatic thickness at expiration and inspiration, thickness ratio and diaphragmatic excursion were studied by sonography in healthy volunteers, while breathing at different levels of PEEP (0, 5, and 10 cmH_2O). Breathing pattern and respiratory muscle metabolism were studied by indirect calorimetry with the CPX ultima indirect calorimetry machine, assuming that every change in Resting Energy Expenditure (REE) over the 20 min period of the experiment is mainly due to the respiratory muscles activity. Subjects were studied in semi-recumbent position and between each step of the study 10 min of recovery was allowed. Sonographic (B and M mode) and metabolic data were recorded after 5 min of adaptation at each step. Diaphragmatic thickness during inspiration and expiration were measured with a 10 MHz probe in the zone of apposition and diaphragmatic excursion in the middle or posterior third of the diaphragm with a broad band sector array (1.7–3.5 MHz) probe. Statistics were performed with the SPSS software package.

RESULTS. 28 healthy volunteers (14 men and 14 women, mean age 33 years, min = 21, max = 45) were studied. Diaphragmatic thickness at expiration progressively increased with PEEP from 1.9 to 2.4 mm (p < 0.01). Diaphragmatic thickness at inspiration increased also from 2.7 to 3.7 mm to leading to an increase in thickness ratio, from 0.35 ± 0.31 to 0.47 ± 0.35 (p < 0.01). Diaphragmatic excursion increased 68 %, from 2.13 to 3.6 cm (p < 0.01). At PEEP 10 tidal volume increased from 0.8 ± 0.4 to 1 ± 0.5 l (p < 0.01) and respiratory rate decreased from 14 ± 4 to 11 ± 4 breaths/min (p < 0.01) maintaining the same minute ventilation (11 l/min). The increase in passive FRC by applying 10 cmH_2O of PEEP, induced a 17 % increase in REE/predicted from 109 ± 26 to 126 ± 20 % (p < 0.01).

CONCLUSIONS. According to our data in healthy individuals increasing passively FRC towards TLC with PEEP modifies the breathing pattern and induces a significant increase in diaphragmatic thickness at end expiration (the same muscular mass in a less diaphragmatic surface), a significant increase in diaphragmatic contraction (thickness ratio and excursion) and a significant increase in the diaphragmatic work of breathing and energy consumption.

Bench to bedside: frontiers in ARDS: 0006–0010

0006

PRACTICE CHANGES IN ARDS: OBSERVATIONS FROM THE OSCILLATE TRIAL

M.O. Meade[1,2], R. Teneja[3], L. Hand[1,2], E. Jiminez[4], A. Arroliga[5,6], J. Sanchez[5,6], N.D. Ferguson[7],
The OSCILLATE Trial investigators and the Canadian Critical Care Trials Group

[1]McMaster University, Medicine, Hamilton, Canada, [2]Hamilton Health Sciences, Critical Care, Hamilton, Canada, [3]University of Western Ontario, Anesthesia, Medicine and Critical Care, London, Canada, [4]Orlando Health Inc., Critical Care Medicine, Orland, USA, [5]Scott and White Hospital, Critical Care Medicine, Temple, USA, [6]Texas A&M HSC College of Medicine, Medicine, Temple, USA, [7]University Health Network, Critical Care Medicine, Toronto, Canada

INTRODUCTION. Mechanical ventilation practices in ARDS are influenced by new research, available technologies, and costs.

OBJECTIVES. To investigate changes in ventilation practices during a randomized trial of high frequency oscillation in adult ARDS.

METHODS. The OSCILLATE pilot trial (June 2007–July 2008) was followed, after a 1-year hiatus, by the OSCILLATE trial (July 2009–August 2012). We analyzed baseline data and on-study data (up to 28 days), as appropriate. We used linear regression to assess for changes in continuous variables (e.g., tidal volume) over time, and the Cochrane Armitage trend test to investigate changing patient proportions (e.g., the proportion of patients receiving neuromuscular blockade) over 4 discreet years of study. We adjusted for concurrent changes in prognostic variables and center effects, and prespecified hypotheses for each analysis.

RESULTS. OSCILLATE enrolled 548 adults with ARDS. Baseline data showed consistent tidal volumes over the four discreet years of study (on average, 7.0 ± 2.0 mL/kg), as well as plateau airway pressures (29 ± 6 cmH_2O), and positive end-expiratory pressures (13 ± 4 cmH_2O) over time. Use of volume assist control mode increased over time (from 16 % in the first year to 27 % in the fourth year; p = 0.009), and pressure control mode decreased (from 67 to 50 %; p = 0.002), with no change in pressure support mode (8.6 % of patients overall at baseline; p = 0.19). Assessing on-study data, there was no change in the proportion of patients receiving systemic corticosteroids (57.9 %), or neuromuscular blockers (54.7 %). Esophageal pressure monitoring was rare (1.1 %). Pulmonary artery catheterizations declined (from 11 to 3 %; p = 0.024). Among 109 patients with severe hypoxemia, there was a steady increase in airway pressure release ventilation (APRV; from 0 to 19 %; p = 0.08), with no change in inhaled nitric oxide (13.9 %) or prone positioning (20.2 %).

CONCLUSIONS. Efforts at volume- and pressure-limitation did not appear to change over time despite changes in ventilator mode, which was predominantly pressure control. Rates of neuromuscular blockade remained constant over time, and pulmonary artery catheterizations declined. APRV was increasingly applied as rescue therapy.

With funding from the Canadian Institutes of Health Research.

0007

PREVALENCE AND MORTALITY OF ARDS USING THE BERLIN DEFINITION: A MULTICENTER PROSPECTIVE EPIDEMIOLOGICAL STUDY IN AN UNIVERSITY HOSPITAL

R. Hernu[1], F. Wallet[2], A. Lepape[2], O. Martin[3], J.-C. Richard[4], Z. Schmidt[5], B. Delannoy[6], C. Demaret[7], T. Rimmelé[3], C. Magnin[8], H. Vallin[2], L. Baboi[4], V. Piriou[2], B. Allaouchiche[3], L. Argaud[1], F. Aubrun[5], O. Bastien[6], J.-J. Lehot[7], L. Ayzac[9], C. Guérin[4], REALYS

[1]Hopital Edouard Herriot, Service de Réanimation Médicale, Lyon, France, [2]Centre Hospitalier Lyon Sud, Service d'Anesthésie-Réanimation, Pierre Bénite, France, [3]Hopital Edouard Herriot, Service de Réanimation Polyvalente, Lyon, France, [4]Hôpital de la Croix Rousse, Service de Réanimation Médicale, Lyon, France, [5]Hôpital de la Croix Rousse, Service de Réanimation Chirurgicale, Lyon, France, [6]Hopital Cardiovasculaire et Pneumologique, Service de Réanimation Polyvalente, Bron, France, [7]Hopital Neurologique, Service d'Anesthésie-Réanimation, Bron, France, [8]Hopital Edouard Herriot, Service de Réanimation des Brûlés, Lyon, France, [9]Hopital Henri Gabriel, Service de Biostatistique, Saint Genis Laval, France

INTRODUCTION. A new definition of ARDS (ARDSn) has recently been proposed[1] to take over the previous (ARDSo) consensus definition [2].

OBJECTIVES. In present study, we aimed at determining: 1. frequency of ARDS in ICU with the new and previous criteria [2] 2. ARDSn prevalence and density of incidence, 3. ARDSn characteristics on admission and day 28 mortality.

METHODS. Prospective epidemiological study in the 10 adult ICUs of the University of Lyon, France, over a 6-month period (March–September 2012). Patients receiving invasive or non invasive mechanical ventilation, with PaO_2/FIO_2 <300 regardless of PEEP level and acute onset of new or increased bilateral infiltrates or opacities on chest X-ray were screened from ICU admission up to discharge. Patients with increased left atrial pressure were excluded. Complete data set was recorded on ICU admission. Patient outcome was measured at day 28 after inclusion. Prevalence was computed as the number of ARDS cases divided by the number of ICU admissions. Density of incidence per 1,000 days without ARDS.patient was computed as number of ARDS cases divided by the cumulative number of days without ARDS in the overall sample.

RESULTS. During the study period 3,504 patients were admitted and 279 fulfilled ARDSo criteria. Among them, 11 did not comply with ARDSn criterion PEEP < 5 cmH_2O. For mild, moderate and severe ARDSn, prevalence was 1.26, 4.37, and 2.03 %, respectively (total prevalence 7.65 %). The corresponding values for density of incidence 2.68, 9.33, and 4.33 ‰, respectively (total density of incidence 16.35 ‰). Main characteristics at time of inclusion (mean ± SD) are shown in table 1. ARDS was due to pneumonia in 54.5, 60.8 and 62 % for each ARDSn category. The day 28 mortality was 27.3, 28.9 and 50.7 % (P < 0.01). In Cox proportional hazard model, SAPS II and neuromuscular blockade on admission increased and body mass index decreased the risk for day 28 mortality. ARDSn stage was not a significant covariate to death.

Table 1

	Mild (n = 44)	Moderate (n = 153)	Severe (n = 71)
Age (years)*	56 ± 17	63 ± 15	57 ± 17
M gender (%)	70.5	68.0	80.3
SAPS II	55 ± 20	55 ± 21	60 ± 24
SOFA	10 ± 4	10 ± 4	11 ± 4
NIV at inclusion (%)	11.4	22.9	11.3
VT (ml/kg PBW) intubation	7.4 ± 1.5	7.2 ± 1.4	7.1 ± 1.3
PEEP (cmH_2O) intubation**	7.5 ± 2.8	7.7 ± 2.7	9.3 ± 3.0
FIO_2 intubation**	0.59 ± 0.26	0.67 ± 0.19	0.87 ± 0.15
Plateau pressure* (cmH_2O)	22 ± 4	22 ± 5	24 ± 5

* P < 0.05, ** P < 0.01 across ARDS stages

CONCLUSIONS. ICU prevalence of ARDSn was 7.65 % and density of incidence 16.35 ‰. Moderate ARDS had highest prevalence and density of incidence but day 28 mortality close to that in mild ARDS.
REFERENCE(S). 1. Ranieri MV. JAMA; 2012. 2. Bernard GR. Intensive Care Med; 1994.

0008

AKT2 DEFICIENCY AND ALTERNATIVE ACTIVATION OF MACROPHAGES PROTECTS FROM ACID-ASPIRATION INDUCED ARDS VIA INDUCTION OF MIR-146A

E. Vergadi[1,2], K. Vaporidi[2], C. Doxaki[1], E. Kondili[2], D. Georgopoulos[2], C. Tsatsanis[1]

[1]University of Crete, Faculty of Medicine, Department of Clinical Chemistry, Heraklio, Greece, [2]University of Crete, Faculty of Medicine, Department of Intensive Care Medicine, Heraklio, Greece

INTRODUCTION. Macrophages are key players in the inflammatory response of ARDS [1]. Activated macrophages can acquire a classical, pro-inflammatory, M1 phenotype, expressing high levels of iNOS; or an alternative, anti-inflammatory, M2 phenotype, expressing high levels of arginase-1 [2]. In animal models of ARDS classical activation of macrophages through TLR4 with increased iNOS expression is observed [1]. We have recently reported that alternative macrophage activation is protective in animal models of acute inflammation [3]; and that macrophage activation is differentially regulated by Akt kinases, Akt1-deficient mice being M1-prone, while Akt2-deficient mice being M2-prone.
OBJECTIVES. We tested the hypothesis that prevention of M1 activation and early M2 polarization is protective in a mouse model of ARDS. Additionally we investigated the mechanisms by which Akt2 affects macrophage phenotype, focusing on the role of miR-146a, a known regulator of TLR4 signaling. Finally we tried to modulate macrophage phenotype in vivo by targeting Akt2 signaling.
METHODS. ARDS was induced in WT and $Akt2^{-/-}$ mice (n = 8/group) by HCl acid aspiration. Additional WT mice were treated intratrachealy with siAkt2 and miR-146a mimic. Lung injury was evaluated by lung compliance, concentrations of protein and cytokines in bronchoalveolar lavage (BAL) and histology. Activation profile of macrophages was analyzed by qPCR and FACS. WT and $Akt2^{-/-}$ macrophages were transfected in vitro with miR-146a mimic or antagomiR and their activation state was assessed.
RESULTS. Acid-induced lung injury in WT mice was characterized by decreased lung compliance, increased protein and cytokine concentration in BAL fluid, and M1 activation of alveolar macrophages with up-regulated iNOS and IL-12β. Lung injury was less severe in $Akt2^{-/-}$ mice and their alveolar macrophages demonstrated an M2 phenotype, including suppressed iNOS and IL-12β expression and up-regulation of Arginase-1. The expression of miR-146a in $Akt2^{-/-}$ macrophages was higher than in WT, both prior to acid aspiration, as well as 12 and 24 h after. MiR-146a over-expression in WT macrophages suppressed LPS-induced iNOS expression and promoted M2 polarization, while miR-146a inhibition in $Akt2^{-/-}$ macrophages restored iNOS expression, supporting the role of mir-146a in Akt2-mediated promotion of M2. Finally, treatment with siAkt2 or miR-146a-mimic suppressed acid-aspiration induced iNOS expression in alveolar macrophages.
CONCLUSIONS. In a mouse model of acid aspiration, depletion of Akt2 prevents M1 and promotes early M2 activation, via induction of miR-146a, resulting in amelioration of lung injury. Modulation of macrophage phenotype through Akt2 or miR146a is feasible in vivo, providing a potential therapeutic approach for ARDS.
REFERENCE(S). 1. Am J Physiol Lung Cell Mol Physiol. 2008;295:L379. 2. Immunity. 2010;32:593. 3. PNAS. 2012;109:9517.
GRANT ACKNOWLEDGMENT. GSRT-Aristeia #2071 to CT, ESICM 2010 Basic Science Award to KV.

0009

PLEURAL DISTENSION OBSERVED BY LUNG ULTRASOUND MAY IDENTIFY LUNG OVERDISTENSION INDUCED BY POSITIVE END-EXPIRATORY PRESSURE IN RATS

A.M. Japiassu[1,2], B. Bergamini[3], N. Carvalho[4], A.R. Carvalho[4,5]

[1]Institute of Clinical Research Evandro Chagas, FIOCRUZ, ICU, Rio de Janeiro, Brazil, [2]D'Or Institute for Research and Education, Rio de Janeiro, Brazil, [3]COPPE-UFRJ, Biomedical Engineering Program, Rio de Janeiro, Brazil, [4]IBCCF-UFRJ, Laboratory of Respiration Physiology, Rio de Janeiro, Brazil, [5]INCT-INBEB, UFRJ, National Institute of Biomolecules and Bioimaging, Rio de Janeiro, Brazil

INTRODUCTION. Lung ultrasonography (LUS) has been used for monitoring lung injury and clearly allows pleural visualization in mechanically ventilated patients. We hypothesized that, as far as lung is overdistended by positive end-expiratory pressure (PEEP), pleural displacement can be evaluated and used as a surrogate for regional lung overdistention.
OBJECTIVE. To evaluate the correlation between the reductions in pleural displacement (dPl) visualized by LUS and the detection of PEEP-induced overdistension in mechanically ventilated rats.
METHODS. Fourteen male Wistar rats (300 ± 40 g) were anesthetized, paralyzed and mechanically ventilated (baseline settings: VT = 6 ml/kg, PEEP = 0, RR = 90 bpm, I:E ratio = 1:2 in room air). Five minutes thereafter, PEEP was sequentially increased to 3, 6 and 8 cmH_2O, 30–45 s per step. At PEEP = 0 and 8 cmH_2O, LUS (Vevo 770 System, Visualsonics, Fujifilm Inc) images were acquired at the right inferior quadrant of the thorax, closed to the liver, with convex probe (17.5 MHz), with capture of one 10-s video. dPl was quantified with a built-purpose routine written in Matlab, by taking the total number of pixels, obtained from a ROI selected at pleural segment and applied for each frame of LUS images. A distension index ($\%E_2 = 100[E_2V_T/(E_1 + E_2V_T)]$, where E_1 and E_2 are the volume-independent and -dependent component of elastance and V_T is the tidal volume) was also calculated in a breath-by-breath basis fitting, with the least squares method, $Paw(t) = Rrs \cdot F(t) + (E_1 + E_2V)^{-} V + EEP$, where Rrs, F and V are respiratory system resistance, airflow and volume. Accordingly, a $\%E_2 < 0$ suggests tidal recruitment whereas $\%E_2 > 10$ % suggests tidal overdistension. The effect of PEEP on $\%E_2$ and dPl was assessed with a Wilcoxon test. Additionally, the Spearman-correlation between $\%E_2$ and dPl was computed.
RESULTS. $\%E_2$ significantly increased with PEEP, while dPl decreased. A significant correlation ($r = -0.34$, $p < 0.01$) was observed between $\%E_2$ and dPl. Fig. 1 (a) Increase in distension index (%E2) with PEEP levels 0 and 8 cmH_2O ($p < 0.001$); (b) decrease in the variation of pleural displacement (dPl) seen by lung ultrasonography ($p = 0.017$); (c) Spearman correlation of dPl and $\%E_2$ ($r = 0.39$; $p = 0.0044$).

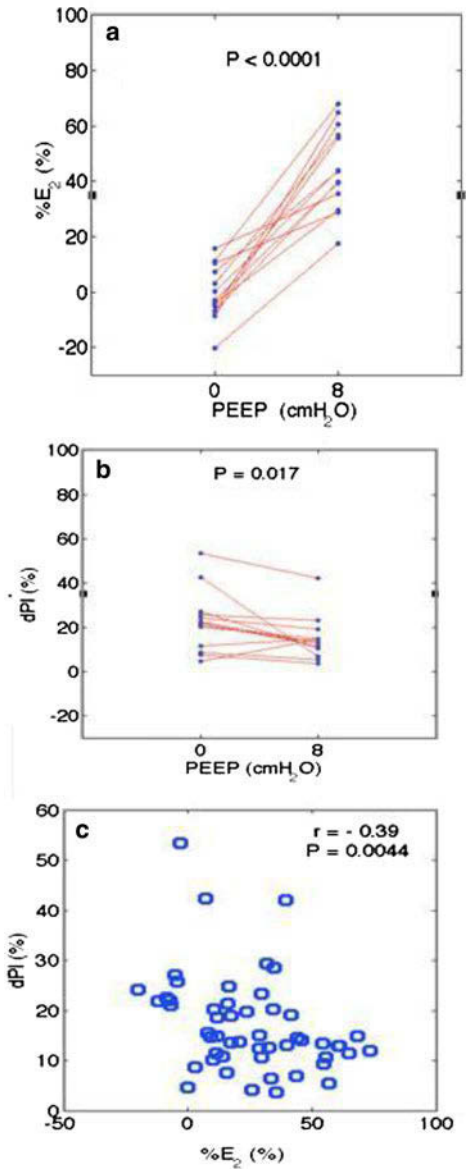


Fig. 1

CONCLUSION. A reduction on measured pleural distension by LUS correlates with PEEP-induced overdistension in lung-healthy mechanically ventilated rats.

0010

INFORMED MIRNA TARGET DISCOVERY FOR GENE AND STEM CELL THERAPY IN ACUTE LUNG INJURY

D.Y. Zhou[1], Y. Shan[1], H. Amatullah[1], P. Gali[1], L. Zhou[1], C. Liles[2], C. dos Santos[1]

[1]University of Toronto, Toronto, Canada, [2]University of Washington, Seattle, Canada

INTRODUCTION. Sepsis-induced acute respiratory distress syndrome (ARDS) is a leading cause of mortality in critically ill patients. Recently, mesenchymal stem cells (MSC) have shown reparative potential in both sepsis and ARDS.
OBJECTIVES. To determine the role of MSC administration in the modulation of pulmonary host-responses to sepsis via differential transcription of regulatory microRNAs (miRNAs).
METHODS. To identify differential expression of regulatory miRNA in septic mice treated with MSC vs. placebo total RNA was isolated from whole lungs [1] and miRNA profiling was performed using the Exiqon miRCURY LNA™ microRNA Arrays. Intensity values were normalized (Lowess). Determination of differential miRNA expression was performed in R/bioconductor using the LIMMA package. miRNAs with a FDR of ≤0.05 were considered differentially expressed in MSC treated mice. In parallel we used microarray analysis to profile mRNA expression in the same samples [2].
RESULTS. MiRNA profiling yielded a total of 21 candidate miRNAs as significantly changes in septic murine lungs in response to MSCs. In parallel, a group of junctional

proteins associated with endothelial leakage were shown to be differentially expressed by microarray (mRNA) and share putative targets for specific miRNAs of interest. To select miRNAs for further analysis we assessed changes in the expression of all top miRNAs by qRT-PCR in response to TNF-α (10 ng/ml) and LPS (1 μg/ml) in primary Human Pulmonary Microvascular Endothelial Cells (HPMEC). Selected miRNAs showed marked regulation by both TNF/LPS and exposure to conditioned medium from MSCs. Specific target genes were shown to be changed as predicted at the protein level by Western blot. Transfection of miRNAs mimic(s) and inhibitor(s) in HPMEC was used to establish a regulatory relationship between the miRNA and mRNA of interest. Measurement of transendothelial electrical resistance and dextran paracellular leakage was used to determine a biological relationship between miRNAs of interest and functional cellular phenotype. Similarly, a recombinant luciferase plasmid construct was used to determine the specificity of the regulatory relationship between the miRNA and mRNA.

CONCLUSION. By combining the mRNA and miRNA microarrays, we generated a high throughput system to analyse putative MSC-dependent regulatory miRNAs in septic lungs. Moreover, exploiting the response to MSC allows us to identifying those transcriptional regulatory changes that are most likely to be therapeutically relevant for the treatment of ARDS/ALI.

REFERENCES. Mei S, et al. Am J Resp Crit Care Med. 2010;182:1047–57; dos Santos et al. Am J Pathol. 2012;181(5):1681–92.

GRANT ACKNOWLEDGMENT. Canadian Institutes of Health Research (Grant # MOP-106545 to CCDS), the ERA of the Ministry of Research and Innovation of Ontario, and Li Ka Shing Knowledge Institute at Keenan Research Centre.

Old and new management strategies in sepsis: 0011–0015

0011

A TIME SERIES EVALUATION OF CRYSTALLOID AND COLLOID RESUSCITATION PRACTICES IN AUSTRALIA AND NEW ZEALAND INTENSIVE CARE UNITS: PRELIMINARY DATA

N.E. Hammond[1,2,3], C. Taylor[1], B. Liu[3], S. Finfer[1,2,4], P. Glass[1], M. Saxena[1,3,5], I. Seppelt[1,6], L. Willenberg[1], J. Myburgh[1,3,5], For the Australian and New Zealand Intensive Care Society (ANZICS) Clinical Trials Group (CTG) and the George Institute for Global Health

[1]The George Institute For Global Health, Critical Care and Trauma Division, Sydney, Australia, [2]Royal North Shore Hospital, Intensive Care, Sydney, Australia, [3]University of New South Wales, Sydney, Australia, [4]University of Sydney, Sydney, Australia, [5]St George Hospital, Intensive Care, Sydney, Australia, [6]Nepean Hospital, Intensive Care, Sydney, Australia

INTRODUCTION. Administering fluid for resuscitation is among the most common practices in the intensive care setting. The type, volume and duration of fluid use vary between countries with colloids administered more often to patients than crystalloids [1]. Colloids are more expensive than crystalloids and recently published research indicates they may be harmful in some patient groups [2–4].

OBJECTIVES. We prospectively planned to track fluid resuscitation in Australia and New Zealand ICUs over a six-year period using the established point prevalence program of the ANZICS-CTG.

METHODS. Patients were included if they were ≥16 years, were present in the participating ICU at 10 am on the study day, and required fluid for intravascular volume expansion at any time on the study day. Data collection for this fluid series was conducted at 5 time points from April 2007 to December 2012. We report preliminary data of 4 time points from April 2007–Jun 2012. Ethics approval was obtained at each hospital, individual patient consent was waived.

RESULTS. Participating sites on the 4 study days ranged from 24 to 44 ICUs, with total numbers of patients requiring fluid resuscitation on the 4 study days ranging between 131–163 patients. Colloids were given for resuscitation in 93/142 (66 %) patients during the 2007 study day, 78/132 (59 %) patients in 2010, 69/131 (52 %) patients in 2011, and 83/163 (63 %) patients in 2012. Crystalloid for resuscitation was administered in 33/142 (23 %) patients in 2007, 29/132 (22 %) patients in 2010, 46/131 (35 %) patients in 2011, and 79/163 (60 %) patients in 2012. Table 1 shows further description of fluid used for resuscitation: the categories are not mutually exclusive as patients could receive resuscitation with more than one type of fluid.

CONCLUSIONS. The use of 4 % albumin remains the most commonly prescribed colloid in this time series with gelatin use decreasing and starch use remaining negligible. Crystalloid use increased over the time series; although 0.9 % saline is still most commonly used, the administration of balanced salt solutions is increasing.

REFERENCE(S). 1. Finfer S, Liu B, Taylor C, et al. Resuscitation fluid use in critically ill adults: an international cross-sectional study in 391 intensive care units. Crit Care. 2010;14:R185. 2. SAFE Study Investigators. Saline or albumin for fluid resuscitation in patients with traumatic brain injury. N Engl J Med. 2007;357:874–84. 3. Myburgh J, Finfer S, Bellomo R, et al. Hydroxyethyl starch or saline for fluid resuscitation in intensive care. N Engl J Med. 2012;367:1901–11. 4. Perner A, Haase N, Guttormsen AB, et al. Hydroxyethyl starch 130/0.42 versus Ringer's acetate in severe sepsis. N Engl J Med. 2012;367:124–34.

Type of fluid used for resuscitation

	2007 (n = 142)	2010 (n = 132)	2011 (n = 131)	2012 (n = 163)
All colloids	93 (66 %)	78 (59 %)	69 (52 %)	83 (63 %)
Albumin 4 %	52 (37 %)	44 (33 %)	46 (35 %)	53 (40 %)
Albumin 20 %	6 (4 %)	14 (11 %)	12 (9 %)	22 (17 %)
6 % HES (130/0.4)	0 (0 %)	0 (0 %)	1 (0.8 %)	6 (4.5 %)
Gelatins	41 (29 %)	25 (18.9 %)	7 (5.3 %)	10 (7.9 %)
All crystalloids	33 (23 %)	29 (22 %)	46 (35 %)	79 (60 %)
0.9 % saline	26 (18 %)	20 (15 %)	30 (23 %)	44 (33 %)
Balanced salt solutions	7 (5 %)	11 (8 %)	16 (12 %)	26 (20 %)

0012

HYDROXYETHYL STARCH 130/0.42 VERSUS RINGER'S ACETATE IN SEVERE SEPSIS: POST-HOC ANALYSES OF COAGULATION, BLEEDING AND TRANSFUSION IN A RANDOMISED TRIAL

N. Haase[1], J. Wetterslev[2], P. Winkel[2], A. Perner[1], 6S trial investigators

[1]Copenhagen University Hospital, Rigshospitalet, Dept. of Intensive Care, Copenhagen, Denmark, [2]Copenhagen University Hospital, Rigshospitalet, Copenhagen Trial Unit, Centre for Clinical Intervention Research, Copenhagen, Denmark

INTRODUCTION. In the Scandinavian Starch for Severe Sepsis/Septic Shock (6S) trial patients assigned to hydroxyethyl starch (HES) 130/0.42 vs. Ringer's acetate had a strongly increased risk of having bleeding and transfusion with red blood cells (RBC) [1]. However, these outcomes were not originally protocolized.

OBJECTIVES. To further explore the relationship between type of trial fluid and haemostatic variables, bleeding and RBC transfusion in the 6S trial.

METHODS. Post-hoc analyses of the blinded, multicenter randomised clinical 6S trial allocating patients with severe sepsis to fluid resuscitation in the intensive care unit with HES 130/0.42 (Tetraspan 6 %, B Braun, Germany) versus Ringer's acetate (Sterofundin ISO, B Braun).

RESULTS. Overall, 93 (23 %) patients assigned to HES 130/0.42 and 60 (15 %) patients assigned to Ringer's acetate had a bleeding episode in the ICU (relative risk (RR) 1.55; 95 % CI 1.16–2.08; p = 0.003).

Most frequently the patients bleed during surgery, from wounds or the upper GI tract, but the increased risk of bleeding in patients in the HES group seemed independent of bleeding location (Table 1). The majority of bleedings occurred within the first days after randomisation (day 1: 33 %; day 2: 15 %; day 3: 7 %) when most trial fluid was given. In this period, international normalised ratio (INR) was higher and plasma levels of haemoglobin lower in the HES-group (p values for differences in area under the curve 0.04 and 0.003, respectively). In multiple regression analysis assignment to HES remained an independent risk factor for bleeding.

The hazards ratios (HR) of bleeding (1.70; 95 % CI 1.23–2.36; p = 0.001) and of being transfused with RBC (1.42; 95 % CI 1.17–1.73; p < 0.001) were significantly higher in the HES group than in the Ringer's acetate group in both adjusted and unadjusted analyses. When patients with bleeding were censored, the HR estimates for 90 day mortality with HES were reduced from 1.20 to 1.15 indicating that bleeding may contribute to the excess mortality with HES.

In all patients, development of a bleeding significantly increased the hazard of dying (HR 1.39; p = 0.01).

CONCLUSIONS. In post hoc analyses of this international, blinded, multicenter randomised trial, patients with severe sepsis assigned to HES 130/0.42 versus Ringer's acetate had impaired coagulation and increased risk of bleeding. HES-induced coagulopathy and bleeding may have contributed to the increased mortality with HES observed in this trial.

REFERENCE(S). 1. Perner A, Haase N, et al. Hydroxyethyl starch 130/0.42 versus Ringer's acetate in severe sepsis. N Engl J Med. 2012;367:124–34.

GRANT ACKNOWLEDGMENT. The 6S trial was funded by the Danish Research Council and other public foundations.

Table 1. Relative risk of bleeding according to trial fluid and anatomical site

Anatomical site of bleeding	HES 130/0.42 (n = 398)	Ringer's acetate (n = 400)	Relative risk (95 % CI)	*P* value
Intracranial	2 (1)	5 (1)	0.40 (0.08–2.05)	0.45
Upper GI-tract	34 (9)	18 (5)	1.89 (1.09–3.30)	0.02
Lower GI-tract	15 (4)	13 (3)	1.16 (0.56–2.40)	0.69
Urinary tract	5 (1)	2 (1)	2.51 (0.49–12.8)	0.29
Lower airway	11 (3)	12 (3)	0.92 (0.41–2.06)	0.84
Wounds	27 (7)	18 (5)	1.50 (0.84–2.69)	0.16
During surgery	33 (8)	26 (7)	1.27 (0.78–2.09)	0.34
Total	93 (23)	60 (15)	1.55 (1.16–2.08)	0.003

Numbers of patients (%) are given. P-values are from Chi square test or from Fisher's exact test if expected numbers were <5

0013

EFFECTS OF DOBUTAMINE ON SYSTEMIC, REGIONAL AND MICROCIRCULATORY PERFUSION PARAMETERS IN SEPTIC SHOCK. A RANDOMIZED, PLACEBO-CONTROLLED, DOUBLE-BLIND, CROSSOVER STUDY

G. Hernandez[1], A. Bruhn[1], C. Luengo[2], T. Regueira[1], E. Kattan[1], A. Fuentealba[1], J. Florez[1], A. Aquevedo[1], R. Pairumani[1], C. Ince[3]

[1]Pontificia Universidad Católica de Chile, Departamento de Medicina Intensiva, Santiago, Chile, [2]Hospital Clínico Universidad de Chile, Unidad de Pacientes Críticos, Santiago, Chile, [3]Academic Medical Centre, Department of Translational Physiology, Amsterdam, The Netherlands

INTRODUCTION. The role of dobutamine during septic shock resuscitation is still controversial since most clinical studies have been uncontrolled and no physiological study has unequivocally demonstrated a beneficial effect on tissue perfusion.

OBJECTIVES. Our objective was to the potential benefits of dobutamine on hemodynamic, metabolic, peripheral, hepatosplanchnic, and microcirculatory perfusion parameters during early septic shock resuscitation.

METHODS. We designed a randomized controlled, double-blind, crossover study comparing the effects of 2.5 h infusion of dobutamine (5 mcg/kg/min fixed-dose) or placebo in septic shock patients with cardiac index ≥2.5 L/min/m^2 and hyperlactatemia. Primary outcome measure was change in microcirculatory perfused vessel density.

RESULTS. Dobutamine significantly increased cardiac index, heart rate and left ventricular ejection fraction compared to placebo. No differences between dobutamine and placebo were found for lactate, mixed venous-arterial pCO_2 gradient, thenar muscle oxygen saturation, capillary refill time, or gastric-to-arterial pCO_2 gradient. Sublingual perfused vessel density (9.0 [7.9–10.1] vs. 9.1 n/mm [7.9–9.9]; p = 0.24) and microvascular flow index (2.1 [1.8–2.5] vs. 2.1 [1.9–2.5]; p = 0.73) were comparable between dobutamine and placebo. Indocyanine green plasma disappearance rate (14.4 [9.5–25.6] vs. 18.8 %/min [11.7–24.6]; p = 0.03), as well as the recovery slope of thenar muscle oxygen saturation after a vascular occlusion test (2.1 [1.1–3.1] vs 2.5 %/s [1.2–3.4]; p = 0.01) were lower with dobutamine compared to placebo.

CONCLUSIONS. Dobutamine failed to improve sublingual microcirculatory, metabolic, hepatosplanchnic or peripheral perfusion parameters despite inducing a significant increase in systemic hemodynamic variables in septic shock patients without low cardiac output but with persistent hypoperfusion.
GRANT ACKNOWLEDGMENT. FONDECYT Chile, Project 1100610.

0014
FLUID BALANCE IN PATIENTS WITH SEVERE SEPSIS AND/OR SEPTIC SHOCK

A. Rodriguez[1], C. De Haro[1], C. Teixido[1], E. Torrents[1], C. Espinal[1], A. Artigas[1]

[1]Critical Care Unit. CIBER Respiratory Diseases. Hospital de Sabadell. Corporació Sanitària i Universitària Parc Taulí (CSPT), Universitat Autònoma de Barcelona (UAB), Tauli Hospital, Barcelona, Spain

INTRODUCTION. Fluid administration is essential for the initial resuscitation of sepsis. Once the initial resuscitation phase is done, a liberal fluid administration therapy could be deleterious.
OBJECTIVES. To evaluate the effect of fluid balance (FB) in the resolution of septic shock and organ dysfunction, as well as the fulfillment of initial resuscitation goals of the Surviving Sepsis Campaign. To evaluate the effect of negative versus positive FB after the second day of sepsis evolution.
METHODS. Retrospective observational study (November2010–November 2011). We included patients with severe sepsis and/or septic shock admitted in a polyvalent ICU. We analyzed clinical variables, cumulative FB in the first 4 days of sepsis and administrated treatment. Patients were classified into two groups regarding if they had positive or negative balance after the second day. Data were analyzed with t-student and Pearson correlation, and were presented as mean ± standard deviation, percentage and Pearson correlation coefficient.
RESULTS. We included 99 patients (58.6 % male), mean age was 66.68 ± 14 years old and the APACHE II at admission was 18.52 ± 7 points. 59.6 % of patients were admitted from the emergency department, 31.3 % from hospitalization ward and 8.1 % from the ICU. The source of sepsis was 40.4 % abdominal, 26.3 % respiratory and 17.2 % urinary tract. The average fluid balance inputs were 11,072.39 ± 4,110 mL and outputs 6,171.98 ± 2,894 mL. Both groups were comparable at baseline. FB was correlated with the initial resuscitation goals of MAP of 65 mmHg ($r = 0.29$, $p < 0.01$) and vasoactive treatment duration ($r = 0.36$, $p < 0.01$) but not with CVP >8 mmHg or SvO_2 ≥70 %. There is a correlation between FB and the SOFA score ($r = 0.54$, $p < 0.01$). Patients with positive FB from the second day had a worse evolution of SOFA score and more renal failure with more renal replacement therapy requirements (25.5 vs 0 %, $p < 0.01$). Positive FB was associated with increased plasma transfusion (18.2 vs 4.5 %, $p < 0.05$) and platelets transfusion (14.5 vs 2.3 %, $p < 0.05$. Positive FB group was associated with more days of mechanical ventilation (9.63 ± 3.10 vs 5.59 ± 9.56, $p < 0.05$) and a trend toward to increase ICU stay (16.96 ± 15.38 vs 11.88 ± 12.72, $p = 0.085$). There is a trend to higher mortality in the positive fluid balance group (35.3 vs 18.6 %, $p = 0.072$).

Evolutive SOFA as positive or negative FB

	Positive fluid balance	Negative fluid balance
SOFA day 2	8.49 ± 3.31	5.57 ± 2.68
SOFA day 3	8 ± 3.55	4.28 ± 2.52
SOFA day 4	6.98 ± 3.97	3.50 ± 2.49

Renal failure as positive or negative FB

	Positive fluid balance	Negative fluid balance
Day 2 (%)	34.5	9.1
Day 3 (%)	20	4.7
Day 4 (%)	15.1	0

CONCLUSIONS. In our patients there is a correlation between the FB and the goal of resuscitation of MAP of 65 mmHg and the vasoactive treatment duration. Patients with positive FB from the second day of sepsis had worst daily SOFA, increased renal failure, more days of mechanical ventilation and a trend to more ICU stay and higher in-hospital mortality.
REFERENCE(S). 1. Boyd JH, et al. Fluid resuscitation in septic shock: a positive fluid balance and elevated central venous pressure are associated with increased mortality. CCM. 2011;39:259–65. 2. Murphy CV, et al. The importance of fluid management in ALI secondary to septic shock. Chest. 2009;136:102–9.

0015
EXTRACORPOREAL CYTOKINE HEMOADSORPTION IN SEVERELY SEPTIC PATIENTS: A MULTICENTER RANDOMIZED CONTROLLED TRIAL

D. Schädler[1], C. Porzilius[2], J. Brederlau[3], A. Jörres[4], G. Marx[5], A. Meier-Hellmann[6], C. Putensen[7], M. Quintel[8], C.D. Spies[4], C. Engel[2], J. Kellum[9], N. Weiler[10], M.K. Kuhlmann[11], Cytosorb European Sepsis Trial Group

[1]University Medical Center Schleswig–Holstein, Campus Kiel, Anaesthesiology and Intensive Care Medicine, Kiel, Germany, [2]University of Leipzig, Leipzig, Germany, [3]Helios Hospital Berlin-Buch, Berlin, Germany, [4]Charité University Medicine Berlin, Berlin, Germany, [5]RWTH University Hospital Aachen, Aachen, Germany, [6]Helios Hospital Erfurt, Erfurt, Germany, [7]University of Bonn, Bonn, Germany, [8]University Hospital Göttingen, Göttingen, Germany, [9]University of Pittsburgh, Pittsburgh, USA, [10]University Medical Center Schleswig–Holstein, Campus Kiel, Kiel, Germany, [11]Vivantes Hospital Friedrichshain, Berlin, Germany

INTRODUCTION. A novel sorbent hemoadsorption device for cytokine removal (CytoSorb®, CytoSorbents Corporation, USA) was developed and successfully tested in two different animal models of sepsis [1, 2]. The experience in the clinical setting is still limited to case reports.
OBJECTIVES. In this first clinical trial, we tested the hypothesis that treatment with sorbent hemoadsorption could safely and effectively reduce cytokines in septic patients with acute lung injury (ALI).
METHODS. Ventilated patients fulfilling the criteria for severe sepsis and ALI were enrolled in this multicenter randomized, controlled, open-label study comparing standard of care with or without hemoperfusion treatment. Primary endpoints were safety and IL-6 reduction. Treated patients were anti-coagulated with either regional citrate or systemic heparin and underwent hemoperfusion at flow rates of ~200–300 ml/min for 6 h per day for 7 consecutive days. The overall mean reduction in individual plasma cytokines for the control and treatment groups during the treatment period was calculated using a generalized linear model.
RESULTS. 43 patients (18 treated, 25 control) completed the study and were further analyzed. Incidence of organ dysfunction at enrollment (treatment vs. control) was: septic shock (94 vs. 100 %, $p = 0.42$), acute respiratory distress syndrome (67 vs. 56 %, $p = 0.33$), and renal failure (39 vs. 24 %, $p = 0.54$). During 115 treatments no serious device related adverse events occurred. On average, there were no changes in hematology and other blood parameters except for a modest reduction in platelet count (<10 %) and albumin (<5 %) with treatment. Hemoperfusion decreased IL-6 blood concentration significantly (−49.1 %, $p = 0.01$), with similar reductions of MCP-1 (−49.5 %, $p = 0.002$), IL-1ra (−36.5 %, $p = 0.001$), and IL-8 (−30.2 %, $p = 0.002$). 28-day (28 vs. 24 % control, $p = 0.84$) and 60-day mortality (39 vs. 32 % control, $p = 0.75$) did not differ significantly between the two studied groups.
CONCLUSIONS. In this first clinical study of a novel sorbent hemoadsorption device in patients with severe sepsis and ALI, the device appeared to be safe and decreased the blood concentration of several cytokines. Further research is needed to study the effect of the device on the clinical outcome of septic patients (clinicaltrials.gov ID NCT00559130).
REFERENCE(S). 1. Kellum JA, et al. Crit Care Med. 2004;32:801–5. 2. Peng Z-Y, et al. Crit Care Med. 2008;36:1573–7.
GRANT ACKNOWLEDGMENT. The study was supported by CytoSorbents Corporation, USA.

Management and outcome of acute kidney injury: 0016–0020

0016
SURVIVAL AND QUALITY OF LIFE AT 6 MONTHS IN CRITICALLY ILL PATIENTS WITH ACUTE KIDNEY INJURY

S. Nisula[1], S. Vaara[1], K.-M. Kaukonen[1,2], M. Reinikainen[3], M. Poukkanen[4], V. Pettilä[1,5], A.-M. Korhonen[1], The FINNAKI Study Group

[1]Helsinki University Central Hospital, Intensive Care Units, Division of Anaesthesia and Intensive Care Medicine, Department of Surgery, Helsinki, Finland, [2]Monash University, Australian and New Zealand Intensive Care Research Centre, Department of Epidemiology and Preventive Medicine, Melbourne, Australia, [3]North Karelia Central Hospital, Department of Intensive Care, Joensuu, Finland, [4]Lapland Central Hospital, Department of Anesthesia and Intensive Care Medicine, Rovaniemi, Finland, [5]University of Helsinki, Institute of Clinical Medicine, Helsinki, Finland

INTRODUCTION. Acute kidney injury (AKI) has high incidence among the critically ill and associates with dismal outcome [1]. Not only the long-term survival, but also the quality of life (QOL) of patients with AKI is relevant due to substantial burden of care regarding these patients.
OBJECTIVES. To study the long-term outcome and quality of life of patients with AKI treated in intensive care units (ICUs).
METHODS. We conducted a 6-month follow-up of ICU patients from a prospective, observational, multi-centre FINNAKI study [2]. We included study centres with over 70 % follow-up rate. We acquired mortality data and evaluated QOL of survivors with the EuroQol (EQ-5D) questionnaire [3].
RESULTS. Of the 1568 study patients, 635 [40.5 %, 95 % confidence interval (CI) 38.0–43.0 %] had AKI (Kidney Disease Improving Global Outcomes, KDIGO criteria), and 181 (11.5 %) received renal replacement therapy (RRT). 35.3 % (95 % CI 31.5–39.0 %) of the AKI patients, compared to 16.5 % (95 % CI 14.1–19.0 %) of patients without AKI, died within 6 months. The 6-month mortality for patients with RRT was 39.2 %.
80.6 % of the survivors (959/1,190) answered the EQ-5D questionnaire at 6 months. The responders' severity-of-illness scores (interquartile range, IQR) were slightly higher than those of the non-responders [SAPS II 39 (30–48) vs. 35 (25–46), SOFA (day 1) 8 (6–10) vs. 7 (5–9)], otherwise the groups were comparable.
The median (IQR) EQ-5D index at 6 months was 0.690 (0.533–1.00), as compared to 0.845 (0.812–0.882) for the age and sex-matched general population. The EQ-5D was comparable in patients with AKI of any stage and in RRT-treated patients: 0.676 (0.520–1.00) vs. 0.676 (0.489–1.00), respectively.
The admission EQ-5D was available for 774/1,190 (65 %) patients. Mean increases of 0.017 (no AKI) and 0.024 (AKI) in the EQ-5D index were observed after the critical illness and follow-up period.
CONCLUSIONS. Over 35 % of patients with AKI die within 6 months after ICU admission. The QOL of surviving AKI patients is significantly lower compared to the general population already at ICU admission. This level is preserved, however, through critical illness and is comparable to patients without AKI.
REFERENCE(S). 1. Bagshaw SM, et al. Changes in the incidence and outcome for early acute kidney injury in a cohort of Australian intensive care units. Crit Care. 2007;11(3):R68. 2. Nisula S, et al. Incidence, risk factors and 90-day mortality of patients with acute kidney injury in Finnish intensive care units: the FINNAKI study. Intensive Care Med. 2013;39(3):420–8. 3. Brooks R. EuroQol: the current state of play. Health Policy. 1996;37(1):53–72.
GRANT ACKNOWLEDGMENT. Clinical Research funding from Helsinki University Hospital, and a grant from the Finnish Society of Intensive Care, and a grant from the Academy of Finland.

0017

VALIDATION OF A CONTINUOUS INFUSION OF VERY LOW DOSE IOHEXOL (CIVLDI) TO MEASURE GLOMERULAR FILTRATION RATE (GFR): A NEW GOLD STANDARD FOR AKI?

J.J. Dixon[1], K. Lane[1], R.N. Dalton[2], C. Turner[2], R.M. Grounds[1], I.A.M. MacPhee[3], B.J. Philips[1], Acute Kidney Injury Research Group

[1]St George's Healthcare NHS Trust and St George's University of London, General Intensive Care, London, UK, [2]Guy's and St Thomas' NHS Foundation Trust, Paediatric Biochemistry, London, UK, [3]St. George's Healthcare NHS Trust and St George's University of London, Renal Medicine, London, UK

INTRODUCTION. There is currently no accurate method of measuring GFR in patients with AKI. Current definitions are based upon >50 % change in serum Creatinine concentration (SCr) and reduced urine output [1], however, these criteria have limitations in patients with AKI and diagnosis may be delayed if using these criteria alone. We have designed a method of continuous measurement of GFR with the intention of applying it in patients with AKI. The purpose of this crossover trial was to prove the concept and safety in volunteers over a range of GFR from normal to <30 mL/min/1.73 m^2.

OBJECTIVES. 1. Validate a method of measuring Glomerular Filtration Rate (GFR) that we will eventually use to measure Acute Kidney injury (AKI); 2. Determine the intra-individual variation in GFR in people with stable renal function and the minimum change our method can measure.

METHODS. The trial was registered with the European Clinical Trials Database. 17 volunteers were allocated, via block randomisation, to measurement of GFR, either by measuring the plasma clearance of a single intravenous injection of Iohexol or by measuring the plasma and renal clearance of a continuous infusion of very low dose Iohexol (CIVLDI; 0.5 mL/h for 12 h). GFR was then measured by the other method after a washout period of 4-28 days. Iohexol was measured by HPLC–MS/MS at 10 time points. The time to steady state was determined, along with intra-individual variation in GFR (99 % confidence intervals).

RESULTS. Accuracy: There were no crossover effects ($P = 0.43$). There was no difference in GFR between the two methods ($P = 0.82$). Correlation between the methods was 0.98 ($P < 0.0001$); Bland–Altman comparison revealed a bias of 2.2 mL (3.5 %) with limits of agreement −2 to 12.6 mL/min/1.73 m^2 when GFR was measured by CIVLDI. Plasma clearance overestimated renal clearance by 5.5 ± 7.3 mL/min/1.73 m^2. Time to plasma steady state concentration was 155 ± 84 min in subjects with GFR >60 mL/min/1.73 m^2 and 487 ± 127 min in subjects with GFR <60 mL/min/1.73 m^2.

Precision: Intra-individual variation in GFR was 8.8 % ($P < 0.01$). Changes >8.8 % represent a true change in GFR.

CONCLUSIONS. CIVLDI appears to be accurate and precise. Once the time to steady state has elapsed, changes >8.8 % represent a true change in GFR. This is less than the changes required in SCr to define AKI. In future, we aim to apply this method in patients with AKI. We predict CIVLDI will augment research into suitable AKI biomarkers because smaller changes in GFR can potentially be detected at an earlier stage than with conventional criteria.

REFERENCES. 1. Kidney Disease Improving Global Outcomes work group. KDIGO Clinical Practice Guidelines for Acute Kidney Injury. Kidney Int Suppl. 2012;2(1):1–138.

GRANT ACKNOWLEDGMENT. St. George's Hospital Charity.

0018

THE ATTRIBUTABLE MORTALITY OF ACUTE KIDNEY INJURY: A SEQUENTIALLY MATCHED ANALYSIS

S. Vaara[1], V. Pettilä[1,2], K.-M. Kaukonen[1,3], S. Bendel[4], A.-M. Korhonen[1], R. Bellomo[3], M. Reinikainen[5], FINNAKI Study Group

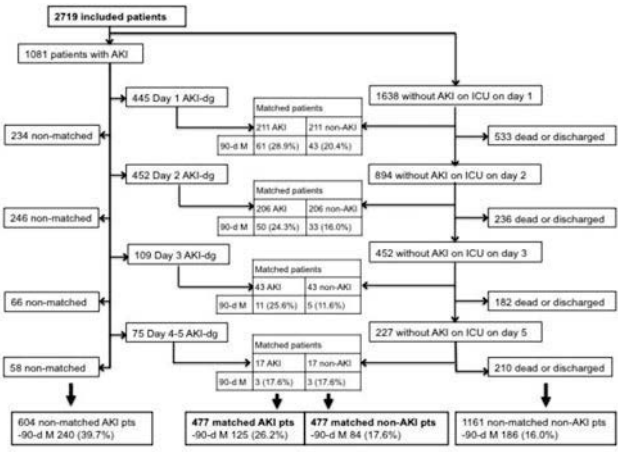
[1]Helsinki University Central Hospital, Division of Anesthesia and Intensive Care Medicine, Helsinki, Finland, [2]University of Helsinki, Department of Clinical Sciences, Helsinki, Finland, [3]Monash University, ANZIC Research Centre, Department of Epidemiology and Preventive Medicine, Melbourne, Australia, [4]Kuopio University Hospital, Division of Intensive Care, Kuopio, Finland, [5]North Karelia Central Hospital, Department of Intensive Care, Joensuu, Finland

INTRODUCTION. The role of acute kidney injury (AKI) as an independent risk factor for adverse outcomes has been well described. However, the magnitude of excess mortality attributable to AKI, i.e. the number of deaths that might be avoided if AKI would not develop, has not been evaluated among general intensive care unit (ICU) patients.

OBJECTIVES. This study aimed to estimate the excess mortality attributable to AKI.

METHODS. We studied a cohort of 2,719 consecutive patients from 16 participating ICUs from the prospective Finnish Acute Kidney Injury study. We included patients with either emergency admission to ICU or elective post- surgical patients with an expected ICU stay greater than 24 h. We sequentially matched patients who developed AKI and those without AKI at four time points according to the day of AKI diagnosis after ICU admission (Figure). Patients were matched according to age, sex, ICU admission diagnosis, Simplified Acute Physiology Score II score without renal and age components, and the propensity to develop AKI at each of the four matching time points. We used the Kidney Disease: Improving Global Outcomes -definition of AKI and considered both creatinine and urine output criteria.

RESULTS. Of the 2,719 patients included in the study, 1,081 (39.8 %) developed AKI during ICU treatment on days 1 to 5. Of these, 477 patients were matched to 477 patients who did not develop AKI. The 90-day mortality of the matched patients with AKI was 125 of 477 (26.2 %) compared with 84 of 477 (17.6 %) for their matched controls without AKI (Figure). Consequently, the absolute excess 90-day mortality attributable to AKI was estimated at 8.6 percentage points (95 % confidence interval 2.6–17.6 percentage points). Of the 209 observed deaths, 41 (19.6 %) were estimated to be statistically attributable to AKI, and of the 954 critically ill patients included in the matched pairs, 41 (4.3 %) were estimated to have died because of AKI.



[Figure. Study flow chart with 90-day mortality.]

CONCLUSIONS. Among general ICU patients, the absolute excess 90-day mortality statistically attributable to AKI is substantial (8.6 %). Our findings are useful in planning suitably powered future clinical trials to prevent and treat AKI in critically ill patients.

GRANT ACKNOWLEDGMENT. The study has been supported by the Academy of Finland, Helsinki University Central Hospital EVO Grants (T 102010070 and TYH 2010109 and 2011210 and 2013343), and a grant from the Finnish Society of Intensive Care. STV has received a grant from the Instrumentarium Foundation.

0019

PREDICTIVE VALUE OF NEUTROPHIL GELATINASE-ASSOCIATED LIPOCALIN (NGAL) FOR USE OF RENAL REPLACEMENT THERAPY IN PATIENTS WITH SEVERE SEPSIS

P.B. Hjortrup[1], N. Haase[1], F. Treschow[2], M.H. Møller[3], A. Perner[1]

[1]Copenhagen University Hospital, Rigshopitalet, Dept. of Intensive Care, Copenhagen, Denmark, [2]Holbæk Hospital, Dept. of Intensive Care, Holbæk, Denmark, [3]Copenhagen University Hospital, Bispebjerg, Dept. of Intensive Care, Copenhagen, Denmark

INTRODUCTION. NGAL has been proposed as an early marker of acute kidney injury (AKI) and renal replacement therapy (RRT) and promising results in prediction of RRT have been reported [1]. High NGAL concentrations have been reported in patients with inflammation without AKI. Patients with severe sepsis have systemic inflammation and the exact timing of the renal insult is less clear, which may invalidate NGAL as a marker of AKI in these patients.

OBJECTIVES. To assess the predictive value of plasma and urine NGAL for use of RRT and AKI in patients with severe sepsis.

METHODS. This was a prospective observational study in three ICUs in Denmark and a sub-study of the 6S trial where adult ICU patients with severe sepsis needing fluid resuscitation were randomly assigned to either hydroxyethyl starch 130/0.42 or Ringer's acetate [2]. Patients receiving RRT at screening were excluded. Urine and plasma samples were taken at randomization, and NGAL was measured using particle-enhanced turbidimetric immunoassay (BioPorto Diagnostics A/S, Denmark). A statistical analysis plan was published online prior to samples being analysed. The primary outcome measure was the predictive value of NGAL for the use of RRT in the ICU and secondary outcomes were development of AKI within 5 days and 90-day mortality. We defined AKI by RIFLE plasma creatinine criteria and by SOFA-score 2 or above in the kidney component.

RESULTS. Two-hundred-twenty-two patients had samples taken (211 patients had plasma and 162 urine sampled) median 4 (IQR 0–13) hours after ICU admittance. The age was 66 (57–75) years and SAPS II 54 (39–66). Forty (18 %) patients had RRT in ICU and 123 (55 %) had died at 90 days. At enrollment 91 (41 %) and 71 (32 %) patients had AKI according to RIFLE and SOFA, respectively. Of the remaining patients 32 (24 %) and 28 (19 %) developed AKI during the first 5 days according to RIFLE and SOFA, respectively. Areas under receiver operator characteristics curve (AUC) for predicting use of RRT, AKI and mortality ranged from 0.55 to 0.74 (Table). The predictive value was unaffected by the normalization of urinary NGAL to urinary creatinine, by the stratification for trial fluid (HES vs. Ringer's), by the exclusion of patients with chronic kidney disease, urinary tract infection and those who had received known nephrotoxic drugs or by the changing of observation period for AKI to 1, 3 or 7 days.

CONCLUSIONS. In ICU patients with severe sepsis, plasma and urine NGAL had low or no predictive power for use of RRT, AKI and mortality. Use of a single NGAL value as a predictive marker may not be recommended in these patients.

REFERENCES. 1. Hjortrup et al. Crit Care. 2013;17:211. 2. Perner et al. NEJM. 2012;367:124.

GRANT ACKNOWLEDGEMENTS. The 6S trial was funded by the Danish Research Council and other public foundations. BioPorto supported this sub-study.

Prediction of NGAL for RRT, AKI and mortality

	AUC (95 % CI)	Cutoff	Sensitivity	Specificity	PPV	NPV
RRT (pNGAL)	0.70 (0.61–0.78)	641 ng/mL	0.69	0.64	0.30	0.90
RRT (uNGAL)	0.62 (0.51–0.73)	1,832 ng/mL	0.46	0.77	0.28	0.88
RRT (creatinine)	0.74 (0.67–0.82)	166 μmol/L	0.63	0.75	0.36	0.90
AKI RIFLE (pNGAL)	0.67 (0.56–0.78)	559 ng/mL	0.58	0.76	0.45	0.85
AKI RIFLE (uNGAL)	0.70 (0.58–0.83)	737 ng/mL	0.56	0.83	0.52	0.85
AKI SOFA (pNGAL)	0.65 (0.55–0.76)	324 ng/mL	0.85	0.46	0.26	0.93
AKI SOFA (uNGAL)	0.74 (0.62–0.85)	799 ng/mL	0.70	0.74	0.36	0.92
Mortality (pNGAL)	0.55 (0.47–0.63)	641 ng/mL	0.46	0.63	0.60	0.49
Mortality (uNGAL)	0.61 (0.53–0.70)	1,687 ng/mL	0.37	0.82	0.69	0.56

0020

CLINICAL AND ECONOMIC IMPACTS OF A SWITCH FROM A HIGH TO LOW INTENSITY CONTINUOUS RENAL REPLACEMENT THERAPY IN PATIENTS WITH ACUTE KIDNEY INJURY

A.L. Paterson[1], A.J. Johnston[1], R. Gokhale[1], D. Kingston[1], R. Mahroof[1]

[1]John Farman Intensive Care Unit, Addenbrooke's Hospital, Cambridge, UK

INTRODUCTION. High intensity continuous renal replacement therapy (RRT) in patients with acute kidney injury (AKI) on intensive care units (ICU) has failed to show an improvement in patient mortality compared to lower intensity protocols [1, 2]. In Sept 2011 the standard RRT protocol used on our unit was switched from high, 30-35, to low, 20 mL kg^{-1} h^{-1}, intensity dose ultrafiltration. Our unit admits all general ICU patients including transplant (liver, multi-visceral), haem-oncology, tertiary hepatology and interventional radiology. Our Unit does not admit cardio-thoracic surgery and neuro-surgical patients.

OBJECTIVES. We explored the effect of the protocol switch on: (a) patient mortality, length of ICU stay and duration of organ support; (b) the unit's expenditure on RRT disposables.

METHODS. All patients receiving RRT for 12 months on either side of the switch in RRT dose were investigated. Patients on long-term dialysis prior to admission and inter-hospital ICU to ICU transfers were excluded. Chi squared, Mann–Whitney *U* and *T*-test(s) were used to assess statistical significance.

RESULTS. Demographics of patients in cohort 1 (PRE) (high dose RRT, n = 187) and cohort 2 (POST) (low dose RRT, n = 179) were comparable (see Table), except for a higher incidence of chronic kidney disease (CKD) stage 3–5 at baseline in the POST group, 50 vs 31 %, p = 0.001. There were no differences in mean APACHE II, 21.8 vs 22.0 p = 0.78; and ICNARC scores, 28.9 vs 27.9 p = 0.20; between the PRE and POST groups respectively.

Cohort demographics

Parameter	Cohort 1	Cohort 2	p value
Age—median (IQR)	64 (51–74)	66 (54–77)	0.14
Sex—male	105 (56 %)	118 (66 %)	0.08
No. organs supported			0.68
RRT only	22 (11 %)	26 (14 %)	
2 organs	45 (23 %)	44 (23 %)	
3 organs	131 (66 %)	118 (63 %)	

No difference in in-hospital mortality, 41 vs 42 %, p = 0.92; or ICU mortality, 29 vs 34 %, p = 0.40, was seen between the two cohorts. Patients in the POST group who survived to ICU discharge, had a shorter median ICU length of stay than the PRE group, 8 days (interquartile range (IQR) 4–16) vs 12 days (IQR 6–22), p = 0.05; with a trend towards a shorter duration of RRT, median 4 days (IQR 2–6) vs 4 days (IQR 3–7), p = 0.07.

There was a comparable duration of invasive ventilatory support, median 7 days (IQR 4–16) vs 11 days (IQR 4–22), p = 0.13; and inotrope support, median 4 days (IQR 2–5) vs 3 days (IQR 2–5), p = 0.89; between the two cohorts. The percentage change (mean ± standard deviation) in eGFR from the patient's pre-admission baseline to hospital discharge was also equivalent, PRE −1 ± 36 % vs POST 4 ± 44 %, p = 0.47.

A 25 % reduction in dialysis/replacement fluid usage per day of RRT was observed with the new protocol, equating to a cost saving of over £27,000 (€31,500) per annum.

CONCLUSIONS. A switch from high to low intensity continuous haemodiafiltration had minimal effects on clinical outcomes and resulted in marked cost-savings.

REFERENCES. 1. Palevsky PM, Zhang JH, O'Connor TZ, et al. Intensity of renal support in critically ill patients with acute kidney injury. NEJM. 2008;359:7–20. 2. Bellomo R, Cass A, Cole L, et al. Intensity of continuous renal-replacement therapy in critically ill patients. NEJM. 2009;361:1627–38.

Monitoring the brain: not an easy task: 0021–0025

0021

BRAIN THERMOMAPPING DURING STROKE

A. Butrov[1], D. Cheboksarov[1], O. Shevelev[2], M. Shevelev[3]

[1]Peoples' Friendship University of Russia, Department of Anesthesiology and Intensive Care, Moscow, Russian Federation, [2]Peoples' Friendship University of Russia, Pathophysiology, Moscow, Russian Federation, [3]Moscow State Technical University named after N.E. Bauman, Moscow, Russian Federation

INTRODUCTION. Development of the technique of expeditious monitoring in patients suffering from stroke at the early stages of hospitalization (2–24 h from the beginning of the disease).

OBJECTIVES. Definition of the diagnostic opportunities of noninvasive thermomapping in cerebral stroke.

METHODS. Measurement of the cerebral temperature with thermomapping creation carried out by registration of electromagnetic radiation from a brain in the decimeter range device RTM-01. 20 patients with ischemic stroke, confirmed by CT scan (54–81 ages) were surveyed. In a control group healthy people were investigated.

RESULTS. Temperature of healthy peoples' hemispheres lacks noticeable thermo-heterogeneity in normal conditions of the environment (Tair = 25 °C, Patm = 750 mmHg). Healthy brain temperature on the average was 36.7 ± 0.01 °C with a range deviations ranging from 35 to 38 °C (KK Pearson's 0.899 ($p < 0.001$). Brain temperature in stroke patients is on average 37.2 ± 0.02 °C. In the injured brain section and the "penumbra", the temperature of the cortex reached 39–42 °C. The temperature increase range in the injured hemisphere reached about 7–9 °C and showed high level of thermo-heterogeneity of the brain (Pearson's-0,151 KK, $p > 0.1$).

CONCLUSIONS. The obtained data considers thermomapping of the cerebral hemispheres by registration of electromagnetic radiation as a perspective technique of expeditious monitoring of patients with an ischemic stroke.

0022

CEREBRAL PERFUSION PRESSURE IS LOWER IN PATIENTS WITH MYOCARDIAL INJURY AFTER SUBARACHNOID HEMORRHAGE

M. Hravnak[1], Y. Chang[2], T.J. Price Jr.[1], E. Crago[1], B. Jankowitz[2], R.M. Friedlander[2]

[1]University of Pittsburgh, School of Nursing, Pittsburgh, USA, [2]University of Pittsburgh, School of Medicine, Dept. Neurosurgery, Pittsburgh, USA

INTRODUCTION. Patients with aneurysmal subarachnoid hemorrhage (aSAH) who also display accompanying myocardial injury (SAHMI) are known to experience poorer outcomes than patients with no SAHMI. Although we have determined that the systemic perfusion impairment associated with SAHMI can be subtle and transient, we still suspect that such systemic perfusion impairment could contribute to a cerebral perfusion shortfall.

OBJECTIVES. We sought to test the hypothesis that patients with SAHMI, manifested by elevated cardiac troponin I (cTnI) and myocardial wall motion abnormality (WMA), would display lower dynamic cerebral perfusion pressure (CPP) than patients with no SAHMI in the immediate post injury period (days 0–3), even when the severity of aSAH is taken into account.

METHODS. Convenience sample of 44 patients diagnosed with aSAH. Twenty-two patients with cTnI ≥0.3 ng/ml and WMA by echocardiographic determination were matched to 22 patients with cTnI = 0 and no WMA. Match criteria were age ± 5 years, gender, race, Fisher grade and Hunt/Hess score (HH). Intracranial (ICP) and CPP (determined as MAP-ICP) were measured every 2 h from admission to day 3 post-aSAH, along with measures of systemic perfusion (heart rate [HR], systolic [SBP], diastolic [DBP] mean arterial [MAP], and central venous pressures [CVP]). SAHMI cases and no-SAHMI controls perfusion parameters across days 0–3 were compared with generalized estimating equations (GEE) to fit a repeated measure linear regression.

RESULTS. The sample was primarily female (86 %) and white race (86 %) with mean age 56 ± 10 years. SAHMI case patients peak mean cTnI was 8.9 ± 9.6 ng/ml. SAHMI cases exhibited significantly lower CPP than controls across days 0–3 (b = −7.9, p = 0.007). Although SAHMI cases and controls had similar ICP (b = −0.87, p = 0.262), the SAHMI cases displayed lower MAP (b = −7.06, p = 0.002) and SBP (b = −14.42, $p < 0.001$), but higher HR (b = 7.27, p = 0.013) and CVP (b = 2.42, p = 0.02).

CONCLUSIONS. Patients with SAHMI have lower CPP across days 0–3 after aneurysmal subarachnoid hemorrhage than patients with no SAHMI, even when the severity of hemorrhage is taken into account. Since ICP remains similar between the groups, it appears that lower MAP in the SAHMI group is responsible for the lower CPP. Further study is needed to determine if the demonstrated lower CPP is accompanied by cerebral tissue hypoxia and poorer neuropsychologic function.

GRANT ACKNOWLEDGMENT. Funding U.S. National Institutes of Health. NHLBI R01HL074316.

0023

CEREBRAL NEAR-INFRARED SPECTROSCOPY IN ADULTS ON VENO-ARTERIAL EXTRACORPOREAL MEMBRANE OXYGENATION

S. Cristallini[1], D. Fagnoul[1], B. Rondelet[1], S. Scolletta[1], K. Donadello[1], J.-L. Vincent[1], D. De Backer[1], F.S. Taccone[1]

[1]Hopital Erasme, Bruxelles, Belgium

INTRODUCTION. Veno-arterial extracorporeal membrane oxygenation (VA-ECMO) is increasingly used for cardiovascular support in critically ill patients but it can result in thromboembolic complications or brain hypoperfusion in some cases.

OBJECTIVES. Continuous monitoring of cerebral oximetry (rSO_2) can be helpful to detect brain hypoperfusion or cerebrovascular accident (CVA) during VA-ECMO therapy.

METHODS. Of the 53 patients treated with VA-ECMO over from October 2011 to April 2013, 16 patients (median age 53 years; 11 males) were monitored with cerebral near-infrared spectroscopy (NIRS, Foresight, CAS Medical System Inc., Branford, CT), placed on patients' forehead. Patients were analyzed for: baseline (rSO_2); the percentage of time spent below the rSO_2 threshold of 60, 55 or 50 % (%T <60, 55, 50 %); the maximum differential in right-left rSO_2 values. Also, rSO_2 findings were recorded, analyzed, and correlated with clinical events. VA-ECMO was initiated by percutaneous femo-femoral or central thoracic cannulation in 14 and 2 patients, respectively.

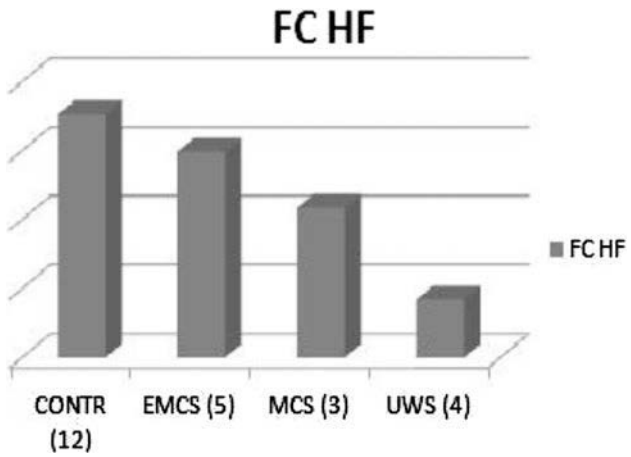
RESULTS. The median duration on VA-ECMO in the 16 patients was 5 (range 2–18) days; the median duration of NIRS monitoring was 4 (2–8) days. Overall ICU mortality was 50 %. Initial rSO_2 was 62 [52–67] %. Thirteen (81 %) patients presented with rSO_2 <60 % for at least 5 % of the time of monitoring. Therapeutic interventions, including increasing mean arterial pressure and/or ECMO flow, decreased $PaCO_2$ and red blood cells transfusion, corrected these values to >60 % in 10 patients; in three patients, persistent decreased rSO_2 below 50 % finally resulted in brain death diagnosis. In the four patients having a maximum differential right-left side rSO_2 values exceeding 10 % for more than 15 min, cerebral CT-scan eventually yielded large ischemic CVA. Patients without encephalopathy at ICU

discharge (n = 5) tended to have a shorter period with rSO_2 below 55 % than others (2 [1–13] % vs. 29 [0–86] %, p = 0.08).
CONCLUSIONS. Cerebral oxygenation monitoring may be helpful to detect CVA occurrence or brain hypoperfusion during ECMO. This can help to guide therapeutic strategies.

0024
PREDICTIVE VALUE OF EARLY LINEAR AND NON-LINEAR ANALYSIS OF EEG SIGNALS IN BRAIN DAMAGE ON NEUROLOGICAL OUTCOME

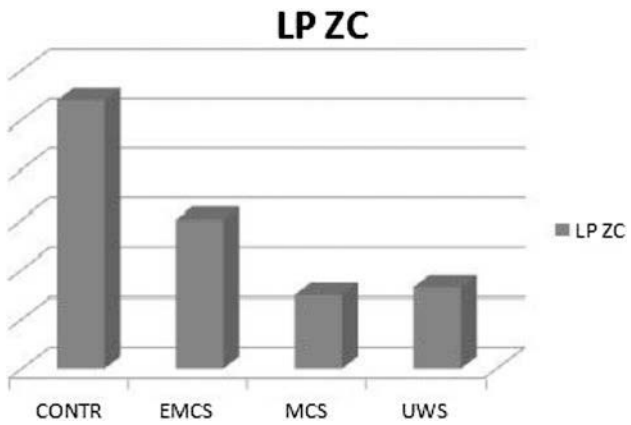
L. Prisco[1], M. Ganau[2], M. Cusenza[3], A. Accardo[3], W. Calligaris[4], A. Draisci[4], G. Romano[4], M. Semencic[4], F. Monti[4]

[1]University College Hospital London NHS Trust, Critical Care, London, UK, [2]University of Cagliari, Graduate School of Biomedical Engineering, Cagliari, Italy, [3]University of Trieste, Trieste, Italy, [4]University Hospital of Cattinara, Neurophysiology Department, Trieste, Italy
INTRODUCTION. Electrophysiological examinations constitute objective and accurate measures of cerebral function. They can be recorded at bedside, which is of major value in intensive care units.
OBJECTIVES. The objective of the present study considers the linear and non-linear analysis [1] of early resting electroencephalography (EEG) signals (<1 week after acute brain injury) and differences between brain regions as predictors for poor outcome.
METHODS. We studied 24 comatose patients (coma secondary to brain damage) and 12 healthy controls and compared their EEG power spectra, zero crossing and fractal dimension by grouping the EEG signals in four regions: left posterior (LP), right posterior (RP), fronto-central (FC), parieto-temporo-occipital (PTO). Consciousness at 1 and 6 months was evaluated using the Coma Recovery Scale-Revised and according to the scale patients were defined as Unresponsive Wakefulness Syndrome (UWS), Minimally Conscious State (MCS), communicative patients (emerging MCS, EMCS).
RESULTS. The quantitative analysis performed, showed that the impact of FC high frequency bands is considerably higher on neurological outcome.



Graph 1

Both linear and non-linear parameters derived from early EEG analysis showed the ability to predict recovery of communicative skills in brain injured patients at 6 months. Particularly the stepwise multiple regression included the ZC parameter of the left hemisphere as independent variable (constant 0.7286, T-value 3.76, p < 0.01) but with partial explanation of the model (Rsq 29.98).



Graph 2

CONCLUSIONS. Despite some limitations and biases of the present study (such as the small number of patients investigated), we can conclude that the predictive and discriminative value of early linear and non-linear EEG analysis in brain injury patients could integrate the admission clinical evaluation in order to identify those patients who will recover communicative skills.

REFERENCE(S). 1. Accardo A, Cusenza M, Monti F. Linear and non-linear parameterization of EEG during monitoring of carotid endarterectomy. Comput Biol Med. 2009;39(6):512–8.

0025
HYPERTONIC SALINE AND MULTIMODAL BRAIN MONITORING

C. Dias[1], E. Pereira[1], A. Cerejo[2], J.-A. Paiva[3], M. Czosnyka[4]

[1]Hospital S. Joao, Intensive Care, Neurocritical Care Unit, Porto, Portugal, [2]Hospital S. Joao, Neurocirurgia, Porto, Portugal, [3]Hospital S. Joao, Intensive Care, Porto, Portugal, [4]Cambridge University, Academic Neurosurgery, Cambridge, UK
INTRODUCTION. Intracranial hypertension (IHT) is an important cause of secondary lesion in head injury (HI). Hyperosmolar therapy is recommended as a non-surgical measure to manage high intracranial pressure (ICP) either with mannitol or hypertonic saline (HTS) [1]. Emerging evidence suggests that small bolus of high concentrations of HTS are very effective in decreasing ICP, but still there is no consensus about other consequences on brain microcirculatory hemodynamics and oxygenation.
OBJECTIVES. Evaluate the effects of HTS bolus with multimodal brain monitoring in a neurocritical care unit.
METHODS. Prospective study of adult patients admitted in NCCU with severe HI and outbreaks of IHT treated with bolus of 0.5 ml/kg of 20 % HTS. Patients were continuously monitored with intraparenchymal intracranial pressure (ICP), cerebral perfusion pressure (CPP), transcutaneous cerebral oximetry (CO), tissue oxygenation ($pbtO_2$), cerebral blood flow (CBF), cerebrovascular resistance (CVR) and cerebrovascular reactivity indexes related to pressure (PRx), oxygenation (ORx and ORxshort), cerebral oximetry (COx) and cerebral blood flow (CBFx). Catheter probes were placed in the penumbra area defined by CT. ICM+® software was used to collect and perform primary and secondary analysis of brain monitoring data. Time average of the above mentioned variables were calculated at baseline (60 min) and during 210 min after the start of the drug divided in regular intervals of 30 min. Local ethics committee approval was obtained.
RESULTS. Eighteen consecutive patients were enrolled 89 % male, with mean age 42 yrs old, SAPS II score 45 (predicting mortality 36 %). Postresuscitation median Glasgow Coma Score was 7 (range 3–14). The most frequent pattern according to Marshall Classification on first head-CT was 4—diffuse injury with midline shift (range 2–6). During ICU stay we identified 134 episodes of IHT managed with HTS. From baseline to 90 min after the bolus, ICP and CPP improved (p < 0.0001) with a mean decrease in ICP of 8.9 mmHg. After this period CPP was maintained stable and ICP started to increase slowly, but within safety range. Mean increase in CBF was 12.7 ml/min/100 g and decrease in CVR was 1 mmHg min 100 g/ml, both changes were significant (p < 0.005). Mean values of $PbtO_2$ and CO showed only marginal increases with no statistically significance. Autoregulation index (PRx) impaired during IHT and recovered after HTS staying below 0.3 (p < 0.0001). The oxygenation and flow cerebrovascular reactivity indices showed non-significant modifications.
CONCLUSIONS. Management of intracranial hypertension with 20 % HTS bolus improved cerebral pressures (ICP and CPP), and flow with recover of autoregulation. However, in spite of this hemodynamic improvement, we failed to demonstrate better oxygenation in brain penumbra area.
REFERENCE(S). 1. Diringer MN. New trends in hyperosmolar therapy? Curr Opin Crit Care. 2013;19:77–82.

Trauma, bleeding and coagulopathy: 0026–0030

0026
PREHOSPITAL RISK FACTORS OF MORTALITY AND REDUCED CONSCIOUSNESS AFTER SEVERE TRAUMATIC BRAIN INJURY

S. Tohme[1], C. Delhumeau[1], B. Walder[1], G. Haller[1]

[1]University Hospitals of Geneva, Division of Anesthesiology, Geneva, Switzerland
INTRODUCTION. Severe traumatic brain injury (TBI) is a significant worldwide health concern and an enormous major burden for the society [1]. The period between trauma event and hospital admission in emergency department (ED) could be a determinative for secondary brain injury and early survival.
OBJECTIVES. To investigate the relationship between prehospital factors (arterial hypotension, hypoxemia, hypothermia associated with secondary brain injury) [2] and the outcomes mortality and impaired consciousness of survivors at 14 days.
METHODS. Multicenter, prospective cohort study.
SETTING. Dedicated trauma centers in Switzerland. Patients: Adults with severe TBI (Abbreviated Injury Scale score of head region (HAIS) >3). Main outcome measures: Death and impaired consciousness (GCS ≤13). Association between risk factors and outcome were assessed with univariate and multivariate regression models.
RESULTS. 589 patients were included, median age was 55 years (IQR 33, 70). The median GCS in ED was 4 (IQR 3–14), with abnormal pupil reaction in 167 patients (29.2 %). Median ISS was 25 (IQR 21–34). Three hundred eight patients had a fall (52.5 %) and 190 a road traffic accidents (32.5 %). Median time from OHEMS departure on scene to arrival in ED was 50 min (IQR 37–72); 451 patients had a direct admission (76.6 %). Prehospital hypotension was observed in 24 (4.1 %) patients, hypoxemia in 73 (12.6 %) patients and hypothermia in 146 (24.8 %). Independent associated with mortality was prehospital hypotension (apart of age and severity of TBI). Independent associated with impaired consciousness was prehospital hypoxemia (apart of severity of TBI); indirect admission was a protective factor for impaired consciousness.
CONCLUSION. Mortality and impaired consciousness at 14 days have not the same prehospital risk factors; prehospital hypotension is associated with mortality, prehospital hypoxemia with impaired consciousness. Prehospital hypothermia was not a risk factor in this mature trauma system. Aggressive prehospital strategies increasing blood pressure (and decreasing hypovolemia) could improve survival; strategies increasing oxygen administration in hypoxemic patients could improve consciousness.
Acknowledgement. The author B.W. received support from the Swiss Accident Company and the Bangerter-Rhyner Foundation for this project. The founding agencies had no role in the preparation, review or approval of the abstract. The authors have no conflict of interest.
REFERENCES. 1. Pradat-Diehl P, et al. J Head Trauma Rehabil. 2012 (Epub ahead of print). 2. McHugh GS, et al. J Neurotrauma, 2007;24:287–93.

0027
HAEMOPERITONEUM IN BLUNT EXSANGUINATING TRAUMA

L.D. Umezawa Makikado[1], E. Alted Lopez[1], C. García Fuentes[1], H. Marín Mateos[1], Z. Molina Collado[1], C. Mudarra Reche[1], S. Chacón Alves[1], M. Chico Fernández[1], S. Bermejo Aznárez[1], D. Toral Vázquez[1], J.C. Montejo González[1]

[1]Hospital 12 de Octubre, Madrid, Spain

INTRODUCTION. In patient with blunt trauma presenting haemodynamic instability associated with a free peritoneal effusion, the obvious source of exsanguination is the peritoneum. Nevertheless, extraperitoneal injuries requiring haemostatic control may explain haemorrhagic shock despite the presence of haemoperitoneum and may be missed if only the intraperitoneal site is considered.

OBJECTIVE. The main objective of our study was to describe the incidence of peritoneal bleeding (PB) and/or extraperitoneal bleeding (EPB) in haemodynamically unstable blunt trauma patients with haemoperitoneum.

METHODS. A retrospective-observational, single-center study was carried out in the trauma intensive care unit (ICU) at university hospital. Population: All blunt trauma patients aged 16 years or over with haemodynamic instability (systolic blood pressure threshold lower than 90 mmHg) on hospital admission associated with haemoperitoneum on CT scan or from the operative notes at laparotomy were included. Patients with a minimal traumatic haemoperitoneum were not included. Study period: January 2008 to October 2012. Demographic and clinical data including severity of illness at admission, CT scan results, surgery and/or interventional radiology management, ICU stay and mortality was collected. Active bleeding was defined as injuries that required a haemostatic procedure in the first 24 h of management. A descriptive analysis of the results was performed using SPSS software version 15. Quantitative variables were expressed using mean and SD. Qualitative variables were expressed in the form of percentages.

RESULTS. Of 1,541 patients admitted for severe trauma, 95 patients met the inclusion criteria. 69 % were male, mean age 43.5 (SD 19) years, and mean ISS was 41 (SD 15). 78.9 % required at least one haemostatic procedure to control active bleeding. 51.85 % had PB, 18.95 % had EPB and 29.47 % had both. Among the patients with active bleeding, 46.7 % had PB, 29 % had EPB and 33.3 % had both.

CONCLUSIONS. In our study, severe blunt trauma patients with hemodynamic instability, the source of bleeding can be multiple. In such cases, as much as 20 %, the presence of hemoperitoneum was not associated peritoneal bleeding, even in the presence of haemorrhagic shock.

REFERENCE(S). 1. Charbit J, Millet I, Martinez O, Roustan JP, Merigeaud S, Taourel P, Capdevila X. Does the size of the hemoperitoneum help to discriminate the bleeding source and guide therapeutic decisions in blunt trauma patients with pelvic ring fracture? J Trauma Acute Care Surg. 2012;73:117–25. 2. Charbit J, Millet I, Lakhal K, Brault-Noble G, Guillon F, Taourel P, Capdevila X. A haemoperitoneum does not indicate active bleeding in the peritoneum in 50 % of hypotensive blunt trauma patients: a study of 110 severe trauma patients. Injury. 2012 [Epub ahead of print].

GRANT ACKNOWLEDGMENT. This research received no grant from any funding agency in the public, commercial, or not-for-profit sectors.

0028
A BETTER INTERPRETATION OF EARLY COAGULOPATHY IN PREDICTING OF MASSIVE TRANSFUSION IN TRAUMA PATIENTS: CONSIDERATION OF SURGICAL BLEEDING AND GREY ZONE APPROACH

J. Charbit[1], K. Lakhal[1], P. Deras[1], J. Manzanera[1], P. Latry[2], X. Capdevila[1]

[1]Lapeyronie University Hospital, Trauma Intensive Care Unit, Montpellier, France, [2]Saint Eloi University Hospital, Clinical Hematology Unit, Montpellier, France

INTRODUCTION. Acute traumatic coagulopathy has been strongly associated with an increase of transfusion requirements, morbidity and mortality. However, the "surgical" bleeding, one of major determinants of massive transfusion, has been surprisingly never considered so far in the establishing this association.

OBJECTIVES. The purpose of our study was to evaluate the performance of standard coagulation tests taken upon admission of severe trauma patients to predict massive transfusion (MT) in the presence or the absence of a surgical bleeding (SB).

METHODS. All severe trauma patients consecutively admitted in our intensive care unit between January 2006 and January 2010, for which an initial standard coagulation (prothrombin time [PT] activated partial thromboplastin time [aPTT]) was performed, were retrospectively studied. The main demographic and lesional data, as well as haemostatic procedure needs (SB and noSB group) and MT needs ($\geq$10 units of packed red blood cells in first 24 h) were collected. The association between coagulopathy and MT was studied by multivariate analysis and construction of ROC curves, by performing a subgroup analysis based on the presence of SB. A approach of type "grey zone" was used considering as limit thresholds with negative likelihood ratio >0.2 and those with a positive likelihood ratio < 5.

RESULTS. Of the 704 patients studied, 116 (16 %) required a MT and 188 (27 %) had a SB (SB group). The main severity criteria were significantly higher in the SB group. MT rate was also higher in the SB group (47 vs 5 %, $p < 0.001$), regardless of the coagulation status at admission. The area under the ROC curve of PT for predicting MT was comparable between SB or noSB groups (0.75 [95 % CI 0.68–0.82] vs 0.79 [95 % CI 0.69–0.88]). This was likewise true for aPTT (0.76 [95 % CI 0.69–0.83] vs 0.72 [95 % CI 0.60–0.84]). Similarly, the number of patients belonged in the grey zone did not significantly differ between these two groups, both for PT (67 vs 68 %) and for aPTT (55 vs. 51 %). By cons, upper boundaries of grey zone were higher in SB group. In addition, PT was significantly associated with MT in multiple logistic regression only in noSB group (OR 21.0 [95 % CI 5.1–86.3]). This association was not found significant in SB group (OR 1.2 [95 % CI 0.8–1.8]). Finally, for given threshold (PT or aPTT), positive predictive value was much high, while negative predictive value and positive likelihood ratio were much lower in the SB group.

CONCLUSIONS. Before interpreting coagulopathy depth in a trauma patient, to define injuries assessment and active bleeding is essential to predict accurately a MT. Coagulopathy is the main determinant of blood loss in the absence of SB and has to be used to predict transfusion requirements. Conversely, in patients having a SB, knowledge of coagulation status does not seem to be crucial to guide an aggressive transfusion strategy since they are already high-risk of MT.

0029
INFLUENCE OF HAEMORRHAGIC SHOCK AND/OR TRAUMATIC BRAIN INJURY ON ACUTE TRAUMATIC COAGULOPATHY ASSESSED BY THROMBOELASTOGRAPHY (TEG®)

A. Tantot[1], S. Figueiredo[1], S. Hamada[1], A. Harrois[1], J. Duranteau[1]

[1]Département anesthésie réanimation, CHU de Bicêtre, Université Paris Sud 11, Le Kremlin Bicêtre, France

INTRODUCTION. Trauma-induced coagulopathy (TIC) is observed in around 25–35 % of all severe trauma patients and is associated with increased mortality and morbidity[1]. Coagulation abnormalities seem to differ between traumatic brain injury (TBI) and non-TBI patients trauma patients. The exact contribution of TBI to the development of TIC remains unclear, as TBI includes a combination of both hypo- and hypercoagulable states.

OBJECTIVES. To compare the incidence and the patterns of coagulopathy in trauma patients exhibiting TBI, haemorrhagic shock (HS) and both HS + TBI.

METHODS. Prospective observational study including patients admitted for primary multiple trauma between February 2011 and April 2013 in a Level 1 trauma center. Blood samples from trauma patients were obtained at their admission, before any transfusion, for standard coagulation tests and TEG® analysis (Kaolin and Functional fibrinogen), as a standard care. Patients with missing data on standard coagulation tests or TEG® were excluded. The population was divided into 4 groups, depending on initial presentation: **1/ TBI**: Abbreviated Injury Score $(AIS)_{head} \geq 3$, **2/HS**: SAP <90 mmHg and active bleeding, **3/ HS and TBI**, **4/"Control" (CL)**: no TBI, no HS. Biological data (standard coagulation tests and TEG®) were compared between those four groups by non parametric test for continuous variables.

RESULTS. 70 patients were included in the study (Table 1). Data are expressed as median (interquartile range).

Table 1

	HS + TBI n = 16	HS n = 19	TBI n = 20	CL n = 15
Platelets count	199 (122–249)	190 (136–240)	238 (187–291)	207 (187–234)
PT ratio (%)	58§ (39–75)	67* (37–82)	82 (73–93)	86 (75–86)
Fibrinogen (g L^{-1})	1.7§ (0.7–2.1)	1.6* (0.9–2)	2.4 (1.7–2.9)	2.3 (1.6–3.1)
[Hb] (g L^{-1})	9§ (8–11)	9.8* (8.6–10.8)	13 (12–14)	12.9 (11.7–14.6)
R (min)	7§ (6–165)	5.3* (4.6–16.4)	6 (3.5–7.6)	4.3 (3.2–6.4)
Angle α (°)	56§ (50–67)	57* (13–68)	62 (56–72)	65 (62–67)
MA (mm)	63§ (52–68)	60* (12–68)	68 (61–73)	71 (66–75)
Ly30 (%)	0 (0–0.4)	0 (0–4)	0 (0–0.5)	0 (0–0.1)
Functional fibrinogen (g L^{-1})	1.9 (0.1–3)	2.2 (0–3.3)	3 (2.2–3.8)	3.5 (2.9–4.3)

* $P < 0.05$ HS vs CL

§ $P < 0.05$ HS + TBI vs CL

CONCLUSION. Trauma patients with HS and/or HS + TBI exhibited more patterns of hypocoagulable state than CL, whereas no statistically significant differences were observed between patients with TBI alone and CL. Further studies are required to better define the exact contribution of TBI to TIC.

REFERENCES. 1. Gruen et al. Lancet;380:1099–108.

0030
FIBRINOGEN ON ADMISSION IN TRAUMA (FIBAT)-SCORE: EARLY PREDICTION OF LOW PLASMA FIBRINOGEN LEVEL IN TRAUMA PATIENTS

S. Campion[1], M. Eurin[1], S. Hamada[2], A. Harrois[2], M. Raux[3], C. Paugam-Burtz[1,4], T. Gauss[1], Traumabase Group

[1]Hôpital Beaujon, Hôpitaux Universitaires Paris Nord Val de Seine, AP-HP, Service d'Anesthésie-Réanimation, Clichy, France, [2]Hôpital Bicêtre, Groupement Hôpitaux Universitaires Sud, AP-HP, Service d'Anesthésie-Réanimation, Kremlin Bicêtre, France, [3]Hôpital Universitaire Pitié Salpétrière, APHP, SSPI, Accueil des Polytraumatisés, Paris, France, [4]Université Paris VII, Paris, France

INTRODUCTION. Low plasma fibrinogen (Fg) level is an independent predictor of mortality in trauma patients [1]. European guidelines recommend substitution if the Fg concentration is below 1.5–2.0 g/L [2]. Thus early identification of patients with a low Fg level appears useful.

OBJECTIVE. The objective of this study was to develop a simple and easy to use clinical score to identify major trauma patients with a Fg $\leq$1.5 g/L at admission in hospital.

METHODS. In this multicenter study, all trauma patients between January 2010 and December 2012 with a Fg dosage on admission were included. Patients with a congenital hypofibrinogenemia, pre-hospital transfusion or pregnancy were excluded. As explanatory variables were chosen: sex, age, injury mechanism, pre-hospital and admission heart rate (HR), systolic blood pressure (SBP), capillary hemoglobin (Hb), variation between pre-hospital Hb and admission Hb (ΔHb), vasopressor need, cardiac arrest, temperature, free intraabdominal fluid assessed by sonography, hemothorax or instable pelvic fracture on x-ray and blood lactate level.

Univariate analysis using Fisher's exact test or Mann–Whitney test and multivariate analysis with a descending stepwise logistic regression on a derivation cohort identified predictive factors for a Fg $\leq$1.5 g/L. One point was attributed for each predictive factor and the final score was the sum of all present factors. Performance of the score was tested on a validation cohort.

Results are expressed as median with interquartile range between the 25th and the 75th percentile and odds ratios (OR) with 95 % confidence interval ($_{95}$CI).

RESULTS. 780 patients were included, 520 in the derivation cohort and 260 in the validation cohort (79 % male, 32 years old [24–47]). Plasma Fg level and clinical and epidemiological characteristics were comparable between the two cohorts.

Five predictive factors were identified after multivariate analysis: free intra-abdominal fluid (OR 2.4, $_{95}$CI [1.1–4.9]), pre-hospital HR $\geq$ 110/min (OR 2.4, $_{95}$CI [1.4–4.3]), admission

Hb ≤10 g/dL (OR 3.6, $_{95}$CI [1.9–6.8]), ΔHb ≥3 g/dL (OR 3.6, $_{95}$CI [1.8–6.9]), blood lactate level on admission ≥2.2 mmol/L (OR 2.3, $_{95}$CI [1.2–4.1]).
Area under the ROC curve in the validation cohort was 0.89 ($_{95}$CI [0.84–0.94]). Predictive performance in the validation cohort is summarized in the table.

Predictive performance on the validation cohort

Score	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Positive likelihood ratio	Negative likelihood ratio	Patients with Fg ≤1.5 g/L, n (%)
=1	0.93	0.44	0.22	0.97	1.6	0.15	7 (8.1 %)
=2	0.77	0.77	0.32	0.95	3.3	0.29	10 (27 %)
=3	0.61	0.91	0.46	0.92	6.5	0.43	10 (50 %)
=4	0.42	0.98	0.64	0.89	20	0.60	14 (82 %)
=5	0.15	0.99	0.83	0.85	21	0.86	7 (87 %)

CONCLUSION. The presented score ≥4 has a good performance to predict a Fg ≤1.5 g/L. A score ≤1 has a good negative predictive value. This easy to use score could allow administering Fg in a timelier and targeted manner in major trauma patients on admission in the hospital.
REFERENCES. 1. Rourke et al. Fibrinogen levels during trauma hemorrhage, response to replacement therapy, and association with patient outcomes. J Thromb Haemost. 2012;10:1342–51. 2. Rossaint R, et al. Management of bleeding following major trauma: an updated European guideline. Crit Care. 2010;14:R52.

Optimisation of antimicrobial use in ICU: 0031–0035

0031

CLINICAL DETERMINANTS OF NON-TARGET ATTAINMENT IN CRITICALLY ILL PATIENTS RECEIVING BETA-LACTAM ANTIBIOTICS: RESULTS FROM THE DALI STUDY

J. De Waele[1], J. Roberts[2], M. Akova[3], M. Bassetti[4], G. Dimopoulos[5], M. Kaukonen[6], D. Koulenti[5], C. Martin[7], P. Montravers[8], J. Rello[9], A. Rhodes[10], T. Starr[2], S. Wallis[2], J. Lipman[2], DALI Study Group

[1]Ghent University Hospital, Ghent, Belgium, [2]Burns Trauma and Critical Care Research Centre, The University of Queensland, Brisbane, Australia, [3]Hacettepe University Hospital, Ankara, Turkey, [4]Azienda Ospedaliera Universitaria Santa Maria della Misericordia, Udine, Italy, [5]Attikon University Hospital, University of Athens Medical School, Athens, Greece, [6]Helsinki University Hospital, Helsinki, Finland, [7]Hospital Nord, Marseille, France, [8]Centre Hospitalier Universitaire Bichat-Claude Bernard, Paris, France, [9]CIBERES, Vall d'Hebron Institut of Research, Barcelona, Spain, [10]St George's Healthcare NHS Trust and St George's University of London, London, UK

INTRODUCTION. Individual factors contributing to underexposure to antibiotics have been studied but it remains unclear what patients are at risk of underdosing. Clinical factors associated with low β-lactam concentrations have not been studied on a large scale.
OBJECTIVES. To describe PK/PD target attainment in patients receiving β-lactam antibiotics and to identify patient characteristics that are associated with suboptimal exposure to β-lactam antibiotics.
METHODS. The DALI study was a prospective, multi-centre pharmacokinetic point-prevalence study [1]. Each patient had 2 blood samples taken for each β-lactam antibiotic. PK/PD targets that were evaluated in this study are 50 and 100 % $f\,T_{>MIC}$.(time of free drug concentration above the minimal inhibitory concentration (MIC).
The MICs were chosen for a worst case scenario in terms of bacterial susceptibility The highest MIC for susceptible bacteria to the antibiotic was assumed (e.g. *Pseudomonas aeruginosa* MIC of 16 mg/L for piperacillin/tazobactam).
In order to identify important covariates, a multivariate analysis (MVA) was performed variables for which the p-value was < 0.2 in univariate analysis.
RESULTS. In 68 ICUs across 10 countries, 343 critically ill patients who received **β**-lactam antibiotics were included in the study. Median age of the patients was 60 (47-73) years, and APACHE -II score on admission was 18 (13-24). Piperacillin (n = 107) and meropenem (n = 78) were prescribed most often.
Predefined PK targets of 50 % $f\,T_{>MIC}$ and 100 % $f\,T_{>MIC}$ were not reached by 66 (19.2 %) and 142 (41.4 %) patients respectively.
The use of extended or continuous infusion was significantly associated with increased target attainment for both 50 % $f\,T_{>MIC}$ and 100 % $f\,T_{>MIC}$; for the latter also increased estimated creatinine clearance was associated with a lower probability of reaching the predefined PK targets.
In patients receiving intermittent infusion only, MVA showed that for the target of 50 % $f\,T_{>MIC}$, only the indication for the antibiotic was associated with target attainment: patients who received antibiotics as therapy rather than prophylaxis were 2.25 times more likely to achieve that goal. For the target of 100 % $f\,T_{>MIC}$, GFR but also the interval between the start of antibiotic therapy as well as recent surgery were significantly associated with target attainment Targets were less frequently attained in the first days of therapy and in post-operative patients.
CONCLUSIONS. This study found that respectively 19 and 41 % of the critically ill patients treated with β-lactam antibiotics did not achieve the predefined targets of 50 % $f\,T_{>MIC}$ and 100 % $f\,T_{>MIC}$. In the overall study population, the use of extended or continuous infusion was the main determinant of target attainment both at middose and at end of dose, whereas creatinine clearance also affected the 100 % $f\,T_{>MIC}$ target.
REFERENCE(S). 1. Roberts, JA. BMC Infect Dis. 2012;1:152.
GRANT ACKNOWLEDGMENT. ESICM ECCRN and the RBWH Research Foundation.

0032

EDUCATIONAL ANTIMICROBIAL STEWARDSHIP PROGRAMME (PRIOAM) ON PRESCRIBING PRACTICE IN THE CRITICAL CARE UNIT OF A TERTIARY HOSPITAL CENTRE

C.M. Ferrández-Millón[1], R. Amaya[1], J.A. Marquez-Vácaro[1], A. Gutierrez-Pizarraya[2], M. Porras-López[1], T. Aldabó-Payás[1], M.V. Gil-Navarro[3], J.A. Lepe[4], C. Ortiz-Leyba[1], A. Diaz-Martinez[1], J. Garnacho-Montero[1], J.M. Cisneros[2]

[1]Virgen del Rocio Hospital, Critical Care Unit, Seville, Spain, [2]Virgen del Rocio Hospital, Infectious Disease Unit, Seville, Spain, [3]Virgen del Rocio Hospital, Farmacy Department, Seville, Spain, [4]Virgen del Rocio Hospital, Microbiology Department, Seville, Spain

INTRODUCTION. Inappropriate use of antibiotics causes an increment in mortality and morbidity of hospitalized patients as well as promotes the development of bacterial resistances. The implementation of antimicrobial stewardship programmes (ASPs) has been encouraged by scientific societies in order to reduce the misuse of antibiotics. An educational, institutionally supported ASP has been developed in the Hospital Virgen del Rocio, a large urban hospital (1,200 beds) with teaching accreditation. Here in we present the results obtained in the ICU during the first 2 years (2011–2012).
OBJECTIVES. The main aims of our study were to assess the clinical, microbiological and economical impact of this stewardship programme.
METHODS. This is an on-going programme that began on January 2011. Institutional Programme for the Optimization of Antimicrobial Treatment (PRIOAM) is an initiative of the local Committee of Hospital Infections and Antimicrobials. A team responsible for the programme implementation was constituted. Sixty-four physicians from different clinical departments elaborated clinical guidelines for the use of antimicrobials. PRIOAM operations team in the ICU (polyvalent Unit with 62 beds) were six critical-care specialists and the type of treatment evaluated by counselling interviews (CIs) included surgical prophylaxis, empirical antimicrobial therapy and directed therapy. Rate of inappropriate antimicrobial prescriptions (IAP), density antimicrobial resistance, defined daily doses (DDD)/100 occupied bed-stays, and ICU mortality were evaluated. Satisfaction with the interview was assessed using anonymous questionnaires. Paired categorical and continuous variables were compared using the Chi squared test and t-test or Mann–Whitney *U* test, respectively. Significance was set at $p < 0.05$. Statistical analyses were performed with the PASW 18.0 statistical package.
RESULTS. In the ICU, a total of 529 CIs were performed during the study period. The most frequently performed assessments were for empirical prescriptions (49.1 %), followed directed treatments (31.6 %) and surgical prophylaxis (19.3 %). In the first six-month period, the rate of IAP was 51.5 % (67/130) that decreased to 35.1 % (61/174) in the last six-month period ($p = 0.001$). The highest rate of IAP at the baseline was observed in directed therapy whereas the improvement in antimicrobial prescriptions was obtained mainly in surgical prophylaxis followed by empirical prescriptions and directed therapy. The global reduction of DDDs was 16.4 % (168.7 DDDs in 2011 vs. 141 DDDs in 2012). Rate of resistance and mortality remained stable during all the study period. In the satisfaction questionnaires, 96.5 % of clinicians described the CIs as positive.
CONCLUSIONS. In the critical care setting, this education-based ASP has obtained outstanding results reducing the rate of IAP and the antimicrobial consumption without changes in the overall mortality. Acceptance among clinicians is excellent.

0033

EFFECTIVENESS OF EARLY ANTIBIOTIC THERAPY EDUCATIONAL PROGRAM IN SEVERE SEPSIS AND SEPTIC SHOCK

P. García Olivares[1], J.C. Sotillo[1], J. Peral[1], M. Sancho[1], E. Bermejo[1], J.M. Gómez[1], P. Santa Teresa[1], S. Arenal[1], A. Jaspe[1], M. Díaz[1]

[1]H.G.U. Gregorio Marañón, Intensive Care Unit, Madrid, Spain

INTRODUCTION. Early administration of antibiotics has shown increased survival in septic patients. The implementation of educational programmes in the field of septic patients also has improved outcome. The impact of both measures together is unknown.
OBJECTIVES. The purpose of this study was to determine the impact of early antibiotic therapy educational program application on prognosis of patients with severe sepsis and septic shock.
METHODS. Observational, prospective study with a before-after format of an early antibiotic therapy educational program in septic patients. In both, pre-educational (March 2011–November 2011) and post-educational group (March 2012–November 2012), demographic data, comorbidities, etiology and type of sepsis (severe sepsis and septic shock), severity scores, microbiological isolates, elapsed time until administration of the first dose of an appropriate antibiotic and Surviving Sepsis Campaign (SSC) bundles compliance, were collected.
Continuous data were reported as mean ± SD or median with interquartile range and categorical data as percentages. The comparison between the two groups was performed using Chi square test for categorical data and Student *t* test for continuous data. Multivariable logistic regression was used to estimate the association between educational program and mortality after adjustment for possible confounding factors.
RESULTS. Two hundred patients were included in the study, 102 in pre-educational and 98 in post-educational group. The demographic data, comorbidities, severity scores etiology and type of sepsis, need of mechanical ventilation and hemodynamic support were similar in both groups.

Table 1

	Pre-educational group	Post-educational group	Significance (p)
Age	60 ± 15	59 ± 15	0.73
Comorbidities	47 %	41 %	0.44
APACHE II	23 ± 7	25 ± 7	0.16
SOFA	9 ± 4	10 ± 4	0.21
Lactate levels	3.8 ± 2.6	3.9 ± 2.2	0.82
Septic shock	67 %	75 %	0.28
Bundles SSC (n°) (6 h)	4 ± 1	4 ± 1	0.50
Abdominal focus	26 %	10 %	0.11
Respiratory focus	50 %	63 %	0.72

There were no differences between the two groups in regard to: microbiological isolation (57 vs 71 %, $p = 0.10$), positive blood culture (39 vs 35 %, $p = 0.59$), percentage of patients who received antibiotics in the first hour (47 vs 45 %, $p = 0.77$) and percentage of patients who received appropriate antibiotic (88 % vs 89 %, $p = 0.98$). In the post-educational group we achieved a decrease in the elapsed time from hospital admission and sepsis recognition

until the first appropriate antibiotic administration (7.2 ± 6.9 vs 2.5 ± 2.4 h; p = 0.037 and 2.7 ± 4.7 vs 1.9 ± 2.8 h; p = 0.20, respectively). ICU mortality rate was lower in post-educational group (32 vs 18.4 %; RR 0.47, 95 % CI 0.24–0.92).
In multiple logistic regression analysis (Table 2) after adjusting for demographic data, comorbidities, severity scores, etiology (respiratory and abdominal) and type of sepsis, number of SSC bundles completed and need of mechanical ventilation, the educational program was associated with a decrease in mortality.

Table 2

	Odds ratio	95 % CI	Significance (p)
Post-educational group	0.29	0.09–0.99	0.04
Age	1.04	1.00–1.07	0.04
Mechanical ventilation	38.22	4.55–320.69	0.00
SOFA	1.30	1.13–1.50	0.00

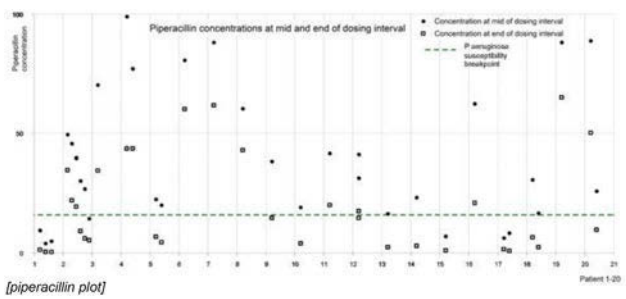
CONCLUSIONS. In our study an early antibiotic therapy educational program was effective in reducing the elapsed time until antibiotic administration, achieving a decrease in mortality.

0034
STANDARD DOSING REGIMENS OF PIPERACILLIN AND MEROPENEM FAIL TO ACHIEVE ADEQUATE SERUM CONCENTRATIONS IN ICU PATIENTS

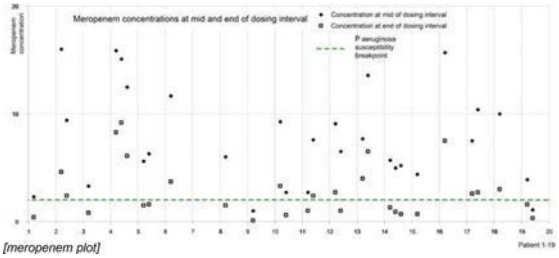
J. Petersson[1,2], C.G. Giske[3], E. Eliasson[4]

[1]Karolinska University Hospital Solna, Department of Anaesthesiology, Surgical Services and Intensive Care, Stockholm, Sweden, [2]Karolinska Institutet, Section of Anesthesiology and Intensive Care Medicine, Department of Physiology and Pharmacology, Stockholm, Sweden, [3]Karolinska University Hospital Solna, Clinical Microbiology, Department of Microbiology, Tumor and Cell Biology (MTC), Stockholm, Sweden, [4]Karolinska Institutet, Division of Clinical Pharmacology, Department of Laboratory Medicine, Stockholm, Sweden

INTRODUCTION. Previous studies have questioned the adequacy of standard dosing regimens of beta-lactam antibiotics in critical care patients.
OBJECTIVES. To study the serum concentration achieved with standard dosing of meropenem and piperacillin in critically ill patients. To evaluate the need for routine measurements of concentrations in these patients.
METHODS. Single center observational study of ICU patients treated with meropenem or piperacillin, excluding patients on renal replacement therapy. Paired serum samples for later analysis were obtained at 50 and 100 % of the dosing interval. When feasible, sampling was repeated every 2–3 days until the end of either antibiotic or ICU treatment. Concentrations of the antibiotics were determined by LC–MS according to quality-assured routine methods in the hospital pharmacology laboratory. Unbound concentration of piperacillin was calculated assuming a protein binding of 20 %, for meropenem protein binding was considered negligible. Measured concentrations were compared to susceptibility testing MIC (minimal inhibitory concentration) breakpoints for *Pseudomonas aeruginosa*, 16.0 and 2.0 mg/L for piperacillin and meropenem respectively. Linear regression was used to correlate antibiotic concentrations with plasma creatinine (P-Crea), measured creatinine clearance (Cl-Crea) and glomerular filtration rate estimated from plasma cystatin C (eGFR).
RESULTS. 33 and 31 paired samples were obtained from 20 and 19 patients treated with piperacillin and meropenem, respectively. Piperacillin dose was 4 g q8h for 19 patients and 4 g q6h for one patient, meropenem 1 g q8h for 16 and 1 g q12h for 2 patients, 1 g q6h for 1 and 0.5 g q6h for 1 patient. Piperacillin concentrations were (mg/L), median (interquartile range), 31 (17–60) and 10 (3–35) at the mid and end of the dosing interval respectively. Meropenem concentrations were (mg/L) 7.5 (4.7–10.2) and 1.6 (0.9–2.8). For piperacillin 21 and 58 % of the concentrations were below the breakpoint for *P. aeruginosa* at the mid and end of the dosing interval respectively, for meropenem the percentages were 6 and 54 %. Concentrations correlated with all estimates of renal function but the correlation coefficient was significantly greater for Cl-Crea than for P-Crea or eGFR.
CONCLUSIONS. Piperacillin 4 g q8h and meropenem 1 g q8h failed to achieve adequate plasma drug concentration in a significant number of patients. In most patients, serum trough concentrations were below the breakpoint for *P. aeruginosa*. This would translate to a suboptimal target achievement (time with serum concentration > MIC), and possibly impaired bacterial killing. Increased dosing, determination of antibiotic susceptibility of isolated pathogens, routine drug concentration measurements or selective measurements based on glomerular filtration rate estimates might be used to tailor antibiotic treatment in the ICU.
PLOTS. For multiple samples in one patient, consecutive results are shown from left to right.



[piperacillin plot]



[meropenem plot]

0035
SEPSIS BAGS: SIMPLE METHOD TO INCREASE PROCESS COMPLIANCE WITH SEPSIS SIX ON THE WARD

J. Burke[1], L. Smith[1], S. Wood[1], A. Hermon[1], T. Szakmany[1]

[1]Royal Glamorgan Hospital, Anaesthesia, Critical Care and Theatres, Llantrisant, UK

INTRODUCTION. In the UK, severe sepsis is estimated to kill 37 000 patients annually, and consume 50 % of critical care resources [1]. The 'Sepsis Six' is designed to facilitate early intervention with three diagnostic and three therapeutic steps to be delivered by staff within 1 h [2]. We have identified that lack of readily available equipment is key in the non-compliance with the delivery of 'Sepsis Six'.
OBJECTIVES. As part of our quality improvement program we designed and distributed 'Sepsis bags' to all wards, with equipment to deliver the 'Sepsis Six'. In a prospective observational study we evaluated whether the use of 'Sepsis bags' can improve the process compliance with the intervention.
METHODS. All adult patients where clinical suspicion triggered the use of 'Sepsis Six' were included. All patients fulfilled the severe sepsis criteria. The 'Sepsis bags' were distributed to every ward in the hospital together with a robust training program on their use. The bags contain iv fluids, giving sets, cannulas, blood gas syringes, blood culture bottles, vacutainers for haematology, biochemistry and lactate, sterile procedure packs to aid aseptic technique and the extract of the local guidance on appropriate antibiotic prescription in severe infections. A standard pro forma was used to collect data on patients referred directly to the outreach team, or identified out of hours and referred to the Critical care team.
RESULTS. 136 patients were identified over the 12 months period. 22 patients had 'Sepsis Six' delivered *without* the 'Sepsis bags'. Only 3 out of 22 received the treatment within 1 h. 114 patients (age: 69 ± 15, Early Warning Score (EWS): 7 ± 3; mean ± SD, respectively) received 'Sepsis Six' using the 'Sepsis bags'. Outreach team in used them in 92 % and ward nurses and medical staff in the remaining 8 % of the cases. Out of the 114 patients, 80 % received the full bundle within 1 h. Delay in administering the full bundle in all cases was caused by delay in antibiotic prescribing, which is not in the remit of outreach nursing staff. There was no delay in administering the treatment and monitoring bundle, which needed the equipment provided within the 'Sepsis bags'. After 24 h of administering the 'Sepsis Six' EWS decreased significantly to 4 ± 2 ($p < 0.001$, Student *T*-test). 19 patients were admitted to the ICU whilst in 7 patients a DNAR decision was made after the intervention. Overall hospital mortality was 22.5 % in all patients in the cohort.
CONCLUSIONS. The use of 'Sepsis bags' significantly improved the compliance with the delivery of this simple, yet effective monitoring and treatment bundle. The successful delivery of 'Sepsis Six' is associated with significant reduction in EWS. Based on our experience we plan to roll out this service to the other acute hospital of the organisation.
REFERENCE(S). 1. Bakker J, et al. Crit Care Med. 1998;26:A131. 2. Daniels R, et al. Emerg Med J. 2011;28(6):507–12.

New findings on cardiac arrest survivors: 0036–0040

0036
BRADYCARDIA DURING THERAPEUTIC HYPOTHERMIA IS ASSOCIATED WITH BETTER OUTCOME IN CARDIAC ARREST SURVIVORS

H. Stær-Jensen[1], G.Ø. Andersen[2], D. Jakobsen[3], T.M. Olasveengen[4], T. Drægni[4], K. Sunde[3]

[1]Oslo University Hospital and University of Oslo, Institute for Experimental Medical Research (IEMR), Oslo, Norway, [2]Oslo University Hospital and University of Oslo, Department of Cardiology, Oslo, Norway, [3]Oslo University Hospital and University of Oslo, Oslo, Norway, [4]Oslo University Hospital, Oslo, Norway

INTRODUCTION. Comatose patients surviving out-of-hospital cardiac arrest (OHCA) are treated with therapeutic hypothermia (TH) for 24 h with target temperature 32–34 °C. Bradycardia is one of several effects occurring during TH, but its impact on outcome or need of treatment, has not been investigated.
OBJECTIVES. To explore a possible association between bradycardia during TH and poor neurological outcome in comatose survivors of OHCA.
METHODS. A retrospective analysis of adult patients resuscitated from non-traumatic OHCA admitted to Oslo University Hospital Ullevål after initial successful resuscitation between 1/1-2009 and 31/12-2010 was performed using data from an established Post Resuscitation Care registry. Haemodynamic data were obtained every fourth hour during the first 72 h of treatment. Patients were categorized into quartiles depending on their average heart rate during the TH period. Observations of heart rate were included during the actual time period patients were in temperature target rate (32–34 °C). Primary endpoint was Cerebral Performance Category (CPC) score at hospital discharge. Patients were classified into good outcome (CPC 1 and 2) or bad outcome (CPC 3–5).
RESULTS. A total of 165 OHCA patients were admitted, of which 107 were comatose and received active treatment including TH. All patients were in temperature target range

(32–34 °C) 8 h after CA. The quartiles of heart rate were ≤49 (50–62), (63–77) and ≥88. Patients with good outcome at discharge in the different quartiles were 18/27 (67 %), 14/25 (56 %), 12/28 (43 %) and 7/27 (26 %) in quartiles 1–4 respectively, P for trend, p = 0.002 (Fig. 1). Patients in the lowest quartile had significantly better outcome compared to the higher groups (p = 0.027) while patients in the highest quartile had significantly worse outcome compared to the lower three groups (p = 0.013). In univariate analyses heart rate below 50 was associated with a ~3 fold increase in the odds of experiencing good outcome (OR 2.8, CI [1.1, 7.1]).

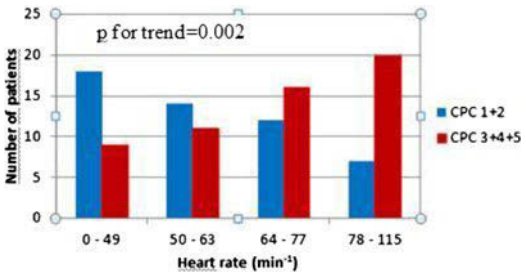


Fig. 1 Heart rate eight hours post arrest and CPC

CONCLUSIONS. Bradycardia during TH is not associated with poor neurological outcome at discharge. On the contrary, patients with the lowest heart rate had excellent outcome while patients with normal to high heart rate during TH seem to have worse prognosis. The mechanisms behind this are not totally clear, but warrant further studies, both experimental and clinical.

REFERENCE(S). 1. Tømte O, Andersen GØ, Jacobsen D, Drægni T, Auestad B, Sunde K. Strong and weak aspects of an established post-resuscitation treatment protocol-A five-year observational study. Resuscitation. 2011;82(9):1186–93.

GRANT ACKNOWLEDGMENT. The study was supported by grants from Eastern Norway Regional Health Authority, Oslo University Hospital, Ullevål.

0037

BLOOD GLUCOSE LEVEL AND OUTCOME AFTER CARDIAC ARREST IN THE HYPOTHERMIA ERA: INSIGHTS FROM A LARGE REGISTRY

F. Daviaud[1], F. Dumas[2,3], N. Demars[4], G. Geri[1,3], A. Bougle[1], T. Morichau-Beauchant[1], Y.-L. Nguyen[1], S. Bourcier[1], W. Bougouin[1,3], J.-D. Chiche[1], F. Pène[1], J. Charpentier[1], A. Cariou[1,3]

[1]Cochin University Hospital, Medical Intensive Care Unit, Paris, France, [2]Cochin University Hospital, Emergency Department, Paris, France, [3]Sudden Death Expertise Center, INSERM U 970 (Team 4), Paris, France, [4]Antoine Beclere Hospital, Intensive Care Unit, Clamart, France

INTRODUCTION. Despite several experimental and clinical studies, the influence of blood glucose (BG) level during the post-resuscitation period after out-of-hospital cardiac arrest (OHCA) is still unclear. At that time, guidelines [1] recommend a moderate glycemic control aiming to avoid hyperglycemia in post-cardiac arrest patients.

OBJECTIVES. To evaluate the role of glycemia on outcome, we included the mean glycemia and its variation over the first 48 h following admission in an analysis of outcome predictors.

METHODS. We conducted a database study in a "cardiac arrest center" at Cochin hospital in Paris, France. Between December 2006 and January 2010, we included 381 patients who were all resuscitated from an OHCA (excepted neurological cause or early death). A moderate glycemic control was applied in all patients (aiming to maintain BG between 5.1 and 7.7 mmol/l). BG was measured at admission and then every 3 h during the first 48 h. The median glycemia and the largest delta (defined by difference between maximum and minimum value over the same period) were also assessed. A multivariate analysis was performed to determine parameters that independently influenced the main outcome (CPC level at ICU discharge).

RESULTS. During the study period, 136/381 patients (36 %) had a favorable outcome (CPC 1–2). Median blood glucose level was 7.6 mmol/l (IQR 6.3–9.8) in patients with a favorable neurologic outcome compared to 9.0 mmol/l (IQR 7.1–10.6) for patients with an unfavorable neurologic outcome ($p < 0.01$). Median blood glucose level variation during the first 48 h was 7.1 (4.2–11) and 9.6 (5.9–13.6) mmol/L in patients with and without a favorable neurologic outcome, respectively ($p < 0.01$). In multivariate analysis, an increased median blood glucose level over the first 48 h (>8.4 mmol/L) was found to be an independent predictor of poor neurological issue (OR = 0.43; 95 %CI [0.24–0.78], p = 0.006). Other predictive factors of a poor outcome were an unshockable rhythm (p = 0.004), cardiac arrest location (p = 0.004), a no flow >4 min (p = 0.01) and a low flow >15 min (p = 0.003). Finally an increase in median glycemia was associated with an increase in the proportion of patients with a poor neurological outcome (figure).

CONCLUSIONS. Even after adjustment with usual prognostic factors, an increase in glycemia during the first 48 h is correlated with an unfavorable neurological outcome. Hyperglycemia could act through different ways, for example by pro apoptotic phenomenon in the cerebral tissue but also by influence in the inflammatory and immunity response. Further clinical research should be performed in order to assess the potential benefit of glycemic control in this setting.

REFERENCE(S). Peberdy MA, et al. Part 9: post-cardiac arrest care: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2010;122(18 Suppl 3):S768–86.

0038

LOW APPARENT DIFFUSION COEFFICIENT CLUSTER-BASED ANALYSIS OF DIFFUSION-WEIGHTED MRI FOR PROGNOSTICATION OF OUT-OF-HOSPITAL CARDIAC ARREST SURVIVORS

C. Park[1], K. Kim[2], J. Kim[2], J.E. Rhee[2]

[1]Seoul National Univ. Hospital, Emergency Medicine, Seongnam-si, Republic of Korea, [2]Seoul National Univ. Hospital, Seongnam-si, Republic of Korea

INTRODUCTION. Recent studies suggested quantitative analysis of diffusion-weighted magnetic resonance imaging as a promising tool for early prognostication of cardiac arrest patients [1–5].

OBJECTIVES. Most of their predicting methods involve significant manual image handling often subjective and difficult to reproduce [1, 3–5]. Therefore developing a computerized analysis method using easy-to-define characteristics would be useful.

METHODS. Comatose out-of-hospital cardiac arrest (OHCA) patients who underwent brain MRI between Jan, 2008 and July, 2012 were identified from an OHCA registry. Apparent diffusion coefficient (ADC) axial images were analyzed using a program to detect and characterize clusters of low ADC pixels from six brain regions including frontal, occipital, parietal, rolandic and temporal and basal ganglia region. Identified clusters were ranked according to size, mean ADC and minimum ADC to assess the regional maximum cluster size (MCS), lowest mean ADC (LMEAN) and lowest minimum ADC (LMIN). Their power to predict poor outcome, defined as 6-month CPC 3 or higher, was assessed by contingency table analyses.

RESULTS. 51 OHCA patients were eligible during the study period. The sensitivities of MCS, LMEAN and LMIN to detect poor outcome varied according to brain region from 62.5 to 90.0 %, 50.0 to 72.5 % and 42.5 to 82.5 % with their specificities set to 100 %, respectively. The MCS of occipital region showed most favorable test profile (sensitivity 90 %, specificity 100 %; AUROC 0.940, 95 % confidence interval 0.874–1.000).

CONCLUSIONS. The cluster-based computerized image analysis might be a simple but useful method for prediction of poor neurologic outcome. Future studies validating its prognostic performance are required.

REFERENCE(S). 1. Wijman CAC, Mlynash M, Caulfield AF, et al. Prognostic value of brain diffusion-weighted imaging after cardiac arrest. Ann Neurol. 2009;65:394–402. 2. Wu O, Sorensen AG, Benner T, Singhal AB, Furie KL, Greer DM. Comatose patients with cardiac arrest: predicting clinical outcome with diffusion-weighted MR imaging. Radiology. 2009;252:173–81. 3. Choi SP, Park KN, Park HK, et al. Diffusion-weighted magnetic resonance imaging for predicting the clinical outcome of comatose survivors after cardiac arrest: a cohort study. Crit Care. 2010 (Accessed 12 Dec 2012, at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2875532/). 4. Kim J, Choi BS, Kim K, et al. Prognostic performance of diffusion-weighted MRI combined with NSE in comatose cardiac arrest survivors treated with mild hypothermia. Neurocrit Care. 2012;17:412–20. 5. Mlynash M, Campbell DM, Leproust EM, et al. Temporal and spatial profile of brain diffusion-weighted MRI after cardiac arrest. Stroke. 2010;41:1665–72.

0039

HEALTH RELATED QUALITY OF LIFE IMPROVES DURING THE FIRST 6 MONTH AFTER CARDIAC ARREST AND HYPOTHERMIA TREATMENT

I.-M. Larsson[1], E. Wallin[1], M.-L. Kristofferzon[2], S. Rubertsson[1]

[1]Uppsala University, Department of Surgical Sciences, Anaesthesiology and Intensive Care, Uppsala, Sweden, [2]Faculty of Health and Occupational Studies, Department of Health and Caring Sciences, University of Gävle, Gävle, Sweden

INTRODUCTION. Patients' quality of life (QoL) after having survived a cardiac arrest has been reported negatively influenced or acceptable to good [1–3]. Feelings of anxiety and depression are present in CA patients [3] and depressions have been shown to be related to QoL [4]. There is little known, however about changes over time in anxiety, depression and health-related quality of life (HRQoL) after surviving CA treated with therapeutic hypothermia (TH). Therefore, the aim of the study was to investigate if there were any changes and correlation in anxiety, depression and HRQoL from hospital discharge until one and 6 months after CA in patients treated with TH.

OBJECTIVES. During a 4-year period at three hospitals in Sweden, 26 patients were prospectively included after CA treated with TH.

METHODS. The patients answered the questionnaires Hospital Anxiety and Depression Scale (HADS), Euroqol (EQ5D), Euroqol visual analogue scale (EQ-VAS) and Short Form 12 (SF12) at three occasions; in connection with hospital discharge, and at one and 6 months after CA.

RESULTS. There was improvement over time in HRQoL, in EQ5D index ($p = 0.002$) and SF12 physical component score (PCS) ($p = 0.005$). Changes over time in anxiety and depression were not found. Seventy-three percentages scored overall health status with EQ-VAS below 70 (scale 0–100) at discharge from hospital and at 6 months this was found in 41 %. Physical problems were most common cause of affected HRQoL. Correlation was found between depression and HRQoL and this was strongest at 6 months ($r_s = -0.44$ to -0.71, $p \leq 0.001$).

CONCLUSIONS. HRQoL are affected negatively in patients after CA treated with TH, but improvement over the first 6 months can be seen. The patients scored lower self-reported levels of HRQoL in physical than in mental components. The result indicates that time is an important factor and patients may require more support the first time after discharge from hospital.

REFERENCE(S). 1. Torgersen J, Strand K, Bjelland TW, et al. Cognitive dysfunction and health-related quality of life after a cardiac arrest and therapeutic hypothermia. Acta Anaesthesiol Scand. 2010;54:721–8. 2. Horsted TI, Rasmussen LS, Meyhoff CS and Nielsen SL. Long-term prognosis after out-of-hospital cardiac arrest. Resuscitation. 2007;72:214–8. 3. Wachelder EM, Moulaert VR, van Heugten C, Verbunt JA, Bekkers SC and Wade DT. Life after survival: long-term daily functioning and quality of life after an out-of-hospital cardiac arrest. Resuscitation. 2009;80:517–22. 4. Moulaert VR, Wachelder EM, Verbunt JA, Wade DT and van Heugten CM. Determinants of quality of life in survivors of cardiac arrest. J Rehabil Med. 2010;42:553–8.

GRANT ACKNOWLEDGMENT. The authors thank the Department of Surgical Sciences, Anaesthesiology and Intensive care, Uppsala university for institutional grants and funds from The Uppsala University Hospital.

0040

EXTRACORPOREAL LIFE SUPPORT ASSOCIATED WITH HYPOTHERMIA AND NORMOXEMIA IN REFRACTORY CARDIAC ARREST

D. Fagnoul[1], F. Taccone[1], A. Behlaj[2], B. Rondelet[2], J.F. Argacha[3], J.L. Vincent[1], D. De Backer[1]

[1]Cub Erasme, Intensive Care, Anderlecht, Belgium, [2]Cub Erasme, Lung Transplantation, Anderlecht, Belgium, [3]Cub Erasme, Cardiology, Anderlecht, Belgium

INTRODUCTION. Unexpected cardiac arrest (CA) remains a major problem worldwide, even thought the in-hospital survival has improved in the last decade. Duration of cardiopulmonary resuscitation (CPR) is an important prognostic factor and the probability of return to spontaneous circulation decreases rapidly when the duration of CPR exceeds 30 min. Extracorporeal cardiopulmonary resuscitation (ECPR) could extend the duration of resuscitation, facilitate return of spontaneous circulation and provide adequate organ perfusion.
OBJECTIVES. We describe a 1-year experience with ECPR for both in-hospital (IHCA) and out-hospital cardiac arrest (OHCA) associated to intra-arrest hypothermia and normoxemia.
METHODS. Since January 1st 2012, ECPR was applied in all patients less than 65 years without major co morbidities who developed refractory cardiac arrest with bystander CPR. We collected the demographic characteristics of patients, the need for vasopressor, inotropes and blood transfusions and data of cardiac arrest were recorded. We recorded also the hospital survival with intact neurological outcome and the rate of organ donation.
RESULTS. We treated 24 patients with a median age of 48 years. Ten patients had IHCA. Acute coronary syndrome and/or major arrhythmias were the main cause of arrest. The mean time from arrest to ALS was 10 [5–15] min and the initial rhythm was shockable in 10 patients. Intra-arrest cooling was used in 17 patients. Temperature on ECMO initiation was 32.9 °C [32–34]. The time from collapse to ECMO was 58 min [45–70]. Early PCI was implemented in 7 patients with successful angioplasty in 5 patients; 18 patients achieved spontaneous cardiac activity after 60 [49–84] minutes after cardiac arrest and no patient had ROSC before ECMO initiation. On day 3, 8 patients were alive, 4 of them treated with norepinephrine (0.2 mcg/kg/min [0.1–0.3]) and 6 patients with vasopressin (single dose during CPR). Dobutamine (20 mcg/kg/min [10–20]) was frequently used (10, 42 %). Seven patients had major bleeding, and 21 patients needed a blood transfusion. The ECMO duration, ICU length of stay and hospital length of stay were 1.5 days [1–2.3], 2 days [1–9] and 2 days [1–9.5] (respectively). Time from collapse to ECPR was shorter in survivors than in non-survivors (41 min [39–58] vs. 60 min [55–77]; ($p = 0.059$). Non-survivors were more likely to have a coagulopathy and received more blood transfusions. Six patients (25 %), including 3 with OHCA, survived with good neurological outcome at hospital discharge. Four patients with irreversible brain damage had organ function suitable for donation, and organ donation was performed in two.
CONCLUSIONS. ECPR provided satisfactory survival rates with good neurologic recovery in refractory CA. ECMO also rapidly stabilized hemodynamics and improved organ function in several patients, making organs suitable for donation.

Information technology, quality improvement and cost saving: 0041–0045

0041

FITTING ICU DATA COMPLEXITY: NEED FOR INNOVATIVE PREDICTION TOOLS. MORTALITY PREDICTION USING SUPERLEARNER

R. Pirracchio[1,2], M. Petersen[1], S. Chevret[3], M. van der Laan[1]

[1]University of California at Berkeley, Biostatistics, School of Public Health, Berkeley, USA, [2]Hôpital Européen Georges Pompidou, Anesthesiology and Critical Care, Paris, France, [3]Unité INSERM UMR-S 717, Biostatistiques et Informatique Médicale, Paris, France

BACKGROUND. Predicting the outcome of patients hospitalized in Intensive Care Units (ICU) is crucial. Many severity scores have been proposed but several external validations studies concluded that they do not calibrate adequately. These scores rely on a logistic regression models, thus on strong assumptions concerning the underlying data distribution, that are unrealistic given the high complexity of ICU data. Poor calibration might then be related to the misspecification of the underlying statistical model rather than the choice of the variables included in the model. We would like to use an automated algorithm to non-parametrically estimate the probability of dying given a set of characteristics, and we wish this estimator to be able to learn from the data using the true knowledge represented by the distribution of the observed data. The *Super Learner* (SL) is a machine learning method that can incorporate a large customized library of different data-fitting algorithms [1]. A weighted combination of the candidates included in the library is used to build the *SL* predictor.
OBJECTIVES. The aim of this study was to assess performances of *SL* based prediction of ICU mortality as compared to the predictions obtained with the SAPS2 and the first SOFA.
METHODS. We used the Multiparameter Intelligent Monitoring in Intensive Care II (MIMIC-II) database [2] that includes all patients admitted to an ICU at Boston's Beth Israel Deaconess Medical Center from 2001. We focused on patients >15 y/o included before December 1st 2012. The prediction of hospital mortality based on the SAPS2 score, the first 24-h SOFA and the *SL* were compared. The *SL* was used with a library of 12 parametric and non-parametric candidate algorithms. Results are expressed as median [IQR], and n (%). The evaluation of the performances of each candidate algorithm included in the *SL* library, as well as the comparison of the 3 prediction methods (*SL*, SAPS2 and SOFA) were based cross-validated area under the receiver operating curves (AUROC [95 % CI]).
RESULTS. 24,508 patients were included: age: 65 [51–77], SAPS2: 38 [27–51], SOFA: 5 [2–8], medical: 2,453 (10 %), trauma: 9,006 (37 %). 3,002 (12.2 %) patients died in hospital. The *SL* predictor outperformed each single candidate algorithm included in its library. As compared to the prediction performances obtained with the SAPS2 (0.71 [0.71–0.72]) or with the SOFA (0.78 [0.77–0.78]), the one obtained with the *SL* were far better with an AUROC of 0.89 [0.88–0.89] ($p < 0.0001$) (Fig. 1).

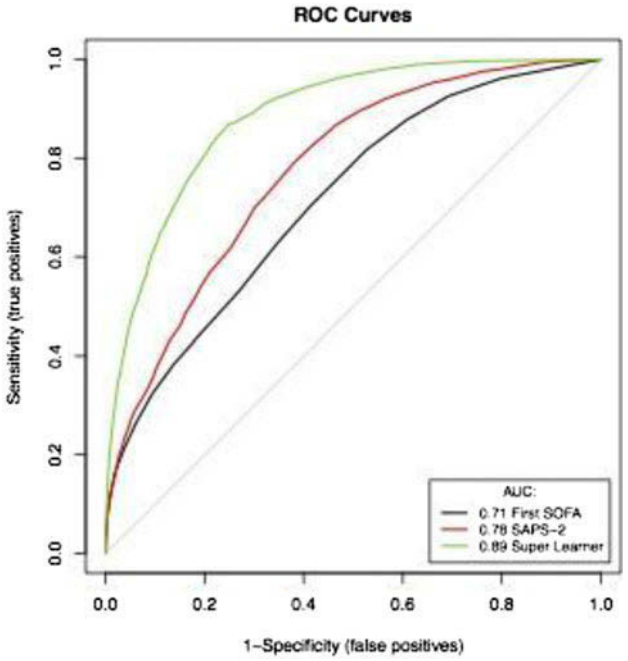


Fig. 1

CONCLUSIONS. As compared to usual severity scores, the *Super Learner* seems to offer a great benefit in predicting hospital mortality from ICU patients.
REFERENCE(S). 1. Van der Laan MJ, Polley EC, et al. Super Learner. Stat Appl Genet Mol Biol. 2007;6(1). 2. Lee J, Scott DJ, et al. Open-access MIMIC-II database for intensive care research. Conf. Proc. Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. 2011;2011:8315–8.
GRANT ACKNOWLEDGMENT. Fulbright fundation and APHP.

0042

ANALYSIS OF THE IMPACT OF MEDICAL DECISION-MAKING ON ICU BED MANAGEMENT USING A SIMULATION MODEL

J. Barado[1], L. Esparza[2], A. Cristina[3], F. Mallor[3]

[1]Navarra Hospital Complex, Pamplona, Spain, [2]García Orcoyen Hospital, Estella, Spain, [3]Public University of Navarra, Pamplona, Spain

OBJECTIVE. Mathematical analysis of the bed management decisions made in our ICU under extreme bed occupancy conditions using simulation tools.
METHODS. Firstly, we built a simulation model bed occupancy in our ICU with the data of patients admitted for a period of 9 years, a total of 6,300. It was based on a queuing system where the clients were the patients, the servers were the beds and the service was the patients' length of stay (LoS). The patients were sorted into eight groups based on their admission status. For each group we fitted the admission patterns and the LoS to mathematical distributions. The model was validated by testing the similarity of the real and simulated output data. The results showed discrepancies located in areas of low and high occupancy levels, leading us to consider the influence of medical decisions (MD) to modify the patient's date of discharge, based on the level of bed occupancy. Secondly, we included these MD in the simulation model, by means of defining of three parameters of a shorter stay in the case of high occupancy and two of a longer one in the case of low occupancy scenarios. We obtained a proper adjustment, both in terms of mean bed occupancy and the bed occupancy distribution (Fig. 1). After confirming the need to include these MD, the third step consisted in analysing the UCI performance depending on the value assigned to the defined parameters.

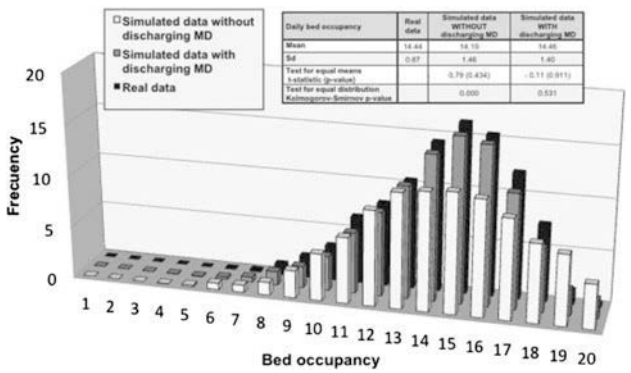


Fig. 1

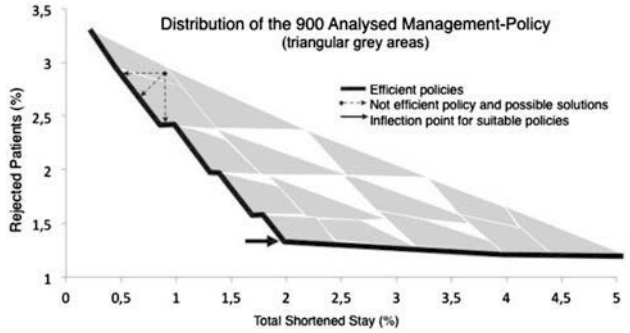


Fig. 2

RESULTS. Each scenario or bed management policy is described for the different values of the LoS reduction and extension parameters. The ICU operational performance is measured based on two objectives: the percentage of patients being refused admission due to bed shortages, and the rate of premature discharge due to bed occupancy pressures, representing the MD. Figure 2 shows the results of the 990 different analysed scenarios on each of the stated objectives (triangular grey areas). The data analysis shows two clinically relevant consequences. Firstly, not all policies are efficient, that is if it is impossible to improve the results of one objective without undermining those of the other, and they correspond to those located on the black line. Therefore, the policies that do not lie on this line should be modified to achieve it. Secondly, the consequences of different policies change depending on where we are in the line of efficient policies. Values to the right of the solid arrow are less suitable, because more aggressive bed management policies wouldn't result in a significant reduction of percentage of rejected admissions.
CONCLUSIONS. MD have an impact on ICU performance indicators. Different management policies lead to very different outcomes, many of which are not efficient. The analysis of ICU capacity problems therefore requires consideration of ICU management policy. This simulation model can be used to that aim, at present situation and to future eventualities and that this approach will open up new possibilities for simulation modeling.

0043
CHANGING PARADIGM OF HEALTH CARE DELIVERY SYSTEM IN DEVELOPING WORLD: INDIA'S FIRST E-ICU "CRITINEXT"

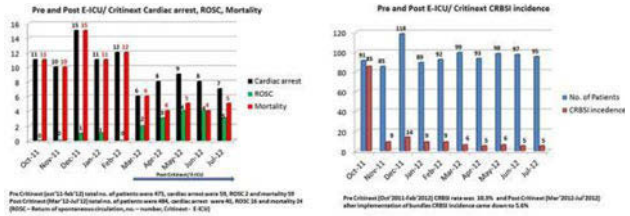
A. Kaushal[1], S. Gupta[1], S. Dewan[1], A. Varma[1]

[1]Fortis Escorts Heart Institute, Critical Care Medicine, New Delhi, India

INTRODUCTION. Intensive care is continuous, 24 × 7, dependent upon cutting edge technology which requires expensive equipments and skilled intensivists. Fewer infrastructures, aging population, high investment requirements and skilled manpower are a huge challenge in developing world. India spends 5.2 % of GDP on healthcare (US ≈ 15 %) and registered physicians are 0.5/thousand as compare to 1.8 in developed world [1]. Out of total hospital deaths 10 % happens of preventable ICU "mistakes and delayed interventions". E-ICU can be a potential mean to bridge this demand supply gap.[2,3]

[Healthcare Scenario in India]

OBJECTIVES. To examine the applicability of E-ICU in developing world and to conclude this improves the outcomes or not.
METHODS. E-ICU was deployed in 17 bedded remote ICU of India in March 2012. A team comprising of intensivists, nurses and technical professionals 24 × 7 monitored the patients (pt.), filtered the alerts and responded as needed from a command centre with real time electronic data, smart alert and audio visual screens. Collaborative approach included standardization of processes, training and quality audits. Cost for all was kept to a minimum to make it economically viable.
RESULTS. Pre E-ICU (Oct'11–Feb'12) out of 475 pt. 59 had cardiac arrest with all 59 mortalities, post E-ICU out of 484 pt. 40 had cardiac arrest with 24 deaths, there was a significant decrease in both cardiac arrest and mortality $p < 0.034$ and $p < 0.001$ respectively. Catheter related blood stream infection decreased from 10.3 % (49 in 475 pt.) to 5.6 % (29 in 484 pt.) $p < 0.014$. ICU stay decreased from 4.23 to 3.61 days.



[Post EICU Cardiacarrest. ROSC. Mortality improvem]

Transfer prevented post E-ICU were 15 resulting in revenue of INR 32.3 lac (€ 46140) compared to INR 15 lac (€ 21430) the cost incurred by remote hospital for deploying E-ICU. E-ICU benefitted nurses by saving their time from data entry and giving more time for pt. care.

Pre and Post E-ICU revenue generation for hospital by preventing transfer

	Pre E-ICU Transfer prevention	Pre E-ICU Revenue generation by transfer prevention		Post E-ICU Transfer prevention	Post E-ICU Revenue generation by transfer prevention (in lac)
Oct 2011	0	0	Mar 2012	2	5.6
Nov 2011	0	0	Apr 2012	3	7.9
Dec 2011	0	0	May 2012	3	6.1
Jan 2012	0	0	Jun 2012	3	4.2
Feb 2012	0	0	Jul 2012	4	8.5

Transfer prevented in view of E-ICU/ Critinext 24x7 support which increased the revenue for the hospital

Table Revenue generation post E-*ICU]*

CONCLUSIONS. Clearly, innovative measures are the order of the day to optimize efficiency of scarce critical care resources. E-ICU has potential to focus on untapped opportunities: geographic locations and underserved segments in developing world. The burgeoning Asian market offers a challenging opportunity for value creation. Other than clinical improvement E-ICU also introduces paperless ICU culture and increased focus on ICU performance. While it will never supplement on site staffing, however a country which lack basic medical staffing at general level, this helps to provide specialized care at bedside which would not have been possible at all.
REFERENCE(S). 1. Retail//Source: National Accounts Statistics 2001: McKinsey Analysis. 2. Rincon T, et al. Centralized, remote care improves sepsis identification, bundle compliance and outcomes. Chest. 2007;132(4):557–8S. 3. Morrison JL, et al. Clinical and economic outcomes of the electronic intensive care unit: results from two community hospitals. Crit Care Med. 2010;38(1):2–8.
GRANT ACKNOWLEDGMENT. Not taken any grant.

0044
IMPACT OF SAFETY PROGRAMMES ON HEALTH CARE COSTS

M.P. Gracia[1], F. Alvarez-Lerma[2], P. Olaechea[3], X. Nuvials[4], R. Gimeno[5], I. Seijas[6], M. Catalan[7], M. Palomar[8], STUDY GROUP ENVIN-HELICS

[1]Hospital Mar, Critical Care, Barcelona, Spain, [2]Hospital del Mar, Barcelona, Spain, [3]Hospital Galdakao, Galdakao, Spain, [4]Hospita Arnau Vilanova, Lleida, Spain, [5]Hospital La Fe, Valencia, Spain, [6]Hospital de Cruces, Baracaldo, Spain, [7]Hospital 12 de Octubre, Madrid, Spain, [8]Hospital Arnau de Vilanova, Lleida, Spain

OBJECTIVE. To assess the impact of the implementation of safety programmes (Bacteremia Zero [BZ] and Pneumonia Zero [PZ]) on the overall rates of mechanical ventilation-associated pneumonia and catheter-related bacteremia and costs attributed to these infections over the past 4 years.
Materials and methods. Data of patients included in the ENVIN-HELICS registry from 2008 (reference year) to 2012 (during the months of April–June) were retrospectively analysed. Infections rates of ventilator-associated pneumonia and catheter-related bacteremia were diagnosed according to criteria defined in the ENVIN-HELICS manual. Health care costs were estimated in terms of prolongation of stay attributed to these infections and costs per day of ICU admission (mean 3000€). It was accepted that prolongation of ICU stay is 8 days for ventilator-associated pneumonia and 12 days for catheter-related bacteremia. The Chi square test was used to assess differences in costs. Statistical significance was set at $P < 0.05$.
RESULTS. During the 3-month study periods of the 5 years analysed, a total of 81,107 ICU patients, with a median APACHE score of 13 were included. In 2008, 8.2 % of patients had one or more episodes of device-related infections as compared with 5.5 % in 2012 ($P < 0.001$). The rates of ventilator-associated pneumonia decreased from 14.9 ‰ in 2008 to 7.3 ‰ in 2012, and the rates of catheter-related bacteremia from 4.3 to 2.7 ‰. From the implementation of BZ and NZ projects, as compared with 2008, a total of 485 episodes of catheter-related bacteremia and 1,461 episodes of ventilator-associated pneumonia were prevented (only during the 3-month control period), with a theoretical decrease of 5,820 days in the case of catheter-related bacteremia and 26.298 days in the case of ventilator-associated pneumonia. The cost savings of ICU stays during the analysed months were estimated as 96.354.000 €, with an increase of savings between 2008 and 2009 of 13.200.000 € and between 2008 and 2012 of 38.300.000 € ($P < 0.001$).
CONCLUSIONS. The overall rates of ICU-acquired infection showed a decrease from the beginning of the BZ and PZ programmes, and effectiveness of these measures have remained and increased along the development of the projects. The implementation of these

programmes has been associated with important economic savings to the Spanish health care system that increases each year.

0045
DEVELOPMENT OF A TRIGGER-BASED AUTOMATED NOSOCOMIAL INFECTION SURVEILLANCE

A.-M. Kaiser[1], S. Evelein-Brugman[2], A. Beishuizen[2], J. Peppink[2], C. Vandenbroucke-Grauls[1], A. Girbes[2]

[1]University Hospital VU Medical Centre, Department of Medical Microbiology and Infection Control, Amsterdam, The Netherlands, [2]University Hospital VU Medical Centre, Department of Intensive Care, Amsterdam, The Netherlands

INTRODUCTION. Results of nosocomial infection surveillance are important indicators of quality of care. However, continuous registration is laborious. The availability of a Patient Data Management System (PDMS) has created opportunities for a trigger-based electronic surveillance system (ESS).

OBJECTIVES. To develop a trigger-based ESS for ventilator-associated pneumonia (VAP) and catheter-related sepsis (CRS).

METHODS. Prospective comparison of VAP/and CRS surveillance based on electronic data collection and manual daily assessment of VAP and CRS in all patients with surveillance based on electronic data collection and assessment of VAP and CRS in patients upon a trigger signal from the ESS. Slightly amended CDC infection criteria were used. The trigger consisted of components of the VAP/CRS criteria which were available and updated by ESS each day. The components were: the use of specific antibiotic, the presence of ventilation/catheter and the presence of relevant clinical symptoms. Assessment of the presence of VAP or CRS was only performed for those patients with a positive trigger signal from the ESS. This assessment involved the evaluation of chest radiographs and of the results of microbiology cultures. The assessment was performed by an infection control practitioner together with an intensive care physician.

RESULTS. A total of 555 patients was screened for VAP and CRS. The incidence of VAP was 3.3/1,000 ventilation days, of CRS 1.7/1,000 catheter days. For VAP, the trigger-based screening had a sensitivity of 92.3 % and a negative predictive value of 99.8 % compared to manual screening of all patients. For CRP this sensitivity was 91.3 % and the negative predictive value was 99.6 %. For both CRS and VAP screening, the trigger-based screening reduced labour time by 84 %: from 4.4 h per week without trigger to 42 min per week for screening with trigger.

CONCLUSIONS. In an environment with PDMS, surveillance of VAP and CRS with a trigger-based screening system for patients fulfilling part of the VAP or CRS criteria is feasible, has a high sensitivity and negative predictive value, and diminishes workload.

0047
REDUCTION OF UNWANTED SYMPTOMS IN DUTCH CRITICALLY ILL ICU PATIENTS AFTER WITHDRAWAL OF LIFE SUSTAINING THERAPY BY INTRODUCTION OF A SIMPLE DIRECTIVE; THE RESULTS OF A 2-YEAR PROSPECTIVE OBSERVATIONAL STUDY

J.L. Epker[1], E.J.O. Kompanje[1]

[1]Erasmus Medical Centre (ErasmusMC), Intensive Care, Rotterdam, The Netherlands

INTRODUCTION. In end-of-life management, various ethical and practical issues are relevant. One of the most disturbing events after treatment withdrawal is the occurrence of unwanted symptoms like death rattle stridor and terminal restlessness. The presence of these symptoms is often distressful for the family and should therefore be anticipated if possible [1]. Necessary decisions are sometimes ironically paradoxical. Detubation after ventilation cessation improves family satisfaction with the treatment withdrawal process, however it increases the chance on stridor and death rattle.

OBJECTIVES. To describe and analyze the change in incidence of unwanted symptoms in relation to treatment withdrawal in critically ill Dutch ICU patients in the before and after an educational intervention, focussing on sedation level, medication use and symptom severity.

METHODS. A prospective interventional study in 2 non-academic hospitals for two non-consecutive years, including all patients in whom ventilation and/or vaso-active medication was withdrawn. In the in-between period the nurses and doctors in both hospitals were instructed how to use simple flow diagrams. Rass and Ramsey scales were used to measure sedation levels. Unwanted symptoms as death rattle, stridor and terminal restlessness, were scored using a 5- scale scoring system. ICU research nurses took care of patient inclusion and data collection. Analyses were made using IBM SPSS statistics 19.0.

RESULTS. Respectively 139 and 102 patients were included. There were no statistical differences in the two populations in age, sex, disease severity, level of sedation, dosages of midazolam or opioids and the incidence of ventilation withdrawal. However the incidence of detubation was statistically significant higher in the intervention year ($p = 0.001$). Moreover the mean dosage of propofol was significantly lower in that same year. In the intervention year the use of buscopan for death rattle prevention was noted 8 times. In the total population ($n = 241$) severe stridor (scale 4–5) was reported in 8 patients, moderate stridor (scale 3) in 17 patients, severe death rattle was observed in 10 patients, moderate death rattle in 31 patients and severe terminal restlessness was observed in only 11 patients while moderate restlessness was seen in 7 patients. There was no statistical difference in the incidence of unwanted symptoms between the observational year and the intervention period.

CONCLUSIONS. Although unwanted symptoms after treatment withdrawal are experienced as distressing and may therefor keep doctors from full treatment withdrawal, the incidence of severe symptoms is relatively low. With the introduction of practical and compact flow-diagram cards based on the national approved withdrawal of treatment protocol, the incidence of patient extubation increased without compromising patient and family comfort.

REFERENCE(S). 1. Kompanje EJ. The death rattle. Neurocrit Care. 2005;3:107–10.

Planning for care and aiding with coping: 0046–0050

0046
ADVANCE CARE PLANNING IN MAJOR SURGERY: PREVALENCE AND CONCORDANCE IN PATIENTS AND THEIR RELATIVES

F. Gigon[1,2], P. Merlani[2,3], B. Ricou[1,2]

[1]University Hospitals of Geneva, APSI, Intensive Care Unit, Geneva, Switzerland, [2]University of Geneva, Medicine, Geneva, Switzerland, [3]Ospedale Regionale di Lugano, Intensive Care Unit, Lugano, Switzerland

INTRODUCTION. Patients who undergo major cardiovascular surgery experience a journey in ICU. Intensivists may have to take important decisions when such patients are temporarily incompetent. Advance Directives (AD) were developed to respect the patients' autonomy in such cases. The alternative way is to address the patient's wishes through the health care surrogate decision maker (HCS).

OBJECTIVES. To investigate the prevalence of AD and HCS in patients planned for major cardiovascular surgery and their attitudes towards these approaches. To investigate relatives' views for patients on the same topics.

METHODS. Patients and their relatives were met separately before or after surgery. The study was lead by structured interviews according to a questionnaire. Patients' characteristics were extracted from their charts.

RESULTS. Out of 405 eligible patients, 361 (89 %) patients, 256 (71 %) with relatives and 105 (29 %) without relatives answered the interview. Male patients: 256 (71 %). Age (mean ± SD): 68 ± 15 years. 215 (60 %) patients underwent valvular replacement, 92 (25 %) coronary bypass and 54 (15 %) other major cardiovascular surgeries. SAPS II (mean ± SD): 33 ± 15; ASA (mean ± SD): 3 ± 0.5.

16 (4 %) had AD, 8 (2 %) a HCS. At the end of the interview, 60 (17 %) were interested in AD, 50 (14 %) in HCS, and 19 (5 %) in actually writing AD. AD or HCS were considered very useful theoretically but not of interest for themselves, maybe for others. Discomfort or reluctance towards participation in the study was surprisingly rarely noted by the investigators despite such sensitive topics. Only 5 (1 %) patients had a DNR order in their chart whereas they had no AD.

When the data from the 256 patients and from their relatives were compared, 9 (4 %) patients had AD, 6 (3 %) a HCS whereas 4 (2 %) relatives said the patient had AD, 2 (1 %) a HCS, but they were often wrong. At the end of the interview, 48 (19 %) patients were interested in AD, 41 (16 %) in HCS, and 12 (5 %) in actually writing AD. 63 (25 %) and 49 (19 %) relatives said the patient would have an interest in AD and HCS respectively but were wrong in 73 (29 %, $p = 0.008$) and 64 (25 %, $p = 0.03$) cases.

7 (7 %) patients without relatives had AD, 2 (2 %) a HCS. At the end of the interview, 12 (12 %) patients were interested in AD, 9 (9 %) in HCS, and 7 (7 %) in actually writing AD. There was no significant difference compared to data from patients with relatives.

CONCLUSIONS. In our study, very few patients had AD or HCS even when planned to undergo a major surgery. Interest to have AD or a HCS was not higher than 17 % and only 5 % actually wrote AD. The reasons of the discrepancy between the expressed usefulness of AD and HCS and the reality towards such approaches need to be further analysed. Relatives weren't always aware their beloved having AD or a HCS.

GRANT ACKNOWLEDGMENT. This study is sustained by the FNRS (CR31I3_127135/1).

0048
WHEN EOL DECISIONS IN ICU ARE MADE, WHAT THEN? FAMILY MEMBERS' EXPERIENCES OF THE WITHDRAWAL OF TREATMENT

R. Lind[1], P. Nortvedt[2,3]

[1]University Hospital of Northern Norway, Opin-Clinic, Tromsø, Norway, [2]University of Oslo, Section for Medical Ethics, Oslo, Norway, [3]Akershus University College of Applied Sciences, Nursing, Oslo, Norway

INTRODUCTION. End-of-life decisions for terminally ill ICU patients are common in ICUs [1]. These processes are thoroughly described in research from the perspectives of both ICU staff and the patients' family [2, 3]. However, little is known about how families experience treatment withdrawal in the final hours after the end-of-life decision-making process.

OBJECTIVES. In this study the objective was to analyse the families' experiences of the process of treatment withdrawal after the end-of-life decision.

METHODS. A constructivist interpretive approach to the grounded theory method of qualitative research was employed with interviews of 27 bereaved family members of former ICU patients 3–12 months after the patient's death.

RESULTS. The core finding is that facing the final hours of the patient's life is a process in several stages where the family needs support and guidance, and appreciate being cared for by nurses and doctors they have met before. The first experiential stage is about temporal dimensions, either experienced as rushing into death as if to "get it over" or as using more time in the process. The next stage involves understanding how the "turning off moment" will take place and how it was actually carried out. This was done in three ways: extubation; decreased oxygen and increased morphine; turning off equipment. Despite advance information, several participants were anxious about the patient's reaction, such as signs of struggling from suffocating. This stage was followed by strong sense impressions of facing the death of a loved one. Spirituality and being able to bid farewell was the last official ICU stage for the families. However, this was followed by emptiness when leaving the dead body in the ICU, feeling unable to go on with life. In this phase several participants longed for more support, care and follow up from the ICU staff.

CONCLUSIONS. Families need to be guided through all the stages they experience in the withdrawal situation. More attention should be paid to communication of how health care personnel assume that the process will progress and thereby try to prepare the families for the many strong impressions which follow treatment termination. We also suggest that clinicians should be more sensitive of the moment when families leave the ICU, and perhaps offer a follow-up talk some weeks later.

REFERENCE(S). 1. Cohen S, Sprung C, Sjøkvist P, et al. Communication of end-of-life decisions in European intensive care units. Int Care Med. 2005;31:1215–21. 2. Halvorsen K, Førde R, Nortvedt P. Value choices and considerations when limiting intensive care treatment: a qualitative study. Acta Anaesthesiol Scand. 2009;53:10–7. 3. Lind R, Lorem GF, Nortvedt P, Hevrøy O. Family members' experiences of "wait and see" as a communication strategy in end-of-life decisions. Int Care Med. 2011;37:1143–50.

GRANT ACKNOWLEDGMENT. Funded by the University Hospital of North Norway.

0049

RISK FACTORS FOR POST-TRAUMATIC STRESS, ANXIETY AND DEPRESSION IN RELATIVES OF ICU PATIENTS WITH SEVERE SEPSIS AND END-OF-LIFE DECISIONS

C.S. Hartog[1,2], D. Schwarzkopf[1], H. Skupin[2], B. Kabisch[2], R. Pfeifer[3], A. Guenther[4], K. Reinhart[2]

[1]Jena University Hospital, Center for Sepsis Control and Care, Jena, Germany, [2]Jena University Hospital, Department of Anesthesiology and Intensive Care, Jena, Germany, [3]Jena University Hospital, Department of Internal Medicine I, Jena, Germany, [4]Jena University Hospital, Department of Neurology, Jena, Germany

INTRODUCTION. Severe sepsis is the main cause of death in the ICU. Care of dying patients puts relatives at risk for developing psychologic symptoms like posttraumatic stress disorder (PTSD) or anxiety and depression, especially if relatives are involved in end-of-life decisions (EOLD) to limit life-sustaining therapy [1]. This investigation was part of a study to improve quality of end-of-life care in the ICU (trial registration NCT01247792).

OBJECTIVES. To predict emotional burden of relatives at 90 days after the patient's death or discharge.

METHODS. Prospective study on 4 ICUs of one university hospital. Patients with severe sepsis and EOLD were included and followed till death or discharge. The attending ICU physician initiated most EOLD and was therefore questioned about each decision-making process. At 90 days, the main relative was asked to participate in a standardized interview containing the Impact of Event Scale (IES) to measure risk for PTSD, the Hospital Anxiety and Depression Scale (HADS) to measure risk for anxiety and depression and questions on satisfaction with the ICU experience (i.e. 6 items about satisfaction with medical care and communication with ICU physicians). Multiple regression models were used to identify predictors for risk of PTSD, anxiety and depression. Beside patient and relatives characteristics and overall satisfaction, the set of predictors included characteristics of the decision-making process.

RESULTS. 145 patients with EOLD were included, 118 patients (81 %) died in the ICU, 93 % of patients died within 90 days. For 23 % of patients, EOLD were perceived to be delayed. Surgeons were involved in the care of 80.7 % of patients. Of 121 relatives who could be contacted, 84 agreed to participate (70 %); 22 relatives (26 %) were male, median age was 57 years. Overall satisfaction was very high with the ICU experience (median of 9 on a scale from 1 to 10). 51 % of relatives had a risk for PTSD, 48 % for anxiety and 33 % for depression. IES rates were lower if relatives were male ($p = 0.024$). IES and HADS depression rates were higher for spouses compared to children ($p = 0.038$, $p < 0.001$, respectively).

Relatives' satisfaction with the ICU experience predicted lower anxiety ($p = 0.025$). Anxiety and depression were also reduced if the EOLD was judged to be delayed ($p = 0.002$, $p = 0.024$). Surgeon involvement tended to predict increased anxiety ($p = 0.095$).

CONCLUSIONS. The rate of PTSD in relatives of patients who died after EOLD is similar to that previously assessed by a French group [1]. Apart from perceived high-quality medical care, satisfactory communication by ICU physicians reduces the relatives' anxiety and depression. Interestingly, having more time to accept the fatality of death may support relatives to cope psychologically.

REFERENCE(S). 1. Azoulay et al. Am J Respir Crit Care Med. 2005;171(9):987–94.

GRANT ACKNOWLEDGEMENT. Funded by the German Ministry of Education and Research, grant no. 01 E0 1002.

0050

END OF LIFE IN NEONATAL AND PAEDIATRIC INTENSIVE CARE: THE COMPLEX DEMANDS OF PATIENT AND FAMILY CARE. A QUALITATIVE EXPLORATORY STUDY

M.J. Bloomer[1], R. Endacott[1,2], B. Copnell[3], M. O'Connor[1]

[1]Monash University, School of Nursing and Midwifery, Frankston, Australia, [2]University of Plymouth, Faculty of Health, Education and Society, Plymouth, UK, [3]Monash University, School of Nursing and Midwifery, Clayton, Australia

INTRODUCTION. Death in childhood is rare in developed countries. In Australia most in-hospital childhood deaths occur in Neonatal and Paediatric Intensive Care (NICU/PICU) settings (Copnell 2005), where family care is a critical component of clinicians' work (Bloomer et al. 2013).

OBJECTIVES. The objectives of this study were to: (1) describe how NICU/PICU nurses care for families before and after a death; and (2) explore the nurses' perspectives on their preparedness/ability to provide family care, whilst caring for the child/infant.

METHODS. Focus group and individual interviews were conducted with registered nurses working in NICU/PICU ($n = 23$), who have cared for a dying infant/child, in two major paediatric centres in Australia.

RESULTS. Qualitative content analysis of transcripts identified 4 processes that influenced care management: (1) Medical influence on the dying process. The medicalisation of NICU/PICU care sometimes resulted in continued aggressive intervention and treatment, despite acknowledgement that death was likely. (2) Navigating communication challenges. Effective communication with families required interprofessional collaboration, with doctors leading end of life discussions. Understanding family dynamics, history and culture was imperative for effective communication and reaching consensus about death. Nurse continuity enabled rapport and facilitated family support before and after death. (3) Preparing for death. Making family memories was a nursing priority. Nurses avoided a 'universal' approach, instead prioritising cultural, religious and social needs of the family prior to the death. Nurses perceived that the best outcomes occurred when families had a high degree of control in deciding when, where and how death occurred. (4) Coming back the next day. After the death, nurses relied on informal peer support to cope with a death, often rationalising the death versus the certainty of ongoing suffering associated with ongoing ICU care. Nurses accepted that death was part of the job, but each death still had an impact.

CONCLUSIONS. This research demonstrates the psychological/emotional, workload and environmental challenges faced by NICU/PICU nurses in caring for a dying baby/child before/after death. More importantly, how nurses manage these challenges and continued to provide individualised care to the patient and family is explored, identifying the uniqueness of this aspect of nursing care.

REFERENCE(S). 1. Bloomer M, Morphet J, O'Connor M, Lee S, Griffiths D. Nursing care of the family before and after death in the ICU—an exploratory pilot study. Aust Crit Care. 2013;26(1):23–8. 2. Copnell B. Death in the pediatric ICU: caring for the children and families at the End of Life. Crit Care Clin North Am. 2005;17(4):349–60.

GRANT ACKNOWLEDGMENT. We acknowledge the Australian College of Nursing for the award of a NBVLL Major Research Grant.

Monday 07 October 2013

Poster Sessions
Organising safer intensive care: 0051–0064

0051

REFERRALS MADE TO CRITICAL CARE; A PROSPECTIVE SERVICE EVALUATION

T. Astles[1], T. Cope[1], S. Nagaraja[1]

[1]University Hospital Aintree, Department of Intensive Care Medicine, Liverpool, UK

INTRODUCTION. Data about patients admitted to Intensive Therapy Units (ITUs) in England are collected and analysed in detail by the Intensive Care National Audit and Research Centre (ICNARC). Detailed reports are then produced giving valuable information about workload and performance of individual departments.

Another important area, which contributes significantly to the day-to-day workload of a department and its staff, is the total number of referrals to ITU—a number of whom may not need admission. These referrals are not captured by ICNARC and so the workload they produce is difficult to quantify.

OBJECTIVES. To measure the workload generated by referrals to ITU especially for patients referred who do not require admission. To quantify the number of patients that would be appropriate for admission to ITU but can't be admitted due to lack of capacity.

METHODS. We prospectively collected data on all non-elective referrals made to the ITU team from July 2012–February 2013.

Demographic data, time of referral and one of the following four outcomes of the referral was recorded:

Outcome of referral
Outcome
Accepted and admitted (for level 2 or 3 care)
Accepted but no bed available (plan for patient's ongoing care recorded)
Declined—doesn't require ITU
Declined—admission to ITU not appropriate

RESULTS. There were 1,105 referrals captured over 203 days (40 days missing), an average of 5.4 referrals per 24-h. The number of referrals per 24-h ranged from 0–15.

419 (38.5 %) patients were admitted, 302 (27.8 %) were felt not need admission to ITU, and in 298 (27.4 %) cases admission to ITU was felt to be inappropriate. There were 69 occasions when a patient was accepted for ITU treatment but it was not possible to admit them due to a lack of beds.

In total, 14.1 % of appropriate referrals were not admitted to the ITU due to lack of available beds. On a monthly basis this ranged from 0 to 29.7 % of appropriate referrals.

CONCLUSIONS. There are two very important conclusions from this study.

Firstly, we have found that over half of the referrals to ITU either do not need ITU treatment or it is felt that ITU admission would not be in the patient's best interest and is therefore inappropriate. Although the decision of whether or not to admit a patient to ITU is part of the Intensivist's role, there are a number of examples where admission was clearly not appropriate. Referrals such as these provide a significant workload for the ITU team who often have to review the patient and sometimes then engage in difficult conversations with both the patient and their family. There is a place for improving the awareness of the role of ITU within the hospital and improving the decision making process about when and who to refer for ITU treatment.

The second conclusion surrounds the number of patients that it is not possible to admit due to lack of beds. There are UK guidelines that state it should be possible to admit 95 % of appropriate referrals to ITU. The finding that we are unable to admit 14 % of appropriate referrals has provided us with useful evidence that we need to expand the number of beds we have in our department.

0052

PHYSICIANS' CLINICAL PRACTICE AND BEHAVIOR CHANGE AFTER PARTICIPATION IN HANDS-ON RESPIRATORY MANAGEMENT WORKSHOP IN JAPAN. FROM THE PERSPECTIVE OF QUALITY IN RESPIRATORY MANAGEMENT PRACTICE

K. Hasegawa[1], R. Tanaka[2], N. Kaneko[3]

[1]Kameda Medical Center, Critical Care Medicine, Kamogawa, Japan, [2]LDS Hospital, Pulmonary and Critical Care Medicine, Salt Lake City, USA, [3]Kameda Medical Center, Pulmonary, Kamogawa, Japan

INTRODUCTION. Mechanical ventilation is an essential technique in critical patients. Specific methods of mechanical ventilator management can improve mortality and decrease the duration of mechanical ventilation [1]. Despite the need for systemic mechanical ventilation management education to acquire specific knowledge and skills for patients' care, there is no respiratory management education either in medical school or in training programs in Japan. The quality of respiratory management practice or its education remains as a big issue to be solved.

OBJECTIVES. The Respiratory Management Hands-on Workshop for Physicians (RMWP) began in November 2010 to respond the demands of systemic mechanical ventilation management education. Over 300 physicians all over Japan have participated in the workshop. We investigated the impacts of RMWP on physician including educational activity and quality of patient care in respiratory management.

METHODS. The preliminary survey and the pre-test were conducted via web. The post-test and the anonymous questionnaire were conducted during the workshop. The post-survey of the past participants, more than 160 physicians participated the workshop of through November 2011 to January 2013, was conducted in March 2013 via web (®Survey Monkey).

RESULTS. In the preliminary survey revealed that the large number of participants selected SIMV (Synchronized Intermittent Mandatory Ventilation) and PCV (Pressure Controlled Ventilation) as initial mechanical ventilator setting in their practice, in contrast, knowledge about SIMV and PCV were low in the pre-test. Those scores were significantly improved in the post-test. In regard to the post-survey, a total of the 64 % (105 out of 165) answered and revealed the physicians' behavioral change. The initial setting of mechanical ventilation was significantly changed and it was consistent with previous post-survey [2]. In addition, 25 % (26 out of 105) physicians held lectures and/or hands-on workshop of respiratory management in their facility after participation in RMWP.

CONCLUSIONS. Physician's experiences of mechanical ventilation were not necessary a guarantee of their knowledge requiring for respiratory management. In terms of quality of patient care, WMRP is valuable because it consistently improved physicians' understandings and changed their clinical practice of respiratory management. In addition, their educational activity would lead to further quality improvement of patient care.

REFERENCES. 1. Acute Respiratory Distress Syndrome Network. Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. N Engl J Med. 2000;342(18):1301–8. 2. Hasegawa K, Tanaka R, Kaneko N. Impact of hands-on respiratory management for physicians and its future perspective. Presented at the annual meeting of American College of Chest Physicians, Atlanta; 2012.

0053

INTRODUCTION OF A CARE PATHWAY FOR PATIENTS UNDERGOING EMERGENCY LAPAROTOMY: THE IMPACT ON MORTALITY AND INTENSIVE CARE UNIT COSTS

C.M. Chalmers[1], P. Carvalho[1], S. Huddart[1], M. Dickinson[1], Y. Soon[2], J. Kirk-Bayley[1], M. Zuleika[1]

[1]Royal Surrey County Hospital, Department of Anaesthetics and Intensive Care, Guildford, UK, [2]Royal Surrey County Hospital, Department of Surgery, Guildford, UK

INTRODUCTION. Patients undergoing emergency laparotomy in the United Kingdom have a high mortality rate, yet many are never admitted to an intensive care unit (ICU)0 [1, 2]. In line with recent guidance [2, 3], our hospital introduced an 'emergency laparotomy pathway' (ELP). This document uses checklists to prompt best practice from admission into the post-operative period. The ELP mandates post-operative admission of all patients to the ICU (an 18-bed, mixed level 2/3 facility). Prior to this the need for ICU admission was decided on a case-by-case basis, with some patients cared for in lower dependency areas.

OBJECTIVES. To determine the impact of the ELP on mortality and cost of ICU stay for patients admitted following emergency laparotomy.

METHODS. From a prospectively collected database, data were analysed for all patients admitted to ICU following emergency laparotomy 3 months pre- and post-ELP introduction. Variables included APACHE II score, and length of stay (LOS) and mortality in ICU and in hospital. The cost of patients' ICU stay, as charged to their funding Primary Care Trust, was obtained from financial records. All variables were compared pre- and post-ELP using the Mann–Whitney *U* test, except mortality (Fisher's exact test); p values <0.05 were considered statistically significant.

RESULTS. Thirty patients were identified before and 31 after introduction of the ELP. As shown in the table below, hospital mortality was significantly reduced (RR 0.54, 95 % CI 0.35–0.84) after introduction of the ELP. Total cost for the groups dropped from £355,891 pre-ELP to £290,934 post-ELP; however there was no significant difference in median cost per patient. There was no significant difference between the groups in cost of ICU stay, APACHE II score, ICU and hospital LOS or ICU mortality.

Comparison of variables pre-/post-ELP introduction

Variable [median (interquartile range), except mortality]	Pre-ELP	Post-ELP	p value
APACHE II score	14.5 (13–17.8)	13 (10–16.5)	0.1
ICU LOS (days)—all	3 (2–8)	4 (3–9)	0.89
ICU LOS (days)—survivors	3 (2–5)	4 (3–8)	0.54
Hospital LOS (days)—all	19 (10.3–30.8)	18 (13.5–52.5)	0.26
Hospital LOS (days)—survivors	15.5 (10.3–30.8)	25 (14–55)	0.24
ICU mortality (%)	13	6	0.42
Hospital mortality (%)	27	6	0.02*
Cost of ICU stay (£ per patient)	£4,519 (£3,045–£10,114)	£6,025 (£,3142–£11,491)	0.83

CONCLUSIONS. Introduction of a care pathway in our hospital has, by enabling best-practice, significantly reduced the mortality of patients undergoing emergency laparotomy, without increasing ICU cost.

REFERENCE(S). 1. Saunders DJ, Murray D, Pichel AC, et al. Variations in mortality after emergency laparotomy: the first report of the UK emergency Laparotomy Network. BJA. 2012;109:268–75. 2. Royal College of surgeons of England and Department of Health. The higher risk general surgical patient: towards improved care for a forgotten group. [Online] 2011. http://www.rcseng.ac.uk/publications/docs/higher-risk-surgical-patient (Accessed 11 Apr 2013). 3. National Confidential Enquiry into Patient Outcome and Death. Knowing the risk: a review of the peri-operative care of surgical patients. [Online] 2011. http://www.ncepod.org.uk/2011report2/downloads/POC_fullreport.pdf (Accessed 11 Apr 2013).

0054

A PROSPECTIVE OBSERVATIONAL STUDY ON THE IMPACT OF A STRUCTURED MECHANICAL VENTILATION WORKSHOP ON PRETEST AND POST TEST ASSESSMENT

S. Jakkinaboina[1], S.P. Haranath[2], T. Mohan Maharaj[3]

[1]Apollo Health City, Critical Care Medicine, Hyderabad, India, [2]Apollo Health City, Pulmonary and Critical Care Medicine, Hyderabad, India, [3]CARE Hospitals, Anesthesiology and Critical Care Medicine, Vishakapatnam, India

INTRODUCTION. Continuing medical education is required for all physicians to remain abreast of the rapid advances in medicine. Intensive care medicine practitioners need to have a thorough working knowledge of mechanical ventilation. We conducted an evidence based and hands-on workshop on mechanical ventilation with evaluation of participants.

OBJECTIVES. To determine the impact on knowledge retention and practical application of attending the mechanical ventilation educational activity among various categories of participants.

METHODS. A prospective observational study was done in Sept 2011 as part of APCRITICON (Andhra Pradesh Critical Care Conference) at Visakhapatnam, Andhra Pradesh, India. 70 participants comprised of consultants, post graduates, registrars, ICU and non ICU doctors and respiratory therapists were included. The total program duration was 9 h including lectures and workshop sessions. Pre-test was conducted just before the program and post test was conducted after completion of the workshop. The fifteen questions on the test were the same before after the test. Feedback forms were given to all delegates on registration and they were asked to mark their evaluation once each talk or workshop was done. Participants were grouped as Consultants, Post Graduates (MD) with no ICU experience, MD with less than 1 year ICU experience, MD with more than 1 year ICU experience and respiratory therapists. The data was analyzed using standard statistical methods.

RESULTS. Complete data was available for 64 participants. The total number of marks was 960. The cumulative pretest marks was 558 and post test 774. The percentage increase in post test was 22 % but the absolute increase was 37.93 %. In the Consultants group, Post MD doctors with no ICU experience, Post MD doctors with <1 year ICU experience, Post MD doctors with >1 year ICU experience, Post graduate doctors, Respiratory technicians the absolute increases were 87.8, 32.26, 26.78, 58.16, 30.27, 40 % respectively. Consultants got the least marks in the pretest and they improved to the highest with an absolute increase of 89 %.

The post MD doctors without ICU experience scored highest in the pretest and the absolute increase was only 40 %. Also, they got highest marks post test at 91 %, but the absolute increase was less as they got highest marks. Post MD doctors with <1 year ICU experience got the least absolute increase at 26.78 % but they got a good score pretest and post test the absolute rise was less.

Pre and post test results of the group

Group	Total number	Pre test marks/total marks	Pre test %	Post test marks/total marks	Post test %	% Increase
Consultant	6	41/90	45.6	77/90	85.6	87.8
Respiratory technician	3	20/45	44.45	28/45	62.22	40
Post MD no ICU experience	3	31/45	69	41/45	91	32.26
Post graduate	20	185/300	61.7	241/300	80.3	30.27
Post graduate <1 year ICU experience	19	183/285	64.21	232/285	81.4	26.78
Post graduate >1 year ICU experience	13	98/195	50.2	155/195	79.48	58.16

Pre and post test results of the whole group

Pre test/ total marks	Pre test %	Post test/ total marks	Post test %	% Increase
558/960	58.12	774/960	80.62	37.93

CONCLUSIONS. CME improved knowledge base for all participants. The more senior the participant, the greater the benefit. Absolute scores increased less for juniors likely because of pre-existing high baseline. The cumulative increase in scores can be used to assess the overall impact of the educational program. Evidence based training is mandatory for everyone working in the ICU to improve knowledge and improve outcomes for the patients.

0055

EVALUATION AND IMPACT OF IMPLEMENTATION OF AN EARLY WARNING SCORING SYSTEM (EWS)/MEDICAL EMERGENCY TEAM (MET)

M. Prchalova[1], M. Donnelly[1], N. Hayes[1], A.-M. Barnes[1], E. Kidney[1]

[1]The Adelaide and Meath Hospital, Incorporating the National Children's Hospital, Anaesthesia and Intensive Care, Dublin, Ireland

INTRODUCTION. A National Early Warning Score is being implemented nation-wide in Irish Acute Hospitals. EWS/MET was implemented in our hospital (a 500 bed tertiary centre with 9 ICU beds only) over a 1 year period.

OBJECTIVES AND METHODS. ICU and Hospital databases and ICU referral books were retrospectively reviewed from August 2012 until December 2012. We collected: total number of inpatient admissions, rate of MET calls and their outcome, MET and non-MET referrals, time spent by ICU registrars outside ICU. Hospital deaths and cardiac arrest calls for 3 years spanning MEWS introduction were reviewed.

RESULTS. Between August 1st and December 31st 2012 there were 6,927 hospital admissions and 247 referrals to the ICU team. 85 = 12.3/1,000 inpatients (34 %) were MET referrals and 162 were non MET referrals (87 direct referrals from A&E, 48 direct team referrals of ward patients and 27 cardiac arrest calls). One month after implementation (9/61) 14 % of all ICU referrals were via MET activation. This increased to (23/53) 43 % by the fifth month (p = 0.0008). The MET call rate peaked in October (17.7/1,000). This month also recorded the highest number of patients on wards with ViEWS score seven and above. Of the 85 MET calls, 33 (38 %) were admitted to ICU. Of the non-MET referrals 27 (36 %) of ward calls including crash calls and 48 (55 %) of A&E referrals were admitted to ICU. The median ViEWS score of MET call patients admitted to ICU was 9 (7-10), similar to the median ViEWS score 9 (8–19) of MET call patients who remained on the ward (p = 0.5). Of those patients who remained on the ward, 50 % were discharged home and the other 50 % were either palliated made NFR or died suddenly. 6 % were referred back to MET again.

Of the re-referrals to the MET, one patient was discharged and died at home (4 ERT calls). One patient was admitted to ICU and later discharged home, and one patient was palliated after 4 re-referrals.

Median time spent with MET call patients admitted to ICU was 80 vs 30 min with patients not admitted to ICU. Median ICU transfer time was 4 h, 25 % were delayed more then 7 h, primarily due to lack of bed capacity. During the study period ICU occupancy was 100 %. There was a consistent drop in cardiac arrests and a trend towards decrease in hospital mortality over the 3 years spanning introduction of ViEWS-ERT 2010-2012 (p = 0.0512 and p = 0.0557 respectively).

CONCLUSION. Since full implementation of the EWS there was a significant increase in MET calls over the 5-month period. There was no significant difference in the VieWS score between patients who were admitted to the ICU and those who were not. This may be linked to shortage of ICU beds or triage decisions that have not yet been made. There is a trend towards decrease in cardiac arrests and hospital mortality. Further work is required to establish mortality benefit and its association with EWS/MET implementation especially in the setting of restricted resources.

0056
FACTORS AFFECTING THE THRESHOLD TRANSFER OF SICK PARTURIENTS TO HIGHER LEVELS OF CARE

A. James[1], R. Endacott[1,2], E. Stenhouse[1]

[1]Plymouth University, School of Nursing and Midwifery, Plymouth, UK, [2]Monash University, School of Nursing and Midwifery, Melbourne, Australia

INTRODUCTION. Current maternal mortality rate directly or indirectly due to pregnancy in the United Kingdom currently stands at 11.39 per 100,000 maternities (CMACE, 2011) and suboptimal care is frequently identified as a contributing factor in these deaths. The appropriate and timely escalation of care for maternity patients is vital in order to ensure they receive the appropriate level of care and have safe clinical outcomes (CMACE, 2011). This may include the need for maternity high dependency care (MHDC), transfer to an intensive care unit (ICU) or other specialist unit. The thresholds at which transfers to higher levels of care happen appear variable (Maternal Critical Care Working Group, 2011).

OBJECTIVES. The aim of the research was to determine what constitutes high dependency care in the maternity unit setting.

Research questions: 1. How do clinicians define MHDC? 2. Is there any difference in the definition of MHDC between professional groups? 3. Does the size and type of hospital/maternity unit influence the definition of MHDC?

METHODS. A three-round Delphi study was used to seek consensus across experts currently involved either directly/indirectly in the provision of/transfer to MHDC. Participants were drawn from seven maternity units in the UK, birth rates ranging from 1,700 to 5,000. Sixty-seven doctors and midwives completed all 3 rounds. Responses to a question about what constitutes MHDC (Round 1) were grouped into themes and participants rated agreement on a 5 point Likert scale (Round 2). Statements that didn't achieve consensus were presented again in Round 3, and participants were also asked if they were familiar with the UK Intensive Care Society levels of care.

RESULTS. Four themes were identified in R1 (conditions, vigilance, interventions and service delivery), common across anaesthetists, obstetricians and midwives. However, midwives were more likely than doctors to request ICU admission for continuous ECG monitoring (63.3 vs. 36.4 %) and arterial line monitoring (73.5 vs. 53.1 %). Smaller maternity units were less likely to provide MHDC and had a more liberal policy of transferring women to ICU. Qualitative comments indicated that a lack of necessary equipment, facilities and skilled midwifery staff were contributing factors. The extent of familiarity with the ICS levels of care (14.3–57.1 % familiarity) tended to correspond with the size of Unit (1,700–4,500 birth rate).

CONCLUSIONS. Whilst it may be seen as accountable and safe practice, this 'early' escalation of care to intensive care or HDC has workload implications for ICUs and may also impact on the bonding process between the mother and her baby.

REFERENCE(S). 1. CMACE. Saving Mothers' Lives: reviewing maternal deaths to make motherhood safe 2006–2008. BJOG. 2011;118(suppl. 1):1–203. Maternal Critical Care Working Group. Providing equity of critical and maternity care for the critically ill pregnant or recently pregnant woman. London: RCA; 2011.

0057
HOW TO ORGANIZE A HDU FACILITY TO SUPPORT YOUR INTENSIVE CARE UNIT

R. Stui[1], T. van Galen[1], J.J. Spijkstra[1]

[1]VU University Medical Center, Intensive Care, Amsterdam, The Netherlands

INTRODUCTION. There is a huge gap between ICU and regular ward care. This gap can be bridged by a high dependency unit (HDU) [1]. It is to be expected that there will be an increased demand for HDU capacity to relieve ICU capacity and increase cost effectiveness [2]. In contrary to accepted ICU standards there is no clear standard how to organize and establish a high performance HDU. Especially concerning nurse patient ratio which is the biggest cost driver.

METHODS. At VUmc, the 9 bed HDU is integrated in the ICU care and management organization. The HDU is intensivist led and patient logistics are fully integrated with the ICU logistic system. Educational and quality programs are shared or combined. Main difference in delivered care: HDU patients are treated for mono-organ or accidental double organ failure, excluding invasive ventilation. HDU distinctive nursing care includes NIV and CPAP, ICP measurement, tracheotomy care, treatment with high dose vaso-active medication and intensive revalidation. HDU management objectives: Annual up to 2,500 patient days. Expected occupancy rate is 90 %. Staffing characteristics HDU: Available for direct patient care 2.5–2.7 (ICU 3.4–3.7) full time equivalent (Fte) per bed. Workload is measured with the Nursing activity score (NAS) [3]. HDU location lay out is similar to the ICU facility.

RESULTS. HDU 2012 management data: 950 admitted patients with an average LOS of 2.2 days and 2,350 patient days in total. Effective occupancy rate 80 %. Case mix origin: 50 % General surgery, 25 % Neurosurgical and 25 % miscellaneous. Post ICU inflow: 191 patients, average LOS of 7 days. Non post ICU inflow: 759 patients, average LOS 1.6 days. This means that 57 % of our population amounts post ICU patients.

Out of 9 (or sometimes less patients), there are 5 post ICU inflow patients. HDU nursing workload is almost equal to ICU workload (HDU NAS 46.2 vs ICU 48.5). HDU operational and consumption costs are €1.234 per patient day vs ICU €2.070.

CONCLUSIONS. We are convinced that at VUmc our HDU contributes strongly to optimal, safe and integrated patient care, reduced unnecessary use of ICU capacity with lower annual costs. Main HDU advantage is the continuity of medical and nursing care and the integrated logistic system. N/P ratio is high and comparable to low level ICU staffing standards. This allows us to provide optimal care for both step-up and step-down patient care. The comparable nursing workload for ICU and HDU patients justifies comparable staffing standards between both departments. An unsolved current (Dutch) problem is lack of funding. There is no additional funding for HDU care which can lead to inappropriate use of costlier ICU capacity.

REFERENCE(S). 1. Lucena et al. Retrospective study of intermediate care. J Hosp Med. 2012. 2. vd Steen et al. Inventory round Medium Care in the Netherlands, NJCC; 2008. 3. NAS 'Nursing Activities Score': Miranda, D. Crit Med Care. 2003;31:328–374.

0058
VITALPAC EARLY WARNING SCORE SYSTEM (VIEWS): A 2-MONTH EVALUATION IN BEAUMONT HOSPITAL

C. Black[1], G. Rufli[1], M. Flynn[1], P. O'Kelly[1], K. Costelloe[1], C. Walshe[1]

[1]Beaumont Hospital, Anaesthesia and Intensive Care, Dublin, Ireland

INTRODUCTION. ViEWS uses physiological vital signs to detect the deteriorating patient, facilitating timely intervention. Of all early warning score systems, the ViEWS is the most sensitive for predicting mortality [1]. The system has been in place in Beaumont Hospital since May 2012.

Beaumont Hospital has modified the ViEWS trigger points to match our current resources (where interns are the most junior doctor) to read:

ViEWS score 4–6 to be reviewed by intern or senior house officer within 30 min

ViEWS score $\geq$7 to be reviewed by registrar or consultant immediately.

OBJECTIVES. To review efficacy and compliance with the Beaumont ViEWS system.

METHODS. Gillian Rufli and Mary Flynn collected data from wards, over a 2-month period, on every ViEWS score that resulted in a patient review by a doctor. Data included 3 stems—patient demographics, ViEWS details and details of the review itself. Statistical analysis was by means of Pearson Chi squared tests.

RESULTS. Results were categorized based on timing of review, review scores and level of doctor reviewing the patient.

There were 380 separate reviews as a result of ViEWS triggers in 205 patients (average age 78, 83 male, 122 female). 228 reviews were of medical patients, 127 surgical and 25 not documented. The average score requiring review was 6.63. In the study period, there were 11 cardiac arrests on the wards, although only 2 had required review according to ViEWS. Four patients required ICU admission following review.

Among our initial key findings: 1. 250/380 (66 %) of calls for review occurred out of working hours 2. Out of hours, patients with a ViEWS $\geq$7 are more likely to be reviewed by an intern in the first instance ($p < 0.05$) 3. Patients requiring repeat reviews, with at least one trigger $\geq$7, were more likely to be reviewed by interns 44/51 (86 %), compared to those patients requiring single review, with a trigger $\geq$7, 24/42 (57 %).

CONCLUSIONS. Our initial results demonstrate that the majority of these calls are out of hours when staffing levels are low. Frequently, patients with high scores are seen by interns, particularly out of working hours. This may be, in part, due to patients requiring repeated review for high scores being patients with high baseline scores, and this may be impacting excessively on the workload of NCHDs out of hours. This is supported by the low incidence of ICU admission and cardiac arrests during the study period.

This project is ongoing. Following completion, we hope to determine if a 'rapid response' ICU outreach team is required in our institution to effectively manage deteriorating patients on the ward.

REFERENCE(S). 1. ViEWS—towards a national early warning score for detecting adult inpatient deterioration. Resuscitation. 2010;81(8):932–7.

0059
DAILY EVALUATION OF FASHTUG PROTOCOL AND SHORT-TERM OUTCOMES

E. Curiel-Balsera[1], C. Joya-Montosa[1], M.C. Martinez-Gonzalez[1], E. Trujillo-García[1], H. Molina-Diaz[1], J. Mora-Ordoñez[1], G. Quesada-Garcia[1]

[1]Carlos Haya Regional Hospital, Intensive Care, Málaga, Spain

INTRODUCTION AND OBJECTIVES. Evaluating the degree of routinely fulfilment of management protocols and its relation to short-term outcomes.

METHODS. Observational, prospective and unicentric study. The FASHTUG protocol was analysed daily for a month in all ICU-admitted patients with >48 h stays. Evaluation was completed without the physicians in charge of these patients were aware of study completion, so as not to modify their daily working routine. The scores of seriousness upon ICU-admission, clinical-demographic variables and death rate upon ICU-discharge. Square Chi and Student's *T*-test, as well as binary logistic regression for multivariate analysis, were used. Maximum error alpha was set at 5 %.

RESULTS. 95 patients (49 males) with average APACHE II score 17.68 $\pm$ 9.1 upon admission and average stay of 4 $\pm$ 2 days. Crude death rate was 14.5 %, and the ratio of fulfilment of the different items was high—ranging from 73.6 $\pm$ 37.7 % in glycemic control to 100 % in stress ulcer prophylaxis. Indeed, 100 % fulfilment was reached in all items and all days of admissions in 27.3 % of the cases. These 100 %-fulfilment patients had shorter average stays ($p = 0.014$).

The least fulfilled item, as previously commented, was glycemic control (73.6 %). Glycemic control was analysed according to the fact that patients were diabetic or not. Differences were observed, as fulfilment was 92.6 $\pm$ 14.3 and 61.9 $\pm$ 42.8 % in diabetic and nondiabetic patients, respectively ($p = 0.0001$).

Death rate was related to seriousness upon admission due to either APACHE II (0.002) or SAPS III (0.0001). Separate or joint fulfilment of any item was not related to better prognosis.

CONCLUSIONS. Most of the items that shape FASHTUG have been tested in different studies, proving to lead to better results and less complications. The high fulfilment level observed in the present study hinders proving these results with such a reduced number of patients. Greater adherence to glycemic control in nondiabetic patients is desirable.

REFERENCE(S). 1. Vincent JL. Give your patient a fast hug (at least) once a day. Crit Care Med. 2005;33:1225–9.

0060
PREDICT: PREDICTION OF READMISSION

B.A.B. Ligtenberg[1], L.M. Dijkema[1], W. Dieperink[1], J.J.M. Ligtenberg[1], J.G. Zijlstra[1]

[1]Univeristy Medical Centre Groningen, CAPE Research Institute, Groningen, The Netherlands

INTRODUCTION. Readmission to the ICU is associated with increased hospital mortality. Therefore identifying patients at risk for readmission is important. The aim of the first study is to determine the clinical characteristics of patients at risk for readmission from routinely collected data. We combined these parameters with the clinical view of the ICU physicians and nurses in a second study.

METHODS. We analysed prospectively collected data from our MediScore ICU database over two periods of respectively 19 and 12 months at the 47 bed ICU of our university hospital. Measurements were conducted on demographic, diagnostic, physiological and

outcome data. To identify the condition of the patient at admission we used several clinical variables and scores: SAPS and APACHE II score were used at admission, TISS score was used during the stay. A multivariate analysis was used to identify predicting variables for early (<72 h after discharge) and late readmission in the first part. To measure the predictive skills of the ICU physicians and nurses, we used the so called **P**rediction of **R**eadmission, **E**valuating **D**ischarge from **I**ntensive **C**are uni**T** (PREDICT) score. This is a Visual Analog Scale (VAS) on which the supervisor, the ICU resident and the ICU nurse registers the risk for readmission by placing a mark on a line (0–10) just before patients discharge from the ICU to the nursing ward.

RESULTS. 5,881 patients were evaluated. The two studies showed readmission rates of respectively 7 and 8.3 %.Most patients were readmitted because of respiratory failure, followed by cardiovascular, medical and gastro-intestinal causes in both studies, respectively 42 and 39 %, 25 and 28 %, 22 and 24 %, 11 and 9 %.Hospital mortality was significantly higher after re-admission, 18.5 % for readmission <72 h versus 1.9 % for non-readmitted patients. Parameters significantly correlated with readmission were TISS MAX and high APACHE II score together with gender (male), high SAPS II score and PREDICT score. The first study showed that without the PREDICT score these correlations were clinically irrelevant. The PREDICT score was significantly higher for patients readmitted, 1.95 versus 1.14. The intensivist scored a PREDICT of 1.81 for readmitted patients and 1.03 for non-readmitted patients.ICU nurses scored a PREDICT of 2.34 for readmitted patients and 1.26 for non-readmitted patients. The clinical view of the intensivist and ICU resident appeared to be fairly accurate. Nurses tended to overpredict readmission more often.

CONCLUSION. Our study identified several variables associated with early readmission, but with insufficient power to predict readmission in a clinically relevant manner. However, combining the parameters with the clinical view of the ICU physicians and nurses, the PREDICT score, it appears that a strong predictive model for identifying ICU patients at risk for readmission is possible. Further research is needed to evaluate the usefulness of the PREDICT score in daily practice.

Predictors of readmission

Predictors	OR	P
Gender	0.583	0.064
SAPS II	0.962	0.009
Apache II	1.072	0.026
TISS maximum	1.031	0.038
Predict score	1.437	0.000

0061

IMPACT OF THE IMPLEMENTATION OF A DAILY CHECKLIST IN A REGIONAL HOSPITAL ICU

S. Gallego[1], J.L. Garcia-Garmendia[1], A. Barrero[1], F. Maroto[1], V. Jorge[1], C. Colon[1], O. Rufo[1], F. Villarrasa[1]

[1]Hospital San Juan de Dios del Aljarafe, Intensive Care Unit, Seville, Spain

INTRODUCTION. Clinical safety strategy is today a fundamental principle of patient care, including the warranty of good clinical practice in daily work. Intensive Care Units (ICU) are areas subject to a wide number of risks that make critical patient especially vulnerable to adverse events. Checklists are a validated tool to prevent adverse events.

OBJECTIVES. To develop, implement and evaluate a checklist of ICU daily goals which link different clinical safety strategies that affect the critical patient, encouraging communication between health professionals.

METHODS. We proceed to design a database together with nursing in a mixed ICU with 8 beds in a district hospital. We collected several lines of safety strategies that comprise 50 items. It uses a computerized form that is filled daily by nurse and physician in charge, including in answers the option "Checklist Helps", which it's chosen when we change our behavior thanks to listing. We analyze the first 3 months after implementation of the Checklist (2013).

RESULTS. We admitted 83 patients with APACHE II medium at 24 h of 14.2 (SD 9) and an average stay of 5.7 days. The total number of stays was 472, and we registered 277 Checklist (59 %) in 81 patients. In 95 records (34.2 %), the patient was on mechanical ventilation, and procedures were performed in 94 (34 %). In 83 cases (30 %) displayed the "Checklist Helps", indicating that the tool has provided security strategy. This has occurred in patient identification (14, 5 %), drug and blood products safety (32, 11.5 %), prevention of nosocomial infection (9, 3.2 %), sedation and analgesia evaluation (14, 5 %), safety in procedures and devices (25, 9 %), pressure ulcer prevention (20, 7.2 %) and deep venous thrombosis prevention(16, 5.7 %), nutritional and metabolic support (11, 3.9 %), patient and family information (4, 1.4 %), and adverse events to notify (7, 2.5 %).

CONCLUSIONS. Daily Goals List or Checklist is a helpful tool to include in safety strategies in daily clinical practice. The record of the "Checklist Helps" allows anticipating situations of risk to the patient from a multidisciplinary perspective and its analysis facilitates registration as areas for improvement. The impact on morbidity and mortality results must still be evaluated.

REFERENCE(S). 1. Weiss CH. Empiric antibiotic, mechanical ventilation, and central venous catheter duration as potential factors mediating the effect of a checklist prompting intervention on mortality: an exploratory analysis. BMC Health Serv Res. 2012;12:198. 2. Weiss CH, Prompting physicians to address a daily checklist and process of care and clinical outcomes: a single-site study. Am J Respir Crit Care Med. 2011;184(6):680–6.

0062

DETERMINATION OF INTENSIVE CARE UNIT ADMISSION AND DISCHARGE CRITERIA ACCEPTED BY PHYSICIANS AND NURSES WORKING IN CRITICAL CARE UNIT

B. Tosun[1], G. Sahiner[1], O. Kızılca[2], S. Acıksoz[1], F.M. Can[2], O. Aslan[1]

[1]Gulhane Military Medical Academy School of Nursing, Ankara, Turkey, [2]Gulhane Military Medical Academy, Department of General Surgery, Ankara, Turkey

INTRODUCTION. Society of Critical Care Medicine Ethics Committee suggests that intensive care unit (ICU) patient admission/discharge criteria should be based on objective data.

OBJECTIVES. To determine the patient admission, discharge and triage criteria accepted by physicians and nurses working in several ICUs.

METHODS. In this descriptive study, 81 nurses and 29 physicians working in several ICUs in a university hospital were enrolled between October 2012 and February 2013. Data collection form, eliciting socio-demographic features and ICU admission/discharge criteria, was developed by the researchers. Data was analyzed and presented in frequency, mean and standard deviation and correlation tables.

RESULTS. Mean age of participants was 29.91 ± 7.17 years and mean working in the critical care period was 4.20 ± 4.24 years. Half of the physicians (48.3 %) and 21.0 % of nurses reported to be involved in decision processes of patient admission/discharge. One third (30.9 %) of participants frequently and 22.7 % of participants seldom reported to sort patients during admission/discharge. While 81.8 % of participants reported no scoring systems, 13.7 % reported Glasgow Coma Scale and 4.5 % reported APACHE scoring systems to be used for patient admission/discharge. Both physicians and nurses defined patient life quality as the leading measure for patient admission/discharge. As working time in ICU gets longer, patient/family demand for non-indicational cases and irreversible illness get less important ($p < 0.05$).

CONCLUSION. We determined that physicians or nurses working in different units had different assessment and measures in mind. We suggest that standard triage measures should be developed for ICU admission/discharge and ICU workers should be trained in medical ethics for decision making processes.

0063

USING CO-PRODUCTION TO DESIGN SERVICE IMPROVEMENTS IN SEVERE ACUTE RESPIRATORY FAILURE AND ECMO

A. Williams[1], C.I. Meadows[1], K. Daly[1], D. Plamping[2]

[1]Guy's and St Thomas' NHS Foundation Trust, London, UK, [2]University of Leeds, Centre for Innovation in Healthcare Management, Leeds, UK

INTRODUCTION. To provide a high quality healthcare service, it is essential to understand the patient and family experience [1].

The FS-ICU questionnaire was developed to quantify intensive care family satisfaction and benchmark ICUs [2].

Families of severe acute respiratory failure and extra-corporeal oxygenation (ECMO) patients often spend a protracted period in critical care and may be in an optimal position to contribute to service improvement.

Service improvement designed by providers and users is more likely to have a greater impact and longevity than that designed solely by providers. Co-production is a technique that attaches equal value to provider and user input [3].

OBJECTIVES. Our main objective was to utilise patients, families and healthcare workers in co-producing an improvement strategy for the severe acute respiratory failure service.

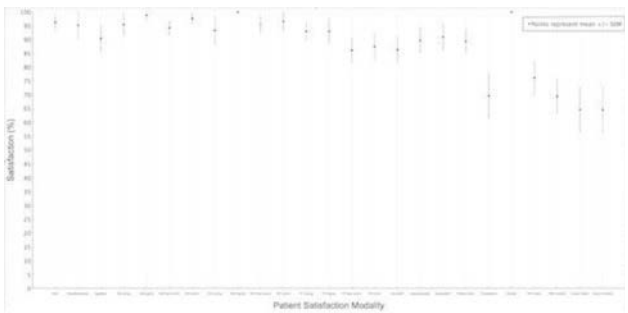
METHODS. Responses from patients and families to a UK-modified FS-ICU questionnaire were used to highlight areas for improvement.

Focused interviews were used to understand 'how the service works' from a user perspective. These data informed the creation of exercises for a workshop designed to co-produce solutions from users and providers.

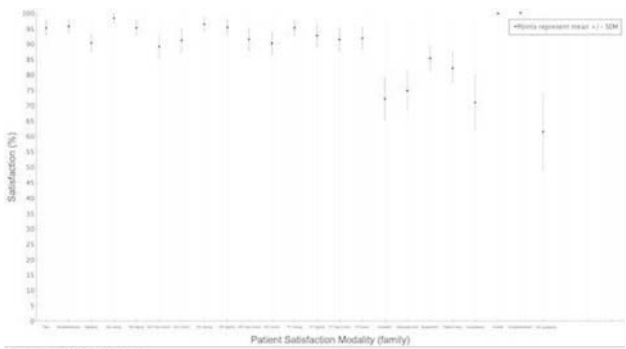
The respiratory failure service encompasses a wide geographic region. Workshop participants included patients, their families, clinicians, allied healthcare professionals and managers from the ECMO centre and referring hospitals.

Deliberative processes were used in order to make sense of multiple perspectives, enabling participants to work explicitly with evidence, experience and opinion. Simple conversation was used to allow all participants to find their voice then, split into groups, further dialogue was used to challenge underlying assumptions and allow diversity of opinion rather than reach an early consensus.

RESULTS. 40 modified FS-ICU responses were received over the 12 months to December 2012 (36 % response, see graphs).



[Patient Satisfaction]



[Family Satisfaction]

Co-produced interventions were designed to address issues with the communication between primary care, referring hospitals and the ECMO centre; the discharge process and follow-up of ECMO patients; consistency and continuity of care including handover; recording key events during the ICU admission; communication of the daily plan with families to facilitate access and time management; and optimising the family room facilities.
CONCLUSIONS. Severe acute respiratory failure patients and their families provide a valid resource when making service improvements. A co-productive workshop can be used to successfully design interventions that may not have been visible from a provider perspective.
REFERENCE(S). 1. Department of Health The NHS Improvement Plan: Putting People at the Heart of Public Services. London: Department of Health Publications; 2004. 2. Wall RJ, et al. Refinement, scoring and validation of the Family Satisfaction in the Intensive Care Unit (FS-ICU) survey. Crit Care Med. 2007;35(1):271–9. 3. Cahn. No more throw-away people. Washington DC: Essential Books; 2000.

0064
RISK FACTORS FOR INTENSIVE CARE UNIT READMISSION

J. De León-Belmar[1], M.L. Mateu-Campos[1], S. Altaba-Tena[1], M.D. Ferrandiz-Selles[1], R. Reig-Valero[1], L. Galarza-Barrachina[1], F. Bernal-Julián[1], L. Albert-Rodrigo[1], J. Torres-García[1], A. Heras-Javierre[1]

[1]General Hospital Universitary Castellón, Intensive Care Medicine, Castellón, Spain
OBJECTIVE. To analyze the causes that increase the risk for intensive care unit (ICU) readmission and to examine which patient characteristics can predict this readmission.
PATIENTS AND METHODS. Retrospective cohort study of patients requiring a readmission from 2000 to 2012 in a mixed ICU of a university teaching hospital.
RESULTS. A total of 18,920 patients were admitted: 68.3 % medical patients, 21.4 % elective surgery and 10.3 % emergency surgery. The site origin: emergency room 45.7 %, followed by surgery and hospitalization ward. Mean age and gender: 60.88 ± 17.20 years and 65.9 % men. The simplified acute physiology score (SAPS) III at admission was 35.74 ± 17.33. Six hundred and ninety-five (695) patients were re-admitted, 3.7 % of total admissions, within a median of 9 days. One hundred and seventy-five (175) patients were readmitted within 72 h (1.1 % of total admissions). The most common diagnostic groups at readmission were: acute respiratory failure (33.7 %); sepsis (15 %) and ischemic heart disease (13 %).Regarding the initial length of stay (LOS) at ICU, in the readmitted group was 14.75 ± 9.8 days versus 8.66 ± 5.23 in the non-readmitted group. The hospital length of stay before the initial admission was also higher in the readmitted group (16.63 ± 26.10 vs 2.34 ± 6.87 days, $p < 0.005$). Patients readmitted to the ICU had a higher SAPS 3 (41.73 vs 35.51, $p < 0.005$) on initial admission to the ICU compared to those who were not readmitted. Patients requiring readmission had a higher mortality rate (24.60 %) compared to those not requiring readmission (12.6 %, $p < 0.001$).
CONCLUSIONS. In this cohort of patients, 3.7 % of patients discharged from the ICU required readmission. Emergency surgery and higher SAPS III at admission and initial ICU length of stay were associated with a higher risk of readmission to the ICU.

Epidemiology of sepsis: 0065–0078

0065
INFECTION: CAUSE OR SEQUELAE OF CARDIAC ARREST

H.E. Kingston[1], M. Crews[1], T. Hargreaves[1], I. Welters[2], D. Wu[2], M. Mogk[3]

[1]Royal Liverpool University Hospital, Intensive Care Unit, Liverpool, UK, [2]Liverpool University, Intensive Care Unit, Liverpool, UK, [3]Moredata GmbH, Giessen, Germany
INTRODUCTION. Figures suggest that approximately 50,000 people suffer an OHCA (Out of hospital cardiac arrest) in the UK every year with an approximal additional 1–5/1,000 inpatient's suffering an IHCA (In hospital cardiac arrest) [1]. Myocardial infarction (MI) as the most frequent cause of cardiac arrest is either related to ischemia from a primary coronary event (type I) or caused by supply-and-demand mismatch (type 2) [2]. Ischaemic heart disease is the most frequent cause of type 1 MI, while pre-existing severe infection associated with hypotension or hypoxia commonly leads to type 2 MI [2].
OBJECTIVES. This study aimed to investigate the association between pre-existing infection and MI in patients suffering from IHCA and OHCA.
METHODS. A retrospective case note review was performed of all patients admitted between 2008 and 2011 to the Intensive Care Unit of a tertiary inner-city university hospital after cardiac arrest. Patient demographics, ECG changes, presenting cardiac rhythm, chest X-ray findings and previous medical history were recorded. Laboratory analysis after arrest included Troponin T levels and infective markers (white cell count, C-reactive protein). Data on presumed cause of arrest, management and outcomes were also collected. The statistical analysis was performed using the Kruskal–Wallis test for numerical data and Chi square test for categorical data.
RESULTS. In total, 64 patients notes were analysed with 44 (69 %) suffering an OHCA and 20 (31 %) having an IHCA. The median APACHE score for OHCA was 17 and IHCA 23 ($p = 0.001$). Hospital survival rate was higher for OHCA at 36.8 % ($n = 17$) than for IHCA at 10 % ($n = 2$). 20 % ($n = 4$) of patients suffering an IHCA were found to have symptoms of sepsis as a likely cause of arrest, as opposed to none of the OHCA patients ($p = 0.002$). Furthermore, 35 % ($n = 7$) of IHCA were on antibiotics prior to arrest compared to 11.9 % ($n = 5$) of OHCA patients ($p = 0.031$). Subsequent to arrest, 70 % ($n = 14$) IHCA were on antibiotics post arrest compared to 52.38 % ($n = 20$) of OHCA ($p = 0.189$).
CONCLUSIONS. A SIRS response is very common in patients post MI regardless of where the arrest occurred [3]. Our results indicate that patients suffering an IHCA are more likely to have their cardiac event as a result of infection, while primary cardiac events are the leading cause of arrest in OHCA patients. The reasons for this may include a poorer functional status of the patient and more severe co-morbidities as reflected in the higher APACHE II scores in IHCA patients. Inpatients are more likely to acquire an infection whilst in hospital. In summary, our results suggest that different causes of cardiac arrest need to be considered in IHCA and OHCA. Different treatment algorithms should be considered for each group of patients.
REFERENCE(S). 1. Nolan JP, et al. Anaesthesia. 2007;62:1207–16. 2. Saaby et al. Eur Heart J. 2012;33(634):0195–668 X. 3. Temple A, et al. CEACCP. 2012;12:283–7.

0066
THE INTENSIVE CARE OVER NATIONS (ICON) AUDIT: EPIDEMIOLOGY OF SEPSIS

J.L. Vincent[1], Y. Sakr[2], On behalf of the ICON investigators

[1]Erasme Hospital, Université libre de Bruxelles, Dept of Intensive Care, Brussels, Belgium, [2]Friedrich-Schiller-University Hospital, Dept of Anesthesiology and Intensive Care, Jena, Germany
INTRODUCTION. There are few data describing the epidemiology of sepsis and organ failure at a global level.
OBJECTIVES. The ICON Audit was sponsored by the World Federation of Intensive and Critical Care Societies to gather data from intensive care units (ICUs) around the world. The aim was to obtain an international picture of the types of critically ill patients hospitalized in our ICUs, with a special emphasis on sepsis and organ failure in terms of epidemiology and disease progression.
METHODS. This multicenter, worldwide audit included 730 ICUs from 84 countries. All adult patients (>16 years) admitted to the participating centers between May 8 and May 18, 2012 were included except those who stayed in the ICU for <24 h for routine postoperative observation. Patients were followed up until death, hospital discharge, or for 60 days. ICU-acquired sepsis was defined as sepsis identified at least 48 h after ICU admission.
RESULTS. Data were obtained on a total of 10,069 patients, the majority from European (54.1 %), Asian (19.2 %), and American (17.1 %) ICUs. ICU and hospital mortality rates were 16.2 and 22.4 %, respectively. Overall 3,718 patients (36.9 %) had sepsis during the ICU stay, including 2,886 (77.6 %) who had sepsis within 48 of admission to the ICU and 832 (22.4 %) with ICU-acquired sepsis. The frequency of sepsis varied according to geographic region, with the lowest frequencies reported in Southern Asia (20.5 %) and North America (28.9 %) and the highest in the Middle East (47.1 %); sepsis occurred in 38.3 and 39.5 % of patients admitted to the Western and Eastern European ICUs, respectively, that took part in this audit. The overall ICU and hospital mortality rates in patients with sepsis were 21.6 and 30.5 % and varied from 10.8 and 17.3 % (Oceania) to 36.6 and 43.6 % (Africa), respectively. ICU and hospital mortality rates were higher (21.6 vs. 12.9 % and 30.5 vs. 17.4 %, $p < 0.001$ pair-wise) and ICU length of stay longer (6 [3–12] vs. 2 [1–4] days, $p < 0.001$) in patients with than in those without sepsis. There was a stepwise increase in ICU and hospital mortality rates according to the severity of sepsis on admission to the ICU or at any time during the ICU stay. Although patients with ICU-acquired sepsis had lower SAPS II scores on admission to the ICU than those who had sepsis within 48 h of admission to the ICU, mortality rates were similar in the two groups.
CONCLUSION. There is considerable variability in the epidemiology of sepsis around the globe.

0067
THE INTENSIVE CARE OVER NATIONS (ICON) AUDIT: PATTERNS OF INFECTION

J.L. Vincent[1], Y. Sakr[2], on behalf of the ICON investigators

[1]Erasme Hospital, Université libre de Bruxelles, Dept of Intensive Care, Brussels, Belgium, [2]Friedrich-Schiller-University Hospital, Dept of Anesthesiology and Intensive Care, Jena, Germany
INTRODUCTION. The ICON Audit was sponsored by the World Federation of Intensive and Critical Care Societies to gather data from intensive care units (ICUs) around the world.
OBJECTIVES. To describe the patterns of infections in the patients included in this large multicenter audit.
METHODS. This multicenter, worldwide audit included all adult patients (>16 years) admitted to the 730 participating ICUs from 84 countries between May 8 and May 18, 2012. Patients were followed up until death, hospital discharge, or for 60 days. Infection was defined according to the definitions of the International Sepsis Forum. Only clinically relevant infections requiring administration of antimicrobial agents were considered. Fungal infections were considered when treatment with antifungal agents was deemed necessary by the attending physician.
RESULTS. Of the 10,069 patients included, 3,718 (36.9 %) had sepsis during the ICU stay, 2,473 of whom (66.5 %) had sepsis present on the day of admission to the ICU. The most common site of infection was the respiratory tract (63.1 %) followed by the abdomen (20.8 %) and blood stream (19.2 %). Among the whole cohort, 5,975 (59.3 %) were receiving antibiotics; 2,257 patients (37.8 %) were receiving prophylactic antibiotics without evidence of infection. The pattern of antibiotic use varied among geographic regions, but ß-lactam antibiotics were used most frequently around the globe. Positive isolates of pathogenic microorganisms were retrieved in 2,494 of the patients with sepsis (67.1 %). Gram-negative microorganisms were retrieved from 66.7 % of positive isolates, whereas Gram-positive bacteria were detected in only 48.9 % of cases. The most commonly isolated pathogens were *Escherichia coli* (22.7 %), *Klebsiella* (17.0 %), and *Pseudomonas species* (16.1 %). The percentage of Gram-positive isolates was as low as 19.4 in Southern Asia, where Gram-negative bacteria contributed to 81.5 % of the positive isolates. Fungi were found in 13.3 and 13.7 % of isolates in Western and Eastern Europe, respectively, but in only 4.8 % of isolates in North America. Infections with MRSA were more common in North America (11.5 %) than in Western Europe (6.5 %). Positive isolates with *Klebsiella* were commonly reported in Africa (31.3 %), Eastern Europe (26.8 %), and Southern Asia (25.0 %) and those with *Pseudomonas species* most commonly in Eastern Europe (20.4 %). Respiratory tract infections were most commonly caused by *Pseudomonas* species (18.8 %), *Klebsiella* (16.9 %), and *Proteus* (14.8 %). *E. coli* was responsible for the majority of abdominal (30.9 %) and urinary tract infections (33.9 %).
CONCLUSION. Patterns of infection vary widely around the globe. Infections due to Gram-negative organisms now largely predominate and *Klebsiella* has become particularly common.

0068
EVALUATION OF 1 YEAR PREHOSPITAL EMERGENCY SEPSIS CARE: AN OBSERVATIONAL STUDY

O. Bayer[1], C. Stumme[1], K. Schneider[1], F. Bloos[1,2], A. Stacke[1], B. Kabisch[1], R. Schäfer[3], C. Hohenstein[3], S. Herdtle[3], J. Reichel[1], C. Hartog[1,2], K. Reinhart[1,2], J. Winning[1]

[1]Jena University Hospital, Department of Anesthesiology and Intensive Care Medicine, Jena, Germany, [2]Jena University Hospital, Center for Sepsis Control and Care, Jena, Germany, [3]Jena University Hospital, Emergency Department, Jena, Germany
INTRODUCTION. Early antimicrobial administration is associated with increased survival in patients with septic shock [1]. Actual data showed a relevant incidence rate of severe

sepsis with 3.3 per 100 emergency medical service encounters (2). For this reason three emergency medical services vehicles and one rescue helicopter were equipped with a "Sepsis-Kit" containing 2 g Ceftriaxone and two blood culture sets.
OBJECTIVES. Retrospective observational study to evaluate the effect of preclinical sepsis therapy.
METHODS. Emergency physicians were asked to initiate sepsis therapy with the "Sepsis Kit" directly on site. If sepsis was suspected, the emergency physician obtained blood cultures and started antimicrobials as well as fluid therapy on site. The patient was then transferred to hospital. Time until administration of antimicrobials was defined as duration from alarm time until 10 min after arrival of the physician on site.
RESULTS. 56 patients diagnosed with sepsis were admitted to the emergency room between March 2012 and April 2013. Patients median age was 73 [IQR 65–82] years, initial body temperature 39.4 [IQR 38.7–39.7] °C, peripheral oxygen saturation 91 [IQR 86–94] %, heart rate 108 [IQR 91–126] beats/min and mean arterial pressure 102 [IQR 80–114] mmHg. 64 % had tachypnea. SAPS2 Score was 30 [IQR 26–35]. Time until administration of antimicrobials and intravenous fluids was median 19 [IQR 18–24] min. No allergic reaction was observed. Patients arrived at hospital after 56 [IQR 46–67] min. In hospital, the diagnosis of sepsis was confirmed in 87.5 % of the patients. 26 (46.4 %) patients had severe sepsis or septic shock. Most common sources of sepsis were respiratory (43 %), urogenital (21 %), skin and soft tissue (8.9 %) and abdominal (8.9 %). Initial median values were procalcitonin 0.5 [IQR 0.2–2.0] ng/mL, leukocytes 11 [IQR 9–15] Gpt/L, C-reactive protein 65 [IQR 35–139] mg/L and serum lactate 2.1 [IQR 1.4–3.6] mmol/L. 61 % patients had a positive blood culture. Ceftriaxone was the appropriate antibiotic therapy in 69 % patients. Patients received 2.5 [IQR 1.5–3.0] litres crystalloids until admitted to the ER. Only 5 (8.9 %) patients were discharged from hospital on the same day. Three (5.4 %) patients died.
CONCLUSIONS. Providing emergency vehicles with a "Sepsis Kit" was a successful measure and was associated with preclinical begin of antimicrobial and fluid therapy. Moreover, emergency physicians' rate of correct sepsis diagnosis is high. Further investigations about the effects of these measures are needed.
REFERENCE(S). 1. Kumar A, et al. Crit Care Med. 2006;34(6):1589–96. 2. Seymour CW, et al. Am J Respir Crit Care Med. 2012;186(12):1264–71.
GRANT ACKNOWLEDGMENT. O. Bayer is supported by an unrestricted grant of the Thuringian Ministry of Cultural Affairs (Landesprogramm ProExzellenz; PE 108-2), the Foundation of Technology, Innovation and Research Thuringia (STIFT) and the German Sepsis Society (GSS).

0069

EPIDEMIOLOGICAL INVESTIGATIONS OF SEVERE SEPSIS: A COMPARISON OF ICD CODE ABSTRACTION STRATEGIES TO THE ACCP/SCCM CONSENSUS CRITERIA

S.B. Wilhelms[1], S. Walther[2], F.R. Huss[3], F. Sjöberg[1]

[1]Linköping University, Department of Clinical and Experimental Medicine, Linköping, Sweden, [2]Linköping University, Department of Medicine and Health, Linköping, Sweden, [3]Uppsala University, Department of Surgical Sciences, Uppsala, Sweden
BACKGROUND. Severe sepsis is diagnosed by the ACCP/SCCM consensus criteria, which are based on physiological and laboratory parameters. To conduct large retrospective registry based studies, several investigators have tried to mirror the ACCP/SCCM criteria by combining sets of ICD codes for organ dysfunction and infection [1–3]. However, previous studies have indicated that different ICD code abstraction strategies collect disparate cohorts of patients with "severe sepsis" [4].
OBJECTIVES. To compare the proportion of patients obtaining an ICD code abstraction indicating severe sepsis at hospital discharge to patients diagnosed with severe sepsis by the ACCP/SCCM consensus criteria during their intensive care unit (ICU) stay.
METHODS. The *Swedish Intensive care Registry* (*SIR*) was used to identify patients (>18 years of age) who were admitted to ICUs during the years 2005–2009 with severe sepsis according to the ACCP/SCCM criteria. Using the *Swedish Hospital Discharge Registry* we investigated whether these patients fulfilled three previously used ICD code abstraction strategies (Angus et al., Flaatten, and Martin et al.) at hospital discharge.
RESULTS. A total of 9,271 patients were registered with severe sepsis in the SIR. A majority of the patients, 55.4 %, with severe sepsis were discharged from hospital with ICD codes which did not correspond to any criteria of Angus et al., Flaatten, or Martin et al. A minority of the patients, 10.3 %, were discharged with ICD codes corresponding to all three code abstraction strategies applied. Overall, 15.1 % of the patients were discharged with ICD codes corresponding to the criteria of Angus et al., 39.8 % of the patients corresponded to the criteria of Flaatten, and 16.0 % patients corresponded to the criteria of Martin et al.
CONCLUSIONS. A majority of the patients with severe sepsis according to the ACCP/SCCM were not discharged with ICD codes corresponding to the ICD code abstraction strategies previously used. Therefore, ICD code abstraction strategies should be used with caution when studying the epidemiology of severe sepsis. Further research is needed regarding the generalizability of the results to other countries and health care systems, as well as studies dealing with the epidemiology of patients with severe sepsis not treated in the ICU.
REFERENCE(S). 1. Angus DC, et al. Epidemiology of severe sepsis in the United States: analysis of incidence, outcome, and associated costs of care. Crit Care Med. 2001;29(7):1303–10. 2. Flaatten H. Epidemiology of sepsis in Norway in 1999. Crit Care. 2004;8(4):R180–4. 3. Martin GS, et al. The epidemiology of sepsis in the United States from 1979 through 2000. N Engl J Med. 2003;348(16):1546–54. 4. Wilhelms SB, et al. Assessment of incidence of severe sepsis in Sweden using different ways of abstracting International Classification of Diseases codes: Difficulties with methods and interpretation of results. Crit Care Med. 2010;38(6):1442–9.

0070

THE LABORATORY RISK INDICATOR FOR NECROTIZING FASCITIS (LRINEC) SCORE IN EARLY RECOGNITION OF HIGH RISK PATIENTS WITH NECROTIZING SOFT TISSUE INFECTION. A RETROSPECTIVE ANALYSIS OF 30 CASES FROM A GENERAL ICU

M. Pozzi[1], M. Laratta[1], L. Gasparini[2], G. Monti[2], R. Fumagalli[1,2]

[1]University of Milano-Bicocca, Monza, Italy, [2]Niguarda Ca'Granda Hospital, Service of Anaesthesia and Intensive Care, Milano, Italy
INTRODUCTION. Necrotizing Soft Tissue Infections (NSTI) are associated with need for intensive care and high mortality (30 %). Initial diagnosis of NSTI among non life-threatening Soft Tissue Infections (STI) may be difficult. Early surgical and critical care management is critical for survival and outcome. LRINEC score was first introduced in 2004[1] to help—using few laboratory data and a cut-off ≥6—in early recognition NSTI, with a low sensitivity (59.2 %) but a high specificity (83.8 %) [2]. In two retrospective studies, discussing its prognostic value [3, 4], a LRINEC ≥6 was significantly associated with higher mortality and a higher rate of complications, with a mild sensitivity and specificity.
OBJECTIVES. To review all cases of NSTI from a general ICU in the last 8 years and to asses the prognostic value of LRINEC score.
METHODS. All case records were reviewed; data were collected at the entry in the Emergency Department or, if coming from a general ward or another hospital, at the ICU admission; Data are presented as median (25th–75th percentile).
RESULTS. We identified 30 patients with NSTI. In 17 of them LRINEC score was available. Table 1 resumes patients characteristics. Mortality rate was 37 %. Dead patients had a more severe clinical presentation, shorter ICU LOS, death occurring in the first days of course, and received earlier first surgery. Despite all patients had a confirmed diagnosis of NSTI, 4 presented with a LRINEC <6. Patients with a LRINEC ≥6 had a significantly more severe clinical presentation measured with SAPSII and were significantly older. None of the patients with LRINEC <6 died, while 6 patients died among the thirteen ones with LRINEC ≥6, that 6 shows a sensibility of 100 % and a specificity of 36 % (PPV 46 %, NPV 100 %) in predicting death. Serum lactate, magnitude of hemodynamic impairment, ICU LOS and number of surgical revisions were higher, although non significantly, in LRINEC ≥6 group (Table 2).
CONCLUSIONS. Retrospective application of LRINEC score to our population confirms its low sensibility in recognizing patients with NSTI. Non-survivors were characterized by a more severe clinical presentation addressing an initial higher intensity of care, in particular for early surgical look. Among patients with diagnosed NSTI a LRINEC ≥6, according to that previously reported, shows high sensitivity and low specificity in recognizing patients at risk for death. The significantly accordance between the simple LRINEC score and the more complex, age and comorbidity-adjusted SAPSII in differentiating high risk patients suggests its usefulness, in the setting of priority-based triage of high-care resources, in ruling out patients with very low probability of severe clinical course and death.
REFERENCE(S). 1. Wong CH, et al. Crit Care Med. 2004;32:1535–41. 2. Liao CI, et al. Tzu Chi Med J. 2012;24:73–6. 3. Corbin V, et al. Ann Dermatol Venereol. 2010;137:5–11. 4. Su YC, et al. ANZ J Surg. 2008;78:968–97.

Table 1

	All (30)	Survivors (19)	Non-survivors (11)
Age (years)	55 (39–61)	49 (22–77)	59 (54–69)
SOFA	8 (6–11)	6 (4–10)	10 (9–13)
SAPSII	41 (29–50)	38 (23–47)	49 (35–57)
Time to first surgical look (h)	12 (5–16)	12 (6–24)	8 (2–16)
ICU stay (days)	9 (3–18)	14 (6–23)	4 (2–14)
Mechanical ventilation (days)	4 (2–12)	6 (0–18)	3 (2–9)

Table 2

	LRINEC < 6 (4)	LRINEC ≥ 6 (13)	p value
LRINEC	3 (1–4)	9 (8–10.5)	
SAPSII	22 (18–25)	49 (43–57)	0.008
Mortality (n)	0	6	
Age (years)	27 (23 to 37)	57 (53 to 69)	0.0013
Time to first look (h)	27 (2 to 102)	12 (4 to 14)	
ICU stay (days)	5 (3 to 8)	14 (3 to 20)	
Serum lactate (mmol/L)	1.4 (1.5 to 4.8)	4.1 (2.3 to 9.5)	
BE	−2.7 (−7.2 to 2.2)	−1.2 (−9.2 to 1.7)	
High-dose catecholamine support (SOFA hypotension class >3) (n)	2	9	

0071

IMPORTED MALARIA: A NEW CHALLENGE IN PORTUGUESE ICU

P.R. Ferreira[1], N. Moreira[2], A. Marques[3], P. Coutinho[3]

[1]Centro Hospitalar e Universitário de Coimbra, Anaesthesiology, HG, Coimbra, Portugal, [2]Centro Hospitalar e Universitário de Coimbra, General Surgery, HG, Coimbra, Portugal, [3]Centro Hospitalar e Universitário de Coimbra, Intensive Care, HG, Coimbra, Portugal
INTRODUCTION. The majority of malaria infections in non endemic countries occur among people who went to areas with ongoing plasmodium transmission. The close relationship of Portugal with African countries and the recent increase in emigration makes this diagnose commoner. World Health Organization recommends that adults with severe malaria should be admitted to ICU, with a 25 % reported mortality.
METHODS. Patients with severe malaria requiring intensive care admitted in a Portuguese tertiary hospital were reviewed retrospectively (April 2003–April 2013). Malaria prognosis score (MPS), malaria score for adults (MSA) simplified acute physiology score (SAPS II) and ICU variables were collected. Statistical analysis was performed with SPSS ®20.
RESULTS AND DISCUSSION. In the last decade 51 cases of malaria were admitted in the hospital, 41 males, age 44 ± 15 years, mean hospital stay was 9 ± 10 days and 3 reported deaths. More than half were admitted after 2010.
Six patients had severe malaria and were admitted in the ICU (50 % males), 4/6 of them after 2010, one died (16.7 %). Mean age was 43 ± 12 and ICU stay was 12 ± 11 days. All patients presented fever on admission, 4 diarrhea, 4 myalgia, 1 seizures and 1 cough and shortness of breath. None had taken antimalarial chemoprophylaxis, and all had travelled from sub Saharian countries recently. *Plasmodium falciparum* was identified in all patients.
MSA was 4.3 ± 2.8, MPS = 2.6 ± 1.7, APACHE II 16.8 ± 3.5, SAPSII 44 ± 9 (predicted mortality 15.3 ± 14.0 %). Mean haemoglobin was 8.4 ± 2.3 g/dL and platelet count 26.6 ± 14.1 × $10^3/\mu$L, two thirds required blood transfusion and 2 were submitted to exchange transfusion. Female sex appears to be a risk factor for transfusional needs ($p = 0.08$).
Four patients needed adrenergic support, 3 were ventilated and 1/6 needed dialysis. All were treated with quinine and doxycycline. Parasitemia was 11.5 ± 8.3 % (2.3–25 %) and became undetectable in 8 ± 11 days.

Age and gender weren't predictors of ICU admission or outcome. Statistical analysis did not identify any ICU variable as a good outcome predictor ($p < 0.05$), probably because the sample was too small.
CONCLUSIONS. Although we haven't been able to identify outcome predictors, it is clear that the incidence of malaria requiring ICU admission is increasing. Growing migration to and from Africa in recent years makes malaria more frequent and Portuguese hospitals should be adequately prepared to manage the situation.
REFERENCE(S). 1. Nature. 2005;434:214–7. 2. Clin Infect Dis. 2010;50(5):679–85. 3. Malaria J. 2012;11:96.

0072
NOSOCOMIAL MENINGITIS: DOES CSF LACTATE REALLY HELP? AN INDIAN EXPERIENCE

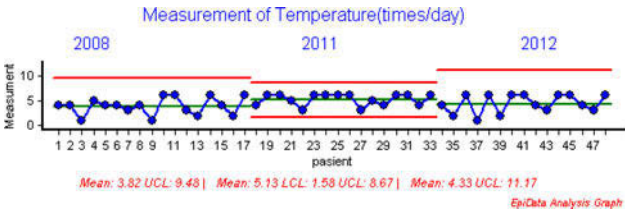
J. Nikhilesh[1], V. Joshi[2]

[1]CHL Hospitals, Critical Care Medicine, Indore, India, [2]Rajshree Hospital and Research Centre, Critical Care Medicine, Indore, India
BACKGROUND. Patients requiring external ventricular drains (EVD) owing to hemorrhagic stroke/traumatic brain injury (TBI) constitute a significant portion of patients in neuro critical care units. These patients are known to acquire meningitis with a prolonged length of stay requiring intra ventricular antibiotics and repeated CSF analysis. Elevated lactate levels in CSF are known to predict origin of the infection as pyogenic [1].
OBJECTIVE. Analyzing outcomes in meningitis secondary to increased EVD duration and correlation of baseline CSF lactate levels with mortality.
SETTING. Forty bedded surgical multi disciplinary ICUs of tertiary care units.
STUDY MODULE. Patients who went on to develop CSF culture positive meningitis post EVD insertion secondary to TBI/hemorrhagic stroke were included. Data was collected with a focus on demographics, length of stay (LOS), SOFA scores and organisms isolated on CSF culture and the antibiotics used as per protocol [2] through the intra ventricular route. Bacterial clearance from CSF/death from ICU were considered as end points. CSF studies were done daily till bacterial clearance was achieved. CSF lactate levels were done at baseline (≥4 mmol/l was a cutoff when meningitis was suspected prior to initiation of antibiotic therapy) and ROC curves were drawn to establish association with mortality. Statistical analysis was done using SPSS version 11.
RESULTS. Forty five patients were included (n = 45, M:F 30:15) for duration dated Oct 2012–Mar 2013. SOFA scores for the cohort were 11 ± 3.2 (range 6–18).The baseline CSF lactate values were 10 ± 4.1 (range 4.2–22).The organisms isolated from CSF were pseudomonas (n = 22, 48.9 %), acinetobacter (n = 14, 31.1 %) and MRSA (n = 9, 20 %) with mean duration of intra ventricular antibiotic therapy 14.8 ± 4.6 days (range 6–29). LOS for the cohort was 16.4 ± 4.4 days. In hospital mortality was 42 % (n = 19).On plotting the ROC curves for association of elevated lactate levels with mortality and length of stay the area under the curve was 0.72 and 0.62 respectively.
CONCLUSION. In cohorts with nosocomial meningitis secondary to EVD insertion elevated CSF lactate levels at baseline have a significant association with increased mortality. The organisms in these infections are mostly multidrug resistant and contribute to significant mortality in neuro critical care units. However the dosing regimens and protocols need to be standardized further and compared with conventional Intravenous regimens.
REFERENCE(S). 1. Leib SL, et al. Clin Infect Dis. 1999;29:69–74. 2. Diedreek van Beek et al. NEJM. 2010;362:146–54.

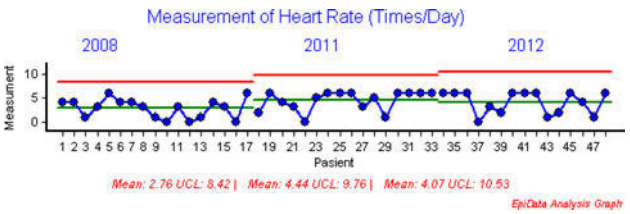
0073
STANDARDISED SIRS/SEPSIS OBSERVATION AT THE GENERAL WARDS

L.T. Gustad[1,2], I.-L. Bangstad[1], M. Torsvik[3], A. Mehl[1,4]

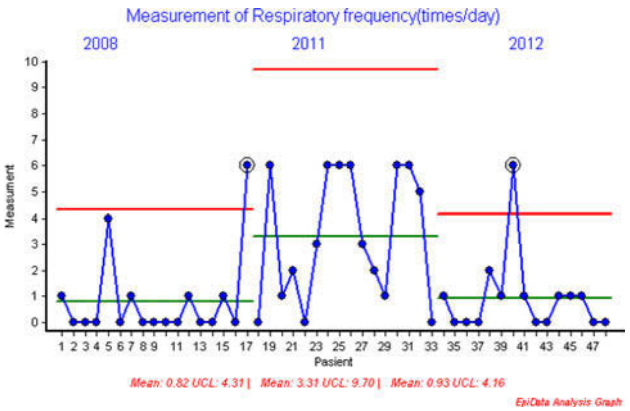
[1]Levanger Hospital, Nord-Trøndelag Hospital Trust, Internal Medicine, Levanger, Norway, [2]Norwegian University of Technology and Science (NTNU), Department of Neuroscience, Trondheim, Norway, [3]Nord-Trøndelag University College, Nursing Education, Levanger, Norway, [4]NTNU, Department of Cancer Research and Molecular Medicine, Trondheim, Norway
INTRODUCTION. Whilst the Surviving Sepsis Campaign [1] have been strong amongst nurses in the intensive care units, nurses at ward level still lacks knowledge about vital signs which can identify early progress in systemic inflammatory response syndrome (SIRS) and sepsis [2].
OBJECTIVES. Early identification of abnormal development of vital signs is essential for rapid treatment, which in turn can improve survival and morbidity with sepsis [3, 4]. We therefore aimed to increase the ward nurses' knowledge and observation frequency of vital signs.
METHOD. All ward nurses at a local hospital where educated in use of a triage system which help the nurses identify patients that develops SIRS/sepsis. The triage is used when the nurse suspect infection and helps to identify if the vital signs of heart rate, temperature, respiratory frequency or a laboratory measure of leucocytes are abnormal. If two or more SIRS signs were positive, the nurses were advised to check hemodynamic variables, alert the doctor about the findings, and repeat recordings of vital signs at least 6 times per days. The Bacteraemia Registry records how often nurses observe vital signs of patients with a positive blood culture. We used Epidata and statistical process control in three periods, one before intervention (2008) and two times after intervention (2011, 2012). For each period we randomly chose 16 patients that subsequently had confirmed bacteraemia.
RESULTS. From 2008 to 2011, ward nurses' average recording per day increased from 3.8 times to 5.1 for temperature, from 2.8 to 4.4 for heart rate and from 0.8 to 3.3 for respiratory frequency ($p < 0.05$ for all). However, especially recording of respiratory frequency dropped back to pre-intervention levels in 2012, one year after first intervention (see epidata analysis 1–3).
CONCLUSION. Education in triage is a potentially effective tool for identification of abnormal vital signs at the wards. However, the implementation of a new standard requires long term repetition and focus.
GRANT ACKNOWLEDGMENT. This study is supported by the Cooperation Committee on Research and Development between Nord-Trøndelag Hospital Trust and Nord-Trøndelag University College and Dr Egil Kjeldaas Funding.
REFERENCES. 1. Dellinger RP, et al. Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock: 2012. Crit Care Med. 2013;41(2):580–637. 2. Robson W, et al. An audit of ward nurses' knowledge of sepsis. Nurs Crit Care. 2007;12(2):86–92. 3. Kenzaka T, et al. Importance of vital signs to the early diagnosis and severity of sepsis: association between vital signs and sequential organ failure assessment score in patients with sepsis. Intern Med. 2012;51(8):871–6. 4. Preece MH, et al. Supporting the detection of patient deterioration: observation chart design affects the recognition of abnormal vital signs. Resuscitation. 2012;83(9):1111–8.



Graph 1 Epidata measurements of Temperature



Graph 2 Epidata heart rate



Graph 3 Epidata respiratory frequency

0074
SEPTIC CHILDREN IN PEDIATRIC INTENSIVE CARE: DESCRIPTIVE ANALYSIS OF THE PREINTERVENTION PERIOD OF THE ABISS-EDUSEPSIS PEDIATRIC STUDY

E. Esteban[1], R. Ferrer[2], S. Segura[1], A. Felipe[3], L. Pérez-Baena[4], A. Bustinza[5], F. Gómez[6], A. Concha[7], ABISS-Edusepsis Pediatric Study Group

[1]Hospital Sant Joan de Déu, Pediatric Intensive Care Unit, Esplugues de Llobregat, Spain, [2]Mutua de Terrassa Universitary Hospital, Crictical Care Unit, Terrassa, Spain, [3]Hospital General de Cataluña, Pediatric Intensive Care Unit, Sant Cugat del Vallès, Spain, [4]Hospital Nuestra Señora de la Candelaria, Pedaitric Intensive Care Unit, Tenerife, Spain, [5]Hospital Gregorio Marañón, Pediatric Intensive Care Unit, Madrid, Spain, [6]Complejo Asistencial Universitario de Burgos, Pediatric Intensive Care Unit, Burgos, Spain, [7]Hospital Universitario Central de Asturias, Pediatric Intensive Care Unit, Oviedo, Spain
INTRODUCTION. Sepsis remains a major cause of morbidity and mortality among children.
OBJECTIVES. To describe the epidemiology of severe sepsis and septic shock in Pediatric Intensive Care Units (PICU) and to analyze sepsis treatment in the preintervention period of the ABISS-Edusepsis Pediatric Study.
METHODS. Prospective, multicenter observational study conducted in 34 PICUs. Patients: children admitted with severe sepsis and septic shock from November-2011 to April-2012. Demographic, clinical and treatment data were collected. Statistical analysis: χ^2 test to compare categorical variables and *t* student test to compare continuous variables.
RESULTS. We collected 223 patients, 138 males (61.9 %), mean age 2.91 ± 4.77, median 1 year. Septic shock in 52.5 % (117) of episodes. Underlying diseases were present in 35.4 % (79) of patients. Sepsis came from the community in 66.4 % of cases and the origin was meningococcal disease in 14.3 % (32), meningitis 12.6 % (28), community pneumonia 12.1 % (27) and abdominal sepsis 12.1 % (27). Severity scores: mean PRISM3 10.48 ± 7.40 and SOFA 6.74 ± 3.76. The mean PICU and hospital length of stay were: mean17 ± 91.70 and 29.70 ± 95.04 and median 5 and 14 days, respectively. Blood cultures were positive in 41.3 % of cases and the microorganisms more frequently isolated were *Neisseria meningitidis* 32.3 %, gram-negative bacilli 24.7 % and *Streptococcus pneumoniae* 10.7 %.the overall mortality rate was 13.9 and 24.1 %in patients with septic shock. To analyze the treatments administered we excluded 25 patients referred from other hospitals. Mean time from the diagnoses of sepsis to antibiotic was 113.88 ± 170.04 min, median 60 min. Inotropes were necessary in 57.1 % of patients, 55.1 % needed mechanical ventilation, 10.6 % renal replacement therapy and 2.6 % ECMO. The antibiotics

administered were: cefotaxime (51 %), vancomycin (11.6 %)and ampicillin (7.1 %). Antibiotic de-escalation was done in 24.7 % of cases. In 88 % of patients the fluid administration was correct, with a mean of fluids 51.41 ± 59.26 ml/kg, median 37 ml/kg. In 25.8 % of cases blood cultures were not obtained previous to antibiotic and in 26.3 % of cases, antibiotics were not administered in the first 3 h (community sepsis) and in 1 h (nosocomial).
CONCLUSIONS. Septic shock has a high mortality in children. There is plenty more scope for improvement in sepsis management in order to decrease morbidity and mortality.
REFERENCE(S). 1. Ferrer R, et al. Improvement in process of care and outcome after a multicenter severe sepsis educational program in Spain. JAMA. 2008;299(19):2294–303.

0075
RECURRENT STROKE FROM FREE-FLOATING CAROTID ARTERY THROMBUS: 14-YEAR EXPERIENCE FROM A TERTIARY INSTITUTE IN SINGAPORE

H.C. Chua[1], Z. Phua[1]

[1]National Neuroscience Institute, Neurology, Singapore, Singapore
INTRODUCTION. Free-floating carotid artery thrombus is a rare cause of cerebral infarcts. Current understanding is limited to small case-series. Recurrent stroke in free-floating thrombus is believed to be due to delayed embolism from the tail of the carotid thrombus to the intracranial circulation.
OBJECTIVES. To review recurrent stroke mechanism in free-floating carotid artery thrombus.
METHODS. All patients admitted from 1999 to 2012 for cerebral infarcts were included. Cases were retrospectively identified from carotid ultrasound reports showing free-floating carotid artery thrombus. Case notes, neuroimaging and electronic records were retrieved and patients with recurrent stroke were studied.
RESULTS. A total of 28,126 carotid ultrasound reports were screened and 61 patients with free-floating thrombus were identified. Of these, recurrent stroke occurred in 4 patients. Age range: 60–83 years. Clinical syndrome: pure motor stroke (n = 2), sensorimotor stroke (n = 1), hemispheric stroke (n = 1). BP on admission ranged from 145/75 to 210/80 mm Hg. In 3 patients, neurological deterioration occurred in the first week of admission coinciding with a drop in BP. Etiology of hypotension included dehydration, anemia and inadvertent administration of anti-hypertensives. Brain scan showed watershed infarcts, which collaborated with hypotension as the underlying cause. Recurrent stroke due to embolism from the tail of the carotid thrombus occurred in only one patient with hemispheric syndrome. All patients were treated with heparin and warfarin.
CONCLUSIONS. Hypotension is the cause of recurrent stroke in 75 % of patients with free-floating carotid artery thrombus. Clinicians treating such patients must be vigilant to this potentially preventable complication.
REFERENCE(S). 1. Finklestein S, Kleinman GM, Cuneo R, Baringer JR. Delayed stroke following carotid occlusion. Neurology. 1980;30:84–8. 2. Bhatti AF, Leon LR Jr, Labropoulos N, Rubinas TL, Rodriguez H, Kalman PG, Schneck M, Psalms SB, Biller J. Free-floating thrombus of the carotid artery: literature review and case reports. J Vasc Surg. 2007;45:199–205.

0076
STATISTICAL STUDY OF PRIMARY AND SECONDARY BACTEREMIA IN AN INTENSIVE CARE UNIT (ICU) IN A 2ND LEVEL HOSPITAL. BACTEREMIA ZERO PROGRAM IMPLEMENTATION

R. Fernandez[1], M.E. Yuste[1], R. Ramírez[1], M. Muñoz[1]

[1]Granada University, Granada, Spain
INTRODUCTION. The vascular catheter-related infections and in consequence, primary and secondary bacteriemia (BRC) increases mortality, complications and hospital stay. In our setting, catheter-related bacteremia is one of the device-associated infections more common.
OBJECTIVES. Show the evolution of bacteremia associated with central venous catheter (CVC) and arterial (CA) in our 18-bed unit, after an educational campaign to professionals involved in the insertion and care of these, from April 2011 to December 2012. Evaluate the numbers of primary bacteremia, catheter-associated secondary infection or other sources in our unit.
METHODS. Data from the full ENVIN registration: 01.04.2011/12.01.2012. 682 hospital beds, 18 ICU beds. N 1,750 (patients admitted to the ICU during this period), 7,742 days of stay, 4,397 days of CVC. Presentation of objectives and team leader at the hospital direction management.
Training and educational campaign were imparted to professionals of our unit and engaging the servicio of Anesthesiology. Some classes were presencial and another were by means of internet. Being a total of 235 people from nursing groups, nursing assistants, senior doctors, medical residents and others.
Implementation of protocol for hand washing, technical skills about the insertion of central venous catheters by nurses and doctors, cleaning and maintenance of catheters, use of chlorhexidine.
RESULTS. During the educational phase 01/04/11–01/06/11, the rates and incidence density (ID) were well above national numbers, 1.83 per 100 patients admitted, 3.52 per 1,000 days of stay and 5.77 per 1,000 CVC days, in Spain 1.28, 2.27, 30.6. The most common germs in our unit were *A. baumannii* and *P. mirabilis* Since 01/06/11 from 01/12/12 rates and ID, fell in an amazing way, putting the numbers below Spanish. The rate was 0.89 per 1,000 days DI 2.09, and 3.94 per 1,000 CVC days. The causative organisms were *S. aureus* and *S. coagulase* negative.
01/01/12–01/06/12, numbers went up due to relaxation with protocols of catheter maintenance and hand hygiene. The rate increased to 1.1, DI 2.44 per day stay and CVC days 4.03. However, after the re-evaluation of all groups and after closely monitoring various points of the protocol (especially hand washing and use of chlorhexidine gel before and after contact with the patient) from 01/06/12 to 01/12/12, decreased again the numbers. Rate 0.82 1.93 DI per stay, per CVC days 3.41. The germs were *P. aeruginosa* and *S. aureus*.
Finally, note the existence of bacteremia secondary to other sites. From 01/01/12 to 01/01/13, we filed a rate of 0.45 per 100 patient bacteremia and bacteremia 0.93 DI 1,000 days of stay. The most frequent focus was abdominal infection (60 %) with Gram+ as main cause (60 %).
CONCLUSIONS. The descent of the rates were due to implementation of Bacteriemia Zero Peak periods are due to relaxation in protocol and increased workload.
REFERENCE(S). ENVIN-HELICS.
GRANT ACKNOWLEDGMENT. Dr. Yuste, Dra Ramírez.

0077
SEPSIS IN PATIENTS WITH ACUTE CORONARY SYNDROME AND DISTRIBUTIVE CARDIOGENIC SHOCK

C. Díaz Mendoza[1], E. Zborovszky[1], J. Ocampo Perez[1], M. Sanchez Palacios[1]

[1]Hospital Insular, ICU, Las Palmas de Gran Canaria, Spain
INTRODUCTION. Systemic inflammatory response is frequent in patients with cardiogenic shock and sometimes for sepsis suspicion antibiotic treatment is added.
OBJECTIVES. To establish incidence of sepsis in patients with acute coronary syndrome (ACS) and mixed distributive cardiogenic shock.
METHODS. We studied retrospectively 76 patients with ACS who developed hypotension in the first 48 h after admission, 54 patients had cardiogenic shock, 18 had mixed distributive cardiogenic shock. We compared patients with cardiogenic shock (G1: 54 patients) with those with distributive cardiogenic shock (G2: 18 patients). Diagnosis of shock was established using clinical and hemodynamic parameters (Swan Ganz Catheter, Vigilance Edwards monitor and CVP monitoring). We analyzed: age, sex, APACHE II index, admission diagnosis, use of fibrinolysis and IIb/IIIa glycoprotein inhibitors, cardiac catheterization, cardiac arrest, clinical suspicion of sepsis and source, use of antibiotics, microbiological cultures, procalcitonin (PCT) level, associated Multiple Organ Failure, days of mechanical ventilation, ICU stay, and mortality. We used the Mann–Whitney *U* test and Pearson correlation for statistical analysis. A $p < 0.05$ was considered statistically significant.
RESULTS. A 50 % (27) of G1 patients received empirical antibiotic treatment, in only 24 % (6) of patients of this group presence of infection was proven by microbiological positive cultures. A 94 % (17) of patients of G2 received antibiotic treatment for suspicion of sepsis ($p = 0.005$), in only 53 % (9) of patients of this group (G2) infection was confirmed. Incidence of sepsis was higher in patients with distributive cardiogenic shock ($p = 0.001$: G2 94 %, G1 46 %). Procalcitonin was positive in 83 % (5) of patients with cardiogenic shock with proven sepsis, while It was in 100 % (9) of patients of G2 with confirmed sepsis by microbiological cultures. There was no statistical significant differences in the other studied variables.
CONCLUSIONS. In only 24 % of G1 patients who received antibiotic empirical treatment, presence of infection was proven. On the other hand in 50 % of G2 patients with empirical antibiotic treatment infection was proved by positive microbiological cultures. PCT level had a high sensitivity and specificity for establish the diagnosis of sepsis. It is advisable to rationalize the use of empirical antibiotic therapy by using PCT test in patients with ACS with distributive cardiogenic shock and suspected sepsis because the clinical signs of systemic inflammatory response who frequently develop these patients not necessarily means presence of infection .
REFERENCE(S). 1. Geppert A. Usefulness of procalcitonin for diagnosing complicating sepsis in patients with cardiogenic shock. Intensive Care Med. 2003;29(8):1384–9 (Epub 20 Jun 2003).

0078
HAS THERE BEEN ANY CHANGE IN THE EPIDEMIOLOGY OF SEVERE SEPSIS IN THE LAST TEN YEARS? RESULTS OF A SPANISH MULTICENTER STUDY

M. García[1], R. Herrán[1], P. Merino[1], A. Muriel[1], R. Cítores[2], N. Albalá[3], M.J. López-Pueyo[4], B. Álvarez[5], M.J. Fernández[6], J. Blanco[1], for the G.R.E.C.I.A. Group

[1]Hospital Universitario Río Hortega, Valladolid, Spain, [2]Hospital Clinico Universitario, Valladolid, Spain, [3]Hospital Clinico Universitario, Salamanca, Spain, [4]Complejo Asistencial Universitario de Burgos, Burgos, Spain, [5]Hospital del Bierzo, Ponferrada, Spain, [6]Hospital General de Soria, Soria, Spain
OBJECTIVES. To describe the differences in the main outcomes of severe sepsis nowadays regarding a historical cohort of 2002.
METHODS. Prospective observational multicenter cohort study carried out in 11 ICUs, during 5 months in 2011. Obtained data were compared with those of a cohort registered in 2002 by the same research group. All episodes of severe sepsis [1] occurring during the observation period were registered. Organ failure was defined as a SOFA score 3 and 4. The results are shown as medians, percentiles, absolute numbers and proportions. *T*-test, Mann–Whitney *U* test, χ^2 and difference in proportions were used as appropriate.
RESULTS. 231 episodes of severe sepsis in 229 patients were registered in 2011. In 2002, 324 episodes of severe sepsis in 311 patients. The results are shown in table 1, 2 and 3. The evolution of mortality in non-survivors on days 0–3, 7, 14 and 28 is shown in the image.
CONCLUSIONS. 1. Severity and mortality rate were significantly lower in 2011 than those in 2002. 2. In the current sample, ICU stay in survivors was significantly lower; hospital stay in both survivors and non-survivors in 2011 was remarkably longer than in 2002.
REFERENCE(S). 1. Levy MM. Crit Care Med. 2003.

Table 1

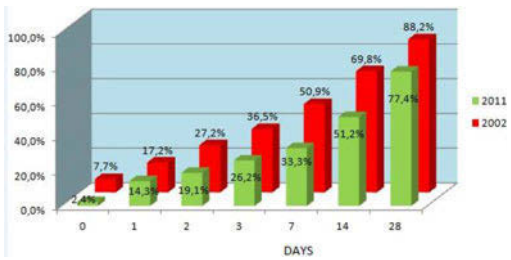
	2001 229 patients 231 episodes	2002 311 patients 324 episodes	p
	Mean ± SD/N (%)	Mean ± SD/N (%)	
Age	66.8 ± 14.2	63.9 ± 14.6	0.02
Sex (male)	153 (66.2)	208 (66.9)	0.87
APACHE II	21.9 ± 6.6	25.5 ± 7.1	<0.001
LOD	5.6 ± 3.3	6.4 ± 3.6	0.01
SOFA D1	8.1 ± 3.6	9.6 ± 3.7	<0.001

Table 2

	2011 229 patients 231 episodes Median (IQR)/N (%)	2002 311 patients 324 episodes Median (IQR)/N (%)	p
Length of stay (days)			
ICU total	8 (4–8)	10 (4–20)	0.26
ICU survivors	7 (4–13)	12 (5–23)	0.001
ICU non-survivors	12 (4–23)	8 (3–18)	0.13
Hospital total	25 (16–51)	35 (22–59)	0.13
Hospital survivors	25 (16–51)	35 (22–59)	0.004
Hospital non-survivors	26.6 (13–38.5)	15 (7–30)	0.001

Table 3

	2011 229 patients 231 episodes Median (IQR)/N (%)	2002 311 patients 324 episodes Median (IQR)/N (%)	p
Mortality day 0	2 (0.87)	13 (4.2)	0.02
Mortality day 1	12 (5.2)	29 (9.3)	0.07
Mortality day 3	29 (9.5)	60 (19.3)	0.02
Mortality day 7	28 (12.1)	86 (27.6)	<0.001
Mortality day 14	43 (18.6)	118 (37.9)	<0.001
Mortality day 28	65 (28.1)	149 (47.9)	<0.001
ICU mortality	62 (27.2)	150 (48.2)	<0.001
Overall mortality	83 (36.4)	169 (54.3)	<0.001



Cumulative Mortality (%) in non-survivors

Haemodynamic monitoring: 0079–0092

0079

FLUID RESPONSIVENESS PREDICTED BY ELEVATION OF PEEP IN PATIENTS WITH SEPTIC SHOCK

E. Wilkman[1], A. Kuitunen[1,2], V. Pettilä[1,3], M. Varpula[1,4]

[1]Helsinki University Central Hospital, Department of Surgery, Division of Anaesthesia and Intensive Care Medicine, Helsinki, Finland, [2]Tampere University Hospital, Tampere, Finland, [3]University of Helsinki, Department of Clinical Sciences, Helsinki, Finland, [4]Heart and Lung Centre, Helsinki University Central Hospital, Department of Cardiology, Helsinki, Finland

INTRODUCTION. Achievement of optimal preload is important in the treatment of circulatory failure. There is also evolving evidence that a positive fluid balance is associated with increased mortality in critically ill patients. Static filling pressures are inadequate indicators of fluid responsiveness in critically ill patients. Dynamic indices may be unreliable in clinical practise, due to arrhythmias or spontaneous breathing efforts. The haemodynamic effects caused by positive end-expiratory pressure (PEEP) resemble those caused by positive pressure ventilation. Elevation of PEEP causes cardiorespiratory interactions, which may pronounce signs of hypovolemia.

OBJECTIVES. Our aim was to assess whether haemodynamic changes during a short elevation of PEEP would predict fluid responsiveness in patients with septic shock.

METHODS. We performed a prospective observational study of 20 patients with septic shock on mechanical ventilation. We assessed changes (Δ) in mean arterial pressure (MAP), systolic arterial pressure (SAP), pulse pressure, central venous pressure (CVP) and pulmonary artery occlusion pressure (PAOP). We also assessed changes in left ventricular end diastolic area (LVEDA) and aortic velocity time integral (VTI_{Ao}) by transesophageal echocardiography. We performed all assessments at PEEP 10 cmH_2O and after elevation of PEEP from 10 to 20 cmH_2O. We defined fluid responsiveness as an increase in cardiac output, measured by thermodilution, of ≥15 % in response to fluid challenge. We assessed the predictive value for fluid responsiveness of the measured variables by receiver operating characteristic (ROC) analysis. We determined the cut-off point of the best predictive variables with Youden Index. We assessed the best clinical cut-off value as the point with the highest negative predictive value (NPV).

RESULTS. The best predictive variables for fluid responsiveness were ΔMAP and ΔSAP ($p = 0.003$ and $p = 0.03$). We detected no association between fluid responsiveness and ΔLVEDA ($p = 0.44$), ΔVTI_{Ao}, ($p = 0.91$), baseline CVP ($p = 0.30$) or PAOP ($p = 0.077$), ΔCVP ($p = 0.84$) or ΔPAOP ($p = 0.78$). In the ROC analysis, the areas under the curve (AUCs, 95 % CIs) for ΔMAP and ΔSAP were 0.91 (0.77–1.0) and 0.82 (0.64–1.0). The best cut-off value for ΔMAP was −10 % (CI 95 % 0.77–1.00, $p = 0.005$) yielding the sensitivity of 83 % and specificity of 86 %. The best clinical cut-off value for ΔMAP was - 8 % with a negative predictive value and sensitivity of 100 %.

CONCLUSIONS. In patients with septic shock on mechanical ventilation, absence of decrease in MAP during elevation of PEEP may be used to identify patients who will not increase their cardiac output in response to fluid challenge.

REFERENCE(S). 1. Luecke T, Pelosi P. Clinical review: Positive end-expiratory pressure and cardiac output. Crit Care. 2005;9(6):607–21.

GRANT ACKNOWLEDGMENT. Helsinki University Hospital EVO-grant T102010070.

0080

DYNAMIC ARTERIAL ELASTANCE IS A PREDICTOR OF ARTERIAL PRESSURE CHANGES TO VOLUME ADMINISTRATION IN FLUID-RESPONDER PATIENTS

M.I. Monge Garcia[1,2], M. Gracia Romero[1], A. Gil Cano[1], A. Rhodes[2], R.M. Grounds[2], C. Maurizio[2]

[1]Hospital del SAS de Jerez, Servicio de Cuidados Críticos y Urgencias, Jerez de la Frontera, Spain, [2]St. George's Healthcare NHS Trust and St George's University of London, Department of Intensive Care Medicine, London, UK

INTRODUCTION. In a previous study, we demonstrated that dynamic arterial elastance (Ea_{dyn}), defined as ratio between pulse-pressure variation (PPV) and stroke volume variation (SVV), allowed to predict the arterial pressure response to volume expansion (VE) in hypotensive preload-dependent patients [1]. A Ea_{dyn} value ≥0.89 predicted a significant increase in MAP after VE with high sensitivity and specificity. However, since SVV was obtained from the arterial pressure-derived monitoring system (Vigileo), a mathematical coupling factor could not be excluded.

OBJECTIVES. We designed this study to assess whether Ea_{dyn}, defined as the ratio between PPV and SVV, obtained from an esophageal Doppler, could predict the arterial pressure response in preload-dependent patients.

METHODS. We included mechanically ventilated patients monitored with an indwelling arterial catheter and an esophageal Doppler (CardioQ-Combi™, Deltex Medical, Chichester, UK). This monitor combined a standard Doppler monitor together with the arterial pressure analysis from the invasive arterial waveform. The decision to give fluids was taken according to the presence of hypoperfusion and preload-dependence condition (increase ≥10 % of cardiac output (CO) during a 2-min passive leg raising maneuver). VE consisted of 500 mL of crystalloid administered over 30 min. We evaluated different aspects of the arterial load: systemic vascular resistance (SVR = MAP/CO), net arterial compliance (C = stroke volume/arterial pulse pressure), and effective arterial elastance (Ea = 90 % of systolic arterial pressure/stroke volume). Dynamic arterial elastance (Ea_{dyn}) was calculated as the ratio between PPV (from the arterial line) and SVV (from the Doppler system), both parameters were calculated and recorded simultaneously by the Doppler monitor.

RESULTS. Twenty-five patients were included. CO increased from 5.5 to 6.7 L/min ($P < 0.0001$) and MAP from 70 ± 16 to 78 ± 18 ($P = 0.0001$). Thirteen patients (52 %) increased their MAP values ≥15 % (pressure-responders). Only Ea_{dyn} allowed detecting a VE-induced increase in MAP ≥15 % (AUC 0.85; 95 % CI 0.65–0.96; $P = 0.0001$). A preinfusion Ea_{dyn} value ≥0.70 discriminate pressure-responders patients with a 85 % of sensitivity and 92 % of specificity.

CONCLUSIONS. Our preliminary results confirm that the assessment of dynamic arterial elastance, defined as the PVV to SVV ratio, obtained from two independent signals, allow predicting the arterial pressure response in mechanically ventilated, preload-dependent patients.

REFERENCES. 1. Monge Garcia MI, Gil Cano A, Gracia Romero M: Dynamic arterial elastance to predict arterial pressure response to volume loading in preload-dependent patients. Crit Care. 2011;15(1):R15.

0081

MEASUREMENT OF HEART–LUNG INTERACTIONS BY ELECTRICAL IMPEDANCE TOMOGRAPHY

C.J.C. Trepte[1], C. Phillips[2], J. Solà i Caros[3], A. Adler[4], M. Rapin[4], S.H. Bohm[5], D.A. Reuter[1]

[1]University Medical Center Hamburg-Eppendorf, Anesthesiology and Intensive Care Medicine, Hamburg, Germany, [2]Oregon Health and Science University, Pulmonary and Critical Care, Portland, USA, [3]Centre Suisse d'Electronique et de Microtechnique (CSEM), Neuchâtel, Switzerland, [4]Carleton University, Department of Systems and Computer Engineering, Ottawa, Canada, [5]Swisstom AG, Landquart, Switzerland

INTRODUCTION. Goal-directed fluid therapy has been shown to improve outcome in critically ill patients. For guidance of fluid therapy dynamic indices of cardiac preload have been shown to be superior in comparison to static or volumetric parameters. While determination of dynamic preload indices from peripheral pulse signals is rather easy to acquire, unfortunately it is highly unreliable in critically-ill patients. In this aspect functional imaging using electrical impedance tomography (EIT) that allows estimation of a central hemodynamic signal may represent a useful alternative.

OBJECTIVES. Non-invasive functional imaging of central hemodynamic signals from within the thorax by means of EIT has been shown to hold promise as an alternative way to assess fluid responsiveness. In an earlier publication [1] EIT-based approach to stroke volume variations (SVV_{EIT}) was presented. However this novel method has not been validated in an independent study. Hence, aim of this study was to validate SVV_{EIT} against SVV_{PC} from pulse contour analysis in an experimental animal model.

METHODS. In a prospective animal study measurements were carried out in 30 anesthetized pigs, ventilated with tidal volumes of 8 ml/kg bodyweight. PEEP of 10 cmH_2O and a respiratory rate of 18/min were applied. SVV_{EIT} was calculated automatically analysing heart–lung interactions in a set of pixels representing the aorta. For the first time such analysis was carried out in an unsupervised way using predefined frequency domain algorithms that had not previously been trained in the study population. Independent assessment of stroke volume variation from calibrated pulse contour analysis was used as experimental reference and for calculation of correlation analysis.

RESULTS. A total of 129 measurements of SVV_{EIT} were acquired. Correlation analysis revealed highly significant correlations for SVV_{and} stroke volume variation by pulse contour analysis ($r = 0.71$; $p < 0.0019$).

CONCLUSION. Estimation of stroke volume variation by electrical impedance tomography does hold the potential to become a reliable non-invasive means to assess heart–lung interactions and dynamic indices of preload by analyzing a central hemodynamic signal within the thorax.

REFERENCE(S). 1. Maisch S, Bohm SH, Sola J, Goepfert M, Kubitz JC, Richter H, Ridder J, Goetz A, Reuter D. Heart–lung interactions measured by electrical impedance tomography. Crit Care Med. 2011.

GRANT ACKNOWLEDGMENT. Else Kröner-Fresenius Stiftung.

0082

COMPARISON BETWEEN INVASIVE AND NON-INVASIVE ASSESSMENT OF DP/DT-MAX OBTAINED WITH TWO PULSE WAVE ANALYSIS DEVICES

F. Franchi[1], P. Mongelli[1], M. Nocci[1], K. Donadello[2], F.S. Taccone[2], C. Ragozzino[1], B. Biagioli[1], S. Scolletta[1]

[1]University of Siena, Siena, Italy, [2]Erasme University Hospital, Brussels, Belgium

INTRODUCTION. Left ventricular (LV) function is often assessed with echocardiography in critically ill patients. Unfortunately, this technique requires an experienced operator and it cannot provide a beat-by-beat evaluation of LV function. Some pulse wave analysis (PWA) systems allow evaluating LV performance on a beat-by-beat basis with an indirect estimation of "dP/dt-max" (maximum rate of pressure change in the left ventricle). Among these PWA systems, SphygmoCor (AtCor Medical, Australia) offers semi-continuously, non-invasively, but operator-dependently, dP/dt-max. Conversely, MostCare (Vygon, Padua, Italy) has the main advantage of being an operator-independent technique that provides continuously, but invasively, dP/dt-max.

OBJECTIVES. Our aim was to compare dP/dt-max obtained by SphygmoCor (Sphy-dP/dt-max) and by MostCare (MC-dP/dt-max) in critically ill patients.

METHODS. We studies 20 heterogeneous patients (age 55 ± 10 years, 15 male, 5 female) admitted to Intensive Care Unit (ICU) who were equipped with a radial artery catheter. Exclusion criteria were: age <18 years, pathologies that could affect the reliability of the arterial signal (e.g., aortic valve and ascending aorta pathologies, cardiac arrhythmias). dP/dt-max was estimated after ICU admission from the analysis of the left or right radial artery during haemodynamic stability, defined as no more than a 5 % variation in heart rate and mean systemic arterial pressure during the time needed for SphygmoCor measurements. Sphy-dP/dt-max was assessed applying the tonometer at the opposite site of the radial artery catheter. MC-dP/dt-max values were averaged over the time needed for each Sphy-dP/dt-max measurement. Linear correlation and Bland–Altman analysis were applied.
RESULTS. The mean Sphy-dP/dt-max was 982 ± 328 (range 506–1452 mmHg/ms). Mean MC-dP/dt-max was 1013 ± 375 mmHg/ms (range 548–1500 mmHg/ms). The correlation between Sphy-dP/dt-max and MC-dp/dt-max was 0.82 (95 % CI 0.76–0.88; $p < 0.001$). The mean bias between dP/dt obtained with the two systems was 30.3 mmHg/msec (Limits of agreement from −313 to 374 mmHg/ms).
CONCLUSIONS. There is a good agreement between dP/dt-max obtained with SphygmoCor and MostCare. These two methods show similar capability of providing an evaluation of LV function in critically ill patients.

0083

NON-INVASIVE, AUTOCALIBRATED CARDIAC OUTPUT DETERMINATION BASED ON THE ANALYSIS OF AN ARTERIAL PRESSURE WAVEFORM RECORDED WITH RADIAL ARTERY APPLANATION TONOMETRY: A PROOF OF CONCEPT PILOT ANALYSIS

B. Saugel[1], A.S. Meidert[1], N. Langwieser[2], J.Y. Wagner[3], F. Fassio[1], W. Huber[1], A. Hapfelmeier[4], R.M. Schmid[1], O. Gödje[5]

[1]II. Medizinische Klinik und Poliklinik, Klinikum rechts der Isar der Technischen Universität München, Munich, Germany, [2]I. Medizinische Klinik, Klinikum rechts der Isar der Technischen Universität München, Munich, Germany, [3]III. Medizinische Klinik, Klinikum rechts der Isar der Technischen Universität München, Munich, Germany, [4]Institut für Medizinische Statistik und Epidemiologie, Klinikum rechts der Isar der Technischen Universität München, Munich, Germany, [5]University Ulm, Global Restructuring Advisors, Ulm, Germany

INTRODUCTION. In critical care, cardiac output (CO) as a determinant for oxygen delivery is a hemodynamic variable of crucial importance in the evaluation of a patient's hemodynamic state. A non-invasive technology for the assessment of a continuous arterial pressure (AP) waveform is radial artery applanation tonometry (AT). So far, AT using the T-Line system (Tensys Medical Inc., San Diego, CA, USA) did not provide CO values in addition to AP values. Recently, an autocalibrating CO algorithm for the determination of CO based on the analysis of an AP waveform recorded using AT has been developed.
OBJECTIVES. In this proof of concept analysis we aimed to describe and evaluate an autocalibrated algorithm for the determination of cardiac output (CO) based on the analysis of an AP waveform recorded using radial artery applanation tonometry (AT) in a continuous non-invasive manner.
METHODS. To be able to exemplarily describe and evaluate the algorithm for CO determination, we deliberately selected 22 patients with impeccable AP waveforms from a database including AP data obtained with AT using the T-Line system (Tensys Medical Inc., San Diego, CA, USA) in intensive care unit (ICU) patients. When recording AP data for this prospectively maintained database, we had simultaneously noted CO measurements obtained from just calibrated pulse contour analysis (PiCCO system; Pulsion Medical Systems, Feldkirchen, Germany) every minute. We applied the autocalibrating CO-algorithm to the AT-derived AP waveforms and noted the computed CO value every minute during a total of 15 min of data recordings per patient (3 × 5 min intervals). These 330 AT-derived CO (AT-CO) values were then statistically compared to the corresponding pulse contour CO (PC-CO) values.
RESULTS. Mean ± standard deviation for PC-CO and AT-CO was 7.0 ± 2.0 and 6.9 ± 2.1 L/min, respectively. The coefficient of variation for PC-CO and AT-CO was 28.0 and 29.9 %, respectively. Bland–Altman analysis demonstrated a mean difference of +0.1 L/min with a standard deviation of 0.8 L/min and 95 % limits of agreement of −1.5 to 1.7 L/min. The percentage error was 23 %.
CONCLUSIONS. Autocalibrating CO can be computed based on the analysis of the AP waveform recorded with AT. In the selected patients included in this pilot analysis, a percentage error of 23 % indicates clinically acceptable agreement between AT-CO and just calibrated pulse contour CO.
GRANT ACKNOWLEDGMENT. BS and ASM received research grants from Tensys Medical Inc. (San Diego, CA, USA). BS and WH collaborate with Pulsion Medical Systems (Feldkirchen, Germany) as members of the medical advisory board. OG consults for Tensys Medical Inc. as medical advisor.

0084

STROKE VOLUME VARIATION GUIDED FLUID THERAPY IN SEVERE SEPTIC SHOCK: WHEN TO STOP CHASING HIGH SVV?

S. Jog[1], S. Sable[1], D. Patel[1], P. Rajhans[1], P. Akole[1], B. Pawar[1], B. Bhurke[1], M. Kothari[1]

[1]Deenanath Mangeshkar Hospital, Department of Intensive Care Medicine, Pune, India

INTRODUCTION. In septic shock recent guidelines recommend [1] fluid challenge technique to be applied based on dynamic parameter like Stroke Volume Variation (SVV), as static parameter like Central Venous Pressure (CVP) has poor correlation with fluid responsiveness. But excessive fluid therapy has been shown to increase mortality during septic shock and to prolong mechanical ventilation.
OBJECTIVES. In patients who are RELATIVELY FLUID OPTIMISED guided by CVP monitoring, we studied the effect further fluid therapy guided by SVV on the outcome of severe septic shock.
METHODS. This was retrospective study conducted in a 55 bedded tertiary level mixed ICU in Pune, India. Inclusion criteria were: 1. Septic shock patients who had received minimum of 30 ml/kg volume expansion before vasopressor therapy. 2. Norepinephrine ≥0.1 mcg/kg/min. 3. CVP ≥12 mmHg. 4. Mechanical ventilation under deep sedation.
Exclusion criteria were arrhythmias, spontaneous mode of ventilation, needing Continuous Renal Replacement Therapy (CRRT) during study period. During the 24 h study period, SVV was continuously monitored with Third Generation Flotrac-Vigileo system (version 3.02). Intravenous fluids either crystalloids or colloids were given in bolus form to keep SVV <12 % throughout the study period. Vasopressors and ionotrope infusions were titrated to keep Mean Arterial Pressure (MAP) ≥65 mm Hg. Positive End Expiratory Pressure (PEEP) and tidal volume (8 ml/kg) were kept constant throughout the study period. Diuresis was avoided.
RESULTS. Consecutive 45 patients with severe septic shock in whom SVV guided fluid therapy was instituted were studied. Average dose of Norepinephrine was 0.19 ± 0.01 mcg/kg/min at baseline. Additionally 22 patients were on Dopamine, 8 patients were on Dobutamine or Epinephrine for ionotropy and 10 patients were on vasopressin as third vasopressor agent. Average amount of SVV guided fluids infused was 4.84 ± 0.91 liters in 24 h. 33.33 % (15/45) patients survived till hospital discharge (Survivors) and 66.66 % (30/45) patients died in the ICU/hospital (Non survivors). Table 1 shows the comparison of Survivors and Non survivors at baseline i.e. before starting SVV guided fluid therapy. Both the groups were comparable.

Comparison of baseline variables

Variable	Survivor	Non survivor	p value
MAP (mmHg)	70.13 ± 8.01	70.63 ± 7.51	0.84
CVP (mmHg)	12.93 ± 3.08	13.83 ± 3.08	0.36
Lactates (mmol/l)	3.07 ± 3.77	4.13 ± 3.48	0.35
Urine (ml/h)	33.33 ± 29.50	35.33 ± 40.51	0.87
$ScvO_2$ (%0	67.57 ± 4.94	65.72 ± 3.53	0.57
LVEF (%)	50.33 ± 10.08	65.72 ± 3.53	0.57
P/F ratio	261.33 ± 100.94	211.31 ± 131.80	0.21
SVV (%)	20.80 ± 5.26	17.87 ± 3.80	0.07

Table 2 shows predictors of mortality by logistic regression analysis at 24 h of study period. CVP, urine output in ml/hr, arterial lactates, amount of fluids received in 24 h had no co relation with mortality whereas worsening of PO_2/FiO_2 ratio ($p = 0.01$) and SVV persistently above 12 % ($p = 0.01$) were independently and significantly related with the mortality.

Predictors of mortality on regression analysis

Variable at 24 h	B value	SE	p value	Odds ratio (CI)
CVP (mmHg)	−0.13	0.25	0.60	0.88 (0.95–1.06)
Urine (ml/h)	0.09	0.01	0.55	1.01 (0.98–1.04)
Lactate (mmol/l)	−0.70	0.47	0.13	0.49 (0.20–1.23)
Fluid volume received (l)	0.27	0.40	0.50	1.31 (0.60–2.88)
P/F ratio	0.01	0.01	0.01	1.01 (1.01–1.02)
SVV <12 % = 1	2.65	1.06	0.01	14.20 (1.78–113.23)
SVV ≥12 % = 2				

CONCLUSIONS. Worsening of oxygenation and persistent higher SVV (≥12 %) at 24 h of SVV guided fluid resuscitation are predictors of mortality in severe septic shock.
REFERENCE(S). 1. Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock, 2012. Intensive Care Med. 2013;39:165–228.

0085

OSCILLATION OF CONTINUOUS CARDIAC OUTPUT MEASUREMENT CAUSED BY INTERMITTENT PNEUMATIC COMPRESSION OF FOOT

H. Mima[1], K. Yunoki[1], H. Ueta[1], T. Shimozono[1], K. Arakawa[2], K. Yamazaki[1]

[1]Kobe City Medical Center General Hospital, Anesthesia and Critical Care, Kobe, Japan, [2]Okayama University Graduate School of Medicine, Anesthesiology and Resuscitology, Okayama, Japan

INTRODUCTION. Cardiac output (CO) measurement with pulmonary artery catheter (PAC) is still valuable in postoperative management in cardiac surgery, but some recent reports have revealed that intermittent pneumatic compression devises (IPC) have potentials to cause serious errors in CO measurement. In continuous mode, calculation of arithmetic mean of CO for several minutes seemed to offset the artifacts by IPC, but we previously reported the novel phenomena which displayed the rhythmic fluctuation of continuous cardiac output (CCO) during the IPC working. Those phenomena mimic sine wave-like curves, so now we rename and call them CCO oscillations. In several cases, stopping the IPCs seemed to abolish the oscillations completely, which suggested that IPC is the most possible candidate for the artifact of CCO.
OBJECTIVES. The aim of this study is to confirm the hypothesis that IPC is the main cause of CCO oscillations. We will also demonstrate the method to obtain the true value of the oscillating CCO, which is crucial to our daily clinical practices.
METHODS. We reviewed the ICU records of consecutive 32 patients from May 2012 to June 2012 retrospectively. All patients admitted to ICU after cardiac surgeries with PAC inserted at operation theatre. Continuous cardiac index (CCI: CCO/body surface area) curves were obtained, calculated and plotted on the Vigilance II (Edwards Lifesciences, Irvine, CA, USA). We mounted and started the IPC (Venostream, Terumo, Japan) after admission to ICU, but sometimes stopped the IPC transiently (<2 h), observing the CCI curve, and tried to define the true value of CI (cardiac index: CO/body surface area). Inflation cycle of IPC was about once/55 s regularly. Oscillation is defined to be positive when the CCO curve is alternating current-like appearance and the difference between CI max and CI min exceeds 0.5L/min/m^2. Here we describe how often the phenomena occurred, and elicit the amplitude and frequency of oscillations. We also selected the IPC stop test-performed cases, and evaluated its effectiveness and true value of CI. All data are shown as mean ± SD.
RESULTS. Of 32 patients, 31patients were displaying oscillations. In oscillation-positive patients, CI max, CI min, and mean amplitudes (= CI max − CI min) were 3.44 ± 0.83, 2.26 ± 0.6, 1.19 ± 0.65, respectively. Mean frequency was 2.76 ± 0.95 cycles/h. 16 stop tests were performed, and in all cases oscillations disappeared or extremely diminished. True value of CI were 2.38 ± 0.55, and can be expressed as CI min + (0.26 ± 0.19), that is, true values were estimated to be in the range of lower half of oscillations.
CONCLUSIONS. IPC is the main cause of prominent oscillation of CCO measured with PAC. True value of CO can be elicited by IPC stop test and estimated to be in the lower half of oscillations. We also found out wide discrepancy between inflation cycle of IPC and CCO oscillation frequency.

0086

A NOVEL CO_2 BASED METHOD FOR CONTINUOUS NON-INVASIVE CARDIAC OUTPUT MONITORING

C. Hällsjö Sander[1], F. Suarez Sipmann[2], M. Hallbäck[3], M. Wallin[3], A. Oldner[1], A. Larsson[2], J. Batista Borges[2], H. Björne[1]

[1]Karolinska University Hospital Solna, Department of Anaesthesia, Surgical Services and Intensive Care, Solna, Sweden, [2]Uppsala University/Surgical Sciences, Hedenstierna Laboratory, Uppsala, Sweden, [3]Maquet Critical Care AB, Solna, Sweden

INTRODUCTION. We present a novel non-invasive continuous method to estimate cardiac output by measuring effective pulmonary blood flow (EPBF) based on the analysis of expired CO_2.

OBJECTIVES. To evaluate a novel continuous non-invasive measurement of EPBF based on a capnodynamic method in a porcine experimental model.

METHODS. The EPBF method is based on the analysis of changes in expired CO_2 and CO_2 elimination through an optimal fitting procedure between a mathematical model of a single compartment lung and measured data. The required alveolar CO_2 changes, between 0.1 to 1 kPa, are induced by introducing a variable ventilation sequence by alternating 5 shorter breaths without an inspiratory pause with 5 longer breaths increasing the inspiratory time by adding a 60 % inspiratory pause while maintaining the same expiratory time. By updating data breath by breath we obtained a continuous measurement method.
Experimental procedures: 10 anesthetized and muscle relaxed pigs (24–30 kg) were ventilated in a volume-controlled mode using a Servo-i ventilator (Maquet Critical Care) and expired CO_2 was analyzed using a standard mainstream capnometer. Reference cardiac output measurements were performed by a Transonic pulmonary flow probe placed at the main pulmonary artery. Cardiac output was decreased 30–50 % by brief inflations of an inferior vena cava balloon and increased 30–50 % by infusion of dobutamine in healthy lung conditions and after inducing lung injury by repeated lung lavages. Arterial and mixed venous blood gases were obtained at each protocol step. We evaluated the performance at different shunt conditions by studying two different PEEP levels: 5 and 12 cmH_2O.

RESULTS. For PEEP 5 and 12 cmH_2O shunt levels were 0.16 (0.06–0.29) (median, range) and 0.1 (0.04–0.23) prelavage and 0.31 (0.11–0.52) and 0.12 (0.06–0.23) in lavaged animals. Correlations between the two cardiac output measurement methods were $r = 0.92$ and $r = 0.79$ for prelavaged animals and $r = 0.67$ and $r = 0.71$ for lavaged animals at PEEP 5 and 12 cmH_2O respectively. When analyzing data according to shunt levels, grouped as shunt <0.15, 0.15–0.30 and >0.3 the obtained correlations were 0.78, 0.82 and 0.37 respectively.

CONCLUSION. The presented novel non-invasive, continuous method to measure EPBF provided good estimates of cardiac output in the experimental conditions studied when shunt levels ≤ 0.3. Whether some correction algorithms can further improve cardiac output estimations based on EPBF remains to be established.

GRANT ACKNOWLEDGMENT. This study was supported by Maquet Critical Care AB.

0087

VENTRICULO-ARTERIAL COUPLING IN SEPTIC SHOCK PATIENTS

B. Ferro[1], P. Bertini[1], R. Baldassarri[1], L. Doroni[1], F. Guarracino[1]

[1]Azienda Ospedaliero Universitaria Pisana, Cardiothoracic Department, Pisa, Italy

INTRODUCTION. Cardiac dysfunction often occurs in patients with septic shock and can significantly affect outcome [1]. The systematic evaluation of patients in septic shock for the presence of cardiac dysfunction is complexed by the associated peripheral vasodilation which often masks cardiac impairment. One physiologic approach to unravel the interaction between the heart and the circulation when both are affected is to examine ventriculo-arterial coupling [2].

OBJECTIVES. To evaluate ventriculo-arterial coupling in septic shock patients noninvasively [3].

METHODS. We measured routine hemodynamics using indwelling arterial and pulmonary arterial catheters and a transthoracic echocardiogram in 20 septic patients upon ICU admission. End-systolic elastance (Ees) was measured by echocardiographic single-beat method (Ees[SB]). Arterial elastance (Ea) was calculated as 0.9 systolic arterial pressure/stroke volume and the Ea/Ees ratio was calculated (normal 0.5–1.36) [2].

RESULTS. Ea/Ees was >1.36 (uncoupled) in fifteen patients, and ≤ 1.36 in 5 patients. No correlation was found between Ees(SB) and either cardiac output or left ventricular ejection fraction.

CONCLUSIONS. Septic shock patients on presentation have a high prevalence of ventriculo-arterial decoupling (Ea/Ees >1.36), which is associated with impaired LV performance. Since Ea/Ees decoupling is an index of cardiovascular inefficiency and a determinant of cardiac energetic, we speculate that decoupled septic patients may benefit from therapy aimed at normalizing Ea/Ees.

REFERENCES. 1. Vieillard-Baron A. Septic cardiomyopathy. Ann Intensive Care. 2011;1(1):6. 2. Starling MR. Left ventricular-arterial coupling relations in the normal human heart. Am Heart J. 1993;125:1659. 3. Chen CH, Fetics B, Nevo E, Rochitte CE, Chiou KR, Ding PA, Kawaguchi M, Kass DA. Noninvasive single-beat determination of left ventricular end-systolic elastance in humans. J Am Coll Cardiol. 2001;38(7):2028–34.

0088

RELIABILITY OF NON-INVASIVE CARDIAC SYSTEM (NICAS®) BIOIMPEDANCE AS CARDIAC OUTPUT MONITORING IN CARDIOTHORACIC INTENSIVE CARE

G. Tavazzi[1], Y. Mebrate[2], M. White[3], S. Price[3]

[1]University and Foundation Policlinico San Matteo IRCCS, Intensive Care Dept 1, Pavia, Italy, [2]Royal Brompton Hospital, Clinical Engineering, London, UK, [3]Royal Brompton Hospital, Adult Intensive Care, London, UK

INTRODUCTION. Hemodynamic monitoring plays a central role in the management of critical ill patients. In the last several years, aiming at a monitoring less invasive as possible, numerous devices have been proposed and studied. One of them is the continuous Non-Invasive Cardiac System (NICaS®) utilizing whole body bioimpedance cardiography with electrodes placed on one wrist and on the contralateral ankle [1].

OBJECTIVES. We examine the use of NICaS® as CO monitoring in cardiothoracic intensive care patients.

METHODS. We performed 27 CO measurements on 18 patients (one patient had 5 and another 6 measurements) using NICaS® and echocardiography.
The two measurement methods were carried out simultaneously on the same patient. Two experienced physician sonographers have performed the echocardiography.
12 patients were male and 6 female; 1 patient was on veno-arterial extracorporeal support and intraaortic balloon pump (IABP); another one had IABP; 2 patients had septic shock, 2 underwent pacemaker optimization, 11 were post cardiac surgery patients and 1 had a transcatheter aortic valve implantation. 16 were on positive pressure ventilation (mean peak pressure 18 ± 5 cmH_2O); the mean systolic pressure was 79 ± 11 mmHg.

RESULTS. We found significant difference between the values measured using the two methods, paired *T*-test shows mean difference of SV 61 ml using US method against 42.5 ml of NICAS ($p = 0.000128$) (Graph 1, Graph 3) and mean difference of CO 5.66 L/min (CI 3.12 L/min/m^2) using US method against 3.92 L/min (CI 2.18 L/min/m^2) of NICAS ($p = 0.000131$) (Graph 2, Graph 3).

T-test for Dependent Samples (Spreadsheet1 in Workbook1)
Marked differences are significant at p < .05000

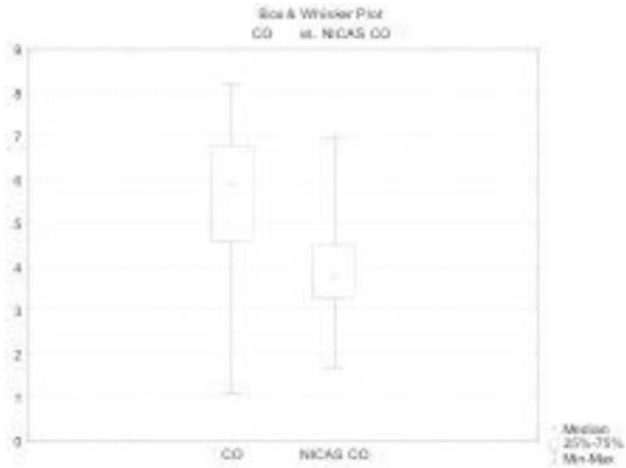
Variable	Mean	Std.Dv.	N	Diff.	Std.Dv. Diff.	Lower 95% Confidence	Upper 95% Confidence	t	df	p
US SV	61.0	17.7								
NICAS SV	42.5	16.9	26	18.5	20.9	10.1	27.0	4.53	25	0.000128

Graph 1

T-test for Dependent Samples (Spreadsheet1 in Workbook1)
Marked differences are significant at p < .05000

Variable	Mean	Std.Dv.	N	Diff.	Std.Dv. Diff.	Lower 95% Confidence	Upper 95% Confidence	t	df	p
CO	5.66	1.73								
NICAS CO	3.92	1.34	27	1.74	2.02	0.94	2.54	4.48	26	0.000131

Graph 2



Graph 3

CONCLUSIONS. NICaS® has been shown to perform well on heart failure patients for CO monitoring [1], however, our results have shown that the reliability of the NICaS itself and compared to echocardiography to measure CO and to track the CO changes in ICU patients was not clinically acceptable.

REFERENCE(S). 1. Marina Leitman, et al. Eur J Heart Failure 2006;8:136–40.

0089

ARE WE STILL PERFORMING PULMONARY ARTERY CATHETERIZATIONS IN THE 21ST CENTURY?

S. Appavu[1]

[1]University of Illinois, Rockford, IL, USA

INTRODUCTION. The use of pulmonary artery catheter (PAC) in the monitory of the critically ill patient has fallen into disfavor. Connors [1] showed that the use of PAC was associated with increased mortality, ICU length of stay and health care cost. Bernard et al. [2] reporting on the National Heart, Lung and Blood Institute workshop called for further clinical studies on the use of PAC. In a presentation at the International Symposium on Intensive Care and Emergency Medicine in Brussels, Belgium in 2005, we showed a statistically significant decline in the use of the PAC between the years of 2000 and 2001. Several newer modalities of hemodynamic monitoring have also been clinically introduced in the last decade.

OBJECTIVES. Because of all of the above, it is unknown whether or not pulmonary artery catheters are still being clinically used and if so, how often and for what indications. Therefore, we performed the following study.

METHODS. We studied the use of PAC within the state of Illinois, USA. The major cities within the state include Chicago, Aurora, Rockford and Peoria. All the hospitals within the state of Illinois report diagnosis related group (DRG) data including ICD9 9 diagnostic and procedure codes to the Illinois health care cost containment council database throughout each year. We searched this database for pulmonary artery pressure monitoring and pulmonary artery wedge pressure monitoring using the corresponding codes. Then we analyzed the data to find the total number of cases of PAC use, the age and gender of patients and the indications for PAC use.

RESULTS.

	2007	2012
Number of PACs	2,036	2,419
Patient's age (mean ± SD)	65.2 ± 13.4	64.7 ± 13.5
Males	1,283	1,581
Females	753	838
Catheter use/1,000 discharges	1.19	1.55

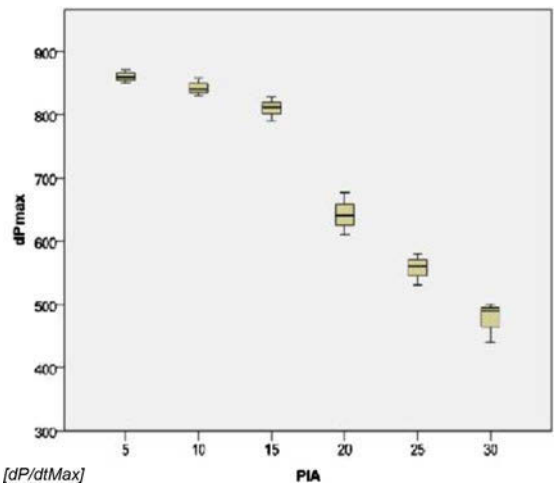
the most frequent indications for PAC use were circulatory disorders except acute myocardial infarction and major cardiovascular procedures.
CONCLUSIONS. Even though the use of PAC has declined compared to the 20th centruy, it is still performed for specific indications and its use over the periods studied remains stable.
REFERENCE(S). 1. Connors AF Jr, Speroff T, Dawson NV, et al. for the SUPPORT investigators. The Effectiveness of Right Heart Catheterization in the Initial Care of the Critically Ill Patients. JAMA 1996;276:889-897 (2) Bernard GR, Sopko G, Cerra F, et al. Pulmonary Artery Catheterization and Clinical Outcomes. National Heart, Lung and Blood Institute and Food and Drug Administration Workshop Report. JAMA 2000;283:2568-257

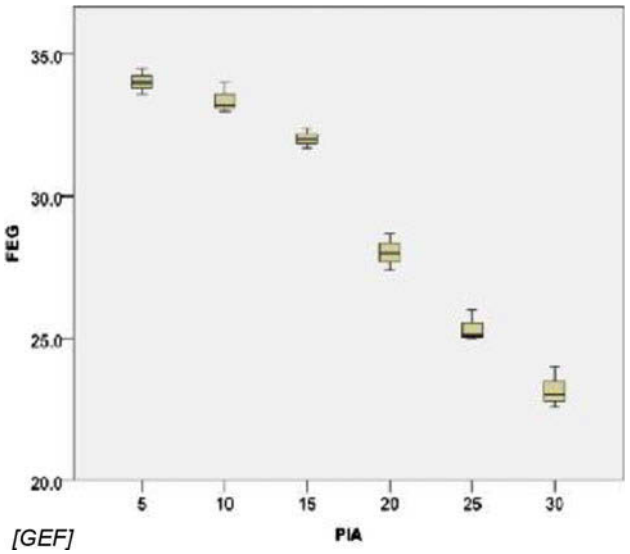
0090

CHANGES OF CARDIAC CONTRACTILITY VARIABLES, GLOBAL EJECTION FRACTION (GEF) AND FEMORAL DP/DTMAX WITH INCREASED INTRA-ABDOMINAL PRESSURE IN NORMOVOLEMIC PORCINE MODEL

L. Torres[1], T. Mondragon[1], G. Magdaleno[1], E. Deloya[1], J. Mendoza[1], S. Leco[1], D. Hernandez[1], F. Jimenez[1], M. Moreno[1], M. Poblano[1], F. Tendillo[2]

[1]Hospital Juarez de Mexico, Intensive Care Unit, Mexico, Mexico, [2]Hospital Universitario Puerta de Hierro Majadahonda, Intensive Care Unit, Madrid, Spain
INTRODUCTION. Hemodynamic monitoring is essential in the critical patient, the evaluation of ventricular function is important and is commonly assessed by echocardiography. The pulse wave analysis systems can also monitor cardiac function in a continuous fashion with variables like the fraction of expulsion overall and dP/dtMAX. The dP/dtMAX is usually estimated over the first 20 ms of the intraventricular pressure upstroke. Whereas peripheral artery derived dP/dtMAX is actually measured after aortic valve opening, it occurs during the left ventricular ejection phase. The fraction of expulsion is a dependent variable preload. The intra-abdominal hypertension (IAP) produced hemodynamic changes that can affect these hemodynamic variables.
OBJECTIVES. To analyze GEF and femoral dP/dtMAX variations in different levels of IAP in normovolemic porcine models.
METHODS. We used 3 pigs, York-Landrace 50-50, weighing approximately 35 kg, an intraperitoneal catheter was placed and a progressive volume of saline 0.9 % solution was infused to increase intra-abdominal pressure. The IAP baseline was 5 mmHg with increased by 5 mmHg every 10 min up to 30 mmHg. We obtained measurements of hemodynamic variables of preload, global end diastolic volume (VTDG), stroke volume variation (SVV) and contractility, GEF and femoral dP/dtMAX, with the system PiCCO® (Pulsion Medical Systems AG, Munich, Germany). Statistical analysis was performed by ANOVA, considering significant p less than 0.05. We used the SPSS v.18.
RESULTS. A total of 180 measurements were performed. GEF and femoral dP/dtMAX variations in different intra-abdominal pressure levels were significant at $p < 0.05$. Preload variables were evaluated: global end diastolic volume and stroke volume variation, finding significant changes $p < 0.05$.
CONCLUSIONS. In our animal model the progressive increased of the IAP induced changes in measurement the contractility variables. These variables are dependent of the preload state, so should be take these results with caution, since changes may be secondary to changes induced directly by effect increased IAP on preloading not on contractility.





REFERENCE(S). 1. Scolletta S, Bodson L, Donadello K. Assessment of left ventricular function by pulse wave analysis in critically ill patients. Intensive Care Med; 2013.

0091

CENTRAL VENOUS ULTRASOUND TO EVALUATE ICU PATIENTS VOLEMIC STATUS: VENTILATORY PATTERN INFLUENCE

V. Alvisi[1], F. Tartari[1], G. Zani[1], R. Ragazzi[1], A. Ferraresi[1], S. Spadaro[1], C.A. Volta[1]

[1]University of Ferrara, Anesthesiology and Intensive Care, Department of Morphology, Surgery and Experimental Medicine, Ferrara, Italy
INTRODUCTION. Investigation of central venous vessels is of great importance to understand patient's blood volume [1]. Ultrasound hemodynamic investigation is cheap, safe and easy to perform at the bedside [2, 3]. Correlations have been found between blood volume and the Inferior Vena Cava (IVC) diameter and between blood volume and changes in the IVC diameter during respiratory activity, generally expressed in terms of collapse index [4–6]. In recent years, Pressure-Support Ventilation mode (PSV) is widely used in intensive care units; however, there is a lack of studies on the ultrasound IVC investigation in subjects in PSV.
OBJECTIVES. Aim of this study is to evaluate the IVC ultrasonographic behavior in PSV mechanically ventilated patients and its reliability as a volemic status index at different levels of applied Positive End-Expiratory Pressure (PEEP).
METHODS. The IVC was assessed using a portable ultrasound device to investigate the inspiratory and expiratory caval diameter and the caval collapse index. These measurements were repeated in each patient by applying different levels of extrinsic PEEP (PEEPe): 0, 5, 10 cmH_2O. At each level of PEEPe was also detected the Central Venous Pressure (CVP).
RESULTS. 16 patients undergoing mechanical ventilation for acute respiratory failure were enrolled. The main results were: • IVC diameter shows respiratory changes similar to those seen during spontaneous ventilation.
• Inspiratory mean IVC diameter progressively increases with increasing PEEPe; this variation was statistically significant from PEEPe 0 and 5 up to 10 cmH_2O.
• The average value of the expiratory caval diameter increases statistically with the increase of PEEPe from 0 to 5 cmH_2O. Any additional increase of the expiratory caval diameter was observed at increasing levels of PEEPe.
• The IVC Collapse Index (IVC-CI) exhibited a progressive decrease with increasing PEEPe, with a statistically significant drop from PEEPe 0 and 5–10 cmH_2O.
• CVP rises gradually and in a statistically significant way increasing PEEPe. No statistical correlation was observed between CVP values and IVC-CI modifications.
CONCLUSIONS. IVC-CI variation associated with increasing PEEPe is not an appropriate index of hypovolemia. IVC-CI data obtained during PSV should always be interpreted in relation to the applied PEEP.
REFERENCE(S). 1. Marik PE, et al. Chest. 2008;134:172–8. 2. Carr BG, et al. J Trauma. 2007;63:495–500. 3. Fields JM, et al. Acad Emerg Med. 2011;18:98–101. 4. Feissel M, et al. Intensive Care Med. 2004;30:1834–7. 5. Stawicki SP, et al. J Am Coll Surg. 2009;209:55–61. 6. Nagdev AD, et al. Ann Emerg Med. 2010;55:290–5.

0092

INVESTIGATION ON THE ORIGIN OF CARDIOGENIC ACTIVITY IN ELECTRICAL IMPEDANCE TOMOGRAPHY (EIT)

F. Braun[1], M. Proença[1], B. Grychtol[2], A. Adler[3], J.-P. Thiran[4,5], J. Solà[1], F. Suarez-Sipmann[6], S.H. Bohm[7]

[1]Centre Suisse d'Electronique et de Microtechnique (CSEM), Neuchâtel, Switzerland, [2]German Cancer Research Centre (DKFZ), Department of Medical Physics in Radiology, Heidelberg, Germany, [3]Carleton University, Systems and Computer Engineering, Ottawa, Canada, [4]École Polytechnique Fédérale de Lausanne (EPFL), Signal Processing Laboratory (LTS5), Lausanne, Switzerland, [5]University Hospital Center (CHUV) and University of Lausanne (UNIL), Department of Radiology, Lausanne, Switzerland, [6]Uppsala University, Surgical Sciences, Section of Anaesthesiology and Critical Care, Uppsala, Sweden, [7]Swisstom AG, Landquart, Switzerland
INTRODUCTION. Electrical impedance tomography (EIT) is a functional imaging technique successfully used to monitor ventilation. Being non-invasive and low cost, EIT is an

appealing candidate for a new generation of hemodynamic monitors. Recent works describe the use of EIT to measure hemodynamic parameters such as blood pressure [1] or stroke volume [2].
OBJECTIVES. This study aimed at testing the hypothesis that cardiogenic EIT activity in pigs is dominated by heart movement phenomena rather than changes in blood volume.
METHODS. Twelve piglets were anesthetized and mechanically ventilated in the supine position. EIT data were recorded using the Enlight® device (Timpel SA, Brazil) with 32 equidistantly placed electrodes. ECG and pulmonary artery pressure (PAP) were recorded synchronously. Image reconstruction was performed with EIDORS [3] using the GREIT approach and a 3D pig shaped thorax model. Two independent maneuvers were performed for each pig. Pulsatility maneuver: ventilation was interrupted for 30 s while cardiogenic-induced impedance changes were recorded using ECG-gated ensemble averaging [1]. Cardiac pulsatility power images were generated by calculating the pixel-wise temporal standard-deviation of the averaged impedance tracings, localizing the position of maximum heart-related impedance change. Bolus injection maneuver: ventilation was interrupted for 30 s while a hypertonic saline bolus was injected into the right ventricle. Bolus-induced impedance changes were retrieved by band-pass filtering the recorded sequence of EIT images, localizing the position of maximum blood flow within the heart chambers.
RESULTS. Figure 1a illustrates that the location of maximal pulsatility power as outlined by the two black lines does not match with the position of the heart chambers identified during bolus injection (yellow pixels) in Fig. 1b, d. The two cardiogenic centers of activity depicted by pulsatility images appear in the region where the heart interacts with the surrounding tissue. These results were found consistently in all pigs.

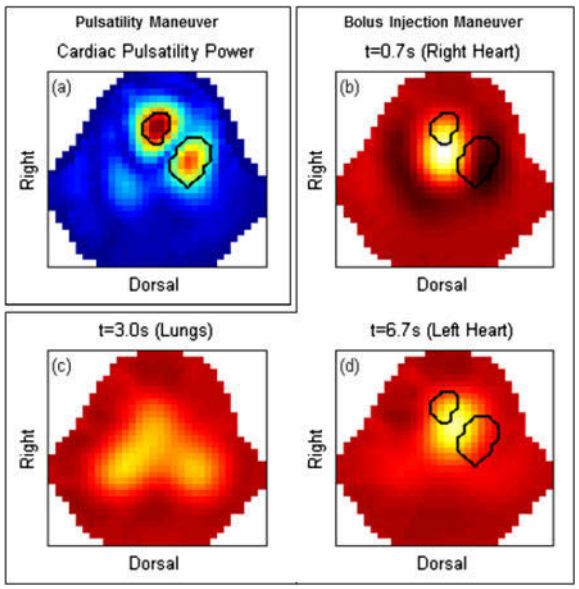


Fig. 1 Pulsatility power (**a**) vs. bolus (**c**, **d**)

CONCLUSIONS. There is a clear mismatch between the heart region localized by (1) cardiogenic pulsatility images and (2) hypertonic bolus injections. We therefore hypothesize that, in pigs, cardiogenic EIT activity might be dominated by heart movement phenomena rather than changes in blood volume.
REFERENCE(S). 1. Solà J, et al. Non-invasive monitoring of central blood pressure by electrical impedance tomography: first experimental evidence, Med Biol Eng Comput. 2011; Springer. 2. Vonk-Noordegraaf A, et al. Determination of stroke volume by means of electrical impedance tomography, physiological measurement. IOP Publishing; 2000. 3. Adler A, et al. Uses and abuses of EIDORS: an extensible software base for EIT, physiological measurement. IOP Publishing; 2006.

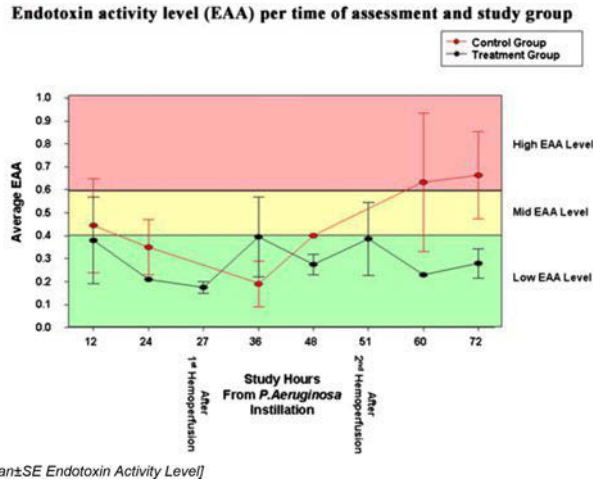
Sepsis: insights from the bench: 0093–0106

0093

POLYMYXIN B HEMOPERFUSION IN AN ANIMAL MODEL OF SEVERE *P. AERUGINOSA* PNEUMONIA: PRELIMINARY RESULTS ON ENDOTOXEMIA AND HEMODYNAMICS

G. Li Bassi[1], E. Aguilera[1], S. Terraneo[1], J.D. Martí[1], I. Roca[2], R.C. Peralta[1], L. Muñoz[2], M. Rigol[1], T. Comaru[1], M. Rinaudo[1], F. De Rosa[1], L. Fernandez[1], N. Luque[1], J. Vila[2], A. Torres[1]

[1]Hospital Clinic, IDIBAPS, CibeRes, Barcelona, Spain, [2]Department of Clinical Microbiology, CRESIB, Hospital Clínic, Universitat de Barcelona, Barcelona, Spain
INTRODUCTION. Previous studies [1] demonstrated hemodynamic benefits and improved outcomes associated with the use of Polymyxin B hemoperfusion (PMX) in patients with septic shock from intra-abdominal Gram-negative infections. To date, the potential role of PMX in severe respiratory Gram-negative infections is unknown.
OBJECTIVES. We assessed in pigs with severe *P. aeruginosa* pneumonia the effects of PMX on endotoxemia and hemodynamics.
METHODS. We studied 6 anesthetized and intubated pigs (32.2 ± 4.1 kg). Under strict asepsis, we surgically cannulated the femoral artery and inserted a Swan-Ganz catheter into the pulmonary artery for hemodynamic monitoring. Animals were inoculated with 15 mL of a suspension of 10^7 colony-forming units (cfu)/mL of *P. aeruginosa* ATCC 27853 into each pulmonary lobe. Pigs were randomly assigned to either standard treatment, or 180-min hemoperfusion therapy with polymyxin B adsorbent column (Toraymyxin, Toray Industries, Tokyo, Japan) after 24 and 48 h from bacterial inoculation. PMX was carried out through a double-lumen venous catheter, blood flow was set at 70–100 ml/min, and 100 UI/kg/h of heparin was administered throughout the treatment. At baseline, and every 12 h, we assessed hemodynamics, and endotoxin activity level in whole blood (EAA) by methods based on neutrophil-dependent chemiluminescence [2]. After 72 h from *P. aeruginosa* instillation, animals were euthanized and lung bacterial burden was quantified.
RESULTS. The mean pulmonary *P. aeruginosa* colonization in the control and treatment group was 3.5 ± 0.9 and 3.4 ± 2.2 log cfu/gr, respectively ($p = 0.68$). As reported in the figure, following *P. aeruginosa* instillation, EAA in the control and treatment groups were 0.48 ± 0.32 and 0.31 ± 0.16, respectively ($p = 0.13$). Heart rate, pulmonary arterial pressure, cardiac output and pulmonary vascular resistances did not differ between groups. Mean arterial pressures in the control and treatment groups were 76.5 ± 9.7 and 86.3 ± 12.9 mmHg, respectively ($p < 0.01$). Whereas, systemic vascular resistance were 1917.7 ± 702.7 dynes s/cm^5 in the control group and 2,120.1 ± 826.1 in the treatment group ($p = 0.28$).



CONCLUSIONS. This preliminary assessment demonstrates that PMX in severe *P. aeruginosa* pneumonia slightly decreases endotoxemia and improves mean arterial pressure.
REFERENCE(S). 1. Cruz D, et al. JAMA. 2009;301(23):2445–52. 2. Romaschin AD, et al. J Immunol Methods. 1998;212:169–85.
GRANT ACKNOWLEDGMENT. Toray Industries, Tokyo, Japan.

0094

EVALUATION OF THE EFFECT OF POLYMYXIN B DIRECT HEMOPERFUSION ON IMPROVEMENT HEMODYNAMIC INSTABILITY IN PATIENTS WITH SEPTIC SHOCK

S. Yoshida[1,2], S. Chihara[3], H. Tatsumi[2], H. Imaizumi[2], Y. Masuda[2], K. Goto[2], K. Takahashi[2], Y. Shichinohe[1], K. Hazama[1], M. Yamakage[4]

[1]National Hospital Organization, Hokkaido Medical Centre, Department of Emergency Medicine and Critical Care, Sapporo, Japan, [2]School of Medicine, Sapporo Medical University, Department of Inteisive Care Medicine, Sapporo, Japan, [3]Sapporo Medical University Hospital, Department of Clinical Engineering, Sapporo, Japan, [4]School of Medicine, Sapporo Medical University, Department of Anaesthesiology, Sapporo, Japan
INTRODUCTION. According to Surviving Sepsis Campaign guidelines, adjunctive therapies for septic shock patients to improve hemodynamic instability are limited. Therefore, a high dose of a vasopressor is often required to achieve target arterial pressure during the first 6 h of resuscitation. The efficacy of polymyxin B hemoperfusion (PMX) for septic shock was reported of the end of the 1980s for the first time in Japan. Recently, some randomized controlled trials and systematic reviews have also shown the beneficial effects of PMX. This treatment is not widely used presumably because of the lack of evidence and uncertainty in the improvement in shock. We conducted this study to clarify the factors that are associated with improvement of hemodynamic instability in septic shock patients.
METHODS. Patients with septic shock admitted to the ICU and treated with PMX in the past 3 years were eligible for this study. We evaluated the changes in catecholamine requirement and vasopressor dependency within 24 h of PMX treatment. Then patients were divided into two groups according to significant improvement in hemodynamic instability within 24 h of PMX treatment. Time factors (time intervals to start of administration of catecholamine and to start of treatment with PMX, and PMX treatment time), volume of fluid resuscitation, APACHE II score and SOFA score were compared in the two groups. Mortality rate at 28 days after ICU admission and length of ICU stay were also evaluated. Exclusion criteria included death within 24 h of ICU admission, administration of corticosteroids at a dose above 200 mg of hydrocortisone, or equivalent of prednisolone or methylprednisolone, and age younger than 18 years. Data were analyzed by the t test and the Chi square test, and $p < 0.05$ was considered statistically significant.
RESULTS. Twenty-four patients were enrolled in this study. Nine patients (38 %) showed significantly improved hemodynamic instability and did not require for catecholamine administration within 24 h of PMX treatment (group R), and 15 patients (62 %) still required for catecholamine support 24 h after PMX treatment (group NR). APACHE II score was not significantly higher in group NR than in group R. Time factors were not significantly different. Volume of fluid resuscitation within 24 h of PMX treatment was higher in group NR than in group R (3,554 vs 2,483 mL, $p < 0.006$), and SOFA score was significantly higher in group NR than in group R (9 vs 7, $p < 0.02$).
CONCLUSIONS. The results of this study indicate that the use of PMX in the early period prior to progression to multiple organ failure are important for improvement in hemodynamic instability with PMX treatment. PMX could be an effective adjunctive therapy for septic shock without risk factors of corticosteroids, such as infection.

0095
TLR-2-INDUCED MITOCHONDRIAL DYSFUNCTION IN CULTURED HUMAN HEPATOCYTES

V. Jeger[1,2], M. Steinmann[1], J. Takala[1], S.M. Jakob[1], S. Djafarzadeh[1]

[1]University Hospital Inselspital Bern, Department of Intensive Care Medicine, Bern, Switzerland, [2]University of Bern, Graduate School for Cellular and Biomedical Sciences, Bern, Switzerland

INTRODUCTION. Hepatic mitochondrial function may be impaired in sepsis, and it has been shown that Toll-like receptors TLR-3 and TLR-4 can be involved. TLR-2 is stimulated by Gram positive bacteria (e.g. *Listeria monocytogenes*). Its stimulation is involved in cytokine upregulation (via NF-κB) and mitochondrial network fragmentation, which is associated with apoptosis.

OBJECTIVES. To evaluate whether TLR-2 stimulation is implicated in hepatic mitochondrial dysfunction and apoptosis.

METHODS. Human hepatocellular carcinoma cell line (HepG2) was cultured and incubated with placebo or heat-killed *Listeria monocytogenes* (HKLM) at concentrations of 10^7 HKLM/ml and 10^8 HKLM/ml for 1 and 24 h ($n \geq 10$). Mitochondrial respiration was measured by high-resolution respirometry (Oroboros Instruments, Innsbruck, Austria). For Western blot analysis, HepG2 cells were exposed to HKLM at concentrations of 10^7 HKLM/ml and 10^8 HKLM/ml for 4, 8, 24 and 72 h. Caspase-3 and actin protein levels were determined by sodium dodecyl polyacrylamide gel electrophoresis (SDS-PAGE) and Western blotting. Statistics: paired sample t-test.

RESULTS. 24 h of incubation with HKLM at a concentration of 10^7 HKLM/ml induced a significant reduction in complex IV-dependent mitochondrial respiration (100 ± 31 in unstimulated vs. 84 ± 20 pmol/[s million cells] in stimulated cells; $p = 0.048$). Complex I-dependent (67 ± 24 in unstimulated vs. 59 ± 15 pmol/[s million cells] in stimulated cells; $p = 0.15$) and complex II-dependent respiration (100 ± 28 in unstimulated vs. 92 ± 23 pmol/[s million cells] in stimulated cells; $p = 0.18$) were not significantly affected. Incubation of cells with HKLM (10^8 HKLM/ml for 24 h) and 1 h incubations at both concentrations did not affect maximal mitochondrial respiration (Fig. 1). Active caspase-3 protein levels were not increased under any condition (Fig. 2).

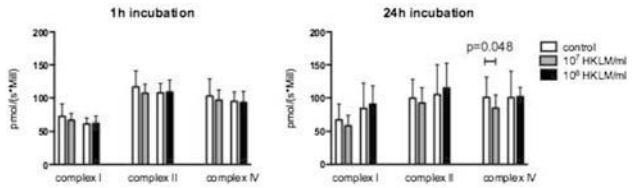


Figure 1: Maximal respiration rates of HepG2 after 1 and 24h incubation with 10^7 and 10^8 HKML/ml. Data are presented as mean + SD. n ≥ 10.

Fig. 1

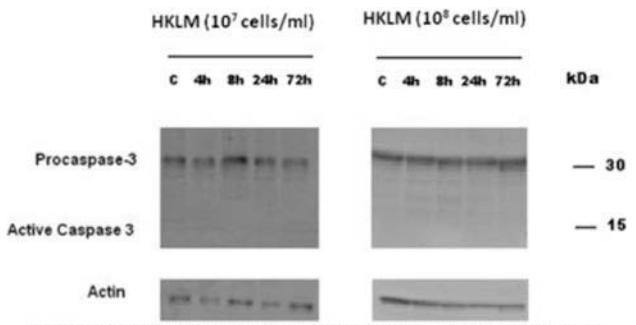


Figure 2: Western blot analysis of procaspase-3 and active cleaved caspase-3 from HepG2 cells after incubation with 107 and 108 HKLM/ml for 4, 8, 24 and 72 hours (n≥6).

Fig. 2

CONCLUSIONS. In this study, we demonstrate that in cultured human HepG2 cells, stimulation of TLR-2 with HKLM for 24 h induces a reduction in maximal mitochondrial oxygen consumption of complex IV in a time- and dose-dependent manner. We observed previously reductions of complex IV-dependent respiration after TLR-3 and TLR-4 stimulation [1]. These results suggest that TLR-2, -3 and -4 signaling use similar mechanisms (e.g. mitochondrial permeability transition pore opening) to induce changes in mitochondrial respiration. HKLM did not induce any signs of early apoptosis. The clinical relevance and the pathomechanism of our findings remain to be evaluated.

REFERENCE(S). 1. Djafarzadeh S, et al. Toll-like receptor-3-induced mitochondrial dysfunction in cultured human hepatocytes. Mitochondrion. 2011;11(1):83–8.

GRANT ACKNOWLEDGMENT. VJ was supported by a MD-PhD scholarship of the Swiss national science foundation (No. 133901).
(VJ and MS contributed equally)

0096
ABSENCE OF DJ-1 ATTENUATES MORBIDITY AND MORTALITY IN EXPERIMENTAL SEPSIS THROUGH IMPROVED BACTERIAL CLEARANCE

H. Amatullah[1], Y. Shan[1], P. Gali[1], D.Y. Zhou[1], T. Maron-Gutierrez[1], J. Haitsma[2], D. Steward[3], S. Mei[4], C. Liles[5], C. dos Santos[1]

[1]University of Toronto, Toronto, Canada, [2]Lund Univerisity, Lund, Sweden, [3]University of Adelaide, Ottawa, Canada, [4]University of Ottawa, Ottawa, Canada, [5]University of Washington, Seattle, USA

INTRODUCTION. Severe sepsis remains a leading cause of mortality in critically ill patients. Mesenchymal stem cells (MSC) have been shown to attenuate sepsis-induced organ injury and mortality in mice receiving appropriate antibiotics [1]. To characterize MSC-dependent molecular mechanisms of protection from sepsis, our lab examined the gene expression profile of target organs from MSC- vs. saline-treated mice in caecal ligation and perforation (CLP) model of sepsis. Gene expression profiles identified mitochondrial pathways related to the Parkinson disease (autosomal recessive, early onset) 7 [PARK-7] or DJ-1 gene as significantly altered in response to MSCs.

OBJECTIVES. To investigate the clinical relevance of DJ-1 in experimental sepsis.

Methods: Male wild-type (WT) C57Bl/6J and DJ-1null (DJ-$1^{-/-}$, knockout) mice were randomized to sham or CLP surgery. Post-operatively animals received fluid resuscitation (0.5 ml/kg saline), antibiotics (25 mg/kg imipenem), and pain management (0.2 mg/kg buprenorphine) every 12 h. Mortality was determined at 7 days. Organ dysfunction was assessed (i) histologically, (ii) functionally and (iii) biochemically at 24 and 48 h. Bacterial clearance and phagocytosis was determined in vivo and in isolated primary macrophages.

RESULTS. DJ-1 deficiency in mice resulted in a marked decrease in CLP-induced mortality at both 48 h and 7 days. Surprisingly, despite improved survival, DJ-1KO mice had increased ROS and pro-inflammatory response compared to WTs. Increased anti-inflammatory and anti-oxidant markers were additionally observed in DJ-1KO mice at 48 h. Bacterial counts in spleen were markedly decreased in DJ-1KO compared with WT mice. This was in keeping with increased phagocytosis seen in DJ-1KO bone marrow derived (BMM) and peritoneal macrophages.

CONCLUSIONS. Mortality from sepsis has traditionally been linked to degree of inflammation and injury. Taken together our data suggests that (1) early efficient source control in the form of bacterial clearance and (2) heightened mechanisms of protection from injury may underscore survival from sepsis.

REFERENCE(S): 1. Mei S, et al. Am J Respir Crit Care Med. 2010;182:1047–57.

GRANT ACKNOWLEDGMENT. This study is supported by Canadian Institutes of Health Research (Grant # MOP-106545 to CCDS), the Early Research Award of the Ministry of Research and Innovation of Ontario, and Li Ka Shing Knowledge Institute at Keenan Research Centre.

0097
CURCUMIN PROTECTS THE CHEMOTAXIS OF NEUTROPHILS THROUGH CXCR1 AND CXCR2 IN SYSTEMIC INFLAMMATORY RESPONSE SYNDROME

H. Kamohara[1], D. Niimori[1], T. Tashiro[1], T. Johno[1], K. Sagishima[1], Y. Kinoshita[1]

[1]Kumamoto University, Critical Care Medicine, Kumamoto, Japan

INTRODUCTION. Infection, trauma and operation accompany with SIRS (systemic inflammatory response syndrome) by various mediators, such as cytokines, chemokines, hormones, and eicosanoids. Prolong of SIRS worse clinical outcome by organs failure. CXCL8 functions chemotaxis, and enzyme release in neutrophils. After CXCL8 stimulates neutrophils via CXCR1 and CXCR2, coupling with heterotrimeric G proteins increase in the cytosolic free Ca^{2+} concentration. Curcumin (17-bis (4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione) extracted from *Curcuma longa* L. is generally used as a spice and as a coloring agent in food. Curcumin has anti-inflammatory and antioxidant effects and downregulates chemokine expression in inflammatory cells. Curcumin affects kinase reactions, such as MAP kinase, PKC, c-Jun/AP-1, and NF-kB. CXCL8 receptors internalize via clathrin-coated vesicle upon agonist binding. After the release of the agonist, the CXCL8 receptors are transported from the cytoplasm to the nucleus, some of the receptors are transported back to the cell surface via the recycling endosomes. The Rab proteins might be essential since they are involved in the mechanisms of trafficking intracellular vesicles. The endosomal vesicles that participate in the trafficking of CXCL8 receptors may play an important role in the curcumin-mediated regulation.

OBJECTIVES. The objectives were to reveal the effect of curcumin on neutrophil chemotaxis mediated by the interaction between CXCL8 and its receptors.

METHODS. We extracted neutrophils from bloods of healthy donors for in vitro assay, and neutrophils or leukocytes from bloods or body fluids of eighteen patients who underwent esophagectomy for cancer. The expression of CXCL8 and its receptors mRNAs and proteins was examined. Isolated neutrophils were stimulated with or without CXCL8 and/or curcumin for the indicated period in vitro to analyze the chemotactic activity by chemotaxis chambers.

RESULTS. CXCL8 proteins were detected higher in post operative drainage fluid than in post operative serum significantly. Isolated leukocytes from body fluid expressed CXCL8 mRNA higher than circulating leukocytes after operation. Curcumin inhibited the activity of chemotaxis and Ca^{2+} mobilization significantly in healthy neutrophils. CXCL8 promoted the internalization of CXCR1 and CXCR2 in neutrophils. Curcumin inhibited the recovery process of CXCR1 and CXCR2 in neutrophils by FACS. Curcumin upregulated the binding of Rab11 with CXCR1 or CXCR2 in neutrophils by Western blotting.

CONCLUSIONS. Curcumin affects numerous bioactivities that involve signal transduction through CXCR1 and CXCR2. Therefore, curcumin can function as a potent anti-inflammatory agent that regulates the receptor trafficking pathway of cytosol in SIRS.

REFERENCE(S). Takahashi M, Ishiko T, Kamohara H, et al. Med Inflamm. 2007;2007: 10767.

GRANT ACKNOWLEDGMENT. This study was supported by Japan society of the promotion of science.

0098
CELLULAR EFFECTS OF DIFFERENT CONCENTRATIONS OF HUMAN ALBUMIN ON LPS/TNFα-INDUCED ENDOTHELIAL CELL DYSFUNCTION

J. Boisramé-Helms[1,2], X. Delabranche[1,2], A. Berger[1,2], M. Burban[3], H. Kremer[4], M. Hasselmann[1], F. Toti[3], F. Meziani[1,2]

[1]CHU de Strasbourg, Service de Réanimation Médicale, Strasbourg, France, [2]Université de Strasbourg, EA3072, Faculté de médecine, Strasbourg, France, [3]Université de Strasbourg, Laboratoire de Biophotonique et Pharmacologie, Faculté de Pharmacie, Strasbourg, France, [4]CHU de Strasbourg, Service de Cardiologie, Strasbourg, France

INTRODUCTION. Endothelial dysfunction has been associated with the generation of procoagulant microparticles (MPs) and with oxidative and nitrosative stresses. Human albumin may affect endothelial cell function.

OBJECTIVES. To evaluate cellular effects of two concentrations of human albumin on LPS and TNFα-induced endothelial cell dysfunction in term of procoagulant phenotype acquisition.

METHODS. Human endothelial cells (HUVEC, Human Umbilical Vein Endothelial Cells) were co-stimulated by LPS and TNFα and treated with human albumin [4 mg/mL] or [20 mg/mL] for 24 h. Cell viability was assessed with a neutral red test and a Trypan blue exclusion test and apoptosis by flow cytometry. Microparticles were harvested and measured by prothrombinase assay. The antioxidant activity of albumin was assessed by its effect on superoxide anion, nitric oxide and peroxynitrite productions, measured by

histochemistry and electron paramagnetic resonance; the production of cellular glutathione was also measured with a kit for immunoassay.
RESULTS. Albumin [4 mg/mL] improves cells viability after a pro-inflammatory stimulation (HUVEC stimulated by LPS/TNFα: 9 10^4 cells [9, 10] vs. HUVEC stimulated by LPS/TNFα and treated with albumin [4 mg/mL]: 15 [14, 16], $p < 0.05$), while albumin [20 mg/mL] has no effect (11 [9, 12]). This effect is associated with anti-proliferative properties and decreased apoptosis. Albumin [4 mg/mL] also inhibits the generation of procoagulant microparticles after LPS/TNFα stimulation, while albumin [20 mg/mL] doesn't. Finally, albumin [4 mg/mL] increases anti-oxidative glutathione concentrations (HUVEC-LPS/TNFα: 5.1 nM/mg protein [1.6, 11.2] vs. HUVEC-LPS/TNFα-albumin [4 mg/mL]: 12.2 [3.2, 23.0], $p < 0.05$) and significantly decreases nitrotyrosination and cellular production of $O_2^{\bullet-}$ (HUVEC-LPS/TNFα: 95.3 arbitrary unit [12.6, 101.0] vs. HUVEC-LPS/TNFα-albumin [4 mg/mL]: 35.3 [29.0, 39.0], $p < 0.05$).
CONCLUSION. LPS/TNFα stimulation induces procoagulant MPs generation, participating to loss of endothelial anticoagulant properties. Human albumin [4 mg/mL] improves endothelial cell viability and decreases apoptosis, inhibits the generation of procoagulant microparticles and has protective antioxidants effects.
REFERENCES. 1. Cantin AM, Paquette B, Richter M, et al. Albumin-mediated regulation of cellular glutathione and nuclear factor kappa B activation. Am J Respir Crit Care Med. 2000;162(4 Pt 1):1539–46. 2. Meziani F, Kremer H, Tesse A, et al. Human serum albumin improves arterial dysfunction during early resuscitation in mouse endotoxic model via reduced oxidative and nitrosative stresses. Am J Pathol. 2007;171(6):1753–61. 3. Boisrame-Helms J, Kremer H, Schini-Kerth V, et al. Endothelial dysfunction in sepsis. Curr Vasc Pharmacol. 2013;11(2):150–60.
GRANT ACKNOWLEDGMENT. This work has been partially supported by LFB.

0099
SOLUBLE RECEPTORS CD5 AND CD6 IN CRITICALLY ILL PATIENTS WITH SEPTIC SYNDROMES

J. Aibar[1], P. Castro[1], S. Fernández[1], M. Martínez[2], C. Hernández[1], M. Rinaudo[1], M. Butjosa[1], F. Lozano[2], J.M. Nicolás[1]

[1]Hospital Clinic, IDIBAPS, University of Barcelona, Medical Intensive Care Unit, Barcelona, Spain, [2]Hospital Clinic, IDIBAPS, University of Barcelona, Department of Immunology, Barcelona, Spain
INTRODUCTION. CD5 and CD6 receptors are members of the scavenger receptor cysteine-rich superfamily (SRCR-SF) that are expressed on human lymphocytes. Although there is no unifying function for all of the members of the SRCR-SF, some of them have been implicated in the development of the immune system and in the regulation of innate and adaptive immune responses. Soluble forms of CD5 and CD6 receptors (sCD5 and sCD6) have been demonstrated to have a potential role in sepsis pathophysiology in animal models [1, 2]. However, no human data has been published in this field to date.
OBJECTIVES. The aim of this study is to assess sCD5 and sCD6 levels in patients with septic syndromes and non-infectious Systemic Inflammatory Response Syndrome (SIRS) and to analyze their association with morbidity and mortality.
METHODS. The study population consisted of all patients consecutively admitted to a medical intensive care unit (ICU) during 1 year period, that presented either with septic syndrome or non-infectious SIRS at admission or within the first 48 h, and that stayed more than 2 days. Levels of sCD5 and sCD6 were analyzed in these patients in the first 48 h.
RESULTS. We included 218 patients who were admitted with sepsis (23.4 %), severe sepsis (11.5 %), septic shock (38 %) or non-infectious SIRS (27.1 %). Levels of sCD5 and sCD6 had a median value of 10 ng/mL (interquartile range (IQR) 278) and 8.5 ng/mL (IQR 51.5), respectively. Their levels did not follow a normal distribution, and 107 patients (49.1 %) and 99 patients (45.4 %) had undetectable levels for sCD5 and sCD6, respectively. There was a significant correlation between APACHE-II score and sCD6 ($r = 0.45$, $p < 0.01$) and sCD5 ($r = 0.4$, $p < 0.01$) levels, both in each diagnostic category and in the whole population. No other clinical or analytic parameters were found to be related to the levels of these molecules. Logistic regression analysis showed that increased sCD6 levels, but not sCD5, were associated with a slight but significant increased risk of in-ICU mortality (OR 1.001 (IC 95 % 1.000–1.001, $p = 0.007$).
CONCLUSIONS. Levels of sCD5 and sCD6 are correlated with illness severity in critically ill patients with SIRS, either infectious or not. Furthermore, sCD6 levels, but not sCD5, are associated with an increased risk of mortality.
REFERENCE(S). 1. Sarrias MR, Farnos M, Mota R, Sanchez-Barbero F, Ibanez A, Gimferrer I, et al. CD6 binds to pathogen-associated molecular patterns and protects from LPS-induced septic shock. Proc Natl Acad Sci USA. 2007;104:11724–9. 2. Vera J, Fenutria R, Canadas O, Figueras M, Mota R, Sarrias MR, et al. The CD5 ectodomain interacts with conserved fungal cell wall components and protects from zymosan-induced septic shock-like syndrome. Proc Natl Acad Sci USA. 2009;106:1506–11.

0100
NEUTROPHIL CD64 SURFACE ANTIGEN IS SUPERIOR COMPARED TO CONVENTIONAL LABORATORY TESTS IN IDENTIFYING SEVERE SEPSIS

J. Jämsä[1], V. Huotari[2,3], E.-R. Savolainen[2,3], H. Syrjälä[4], T. Ala-Kokko[1]

[1]Oulu University Hospital, University of Oulu, Department of Anaesthesiology, Division of Intensive Care Medicine, Oulu, Finland, [2]Oulu University Hospital, NordLab Oulu, Oulu, Finland, [3]University of Oulu, Department of Clinical Chemistry, Oulu, Finland, [4]Oulu University Hospital, University of Oulu, Department of Infection Control, Oulu, Finland
INTRODUCTION. Leukocyte surface antigen determinations have been shown to be promising in characterizing sepsis [1, 2].
OBJECTIVES. Our purpose was to compare leukocyte surface antigens to C-reactive protein (CRP), procalcitonin (PCT) and lactate in severe sepsis diagnostics.
METHODS. Our material consisted of 27 patients with severe sepsis treated at the Intensive care unit (ICU) at Oulu University Hospital and from 15 non-septic ICU-patients (7 post-operative off-pump coronary artery bypass (OPCAB) patients and 8 ICU-patients with no signs of systemic inflammatory response syndrome (SIRS)). In severe sepsis patients, the D0 values (48 h from the beginning of severe sepsis) of monocyte and neutrophil CD11b and CD64, natural killer cell CD69, and monocyte CD40, as well as CRP, PCT and lactate were compared to peak (within time range of D0 to D2) values of those in non-septic ICU patients. Receiver Operator Characteristics (ROC) analyses were used to choose the cut-off values, and sensitivity and specificity were calculated to investigate the diagnostic performance of the individual test to distinguish severe sepsis from non-septic inflammation.
RESULTS. All antigens and laboratory tests separated severe sepsis patients from non-septic ICU-patients ($p < 0.05$), while neutrophil CD64 showed highest sensitivity (100 %) and specificity (93 %). Based on the cut-off values, neutrophil CD64 did not miss any severe sepsis patients in our material, whereas PCT missed 3, lactate 4 and CRP 7 of 27 severe sepsis patients (Fig. 1).

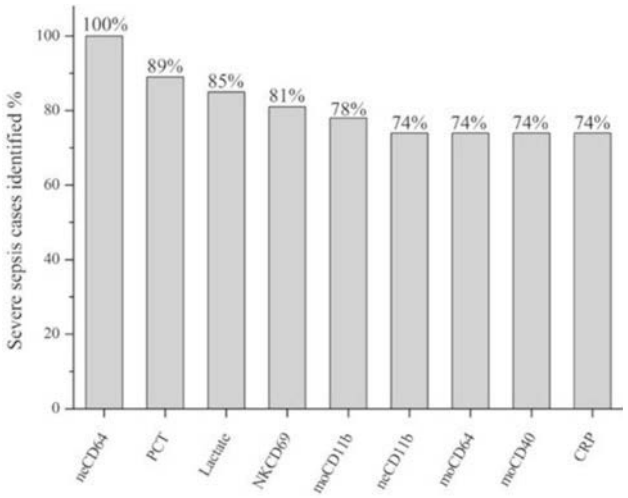


Fig. 1

CONCLUSIONS. Neutrophil CD64 had the best accuracy in separating severe sepsis and non-septic inflammation.
REFERENCE(S). 1. Lilius EM, Nuutila J. Bacterial infections, DNA virus infections, and RNA virus infections manifest differently in neutrophil receptor expression. Sci World J. 2012;2012:527347. 2. Venet F, Lepape A, Monneret G: Clinical review: flow cytometry perspectives in the ICU—from diagnosis of infection to monitoring of injury-induced immune dysfunctions. Crit Care. 2011;15(5):231.
GRANT ACKNOWLEDGMENT. The study was granted by the Oulu University Hospital EVO-grant.

0101
ENDOCAN LEVELS IN PATIENTS WITH SEVERE SEPSIS

M. Behnes[1], D. Pauly[1], D. Lepiorz[1], S. Lang[1], T. Bertsch[2], M. Brueckmann[1], M. Borggrefe[1], U. Hoffmann[1]

[1]1st Medical Department, University Medical Center Mannheim, Medical Faculty Mannheim, University of Heidelberg, Mannheim, Germany, [2]Institute of Clinical Chemistry and Laboratory Medicine, Nuremberg, Germany
INTRODUCTION. Sepsis represents a systemic inflammatory response to an infection. Endocan is a circulating proteoglycan, which regulates leukocyte function and adhesion. Endocan is expressed by endothelial cells in the lung and kidney and has been described as a biomarker of endothelial dysfunction in sepsis. This study evaluates blood levels of endocan during the time course of septic patients presenting to a general intensive care unit (ICU).
PATIENTS AND METHODS. 81 patients presenting to the ICU with clinically proven criteria of SIRS, sepsis, severe sepsis and septic shock were evaluated. Inclusion criteria corresponded with the ACCP/SCCM consensus statement. Blood samples for measurement of endocan were collected within 24 h after the clinical onset of systemic inflammatory response at the ICU. Endocan was measured by ELISA (ELISA Kit JDIEK H1, Lunginnov). Statistical analysis was performed with ANOVA and univariate correlations of endocan were tested with inflammatory markers and APACHE II Score. Patients were followed up to 30 days.
RESULTS. Endocan levels increased according to the severity of systemic inflammation (SIRS/Sepsis: median 1.62 ng/ml, IQR 1.17–9.93 ng/ml ($n = 10$); severe sepsis: median 2.73 ng/ml, IQR 1.47–12.0 ng/ml ($n = 18$); septic shock: median 6.43 ng/ml, IQR 2.33–17.30 ng/ml ($n = 53$) ($p = 0.05$). Endocan levels significantly correlated with pre-sepsin ($r = 0.266$, $p = 0.017$), MCP-1 ($r = 0.258$, $p = 0.024$), procalcitonin ($r = 0.279$, $p = 0.012$) and in tendency with leukocytes ($r = 0.136$, $p = 0.073$) and interleukin 6 ($r = 0.210$, $p = 0.06$) At least endocan was significantly associated with APACHE II score ($r = 0.363$, $p = 0.001$). In patients with a proven infection (i.e. sepsis, severe sepsis and septic shock, $n = 75$) endocan levels in tendency showed higher levels in non-survivors (median 6.71 ng/ml, IQR 2.90–17.37, $n = 33$) compared to survivors (median 2.87 ng/ml, IQR 1.67–12.90, $n = 42$) ($p = 0.07$).
CONCLUSIONS. Endocan levels increased with the severity of sepsis and were associated with APACHE II score. Endocan correlated with several markers of systemic inflammation. Septic patients not surviving sepsis during 30 days follow-up showed higher endocan levels than surviving patients already within the first hours of systemic inflammatory response.

0102
INFLAMMATION-INDUCED AUTOPHAGY IN HUMAN VASCULAR ENDOTHELIAL CELLS

N. Matsuda[1], Y. Konishi[1], R. Itoh[1], J. Tochikubo[1], Y. Adachi[1]

[1]Nagoya University Graduate School of Medicine, Department of Emergency and Critical Care Medicine, Nagoya, Japan
INTRODUCTION. Severe sepsis is a serious disorder with organ dysfunction syndrome via systemic inflammation and cell death. In a systemic inflammation, it is possible that inflammatory-induced autophagy promotes cell death in the vascular endothelial cells.
OBJECTIVES. The purpose of this study was to evaluate expression of intracellular molecules related with autophagy and inflammation after inflammatory stimulation in human vascular endothelial cells.
METHODS. This study was performed under the ethics approval of Nagoya university graduate school of medicine. As human vascular endothelial cells, human pulmonary

endothelial cells (HPAEC) and human umbilical vein endothelial cells (HUVEC) were separately stimulated with tumor necrosis factor-α (TNFα; 10–100 ng/mL) or lipopolysaccharide (LPS; 10–100 μg/mL) for 15, 30, 60 min and 4 h. The cells were evaluated by quantitative PCR and electron microscope imaging. The densitometric comparisons were made using one-way analysis of variance followed by Tukey's multiple comparison test. Differences were considered significant when P values were <0.05.
RESULTS. In HPAEC culture, autophagy-related gene transcription especially in ATG5, ATG12 and LC3 was time-dependently and significantly increased by 2.07 ± 0.28, 3.02 ± 0.52, 6.30 ± 0.50-fold, respectively, after stimulation of 100 μg/mL LPS. MyD88, p38 and FADD in inflammation-related gene significantly increased transcriptional activity by 1.87 ± 0.28, 2.67 ± 0.46, 2.94 ± 0.20-fold at 15 min after 100 μg/mL LPS stimulation, respectively. On the other hand, 100 ng/mL TNFα stimulation increased the transcription of TNFR1, MyD88, FOS and c-JUN by 125.23 ± 4.95, 2.15 ± 0.26, 316.02 ± 60.16, 12.5 ± 0.86-fold, respectively. Weibel–Palade bodies which could promote hypercoagulation in injured vascular endothelium was increased in HPAEC at 4 h after the TNFα stimulation. Electron microscope imaging revealed the increased number of autophagosome and Weibel–Palade body in HPAEC. Inflammatory and autophagy-related molecules showed the same expression pattern after LPS and TNFα stimulation in HUVEC culture.
CONCLUSIONS. This study showed that inflammatory stimulation such as LPS and TNFα could induce transcriptional activation of autophagy-related gene family including ATG5, ATG12 and LC3 in human vascular endothelial cells. Inflammation could induce autophagosome formation in vascular endothelial cells, which might induce amino acid transformation for the translation of mRNA. We concluded that inflammation-induced autophagy could occur in human vascular endothelial cells.

0103
HEAT SHOCK PROTEIN 72 AND 90 INTRACELLULAR MONOCYTE EXPRESSION IN PATIENTS WITH SEPSIS OR SIRS. PRELIMINARY DATA*

K.T. Apostolou[1], K. Psara[2], E. Briassouli[1], K. Vardas[1], T. Tavladaki[3], E. Mageira[1], C. Routsi[1], S. Nanas[1], G. Briassoulis[3]

[1]National and Kapodistrian University of Athens, First Critical Care Department, Athens, Greece, [2]Evangelismos General Hospital, Immunology-Histocompatibility Department, Athens, Greece, [3]University of Crete/University Hospital, Pediatric Intensive Care Unit, Heraklion, Greece

INTRODUCTION. Heat shock proteins (HSP) have intracellular cytoprotective actions, while they act extracellularly as inducers of cytokines and stimulants for immune cells during stress. HSP72 is a cytosolic stress protein that is highly inducible by severe sepsis (SS). HSP90 assists in the activation of a wide range of client proteins, including many involved in signaling and transcription by a mechanism dependent on its ability to bind and hydrolyze ATP.
OBJECTIVES. To determine the intracellular levels of HSP72 and HSP90 in monocytes of patients with SS or systemic inflammatory response syndrome (SIRS) admitted to a general intensive care unit (ICU), compared to those of healthy individuals; to correlate their expression with demographics and severity of illness.
METHODS. Sixteen consecutively admitted patients with SS, 13 with SIRS, and 13 healthy control subjects (H) were enrolled in the study. Patients' demographic characteristics, laboratory exams, Acute Physiology And Chronic Health Evaluation (APACHE) II and the Sequential Organ Failure Assessment (SOFA) scores were recorded on admission. HSPs levels were determined after staining with surface antigens CD33- PE/Cy5 and CD45 PE/Cy7 followed by either HSP72-FITC or HSP90a-PE intracellular staining (4-colour Flow Cytometry). Mean Fluorescence Intensity (MFI) values for each HSP were noted and analyzed.
RESULTS. Neither gender nor age affected the HSPs' expression. Intracellular HSP72 MFI differed significantly among groups ($p < 0.04$, Kruskal–Wallis), being higher in patients with SIRS (26.7 ± 5) as compared to H group (15.4 ± 2) or SS patients (16.2 ± 2, $p = 0.05$ Mann–Whitney). HSP90 showed a non-significant higher trend in the SIRS (34 ± 8 pg/ml) compared to SS (21.6 ± 6) or H groups (17.6 ± 3). The HSP72 mean fluorescence intensity decreased in patients with high APACHE II scores ($r = -0.446$, $p = 0.015$).
CONCLUSIONS. SIRS increased HSP72 and 90 expressions in monocytes, indicating a protective function of HSP in monocytes during the acute phase of stress. The down-regulation of HSP-positive cells in patients with severe sepsis seems to be a result of adaptation mechanisms to severity of illness.
GRANT ACKNOWLEDGEMENT: This research has been co-financed by the European Union (European Social Fund (ESF)) and Greek national funds through the Operational Program "Education and Lifelong Learning" of the National Strategic Reference Framework (NSRF)-Research Funding Program: THALES.
*Part of the study "Heat shock proteins and glutamine alterations related to hormonal, immunological, inflammatory and molecular response to sepsis: A combined clinical and experimental study".

0104
HIGH FLUORESCENCE LYMPHOCYTES AND IMMATURE GRANULOCYTES AS EARLY MARKERS OF SEPSIS IN CRITICALLY ILL PATIENTS

B. Arneth[1], K. Hommel[2], S. Gehrisch[3], G. Siegert[3], M. Ragaller[2]

[1]University Hospital Dresden, Clinical Chemistry and Laboratory Medicine, Dresden, Germany, [2]University Hospital Dresden, Anaesthesiology and Intensive Care Medicine, Dresden, Germany, [3]University Hospital Dresden, Dresden, Germany

OBJECTIVES. The latest-generation XE5000 hematology analyzer records mature and related immature cell populations, such as neutrophils, immature granulocytes (IGs), and high fluorescence lymphocytes (HFLCs). In this study, the value of these new parameters was examined with regard to the detection of immature cells in patients with sepsis in an intensive care unit.
METHODS. In 38 patients of an anesthesiological/surgical intensive care unit, the new markers were measured in early morning whole blood samples using a XE5000 (SYSMEX Europe, Norderstedt).
RESULTS. Twenty of 38 patients developed sepsis during their intensive care unit stay, 10 patients developed a local infection. The numbers of IGs and HFLCs were significantly higher in patients with sepsis and infection versus those without evidence of infection (HFLC 0.021 ± 0.01 vs. 0.01 ± 0.01 Gpt/l, $p < 0.05$; IG 0.45 ± 0.2 vs 0.018 ± 0.01 Gpt/l, $p < 0.01$). Absolute IG value was a better measure of the severity of the infection or sepsis than the relative value and the absolute value of HFLCs. ROC curves for the detection of sepsis using IGs and/or HFLCs were generated. The highest AUC was found for absolute IG counts (0.94).
CONCLUSION. Absolute IG number has potential as marker for the early diagnosis of sepsis in critically ill patients in the intensive care unit.
Currently sepsis is usually diagnosed by biochemical markers rather lately. Using the new IG marker, sepsis patients might potentially be treated earlier and more effectively.

0105
ENDOTHELIAL PROTEIN C RECEPTOR POLYMORPHISMS AND RISK OF SEVERE SEPSIS/SEPTIC SHOCK IN CRITICALLY-ILL PATIENTS

A. Vassiliou[1], A. Kotanidou[1,2], N.A. Maniatis[1,3], M. Kallergi[2], F. Karystinaki[2], E. Letsiou[1], C. Glynos[1,2], E. Kourti[2], P. Kopterides[3], D. Vassiliadi[3], N. Nikitas[3], I. Dimopoulou[1,3], A. Armaganidis[1,3], S.E. Orfanos[1,3]

[1]Medical School of Athens University, Evangelismos Hospital, 1st Department of Critical Care Medicine and Pulmonary Services, GP Livanos and M Simou Laboratories, Athens, Greece, [2]Medical School of Athens University, Evangelismos Hospital, 1st Department of Critical Care Medicine and Pulmonary Services, Athens, Greece, [3]Medical School of Athens University, Attikon Hospital, 2nd Dept. of Critical Care, Athens, Greece

INTRODUCTION. Severe sepsis and septic shock are major healthcare problems, affecting millions of people around the world each year, with a mortality of more than 25 % [1]. The endothelial protein C receptor (EPCR) is involved in the regulation of the cytoprotective and anticoagulant pathways of protein C. The human EPCR genotypes can be divided into 4 haplotypes, H1, H2, H3 and the very rare H4, three of which (H1, H3 and H4) contain one or more haplotype-specific single nucleotide polymorphisms (htSNPs). One haplotype (H2) consists of the common alleles of all haplotype-tagging (ht)SNPs [2–3]. The functional importance of these mutations has been investigated in various diseases, but their role in severe sepsis or septic shock is unknown.
OBJECTIVES. We assessed whether haplotypes in the EPCR gene, notably H1 and H3, modify the risk of severe sepsis and/or septic shock development in critically-ill patients.
METHODS. Three polymorphisms in the EPCR gene were genotyped in 389 Caucasian critically-ill patients, hospitalized in the intensive care units of two major hospitals in Athens, Greece. Multivariate logistic regression analysis controlling for age, APACHE II and SOFA scores, sex and diagnosis was performed to determine the effect of haplotypes H1 and H3 in the EPCR gene on the development of severe sepsis and/or septic shock.
RESULTS. Severe sepsis and/or septic shock occurred in 38.8 % of the critically-ill patients carrying minor alleles belonging to both H1 and H3 haplotypes, in 58.0 % of the H1 carriers, 64.3 % of the H3 carriers and 65.2 % of the patients carrying all common alleles (H2). Compared to H2 carriers, the odds ratios (OR) for developing severe sepsis and/or septic shock were 0.34 (95 % confidence interval (CI) 0.16–0.76, $p = 0.008$) for the H1 and H3 carriers; 0.65 (95 % CI 0.37–1.13, $p = 0.123$) for the H1 carriers; and 0.82 (95 % CI 0.39–1.70, $p = 0.590$) for the H3 carriers.
Conclusion: Our results indicate that carriers of minor alleles belonging to the H1 and H3 haplotypes are at a reduced risk of developing severe sepsis and/or septic shock in this cohort of critically-ill patients.
REFERENCES. 1. Dellinger RP, et al. Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock. Intensive Care Med. 2013;39:165–228. 2. Saposnik B, et al. A haplotype of the EPCR gene is associated with increased plasma levels of sEPCR and is a candidate risk factor for thrombosis. Blood. 2004;103:1311–8. 3. Uitte de Willige S, et al. Haplotypes of the EPCR gene, plasma sEPCR levels and the risk of deep venous thrombosis. J Thromb Haemost 2004;2:1305–10.
GRANT ACKNOWLEDGMENT. The project was funded by the non-profit organization Thorax Research Centre for Intensive and Emergency Thoracic Medicine.

0106
EXPRESSION OF INTRACELLULAR HSPS IN NEUTROPHIL AND MONOCYTE SUBSETS DURING ACUTE PHASE OF STRESS IN CRITICALLY ILL PATIENTS. PRELIMINARY DATA*

T. Tavladaki[1], A.M. Spanaki[1], H. Dimitriou[2], E. Kondili[3], I. Plati[4], K. Apostolou[5], D. Georgopoulos[3], G. Briassoulis[1]

[1]PICU, University of Crete/University Hospital, Heraklion, Greece, [2]Paediatric Haematology Oncology, University of Crete, Medical School, Heraklion, Greece, [3]ICU, University of Crete/University Hospital, Heraklion, Greece, [4]Department of Clinical Biochemistry, University of Crete, Medical School, Heraklion, Greece, [5]National and Kapodistrian University of Athens, First Critical Care Department, Athens, Greece

INTRODUCTION. Intracellular expression of heat-shock-proteins (HSPs) arises early in stress as a tool to protect cellular homeostasis. HSP72-expression is induced by a wide variety of stimuli including Systemic Inflammatory Response Syndrome (SIRS) and Severe Sepsis (SS). HSP90a exerts its chaperone function to ensure the proteolytic turnover of a range of proteins that are involved in cell growth, differentiation and survival.
OBJECTIVES. To investigate the HSP72 and 90a expression in the neutrophils and monocytes of critically ill patients with SS, SIRS (trauma), and healthy blood donors during the early phase of stress as well as longitudinally (days 3 and 5); to correlate their expression with energy expenditure and respiratory quotient (RQ) and outcome.
METHODS. Eight consecutively admitted patients with trauma (19 HSP measurements), 6 with SS (12 measurements), and 8 healthy control subjects (H) were enrolled in the study. Patients' demographic characteristics, laboratory exams, energy expenditure and RQ were obtained using 30-min indirect calorimetry by E-COVX. Acute Physiology And Chronic Health Evaluation II (APACHE II) and the Sequential Organ Failure Assessment (SOFA) scores were measured and documented each time. HSPs levels were determined after staining with surface antigens CD33-PE/Cy5 and CD45 PE/Cy7 followed by HSP72-FITC and HSP90a-PE intracellular staining. Results are expressed as the Mean Fluorescence Intensity (MFI) value for each HSP in the monocyte and neutrophil subpopulations.
RESULTS. Energy expenditure and RQ did not differ between groups and time series and were not related to HSPs levels. Neutrophil HSP72 MFI was negatively related to the SOFA and APACHE II ($r_2 = -0.60$, -0.067, $p < 0.001$). HSPs expression was lower in the non-survivors compared to survivors (neutrophil HSP72, $p = 0.001$). Intracellular HSP72 differed significantly among groups in both monocytes (SIRS 24.8 ± 9 vs. SS 15.9 ± 7, $p < 0.006$) and neutrophils (SIRS 43.3 ± 14 vs. SS 26.8 ± 20, $p = 0.03$). Longitudinally, monocyte HSP72 showed a trend to decrease (16 ± 7 day 1 vs. 11 ± 8 day 5) in contrast to

HSP90a showing an increasing trend (23 ± 7 and 37 ± 23, respectively) among patients with SS.
CONCLUSIONS. HSP response in the critically ill may confer protection if induced in the early phase of stress. HSP72 and 90a monocyte expressions follow different longitudinal courses in severe sepsis, not related to the metabolic response to stress.
GRANT ACKNOWLEDGMENT. This research has been co-financed by the European Union (European Social Fund (ESF)) and Greek national funds through the Operational Program "Education and Lifelong Learning" of the National Strategic Reference Framework (NSRF)-Research Funding Program: THALES.
*Part of the study "Heat shock proteins and glutamine alterations related to hormonal, immunological, inflammatory and molecular response to sepsis: A combined clinical and experimental study".

Special nutrients and metabolic control: 0107–0120

0107

ROLE OF GLYCEMIC STATUS IN THE DEVELOPMENT OF INFECTIOUS COMPLICATIONS IN VICTIMS WITH SEVERE COMBINED TRAUMA

O. Iegorov[1], Y. Nalapko[1], O. Peicheva[1]

[1]Lugansk State Medical University, Anesthesiology, Intensive Care and Emergency Medic, Lugansk, Ukraine
INTRODUCTION. The human body is programmed to maintain a constant homeostasis of all body systems through the complex relationship of neuroendocrine and vegetative systems. Severe trauma violates this phenomenon homeostasis through autonomic and cytokine hyperactivity. Insulin metabolism varies among the first. Develops as a consequence of hyperglycemia, which in these patients is stressful genesis.
OBJECTIVES. To determine the relationship between starting glycemic status and the incidence of infectious complications in patients with severe combined trauma (SCT).
METHODS. The study involved 123 patients with SCT (ISS >26) who were treated in ICU. We're formed two study groups-62 patients who did not differ significantly from each other in age, sex and severity of the condition. Group I included 32 patients who subsequently had a favorable outcome of the current injury. Group II included 30 patients who later died. The degree of injury ISS score in both groups was 32.4 ± 3.5 points and isn't statistically different between groups. Nosocomial complications were fixed in accordance with the criteria of CDC[1].
RESULTS. I stage of the research—analysis of the structure and comparison of complications between the groups. In Group I, infectious complications were 16 patients (50.0 %), and they did not lead to death. In group II patients, who later died, infection had all 30 patients (100.0 %).
In Group I, the average number of events per one patient was 0.72, including infectious complications was 73.3 % (0.56 to 1 patient).
Group II—4.22 complications, which is 5.9 times more than in the I group. The number of infectious complications in Group II was 79 (2.63 by 1 patient).
Phase II study—identifying ceiling starting glycemia above which infection rates significantly increased. In the first 2 days after the injury level of blood sugar in all patients greater than 6.1 mmol/l. According to the correlation analysis showed that the critical level is the concentration of glucose 8.3 mmol/l.
Hyperglycemia is more than 8.3 mmol/l was recorded in 42 patients (67.7 %), of whom 30 were all victims of group II, who later developed a fatal traumatic disease. Blood glucose level above 11.0 mmol/l was observed only in group II (24 victims—80.0 %), and above 14.2 mmol/l in 19 (63.3 %).
CONCLUSIONS. Infectious complications of SCT are an independent predictor of the development of multiple organ failure and adverse outcome of trauma. Victims with SCT in 67.7 % of cases have a predisposition to the development of stress hyperglycemia above 8.3 mmol/l. Blood plasma glucose level at admission above 11.0 mmol/l is associated with the development of infectious complications and adverse outcome of traumatic disease in 100 % of the victims.
REFERENCE(S). 1. Horan TC, et al. CDC/NHSN surveillance definition of health care-associated infection and criteria for specific types of infections in the acute care setting. Am J Infect Control. 2008;36:309–32.

0108

SEPSIS IN DIABETES: ARE RBS AND HBA1C SIMILAR?

J. Nikhilesh[1], V. Joshi[2], B. Pranay[2]

[1]CHL Hospitals, Critical Care Medicine, Indore, India, [2]Rajshree Hospital and Research Centre, Critical Care Medicine, Indore, India
BACKGROUND. Stress related hyperglycemia is known to occur in sepsis. However, there are gaps in our knowledge levels on sepsis behavior in diabetics pertaining to significance of random blood sugar (RBS) levels v/s HbA1C levels (glycosylated Hemoglobin).
OBJECTIVE. To analyze outcomes in sepsis cohorts with diabetes and look for comparisons of outcomes differentiating on RBS vis-à-vis Hba1C levels at baseline.
SETTING. Two medical-surgical ICUs (40 bedded) of tertiary care units.
STUDY MODULE: Consecutive diabetic patients with documented history of being on oral hypoglycemic agents/insulin were included. All the patients were compared for variables such as demographics, SOFA scores, requirement of pressors, requirement of ventilatory support(MV), requirement of dialysis (RRT) and length of stay (LOS) in days. Death/discharge from CCU were considered as end points. Two groups were made differentiating on basis of RBS and HbA1C levels. Statistical analysis was done using SPSS version 11.
RESULTS. Forty patients were included (n = 40, M:F 27:13) in the study duration (Oct 2012–Mar 2012).Mean age of the cohort was 51.1 ± 14.4 years (22–75 years) and SOFA scores were 13 ± 2.8 (8–18).

Cohort characteristics	
RBS (mg/dl)	282 ± 85 (160–550)
HbA1C	7 ± 0.9 (5.2–8.9)
MV	16 (40 %)
RRT	11 (27.5 %)
Pressor requirement	11 (27.5 %)

LOS for the cohort was 2.8 ± 2 days (range 1–8 days).In hospital mortality was 32.5 % (n = 13). On statistical analysis likelihood of dialysis was more in patients with elevated HbA1C (p = 0.02S) whereas likelihood of pressor requirement, increased LOS and ventilator requirement was more with elevated RBS (p = 0.01, 0.02 and p = 0.01S) group. On plotting a ROC curve the likelihood of mortality was more for patients with elevated HbA1C vis-à-vis RBS (AUC 0.59 and 0.36 respectively).
CONCLUSION. Elevated HbA1C levels have a stronger association with mortality vis-à-vis elevated RBS levels in diabetic patients getting admitted with sepsis. Similar results were documented in requirement of RRT but vice versa was noted in terms of ventilator requirement and pressors. However, the sample size is small and we shall need intervention based and follow up trials to formulate definitive strategies for sepsis in diabetic patients.

0109

NORMALIZING GLUTAMINE CONCENTRATION UNCOUPLES RESPIRATORY CHAIN FROM ATP SYNTHESIS IN AN IN VITRO MODEL OF HUMAN SKELETAL MUSCLE. A POTENTIAL MOLECULAR MECHANISM FOR THE HARM CAUSED BY AGGRESSIVE GLUTAMINE SUPPLEMENTATION?

A. Krajcova[1], J. Ziak[1], K. Jiroutkova[1], V. Dzupa[2], M. Fric[3], F. Duska[1,4]

[1]3rd Medical Faculty, Dept of Biochemistry and Molecular Biology, Prague, Czech Republic, [2]Kralovske Vinohrady University Hospital, Dept. of Orthopaedic Surgery, Prague, Czech Republic, [3]Kralovske Vinohrady University Hospital, Dept. of Anaesthesia and Intensive Care Medicine, Prague, Czech Republic, [4]Nottingham University Hospitals NHS Trust, AICU, Nottingham, UK
INTRODUCTION. Skeletal muscle contains myoblasts. These undifferentiated cells are crucial for muscle regeneration as they can proliferate and differentiate into myotubes, which then fuse with muscle fibres. Myoblasts and myotubes can be cultured and used as an in vitro model of skeletal muscle. Rapidly dividing cells use glutamine as an energy substrate [1].
OBJECTIVES. To assess the influence of glutamine concentration on the rate of proliferation of human myoblasts and on skeletal muscle energy metabolism in vitro.
METHODS. Myoblasts were isolated [2] from muscle biopsy samples obtained from 5 volunteers during elective hip surgery. Cells were cultured in triplicates in glutamine concentrations of 0, 0.1, 0.2, 0.3, 0.5 and 5 mM for 20 days. Every 5th day cells were trypsinized and manually counted. Before the end of exposure, half of the cells were allowed to differentiate into myotubes. After 20 days of exposure to various glutamine concentration we assessed the energy metabolism by extracellular flux analysis XF-24 (Seahorse Biosciences) of both myoblasts and myotubes [3]. We measured in tri-or tetraplicates oxygen consumption rate (OCR) at baseline and after addition of (a) ATPase inhibitor oligomycine, (b) mitochondrial uncoupler FCCP, and (c) complex III inhibitor antimycine A. This allowed us to calculate baseline OCR, ATP turnover rate, proton leak through inner mitochondrial membrane and respiratory chain capacity (uncoupled respiration). The latter values are express as % of baseline OCR.
RESULTS. Myoblast proliferation rate was maximal and exponential at 0.3 mM of glutamine, OCR at baseline was unaffected by glutamine concentration in both myoblasts and myotubes (Table 1). In myotubes, proton leak through inner mitochondrial membrane was lowest with 0.2–0.3 mM of glutamine, whilst lower or higher concentrations caused mitochondrial uncoupling (p = 0.04) and tended to decrease ATP production (p = 0.05). Similarly, respiratory chain spare capacity was maximal at 0.2 mM and decreased in both extremes of glutamine concentrations (p = 0.03).

Table 1 Energy metabolism in myotubes (medians)

Glutamine concentration (mM)	0	0.1	0.2	0.3	0.5	5.0	p (Kruskal–Wallis)
Myoblast doubling time (days)	1.68	1.39	1.32	1.14	1.15	1.16	N/A
OCR at baseline (pmol/min)	54 (IQR 46–57)	71 (IQR 21–100)	44 (IQR 25–47)	52 (IQR 45–102)	65 (IQR 54–72)	87 (IQR 71–103)	0.293
Leak (% OCR at baseline)	24 (IQR 11–50)	22 (IQR 17–26)	8 (IQR 0–17)	17 (IQR 13–36)	36 (IQR 32–40)	49 (IQR 39–51)	0.041
ATP turnover (% OCR at baseline)	76 (IQR 50–98)	78 (IQR 74–83)	92 (IQR 83–100)	83 (IQR 74–87)	65 (IQR 62–72)	51 (IQR 49–61)	0.053
Resp. capacity (% baseline)	176 (IQR 132–196)	315 (IQR 164–338)	317 (IQR 276–520)	202 (IQR 187–207)	255 (IQR 183–345)	159 (150–174)	0.031

In myoblasts we saw similar trends which did not reach statistical significance.
CONCLUSIONS. Hypoglutaminaemia in a range seen in critically ill patients (0.2–0.3 mM) brings about optimal conditions for the proliferation of human myoblasts and for ATP production in an in vitro model of human skeletal muscle. Glutamine concentrations above and below this range cause mitochondrial uncoupling and decrease respiratory chain spare capacity. This generates hypothesis that glutamine effect on mitochondrial metabolism may have contributed to disappointing clinical outcomes seen with aggressive glutamine supplementation [4, 5].
REFERENCE(S). 1. Parry-Billings, et al. Lancet. 1990;336(8714):523–5. 2. Thompson, et al. J Clin Invest. 1996;98(10):2346–50. 3. Auger, et al. PLoS One. 2011;6(12):e28536. 4. Heyland, et al. NEJM. 2013;368:1489–97. 5. Andrews, et al. BMJ. 2011;342:d1542.
GRANT ACKNOWLEDGMENT. Supported by IGA NT 12319.

0110

METABOLIC AND INFECTIOUS CONTROL WITH A SPECIFIC ENTERAL FORMULA FOR DIABETES IN HYPERGLYCAEMIC CRITICALLY ILL PATIENTS UNDER MECHANICAL VENTILATION. PROSPECTIVE, RANDOMIZED AND MULTICENTRE STUDY

C. Vaquerizo[1], A. Mesejo[2], J.C. Montejo[3], G. Lobo[4], M. Zabarte[5], I. Herrero[6], J. Acosta[7], A. Blesa[8], F. Martínez-Lozano[9]

[1]Hospital de Fuenlabrada, Madrid, Spain, [2]Hospital Clínico, Valencia, Spain, [3]Hospital 12 de Octubre, Madrid, Spain, [4]Hospital Virgen de las Nieves, Granada, Spain, [5]Hospital Donostia, San Sebastián, Spain, [6]Hospital de Bellvitge, Barcelona, Spain, [7]Hospital General, Alicante, Spain, [8]Hospital Clínico San Carlos, Madrid, Spain, [9]Hospital Reina Sofía, Murcia, Spain
OBJECTIVE. Metabolic and infectious control is a priority in critically-ill patients. Our primary endpoint is to evaluate if the administration of a new diabetes-specific diet achieves

a better glycaemic control and reduces infectious complications in critically ill patients under mechanical ventilation compared to a different composition diabetes-specific diet and to a conventional high-protein diet.
METHODS. Nine University Hospitals Intensive Care Units involved in Spain. 160 patients were estimated to achieve, assuming an alpha risk of 0.05 and a beta risk of 0.2, a 20 % reduction in insulin requirements. Three groups: A: new diabetes-specific diet (T-Diet plus diabet IR®), B: high-protein diet (Isosource protein®), C: diabetes-specific diet (Glucerna select®).
Informed consent. Eligibility criteria: age ≥18 years, enteral nutrition ≥5 days, mechanical ventilation, basal hyperglycaemia (fasting) >126 mg/dL. Exclusion criteria: contraindication for enteral nutrition, BMI ≥35, kidney or liver failure, APACHE II score ≤10, type 1 diabetes. Diet randomization was blind and web-based. Glycaemic target 110–150 mg/dl (perfusion insulin protocol). Calorie calculation: 25 kcal/kg/day. Volume ratio, metabolic, gastro-intestinal and infectious complications control. The daily mean capillary glucose level and the morning plasma glucose level were evaluated. Intention-to-treat analysis (descriptive statistics, Chi square, ANOVA, Student *t* test, Kruskal–Wallis).
RESULTS. Communication with 157 cases (A = 52, B = 53, C = 52). Male 75 %; age 56 (SD 16); BMI 26.6 (SD 3). On admission, the groups were homogenous, without statistically significant differences in APACHE II, SOFA, plasma glucose level, capillary glucose level, HbA1c and HOMA. During ICU stay, there were no differences in caloric and protein intake, volume ratio, days of enteral nutrition, ICU length of stay, days of mechanical ventilation and mortality. Metabolic data in Table 1. Infectious data in Table 2.

Variable	Group A	Group B	Group C	p
Capillary glucose level (mg/dl)	139.7 (SD 29.7)	150.4 (SD 40.7)	146.4 (SD 31.1)	NS
Plasma glucose level (mg/dl)	139 (SD 31)	145 (SD 40)	146 (SD 41)	NS
Insulin/day (IU)	15.2 (SD 21.4)	24.1 (SD 36)	17.8 (SD 24)	NS
Glycaemic Lability Index (GLY)	1.22 (SD 2.79)*	3.05 (SD 12)	0.91 (SD 1.1)*	*<0.05
Delta of capillary glucose level (mg/dL)	-14.5 (SD 35.2)	-1.3 (SD 46.4)	-5.1 (SD 34.5)	NS
Delta of capillary glucose percentage (%)	-15 (SD 28.8)	-4.7 (SD 23.9)	-5.2 (SD 23.1)	NS
Delta of plasma glucose level (mg/dL)	-23.2 (SD 48.3)	0.09 (SD 59.6)	-5 (SD 50.1)	=0.08
Delta of plasma glucose percentage (%)	-8.6 (SD 29.2)	6.9 (SD 43.2)	3.1 (SD 32.7)	=0.08

Table 1

Variable	Group A	Group B	Group C	p
Number of patients with any kind of infection	18/52 34.6%	23/53 43.4%	23/52 44.2%	NS
Incidence rate of infectious complications / % days of treatment	22/546 4.03	24/470 5.11	24/505 4.75	NS
Incidence rate of traqueobronchitis / ‰ days of mechanical ventilation	7/460 1.52*	10/392 2.55	7/424 1.65*	*< 0.01
Incidence rate of ventilator-associated pneumonia / ‰ days of mechanical ventilation	8/460 1.73*	10/392 2.55	6/424 1.41**	*<0.05 **<0.01
Number of patients with bacteraemia	3/52 5.7%	1/53 1.8%	7/52 13.4%*	*=0.06

Table 2

CONCLUSIONS. 1. Glycaemic targets are met in the three groups, with a greater need for insulin in group B. 2. There is a non-significant trend for lower capillary glucose level and lower plasma glucose level with diet of group A. 3. Capillary glucose and plasma glycaemia delta is better with diet A and glycaemic lability index is lower with specific formulas, with statistical significance. 4. There are significant differences in infectious complications with both specific formulas.

0111
ROOT CAUSE ANALYSIS OF DIABETIC KETOACIDOSIS AND ITS COMPLICATIONS: A DEVELOPING COUNTRY EXPERIENCE

M. Jayashree[1], S. Rohit[1], S. Singhi[1]

[1]Postgraduate Institute of Medical Education and Research, Advanced Pediatrics Centre, Chandigarh, India

INTRODUCTION. Diabetic ketoacidosis (DKA)related morbidity and mortality in developing economies is high due to putative reasons such as delay in seeking medical attention, delayed diagnosis and high rate of co-morbidities like infections and undernutrition. However data related to above is scarce.
OBJECTIVES. To evaluate system based contributory factors for occurrence of DKA and its complications with emphasis on level of awareness among parents and treating physicians and issues in pre-referral management of DKA.
METHODS. A retrospective observational Root Cause Analysis (RCA) was conducted for all cases of DKA presenting to Pediatric Emergency of a tertiary care referral hospital in India from July 2010 to June 2011. Possible contributors to poor outcome were discussed a priori by investigators using RCA guidelines and questionnaires were prepared for information retrieval through direct interview or field observations. RCA was initiated and completed for each patient within 7 and 45 days respectively looking into pre-hospital, health care system, referral and continuum of care related factors. Direct interview of parents and referring physician(s) was conducted at admission and over the next 45 days respectively. Data were compiled; time frame of events and causal factor tree was made for each case of DKA.
RESULTS. Of the 30 patients enrolled 26 (86.6 %) were referrals; 16 (61.5 %) from first, 7 (26.9 %) from second and 3 (11.5 %) from third health care facility. More than half (60 %) had new onset diabetes and belonged to poor socioeconomic strata. Twenty two children (73.3 %) had some complication at time of admission like shock (63.3 %), hypokalemia (36 %) and cerebral edema (10 %). Majority of parents were ignorant of symptoms of diabetes or DKA. The median (range) duration of symptoms before seeking medical care was 10 (1–60) days. In known diabetes 49.3 % were noncompliant with insulin, 41.7 % on inappropriate treatment and only 25 % on regular at least once a day blood glucose monitoring. Nearly half of cases (n = 11) remained undiagnosed after first health care facility contact, more so for new onset compared to known diabetes (9/18 vs 2/8; p = 0.022). Even after diagnosis, none received standard recommended treatment. The referring hospitals had limited facilities for blood glucose estimation (40 %), blood gas analysis (20 %)and insulin infusion. Only one third of the physicians were trained pediatricians. Univariate analysis revealed that patients with missed/delayed diagnosis presented more often as severe DKA with higher incidence of complications like shock, cerebral edema and renal failure.
CONCLUSION. Parental ignorance, poor socioeconomic status, treatment non-compliance, missed or delayed diagnosis due to lack of clinical expertise and limited primary health care facilities for optimum management were the root causes for severe and complicated DKA. Parent and physician education regarding symptomatology, complications, early recognition and treatment is the key to improving DKA related outcome.

0112
LIPID METABOLISM IN CRITICALLY ILL SEPTIC PATIENTS STUDIED BY ADIPOSE TISSUE MICRODIALYSIS (MD)

M. Theodorakopoulou[1], F. Frantzeskaki[1], S.E. Orfanos[1], N. Nikitas[1], P. Kopterides[1], S. Karambi[1], P. Papadopoulos[1], A. Antonopoulou[1], A. Diamantakis[1], A. Armaganidis[1], I. Dimopoulou[1]

[1]University Hospital Attikon Athens Greece, 2nd Critical Care Department, Chaidari, Greece

INTRODUCTION. Microdialysis (MD) is a bedside in vivo sampling technique that permits continuous analysis of a patient's interstitial fluid chemistry without consuming blood. As the interstitial fluid bathes the cells, its composition reflects the local metabolic activity of those cells thus reflecting intracellular metabolic changes and disorders. In vivo MD is performed by implanting a commercially available catheter that mimics a blood capillary at the site of interest. In addition, it has been shown that, low cholesterol and low HDL levels as well as high triglyceride levels are related to the progression to sepsis and/or septic shock.
OBJECTIVES. In this study, we used MD to assess the metabolic changes of lipids in intensive care unit patients with sepsis. To this end, a MD probe was inserted into the subcutaneous adipose tissue of the upper thigh.
METHODS. A total of 65 (38 men) mechanically ventilated septic patients having a median age of 69 ± 19 years were studied. All patients met the ACCP/SCCM consensus criteria for sepsis. Upon sepsis onset a microdialysis catheter (CMA60, CMA, Solna, Sweden) was inserted into the subcutaneous adipose tissue of the upper thigh. The dialysate samples were collected in microvials and were analyzed immediately for glycerol using a mobile CMA ISCUS analyzer. Measurements were performed 6 times per day during the first 6 days from sepsis onset. The daily mean values of MD measurements were calculated for each patient. Blood samples were collected from these patients upon sepsis onset and on day 6 and were analyzed for total cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), triglycerides, glycerol and free fatty acids (FFA). Results are expressed as mean ± SD.
RESULTS. Sixty five (38 men) critically ill septic patients with a mean (SD) age of 69 ± 19 years were studied. APACHE II and SOFA at study entry were 20 ± 4 and 8 ± 4, respectively. Sepsis was related to SIRS (n = 7), severe sepsis (n = 17) and septic shock (n = 41). Mortality was 39 %. Serum cholesterol (79 ± 46 mg/l) along with HDL (14 ± 15 mg/dl) and LDL (67 ± 32 mg/dl) were low. Serum triglycerides (149 ± 88 mg/dl) and free fatty acids (FFA, 0.39 ± 0.24 mmol/l) were within normal limits. Serum glycerol was 25 ± 18 μmol/l. Interstitial glycerol was elevated (324 ± 185 μmol/l). Serum FFA correlated with both serum (r = 0.41, p = 0.008) and interstitial (r = 0.32, p = 0.04) glycerol.
CONCLUSIONS. Critical sepsis is characterized by an increase in serum and tissue glycerol and preserved FFA levels, indicating enhanced lipolysis and an increase FFA uptake by peripheral tissues. Serum or interstitial glycerol are better indices of lipid mobilization than serum FFA levels in mechanically ventilated septic patients.

0113
EFFECTS OF RIKKUNSHITO (TRADITIONAL JAPANESE MEDICINE KAMPO) ON ENTERAL FEEDING AND PLASMA GHRELIN CONCENTRATION IN CRITICALLY ILL PATIENTS: A DOUBLE-BLIND, RANDOMIZED, CONTROLLED TRIAL

Y. Yanagida[1], M. Hayakawa[1], H. Yamamoto[1], T. Wada[1], M. Sugano[1], A. Sawamura[1], S. Gando[1]

[1]Hokkaido University Hospital, Emergency and Critical Care Center, Sapporo, Japan

INTRODUCTION. Rikkunshito is one of traditional Japanese medicines (Kampo), and has been widely prescribed for patients with various gastrointestinal symptoms. Recently, the prokinetic function of Rikkunshito for several diseases attracts in Japan.
OBJECTIVES. The aim of the present study was to investigate the effect of Rikkunshito on the intragastric enteral feeding and the plasma levels of ghrelin in critically ill patients.
METHODS. The study population consisted of critically ill patients who were guessed to be received intragastric tube feeding more than 7 days. Patients were prospectively assigned to two treatment groups, and randomized to receive either Rikkunshito or metoclopramide. All patients were received standard enteral nutrition. The patients in both two groups were started continuous intragastric tube feeding according to our protocol. Observational period was defined until gastric feeding was no longer required or 10 days after the enrollment. The primary end point of our study was the rate of success in the enteral feeding. The secondary end points were the changes of the plasma levels of active ghrelin and desacyl ghrelin (non-active ghrelin).
RESULTS. Thirteen patients were assigned to the metoclopramide group and 10 were to the Rikkunshito group. All patients were performed with mechanical ventilation on the enrollment. The proportions of success in the enteral feeding were not different between the two groups. The increase of active ghrelin concentration after the treatment in the Rikkunshito group was larger than that in the metoclopramide group (P = 0.023). The changes of desacyl ghrelin concentrations were not different between the two groups.
CONCLUSIONS. Rikkunshito administration increased the plasma levels of active ghrelin, and resulted in the prokinetic effects as same as metoclopramide in the critically ill patients.
REFERENCE(S). 1. MacLaren R, Kuhl DA, Gervasio JM, Brown RO, Dickerson RN, Livingston TN, Swift K, Headley S, Kudsk KA, Lima JJ. Sequential single doses of

cisapride, erythromycin, and metoclopramide in critically ill patients intolerant to enteral nutrition: a randomized, placebo-controlled, crossover study. Crit Care Med. 2000;28:438–44. 2. Arai M, Matsumura T, Tsuchiya N, Sadakane C, Inami R, Suzuki T, Yoshikawa M, Imazeki F, Yokosuka O. Rikkunshito improves the symptoms in patients with functional dyspepsia, accompanied by an increase in the level of plasma ghrelin. Hepatogastroenterology. 2012;59:62–6.

0114

COMPLIANCE REGARDING THE USE OF EICOSAPENTAENOIC ACID (EPA) AND GAMMA-LINOLENIC ACID (GLA) IN THE TREATMENT OF PATIENTS WITH ARDS: RESULTS FROM THE PARIS STUDY: A ONE-DAY PREVALENCE MULTICENTER OBSERVATIONAL STUDY

A.P. Magalhães-Júnior[1], A. Pontes-Arruda[1], V.D.A. do Ceará[1], A.P. Lima[1], D. Guimarães[1], H.P. Moreira[1], F.E. Mendonça-Neto[1], B. Furtado-Lima[1], L.G. de Castro[1], J.H. Militão[1], H. Monte-Coelho Neto[1], M.F. Colares[2], M. Martins[2], I.S. Bonfim[3]

[1]Christus University Center, School of Medicine, Fortaleza, Brazil, [2]Hospital Fernandes Távora, Fortaleza, Brazil, [3]Hospital Regional do Cariri, Juazeiro do Norte, Brazil

INTRODUCTION. The use of enteral diets with an anti-inflammatory lipid profile, enriched with eicosapentaenoic acid (EPA) and gamma-linolenic acid (GLA) has been recommended by international nutrition guidelines as an important adjuvant therapy in the treatment of patients with impaired lung conditions, especially those suffering from acute respiratory distress syndrome (ARDS). However, there is few data available evaluating if such nutrition intervention has been incorporated in the daily routine of ICU physicians as part of the ARDS standard of care.

OBJECTIVES. To conduct a multicenter one-day prevalence study in ICU's to evaluate the incidence ARDS in the Intensive Care Units and compliance regarding the use of enteral nutrition enriched with anti-inflammatory lipids in this population of patients as recommended by international guidelines.

METHODS. After institutional review board approval was obtained data from all ICU patients in 30 ICU's in 15 Brazilian hospitals were collected during a single day in April 2012. All relevant parameters were collected in loco using patients' original medical records. ARDS was diagnosed using the Berlin definitions [1]. The use of EPA/GLA as part of the ARDS treatment was also audited at the bedside. Categorical variables were compared between the two groups using the χ^2 test or Fisher's exact test as appropriate. Quantitative normally distributed variables between the groups were compared using an unpaired two-sample *t*-test. For quantitative non-normally distributed data, the nonparametric Wilcoxon rank-sum test was used. Normality was assessed by using the Shapiro–Wilk test.

RESULTS. Data from 207 patients were collected. A total of 51 patients were considering as having ARDS in accordance with the Berlin definitions. The use of enteral diet with an anti-inflammatory lipid profile (EPA/GLA) was considered extremely low in this population of patients. Only 3 patients were in use of an EPA/GLA diet as part of their ARDS treatment (none of them identified as suffering from severe ARDS).

CONCLUSIONS. Although the incidence of ARDS was considered high (24 % of the evaluated patients) and despite the fact that current international guidelines are recommending the use of an enteral nutrition with EPA/GLA as an important part of the treatment (Grade A recommendation from the ASPEN/SCCM guidelines for nutrition in critically ill), few patients are in fact using this nutrition intervention.

REFERENCE(S). (1) The ARDS Definition Task Force. Acute Respiratory Distress Syndrome The Berlin Definition. JAMA. 2012;307(23). doi:10.1001/jama.2012.5669

0115

TO EVALUATE THE SAFETY AND EFFICACY OF A FISH OIL-ENRICHED PARENTERAL NUTRITION REGIMEN IN TRAUMA AND BURN PATIENTS

P. Soni[1]

[1]Amandeep Hospital, Critical Care, Amritsar, Punjab, India

INTRODUCTION. Previous studies and a meta-analysis in surgical patients indicate that supplementing parenteral nutrition regimens with n-3 polyunsaturated fatty acids (PUFAs) is associated with improved laboratory and clinical outcomes in the setting of hyperinflammatory conditions. Fish oil (FO) is rich in ω-3 FA, which is highly bioactive compared with MCT and OO. This FO-based IVFE not only is a nutrient and an alternate source of energy but also has anti-inflammatory properties and possesses potentially important pharmacological benefits.

OBJECTIVES. The objective of the present meta-analysis was to evaluate the benefit of n-3 PUFA-enriched parenteral nutrition regimens in trauma and burns (ICU) patients.

METHODS. Prospective, randomized, parallel group study carried out at the Intensive Medicine, Department of Critical Care, Amandeep Hospital, Amritsar, India. Patients were divided into two groups, Group A: omega-3 fatty acid-enriched lipid emulsion were given. Group B: placebo. The patients with polytrauma and burns more then 30 % were included in the study. Omega-3 fatty started after the 24 h in group A.

RESULTS. The combined analysis showed that a fish oil-enriched parenteral nutrition regimen had a positive treatment effect on length of hospital stay (weighed mean difference = −2.98, $P < 0.001$), length of intensive care unit stay, postoperative infection rate (odds ratio = 0.56, $P = 0.04$), and serum levels of Lactate level day 0, 1, 5 days, in these patients. The significant differences were found between the 2 groups in postoperative mortality; incidence of postoperative cardiac complications; serum levels of bilirubin, triglyceride. No serious adverse events related to fish oil treatment were reported.

CONCLUSIONS. Based on the analysis, fish oil-supplemented parenteral nutrition was safe, improved clinical outcomes in trauma and burn patients. More laboratory parameters should be considered in future meta-analyses. The use of n-3 PUFA-enriched parenteral nutrition is safe and effective in reducing the infection rate and hospital/ICU stay.

REFERENCE(S). 1. Chen B, Zhou Y, Yang P, Wan HW, Wu XT. Safety and efficacy of fish oil-enriched parenteral nutrition regimen on postoperative patients undergoing major abdominal surgery: a meta-analysis of randomized controlled trials. JPEN. 2010;34:387–94. 2. Barbosa VM, Miles EA, Calhau C, Lafuente E, Calder PC. Effects of a fish oil containing lipid emulsion on plasma phospholipid fatty acids, inflammatory markers, and clinical outcomes in septic patients: a randomized, controlled clinical trial. Crit Care. 2010;14:R5. 3. Morlion BJ, Torwesten E, Lessire H, Sturm G, Peskar BM, Fürst P, Puchstein C. The effect of parenteral fish oil on leukocyte membrane fatty acid composition and leukotriene-synthesizing capacity in patients with postoperative trauma. Metabolism. 1996;45:1208–13.

GRANT ACKNOWLEDGMENT. I have not received any grant from any source.

0116

VITAMIN D DEFICIENCY IN CRITICALLY ILL PATIENTS

A. Zapatero[1], J. Nolla[1], S. Valles[1], F. Solsona[1], M.P. Gracia[1], Y. Diaz[1], I. Dot[1]

[1]Hospital del Mar, Intensive Care, Barcelona, Spain

INTRODUCTION. The incidence of vitamin D deficiency in critically ill patients has been reported to range from as low as 17 % to as high as 79 %. Data regarding the relationship between 25-hydroxyvitamin D levels and outcomes in the medical intensive care unit are scarce.

OBJETIVE: The objective of the study was to evaluate the prevalence of 25-hydroxyvitamin D deficiency in the intensive care unit and its relationship with prognosis.

METHOD. This was an observational prospective study of all patients admitted to the ICU between February 2011 to November 2011 at a 14-bed closed unit in a university-affiliated hospital. Exclusion criteria were: readmission to ICU, pregnancy, coronary artery disease, non-Caucasian patients, primary hyperparathyroidism, chronic renal failure, patients with malabsorption syndrome and which were under treatment with Vitamin D or drugs that interfere with bone metabolism. Baseline demographics, comorbidities, admission diagnosis and treatment administered were collected as well as severity index (SOFA and APACHE II scores determined from the worst values obtained within 24 h of ICU admission). Serum 25(OH)D concentrations were assayed at ICU admission by liquid chromatography-tandem mass spectrometry. In our study we used 25(OH)D cutoff level of less than 30 ng/dL to define 25(OH)D deficiency. This group was classified into 3 categories: insufficiency <30 to >20 ng/mL; moderate deficiency £ 20 to >10 ng/mL; severe deficiency £ 10 ng/mL. ICU length of stay, and hospital mortality were analyzed.

RESULTS. 135 patients were included [66 % male and 46 female, age 59 (46–74) years]. Admission diagnosis were neurological pathology in 50 patients (37 %); cardiorespiratory pathology in 31 cases (22.9 %); polytrauma in 20 patients (14.8 %); metabolic disease in 18 cases (13.3 %); and sepsis in 16 patients (11.9 %). APACHE II score at ICU admission was 17 (10–23) and SOFA score at ICU admission was 5 (3–8). Global mortality was 18.5 % (25 patients). Mean serum 25(OH)D level was 11 (7–19.78) ng/mL. In 122 (90.4 %) patients low serum 25(OH)D was identified [22 (16.3 %) insufficiency; 42 (31.1 %) moderate deficiency; 58 (43 % severe deficiency); 25(OH)D mean levels in these groups were 23.5 (2.5–25.4), 12.4 (11.05–16.03), 6 (4–8.01)]. Hospital mortality was higher in patients with 25(OH)D severe deficiency (25.9 vs. 13 %, $p = 0.05$). Severe vitamin D deficiency was associated with higher APACHE-II and SOFA scores on ICU admission [APACHE-II (19 vs. 16, $p = 0.002$); SOFA (7 vs. 4), $p = 0.001$]. An association between severe 25(OH)D deficiency and acute renal failure was demonstrated (29.3 vs. 13 %, $p = 0.02$).

CONCLUSION. Low level of 25(OH) is a common finding in the intensive care unit and severe deficiency is associated with increased risk for hospital mortality. Further studies are needed to determine whether correction of 25(OH)D deficiency is associated with improved outcomes for ICU patients.

0117

SEVERE VITAMIN D DEFICIENCY AND A PROGRESSIVE DECREASE IS ASSOCIATED TO MORTALITY AMONG CRITICALLY ILL PATIENTS

R.B. Moraes[1,2], G. Friedman[3,4,5], Y.W. Christmann[4], F.M. Nagel[4], T.C. Lisboa[4], L. Marques[4], L. Bonzanini[4], M.M. Marimon[2], L.M. Burin[2], H.T. Schroeder[6], M.V. Rodrigues[6], M.A. Czepielewski[4,7]

[1]Hospital de Clínicas de Porto Alegre, Intensive Care Unit, Porto Alegre, Brazil, [2]Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil, [3]Universidade Federal do Rio Grande do Sul, Intensive Care Unit, Porto Alegre, Brazil, [4]Hospital de Clínicas de Porto Alegre, Porto Alegre, Brazil, [5]Universidade Federal de Ciências da Saúde de Porto Alegre, Intensive Care Unit, Porto Alegre, Brazil, [6]Universidade Federal de Ciências da Saúde de Porto Alegre, Porto Alegre, Brazil, [7]Universidade Federal do Rio Grande do Sul, Department of Endocrinology, Porto Alegre, Brazil

INTRODUCTION. Despite the effects of vitamin D (VITD) on bone metabolism, there is insufficient data on the impact of VITD deficiency in critically ill patients. Trials have reported high prevalence of VITD deficiency and an association with mortality. Several issues remain: 1. what values of VITD relate to morbidity and mortality, 2. VITD cinetic and ICU clinical outcomes.

OBJECTIVES. To identify correlation between baseline VITD, its cinetic and mortality or morbidity.

METHODS. From March to November 2012 we prospectively allocated 135 ICU patients in southern Brazil (30°05′S). We included patients with length of hospital stay prior to ICU <3 days. Exclusion criteria: <18 years; cardiac or elective surgeries; chronic renal failure requiring dialysis or creatinine >2 mg/dL; expected ICU stay <3 days, expecting death <24 h; pregnant women, patients with tuberculosis, sarcoidosis, hypo/hyperparathyroidism. Demographic and laboratory data were collected: APACHE II, SOFA, lactate, parathyroid hormone (PTH) and serum 25[OH]D3 on admission and weekly until discharge from ICU. Outcomes: mortality, need for mechanical ventilation, length of stay, infections and positivity of cultures.

RESULTS. Median VITD = 13.3 [8.1–20] ng/mL. 75 % of patients had VITD <20 ng/mL. Women = 47.4 %; Caucasians = 78 %; age = 56 ± 16 y; APACHE = 18 [13–24]; SOFA = 5 [2–8]; PTH = 124 [58–217]). Area under ROC curve of VITD for hospital mortality was 0.61 (95 % CI 0.495–0.73). The point of 11.9 ng/mL had a sensitivity of 62 % and specificity of 65 %. Patients with VITD levels <12 ng/mL had a higher hospital mortality (32.2 % × 13.2 %, $p = 0.014$), but no differences in duration of mechanical ventilation, length of ICU or hospital stay, positivity of cultures or infections. The cutoff of 20 ng/mL shows no difference for any of the outcomes. Non-survivors showed a decrease in VITD levels after 2 weeks of ICU stay.

CONCLUSIONS. Severe VITD deficiency (VITD levels <12 ng/mL) as well as VITD decrease throughout ICU stay (1) is associated with increased mortality; and (2) may constitute a level to define VITD supplementation in critically ill patients.

REFERENCE(S). 1. Holick MF, Binkley NC, Bischoff-Ferrari HA, et al. Evaluation, treatment, and prevention of vitamin D deficiency: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab. 2011;96:1911–30. 2. Lee P, Nair P, Eisman JA, Center JR. Vitamin D deficiency in the intensive care unit: an invisible accomplice to morbidity and mortality? Intensive Care Med. 2009;35(12):2028–32. 3. Braun A, Chang D, Mahadevappa K, Gibbons FK, Liu Y, Giovannucci E, Christopher KB. Association of low serum 25-hydroxyvitamin D levels and mortality in the critically ill. Crit Care Med. 2011;39:671–7.

GRANT ACKNOWLEDGMENT. Financial Support: FIPE-HCPA and PPG-Endocrinology-UFRGS.

0118

LOW DOSE (0.05 U/KG/H) VERSUS STANDARD DOSE (0.1 U/KG/H) INSULIN INFUSION IN PEDIATRIC DIABETIC KETOACIDOSIS: A RANDOMIZED CONTROLLED STUDY

K. Nallasamy[1], M. Jayashree[1], S. Singhi[1]

[1]PGIMER, Dept. of Pediatrics, Chandigarh, India

INTRODUCTION. The recommended insulin dose (0.1 U/kg/h) in current DKA guidelines is not based on strong clinical evidence. Physiological dose–effect studies showed that even lower doses (0.03 and 0.05 U/kg/h) could adequately normalize the raised ketones. Recent retrospective studies observed a dose of 0.05 U/kg/h to be as effective as standard dose in correcting acidosis. Given the possible association of rapid glucose fall following start of insulin and risk for cerebral edema, lower insulin doses may potentially be safer. Also, using low dose could minimize therapy related complications like hypokalemia and hypoglycemia.
OBJECTIVES. To compare the efficacy and safety of low dose (0.05 U/kg/h) with standard dose (0.1 U/kg/h) insulin in pediatric DKA.
PRIMARY. Rate of fall in blood glucose (BG) till it reaches to ≤250 mg/dl.
SECONDARY. Rate of resolution of acidosis, incidence of cerebral edema, hypokalemia and hypoglycemia.
DESIGN. Open-labeled Randomized Controlled Trial.
SETTING. Pediatric Emergency and Intensive care Units of a tertiary care hospital.
SUBJECTS. Children ≤12 years with DKA between July 2011 and December 2012.
INTERVENTIONS. Fifty children were randomized to receive either low dose (n = 25) or standard dose (n = 25) insulin. A uniform fluid correction (6.5 %) over 36 h with additional initial bolus to correct shock was administered in both groups.
RESULTS. Mean (SD) age of study population (n = 50) was 6.9 (3.7)years. New onset TIDM presenting as DKA was seen in 29 (58 %). Two thirds (n = 34; 68 %) had severe DKA at enrollment. Baseline clinical and biochemical (pH, HCO_3, BG) variables were comparable between two groups. The time taken for BG to reach ≤250 mg/dL in low vs. standard dose group, was similar [(6.0 vs 6.2 h) and mean ± SD rate of BG fall till ≤250 mg/dL (45.7 ± 18 vs 51.4 ± 24 mg/dL/h) were similar. However the first hour BG fall was significantly higher in standard as compared to low dose (63.2 vs 39.1 mg/dL; p = 0.01), with 4 (16 %) children in the former compared to none in the latter showing a BG fall >100 mg/dL. Duration for resolution of acidosis (low vs. standard dose: 16.5 vs 17.2 h; p = 0.73) and rate of resolution were similar in both. Incidence of hypokalemia was significantly higher with standard dose (48 vs. 20 %; p = 0.04); the difference being more in malnourished (88 vs. 28 %; p = 0.02). Five (20 %) and 1 (4 %) with standard and low dose infusion (p = 0.08) respectively developed hypoglycemia. One child in standard dose group developed cerebral edema and there were no deaths.
CONCLUSIONS. Low dose is as effective as standard dose insulin in children with DKA. However it may be preferred in malnourished children and in situations warranting a gentler fall in BG.
REFERENCE(S). 1. Wolfsdorf J. Pediatric Diabetes. 2009;10(s12):118–33. 2. Noyes KJ. Pediatr Diabetes. 2007;8:150–56. 3. Puttha R. Pediatr Diabetes. 2010;11:12–7. 4. Al Hanshi S. Pediatr Crit Care Med. 2011;12:137–40. 5. Bradley P. Am J Ther. 2007;14:265–8.

0119

MACRONUTRIENTS UTILIZATION AND BALANCES DURING THE FIRST WEEK OF HOSPITALITION IN VENTILATED CRITICALLY ILL CHILDREN

C. Moullet[1], C. Jotterand[1], J. Depeyre[1], M.-H. Perez[2], J. Cotting[2]

[1]University of Applied Sciences Western Switzerland (HES-SO), Nutrition and Dietetics Department, Geneva, Switzerland, [2]University Hospital (CHUV), Pediatric Intensive Care Unit, Lausanne, Switzerland

INTRODUCTION. In critically ill children, adequate nutritional support is associated with decreased mortality and morbidity. Nutritional needs may be influenced by the metabolic stress, treatments, fever, etc. which makes difficult the acute determination of macronutrients needs. If energy needs have been documented, substrate utilization during the stay remains unknown.
OBJECTIVE. The aim of this study was to determine macronutrients utilization and balances during the first week of hospitalization in ventilated critically ill children.
METHODS. Children with expected mechanical ventilation ≥72 h and a FiO_2 ≤60 % were consecutively included. Energy expenditure, respiratory quotient (RQ) and substrate utilization were calculated from the values of oxygen consumption and carbon dioxide production measured by indirect calorimetry and from total urinary nitrogen measured by chemoluminescence daily. A total of 328 measurements were performed. Macronutrients intakes were recorded using a computerized information system (MetaVision, Imdsoft). Macronutrients balances were then calculated as the difference between oxidation and intakes. The RQ was also compared with the RQ of the macronutrients administered (RQmacr).
RESULTS. We included 63 children, 34 boys and 29 girls with a median age (IQR) of 21 (0–103) months. Energy, protein and lipids balances remained negative during the first week of hospitalization while carbohydrates balance was positive from the first day. On average, energy expenditure was 54 ± 10 kcal/kg/d and energy balance was −9 ± 16 kcal/kg/d. Protein, lipids and carbohydrate oxidation were 1.4 ± 0.4, 3.1 ± 1.5 and 5.1 ± 2.8 g/kg/d, respectively. The mean balance was −0.4 ± 0.6 g/kg/d for proteins, −1.9 ± 1.8 g/kg/d for lipids and +1.8 ± 3.1 g/kg/d for carbohydrates. RQ measured was lower than RQmacr calculated (0.81 ± 0.06 versus 0.92 ± 0.05).
CONCLUSION. In our group of ventilated critically ill children, we observed a slight lipolysis and catabolism during the first week of hospitalization. The carbohydrate oxidation was insufficient, probably due to a reduced oxidation capacity and insulin resistance in metabolic stress conditions.

0120

THE USE OF ANTI-INFLAMMATORY LIPIDS FOR THE TREATMENT OF CRITICALLY ILL PATIENTS WITH SYSTEMIC INFLAMMATION: A META ANALYSIS OF OUTCOMES DATA

H.P. Moreira[1], A. Pontes-Arruda[1], F.E. Mendonça-Neto[1], B. Furtado-Lima[1], L.G. de Castro[1], J.H. Militão[1], V.D.A. do Ceará[1], H. Monte-Coelho Neto[1], A.P. Lima[1], A.P. Magalhães-Júnior[1], D. Guimarães[1]

[1]Christus University Center, School of Medicine, Fortaleza, Brazil

INTRODUCTION. Several studies have reported the effects of anti-inflammatory lipids in the treatment of critically ill patients suffering from systemic inflammatory diseases such as ALI, ARDS and sepsis. Several trials reported the effect of this approach but they are not unanimous in their findings [1–7]. Although some trials demonstrated improve in several outcomes such as intensive care days, mechanical ventilation days, reduction in the development of new organ dysfunctions and reduction in the 28-days all-cause mortality, others were unable to demonstrate such benefits. In such situation a meta-analysis of the available evidence is of pivotal importance to determine the possible benefits of using anti-inflammatory lipids in the critically ill population of patients.
OBJECTIVES. To perform a meta-analysis trials comparing evaluating the use of anti-inflammatory lipids to determine the effectiveness of this approach in critically ill patients.
METHODS. Searches of MEDLINE, EMBASE, Cochrane, and NIH databases were performed. Outcome measures included 28-days mortality, ventilator and ICU-free days, and development of new organ failures. Effects were calculated using a random effects model. Results were analyzed combining studies using anti inflammatory-lipids either delivered using enteral route as part of a total enteral nutrition regimen or as a supplement (delivered in bolus).
RESULTS. Seven studies were included in this meta-analysis (n = 1,048 patients). Overall results demonstrated reduction in the risk of developing new organ failures (OR = 0.25; 95 % CI 0.15–0.43; p < 0.0001), time on mechanical ventilation (SMD = 0.35; 95 % CI 0.06–0.64; p = 0.01) but not ICU stay (SMD = 0.02; 95 % CI −0.28 to 0.34; p = 0.86). Analysis of mortality of all seven studies using RR was associated with reduction in the 28-days all-cause mortality (RR = 0.78; 95 % CI 0.61–1.00, p = 0.05).
CONCLUSIONS. This evaluation showed that when comparing studies regardless of the methodology or trial design, the use of anti-inflammatory lipids is associated with reduction in the 28-days all-cause mortality as evaluated by relative risk, reduction in the time spend using mechanical ventilation, and reduction in the development of new organ dysfunctions, but not with time spend at the ICU.
REFERENCE(S). 1. Gadek J, et al. Crit Care Med. 1999;27:1409–20. 2. Singer P, et al. Crit Care Med. 2006;34:1033–8. 3. Pontes-Arruda A, et al. Crit Care Med. 2006;34:2325–3. 4. Grau-Carmona T, et al. Clin Nutr. 2011;30:578–84. 5. Pontes-Arruda, et al. Crit Care. 2011;15:R144–R158. 6. Stapleton RD, et al. Crit Care Med. 2011;39:1655–62. 7. Rice TW, et al. JAMA. 2011;306:1574–81.

Acute coronary syndromes: 0121–0133

0121

XENON INHALATIONS IN COMPLEX ANTIANGINAL TREATMENT OF PATIENTS WITH ACUTE CORONARY SYNDROME: A PILOT STUDY

I.V. Molchanov[1], V.I. Potievskaya[1], E.H. Shebzuhova[1]

[1]Russian Medical Academy of Postgraduate Education, Anaesthesiology and Resuscitation, Moscow, Russian Federation

INTRODUCTION. Xenon is one of the most promising gas anesthetics, similar in its properties to the ideal anesthetic. It possesses also analgetic, neotropic, neuroprotective, antihypoxic, antiinflammatory, sedative effects. The main clinical symptom of ACS is anginal status, the treatment of which involves the use of narcotic analgesics, which have a number of side effects. We conducted a prospective study to investigate the efficiency of complex intensive therapy of ACS by including xenon—oxygen inhalations.
OBJECTIVES. 50 patients admitted to cardiological intensive care unit with ACS were treated according to the recommendations of ESC. Xenon was included in the treatment of 30 patients. 20 patients received only conventional therapy.
METHODS. Xenon therapy was performed by inhalations of gas mixture containing from 25 to 50 % xenon and from 40 to 70 % oxygen. The number of sessions ranged from 3 to 5. Monitoring BP, heart rate, oxygen saturation, transcutaneous PO_2 and PCO_2 in arterial blood, parameters of systemic hemodynamics was conducted in all the patients. Thromboelastography was performed before and after the session of xenon inhalation. Laboratory methods for the study included myocardial necrosis markers (cardiac troponin I, creatine kinase MB).
RESULTS. Xenon provided fast pain relief and a positive dynamics of clinical status. No significant changes in HR and BP were observed during inhalations of xenon–oxygen mixture. The study demonstrated increase in stroke volume from 64.75 ± 2.75 to 71.00 ± 3.31 ml (p < 0.05), cardiac index from 3.07 ± 0.22 to 3.48 ± 0.14 l/min/m^2 (p < 0.05) and reduction in system vessel resistance from 1,494.75 ± 42.17 to 1,397.75 ± 39.28 din sm m^2 (p < 0.05) after the session of xenon breathing. PCO_2 in arterial blood did not change significantly. The obtained data showed reduction of coagulation potential in patients with ACS after xenon treatment. The analysis of markers of myocardial necrosis level demonstrated significant decrease to the third day of observation. In the control group only a tendency to reduce the level of troponin I was observed.
CONCLUSIONS. In this pilot study we revealed a positive effect of xenon in patients with ACS: xenon causes fast chest pain relief, has no adverse effects on monitoring parameters, induces favourable changes in systemic hemodynamics, reduces hypercoagulation and provides faster dynamics of necrosis markers. Further studies needed to determine the place of xenon in ACS treatment.
REFERENCE(S). 1. Burov NE, Potapov VN, Makeev GN. Xenon in anesthesiology; 2000. 2. Burov NE, Molchanov IV, Nikolaev LL, Potapov VN. Technical support of xenon anesthesia. Clin Anesthesiol Resuscitation. 2005;2:27–32. 3. Pagel PS. Cardioprotection by noble gases. J Cardiothorac Vasc Anesth. 2010;24(1):143–63 (Epub 20 May 2009).

0122

REPERFUSION INJURY ACCORDING TO REPERFUSION STRATEGY AFTER ST-ELEVATION MYOCARDIAL INFARCTION: ASSESSMENT WITH CARDIOVASCULAR MAGNETIC RESONANCE

L. Palacios Gamir[1], R. Oltra[1], V. Bodi[2], R.C. Huerta[1], F.J. Chorro[2]

[1]Clinic Hospital of Valencia, ICU, Valencia, Spain, [2]Clinic Hospital of Valencia, Cardiology, Valencia, Spain

INTRODUCTION. In ST-segment elevation myocardial infarction (STEMI) timely reperfusion is the primary therapeutic goal but may cause reperfusion injury (RI) including microvascular obstruction (MVO) and intramyocardial hemorrhage (IMH). Different reperfusion strategies exist for achieving reperfusion and some patients do not undergo timely reperfusion. Cardiovascular magnetic resonance (CMR) allows for detection of both MVO and IMH. Data on the incidence of RI assessed with CMR according to reperfusion strategy is scarce.

OBJECTIVES. To assess reperfusion injury according to reperfusion strategy after ST-elevation myocardial infarction through cardiovascular magnetic resonance.
METHODS. We stratified STEMI patients according to reperfusion therapy: no reperfusion within 12 h after symptom onset, primary PCI (percutaneous coronary intervention), thrombolysis plus early PCI and rescue PCI. Using CMR, the incidence RI (frequency of IMH and MVO in >1 segment) was determined in T2 and late enhancement sequences.
RESULTS. 379 patients were included in the study. Reperfusion mode was: no reperfusion, n = 44, pPCI, n = 147, thrombolysis, n = 142 and rescue PCI, n = 46. Overall incidence of both IMH and MVO was 34 %. In the "no reperfusion" group, the incidence of RI was significantly lower compared to all other groups, while the contrary was the case for rescue PCI. There was a non-significant trend towards less RI in patients treated with thrombolysis compared to primary PCI.
CONCLUSIONS. RI in a non-selected STEMI population occurs frequently in relationship with reperfusion therapies. Using CMR we found that RI is most frequent in patients undergoing rescue PCI while patients who do not receive reperfusion within the first 12 h displayed the lowest incidence. There was a non-significant trend towards a lower incidence of RI in patients with successful thrombolysis compared to primary PCI. Additional therapies to minimize RI are needed.
REFERENCE(S). 1. Turer AT, et al. Pathogenesis of myocardial ischemia–reperfusion injury and rationale for therapy. Am J Cardiol (Author manuscript; available in PMC 2011 August 1). 2. Thiele H, et al. Prognostic value of intramyocardial hemorrhage detected by cardiac magnetic resonance imaging in acute reperfused ST-elevation myocardial infarction. 3. Hombach V, et al. Sequelae of acute myocardial infarction regarding cardiac structure and function and their prognostic significance as assessed by magnetic resonance imaging. Eur Heart J. 2005;26(6):549–57 (Epub 15 Feb 2005).

0123
RISK FACTORS ASSOCIATED WITH MORTALITY IN ACUTE MYOCARDIAL INFARCTION IN ELDERLY PATIENTS

F. García[1], J.A. Ortega[1], J.M. Lebron[1], S. Arrabal[1], S. Vitaller[1]

[1]Marbella Hospital, Intensive Care Unit, Marbella, Spain
INTRODUCTION. Due to increased life expectancy, more and more elderly patients are treated in hospital in serious diseases, including ischemic heart disease. The objective of this study is to find the possible risk factors higher hospital mortality in patients with acute myocardial infarction in patients over 70 years.
METHODS. We conducted a study with retrospective data collection, we selected all patients with a diagnosis of acute myocardial infarction (electrical and analytical criteria) admitted between January 2008 and December 2012. We selected patients over 70 years as cases. The variables analyzed as possible risk factors included age, sex, presence of hypertension, diabetes mellitus, smoke, dyslipidemia, ischemic heart disease, GRACE score, revascularization technique, Killip class, use of IABP, presence of acute renal failure, postinfarction angina, reinfarction, stroke, mechanical complications, cardiogenic shock. Descriptive study was conducted initial and subsequent analysis by logistic regression using as dependent variable mortality over 70 years.
RESULTS. Among patients hospitalized for acute myocardial infarction (515), 167 (32.4 %) were older than 70 years, 70.7 % were men, the most frequent location of infarction was inferior (37.7 %), postinfarction hospital mortality in this group was 8.4 % (14 patients). In multivariate logistic regression analysis showed risk factors for hospital mortality: Killip class >1 (OR 3.2, 95 % CI 1.033–9.95), GRACE score >210 (OR 4.4, 95 % CI 1.18–16.99), need for IABP (OR 13.43, 95 % CI 1.44–125.05); Occurrence of acute renal failure (OR 4.64, 95 % CI 1.30–16.48). In all other variables were not statistically significant. Hospital mortality in this group was significantly higher (OR 3.09, 95 % CI 1.34–7.11) for mortality under 70 years (2.87 %).
CONCLUSIONS. Among patients older than 70 years, admitted to the ICU for acute myocardial infarction, the risk factors for hospital mortality are above, consistent with those published in the literature and similar to younger patients. Also, in-hospital mortality in this group was significantly higher than the mortality in patients below 70 years in our sample.
REFERENCES. 1. Alexander KP, Newby LK, Cannon CP, Armstrong PW, et al. Acute coronary care in the elderly, part I non-ST-segment-elevation acute coronary syndromes. 2. Avezum A, Makdisse M, Spencer F, Gore JM, Fox KA, Montalescot G, Eagle KA, White K, Mehta RH, Knobel E, Collet JP; GRACE Investigators. Impact of age on management and outcome of acute coronary syndrome: observations from the Global Registry of Acute Coronary Events (GRACE). Am Heart J. 2005;149:67–73. 3. Rathore SS, Mehta RH, Wang Y, Radford MJ, Krumholz HM. Effects of age on the quality of care provided to older patients with acute myocardial infarction. Am J Med. 2003;114:307–15.

0124
EVALUATION OF GRADE 3 ISCHAEMIA AS A PROGNOSTIC FACTOR FOR MORTALITY IN PATIENTS WITH ST-ELEVATION ACUTE CORONARY SYNDROME

M. Arias-Verdú[1], T. García-Paredes[1], R. Rivera-López[2], E. Aguilar-Alonso[3], J. Arboleda-Sánchez[1], J. Gómez-Martín[4], G. Quesada-Garcia[1], R. Rivera-Fernández[1]

[1]Hospital Carlos Haya, Intensive Care Unit, Málaga, Spain, [2]Hospital Virgen de las Nieves, Cardiologia, Granada, Spain, [3]Hospital Infanta Margarita, Intensive Care Unit, Córdoba, Spain, [4]Universidad de Granada, Facultad de Medicina, Granada, Spain
OBJECTIVE. To analyze in patients with ST elevation acute coronary syndrome (STEMI), the relation between mortality and Grade 3 ischaemia evaluated by ECG.
METHODS. We undertook a nested case–control study in a cohort (N = 524) of patients with STEMI admitted to Carlos Haya hospital, Malaga, Spain between 2008–2010. The cases comprised the patients who died in the hospital (n = 38) and the controls (n = 81) were composed of a random sample of patients who survived (1 in each 6). We analyzed age, sex, Killip on admission, TIMI, APACHE II and mortality. We also analyzed the ECG on admission to the hospital and after the repermeabilization (fibrinolysis or primary angioplasty) and examined the presence of Grade 3 ischaemia (J point above 50 % of the voltage of the R wave in inferior infarctions and absence of S wave in at least two of the V1–V3 leads in anterior infarctions). Statistical analysis was done with the Student *t* test, χ^2 and multiple logistic regression.
RESULTS. A total of 38 (7.25 %) patients died in the hospital. A first ECG was available for 104 patients, and Grade 3 ischaemia could be assessed in 101 cases, 31 of the 38 who died and 70 of the 81 controls. Those who died were older (75.66 ± 8.20 vs. 64.48 ± 13.61 years; $p < 0.001$), and had a higher APACHE-II (19.11 ± 7.37 vs. 10.32 ± 3.28; $p < 0.001$) and TIMI (7.39 ± 2.94 vs. 3.62 ± 2.31; $p < 0.001$).
The Killipin those who died was I (26.3 %), II (21.2 %), III (13.2 %), and IV (39.5 %); and in the controls it was I (75.3 %), II (13.6 %), III (7.4 %), and IV (3.7 %); ($p < 0.001$).
Of the 31 who died, 17 (54.8 %) had Grade 3 ischaemia and 22 (31.4 %) of the 70 survivors ($p = 0.028$). 97 patients underwent reperfusion procedures. We classified the patients according to the ECG information after reperfusion, or if absent the ECG on admission, and found that Grade 3 ischaemia was present in 41.9 % of the 31 who died and 18.3 % of the 71 survivors ($p = 0.012$).
Logistic regression showed that Grade 3 ischaemia after the reperfusion procedure (or if absent using the information from the admission ECG) complemented the Killip classification; with the OR for Grade 3 ischaemia 3.51 (1.11–11.08) and for Killip-I OR: 1; Killip-II OR: 3.83 (1.11–11.08); Killip-III OR: 2.56 (0.39–16.5) and Killip-IV OR: 53.23 (9.79–289.58). The discrimination of this model, evaluated with the area under the ROC curve, was 0.84 (0.74–0.93) and for the Killip classification 0.80 (0.69–0.90). Grade 3 ischaemia did not complement the TIMI or the APACHE II classification.
CONCLUSIONS. In patients with STEMI, Grade 3 ischaemia as evaluated with the ECG after the repermeabilization procedure and on hospital admission was related with mortality, complementing the Killip classification, though it added no further information to the commonly used prognostic indices TIMI and APACHEII.

0125
LEVOSIMENDAN INFUSION IN ACUTE HEART FAILURE DUE TO MYOCARDIAL INFARCTION

C. Gutu-Bahov[1,2], T. Dumitras[3], V. Cojocaru[1], S. Matcovschi[3], N. Gurschi[1], C. Talmaci[3]

[1]State University of Medicine and Pharmacy 'Nicolae Testemitanu', Chair of Anaesthesiology and Reanimatology Nr. 2, Chisinau, Moldova, [2]Clinical Municipal Hospital 'Sfanta Treime', Critical Care Unit, Chisinau, Moldova, [3]State University of Medicine and Pharmacy 'Nicolae Testemitanu', Department of Internal Medicine, Chisinau, Moldova
INTRODUCTION. There is still a controversy about the complications and survival benefits of levosimendan infusion without using bolus doses.
OBJECTIVES. To assess the efficacy, and 5 days survival of patients with myocardial infarction complicated by acute heart failure, receiving levosimendan infusion versus dobutamine infusion.
METHODS. We retrospectively analyzed 36 case histories of patients hospitalized with myocardial infarction (MI) in Critical Care Unit of Clinical Municipal Hospital "Sfanta Treime" in 2010–2012. The inclusion criteria were MI with Q wave on ECG, clinical signs of acute heart failure (AHF), echocardiography with left ventricle ejection fraction (LVEF) <40 %, signs of pulmonary edema on chest radiography, brain natriuretic peptide (BNP) >400 g/ml, systolic blood pressure (BP) >85 mmHg. Changes in clinical symptoms, LVEF, BNP were measured after 24-h infusion and at day 5. The treatment was supplied by dopamine infusion.
RESULTS. Retrospectively the patients were divided into two groups: group I (26 patients) received continuous 24-h infusion of levosimendan at a dose of 0.05–0.1 mg/kg/min infusion, without bolus, and group II (10 patients) received continuous dobutamine infusion at a dose of 2.5–5 mg/kg/min for 24 h. In group I, infusion of levosimendan in 23 patients led to a decrease of dyspnea and number of lung rales and positive radiological dynamic. During infusion of levosimendan in 8 (31.7 %) patients different arrhythmias were recorded. Fatal outcome occurred in 2 patients (7.7 %). After infusion of levosimendan BNP's level decreased 2-fold in 16–24 h and mean LVEF fraction increased from 29.8 ± 3.5 % to 39.6 ± 2.27 % in 24–48 h, $p < 0.05$. After 24 h of completion of dobutamine infusion heart rate and diastolic BP did not differ from the original, systolic BP decreased, the number of pulmonary rales decreased and a positive radiological dynamic was registered. Episodes of arrhythmias were detected in 9 patients, mean LVEF before the infusion constituted 33.7 ± 1.7 and 34.3 ± 1.9 %, 24–48 h after infusion, and BNP dynamic was absent. Fatal outcome in the dobutamine group was 40 % (4 patients).
CONCLUSIONS. In patients with acute heart failure due to myocardial infarction, treatment with levosimendan infusion contributed to a more pronounced beneficial effect on hemodynamics, with rapid resolution of heart failure and more increased left ventricular ejection fraction, as well as lower rate of complications and higher 5 days survival, than with dobutamine infusion.
REFERENCE(S). 1. Moiseyev VS, et al. Safety and efficacy of novel calcium sensitizer, levosimendan, in patients with left ventricular failure due to an acute myocardial infarction. A randomized, placebo-controlled, double-blind study (RUSSLAN). Eur Heart J. 2002;23(18):1422–32.

0126
THE ASSOCIATION BETWEEN CIRCULATING PLASMINOGEN ACTIVATOR INHIBITOR TYPE 1 (PAI-1) LEVELS, THE PAI-1 4G/5G POLYMORPHISM AND INCIDENT MYOCARDIAL INFARCTION

I. Tsangaris[1], G. Tsaknis[1], G. Nikolopoulos[2], S. Bonovas[2], P. Bagos[3], A. Tsantes[4], P. Kopterides[1], E. Vrigkou[1], D. Konstantonis[1], A. Armaganidis[1]

[1]2nd Department of Critical Care Medicine, "Attiko" University Hospital, Medical School, University of Athens, Athens, Greece, [2]Hellenic Centre for Disease Control and Prevention, Athens, Greece, [3]Department of Computer Science and Biomedical Informatics, University of Central Greece, Athens, Greece, [4]Department of Hematology and Blood Bank Unit, "Attiko" University Hospital, Medical School, University of Athens, Athens, Greece
INTRODUCTION. Circulating levels of Plasminogen Activator Inhibitor type 1 (PAI-1) are increased in individuals carrying the 4G allele at position −675 of the PAI-1 gene. In turn, overexpression of PAI-1 has been found to affect both atheroma and thrombosis. However, the association between PAI-1 levels and the incidence of Myocardial Infarction (MI) is complicated by the potentially confounding effect of well-known cardiovascular risk factors.
OBJECTIVES. The current study tried to investigate in parallel the association of PAI-1 activity with the PAI-1 4G/5G polymorphism, MI, and components of Metabolic Syndrome (MetS).
METHODS. The current meta-analysis was conducted according to the MOOSE guidelines and the PRISMA statement. The methodology was pre-specified and documented in a protocol. A comprehensive electronic search of PubMed and Scopus was conducted up until May 2010. The following keywords or combination of them were used: "Plasminogen activator inhibitor", "PAI-1", and "Myocardial infarction". After an initial screening of titles and abstracts, only relevant studies remained. Subsequently, full text articles were

critically evaluated for eligibility and their reference lists were manually scanned to identify further studies for inclusion. Furthermore, in an effort to limit the effect of "grey literature"-related bias, 25 studies published in conference proceedings or as short abstracts were also considered (if found). Using meta-analytical Mendelian randomization approaches, genotype-disease and genotype-phenotype associations were modeled simultaneously.
RESULTS. According to the recessive model of inheritance, which was supported from the data, the MI-related odd ratio for the 4G/4G individuals was 1.136 with 95 % confidence interval (CI) 0.995, 1.297. Moreover, the 4G homozygotes had, on average, higher PAI-1 activity by 1.926 units compared to 5G carriers (95 % CI 1.132, 2.720). The meta-regression analyses showed that increased levels of triglycerides ($p < 10\text{-}4$), cholesterol ($p < 10\text{-}4$) and PAI-1 ($p = 0.020$) in controls were associated with reduced MI risk for 4G homozygotes. Finally, cholesterol ($p < 10\text{-}4$) and triglyceride ($p < 10\text{-}4$) levels were positively related to the mean genotype difference of PAI-1 activity in controls.
CONCLUSIONS. Mendelian randomization approaches suggested that PAI-1 could lie in the etiological pathway to MI. However, the meta-regression analyses compromised this evidence. Although meta-regression methods are prone to biases, further research is needed on the kind of association, if any, between PAI-1 levels and some components of MetS.
REFERENCES. Tsangaris I, Tsantes A, Bonovas S, Lignos M, Kopterides P, Gialeraki A, Rapti E, Orfanos S, Dimopoulou I, Travlou A, Armaganidis A. The impact of the PAI-1 4G/5G polymorphism on the outcome of patients with ALI/ARDS. Thromb Res. 2009;123(6):832–6.
GRANT ACKNOWLEDGMENT. Greek Ministry of Health and Social Solidarity (Grant 70/3/10260 to Dr I. Tsangaris).

0127
IS THERE AGREEMENT AMONG INTERVENTIONAL CARDIOLOGISTS IN THE TREATMENT OF INTERMEDIATE CORONARY STENOSIS?

M.A. Ramirez-Marrero[1], M. Cano-Garcia[1], J.L. Delgado-Prieto[1], M. Jimenez-Navarro[2], M. de Mora-Martin[3]

[1]Hospital Carlos Haya, Cardiology, Malaga, Spain, [2]Hospital Clinico Virgen de la Victoria, Cardiology, Malaga, Spain, [3]Hospital Carlos Haya, Malaga, Spain
INTRODUCTION. An intermediate coronary lesion was defined as a stenosis between $\geq$40 and $\leq$70 %. The fractional flow reserve (FFR) by pressure guidewire is indicated to assess the hemodynamic significance of moderate stenosis in the absence of functional information. The aim of this study is to analyze the interobserver variability in visual assessment of angiographically intermediate coronary lesions by interventional cardiologist experts, and their comparison with the functional severity by pressure guide.
MATERIALS AND METHODS. Analysis of patients with intermediate coronary lesions undergoing coronary angiography between January 2008 and March 2011 admitted for ACS. Guide pressure was performed in all cases. Lesions were considered significant if FFR was $\leq$0.75. All lesions were visualized independently by three expert interventional cardiologists with at least 5 years of experience, who rated the coronary lesions in "severe" and "severe." The degree of agreement was measured using the kappa statistic.
RESULTS. We included 93 intermediate lesions belonging to 79 patients. The 73.4 % were men, mean age 61 $\pm$ 9 years. The most common reason for admission was unstable angina. All lesions with positive pressure wire were revascularized, except in one case due to technical difficulties. Lesions with negative pressure wire were not revascularized. Of the 93 lesions, 19 (20.4 %) lesions were considered responsible for coronary event. The overall kappa between observers was 0.263 (95 % CI 0.124–0.402, $p = 0.0001$) and between observers and assessing FFR in 0153 (95 % CI 0.049–0.258, $p = 0.0003$). No significant difference between the percentage of total agreement between observers when the lesion was functionally significant versus when the pressure wire was negative (35.4 vs 48.5 %, $p = 0.189$). The visual assessment tends to overestimate the severity of lesions compared with FFR, existing over 21.5 % classified as severe injuries by the Observer-1, 23.7 % by the Observer-2 and 17.2 % for the Observer-3.
CONCLUSIONS. There is great variability in the visual assessment of intermediate coronary lesions. This means that in clinical practice could be treated functionally non-significant coronary lesions unnecessarily, which could result in possible complications for the patient. The use of FFR is limited by the additional time needed and the current facility for the treatment of these coronary lesions, which favors to be treated even in a time less than that required for evaluation, or to defer the decision to clinically evaluate its impact, revascularization postponing for a second time, resulting in the need for a new procedure, the greater number of days of hospitalization, higher complication rate and higher economic costs.

0128
CLINICAL IMPACT OF INTRA-AORTIC BALLOON PUMP DURING PERCUTANEOUS CARDIOPULMONARY SUPPORT IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION COMPLICATED BY CARDIOGENIC SHOCK

J.H. Yang[1], T.K. Park[1], C.R. Chung[1], C.-M. Park[1], K. Jeon[1], G.Y. Suh[1], S.-H. Choi[1]

[1]Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Republic of Korea
INTRODUCTION. While on percutaneous cardiopulmonary support (PCPS), the left ventricle (LV) is only partially unloaded and LV afterload may be high. Intra-aortic balloon pump (IABP) has been considered as being one of the options to optimize hemodynamic status in patients with LV distension.
OBJECTIVES. We investigated whether IABP support, combined with PCPS, improves in-hospital survival in patients with acute myocardial infarction (AMI) complicated by cardiogenic shock.
METHODS. Using a retrospective, single-center registry between January 2004 and December 2011, we analyzed 96 consecutive Korean patients with cardiogenic shock complicating AMI assisted by a PCPS system. The primary outcome was in-hospital mortality. The secondary outcome was the success rate of weaning from PCPS and the lactate clearance for 48 h (%).
RESULTS. Combination of IABP and PCPS was performed in 41 (42.7 %) patients. In-hospital mortality occurred in 51 patients (PCPS with IABP versus PCPS alone; 51.2 vs. 54.5 %, $P = 0.747$). The success rate of weaning from PCPS was also similar (63.4 vs. 58.2 %, $P = 0.604$). Complications such as ischemia of lower extremity or bleeding of PCPS insertion site did not increase in PCPS with IABP ($P = 0.521$ and $P = 0.667$, respectively). Among survivors for 24 h more, lactate clearance was not significantly different between the PCPS alone and PCPS with IABP ($P = 0.918$).
CONCLUSIONS. The combined use of PCPS and IABP could not improve in-hospital survival.
REFERENCE(S). 1. Phillips SJ, Zeff RH, Kongtahworn C, Grignon A, Barker L, Iannone LA, Tannenbaum M, Verhey MH, Wickemeyer WJ, Ghali MG, et al. Benefits of combined balloon pumping and percutaneous cardiopulmonary bypass. Ann Thorac Surg. 1992;54(5):908–10. 2. Sung K, Lee YT, Park PW, Park KH, Jun TG, Yang JH, Ha YK. Improved survival after cardiac arrest using emergent autopriming percutaneous cardiopulmonary support. Ann Thorac Surg. 2006;82(2):651–6. 3. Madershahian N, Liakopoulos OJ, Wippermann J, Salehi-Gilani S, Wittwer T, Choi YH, Naraghi H, Wahlers T. The impact of intraaortic balloon counterpulsation on bypass graft flow in patients with peripheral ECMO. J Card Surg. 2009;24(3):265–8. 4. Sauren LD, Reesink KD, Selder JL, Beghi C, van der Veen FH, Maessen JG. The acute effect of intra-aortic balloon counterpulsation during extracorporeal life support: an experimental study. Artif Organs. 2007;31(1):31–8.

0129
GENDER IMPACT ON COMPLICATIONS IN ST-ELEVATION ACUTE CORONARY SYNDROME

J. Muñoz-Bono[1], E. Trujillo-García[1], J.A. Arboleda-Sánchez[1], R. Rivera-Fernández[1], M.D. Fernández-Zamora[1], T. García-Paredes[1]

[1]Carlos Haya Regional University Hospital, Intensive Care Unit, Málaga, Spain
INTRODUCTION. The main death cause in industrial countries is ischemic cardiopathy. Gender-related differences in death rate have been reported by some studies. Thus, high and short-time hospital death-rate is observed in females who suffer acute coronary syndrome (ACS).
OBJECTIVES. Describe gender impact on complications in ICU-admitted, st-elevation acute coronary syndrome patients.
METHODS. An observational and prospective study on ST-elevation ACS patients from January 2002 to January 2012 in our Intensive Care Unit, and collected in the ARIAM-Andalucía database. Cardiovascular complications are analysed throughout hospitalization. Pearson's Chi squared test was used as statistical method for comparison purposes—the level of significance was set at 95 %—and binary logistic regression was used for multivariate analysis.
RESULTS. A total number of 569 patients were included in this study (78.9 % were males). Complications were right cardiac failure (3.2 %), cardiac tamponade (0.7 %), hypertension (6.7 %), cardiac shock (6.3 %), complete AV block (13.7 %), cardiac arrest (11.1 %), VF (4 %), pulseless VT (5.1 %), mechanical defects (1.8 %), and CVA (1.1 %). The table below shows complication analysis by gender:

Complications

	Male (%)	Female (%)	p
Right ventricular failure	3.1	3.3	ns
Tamponade	0.7	0.85	ns
Cardiogenic shock	4.9	11.7	0.009
Ventricular arrhythmias	9.1	9.1	ns
AV blocks	7.6	6.7	ns
Mechanical defects	1.8	1.7	ns
CVA	1.1	0.8	ns
Renal failure	5.3	6.7	ns

Adjusting seriousness (by Killip and Grace scale), reperfusion delay and infarct localization by age, "female" is an independent predictor in cardiac-failure patients ($p = 0.049$, OR 12.5; IC 95 %).
CONCLUSIONS. Female gender involves higher possibility of cardiac failure with no differences regarding other complications.
GRANT ACKNOWLEDGMENT. Ariam researchers.

0130
HEAD-TO-HEAD COMPARISON OF 1 WEEK VERSUS 6 MONTHS CMR-DERIVED INFARCT SIZE FOR PREDICTION LATE EVENTS AFTER STEMI

L. Palacios Gamir[1], R. Oltra[1], V. Bodi[2], R.C. Huerta[1], F.J. Chorro[2]

[1]Clinic Hospital of Valencia, ICU, Valencia, Spain, [2]Clinic Hospital of Valencia, Cardiology, Valencia, Spain
INTRODUCTION. Infarct size (IS) diminishes during the first months after ST-elevation myocardial infarction (STEMI). The incremental prognostic value of IS regression and of final IS at 6 months is unknown.
OBJECTIVE. To compare cardiovascular magnetic resonance (CMR)-derived IS at 1 week and 6 months after MI for predicting late major adverse cardiac events (MACE).
METHODS. 250 patients underwent CMR at 1 week and 6 months after MI. IS was determined as % of left ventricular mass (%LV) and the extent of segments with transmural necrosis (in >50 % of wall thickness, ETN). During 163 weeks, 23 late MACE (cardiac death, MI or readmission for heart failure after 6 months) occurred.
RESULTS. Patients with MACE had a larger IS than those without MACE: at 1 week (%LV 32 $\pm$ 17 vs. 21 $\pm$ 14, $p = 0.001$, ETN 6 [4–9] vs. 3 [1–5], $p < 0.0001$) and at 6 months (%LV 28 $\pm$ 15 vs. 17 $\pm$ 13, $p < 0.001$, ETN 5 [2–6] vs. 3 [1–5], $p = 0.005$). Late MACE rates in IS >median were higher at 1 week (%LV 14 vs. 5 %, $p = 0.02$, ETN 14 vs. 4 %, $p = 0.007$) and 6 months (%LV 14 vs. 5 %, $p = 0.02$, ETN 12 vs. 5 %, $p = 0.053$). The C-statistic for predicting late MACE of CMR at 1 week and 6 months was comparable (0.720 vs. 0.746, $p = 0.1$). Only ETN at 1 week (HR 1.31, 95 % CI [1.14–1.52], $p < 0.0001$, per segment) independently predicted late MACE.
CONCLUSIONS. CMR-derived IS at 6 months does not offer prognostic value beyond IS at 1 week after MI. The strongest predictor of late MACE is ETN at 1 week.
REFERENCE(S). 1. Marra MP, et al. MRI in acute myocardial infarction. Eur Heart J. 2011;32(3):284–93. doi:10.1093/eurheartj/ehq409. 2. Mandapaka S, et al. Does late gadolinium enhancement predict cardiac events in patients with ischemic cardiomyopathy? Circulation. 2006;113:2676–8. 3. Hombach V, et al. Sequelae of acute myocardial infarction regarding cardiac structure and function and their prognostic significance as assessed by magnetic resonance imaging. Eur Heart J. 2005;26(6):549–57 (Epub 15 Feb 2005).

0131
REPERCUSSION OF COMPLETE PERCUTANEOUS CORONARY REVASCULARIZATION ON PROGNOSIS OF ELDERLY PATIENTS

M.A. Ramirez-Marrero[1], M.A. Roldan-Jimenez[1], J.L. Delgado-Prieto[1], M. Jimenez-Navarro[2], M. de Mora-Martin[1]

[1]Hospital Carlos Haya, Cardiology, Malaga, Spain, [2]Hospital Clinico Virgen de la Victoria, Cardiology, Malaga, Spain

INTRODUCTION AND OBJECTIVES. Prevalence of ischemic heart disease is increasing due to progressive population ageing. Our aim was to analyze the baseline characteristics of elderly patients undergoing percutaneous coronary revascularization and the impact of the anatomic revascularization in their long term survival.

MATERIALS AND METHODS. Retrospective study of all elderly patients (over 75 years old) consecutively admitted for acute coronary syndrome between January 2008 and December 2009. Complete revascularization was defined according to anatomical criteria, i.e. when no stenosis was greater than 70 % in epicardial coronary arteries or branches of more than 2 mm, assessing their impact on cardiovascular mortality. An average follow-up of 35.4 ± 14 months was performed, being such follow-up completed in 98.6 % of the cases.

RESULTS. A total of 146 patients, with a mean age of 78.22 ± 2.70 years, were included. 90 (62.9 %) were male, 113 (79 %) hypertensive, 66 (46.2 %) had diabetes and dyslipidemia, 78 (54.5 %) showed prior history of angina and 45 (31.5 %) of acute myocardial infarction. Multivessel coronary heart disease was present in 63.6 % of the patients. Revascularization was incomplete in 80 (53.8 %) patients which, compared to patients with complete revascularization, presented a larger number of stenosed vessels (2.44 ± 0.69 vs. 1.32 ± 0.61, p = 0.0001), and a greater history of prior myocardial infarction (23.1 vs. 8.4 %, p = 0.002) and comorbidity (Charlson comorbidity index 19 ± 1.13 vs. 0.80 ± 1.02, p = 0.03). After the follow-up, 18 patients had died of cardiovascular causes, with a predominance of those who had received incomplete coronary revascularization (10.2 vs. 2.9 %, p = 0.03). After adjustment, complete revascularization predicted lower risk of cardiovascular mortality (OR 0.32; 95 % CI 1.05–1.08). On the contrary, the presence of hyperlipidemia and a highest score of Charlson index related to higher cardiovascular mortality (OR 3.02; 95 % CI 1.2–9.2 and OR 1.72, 95 % CI 1.09–2.71, respectively).

CONCLUSIONS. Complete coronary revascularization improves the long-term prognosis in terms of cardiovascular mortality in elderly patients undergoing percutaneous coronary intervention.

0132
PATIENTS ADMITTED WITH DIAGNOSIS OF STABLE ANGINA PECTORIS: CLINICAL PROFILE AND OUTCOME

B. Pérez Villardón[1], A.M. Garcia Bellon[2], A.M. Gonzalez Gonzalez[2], D. Gaitan Roman[2], M. Ramirez Marrero[2], J. Cano Nieto[2], R. Vivancos Delgado[2], M. De Mora Martin[2]

[1]Hospital Carlos Haya/Hospital Comarcal Axarquía, Servicio de Cardiologia, Málaga, Spain, [2]Hospital Carlos Haya, Servicio de Cardiologia, Malaga, Spain

INTRODUCTION. Stable angina is a clinical syndrome attributed to myocardial ischaemia; usually the pathological substrate is the atheromatous narrowing the coronary arteries. The aim of this study is to assess the clinical characteristics of patients (p) referred for coronary angiography with the diagnosis of stable angina.

METHODS. We identified 198p referred for coronary angiography from January 2011–November 2011 with stable angina pectoris as indication. The cardiovascular risk factors (CVRF) were recorded at the time of inclusion, the canadian cardiovascular society functional classification of angina (CCS class) and left ventricular ejection fraction (LVEF). We also evaluated the ischaemia tests performed, the treatment, the results of the coronary angiography, and the short-term outcome.

RESULTS. A total of 198p were included, with a slight predominance of males (61.6 %) mean age of 65 ± 10.4 years. CVRF: 81.8 % high blood pressure, 66.2 % dyslipidemia, 47.5 % current/former smokers, 33.8 % diabetes mellitus, 35.9 % menopause, 11.1 % family history of ischemic disease. Treatment for a depressive disorder was present in 13.6 %. The body mass index was 30.1 ± 4.6 kg/m^2. The average creatinine was 1.1 ± 0.7 mg/dl, 9.6 % had kidney failure and 1.5 % needed dialysis. Peripheral vascular disease history was present in 7.6 %, and previous stroke in 5.6 %.

CCS class: II in 57.6 %, III in 41.9 % and IV in 0.5 %. The LVEF was <50 % in 5.6 %. Sinus rhythm was present in 95 %, mean heart rate 69.8 ± 11.1 bpm.

A previous ischaemia test was performed in 65.6 %: exercise test (22.7 %), cardiac gammagraphy (28.3 %), stress echo (1 %), cardiac-CT (5 %), ≥2 tests (8.6 %). These tests were conclusive in 85.4 % and concordant with the coronariography results in 61 %. The radial artery access was used in 70.7 %. The coronariography results were: normal coronary arteries (26.3 %), diffuse non-obstructive disease (14.6 %), slow flow (3 %), milking (1 %), 1-vessel disease in 30.8 %, 2-vessel in 11.6 %, 3-vessel or left main stenosis in 12.1 %. The left anterior descending coronary artery was the most frequent involved (31.4 %). A percutaneous coronary intervention was performed in 41.4 %, and coronary artery bypass grafting in 8 %. The revascularization was complete in 79.6 %; in 54.8 % were used drug eluting stents. During the in-hospital stay, 10p (5.1 %) had any complication: 1p nosocomial urinary tract infection, 2p haematomas that required an imaging test, 2p atrial arrhythmias, 3 acute myocardial infarction post-procedure, 1 coronary dissection, 1 cardiogenic shock. During the follow-up, 21p (10.6 %) suffered any MACE, and in 19p (9.6 %) a new coronariography was performed: 13p had no changes, 4p had bare metal stent restenosis, 2p had coronary artery spasm.

CONCLUSIONS. Patients suspected of stable angina pectoris have a high comorbidity. Frequently they have non-obstructive coronary artery disease (45.4 %). The coronariography is a safety procedure with a low rate of complications.

0133
NON INVASIVE CORONARY ANGIOGRAPHY BY 64-SLICE COMPUTED TOMOGRAPHY: PREVALENCE OF OBSTRUCTIVE CORONARY DISEASE

M.A. Ramirez Marrero[1], A.M. Garcia Bellon[1], B. Perez Villardon[1], A.M. Gonzalez Gonzalez[1], D. Gaitan Roman[1], M. De Mora Martin[1]

[1]Hospital Carlos Haya, Servicio de Cardiologia, Malaga, Spain

INTRODUCTION. Coronary computed tomography of 64 slices (CT 64) has shown a high negative predictive value. The aim of this study is to evaluate the presence of obstructive coronary artery disease in patients without a history of known coronary artery disease (CAD) undergoing CT 64.

MATERIALS AND METHODS. We evaluated 80 patients undergoing CT 64 from September 2008–September 2011. We excluded patients with previous CAD, acute coronary syndrome, typical clinical for ischemic heart disease, severe renal insufficiency and patients with a history of allergic reactions to iodinated contrast. We used a Philips Brilliance CT 64 scanner. We used contrast of low osmolarity. In patients with high heart rate we used esmolol iv. In all procedures sublingual nitroglycerin was used.

RESULTS. We analyzed 80 patients, with a slight predominance of males (58.8 %), mean age 57.9 years. Regarding cardiovascular risk factors, highlights: 66.3 % were hypertensive, 58.8 % had dyslipidemia, 50 % were diabetics, 41.3 % were overweight, 26.3 %were obese, 28.8 % were active smokers, 31.3 % were former smokers. 35 % had a family history of ischemic heart disease. Reason for request CT: 41.3 % atypical chest pain, 16.3 % unexplained dyspnea, 22.5 % pathological ECG, 2.5 % prior to start vigorous exercise, 17.5 % prior to non cardiac surgery. 41.2 % had previously performed another test of ischemia: 25 % scintigraphy, 8.8 % wall motion abnormalities on echocardiogram, 7.5 % non-conclusive stress test.

Agatston Score was <10 in 27.5 %, 11–100 in 38.8 %, 101–400 in 22.5 %, 401–1,000 in 8.8 %, >1,000 in 2.5 %. Coronary lesions were found in 59 p (73.8 %): 30 % fibrocalcified plate, 18.8 % calcified plaque, 18.8 % fibrofatty plate, 5 % ulcerated plaque, 1.3 % thrombotic lesion. We found significant lesions in 20 p (25 %): 6.3 % in DA, 6.3 % in CD, 2.5 % in Cx, 1.3 % LM lesion, 2.5 % two-vessel disease, 6.3 % 3-vessel disease.

CONCLUSIONS. The presence of obstructive lesions was observed in 25 %. Thus, the use of TC 64 for the evaluation of patients with suspected CAD and ischemia induction studies negative or non-conclusive significantly helps in the actual characterization of coronary disease.

Mechanical ventilation: current practice and novel ideas: 0135–0148

0135
EFFECTS OF INHALED NITROGLYCERIN COMPARED WITH INHALED ILOPROST IN PATIENTS WITH HYPOXEMIC ACUTE RESPIRATORY DISTRESS SYNDROME

K. Trongtrakul[1], A. Wongsa[1], K. Piyawechvirutana[1]

[1]Pramongkutkloa Hospital, Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, Bangkok, Thailand

INTRODUCTION. Nitric oxide and iloprost have been used to improve oxygenation as inhaled pulmonary vasodilators for improving V/Q mismatch, one mechanism of hypoxemia in ARDS. Although there are quite costly and some requires sophisticated machine. We assumed nitroglycerin, a nitric oxide donor, was comparable with iloprost for treating hypoxemia in ARDS.

OBJECTIVES. To investigate the effects of inhaled nitroglycerin versus inhaled iloprost on improving oxygenation in hypoxemic ARDS patients.

METHODS. We conducted a prospective randomized crossover study within patients comparison in ten ARDS patients, 15 treatment episodes with moderate to severe ARDS, at MICUs of Pramongkutklao Hospital. The ARDS patients were randomized to received 15 min nebulization of nitroglycerin (10 mcg/kg) or iloprost (5 mcg) as an initial medication followed by a crossover to other agent after 60 min. Hemodynamic, lung mechanic and oxygenation variables was measured before (minute-0), immediately after (minute-15) and 30 min (minute-45). Both medications were nebulized using ultrasonic nebulizer. Primary outcome was comparative effects of nebulized nitroglycerin versus iloprost to oxygen variables. Secondary outcome was the adverse effect of nitroglycerin measured by methemoglobin level before and after nebulization.

RESULTS. Ten ARDS patients had mean age of 67 ± 16 years old, body weight of 56 ± 10 kg. Pneumonia was the most common causes of ARDS. Nine were moderate and one was severe ARDS classified by ARDS Berlin Definition 2012. Average baseline parameters of 15 treatment episodes in ten ARDS patients include tidal volume of 8 ± 2 ml/kg PBW, PEEP of 13 ± 3 cmH_2O, PF ratio of 157 ± 41 and respiratory compliance of 24 ± 7 ml/cmH_2O. The primary outcome showed that the mean difference in oxygenation variables between baseline and minute-15 after received inhaled nitroglycerin or iloprost as monitored by PaO_2, SaO_2, and PF ratio were 0.2 ± 1.8 versus 4.3 ± 2.6 mmHg, − 0.3 ± 0.3 versus 0.4 ± 0.3 percent, and 0.7 ± 3.5 versus 8.3 ± 5.1, respectively. The mean differences in oxygenation variables, when compared between inhaled nitroglycerin and iloprost indicated that inhaled iloprost resulted in more change in PaO_2, SaO_2, and PF ratio, but were not significant (4.1 ± 3.6 mmHg, p = 0.28; 0.7 ± 0.4 percent, p = 0.80; and 7.6 ± 6.79, p = 0.28, respectively). In regards to adverse effects, methemoglobin level was measured before, minute-15, and minute-45 after inhale nitroglycerin. The levels measured at the three points of time were 0.18 ± 0.12, 0.24 ± 0.13, and 0.21 ± 0.08 percent, respectively but the difference was not statistically significant (p = 0.44).

CONCLUSIONS. Among hypoxemic ARDS patients using ultrasonic nebulizer for inhaled iloprost 5 mcg has a better trend of oxygenation detected by PaO_2, SpO_2, and PF ratio, as compared to inhaled nitroglycerin 10 mcg/kg but were not statistically significant.

GRANT ACKNOWLEDGMENT. The Thai Society of Critical Care Medicine.

0136
SPONTANEOUS EFFORT CAUSES OCCULT PENDELLUFT DURING MECHANICAL VENTILATION

T. Yoshida[1,2], V. Torsani[2], S. Gomes[2], R.R.D.S. Santiago[2], M. Beraldo[2], M.R. Tucci[2], W.A. Zin[3], B.P. Kavanagh[4], M.B.P. Amato[2]

[1]Osaka University Graduate School of Medicine, Department of Anesthesiology and Intensive Care Medicine, Suita, Japan, [2]Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Heart Institute (InCor), São Paulo, Brazil, [3]Universidade Federal do Rio de Janeiro, Instituto de Biofísica Carlos Chagas Filho, Rio de Janeiro, Brazil, [4]University of Toronto, Hospital for Sick Children, Departments of Critical Care Medicine and Anesthesia, Toronto, Canada

INTRODUCTION. Traditionally, we assume that diaphragmatic contraction uniformly lowers pleural pressure (P_{pl}) by the same amount at all points on the lung surface, creating a uniform increase in transpulmonary pressure [1, 2]. This assumption (i.e. the fluid-like behavior of normal lungs) has been the basis of the use of esophageal pressures, also explaining why spontaneous breathing augments ventilation and gas exchange. However, in a typical patient with injured lungs, we recently observed a Pendelluft phenomenon:

movement of air within the lung—from non-dependent to dependent regions, without overall change in lung volume. The regional (non-dependent) lung deflation was occurring simultaneously to the diaphragmatic contraction, in a pattern not previously described. Lung heterogeneities might explain different rates of lung expansion occurring during inspiration—but not a simultaneous deflation.

OBJECTIVES. We hypothesized that, contrary to traditional concepts, negative P_{pl} generated by diaphragmatic contraction might not be transmitted all over the lung surface in the setting of injured lungs, but rather *localized* to dependent lung, and that such locally concentrated P_{pl} would cause Pendelluft.

METHODS. We used EIT and dynamic CT to analyze regional inflation in anesthetized pigs with lung injury vs. normal lungs. P_{pl} in dependent lung was measured using intrapleural catheters, and the additional airway pressure needed to achieve comparable dependent lung inflation during paralysis vs. spontaneous breathing was estimated.

RESULTS. In all lung-injured animals (n = 7), spontaneous breathing caused Pendelluft, which was associated with more negative local P_{pl} in dependent regions vs. esophageal pressure (-14.3 ± 3.3 vs. -7.1 ± 2.1 cmH_2O, $P < 0.01$). In contrast, in normal lungs, we observed simultaneous inflation of different lung regions during spontaneous breathing, consistent with fluid-like behavior of the lung. Dynamic CT confirmed the Pendelluft, which occurred despite limitation of tidal volume to <6 mL/kg. Comparable over-inflation of dependent lung during paralysis required almost 3-fold greater driving pressure (and tidal volume) vs. spontaneous breathing (28.0 ± 0.5 vs. 10.3 ± 0.6 cmH_2O, $P < 0.01$; 14.8 ± 4.6 vs. 5.8 ± 1.6 mL/kg, $P < 0.05$).

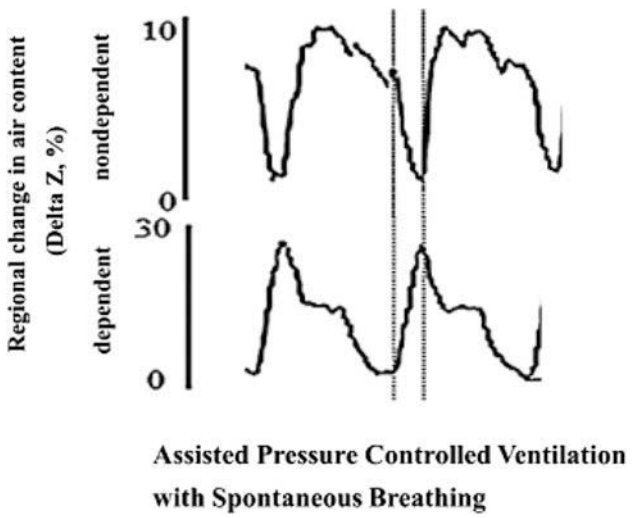


Fig. 1

CONCLUSIONS. 1. Pendelluft may constitute a novel mechanism of ventilator-induced lung injury. The observed overstretch of the dependent lung could cause occult local injury, which cannot be detected (and therefore avoided) using conventional monitoring. 2. Pendelluft occurs because, in contrast to normal lung, the injured lung does not exhibit fluid-like behavior, and in this case the transmission of local changes in pleural pressure is heterogeneous. In this context, a single spatial measurement (e.g. esophageal pressure monitoring) does not represent an overall change in P_{pl}.

REFERENCES. 1. Hoppin FG Jr., et al. J Appl Physiol. 1969;27:863. 2. D'Angelo E, et al. J Appl Physiol. 1974;37:311.

Grant. CAPES, FINEP, LIM09

0137

AUTOMATIC DYNAMIC HYPERINFLATION AND ASYNCHRONY DETECTION DURING MECHANICAL VENTILATION USING THE RANDOM-DISTORSION TEST AND THE CURVEX PLATFORM

E. L'Her[1,2], F. Lellouche[3], Q.-T. Nguyen[4], D. Pastor[4]

[1]Université de Bretagne Occidentale, CHRU de Brest, LATIM INSERM UMR 1101, Brest, France, [2]CHU de Brest, Université de Bretagne Occidentale, Réanimation Médicale et Urgences Adultes, Brest, France, [3]Université Laval, Centre de Recherche IUCPQ, Québec, Canada, [4]Telecom Bretagne, Lab-STICC CNRS UMR 6285, Brest, France

INTRODUCTION. Patient-ventilator asynchrony has been associated with adverse outcomes, and patients with high rates of asynchronies (as defined by an asynchrony index (AI) of greater than 10 %) are characterized by longer durations of mechanical ventilation and ICU stay.

OBJECTIVES. The purpose of this study was to assess the performance of an automatic flow and pressure curve analysis to detect dynamic hyperinflation and specific patterns of asynchrony.

METHODS. We performed a retrospective analysis on a noninvasive ventilation pressure and flow curves database; from these files, 20 cycles/sequences were blindly selected, after at least 5 min of signal stabilization for each patient. Oesophageal pressure was measured in all cases, in order to validate the occurrence of ineffective efforts. Flow curves were independently analyzed by two different experts, who classified them as having or not the different abnormalities that were monitored and assigned an AI for each. Curvex automatically evaluated the same sequences. Curvex is a signal treatment platform, based on the random-distortion test [1] and multiple mathematical algorithms that automatically detect dynamic hyperinflation (i.e. intrinsic PEEP) [2], and various types of asynchronies: ineffective efforts, short and prolonged inspiration, double and multiple triggering. It allows providing the clinician an overall AI value and the qualification of the different types of asynchrony.

RESULTS. Twenty-five sequences (604 cycles) were evaluated in 18 patients. Mean AI was 16 ± 3 % [0–52]. AI evaluated by Curvex was well correlated to the gold standard (rho = 0.985; $p < 0.0001$), with a low estimation bias (d = 0; see Fig. 1). Automatic AI evaluation depicted a 93 % Se, 99 % Sp, 94 % positive predictive value and a 98 % negative predictive value. When an asynchrony and/or intrinsic PEEP was detected, automatic qualification was always in agreement with the experts.

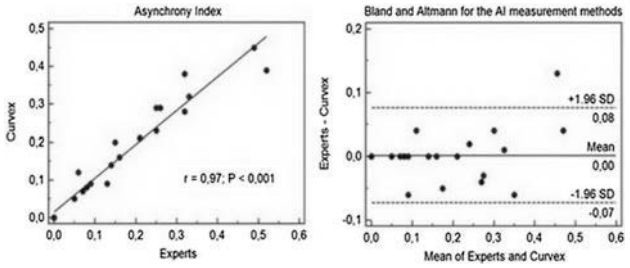


Fig. 1

CONCLUSIONS. In this study, the random-distortion test and the Curvex platform classified breaths as intrinsic PEEP and asynchronies in close agreement with experts.

REFERENCE(S). 1. Pastor D, Nguyen Q-T (2012) Testing the Mahalanobis distance between a random signal with unknown distribution and a known deterministic model in additive and independent standard Gaussian noise: the random distortion testing problem. Rapports Telecom Bretagne; RR-2012-04-SC. 2. Nguyen QT, Pastor D, L'her E. Automatic detection of AutoPEEP during controlled mechanical ventilation. Biomed Eng Online. 2012;11:32.

GRANT ACKNOWLEDGMENT. This study was supported by the "Fonds de Maturation Région Bretagne" 2012.

0138

SAFETY AND EFFICACY OF VENTILATION DELIVERED BY A FULL AUTOMATED MODE (INTELLIVENT-ASV): A RANDOMIZED CONTROLLED STUDY

E. Bialais[1], L. Vignaux[2], X. Wittebole[1], D. Novotni[2], J. Meyer[2], M. Wysocki[2], T. Sottiaux[3], G. Reychler[4], J. Roeseler[1], P.-F. Laterre[1], P. Hantson[1]

[1]Saint Luc University Hospital, Intensive Care, Brussel, Belgium, [2]Hamilton Medical AG, Bonaduz, Switzerland, [3]Clinique Notre-Dame de Grâce, Intensive Care, Gosselies, Belgium, [4]Saint Luc University Hospital, Pneumology, Brussel, Belgium

INTRODUCTION. Intellivent-ASV is a full closed-loop mechanical ventilation mode which keeps $EtCO_2$ and SpO_2 within expert-based target ranges, based on the patient's characteristics and clinical condition (normal lung, ARDS, chronic hypercapnia or brain injury). Safety and efficacy have been demonstrated over short period of time in post-operative and ICU patients [1, 2].

OBJECTIVES. This prospective randomized controlled study compared safety (time spent in sub-optimal ventilation ranges), efficacy (time spent in optimal ventilation ranges), and number of manual adjustments between Intellivent-ASV and conventional ventilation over a 48 h period.

METHODS. Patients mechanically ventilated for at least 48 h were randomized to be ventilated on Intellivent-ASV or conventional ventilation using a S1-ventilator (Hamilton medical AG, Bonaduz, Switzerland). For conventional ventilation, settings were determined by the clinician in charge of the patient. Ventilation and oxygenation parameters were recorded breath by breath and blood gases were performed every 6 h. The ventilation ranges were defined by a panel of expert [3]. Time spent in ventilation ranges was calculated for SpO_2, $EtCO_2$, tidal volume (Vt) and respiratory rate (RR). Clinicians in charge of the patient could adjust manually ventilator settings at any time.

RESULTS. Eighty patients aged 59 [46–70] years, with an APACHE II 24 [18–29], were included. 42 were ventilated with Intellivent-ASV and 38 with conventional ventilation. Characteristics at inclusion were not statistically different between the groups. In the Intellivent-ASV group, the study had to be stopped for 2 patients: one pneumothorax not in relation to the ventilation and one respiratory drive increased caused by severe metabolic acidosis.

Safety and efficacy over the 48 h

	Safety: time spent in sub optimal range (%)			Efficacy: time spent in optimal range (%)		
	Intellivent-ASV	Conventional	p	Intellivent-ASV	Conventional	p
SpO_2	1 [0–2]	1 [0–4]	0.097	91 [78–98]	69 [49–96]	0.014
$EtCO_2$	0 [0–0]	0 [0–2]	0.854	93 [60–99]	90 [36–99]	0.338
Vt	1 [0–2]	1 [0–2]	0.328	91 [82–97]	82 [40–93]	0.016
RR	1 [0–4]	2 [0–6]	0.158	87 [60–96]	83 [62–95]	0.732

Intellivent-ASV required less manual adjustments than conventional ventilation (3 [1–5] vs. 13 [8–19] manual adjustments over the 48 h, $p < 0.001$). Total number of adjustments was significantly higher with Intellivent-ASV (275 [145–437] vs. 13 [8–19], $p < 0.001$).

CONCLUSIONS. Over a 48 h period, Intellivent-ASV was able to provide ventilation as safe and efficient as conventional ventilation, without generating additional risk for the patient. In addition, the number of manual adjustments was dramatically reduced.

REFERENCE(S). 1. Arnal et al. Intensive Care Med. 2012;38:781–7. 2. Lellouche et al. Intensive Care Med. 2013;39(3):463–71. 3. Wysocki et al. Intensive Care Med. 2010;35:S106.

GRANT ACKNOWLEDGMENT. This study was supported by Hamilton Medical.

0139

PREDICTIVE VALUE AND INTER-PROFESSIONAL UTILISATION OF INDICES OF OXYGENATION IN THE FIRST 24 H OF 3130 VENTILATED ICU ADMISSIONS TO A CENTRAL LONDON ICU

F. Wade-Smith[1], C. Bell[1], A. Feehan[1], K. Peters[1], G. Parsons[1], P.A. Hopkins[1]

[1]King's College Hospital NHS Foundation Trust, London, UK

INTRODUCTION. Adult respiratory distress syndrome (ARDS) is a major cause of oxygenation failure in patients admitted to intensive care and can be a cause and a consequence of critical illness. However, ARDS is a highly dynamic condition and early categorisation of severity and prediction of outcome have proved difficult [1, 2]. Recently a new definition has been applied in an effort to improve the clinical management and research of this condition [3].
OBJECTIVES. Using the APACHE II oxygenation values we tested the predictive value of early composite oxygen indices in 3,130 consecutive ventilated admissions (obtained over a 21 month period). We also applied the three Berlin ARDS PaO_2/FiO_2 ratios to this same population to compare outcome differences in the absence of other definition components. Finally we surveyed the inter-professional use and understanding of these descriptions of oxygenation failure when used in the first 24 h.
METHODS. Institutional ethical approval and statistical support was obtained. *Survey-monkey* supported the interprofessional survey of nurse, therapists and physicians. Data were extracted from the clinical information system (Medtrack; Medical associated Software House). The strength of individual clinical and physiological variables with death were tested with Chi squared tests for categorical data and Mann–Whitney *U* for numeric data. This information was used for step wise linear regression in a multivariate model (Sigmaplot version 11.0; Systat Software Inc).
RESULTS. Table 1 shows the results of applying the PaO_2/FiO_2 component (APACHE II) of the Berlin ARDS definitions in our ICU population. Data are mean (SD), median (IQR), or n (%). MILD PaO_2/FiO_2 <40, Moderate PaO_2/FiO_2 <26.6, Severe PaO_2/FiO_2 <13.3 kPa.

Outcomes by Berlin PaO_2/FiO_2 extracted from APACHE

PaO_2/FiO_2 category	No	Mild	Moderate	Severe
Admitted to ICU	1331 (42.5 %)	898 (28.7 %)	692 (22.1 %)	209 (6.7 %)
Mean age	52.3	60.1	60.3	58.0
APACHE II (mean)	13.2	17.1	19.8	23.8
APACHE II (median; IQR)	12 (8, 18)	17 (12, 21)	19 (15, 24)	23 (18, 30)
ICU LOS (mean) days	5.0	6.5	8.1	9.1
Hosp LOS (mean) days	25.1	27.9	25.6	22.5
ICU mortality	126 (9.5 %)	144 (16 %)	170 (24.6 %)	96 (45.9 %)
Hospital mortality	184 (13.8 %)	221 (24.6 %)	241 (34.8 %)	101 (48.3 %)
Mortality by full Berlin criteria		20 %	41 %	52 %

In the multivariate model, correcting for age and chronic health, PaO_2/FiO_2 (OR 1.16; 1.09–1.23) and oxygenation index (OR 1.53; 1.49–1.59) had small but significant associations with outcome. In our inter-professional survey we found that oxygenation index was not routinely calculated; that the dynamic nature of ARDS/oxygenation indices was poorly understood; and that the Berlin definitions were not yet being applied.
CONCLUSIONS. Crude Berlin definition PaO_2/FiO_2 ratios did provide a guide to outcome and length of stay, but isolated static oxygenation indices corrected for confounders had only limited utility in predicting survival. The inter-professional understanding and use of these descriptions of oxygenation failure was limited, and does not reflect the evidence base.
REFERENCE(S). 1. Doyle RL, et al. Identification of patients with acute lung injury: predictors of mortality. Am J Respir Crit Care Med. 1995;152:1818–24. 2. Monchi M, et al. Early predictive factors of survival in the acute respiratory distress syndrome. A multivariate analysis. Am J Respir Crit Care Med. 1998;158:1076–81. 3. ARDS Definition Task Force. Acute respiratory distress syndrome: the Berlin Definition. JAMA. 2012;307: 2526–33.

0140
EFFECTS OF TWO VENTILATORY PATTERNS DURING VARIABLE VENTILATION IN HEALTHY LUNGS UNDER ANESTHESIA

V.G.L. Mancin[1], L.M. Camilo[1], M.B. Ávila[1], L.F. Cruz[1], G.C.M. Ribeiro[2], L.H. Travassos[1], W.A. Zin[1], A.R. Carvalho[1]

[1]Federal University of Rio de Janeiro, Carlos Chagas Filho Biophysics Institute, Rio de Janeiro, Brazil, [2]Federal University of Rio de Janeiro/COPPE, Biomedical Engineering Program, Rio de Janeiro, Brazil
INTRODUCTION. Mechanical ventilation is essential at general anesthesia. However it can exacerbate previous lung injuries as well as induce it in healthy lungs. To minimize these damages, many protective ventilatory strategies such as variable ventilation have been proposed (Spieth 2009).
OBJECTIVES. In this study we aimed to evaluate the effects of two different ventilatory patterns in pulmonary function and gas exchange during variable ventilation in healthy lungs under anesthesia.
METHODS. Twelve male Wistar rats (±250 g) were sedated, anesthetized, paralyzed and mechanically ventilated in volume-controlled mode, tidal volume: 6 ml/kg, ZEEP, respiratory rate: 90 bpm, I:E ratio: 1:2 and F_iO_2: 0.5. To obtain PEEP of minimal Ers ($PEEP_{minErs}$), a recruitment maneuver (RM) was performed by sequentially increasing PEEP until 8 cmH_2O, followed by PEEP titration during exhalation. A new RM was performed to set $PEEP_{minErs}$. The animals were divided into 2 groups: VV (n = 6), in which animals were ventilated with cycle by cycle tidal volume variation, from Gaussian distribution (with variation coefficient of 10 %) and VVburst (n = 6), in which animals were ventilated with the same criteria but the Gaussian distribution was divided in 4 quartiles sequences, as follows: 4°, 1°, 3°, 2°; being the 4° quartile the higher volume and 1° quartile the lower. Airway pressure, flow, blood pressure and heart rate were continuously monitored. The respiratory mechanics was estimated cycle to cycle by the least squares method, and measures of respiratory variables were the Ers and the fraction of volume-dependent elastance (%E2). Arterial blood gases were analyzed after 5 and 120 min on VV, and 15, 30, 45, 60, 75, 90, 105 e 120 min on VVburst. The study was approved by the institutional animal ethics committee.
RESULTS. At the end of 2 h of ventilation, both groups showed respiratory mechanics impairment, with increase in Ers (VVburst, 5.22 vs VV, 4.8 cmH_2O/mL s), and lower $\%E_2$ in VVburst than VV (7.48 vs 14.07 %, respectively). Concerning blood gases, animals ventilated with VV displayed an increase in oxygenation at the end of experiment, which was not observed in VVburst group (VV 0.23 ± 0.11 vs VVburst 0.18 ± 0.16).
CONCLUSIONS. The use of VV showed a better alveolar stability level and gas exchange than a use of a specific pattern of variability (VVburst) in healthy lungs under anesthesia. We consider that the random pattern of ventilation within a Gaussian distribution seems to be beneficial when compared to a variable ventilation with a deterministic pattern.
REFERENCE(S). 1. Spieth PM, et al. Variable tidal volumes improve lung protective ventilation strategies in experimental lung injury. Am J Respir Crit Care Med. 2009;179:684–93.
GRANT ACKNOWLEDGMENT. CNPq, FAPERJ.

0141
MECHANICAL VENTILATION WITH HELIOX IN A RAT MODEL OF ACUTE RESPIRATORY DISTRESS SYNDROME

C.J.P. Beurskens[1,2], H. Aslami[2], F.M. de Beer[1,2], M.B. Vroom[1], N.P. Juffermans[1,2]

[1]Academic Medical Center, University of Amsterdam, Department of Intensive Care, Amsterdam, The Netherlands, [2]Academic Medical Center, University of Amsterdam, Laboratory of Experimental Intensive Care and Anesthesiology, Amsterdam, The Netherlands
INTRODUCTION. Low tidal volume ventilation with use of limited plateau pressures is protective in Acute Respiratory Distress Syndrome (ARDS). Helium has a lower density than nitrogen. Also, diffusion capacity of CO_2 is increased. Therefore, mechanical ventilation using a gas mixture with oxygen in helium (heliox) instead of oxygen in air may improve gas exchange.
OBJECTIVES. We hypothesized that heliox allows for lower minute volume ventilation and inspiratory pressures while maintaining gas exchange in a rat ARDS model.
METHODS. Sprague–Dawley rats (N = 8) were intratracheally challenged with 1 mg/kg LPS from Escherichia Coli and mechanically ventilated with helium/oxygen (50 %/50 %) for 4 h. Healthy controls received saline and were ventilated with oxygen/air (50 %/50 %). Tidal volume was targeted at 6 ml/kg by adjusting positive inspiratory pressures by using a rodent pneumotachometer. PEEP was set at 5 cmH_2O and inspiration to expiration ratio at 1:2. The respiratory rate was adjusted to maintain arterial pCO_2 within 4.5–6.0 kPa, according to hourly drawn arterial blood gases. After 4 h of mechanical ventilation, rats were bled and bronchoalveolar lavage fluid (BALF) was collected. Data was analyzed by 1-way ANOVA or Kruskal–Wallis, according to the distribution and expressed as mean ± SD.
RESULTS. LPS resulted in ARDS, evidenced by significantly increased pulmonary cell influx, BALF protein levels and BALF levels of IL-1β, IL-6, TNF-α and CINC3. In ARDS, higher respiratory rates, minute volume and peak inspiratory pressures were applied to target preset tidal volumes compared to healthy controls, whereas lung compliance was significantly lower ($P < 0.05$ for all). The relative increase between end of experiment and baseline of peak inspiratory pressures in ARDS versus healthy controls ventilated with oxygen/air (52 ± 26 vs. 6.2 ± 19 %, $P < 0.01$) was partly abrogated in animals ventilated with heliox (45 ± 32 vs. 16 ± 18 %, ns). Also the relative decrease in lung compliance in ARDS versus healthy controls ventilated with oxygen/air (−34 ± 13 vs. −2 ± 21 %, $P < 0.05$) was partly abrogated during heliox ventilation (26 ± 18 vs. 12 ± 14 %, ns). Minute volume ventilation increased compared to baseline in ARDS versus healthy controls ventilated with oxygen/air (31 ± 8 vs. 11 ± 8 %) and in heliox ventilated animals (26 ± 14 vs. 6 ± 5 %, $P < 0.05$ for both). As per protocol, heliox did not affect CO_2 levels in ARDS compared to ventilation with oxygen/air (pCO_2 5.8 ± 1.3 kPa vs. 5.8 ± 0.8 kPa, ns), nor was pO_2 affected (28.8 ± 3.4 vs. 28.5 ± 3.9 kPa, ns). Also, heliox did not reduce any of the inflammatory parameters in ARDS.
CONCLUSIONS. Heliox modestly improved lung compliance in LPS-induced ARDS, without allowing for lower minute volume ventilation. There was no effect on inflammation.

0142
INTRAPULMONARY PERCUSSIVE VENTILATION SUPERIMPOSED TO CONVEN TIONAL MECHANICAL VENTILATION: COMPARISON BETWEEN VOLUME-CONTROLLED AND PRESSURE-CONTROLLED MODE. A BENCH STUDY

G. Riffard[1], J. Buzenet[2], C. Guérin[3,4,5]

[1]Hopital Nord, Réanimation Polyvalente, Saint-Etienne, France, [2]Haute Ecole Ingenieur, Lille, France, [3]Hôpital de la Croix Rousse, Réanimation Médicale, Lyon, France, [4]Université de Lyon, Lyon, France, [5]INSERM 1044, Créatis, Lyon, France
INTRODUCTION. Intrapulmonary percussive ventilation (IPV) can be added to conventional mechanical ventilation to improve secretions clearance in patients receiving invasive ventilation. Previous bench study suggested that dynamic hyperinflation may occur if IPV was superimposed to volume-controlled mode (VC). We tested the hypothesis that pressure-controlled mode (PC) would protect against this risk.
OBJECTIVES. To assess on the bench the impact of VC vs. PC from 5 ICU ventilators on delivered tidal volume and lung pressure during IPV.
METHODS. Each of the 5 ICU ventilators tested was connected to IPV device cone adaptor, which was attached to lung model (compliance 30 ml cmH_2O^{-1} resistance 20 cmH_2O s L^{-1}). We measured inspired tidal volume (VTI), airway opening pressures between lung model inlet and cone adaptor, and lung pressure. Measurements were first performed IPV off and ICU ventilator set in VC or PC mode targeting inspiratory tidal volume 500 ml. For each mode, 0.8 or 1.5 s inspiratory time and 7 or 15 cmH_2O PEEP were tested. The experiments were repeated while IPV set at 20 or 30 PSI working pressure. Differences in VTI (ΔVTI) and lung pressure between IPV off and on were the dependent

variables. The effect of VC or PC mode was tested between ICU ventilators for inspiratory time, PEEP and IPV working pressure using repeated measures analysis of variance.
RESULTS. For 0.8 s inspiratory time and 20 PSI working pressure IPV the mean values of DVTI were systematically positive in VC and systematically negative in PC mode and, hence were significantly greater with the former than with the latter. PEEP had no effect on DVTI. For 1.5 s inspiratory time and 20 PSI working pressure IPV and for both inspiratory times at each working pressure IPV, mode and PEEP had significant effect on DVTI. The greatest magnitude in DVTI was observed for 1 0.5 s inspiratory time and 30 PSI working pressure IPV (Table 1). Same findings pertained to lung pressure. *$P < 0.05$ vs. VC **$P < 0.05$ across ventilators.

Table 1

Ventilator**	DVTI (ml) PC PEEP 7	DVTI (ml) PC PEEP 15	DVTI (ml) VC PEEP 7	DVTI (ml) VC PEEP 15
A	−176 ± 6*	−112 ± 15*	369 ± 16	288 ± 8
B	−27 ± 25*	−18 ± 2*	338 ± 11	295 ± 11
C	−73 ± 7*	−34 ± 4*	264 ± 6	171 ± 15
D	−66 ± 11*	−9 ± 18*	258 ± 4	180 ± 5
E	−68 ± 4*	−62 ± 11*	268 ± 17	224 ± 8

CONCLUSIONS. When using IPV combined to conventional mechanical ventilation PC mode should be used to prevent lung hyperinflation. A 20 PSI working pressure should be preferred over 30 PSI.

0143
PATIENT-VENTILATOR INTERACTION USING TIME-VARYING PULMONARY MECHANICS: A RETROSPECTIVE COMPARISON BETWEEN PRESSURE SUPPORT AND NEURALLY ADJUSTED VENTILATORY ASSIST

Y.S. Chiew[1], E.J. van Drunen[1], S. Poole[1], B. Lambermont[2], P. Morimont[2], N.S. Damanhuri[1], C. Pretty[3], G.M. Shaw[4], T. Desaive[3], J.G. Chase[1]

[1]University of Canterbury, Mechanical Engineering, Christchurch, New Zealand, [2]University Hospital of Liege, Medical Intensive Care Unit, Liege, Belgium, [3]University of Liege, GIGA-Cardiovascular Sciences, Liege, Belgium, [4]Christchurch Hospital, Department of Intensive Care, Christchurch, New Zealand

INTRODUCTION. Neurally adjusted ventilatory assist (NAVA) ventilation has been shown to improve patient-ventilator interaction compared to pressure support (PSV). However, quantifying variability and patient-ventilator interaction is difficult and tedious. Thus, these investigations are often retrospective and not feasible in real-time.
OBJECTIVES. This study presents a model-based method that can be applied in real-time to monitor breath-to-breath mechanics, comparing patients ventilated in two different ventilation modes.
METHODS. Airway pressure and flow from 22 patients ventilated with a Servo-I ventilator (Maquet, Solna, Sweden) using PSV and NAVA ventilation modes was recorded, each for 20 minutes[1]. Data was obtained using the Servo-tracker V4.0 (Maquet, Solna, Sweden). Patient-specific $E_{drs}(t)$ was calculated using Eq. (1) and mapped across each ventilation mode.

$$P_{aw}(t) = R_{rs} \times Q(t) + E_{drs}(t) \times V(t) + P_0 \quad (1)$$

P_{aw} is the airway pressure, t is time, R_{rs} is a patient-specific constant resistance of the conducting airway, Q is the air flow, V is the lung volume and P_0 is the offset pressure. The resulting $E_{drs}(t)$ map for each patient and ventilation mode are compared using peak and average elastance across all breaths.

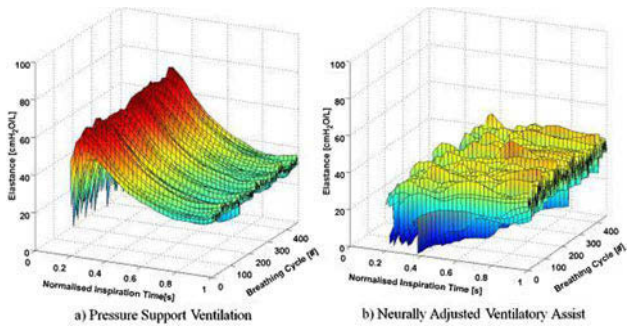


Fig. 1 Edrs Map PS and NAVA

RESULTS. PSV has a higher peak and average elastance ($p < 0.05$) for 15 of 22 patients. PSV was more consistent in shape across breaths and had a different shape than NAVA, as seen in the figure below. PSV consistently provides the same pressure support regardless of underlying patient demand, whereas NAVA matches delivery to patient-specific demand and diaphragmatic signal (*Eadi*)[2].
CONCLUSIONS. Lower elastance indicates less risk of overstretching or ventilator induced injury. Thus, monitoring time-varying pulmonary mechanics can provide clinically useful information to guide ventilation, identify the level of pressure support, and guide ventilation mode selection.
REFERENCES. 1. Piquilloud et al. Intensive Care Med. 2011;37:263–71. 2. Moorhead et al. J Clin Monit Comput. 2012, 1–10.

0144
TALON: TIDAL VOLUME CONTROL IN ICU—HOW CONSERVATIVE ARE WE WITHOUT PROTOCOLS?

K. Orr[1], J. Guy[1], L. McNeill[1], A. Ferguson[1], T. Price[1]

[1]Craigavon Area Hospital, Portadown, UK

INTRODUCTION. Lung-protective ventilation (LPV) is well established in acute respiratory distress syndrome (ARDS) but may have wider benefits [1]. LPV studies in patients without ARDS have used tidal volumes (TV) of 6–9 ml/kg predicted body weight (PBW). It is important to understand current ventilator practice in non-ARDS patients to assess relevance of study data.
OBJECTIVES. This was a pilot observational study of TV profile for ventilated patients in a district general hospital without a formal policy on TV goals in non-ARDS.
METHODS. Data was prospectively collected on 50 consecutive ventilated patients for the first 7 days of ICU stay, including demographics, ventilator settings, ICU length of stay (LOS) and outcome. One patient met criteria for ARDS and was excluded from analysis. A cut-off for LPV of 8.5 ml/kg PBW was chosen based on mean TV in LPV studies to date. Ventilator mode was pressure-regulated volume control then pressure support.
RESULTS. Patient characteristics are shown in Table 1. Mean ± SEM duration of ventilation (DOV) was 53.8 ± 7 h (67.8 ± 9.79 h in men and 40.3 ± 9.1 h in women, $p = 0.05$). Overall mean TV was 8.47 ± 0.19 ml/kg PBW. 59.2 % of patients met LPV criteria and this group had a mean TV of 7.6- ± 0.16 ml/kg PBW compared to 9.7 ± 0.19 in the non-LPV patients. There were no differences in BMI, actual weight, LOS, DOV, or outcome between LPV and non-LPV groups. Females spent a greater proportion of ventilated time in non-LPV ventilation (56.8 ± 7.9 % of ventilated time vs 30.6 ± 6.4 %, $p = 0.013$) and the overall non-LPV status was significantly higher ($p = 0.042$), independent of BMI. The risk of exposure to non-LPV ventilation (both overall non-LPV status and exposure to periods of non-LPV) was inversely related to height, with a greater risk for patients <66 inches tall ($p < 0.0001$).

Table 1

	LPV	Non-LPV	mean±SEM
N	29	20	
Age	57.3 + 3.79*	62.5 + 4.4*	p = NS
Females (n)	11	14	p = 0.042
APACHE II	15.4 + 1.2*	16.9 + 1.5*	p = NS
BMI	24.9 + 1*	25.7 + 1.2*	p = NS
LOS (days)	3.8 + 0.4*	3.4 + 0.5*	p = NS
DOV (h)	57 + 9*	49.2 + 11*	p = NS
Mortality	13.8 %	30 %	p = NS

* Mean + SEM

CONCLUSIONS. The impact of LPV in the non-ARDS population remains to be established. In this study, a high proportion of patients achieved LPV with mean TV <8.5 ml/kg PBW, despite the absence of a formal policy encouraging this. Overall, LPV patients were still exposed to periods of non-LPV ventilation. The risk of exposure to non-LPV status and to longer episodes of non-LPV ventilation was higher in females, most likely related to the impact of decreasing height. It appears that staff are less likely to further reduce TV in patients less than 66 inches tall. LPV status was not associated with outcome difference in this study. PBW should be documented at admission and tidal volume reviewed carefully during daily rounds.
REFERENCE(S). 1. Neto A, et al. JAMA. 2012;308(16):1651.
GRANT ACKNOWLEDGMENT. No conflicting interests identified.

0145
A MEMBRANE OXYGENATOR PHOSPHORYLCHOLINE COATED (ABYLCAP) ALLOWS PROTECTIVE VENTILATION IN HYPERCAPNIC PATIENTS WITH MINIMAL IMPAIRMENT OF COAGULATION AND IMPROVEMENT OF RIGHT VENTRICULAR FUNCTION

F. Turani[1], S. Martini[2], F. Candidi[2], A. Belli[2], S. Busatti[2], M. Falco[2]

[1]European Hospital/Aurelia Hospital, Anesthesia and Intensive Care, Rome, Italy, [2]European Hospital/Aurelia Hospital, Rome, Italy

INTRODUCTION. Extracorporeal CO_2 removal may be a useful support in hypercapnic patients, in which mechanical ventilation may result in VILI and Barotrauma. Many ECCO2R systems are actually used, but a new ECCO2R device—fosforilcoline coated- may decrease the thrombogenicity during the treatment.
OBJECTIVES. The aims of this study to evaluate.
1. The clinical safety of this device
2. The changes of the main cardiorespiratory indices
3. The coagulative response.

METHODS. Ten patients with hypercapnic respiratory failure have been enrolled in the study. ECCO2R was initiated by using a modified continuous veno-venous hemofiltration system with a membrane oxygenator (ABYLCAP Bellco Mirandola IT—membrane surface area: 0.67 m^2, priming volume 90 ml, blood flow 280–350 ml/min, phosphorylcholine coated). Femoral vein cannulation with a double lumen catheter (14 F, Arrow International) was used to connect the patients to the extracorporeal system. Heparin was infused to maintain ACT < 190–240 > s. All patients had ECCO2R for 4 days. Every 12 h the changes of PH, $PaCO_2$, Peak Pressure, PaO_2 were evaluated. Platelets count and fibrinogen were evaluated every 24 h. Vigileo system was used to monitor CCO (continuous cardiac output). RVEDA/LVEDA ratio was assessed by echocardiography. All data are expressed as mean ± SD. ANOVA TEST one way with Bonferroni correction was used to compare the changes of parameters. $P < 0.05$ was considered statistically significant.
RESULTS. At Table 1 are reported the main results of this study. The CO_2 removal by membrane oxygenator ranged from 56 to 37 ml/min. Only one oxygenator was used for every patient without clotting of the circuit nor any major bleeding problem.

Table 1

	Day 0	Day 2	Day 4
pH	7.24 ± 0.06	7.38 ± 0.1	7.41 ± 0.07*
$PaCO_2$ (mmHg)	70 ± 5	57 ± 8	52 ± 3*
Peak pressure (cmH_2O)	48 ± 4	28 ± 4	25 ± 6*
Platelets (n × 1,000)	199 ± 30	135 ± 45	102 ± 25*
Fibrinogen (mg)	296 ± 35	348 ± 28	372 ± 36
RVEDA/LVEDA ratio	0.95 ± 0.06	0.78 ± 0.05	0.57 ± 0.04*

* $p < 0.05$ vs. day 0

CONCLUSIONS. ECCO2 removal with a membrane oxygenator phosphorylcholine coated allows protective ventilation without impairment of coagulation (minimal decrease of platelets, no fibrinolysis).Right ventricular function improves during this treatment.
REFERENCE(S). 1. Livigni S, et al. Crit Care. 2006;10:R 151.
GRANT ACKNOWLEDGMENT. Institutional funds.

0146

USING MODELLING TO INVESTIGATE MECHANICAL VENTILATION STRATEGIES IN ACUTE RESPIRATORY DISTRESS SYNDROME

A. Das[1], A. Cole[2], T. Ali[2], M. Chikhani[2], M. Haque[2], W. Wang[1], J.G. Hardman[2], D.G. Bates[1]

[1]University of Exeter, Centre for Systems, Dynamics and Control, Exeter, UK, [2]University of Nottingham, Division of Anaesthesia and Intensive Care, Nottingham, UK

INTRODUCTION. Reducing alveolar ventilation-perfusion mismatch, recruiting collapsed regions in the lung and improving poor oxygenation (O_2) are major aims in optimising mechanical ventilation (MV) settings in acute respiratory distress syndrome (ARDS) patients. Computational modelling offers a viable method for testing ventilatory strategies safely. Our aim is to simulate ARDS patient parameters in silico to compare model based predictions of ventilatory strategies with data reported in the literature. A high fidelity, multi-organ based mathematical model has been developed [1–3] to address this issue and will be validated against clinical data of ARDS patients receiving MV.

OBJECTIVES. To simulate the gas exchange defect of ARDS and to subject this model to various clinically-relevant recruitment manoeuvres, measuring the resultant gas exchange and alveolar pressure profiles.

METHODS. The Nottingham Physiological Simulator (NPS) [1] was configured to match ARDS patients presented in clinical data described by Nirmalan [4]. Cardiac output, haemoglobin concentration and fractional inspired O_2 were set to values given in this study. Tidal volume and O_2 consumption were also adjusted to match the model's mixed venous O_2 and carbon dioxide tensions ($PaCO_2$). A genetic algorithm was then executed to determine a combination of alveolar and pulmonary vascular resistances as well as compliance parameters of multiple alveolar compartments, which minimised the differences in pulmonary arterial O_2 (PaO_2) and calculated pulmonary shunt fraction (Qs/Qt). During pressure controlled ventilation, the disease scenarios created by the model were subjected to commonly administered recruitment manoeuvres (RM) [5], and PaO_2, $PaCO_2$ and intra-alveolar pressures were measured.

RESULTS. The model generated values of arterial gas pressures, PaO_2/FIO_2 ratios and venous admixture that showed good agreement with the findings of Nirmalan [4]. The application of RMs to the modelled patients clearly demonstrated improvements in PaO_2 as the patient responses were accurately predicted in accordance to physiological changes in MV settings.

CONCLUSIONS. Little progress has been made in the clinical settings to determine the ideal parameters for MV, understanding the application of RM in ARDS, and to elucidate the pathophysiology of an ARDS patient undergoing MV. We have shown how a mathematical model of physiological processes can offer an alternative to expensive and time consuming in vivo experiments. The further development of such tools can offer clinicians a detailed insight into the disease process and determine the best MV strategy for ARDS.

REFERENCE(S). 1. Hardman JG, et al. Br J Anaesth. 1998;81(3):327. 2. Das A, et al. J R Soc Interface. 2011;8(54):44. 3. Das A, et al. IEEE Trans Biomed Eng. 2013. 4. Nirmalan M, et al. Br J Anaesth. 2001;86(4):477. 5. de Matos G, et al. Critical Care. 2012;16:84.

GRANT ACKNOWLEDGMENT. This work was funded by the EPRSC (EP/I036680/1).

0147

THE EFFECT OF TRIGGERING TYPE ON POST TRIGGERING PRESSURE VARIATIONS DURING PRESSURE SUPPORT VENTILATION; A SIMPLIFIED SURROGATE FOR DYS-SYNCHRONY

M.M.H. Al-Najjar[1], T.S. Fahmy[2], M.A. Al-Shafee[2], H.H. Al-Atroush[2], S. Mokhtar[2]

[1]King Fahd Armed Forces Hospital, Adult Cardiac Surgery Department, Jeddah, Saudi Arabia, [2]Faculty of Medicine, Cairo University, Critical Care Medicine Department, Cairo, Egypt

INTRODUCTION. Several studies have compared flow and pressure-triggering using invasive and non-invasive techniques (Aslanian P et al.). Their reports were mainly focused on the trigger phase and the effects on the work of breathing mostly favored flow-triggering. We sought to evaluate the effect of triggering type on patient's synchrony in the post trigger phase using the variations in airway pressures with the set inspiratory pressure as a major surrogates for dys-synchrony, when all other parameters are kept constant.

OBJECTIVES. To compare the effects of pressure- and flow-triggering on post triggering dys-synchrony (increase in pressure more than the set level) during recovery from acute respiratory failure on pressure support mode.

METHODS. Using 3 different ventilators, thirty two patients recovering from respiratory failure on pressure support (PS) ventilation were put on both triggering types (at the same equivalent levels), each for 1 h. The PS and CPAP level, initial rise, and expiratory sensitivity were identical for both trigger types in each patient. At the end of the hour on each trigger mode the measured peak pressure and its difference with the set inspiratory pressure (delta pressure), the mean airway pressure and different ventilatory parameters and ABG were assessed.

RESULTS. Pressure triggering resulted in a significantly higher peak airway pressure, delta pressure as well as lower dynamic compliance at any equivalent sensitivity and PS regardless the level (<0.05). Moreover, at higher sensitivity levels (3 cmH_2O L/min), flow triggering produced higher mean airway pressures and oxygenation (<0.05), longer but insignificant inspiratory time but no difference in PCO_2. On the other hand, there was no significant difference regarding tidal volume, minute volume, frequency, or rapid shallow breathing index.

CONCLUSIONS. Flow-triggering results in less pressure variation and significantly improved patient synchrony during weaning on pressure support ventilation.

REFERENCE(S). 1. Aslanian P, et al. Effects of flow triggering on breathing effort during partial ventilatory support. Am J Respir Crit Care Med. 1998;157(1):135–43.

KEYWORDS. Weaning from mechanical ventilation, Pressure support ventilation, Flow triggering, Pressure triggering.

0148

INHALED NITRIC OXIDE THERAPY FOR ACUTE RESPIRATORY DISTRESS SYNDROME IN ADULTS

I. Fernández Simón[1], S. Alcántara Carmona[1], M. Pérez Redondo[1], I. Lipperheide Vallhonrat[1], N. Martínez Sanz[1], B. Lobo Valbuena[1], H. Villanueva Fernández[1]

[1]Hospital Universitario Puerta de Hierro Majadahonda, Majadahonda, Spain

INTRODUCTION. Inhaled nitric oxide (iNO) therapy showed to improve arterial oxygenation in patients with acute respiratory distress syndrome (ARDS) for the first time in 1993. Since then, numerous studies have evaluated the use of iNO therapy in adults with ARDS.

OBJECTIVES. The aim of this study was to evaluate the clinical characteristics, together with the security of iNo therapy applied in adults with severe ARDS, as well as the effects of this treatment on oxygenation.

METHODS. Retrospective study at the Hospital Universitario Puerta de Hierro Majadahonda, Madrid, Spain.

All patients admitted to the ICU from January 2011 to December 2012 who received iNO therapy were reviewed. Clinical characteristics (age, sex, APACHE II, pulmonary or non pulmonary ADRS, hours of iNO therapy, mechanical ventilation (MV) and ICU and hospitalization days, security and other rescue therapies in ARDS like prone position and neuromuscular blocking agents) were analysed. Changes in PaO_2, PaO_2/FiO_2 and $PaCO_2$ at two and 24 h were also evaluated.

Patients in whom PaO_2/fiO_2 increased a 20 % from baseline were considered as *responders*. Otherwise they were considered as *non responders.*

RESULTS. Twenty of the twenty two patients treated with iNO during the study period present with ARDS. Their mean age was 22 ± 8 years, 14 of them were men. Mean APACHE II score was 22 ± 8. Eighteen suffered from pulmonary originated ARDS, while in two it was secondary to an intraabdominal infection. Mean iNo therapy duration was 125 ± 133 h. Mean MV, ICU and hospitalization days were 22 ± 23, 26 ± 25 and 53 ± 49 days respectively. There were no related adverse events. In three patients we used prone ventilation and 16 received neuromuscular blocking agents, while receiving iNO.

A significant increase in PaO_2 of 29.5 mmHg [$p = 0.006$, (95 % CI 9.8–49.2)] was found at 2 h, and similar increase of 25.2 mmHg was maintained at 24 h [$p = 0.001$ (95 % CI 11.5–38.8)], reaching both statistical significance.

The PaO_2/FiO_2 improved at 2 h and at 24 h, nevertheless when we compared PaO_2 and PaO_2/FiO_2 at two and 24 h their results didn't reach statistical significance. With respect to $PaCO_2$, decreased significantly at 2 h with a mean decrease of 13.2 mmHg [$p = 0.007$ (95 % CI 4.1–22.3)] and at 24 h with a mean decrease of 8.41 mmHg [$p = 0.021$ (95 % CI 1.4–15.4)].

Fifteen patients were considered as responders and nine of them survived (60 %). To the contrary all the non responders died. Global mortality was 55 %.

CONCLUSION. In severe ARDS with severe hypoxia, iNO therapy improved short term oxygenation and ventilation and that was maintained for 24 h in a safe way. Our *responders* patients had a better survival rate but the number is to small.

REFERENCE(S). 1. Ferguson ND, et al. The Berlin definition of ARDS: an expanded rationale, justification, and supplementary material. Intensive Care Med. 2012;38(10): 1573–82 (Epub 25 Aug 2012).

Airway management: 0149–0162

0149

CUFFED ENDOTRACHEAL TUBE SIZE AND LEAKAGE IN PEDIATRIC TRACHEAL MODELS

W.J. Choe[1], J.H. Kim[1]

[1]Inje University Ilsan Paik Hospital, Anesthesiology and Pain Medicine, GoYang, Republic of Korea

INTRODUCTION. Cuffed endotracheal tubes are increasingly used in pediatric patients in the hope that they can reduce air leakage and tube size mismatch by just inflating the cuff.

OBJECTIVES. Authors compared influence of various tube sizes and different levels of cuff pressures to air leakage around the cuff, in artificial tracheal models.

METHODS. Six PVC cylinders of different internal diameters (8.15, 8.50, 9.70, 12.05, 14.50 and 20.00 mm) were prepared. Cylinders were made out of different sizes of syringes, cutting off both ends. These internal diameters are accounting for the internal diameters of the trachea for ages of 3, 4, 8, 12, 16, and adults, respectively, according to Griscom and Wohl's [1] data. An artificial lung connected with cylinder was ventilated with an anesthesia machine. Baseline expiratory tidal volume was measured by connecting artificial lung directly to the anesthesia machine. Cuffed endotracheal tubes of different sizes were located in the cylinders and the cuff was inflated from 15 to 35 cmH_2O, at 5 cmH_2O intervals. Expiratory tidal volume was measured with more than 25 % loss of baseline expiratory tidal volume was considered significant air leakage.

RESULTS. Tube sizes larger than ID 5.0 generally prevents air leakage well for any trachea model, only if the inflated cuff size is larger than the cylinder ID. Tubes smaller than ID 4.5 have a significantly short cuff length and size, therefore it is not easy to prevent air leakage, even with the cuff inflated (Figs. 1, 2, 3).

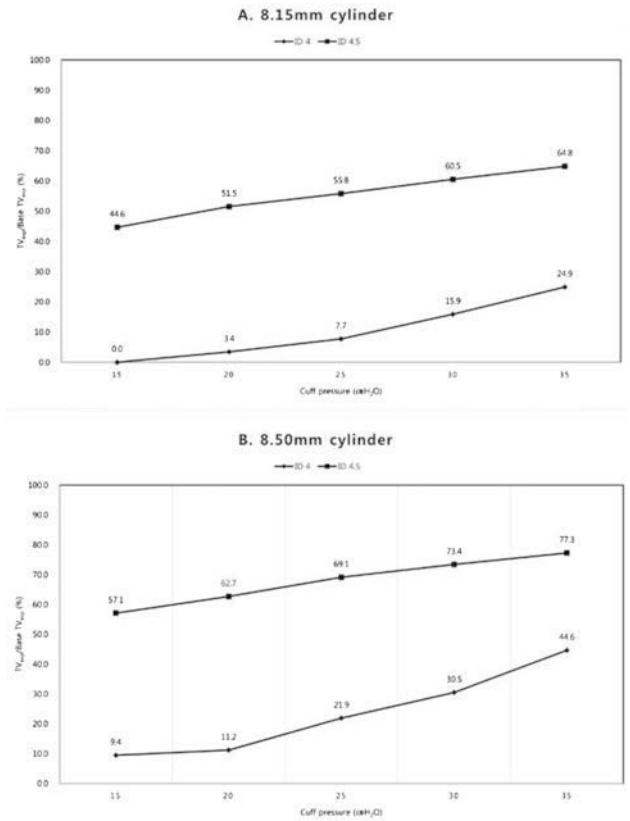


Fig. 1

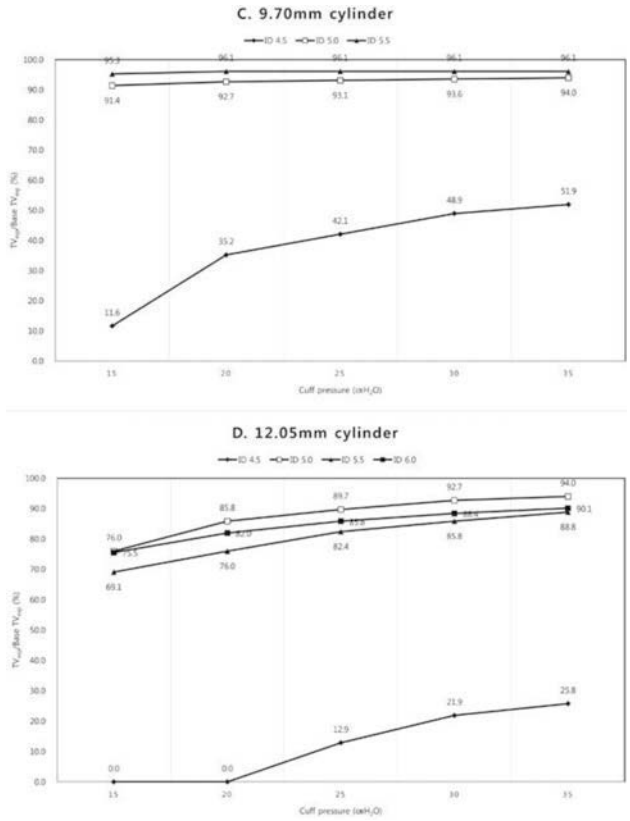


Fig. 2

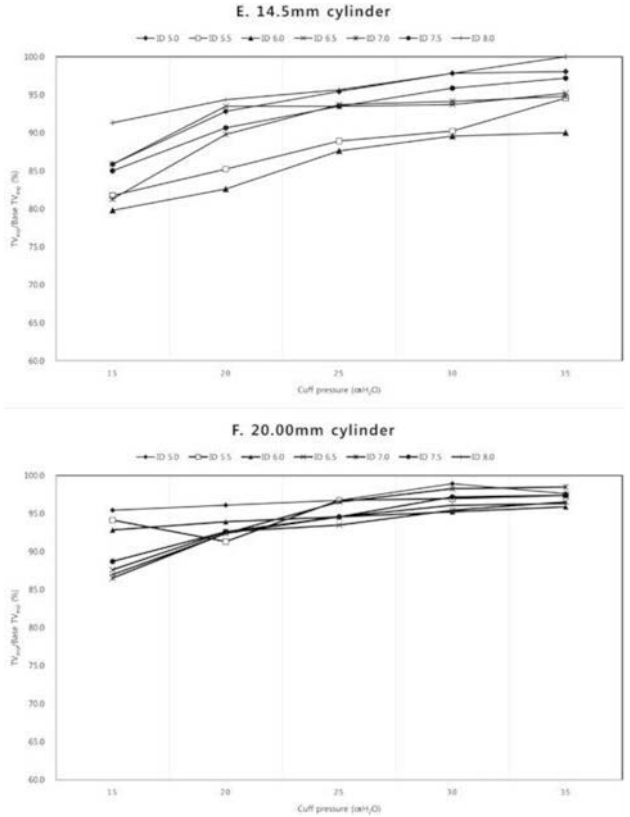


Fig. 3

CONCLUSIONS. Tubes smaller than ID 4.5 are inferior to tubes larger than ID 5.0 in preventing air leakage, and may need a higher cuff pressure to reduce air leakage.

REFERENCE(S). 1. Griscom NT, Wohl ME. Dimensions of the growing trachea related to age and gender. Am J Roentgenol. 1986;146:233–7.

GRANT ACKNOWLEDGMENT. This work was supported by the 2012 Inje University research grant.

0150

LEARNING CURVE OF ULTRASOUND-GUIDED PERCUTANEOUS TRACHEOSTOMY

S. Petiot[1], P.G. Guinot[1], E. Zogheib[1], J.P. Marienne[2], A.M. Guérin[2], H. Dupont[1]

[1]CHU Amiens, Amiens, France, [2]CH Beauvais, Beauvais, France

INTRODUCTION. Several studies have demonstrated the interest of ultrasound-guided percutaneous dilatational tracheostomy (UPDT) in critical care, including in obese patients [1].

OBJECTIVES. The objective of the study was to build a learning curve with the incidence of complications and the duration of realisation.

METHODS. A same team included 80 UPDT prospectively from 2010 to 2012. The modified Ciaglia technic was used for UPDT (Kit Tracoe®). Complications were divided into technical, intraprocedural and postprocedural ones [1]. The consecutive series of patients was divided into eight sequential cohorts of ten patients each. The incidence of complication between all cohorts was statistically examined using Poisson distribution analysis. The Fisher's exact test was used to compare incidence of complication between each sequential cohort. Data were expressed as mean ± SD or number (percentage).

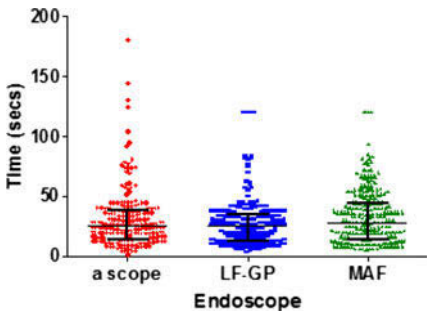
RESULTS. Fifty eight patients were male and 22 female. The mean age was 57 ± 16 and the mean body mass index was 31 kg/m^2 ± 8. The initial diagnosis was for 50 % medical and for 50 % post surgery. The mean SAPSII was 45 ± 14. The mean time of the first phase of ultrasound examination was 11 min ± 6, the mean time of the second phase of UPDT placement was the same. The mean total ultrasound guided procedure time was 22 min ± 10. A total of 27 complications were found. Ten (13 %) complications were technical ones: 8 (10 %) punctures of the tracheal tube cuff and 2 (2 %) multiple punctures. Ten (13 %) complications were intraprocedural: desaturation in 2 patients (2 %), 2 episodes of hypotension (2 %) and 6 (8 %) minor bleeding (<5 mL). Eight (10 %) complications were postprocedural ones, 1 (1 %) skin infection at the puncture site, 2 (2 %) tracheal ring fractures, 3 (4 %) granulomas and 2 (2 %) minor bleeding (<5 mL). Most complications occurred among the first 30 patients: 24 out of 27 complications. The complications incidence was significantly different between the first 30 patients and the next 50 ($p < 0.05$). The mean time of the procedure was also longer for the first 30 patients ($p = 0.003$). These data, for each sequential cohort of ten patients, are exposed in the table.

Group	Ultrasound examination time (min)	Ultrasound guided tracheostomy time (min)	Total time (min)	Incidence of complications n (%)
1: patient 1–10	13 ± 6	17 ± 8	30 ± 11	2 (2 %)
2: patient 11–20	14 ± 6	17 ± 7	32 ± 11	7 (9 %)
3: patient 21–30	12 ± 7	13 ± 6	25 ± 19	9 (11 %)
4: patient 31–40	11 ± 8	9 ± 3	20 ± 8	4 (5 %)
5: patient 41–50	10 ± 5	10 ± 9	20 ± 12	2 (3 %)
6: patient 51–60	8 ± 3	10 ± 3	17 ± 5	1 (1 %)
7: patient 61–70	9 ± 6	8 ± 3	17 ± 8	0 (0 %)
8: patient 71–80	9 ± 6	9 ± 6	18 ± 5	2 (3 %)

CONCLUSIONS. Our study suggested that a minimum of 30 ultrasound-guided percutaneous tracheostomy was necessary to realize this technique with a low complication rate and a short realization time.
REFERENCE(S). 1. Guinot P, Zogheib E, Petiot S. Ultrasound-guided percutaneous tracheostomy in critically ill obese patients. Crit Care. 2012;16:R40.

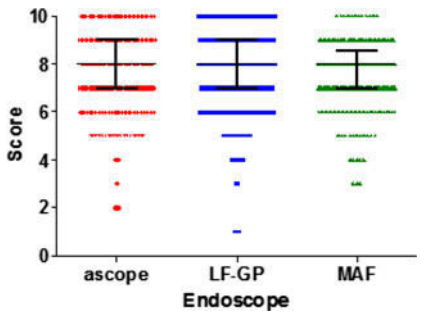
0151
A COMPARISON OF THREE ENDOSCOPES IN ASSESSMENT OF TRACHEOSTOMY POSITION IN SIMULATION MANIKINS

R. Templeton[1], B. McGrath[1], K. Webster[1], W. Simpson[1]
[1]South Manchester University Hospital Trust, Intensive Care Unit, Manchester, UK
INTRODUCTION. Displacement of tracheostomy tubes causes significant patient harm. Fibreoptic endoscopy can assess the position of a tracheostomy tube within the trachea both in elective and emergency situations and can reduce the incidence of patient harm. Simulation manikins are a useful tool in developing the relevant skills.
OBJECTIVES. To compare the time taken to achieve adequate views for assessment of tracheostomy position and the operator's ease of endoscopy score with 3 different endoscopes in manikins.
METHODS. Twenty five anaesthetic trainees assessed tracheostomy tube placement using the Ambu aScope2, Olympus LF-GP, and Olympus MAF. Observations were made using three training manikin variants: METIman (using both 'standard' and 'difficult' airway settings) and SimMan.
Tube position was assessed via the tube lumen and within the trachea by both the oral and nasal routes. For each assessment of tracheostomy placement, the time taken to achieve satisfactory visualisation (determined by observer) was recorded. In addition, the trainee allocated an 'ease of endoscopy score'- with a score of '1' indicating great difficulty and a score of '10' indicating great ease.
Data were analysed using Friedman test to compare the three endoscopes (observations were matched for trainee, route of visualisation, and manikin variant).
RESULTS. 225 observations were made with each endoscope. Satisfactory visualisation was achieved in 120 s or less in over 99 % of observations and in 60 s or less in 92 %.There was a small, but statistically significant, difference between the endoscopes in the mean time to achieve satisfactory visualisation, with the Olympus MAF taking slightly longer. (Friedman test with Dunn's post-test, $p = 0.01$).



Time taken to assess tracheostomy placement

Generally, trainees perceived the overall procedure as 'easy', allocating a median 'endoscopy score' of 8 for all three endoscopes. No statistically significant differences in 'endoscopy scores' between the endoscopes were demonstrable (Friedman test with Dunn's post-test, $p > 0.05$).



Endoscopy scores by endoscope

CONCLUSIONS. Trainees were able to gain satisfactory views to assess tracheostomy placement in under 60 s in the vast majority of observations regardless of the endoscope used, however procedures using the Olympus MAF took slightly longer. Application of an arbitrary scoring system indicated that trainees generally rated the procedures as 'easy'. Assessment of position is achievable in a clinically relevant timeframe.
REFERENCE(S). 1. McGrath BA, Thomas AN. Patient safety incidents associated with tracheostomies occurring in hospital wards: a review of reports to the UK National Patient Safety Agency. Postgrad Med J. 2010;86(1019):522–5. 2. Rai MR, Popat MT. Evaluation of airway equipment: man or manikin? Anaesthesia. 2011;66:1–3.

0152
TEACHING FOUNDATION DOCTORS ABOUT TRACHEOSTOMY COMPLICATIONS: A 6 MONTH FOLLOW UP STUDY

A. Cumpstey[1], E. Horwell[2], S. Benham[2], J. Chantler[2], S. McKechnie[2]
[1]Musgrove Park Hospital, Taunton, UK, [2]John Radcliffe Hospital, Oxford, UK
INTRODUCTION. Over 50 % of patients who have a tracheostomy in ICU are discharged before decannulation [1] NAP4 showed that 70 % of all airway-incidents and 60 % of all deaths in ICU involved tracheostomy complications. Similar complications occur after discharge from ICU and lack of training is a common factor [2]. How much training junior doctors receive in this area remains unknown.
OBJECTIVES. • Quantify the training medical students receive about tracheostomy management.
• Increase the training on preventing and managing tracheostomy complications (e.g. obstruction, displacement) for junior doctors working in Oxford.
• Assess the effectiveness of this training at 6 months.

METHODS. 81 Foundation Year 1 (F1) doctors (from 22 medical schools) completed a new session on preventing and managing tracheostomy complications. Online surveys were distributed before and 6 months after the course (completion rates 83 and 24 % respectively). A paper survey was distributed immediately after the course (100 % completion rate). Each survey assessed knowledge of current best practice as defined by the Intensive Care Society [4] as well as confidence in managing tracheostomies.
RESULTS. Knowledge and confidence were poor before the course: over 70 % were 'not at all confident' in managing complications; in the event of an obstruction just 20 % would correctly deflate the air cuff and only 72 % would call the emergency airway team. 66 % saw patient(s) with a tracheostomy during their medical degree but only 19 % received formal teaching about managing such patients. Immediately after the course, confidence and knowledge increased significantly. 79 % were 'fairly confident' to 'very confident' in managing an obstruction and 74 % would leave the air cuff deflated. 100 % found the course relevant and useful to their work. In their first 6 months as an F1, 47 % had managed at least 1 patient with a tracheostomy. Knowledge faded after the course, e.g. at 6 months only 65 % would deflate the air cuff. 94 % would call for the emergency airway team to a tracheostomy complication.
CONCLUSIONS. Teaching in this area is rare and variable despite most students seeing tracheostomies. Most junior doctors will manage a patient with a tracheostomy during F1/F2. Teaching about tracheostomy complications is seen as both relevant and useful with long term benefit for patients. To maximise effectiveness, teaching should be given just before it is needed to minimise knowledge fade.
REFERENCE(S). 1. Martinez GH, Fernandez R, et al. Tracheostomy tube in place at intensive care unit discharge is associated with increased ward mortality. Respir Care. 2009;54(12):1644–52. 2. McGrath BA, Thomas AN. Patient safety incidents associated with tracheostomies occurring in hospital wards: a review of reports to the UK National Patient Safety Agency. Postgrad Med J. 2010;86(1019):522–5. 3. MacKenzie S, Murphy P, et al. Standards for the care of adult patients with a temporary tracheostomy, Guidelines from the Intensive Care Society; 2008.

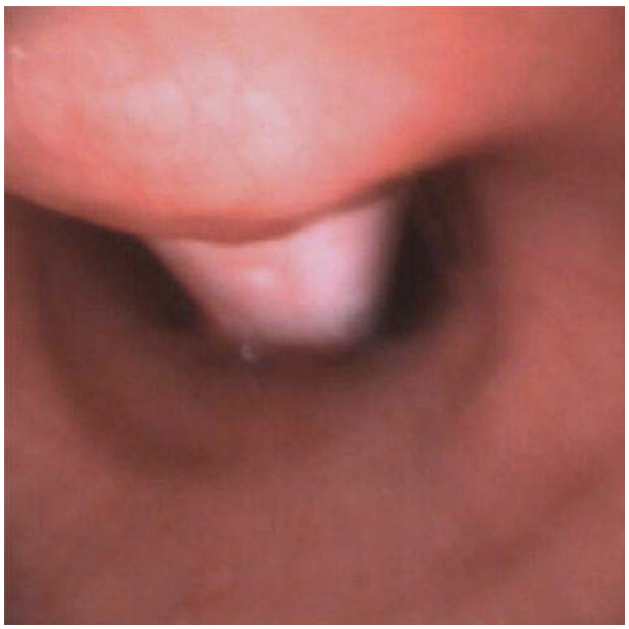
0153
EVALUATING THE AMBU® ASCOPE™ 3 SYSTEM FOR PERFORMING PERCUTANEOUS DILATATIONAL TRACHEOSTOMY IN CRITICAL CARE PATIENTS

B.A. McGrath[1], A.M. Bentley[1]
[1]University Hospital of South Manchester, Acute Intensive Care Unit, Manchester, UK
INTRODUCTION. The Ambu® aScope™ 3 system is a novel disposable bronchoscope (5.5 mm maximum external diameter with 2.2 mm suction/working channel) which connects to a separate portable aView™ monitor. We report the first observations in clinical practice of this system for performing percutaneous dilatational tracheostomy (PDT) in critical care patients.
OBJECTIVES. To evaluate the functionality and ease of use of the aScope™ 3 system performing PDT in our ICU.
METHODS. Five CE-marked aScope™ 3 bronchoscopes and an aView™ monitor were supplied by Ambu® for the evaluation. Standard practice for our unit is to use non-disposable bronchoscopy (Olympus® BF-260) to guide PDT insertion, with images displayed on the EVIS LUCERA SPECTRUM 'stack' system. Clinical decision to perform PDT was made by attending clinicians who also performed the procedures. Bronchoscopy to guide the PDT using the aScope™ 3 system was performed by the authors. A 5-point Likert scale was used (1 fully disagree, 3 neutral, 5 fully agree) to evaluate functionality and ease of use of the system, applied to 10 statements (see Table 1). Overall impressions of performance (satisfactory: yes/no) and whether the operator felt that the aScope™ 3 system could replace our existing non-disposable system (yes/no) were also recorded.
RESULTS. All 5 procedures were completed uneventfully between 11/3/13 and 8/4/13 (BAM 4 procedures, AB 1). Data were explored using the Shapiro–Wilk test and the results (median Likert scores for functionality and ease of use) shown in Table 1. Clear images of the needle and guide-wire entering the trachea were recorded in all 5 procedures. The authors agreed in all 5 PDTs that the aScope™ 3 system was satisfactory and that the system could have replaced our existing non-disposable system for guiding the PDT.

Table 1 Median Likert scores for functionality

	Median score	Range of scores (min–max)
Easy to connect and set up the aScope 3 system	5	5
Blood and secretions were easily cleared from the lens	5	4–5
Easy and intuitive to use suction system	5	5
Suction capability was adequate for clearing blood and secretions	5	4–5
Functionality of working channel was satisfactory	4	4–5
Easy navigation and recording of images on aView monitor	3	1–4
Ergonomics of the device satisfactory	4	3–5
Lightweight design was a clear benefit	3	3
Image quality was clear and adequate to verify accurate placement of the tracheostomy	5	5

CONCLUSIONS. Our evaluation demonstrated that the Ambu® aScope™ 3 system was assessed as easy to use and performs satisfactorily for guiding PDT in critically ill patients. The system is portable and easy to position for the bronchoscopist and clinician performing PDT to view. The monitor display is smaller and of lower resolution (800 × 480 pixel, 8.5 inch colour TFT LCD screen) than our non-disposable system, but image quality was good enough to guide the procedures and the smaller monitor could be positioned flexibly at the bedside. Suction capabilities were adequate. The lowest scores were in relation to the functionality of the aView™ monitor, which had pre-release software installed. The lightweight handle was not perceived as a particular advantage. The disposable nature of the system may have cost advantages, especially when considering potential damage to bronchoscopes during PDT. One patient had cavitating lung lesions which illustrates an example of potential infection control advantages over non-disposable equipment.



aScope 3 aView monitor view of PDT

GRANT ACKNOWLEDGMENT. Ambu® provided a donation to our ICU research fund for conducting this evaluation.

0154
TRACHEOSTOMY CARE IN GENERAL WARDS IN RELATION TO DECANNULATION TIME, ADVERSE EVENTS AND LENGTH OF STAY: A RETROSPECTIVE QUALITY OF HEALTH REVIEW

A. Huang[1], M.W. Loh[1]

[1]Changi General Hospital, Anaesthesia and Surgical Intensive Care, Singapore, Singapore

INTRODUCTION. Timely review and intervention for patients with tracheostomies in the hospital is important to facilitate decannulation and prevent morbidity. Tracheostomy for ICU patients requiring prolonged assisted ventilation provides a safe airway, allows better pulmonary toilet, facilitates weaning and expedites discharge from the ICU. This potentially allows better allocation of ICU resources. The lack of a dedicated team and standardized protocols with regards to management of tracheostomies in the general wards may lead to suboptimal care [1, 2].

OBJECTIVES. We aim to evaluate the prevalence of tracheostomies in the surgical intensive care unit (SICU) and outcomes of these patients upon discharge to the general wards.

METHODS. The SICU patient database was searched for patients who had a tracheostomy while in the ICU from 1st Jan 2007 to 31st Dec 2011. Patients who had a tracheostomy for ear, nose and throat pathologies were excluded. The primary outcome was decannulation time, while secondary outcomes included adverse events related to the tracheostomy and ICU and hospital LOS (length of stay). This study has been approved by the hospital Ethics board.

RESULTS. During these 5 years, 204 patients underwent tracheostomies during their course of SICU stay. There were 54.4 % survivors, 36.8 % died and 8.8 % had incomplete data. The mean age was 57 ± 19.8 and mean APACHE II score was 22 ± 6.2. Prior to hospital discharge, 49 % of patients were decannulated. The time to decannulation was 31.3 ± 29.3 days. Out of the 25 % (51/204) of patients who encountered adverse events, the most prevalent was desaturation due to mucus plugging (51 %, 26/51). ICU readmission due to tracheostomy complication was 5.9 %. The ICU LOS was 21 ± 20.5 days and the hospital LOS was 67.5 ± 48.9 days.

CONCLUSIONS. Decannulation time is long and complications are common. The implementation of specific strategies and a multidisciplinary tracheostomy team for regular review and consensus decisions regarding tracheostomy weaning might improve patient care and decannulation time.

REFERENCE(S). 1. Tobin A, Santamaria J. An intensivist-led tracheostomy review team is associated with shorter decannulation time and length of stay: a prospective cohort study. Crit Care. 2008;12R48. 2. Garrubba M, Turner T, Grieveson C. Multidisciplinary care for tracheostomy patients: a systematic review. Crit Care. 2009;13:R177.

0155
CICATRICIAL STENOSIS OF TRACHEA AFTER PROLONGED ARTIFICIAL LUNG VENTILATION. STRATEGY OF COMBINED TREATMENT

O.D. Eshonkhodjaev[1], R.A. Ibadov[1], S.N. Khudaybergenov[1], A.S. Arifjanov[1]

[1]Republican Specialized Center of Surgery named after acad. V. Vakhidov, Tashkent, Uzbekistan

INTRODUCTION. Thanks to the achievements of the modern resuscitation, saving of the patients that are on long-term artificial lung ventilation (ALV) who were previously considered to be hopeless has been possible.

OBJECTIVES. Thus, the CST being a life-threatening and disabling illness remains to this day to be the most urgent problem of intensive care, thoracic surgery, endoscopy and otorhinolaryngology.

METHODS. 46 patients with the CST have been treated in RSCS Vakhidov:stenoses located in the upper third of trachea in 25 (54.34 %) patients, 6 (13.1 %) had narrowing of the thoracic part of trachea, tracheolaryngeal localization with the affliction of the subglottic part of larynx and the upper third of trachea has been seen in 8 (17.4 %), the combined affliction of the larynx and thoracic part of trachea was present in 3 (6.5 %), and in 4 cases there were cicatricial narrowing of the cervical and thoracic parts of trachea (8.69 %).

RESULTS. Radical method that allows removing the scar-narrowed segment of trachea completely is a circular resection of trachea which was performed by us in 11 patients. So, the patients after severe combined head injuries and polytraumas or after neurosurgical interventions for acute emergency conditions in pathologies of the central nervous system require a long rehabilitation because of the neurological status which does not allow a radical intervention in the form of circular resection of trachea for such patients. In the first stage we have conducted a bronchoscopic laser photodestruction or diathermocoagulation of the stenosis with a subsequent bougienage of the narrowing of trachea. In patients with a total scarry obliteration of the lumen of trachea an endoscopic recanalization has been performed. Afterwards, in order to prevent the growth of granulation and restenosis of the lumen of trachea, as well as for the formation of a stable lumen, stents in a variety of modifications, including linear silicone ones with the spines on the surface- the types of Dumont have been installed, and also the T-shaped endoprosthesis have been used. After removing the T-shaped endoprosthesis the plastics of the defect in the anterior wall of trachea was performed.

CONCLUSIONS. Dissection of stenosis with the excision of scarry tissues and the formation of a lumen on the T-shaped endoprosthesis in patients with cicatricial stenosis of the laryngo-tracheal localization allows to rehabilitate patients from their comorbidities, to eliminate the signs of purulent endobronchitis, to retain the ability of breathing through the natural airways and phonation, eliminating the risk of migration and obstruction of the stent and allows to generate a sufficient lumen of trachea with a subsequent performing of the plastic surgery to close the defect of the anterior wall of trachea and the soft tissues of the neck.

0156
ET TUBE IN EMERGENCY: DOES SIZE MATTER?

V. Joshi[1], J. Nikhilesh[2], P. Bajpai[3]

[1]Rajshree Hospital and Research Centre, Critical Care Unit, Indore, India, [2]CHL Hospitals, Critical Care Unit, Indore, India, [3]Aurobindo Hospital, Medicine, Indore, India

INTRODUCTION. This prospective study is done in continuation of pilot study presented at ESICM 2012 to improve quality of airway management in emergency situation. This communication is a follow up from the same.

OBJECTIVES. To analyze outcomes in unplanned (emergency) intubations using ET tube no.7.5 or 8.5 or any no. for adult patients in three tertiary care hospitals.

SETTING. 70 bedded multispecialty medical and surgical intensive care units (ICUs).

METHODS. Patients requiring emergency intubation in ICU were included and data was collected with a focus on variables such as demographics, APACHE II scores, co morbidities such as diabetes(DM), hypertension(HTN), coronary artery disease (CAD), smoking and duration of stay in ICU. Death/discharge from ICU was considered as end points. They were compared across three groups [A] A 7.5 no ET tube group [B] A 8.5 no ET tube group [C] Random no. ET tube group [random numbers] getting admitted to hospital in the same duration for similar variables. A multivariate logistic regression analysis was done using SPSS version 15.

RESULTS. One hundred and forty patients were included for fixed No. 7.5 ET tube (n = 140, M: F 80:60) and one hundred and forty for 8.5 [n = 140, M: F 86:54] which were compared against a control group of one forty patients where random no. of ET tube were used (n = 140, M: F 78:62) during Nov 12–April 13 in three different tertiary care centers. The results were as follows.

Comparison of using different size ET tubes

Feature	7.5 gr.	8.5 gr.	Random gr.
Age in years	54.3 ± 6.3	52.7 ± 8.3	55.9 ± 7.7
APACHE II	17.0 ± 4.1	15.4 ± 3.7	16.8 ± 2.8
No. of intubation	140	140	140
Stay in ICU (days)	4.8 ± 2.3	3.6 ± 1.8	6.3 ± 5
Within 30 days mortality	9 (6.4 %)	14 (10 %)	12 (8.5 %)
Hypoxic brain injury	0 (0 %)	5 (3.5 %)	3 (2.1 %)

A 7.5 size tube had a lesser likelihood of 30 day mortality and hypoxic injury than tube 8.5 and random sized tube (OR = 0.82 and 5.983 respectively).

CONCLUSIONS. E T tube of 7.5 size had a statistically significant association with a 30 day mortality benefit and decreased rate of hypoxic injury vis-a-vis 7.5 size/randomly sized ET tubes. This has an implication on outcomes in subgroups of patients requiring emergency intubations in ICUs.

REFERENCE(S). Joshi V. Publication/e-poster at ESICM LIVES 2012 Lisbon [Portugal]. Can fixed no. 7.5 ET tube saves lives better in emergency? Intensivist, Dept. of Critical Care Medicine, Rajshree Hospitals, Indore, India.

0157

PERCUTANEOUS AND SURGICAL TRACHEOSTOMY. REVIEW OF 164 CASES OVER A 4 YEAR PERIOD

D. Pastor-Marcos[1], P. Jiménez-García[1], M. González-Vaquero[1], J. Valdivia-Ruiz[1], M. Riesco-Crespo[1], A.M. Domínguez-Berrot[1]

[1]Complejo Asistencial Universitario de León, León, Spain

INTRODUCTION. Tracheostomy (TQ) is an essential technique to perform a complete weaning in critical patients. The techniques most frequently used are: percutaneous (PC) and surgical (S).

OBJECTIVES. To describe the characteristics of patients admitted to our Intensive Care Unit (ICU) who were tracheostomized as well as to assess the differences between both modalities.

METHODS. Clinical files reviewed (Retrospective observational study) from 01/01/2009 to 31/12/2012 of patients admitted our hospital ICU (III level; 16 beds; medical-surgical-trauma) who underwent TQ. Data collected among others were, demographic data, APACHE II score, TQ modality: PC (Ciaglia Blue-Rhino, Cook Medical) or S, reason for TQ, days on mechanical ventilation (MV), delay from the indication of TQ, previous extubation failure, complications, ICU stay, in-hospital stay, decannulation and mortality. Statistical analysis was performed using IBM SPSS Statics 19, by using *T-probe* for quantitative variables (mean ± SD) y X^2 for qualitative variables (%).

RESULTS. In the study period 2,506 patients were admitted in the ICU. 164 patients underwent TQ. Their characteristics are collected on graphic 1.

SEX (M/F)ϕ		67.2/32.1
AGE*		61.35±16.08
APACHE II SCORE*		19.88±6.43
TQ CAUSEϕ	COMA	52.4
	COPD	8.5
	POLINEUROPATHY	14.0
	SECRETIONS MANAGEMENT	14.6
	OTHERS	10.4
PREVIOUS EXTUBATION FAILUREϕ		24.5
TQ TYPEϕ	PC	48.8
	S	51.2
COMPLICATIONSϕ	NO	89
	NEUMOTHORAX	1.8
	SUBCUTANEOUS ENPHYSEMA	0.6
	BLEEDING	7.31
	INFECTION	1.2
ICU MORTALITYϕ		11.6
ICU MORTALITY CAUSEϕ	NEUROLOGIC	42.1
	RESPIRATORY	15.8
	INFECTION	36.8
	OTHERS	5.3
IN-HOSPITAL MORTALITYϕ		30.5
IN-HOSPITAL MORTALITY CAUSESϕ	NEUROLOGIC	6.9
	RESPIRATORY	62.1
	INFECTION	20.7
	OTHERS	10.3
DECANNULATEDϕ		45.7
DAYS ADMISSION-TQ*		16.38±9.10
DAYS INTUBATION – TQ*		15.72±8.45
DELAY TQ (INDICATION – TQ)*		3.77±2.89
DAYS MV*		22.98±16.14
TQ-DISCHARGE ICU*		15.58±13.23
ICU STAY*		26.96±17.70
IN-HOSPITAL STAY*		51.66±37.30
DAYS TQ – DECANNULATION*		35.93±33.48
DISCHARGE ICU – DECANNULATION*		24.85±26.12

Graphic 1. *Mean ± SD; Φ = %

Differences in outcome between both techniques were compared (Graphic 2). No significant differences were found regarding APACHE II score, ICU mortality, in-hospital mortality, in-hospital stay and decannulation. Significant differences were found in delay from the indication, MV days, ICU stay and complication rate, being bleeding the most frequent.

		PERCUTANEOUS (80)	SURGERY (84)	p
DELAY TQ*		3.13±2.67	4.39±2.98	0.005
DAYS MV*		19.44±12.08	26.35±18.68	0.006
ICU STAY*		24.16±13.41	29.63±20.72	0.048
ICU MORTALITYϕ		13.8	9.52	0.398
IN-HOSPITAL MORTALITYϕ		15	21.4	0.287
APACHE SCORE*		20.76±6.67	19.04±6.11	0.086
DECANULATIONϕ		46.3	45.2	0.897
COMPLICATIONϕ		5	16.7	0.017
	NEUMOTHORAX	1.25	2.38	0.589
	SUBCUTANEOUS ENPHYSEMA	1.25	0	0.304
	BLEEDING	2.5	11.90	0.021
	INFECTION	0	2.38	0.165

Graphic 2

CONCLUSIONS. The tracheostomy is a safe technique. Percutaneous modality allows less delay and less complication rate due to bleeding, shortens weaning and ICU stay. Nevertheless, we did not find any differences in decannulation, hospital stay or mortality.

0158

EFFECT OF INTRODUCTION OF A CHECK LIST FOR PERCUTANEOUS TRACHEOSTOMY ON THE RATE OF COMPLICATIONS AND CLOSE CALLS/ NEAR MISSES

A. Syed Mohammad[1], R. Hyder[1], S. Tipu[1], S. Katiyar[1]

[1]Bhopal Memorial Hospital and Research Centre, Anaesthesia and Critical Care, Bhopal, India

INTRODUCTION. Percutaneous tracheostomy can result in immediate complications (bleeding, loss of airway, false passage, desaturation, hypotension, brain damage and death) or situations called 'Close Call' or 'near miss' i.e. an event, situation or error that took place but was captured before reaching the patient.

Factors responsible for these include inadequate patient preparation, monitoring and backup plan, lack of expertise and lack of clarity in role allocation. Perioperative checklists have been shown to reduce reduce morbidity and mortality [1]. We therefore introduced a checklist which requires ticking all the appropriate boxes before the procedure in an attempt to increase patient safety.

OBJECTIVES. Study the impact of a checklist implementation on perioperative complications and 'close calls' during percutaneous tracheostomies.

METHODS. Retrospective data from the audit forms which were filled at the time of the procedure of 49 tracheostomies performed before checklist introduction was compared with the data which is being collected since the introduction of the checklist (19 cases so far).

RESULTS. Prior to introduction of checklist there were five instances of procedure performed without consent/assent. On eight occasions it was found just before tracheostomy that feed was given within previous 6 h and the procedure had to be postponed after having made all arrangements. On five occasions there was no one designated for providing anaesthesia and drugs were given only when patients had tachycardia and hypertension. On six occasions the only skilled airway person was the one performing the tracheostomy with only an unskilled nurse at the head end. Four instances were recorded where preoxygenation was not performed and the patients desaturated (SpO_2 < 85 %) and eight instances where vasopressor was not ready and hypotension (<90 mmHg sys) occurred. For confirmation of successful tracheostomy tube placement $EtCO_2$ monitor was not ready in 15 cases. Appropriate sized trachy tube was unavailable on two occasions and the patient had to be ventilated by manually blocking the stoma till the tube arrived. On three occasions there was no senior help or surgical backup available at the time of the procedure.

Since the checklist was introduced on February 2013, 19 tracheostomies have been performed of which only once a procedure was postponed due to thrombocytopenia as the platelet count was normal a day before but fell to <50,000 on the morning of the procedure and the report was delayed. The above data shows 56 instances of complications and close calls in 49 tracheostomies before and 1 close call in 19 procedures since the introduction of checklist.

CONCLUSIONS. Although the case numbers are few but there is a very significant trend towards reduction in rate of complications and close calls with the introduction of the tracheostomy checklist.

REFERENCE(S). 1. Haynes AB, et al. for the Safe Surgery Saves Lives Study Group. N Engl J Med. 2009;360:491–9.

0159

DIFFERENCES IN TRACHEOSTOMY WEANING IN CRITICALLY ILL PATIENTS ACCORDING TO THE INDICATION OF TRACHEOSTOMY AT QUEEN'S HOSPITAL

N. Ojukwu[1], T. Chamroo[2], N. Muchoki[2], N. Patel[2], J. Darroch[2], J. Jones[2], G. De la Cerda[2]

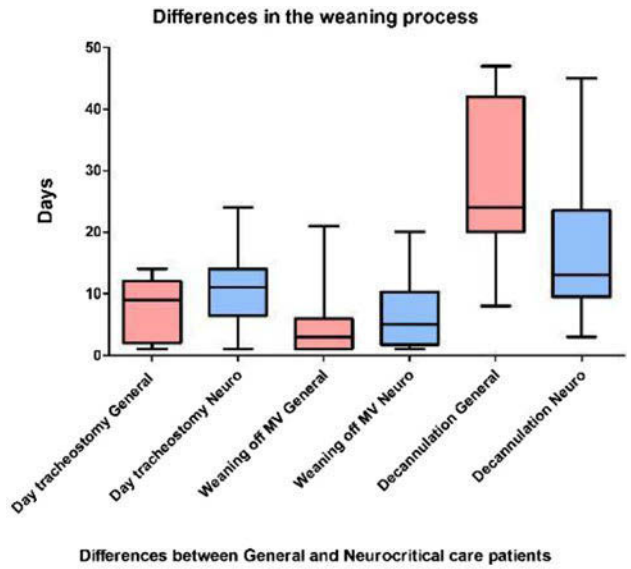
[1]Queen's Hospital, Neuro Critical Care, Romford, UK, [2]QH, Romford, UK

INTRODUCTION. Tracheostomies continue to be the most frequent procedure performed in critically ill patients for prolonged respiratory support (>21 days) [1]. Despite its popularity, there is still ongoing debate about the optimal timing [1] and duration of the weaning process after tracheostomy including cuff deflation, speaking valve insertion and decannulation. Whether the weaning process is affected by the indication of the tracheotomy is still yet to be determined.

OBJECTIVES. We aimed to compare the differences in the weaning process between neuro ITU and general ITU patients whom underwent tracheostomies.
METHODS. Retrospective cohort analysis of prospective collected data at a tertiary neuroscience centre of patients requiring tracheostomy from October 2012 to March 2013 in our Neurocritical care unit and our General ICU. Weaning after tracheostomy was performed in accordance with local protocols. Patients were classified into two groups: patients needing tracheostomy due to a low level of consciousness (Neuro ITU patients), and those requiring tracheostomy for prolonged respiratory weaning (General ITU patients). Timing of tracheotomy insertion, cuff deflation, speaking valve, weaning from mechanical ventilation (post-tracheostomy) and decannulation were analysed. Complications during weaning were also recorded.
RESULTS. A total of 48 patients underwent tracheostomies during ICU stay (Table 1). Length of mechanical ventilation post tracheostomy is longer in neuro ITU patients [6.96 days ± 1.201] than in general ITU patients [5.632 ± 1.864], although this difference is not statistically significant (p-value = 0.6116). Speaking valves were inserted earlier in neuro ITU patients (9.111 days ± 2.207) compared to general ITU patients (12.05 days ± 3.639). We were unable to decannulate a high proportion of neuro ITU patients (52 %) due to prolonged low level of consciousness, transfer back to referring hospitals and death. For those whom were decannulated, the procedure was performed earlier in neuro ITU patients (12.48 days ± 4.286) than General ITU patients (20.26 days ± 4.680).

Table 1 Patient demographics

Patient demographics	Neuro ITU patients	General ITU patients
Total number of patients	29	19
Age (years)	52.4 (17–84)	58.0 (18–78)
Gender (M/F)	3:1	2:1
Percutaneous/surgical tracheostomies ratio	1:1	2:1
Unable to decannulate (%)	52	37
Failed Decannulation (%)	10	26



Box plot

CONCLUSIONS.
1. The tracheostomy weaning process varies according to the indication of tracheostomy.
2. Intensivists should, therefore, tailor weaning processes towards the unique clinical characteristics of the different sub-groups of ICU patients.

REFERENCE(S). Bittner et al. The ventilator liberation process: update on technique, timing, and termination of tracheostomy. Resp Care. 57(10).

0160

DEATH AFTER PERCUTANEOUS DILATATIONAL TRACHEOSTOMY: SYSTEMATIC LITERATURE SEARCH AND ANALYSIS OF 63 CASES

M. Simon[1], S.A. Braune[1], M. Metschke[1], K. Püschel[2], S. Kluge[1]

[1]Department of Intensive Care Medicine, University Medical Center Hamburg-Eppendorf, Hamburg, Germany, [2]Department of Legal Medicine, University Medical Center Hamburg-Eppendorf, Hamburg, Germany

INTRODUCTION. Since the widespread acceptance of percutaneous techniques in the intensive care unit setting, the number of critically ill patients undergoing tracheostomy has steadily increased. However, this procedure can be associated with major complications, including death.
OBJECTIVE. To estimate the incidence and analyse the causes of lethal complications due to percutaneous dilatational tracheostomy (PDT).
METHODS. Systematic literature search and analysis of cases with lethal outcome due to PDT-related complications published between 1985 and 2012. In addition, unpublished cases from our own departmental records were retrospectively analysed.
RESULTS. 63 cases with lethal outcome following PDT were identified including 60 published cases and 3 of our own patients. The incidence of lethal complications was 0.19 %. Of all fatal complications, 33.3 % occurred during the procedure and 47.6 % within 7 days of the procedure. The main causes of death were hemorrhage (38.1 %), airway complications (27.0 %), tracheal perforation (17.5 %), and pneumothorax (6.3 %). We found specific risk factors for complications in 73.0 % of patients, 28.6 % of patients had more than one risk factor. Bronchoscopic guidance was used only in 46.0 % of cases.
CONCLUSIONS. According to this analysis, PDT-related death occurs in approximately 1 out of 500 patients. Careful patient selection, bronchoscopic guidance, pre–interventional ultrasound, and securing the tracheal cannula with sutures may reduce severe complication rates.

0161

HARM FROM TRACHEOSTOMY-RELATED PATIENT SAFETY INCIDENTS IS REDUCED FOLLOWING THE INTRODUCTION OF THE UK NATIONAL TRACHEOSTOMY SAFETY PROJECT RESOURCES IN 4 MAJOR UK TEACHING HOSPITALS

B. McGrath[1], D. Atkinson[2], S. Laha[3], A. Perks[4], L. Bates[5], J. Moore[2], on behalf of ANWICU kNOWLEDGe

[1]University Hospital of South Manchester, Acute Intensive Care Unit, Manchester, UK, [2]Central Manchester Foundation Trust, ICU, Manchester, UK, [3]Lancashire Teaching Hospitals Foundation NHS Trust, ICU, Preston, UK, [4]Salford Royal Hospital, Anaesthesia, Manchester, UK, [5]Royal Bolton Hospital, ICU, Bolton, UK

INTRODUCTION. The UK National Tracheostomy Safety Project (NTSP) was initiated and facilitated by collaboration between the critical care units which formed the Learning and Development Group of the Association of North Western Intensive Care Units (ANWICU kNOWLEDGe). The aim of the project was to improve the multidisciplinary management of tracheostomy and laryngectomy emergencies as harm can occur following patient safety incidents [1, 2].
OBJECTIVES. We hypothesised that introduction of training, supported by the NTSP resources and initiatives would reduce the severity of harm resulting from post-procedural tracheostomy-related patient safety incidents in 4 major teaching hospitals (NHS Trusts).
METHODS. 'Cohort' tracheostomy wards were identified to manage all 'neck-breathing' patients and training was delivered to relevant medical, nursing and allied health staff. Bedside equipment, bed-head signs and emergency management training and equipment were provided [3, 4]. Local critical incident reporting systems were interrogated for approximately 2 years before and after the implementation to ascertain whether the implementation of the NTSP resources influenced the nature and severity of harm. Incidents were anonymised by base hospitals. Administrative staff then amalgamated the incidents from all 4 Trusts. The dates, hospital and location fields were temporarily removed before analysis to reduce any potential bias when assessing incidents The free text of incident along with manager's report if available was reviewed by one of the authors experienced in critical incident classification and review to ensure consistency. Data were analysed using SPSS and simple analysis made using 2 × 2 contingency tables.
RESULTS. A total of 580 incidents were reviewed. Two (removed) reports referred to incidents that occurred at the time of tracheostomy procedure. There were 154 non-clinical incidents and 137 non-tracheostomy incidents also removed from the analysis. Table 1 shows the effect of implementing the NTSP resources on rates of harm per Trust. Figure 1 represents totals. We considered 'no harm and temporary harm (TH)' vs 'more than TH' in keeping with similar analyses [1, 2]. There was a clinically and statistically significant reduction in 'more than TH' following the introduction of NTSP initiatives (2 tailed Fisher's exact $p < 0.0001$). This effect remains when considering combined 'some harm' vs 'no harm' ($p < 0.0001$) and also for each individual Trust ($p < 0.0001$).

Table 1 Levels of harm per incident per trust

	Training	No harm	Temporary harm (TH)	No harm and TH combined	TH with increased length of stay	Intervention required to sustain life	Caused/ contributed to death	More than TH categories (combined)	Total
Trust 1	Pre	16	40	56	4	10	1	15	71
	Post	17	16	33	0	0	0	0	***33***
Trust 2	Pre	13	11	24	8	2	2	12	36
	Post	12	13	25	2	1	0	3	28
Trust 3	Pre	1	27	28	3	12	4	19	47
	Post	10	24	34	0	6	0	6	40
Trust 4	Pre	1	5	6	7	2	1	10	16
	Post	11	3	14	1	1	0	2	16

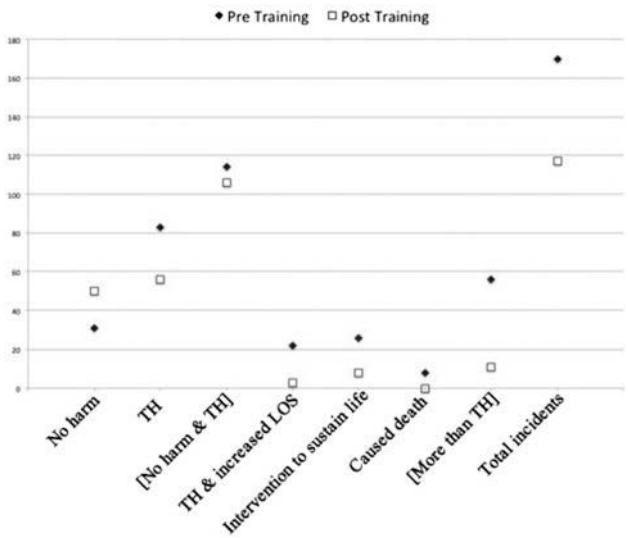


Figure 1. Total numbers of incidents and associated levels of harm for 4 Trusts combined, divided into incidents occurring Pre and Post NTSP training. TH - Temporary Harm. Combined harm categories are in [square brackets].

Fig. 1 Incidents pre and post training

CONCLUSIONS. The introduction of NTSP initiatives reduced the rates and severity of harm resulting from tracheostomy-related patient safety incidents in 4 major teaching hospitals. Wider implementation could further reduce harm in this vulnerable group.

REFERENCE(S). 1. McGrath BA, Thomas AN. Postgrad Med J. 2010;86(1019):522–5. 2. Thomas AN, McGrath BA. Anaesthesia. 2009;64(4):358–65. 3. McGrath BA, et al. Anaesthesia. 2012;67(9):1025–41. 4. http://www.tracheostomy.org.uk.

0162
COMPLICATION RATES OF PERCUTANEOUS TRACHEOSTOMY INSERTION

H. Martin[1], M. Chong[2], B. Bray[3], P. Morgan[3]

[1]Croydon University Hospital, London, UK, [2]St George's Healthcare NHS Trust and St George's University of London, London, UK, [3]Surrey and Sussex NHS Trust, Redhill, UK

INTRODUCTION. Percutaneous tracheostomy insertion is an essential skill for intensivists. There is no clear consensus on the method of insertion, and complications are common. The literature has the complication rate between 2 and 20 %.

OBJECTIVES. The aim of this study was to compare the complication rate of two different methods of insertion. This was carried out at a district general hospital (DGH) near London.

METHODS. This was a retrospective study using the data from all tracheostomy insertions done in the year 2011. At this trust each tracheostomy done has a proforma completed. These were collated and the method of tracheostomy insertion obtained from the intensivists. The methods used were either cutting of the skin, then needle insertion and finally blunt dissection (CUT) or needle insertion, then cutting of the skin and lastly blunt dissection (NEEDLE). The notes of each case were obtained and reviewed for any complications from the tracheostomy. This information was then analyzed by a Chi squared test for a 95 % significance.

RESULTS. 56 percutaneous tracheostomies were done at this DGH in 2011. 15 of which the notes were either unobtainable or the relevant information could not be found. Of the remaining 41, 22 were done by NEEDLE technique and 19 done by CUT. There were 4 complications in the NEEDLE group, of which 2 required further surgical intervention due to bleeding, the other complications were minor bleeding and accidental decannulation. And 1 complication in the CUT group, no further intervention was needed as it was minor bleeding. The complication rate between the groups was not statistically significant ($p = 0.1036$). The total of 5 complications (12.2 %) at the hospital is favourable compared with the study by Glossop et al. who had a complication rate of 25 %. And the major complication rate of 4.9 % (2 of 41) is comparable to a large study by Dempsey at el which had a major complication rate of 3.3 %. Although, accidental decannulation, of which there was 1 case was not considered a major complication in the Dempsey et al. study. There were no deaths in our study related to tracheostomy insertion.

CONCLUSIONS. There appears to be no correlation between method of insertion of percutaneous tracheostomy and complication rate but further prospective larger studies would be beneficial in this area. The complication rate of tracheostomy insertion in our study is comparable with the current literature.

REFERENCE(S). 1. Dempsey GA, Grant CA, Jones TM. Percutaneous tracheostomy: a 6 yr prospective evaluation of the single tapered dilator technique. Br J Anaesthesia. 2010;105(6):782–8. 2. Glossop AJ, Meekings TC, Hutchinson SP, Webber SJ. Complications following tracheostomy insertion in critically ill patients—experience from a large teaching hospital. J Intensive Care Soc. 2011;12(4):301–6.

Traumatic brain injury: 0163–0176

0163
LACK OF ASSOCIATION BETWEEN TRAUMATIC BRAIN INJURY AND SIGNIFICANT MYOCARDIAL DYSFUNCTION

M. El Rayes[1], F. Bernard[2], G. Giraldeau[1], K. Serri[3]

[1]Hôpital du Sacré Coeur de Montreal, Cardiology, Montreal, Canada, [2]Hôpital du Sacré Coeur de Montreal, Critical Care, Montreal, Canada, [3]Hôpital du Sacré Coeur de Montreal, Cardiology, Critical Care, Montreal, Canada

INTRODUCTION. A variety of cardiac manifestations have been described in catastrophic neurological events. Myocardial dysfunction has been described in up to 40 % of patients with subarachnoid hemorrhage (SAH) [1] or brain death [2], which is thought to be related to catecholamine toxicity [3]. There is no data to date describing myocardial function in moderate to severe traumatic brain injury (TBI) not leading to brain death.

OBJECTIVES. Our objectives were to determine the prevalence and severity of myocardial dysfunction in patients with moderate to severe TBI.

METHODS. This a prospective observational study of 48 consecutive patients admitted to a tertiary care Intensive Care Unit with moderate to severe TBI, as defined and graded by the Glascow Coma Scale (GCS). Demographic, clinical, laboratory and radiographic data were collected at the time of admission. Troponin I levels were drawn daily for the first 48 h after admission. Measurement of intracranial pressure (ICP) was documented where clinically indicated. A transthoracic echocardiogram was performed within 4 days of admission, with measurement of left ventricular (LV) function and dimensions according to current guidelines.

RESULTS. Baseline characteristics are shown in table 1. A majority of patients had severe brain injury (83 %). 35 patients required ICP monitoring, and 12 of these had an elevated ICP (26 %). Hospital mortality was 19 %. The average maximum troponin was 1.06 mcg/L (±4). 15 patients had an elevated troponin level (31 %). No patients received inotropic support. Echocardiographic results are shown in Table 2. Echocardiograms were performed an average of 62 h post trauma. There was no significant LV dysfunction. Four patients had regional wall motion abnormalities in a non coronary distribution with preserved LV ejection fraction. LV dimensions, LV diastolic function and right ventricular systolic function were normal.

Table 1 Baseline characteristics

Mean age (years)	37 (±17)
Male (%)	67
Female (%)	33
Mean GCS	6 (±3)
Severe injury (GCS <8) (%)	83
Mean Rotterdam score	3.5 (±1.2)
Mean Marshall score	2.8 (±1.5)
ICP monitoring (%)	73

Table 2 Echocardiographic results

Mean LVEF (%)	65 (±4)
Mean LVEDD (mm)	46 (±6)
Mean LVESD (mm)	30 (±6)
Mean E/A	1.5 (±0.5)
Mean lateral E/e'	6 (±2)
Mean RV S' (cm/s)	15 (±3)

CONCLUSIONS. Although troponin elevation is frequent in patients with moderate to severe TBI, we did not identify any global myocardial dysfunction. It is possible that the young age of patients with TBI and the absence of cardiovascular risk factors are protective against significant myocardial injury from catecholamine excess. Another possibility is that myocardial dysfunction occurs very early and corrects rapidly, unlike in SAH. Further study with strain imaging could identify whether patients with TBI and troponin rise have subclinical myocardial dysfunction.

REFERENCE(S). 1. Jyotsna M, et al. Importance of detection of segmental wall motion abnormalities of left ventricle in nontraumatic subarachnoid hemorrhage: a prospective study. Echocardiography. 2010;496–500. 2. Dujardin KS, et al. Myocardial dysfunction associated with brain death: clinical, echocardiographic, and pathologic features. J Heart Lung Transplant. 2001;20:350–7. 3. Banki NM, et al. Acute neurocardiogenic injury after subarachnoid hemorrhage. Circulation. 2005;112:3314–9.

0164
HAEMOGLOBIN THRESHOLDS FOR RED BLOOD CELLS TRANSFUSIONS IN CRITICALLY ILL PATIENTS WITH ACUTE PRIMARY BRAIN INJURY: RESULTS FROM AN INTERNATIONAL SURVEY

F.S. Taccone[1], G. Citerio[2], M. Oddo[3]

[1]Hopital Erasme, Bruxelles, Belgium, [2]San Gerardo Hospital, Monza, Italy, [3]Lausanne University Hospital, Lausanne, Switzerland

INTRODUCTION. The exact hemoglobin (Hb) threshold to start red blood cell (RBC) transfusion is not defined in patients with acute brain injury (ABI). Experimental and clinical evidence suggests that restrictive Hb target (7 g/dl) may cause further secondary cerebral hypoxia/ischemia, particularly in patients with more severe forms of ABI. On the other extent, liberal Hb target (10 g/dl) may increase infections and morbidity.

OBJECTIVES. The aim of this survey was to investigate the practices of RBC transfusion in ICU patients with primary ABI to examine Hb thresholds that trigger RBC transfusion in this specific ICU population.

METHODS. We conducted a web-based survey for ICU clinicians who manage patients with primary ABI (including subarachnoid hemorrhage, SAH; traumatic brain injury, TBI; ischemic and hemorrhagic stroke; hypoxic ischemic encephalopathy, HIE; post-operative neurosurgical patients; status epilepticus, central nervous system infections; non-infectious encephalitis). An anonymous questionnaire was sent to members of the European Society of Intensive Care Medicine, the Neurocritical Care Society and the Australian and New Zealand Intensive Care Society; also, two reminders were sent.

RESULTS. A total of 867 responses were obtained through the five continents, half of which ($n = 485$) were from European centers; 204 (24 %) responders had a specific certificate in neurocritical care and most of them (84 %) were specialists in anesthesiology or intensive care and had <15 years of practice (68 %). 54 % of responders set the Hb threshold to initiate RBC at 7–8 g/dl. However, half of the responders recognized the need for a different threshold for RBC transfusion in patients with ABI following TBI ($n = 349$), SAH ($n = 279$), ischemic stroke ($n = 181$) and HIE ($n = 109$). In these forms of ABI, many responders set a higher Hb threshold of RBC at 9 g/dl or more (TBI 48 %; SAH 38 %; ischemic stroke 36 %; HIE 29 %). Factors that mostly affected divergence in RBC transfusion policy were known coronary artery disease ($n = 474$), active bleeding ($n = 462$), low SvO_2 ($n = 393$), low brain tissue PO_2 ($n = 314$). Most of responders underlined the need for a randomized clinical trial that compare either two different Hb thresholds for RBC transfusion ($n = 447$) or a restrictive vs. neuromonitoring (brain tissue PO_2)-guided strategy ($n = 316$), particularly after SAH, TBI, stroke and HIE.

CONCLUSIONS. The hemoglobin threshold for RBC transfusion after primary ABI remain below 8 g/dl for approximately half of ICU clinicians. However, 50 % of them still recognized the need for a higher Hb threshold (9 g/dl) in certain conditions, such as SAH, TBI, stroke and HIE, especially when signs of systemic or brain hypoxia are present. This survey identified the need of a randomized clinical trial in this setting.

0165
PHOSPHORYLATED NEUROFILAMENT HEAVY SUBUNIT (PNF-H) IN BLOOD AS A POTENTIAL DIAGNOSTIC AND PROGNOSTIC BIOMARKER IN TRAUMATIC BRAIN INJURY

W. Radwan[1], A. Rabah[2], H. Saber[3], M.O. Elghonemi[1]

[1]Cairo University, CCM, Cairo, Egypt, [2]Cairo University, Neurology, Cairo, Egypt, [3]Beni Suef University, CCM, Cairo, Egypt

INTRODUCTION. One of the main drawbacks in the management of patients with traumatic brain injuries (TBI) is the absence of a widely available and rapid diagnostic test. The detection if a neuron specific protein that is released in blood following TBI may yield diagnostic and prognostic information in such patients.

OBJECTIVES. To assess whether Phosphorylated Neurofilament H(pNF-H) might provide useful diagnostic information for TBI in the early evaluation of such patients and weather levels of pNF-H correlated with different clinical variable.

METHODS. A total of 30 patients presenting to the critical care department of Cairo University diagnosed with TBI were prospectively studied. Blood samples for pNF-H were assayed on admission and after 7 days and mean pNF-H levels were correlated to Glasgow Coma Scale (GCS). We used Marshall score to assess CT findings on admission and after 7 days and scores were correlated with mean pNF-H levels. Rankin score at 3 months was used to detect the degree of disability.

RESULTS. pNF-H levels showed a negative correlation with GCS on admission and after 7 days in traumatic brain injury; hence higher neuromarker levels were associated with lower GCS on admission and after 7 days ($r = 0.66–0.78$, $p < 0005$). There was a negative

correlation between neurofilament levels and Marshall CT scores on admission and after 7 days ($r = 0.56–0.04$, $p < 0.005$) hence higher pNF-H levels correlated with worse CT findings. Patients who died or had the greatest (Rankin 6 and 5) after 3 months had the highest levels of pNF-H on admission and after 7 days. The cut off level of Neurofilament to detect death and disability was 35 pg/ml on admission (sensitivity 82 %, specificity 78 %) and was 11 pg/ml after 7 days (sensitivity 87 %,specificity 92 %, $p < 0.005$).
CONCLUSIONS. Plasma levels of pNF-H were measurable is patients with TBI. Levels of pNF-H were significantly higher in patients who had lower GCS and more extensive CT finding, Patients with worst outcomes had significantly higher levels of pNF-H than those with better outcome. Cut off levels to detect death or severe disability were 35 pg/ml on admission and 111 pg/ml after 7 days. More extensive studies will be needed with higher patient population before the routine use of pNF-H in TBI.
REFERENCES. 1. Petzold A. Neurofilament phosphoforms: surrogate markers for axomal injury, degeneration and loss. J Neurol Sci. 2005;233:183–98. 2. Ingebrigtsen T, et al. Traumatic brain damage in minor head injury: relation of serum S-100 protein measurements to magnetic resonance imaging and neurobehavioral outcome. Neurosurgery. 1999;45(3):468–76. 3. Anderson RE, et al. High serum S100B levels for trauma patients without head injuries. Neurosurgery. 2001;48:1255–60. 4. Anderson KJ, et al. The phosphorylated axonal form of the neurofilament subunit NF-H (pNF-H) as a blood biomarker of traumatic brain injury.
GRANT ACKNOWLEDGMENT. This study was supported by University of Cairo.

0166
THIOPENTAL COMA IN PATIENTS WITH INCREASED CRANIAL PRESSURE REFRACTORY TO STANDARD TREATMENT

N. Shaikh[1], Y. Hanssens[2], M.P. Sujith[1], G.S. Al Sulaiti[3]

[1]Hamad General Hospital, Anesthesia and Intensive Care, Doha, Qatar, [2]Hamad General Hospital, Clinical Pharmacy Services, Doha, Qatar, [3]Hamad General Hospital, Neurosurgery, Doha, Qatar
INTRODUCTION. Secondary brain injury causing refractory intracranial hypertension is usually fatal. Barbiturate coma is the recommended therapy in this desperate clinical condition. Due to its adverse effects however, it is reserved for patients refractory to first line therapy such as mannitol and hypertonic saline.
OBJECTIVES. To evaluate the efficacy and safety profile in patients with secondary brain injury requiring thiopental coma for the control of refractory intracranial hypertension.
METHODS. All patients who were admitted to the intensive care unit (ICU) of Hamad General Hospital, a tertiary hospital, requiring thiopental coma to control refractory intracranial hypertension were enrolled in this study.
Patients with hepatic and/or renal impairment were excluded.
Patients' demographic data, diagnosis, post resuscitation Glasgow coma score (GCS), neurosurgical intervention, intracranial pressure (ICP) before, during and after thiopental coma, duration of thiopental coma, use of vasopressors, occurrence of pneumonia, hepatic and/or renal impairment, septic shock, ICU stay and Glasgow Outcome Score (GOS) were recorded. Dosage of thiopental was as follows: 20 mg/kg/h during the first hour, 10 mg/kg/h for the next 3 h followed by a continuous infusion of 3 mg/kg/h. During the thiopental coma, continuous bispectral index (BIS®) monitoring was applied.
RESULTS. A total 58 patients were enrolled during the 5-year study period. The majority were male (95 %) and suffered traumatic brain injury (86.5 %). Average age was 32 years. There was a significant reduction in ICP following thiopental coma (from 47 ± 12 to 18.5 ± 3.4 mmHg; $p < 0.001$). Mean GCS upon admission was 5.63 (SD = 2.5), duration of thiopental coma was 3.03 days (SD = 1.5), ICU stay was 20.68 days (SD = 22.2) and GCS upon transfer to the ward was 10.6 (SD = 3.06). All patients required vasopressors, 43.1 % had pneumonia, 95 % had dyskalemia and 50 % suffered renal impairment during thiopental coma, 49 % of these patients had liver impairment, 23 % suffered septic shock, and 9 % had enteral feed intolerance. Eleven percent of the patients treated with thiopental coma recovered completely while 5.2 % had mild to moderate functional disabilities. Age did not seem to influence survival. Usage of more than one vasopressor, hypokalemia, hypernatremia and renal impairment were significantly associated with mortality ($P < 0.005$).
CONCLUSION. Thiopental coma significantly reduces raised ICP. Decompressive craniectomy in combination with thiopental coma did not show any survival benefits while age did not influence survival.
Usage of more than one vasopressor, hypokalemia, hypernatremia and renal impairment were the risk factors for increased mortality in thiopental coma patients treated in our institution.

0167
A NOVEL HYPERTONIC SALINE INFUSION REGIME FOR THE TREATMENT OF INTRACRANIAL HYPERTENSION FOLLOWING TRAUMATIC BRAIN INJURY

T. Ali[1], A. Monkhouse[1], H. Madder[1]

[1]John Radcliffe Hospital, Neurosciences Intensive Care Unit, Oxford, UK
INTRODUCTION. Traumatic brain injury (TBI) is a major cause of morbidity and mortality. The key in managing TBI on the intensive care unit (ICU) is to prevent secondary brain injury resulting from intracranial hypertension as this is associated with poor outcome [1]. Various methods of controlling intracranial pressure (ICP) are utilised on ICU, however the two main agents used are mannitol and hypertonic saline (HTS). HTS has been shown to have a better side effect and safety profile than mannitol [2] and demonstrates more effective reduction of ICP both as boluses and as infusions [3].
OBJECTIVES. To establish the safety of a local protocol on the use of 2.7 % HTS for treatment of resistant intracranial hypertension. The protocol commenced a 48 h infusion at 0.5 ml/kg/h with 0.2 ml/kg/h adjustments 4 hourly in response to serum sodium. It targets a serum sodium of 145–155 mmol/l and serum osmolality of 300–320 mOsmol/l.
METHODS. A single centre retrospective study in 30 consecutive unselected patients on Neurosciences ICU (NICU) at the John Radcliffe Hospital. Patient notes, charts and electronic results were utilised for data collection. The collected data included ICP, serum sodium and osmolality, and adverse effects.
RESULTS. Thirty patients were analysed for day 1 and 27 patients for day 2. Loss of three patients' data was due to early discontinuation, death and treatment withdrawal. Improvement in ICP, defined as a fall below 20 mmHg from direct measurement, occurred in 23/30 (76 %) patients. No improvement, described by ICP greater than 20 mmHg, occurred in 7/30 (23 %) patients. Mean rise in serum sodium on day 1 was 2.3 and 4.6 mmol/l on day 2. The mean rise in serum osmolality at the end of the infusion (48 h) was 12.5 mOsmol/l. Overshoot in serum sodium, defined as greater than 155 mmol/l, occurred in 7/30 (23 %) patients however no adverse effects occurred. Adverse effects sought included renal impairment, electrolyte disturbances and dilutional coagulopathy.
CONCLUSIONS. The local protocol for use of 2.7 % saline is safe, effective and easily administered. It significantly decreased ICP in majority of patients with no adverse effects. Sustained hypernatremia occurred in 23 % of patients and was safely tolerated. Further larger controlled trials are required before recommendation for widespread use.
REFERENCE(S). 1. Forsyth LL, Liu-DeRyke X, Parker D Jr, Rhoney DH. Role of hypertonic saline for the management of intracranial hypertension after stroke and traumatic brain injury. Pharmacotherapy. 2008;28:469–84. 2. Battison C, Andrews PJ, Graham C, Petty T. Randomized, controlled trial on the effect of a 20 % mannitol solution and a 7.5 % saline/6 % dextran solution on increased intracranial pressure after brain injury. CCM. 2005;33:196–202. 3. Larive LL, Rhoney DH, Parker D Jr, Coplin WM, Carhuapoma JR. Introducing hypertonic saline for cerebral edema: an academic center experience. Neurocrit Care. 2004;1:435–40.

0168
SUCCESSFUL WEANING AFTER CERVICAL SPINAL CORD INJURY. PRELIMINARY RESULTS IN 34 TETRAPLEGIC PATIENTS

U. Hamsen[1], T. Ramczykowski[1], O. Kuhs[1], M. Aach[1], T.A. Schildhauer[1], J. Swol[1]

[1]BG University Hospital Bergmannsheil, Department of General and Trauma Surgery, Bochum, Germany
INTRODUCTION. Cervical spinal cord injury with tetraplegia lead to respiratory failure and long-term invasive ventilation. Due to the spinal shock the mucosal clearance is reduced. There is a high risk of ventilator-associated pneumonia. The swallow disability is often present. The paralysis of the intercostal musculature leads to dependence of respirator.
METHODS. All patients suffered from acute spinal cord injury with tetraplegia. Injury, clinical course and outcome data was extracted retrospectively using the ICU database. To evaluate predictors for successful weaning we assessed 34 consecutive patients (31 male, 3 female; age 60.7 ± 17.3 years) treated in our center between 1.10.2010 and 1.12.2011.
RESULTS. 32 of 34 patients were discharged from hospital, 2 patients died within hospital stay. 33 patients received tracheostoma for weaning. Mean days ventilated before performed tracheostomy was 9.6 ± 8.7. 28 patients left hospital weaned from ventilator (88 %). 13 of 28 patients left hospital without tracheostoma. Mean duration of ventilation was 30.1 ± 24.7 days.
CONCLUSIONS. Tetraplegic patients are often at an advanced age (>50 years old), which is an unfavorable situation for weaning. Percutaneous tracheostomy simplifies phoniation because the stoma is better sealed. Percutaneous gastrostomy prevents microaspiration and recurrent pneumonia. Weaning from mechanical ventilation is possible and should be aimed once the patient has adapted to the new situation of tetraplegia after resolution of spinal shock.
REFERENCE(S). Call MS, Kutcher ME, Izenberg RA, Singh T, Cohen MJ. Spinal cord injury: outcomes of ventilatory weaning and extubation. J Trauma. 2011;71(6):1673–9.
GRANT ACKNOWLEDGMENT. Conflict of interests: None to declare.

0169
NEFOPAM IN THE STRUCTURE OF POST-OPERATIVE PAIN RELIEF AFTER NEUROSURGICAL OPERATIONS

A. Kondratyev[1], R. Nazarov[1], R. Rutkovskii[1]

[1]Russian Neurosurgical Institute after A.L. Polenov, Saint Petersburg, Russian Federation
INTRODUCTION. The issue of safe and effective pain management in the early postoperative period is still very actual.
OBJECTIVES. The aim of the study was to compare the results of using of centrally acting non-opioid analgetic Nefopam and NSAIDs Ketoprofen. To evaluate the possibility to use Nefopam for postoperative analgesia in neurosurgical patients.
METHODS. In our study we enrolled 147 patients with brain tumors, intracranial vascular pathologies mass lesions and spinal cord who underwent elective neurosurgical treatment. All patients were divided into two groups: in the first group (44 patients) the postoperative pain management was provided by using ketoprofen (100 mg). The patients of the second group (103) received Nefopam 20 mg. Patients in both groups were comparable in age, weight, sex, somatic pathology (physical status by ASA). Randomization was achieved by the introduction of Acupan on the odd days and Ketonal—on the even days. The first dose of the drug was administered during the final stages of the operation intravenously (Nefopam 20 mg as an infusion over 15–30 min, Ketoprofen—100 mg as a bolus). The administration of the next doses of the drugs was based on the assessment of pain intensity. The main criterion for evaluating the effectiveness of pain management in our study was the subjective report of the patient about the quality of analgesia in the first postoperative day (all patients were transferred to the surgical department on the second day after surgery). Checkpoints pain assessment: after waking the patient/after transportation to the ICU, and in 21-00 on the first postoperative day, 8-00 on the second day after surgery. The perception of pain was assessed by a visual analog scale (10-point) or verbal numeric scale (10-point), depending on patient preference.
RESULTS. In the first group (Ketoprofen) in 34 % of cases patients required an additional injection of the drug, in the second group (Nefopan)—39.8 % of patients needed the addition analgesia. The average score when assessing the intensity of acute post-operative pain using a visual analog scale (10-point) or verbal numeric scale (10-point) was 1.05 ± 0.41 in patients of Group I and 1.4 ± 0.49 in group II. This result suggests that the traditional NSAID analgesic has the comparable effect with nefopam. Effect on the clotting ability of the blood was assessed indirectly by quantifying the amount of the hemorrhagic discharge from subcutaneous drainage in the first postoperative day. Application of Ketonal led to a more significant bleeding: group I—240 ± 78 ml, group II—189 ± 93 ml.
CONCLUSIONS. Thus, on the basis of these data we can assume that Nefopam can be successfully used for the relief of acute pain in the postoperative period in neurosurgical patients. In some clinical cases (intraoperative problems with haemostasis, allergy on NSAIDs, aspirin asthma, ulceration in the digestive tract) the use of nefopam may be more preferable.

0170
EARLY DETECTION OF ANTIPITUITARY ANTIBODIES AND PITUITARY DYSFUNCTION IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY

A.T. Mazzeo[1], F. Guaraldi[2], M. Parasiliti Caprino[2], A. Berton[2], G. Mengozzi[3], M. Lucchiari[3], F. Borelli[1], V. Fanelli[1], F. Civiletti[1], A. Sollazzo[1], L. Costa[1], S. Tosetto[1], S. Cavallo[4], M. Berardino[4], C. Capisani[1], I. Mastromauro[1], C. Filippini[1], A. Ducati[5], S. Grottoli[2], E. Ghigo[2], L. Mascia[1]

[1]University of Turin, Anesthesia and Intensive Care, Turin, Italy, [2]University of Turin, Endocrinology, Turin, Italy, [3]University of Turin, Biochemical Clinic, Turin, Italy, [4]Ospedale CTO Torino, Anesthesia and Intensive Care, Turin, Italy, [5]University of Turin, Neurosurgery, Turin, Italy

INTRODUCTION. Hypopituitarism is a common complication affecting late recovery after traumatic brain injury (TBI) but data on neuroendocrine dysfunction in the very early phase after injury are scanty. Recent studies showed the presence of antipituitary antibodies (APA) associated with hypopituitarism in TBI patients 3 years after trauma. Systemic inflammation has been proposed among the possible mechanisms involved in the pathogenesis of endocrine dysfunction in critically ill patients.

OBJECTIVES. Aim of this study was to investigate incidence of pituitary dysfunction, presence of APA, and their relationship with systemic inflammation during the early phase of TBI.

METHODS. Severe TBI patients consecutively admitted to the ICU were prospectively included. Patients with history of endocrine dysfunction or autoimmune disorders were excluded. Demographic data, severity indexes on admission and physiological variables were recorded. Blood samples were obtained on day 1, 2 and 4 to measure TSH, fT3, fT4, prolactin, ACTH, cortisol, GH and IGF1, osmolality, sodium concentration and interleukin (IL)-6 (ELISA). Presence and title of APA were evaluated by indirect immunofluorescence performed on cryostat section of monkey anterior and posterior pituitary gland (Euroimmun, Germany), using an optimized IFI method (secondary Ab: FITC conjugated goat anti-human IgA, IgM, IgG: dilution 1:200). Data are expressed as mean ± SD. Anova for repeated measurements and unpaired t test were applied.

RESULTS. Twenty-five patients were included, 21 male, mean age 41 ± 19, median GCS 4 (range 3–13), median GCSm 2, APACHE II 18 ± 12, ISS 34 ± 9. fT4 and fT3 significantly decreased from day 1 becoming below the physiologic range on day 4 (10.84 ± 2.7, 10.57 ± 3.03, 7.47 ± 1.64, $p = 0.0005$ and 2.45 ± 0.61, 2 ± 0.5, 1.7 ± 0.36, $p < 0.001$ respectively). TSH and prolactin levels remained within the physiological range over time. Prolactin ($p < 0.0001$) and TSH ($p = 0.02$) levels were significantly reduced when patients received dopamine infusion. Diabetes insipidus was detected in 20 % of patients. The remaining hormonal dosage are under evaluation.

On day 1, 2 and 4 anti cytoplasmic Abs (anterior and posterior pituitary) were detected in 43, 53 and 35 % of patients with 1:10 dilution, 43, 47 and 29 % with 1:20 dilution, and 19, 5 and 6 % with 1:40 dilution respectively; Anti nuclear Abs (1:40 dilution) were positive in 9, 10 and 18 % of patients. FT4 was low in 86 % of patients on day 4 and in 38 % of this group APA were positive.

Patients with positive APA showed IL6 levels higher than those without APA ($p = 0.039$). Early pituitary dysfunction and presence of APA were not related to severity indexes on admission.

CONCLUSIONS. This study demonstrates that the dysfunction of pituitary axis is already present in the very early phase after severe TBI. The presence of APA, showed for the first time in the early phase after TBI, was associated with a systemic inflammatory reaction.

0171
AUDIT OF INTRACRANIAL PRESSURE MONITORING IN TRAUMATIC BRAIN INJURY

N. Pathmanathan[1], G. Purushothaman[1], S. Long[1], E. Balakumar[1]

[1]Hull and East Yorkshire Hospitals, Intensive Care Unit, Hull, UK

INTRODUCTION. A recent randomized controlled trial has brought into question the effectiveness of intracranial pressure (ICP) monitoring and the threshold for maintaining ICP below 20 mmHg [1]. However, ICP monitoring remains the current standard for patients with severe traumatic brain injury (TBI) who are admitted to the neuro-intensive care units of most developed countries. The 3rd edition of the Guidelines for the Management of Severe Traumatic Brain Injury [2] from the Brain Trauma Foundation outlines a level II recommendation that 'ICP should be monitored in all salvageable patients with a severe TBI (GCS 3–8 after resuscitation)'.

OBJECTIVES.

- To review insertion rates of ICP monitoring for TBI and compare against current guidelines
- Evaluation of 30 day mortality

METHODS. We conducted a retrospective review of admissions over 1 year from January to December 2011. All adult patients admitted to the neuro-intensive care unit with TBI were included. Baseline demographics, mechanism of injury, severity of head injury, insertion of ICP monitor and outcome at 30 days were collected. Patients admitted to the neuro-high dependency unit were excluded.

RESULTS. 36 patients were admitted with TBI. Five were excluded due to initial GCS not being clearly documented. 31 patients were included in the analysis. Mean age was 39; 81 % were male. The majority of TBI was secondary to falls (18), followed by road traffic collisions (11) and assaults (2).

All patients with ICP monitoring had a subdural bolt sited.

Table 1 Outcome by severity of TBI

Grade	Number	30 day mortality (%)
Mild (GCS 14–15)	2	0 (0)
Moderate (GCS 9–13)	11	2 (18.2)
Severe (GCS 14–15)	23	7 (30.4)

Table 2 ICP monitoring rates

Grade	ICP monitored (%)	No ICP monitoring (%)
Mild (GCS 14–15)	0 (0)	2 (100)
Moderate (GCS 9–13)	6 (54.5)	5 (45.5)
Severe (GCS 3–8)	14 (60.9)	9 (39.1)

Table 3 Outcome by severity and presence of ICP m

Grade	ICP monitoring	Number	30 day mortality (%)
Moderate (GCS 9–13)	No	5	1 (20.0)
Moderate (GCS 9–13)	Yes	6	1 (16.7)
Severe (GCS 3–8)	No	9	5 (55.6)
Severe (GCS 3–8)	Yes	14	2 (14.3)

There were no recorded complications from ICP monitors.

CONCLUSIONS. Insertion rates for ICP monitoring of severe TBI are significantly lower than the currently recommended standard.

There was a large difference in mortality rates for patients with severe TBI who were treated with or without an ICP monitor. Although overall numbers are small, this suggests we should implement ICP monitoring routinely in severe TBI. Further work will focus on longer term survival and neurological outcome.

REFERENCE(S).1. Chesnut RM, Temkin N, Carney N, et al. A trial of intracranial-pressure monitoring in traumatic brain injury. N Engl J Med. 2012;367(26):2471–81. 2. Guidelines for the management of severe traumatic brain injury. 3rd edition. 2007. Brain trauma foundation.

0172
FEVER, LEUKOCYTOSIS AND C-REACTIVE PROTEIN IN NEUROCRITICAL CARE

M.J. Ferreira da Silva[1], A. Lages[1], P. Silveira[2], L. Lencastre[2]

[1]Hospital de Braga, Internal Medicine Department, Braga, Portugal, [2]Hospital de Braga, Intensive Care Unit, Braga, Portugal

INTRODUCTION. Fever is a common finding in patients with brain injury, which can be related to a multiplicity of causes. Its presence may complicate up to 70 % of all Intensive Care Unit (ICU) admissions, with direct impact in short and long-term mortality. One of the most challenging questions is whether its presence is infectious or due to neuronal lesion, leading to significantly differences in treatment approaches.

OBJECTIVES. To evaluate the incidence of fever in acute neurological/neurosurgical patients in ICU, and to relate it to C-reactive protein (CRP) and leukocytes values.

METHODS. Retrospective study of 106 patients admitted in our ICU to neurointensive care measures, during 2011. Using SPSS 20.0, following data was analysed: demographics; type of admission (planned or emergent traumatic/medical); admission Glasgow Coma Scale (GCS); Acute Physiology and Chronic Health Evaluation (APACHE) II score; body temperature; CRP and leukocytes values; subarachnoid haemorrhage (SAH); invasive procedures (intracranial pressure sensor (ICPS), cranial drainage and external ventricular drains (EVD)), craniotomy and mortality. Fever was defined by body temperature >38.3 °C, at least documented on one measurement for 2 days in a row.

RESULTS. The majority of patients (43.4 %) were admitted after traumatic brain injury (TBI). Admission GCS was lower than 6 in 43 patients. The mean APACHE II score was 19.26 (±7.6). Fifty-four patients (50.9 %) developed fever, in which 65.6 % were admitted after emergency surgery, and 54.3 % had TBI. Admission type and presence of fever were statistically significant ($p = 0.003$). Fever was also associated with SAH ($p = 0.02$) and ICPS ($p < 0.0001$). Cranial fracture, craniotomy, cranial drainage and EVD didn't show significant relation with fever onset. More than 70 % of patients had leukocyte count above 10,000/μL, but no direct relation to fever was found. In opposition, values of CRP superior to 50 mg/L were associated with a higher incidence of fever showing a statistically significant result ($p < 0.001$). Fever as an independent variable was not associated with a higher ICU mortality ($p = 0.06$).

CONCLUSIONS. As observed in other studies, elevated body temperature is frequently encountered in patients with brain injury and appears to be related with both medical and traumatic causes. Fever can be caused by exogenous or endogenous pyrogens, which are released after neuronal insult. SAH and ICPS appear to have an important role in fever onset. Elevated CRP may be more significant than leukocytosis as a predictor of fever in neurocritical patients. Its role to distinguish infectious/non-infectious causes remains unknown and requires further studies with other biological markers. We believe this is a starting point to future prospective studies that may help set new references in cut-off values of well-known biomarkers.

REFERENCE(S). 1. Neurobiol Dis. 2003;12:163–73.

0173
PUPILLARY ALTERATIONS AND OTHER PROGNOSTIC FACTORS IN PATIENTS WITH STRUCTURAL BRAIN LESION WHO UNDERGO DECOMPRESSIVE CRANIECTOMY

M. Arias-Verdú[1], M. Delgado-Amaya[1], R. Gutiérrez-Rodriguez[1], A. Muñoz-López[1], S. Fernández-Jimenez[1], G. Jiménez-Pérez[1], R. Rivera-Fernández[1], A. Pérez-Rielo[1]

[1]Hospital Carlos Haya, Intensive Care Unit, Málaga, Spain

OBJECTIVE. To analyze in patients admitted to the ICU by structural brain lesion who undergo decompressive craniectomy (DC) the relation between mortality and the clinical characteristics of the patient in an attempt to define modifiable risk factors.

METHODS. The prospective study included all those patients with structural brain damage (spontaneous subarachnoid haemorrhage (SAH) secondary to aneurysm rupture, spontaneous intracerebral haemorrhagic (SIH), ischaemic stroke and traumatic brain injury (TBI)) requiring decompressive craniectomy at some time during their ICU stay, between 2006–2012. Data were recorded on age, sex, Glasgow coma scale, abnormal pupils, admission diagnosis, reason for DC, time of DC, administration of pentotal, mortality (ICU and hospital), cranial tomography characteristics, etc. The statistical analyses were done with the Student test, Chi squared test and logistic regression.

RESULTS. The sample included 62 patients, 19 with SAH secondary to aneurysm rupture, 5 with SIH, 6 with ischaemic stroke, and 32 with TBI. Their age was 73 ± 48.22 years, the depth of coma on admission, assessed with GCS, was 9.35 ± 68, and APACHE II 21.57 ± 5.87. Prior to surgery 28 patients (45.2 %) had isochoric pupils, 32 (51.6 %) had anisocoria and 2 (3.2 %) had bilateral nonreactive mydriasis. ICU mortality was 29 % and hospital mortality 40.3 %. Those patients who died in the hospital presented no significant differences concerning age and Glasgow coma scale. The mortality in 34 patients with

abnormal pupils before surgery was 58.8 %, and in 28 patients with normal pupils before surgery it was 17.9 % ($p = 0.001$); OR 6.57 (2.01–21.47). According to the diagnosis, the mortality in 32 patients with TBI was 31.3 %, in those with SAH it was 52.6 %, in those with ICH it was 80 %, and in those with ischaemic stroke it was 16.7 % ($p = 0.083$).
In the 41 patients who underwent DC during the first 48 h the mortality was 31.7 % and in the 21 who underwent DC later it was 31.7 % ($p = 0.053$).
Multivariate analysis showed that mortality in these patients was related with abnormal pupils before surgery: OR 10.63 (2.46–45.91), type of diagnosis: OR 3.5 (1–12.23), and surgery within the first 48 h: OR 0.178 (0.042–0.759).
CONCLUSIONS. Hospital mortality in patients with structural brain damage who undergo DC is far worse in those whose surgery is delayed and in those who have pupillary abnormalities before surgery. Our data suggest that measures to prevent the onset of these pupillary abnormalities might improve the survival of these patients.

0174
DIFFUSE AXONAL INJURY IN PATIENTS WITH HEAD INJURIES. EARLY PROGNOSIS AND FACTORS ASSOCIATED

A.M. Bueno González[1], M.C. Corcobado Marquez[1], A. Serrano Lázaro[1], M.C. Espinosa González[1], M. Portilla Botelho[1], A. Ambrós Checa[1]

[1]Hospital Universitario Ciudad Real, Critical Care, Ciudad Real, Spain
INTRODUCTION. Diffuse axonal injury (DAI) is usually associated to severe trauma, although the prognosis impact is not yet well established.
OBJECTIVES. The aim is describe the clinical features and the radiological findings in DAI after head trauma, to analyze the utility of MRI and CT-scan to detect this lesion, and to evaluate its prognosis impact by consciousness level recovery and mortality.
METHODS. A total of 189 patients admitted with head injury in the ICU of Ciudad Real University Hospital from 2008 to 2012 were included. Demographic and clinical characteristics, as well as radiological findings assessed by magnetic resonance imaging (MRI) and CT-scan at admission in the intensive care unit are described. DAI was defined by the presence of haemorrhagic traumatic lesions <10 mm, and consciousness level recovery was defined by a Glasgow coma scale (GCS) ≥11.
RESULTS. Average age of patients was of 40 ± 20 (SD) years, 76 % had a severe head trauma and 28 % showed DAI. The most frequent injuries were Subarachnoid Haemorrhage (SAH) (61 %) and Intraventricular Haemorrhage (IVH) (51 %). MRI was performed in 16 patients (30 %). 14 cases (33 %) did not recover level of consciousness, 10 patients (19 %) presented disautonomy, and 8 cases (17 %) died.MRI showed injuries in all the cases located in subcortical white matter, corpus callosum (CC) and brain stem (BS), while CT-scan only found lesions in the 60 %, 8 % and none in BS, respectively. All the patients with injury in CC and BS, associated lesion in subcortical white matter; while those who had a damaged midbrain also had a lesion in CC. All the patients with account ≥5 haemorrhagic milimetric lesions, 63 % of patients with lesion in CC and BS (RR 2.40, 95 % CI 1.31–4.39), 54 % of patients with GCS ≤3 at admission at ICU (RR 1.97, 95 % CI 1.25–3.11), and 60 % of patients with disautonomy (RR 2 95 % CI 1.04–3.81) were related with a poor prognosis, not recovering consciousness, although there was not related with mortality. The mechanism of trauma, especially higher energy traffic accidents (OR = 3.69, 95 % CI 1.56–8.73) and Intraventricular Haemorrhage (IVH) (OR = 9.13 95 % CI 3.47–23.99) were independent risk factors associated with DAI. Epidural haematoma (EPH) (OR = 0.083, 95 % CI 0.016–0.41) and Subdural haematoma (SDH) (OR = 0.378, 95 % CI 0.162–0.885) were protective factors.
CONCLUSIONS. MRI was a better test than CT-scan to detect DAI. The presence of a deeper injury is associated to superficial cerebral lesions and to a lower GCS at ICU discharge, confirming Ommaya's model. The presence of ≥5 haemorrhagic milimetric lesions, mostly when located in CC and BS, a GCS ≤3 at admission in ICU, and the presence of disautonomy were related with a poor prognosis. IVH was identified as a risk factor for DAI, while Subdural and Epidural haematoma behaved as protective factors.
REFERENCE(S). The Journal of TRAUMA® Injury, Infection, and Critical Care. vol 71, no. 4; 2011.
GRANT ACKNOWLEDGMENT. No conflict of interest.

0175
APPLICATION SHORT-LATENSY SOMATO-SENSORED EVOKED POTENTIALS FOR EVALUATION OF SWALLOWING DISORDERS IN EARLY PERIOD AFTER POSTERIOR FOSSA SURGERY

V. Podlepich[1], I. Savin[1], A. Goryachev[1], A. Oshorov[1], V. Shimanskij[1], E. Sokolova[1], I. Mackovskij[1], E. Anan'ev[1], A. Nechaeva[2]

[1]Burdenko Research Neurosurgery Institute, Russian Academy of Medical Sciences, Moscow, Russian Federation, [2]Pirogov Russian National Research Medical University, Moscow, Russian Federation
OBJECTIVES. Neurogenic dysphagia after removal of fossa posterior tumors (FPT) appears in 17 % of cases. The level of necessary upper airway protection depends on severity of dysphagia. In our neuro-ICU the clinical screening test (CST) and fibreoptic evaluation of swallowing test (FEST) is used to determine the severity of swallowing disorders. The CST and FEST require patient's collaboration during examination. We applied evaluation of somato-sensored evoked potentials (SSEP) to predict swallowing disorders in post-operative period in FPT of sedated patients.
METHODS. It was a prospective pilot study during the period of 09-12.2011 year. It included 17 patients operated for FPT. All patients passed SSEP at the day before operation. No significant asymmetry of response was revealed in any patient. All patients were delivered to ICU intubated and mechanically ventilated after operation. 12 patients after full recovery from anesthesia, returning to consciousness and passing spontaneous breathing test (SBT) underwent CST of 6 points without deficit were considered to have none or low level of dysphagia and successfully extubated in 4.5 h after operation. These patients formed 1st group. 5 patients required prolongation of post-operative mechanical ventilation for more than 15 h because of unpassed CST i.e. no reaction on ETT, absence of cough, no reaction on suctioning from trachea. These patients formed 2nd group. We performed SSEP in all patients immediately after admission to ICU.
RESULTS. We revealed significant asymmetry of Central Conduction Time in 2nd group. Inverse correlation between amplitude N20 at admission and time to get readiness to extubate was determined.

0176
RELATION BETWEEN MORTALITY IN THE HOSPITAL AND AT 1 YEAR WITH THE CRANIAL CT EVALUATED USING THE MARSHALL CLASSIFICATION IN PATIENTS WITH TRAUMATIC BRAIN INJURY

M.A. Prieto-Palomino[1], M. Arias-Verdú[1], E. Curiel Balsera[1], M. Delange-Van Der Kroff[2], M. Domínguez-Paez[3], I. Macias-Guarasa[1], P. Fernández-Ortega[1], R. Rivera-Fernández[1]

[1]Hospital Carlos Haya, Intensive Care Unit, Málaga, Spain, [2]Hospital Axarquia, Intensive Care Unit, Velez-Málaga, Spain, [3]Hospital Carlos Haya, Department of Neurosurgery, Málaga, Spain
OBJECTIVE. To evaluate in patients admitted to the ICU with traumatic brain injury (TBI) the relation between the cranial CT findings on admission using the Marshall classification and hospital and 1-year mortality.
MATERIALS AND METHODS. A prospective cohort study of patients admitted consecutively to the ICU of Carlos Haya hospital, Malaga with TBI in 2004–2008. Data were recorded on different scores of severity and cranial CT on admission using the Marshall classification. The results were analyzed on discharge and at 1 year.
RESULTS. The cohort comprised 531 patients, aged 40.35 ± 19.75 years; 152 (28.6 %) died in the hospital and 171 (32.2 %) had died at one year; 35 (6.6 %) were lost to follow-up.
The patients who died in the hospital were older (47.07 ± 21.41 vs. 37.65 ± 18.38, $p < 0.001$), had a higher APACHE II (23.71 ± 6.23 vs. 15.63 ± 5.82, $p < 0.001$), and lower Glasgow (5.17 ± 3.01 vs. 8.47 ± 3.71, $p < 0.001$). Mortality was significantly related with the morphological CT lesion on admission, such that mortality in patients with diffuse Type I injury (N = 55) was 5.5 %, in those with Type II injury (N = 149) it was 8.1 %, in those with Type III injury (N = 130) it was 31.5 %, and in those with Type IV injury (N = 44) it was 68.2 %. Mortality in those with an evacuated mass (N = 120) was 36.7 % and in those with a non-evacuated mass (N = 33) it was 66.7 %; $p < 0.001$. The logistic regression analysis showed that hospital mortality was associated with Apache II (OR 1.127, CI 1.071–1.186), age (OR 1.027, CI 1.012–1.042), ISS (OR 1.03, CI 1.01–1.05), Glasgow score on admission (OR 0.875, CI 0.791–0.969), and the admission CT: diffuse Type I lesion (OR 1), Type II (OR 1.419, CI 0.319–6.363), Type III (OR 4.137, CI 1.002–17.074) and Type IV (OR 15.637, CI 3.35–79.919); evacuated mass (OR 6.907, CI 1.622–29.41), non-evacuated mass (OR 19.953, CI 3.834–103.831).
Mortality at 1 year was related in multiple logistic regression with the APACHE II (OR 1.131, CI 1.075–1.19), age (OR 1.039, CI 1.024–1.054), ISS (OR 1.025, CI 1.0006–1.044), Glasgow coma score on admission (OR 0.876, CI 0.793–0.967), and the Marshall classification: diffuse Type I lesion (OR 1), Type II (OR 2.98, CI 0.677–13.124), Type III (OR 5.092, CI 1.201–21.582), and Type IV (OR 17.227, CI 3.60–82.445); evacuated mass (OR 10.127, CI 2.315–44.301), non-evacuated mass (OR 26.769, CI 2.315–44.301).
CONCLUSION. The CT lesion on admission done routinely in patients with TBI admitted to the ICU and evaluated according to the Marshall classification correlates well with mortality in the hospital and at 1 year. It also provides additional information about the widely known prognostic factors, such as the APACHE II and ISS, age, and Glasgow coma scale.

Acute kidney injury: 0177–0190

0177
ARE RIFLE-CRITERIA USEFUL TO DISTINGUISH PATIENTS PROGNOSIS WITH ACUTE RENAL FAILURE ON ICU?

D. Martina[1], B. Gottschlich[2], P. Jens[2,3], M. Ragaller[1]

[1]University Hospital Dresden, Anaesthesiology and Intensive Care Medicine, Dresden, Germany, [2]University Hospital Dresden, Dresden, Germany, [3]University Hospital Dresden, Nephrology, Dresden, Germany
OBJECTIVES. In 2004 the RIFLE-classification to define acute renal failure by clinical parameters was published. In the current investigation these criteria were used in the clinical routine to classify acute renal failure as well as to give some information about the prognosis of critically ill patients with acute renal failure. Therefore the two arms of the RIFLE criteria (increase of creatinin vs. oligo-anuria) were separately analyzed for their impact on necessity of renal replacement therapy (RRT) and outcome. After approval by the local ethical board a population of 2,835 surgical ICU-patients was investigated.
METHODS. Acute renal failure was diagnosed either by increase of the creatinin concentration in plasma or by the symptom of oligo-anuria whatever comes first. Furthermore, SAPS-II, age, underlying disease, fluid therapy, diuretics, RRT and outcome were documented.
RESULTS. In 206 patients (7.3 %) diagnosis of acute renal failure was assured via RIFLE-criteria. 106 patients showed an increase of creatinin over the threshold (creatinin-group) as the first sign whereas 100 patients were diagnosed by oligo-anuria as the first symptom of renal failure (anuria-group). End stage kidney disease patients (ESKD) were excluded from the analysis. In contrast to the anuria-group with a mortality rate of 3 %, the creatinin-group showed a remarkable mortality rate of 44.3 %. In 177 patients RRT was avoided by fluid-therapy, catecholamines and diuretics. 27 patients of the creatinin group and 2 patients of anuria-group needed RRT. 78.8 % of the patients with the necessity of RRT died on ICU.
CONCLUSIONS. Diagnosis of acute renal failure on ICU via RIFLE criteria is clinically feasible and useful. The two different arms of RIFLE criteria obviously discriminate two types or phases of acute renal failure. Patients with acute renal failure diagnosed via increase of creatinin have a higher requirement of RRT and more worse prognosis.
REFERENCE(S). Bellomo R. Crit Care. 2004;8:R204–12.

0178
ACUTE KIDNEY INJURY IN THE ICU IS INDEPENDENTLY ASSOCIATED WITH ANAEMIA AT HOSPITAL DISCHARGE

J.R. Prowle[1,2], I. Kolic[1], J. Purdell-Lewis[1], R. Taylor[1], C.J. Kirwan[1,2]

[1]Barts Health NHS Trust, Adult Critical Care Unit, London, UK, [2]Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, UK

INTRODUCTION. Anaemia occurs frequently in patients who develop acute kidney injury (AKI) in the ICU. Persistent anaemia may contribute to duration of hospitalization, health care costs and morbidity in ICU survivors. It is uncertain to what extent AKI in the ICU persists as a risk factor for anaemia after ICU discharge and apparent recovery of renal function.
OBJECTIVES. To assess the relationship between AKI category in ICU and anaemia indices at hospital discharge.
METHODS. We examined all ICU admissions of ≥5 days who survived to hospital discharge during 2011 in our ICU. AKI was defined by KDIGO creatinine criteria, ESRD was excluded. We examined the association of AKI category with haemoglobin concentration (Hb) and red cell distribution width (RDW) at hospital discharge in univariate analysis (ordinary ANOVA) and in multiple linear regression analysis accounting for other potentially relevant covaraites (Age, Sex, Admission Creatinine, APACHE II, Hospital Discharge eGFR, Hospital LOS, Admission Hb, Admission RDW). Variables significant to a p-value of 0.1 on uni-variate analysis were considered and multi-variable models developed by backward elimination of non-significant co-variates.
RESULTS. We identified 253 patients, median age was 49 (IQR 31–63) and 69 % were male; 97 had No AKI, 68 AKI-1, 29 AKI-2 and 62 AKI-3. RRT was needed 47 patients none of whom immediately required long-term dialysis after ICU discharge. Only 19/253 patients (7.5 %) had eGFR <60 at hospital discharge. In all patients median discharge Hb was 10.5 (IQR 9.5–11.5) and RDW was 15.5 % (IQR 14.2–16.6). AKI category was significantly associated with lower Hb ($p = 0.0004$) and higher RDW ($p < 0.0001$) at discharge (Fig. 1). In multivariable modelling all AKI categories were associated with high RDW at discharge (Table 1) while only AKI-3 was associated with lower Hb (Table 2). In contrast neither hospital discharge eGFR nor hospital admission creatinine were significantly associated with discharge Hb or RDW.

Table 1 Multiple-LR RDW

Coefficients	Estimate	SE	p-value
Intercept	11.67	0.82	<0.0001
No AKI	Ref	Ref	Ref
AKI-1	0.71	0.31	0.02
AKI-2	0.89	0.41	0.03
AKI-3	1.12	0.35	0.001
Male sex	-1.10	0.27	<0.0001
RDW % Hosp Adm	0.25	0.05	<0.0001
APACHE II ICU Adm	0.04	0.02	0.04

Multiple R-squared: 0.2697

Table 2 Multiple-LR haemoglobin

Coefficients	Estimate	SE	p-value
(Intercept)	9.5	0.49	<0.0001
No AKI	Ref	Ref	Ref
AKI-1	−0.19	0.22	NS
AKI-2	−0.27	0.30	NS
AKI-3	−0.89	0.23	0.0002
Haemoglobin Hosp Adm	0.10	0.04	0.004

Multiple R-squared: 0.1025

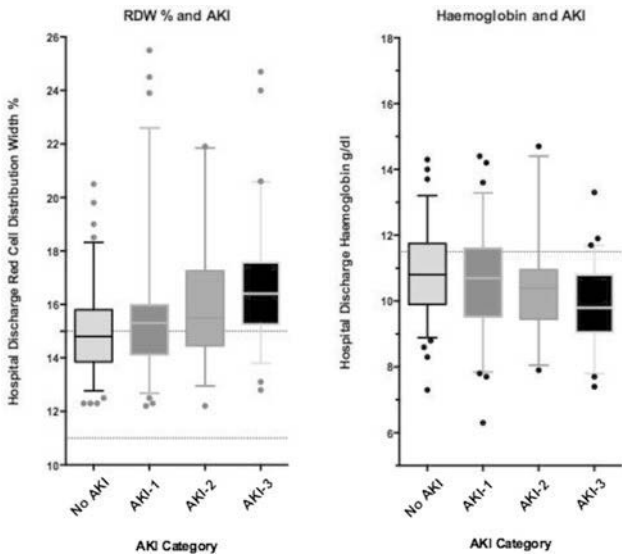


Fig. 1 AKI category in ICU and anaemia indices at hospital discharge

CONCLUSIONS. AKI in the ICU affected anaemia indices at hospital discharge, even with apparent recovery of renal function in most patients, conversely assessment of chronic kidney disease (CKD) by eGFR was not significantly associated with anaemia. However, assessment of CKD status at hospital discharge can be confounded by loss of muscle mass in sicker patients so many AKI survivors may have unappreciated reduction in true GFR. Higher RDW was more strongly associated with AKI category that lower Hb, suggesting that haematinic deficiency may contribute to post-AKI anaemia. In addition, the true impact of AKI on Hb may be limited by blood transfusion. Further research is required to examine factors associated with anaemia after ICU discharge. AKI survivors may be a particular group in which targeted intervention for anaemia might improve outcomes.

0179

INCIDENCE OF ACUTE KIDNEY INJURY IN THE PATIENTS UNDERGOING SURGICAL TAVI

A. Kogan[1], L. Sternik[1], E. Nachum[1], E. Raanani[1]

[1]Sheba Medical Center, Ramat Gan, Israel

INTRODUCTION. Acute kidney injury (AKI) occurs in 5–10 % of patients after conventional aortic valve replacement. In the modern practice transfemoral or transapical aortic valve implantation are being used more and more widely. Very few data exist in the AKI associated with surgical aortic valve implantation (TAVI).
OBJECTIVES. We perform study to determine incidence, predictive factors and prognosis of AKI following TAVI.
METHODS. We prospectively studied 52 consecutive patients (Logistic EuroSCORE 22.1 ± 7.2) who underwent surgical transapical, transaortic or transaxillary aortic valve implantation (TAVI) with Edwards SAPIEN heart valve Or Medtronic heart valve between October 2010 and October 2012 in our department. AKI was defined according to RIFLE criteria.
RESULTS. AKI was identified in 14 patients (26.9 %) and 2 (3.83 %) patients required renal replacement therapy. The unadjusted 30-days mortality rate was 7.69 % (4 patients) in those patients with AKI and zero mortality in those without AKI ($P > 0.0005$). Univariate analysis identified preoperative serum creatinine more than 1.5 mg/dl, logistic EuroSCORE more than 25 and blood transfusion as risk factors to be associated with AKI. By multivariate analysis preoperative serum creatinine level remained as the only independent predictor of AKI.
CONCLUSIONS. In this study, AKI occurred in one-fourth of the patients after surgical aortic valve implantation and associated with high risk of in-hospital mortality. Preoperative serum creatinine level was identified as the only predictor of AKI.

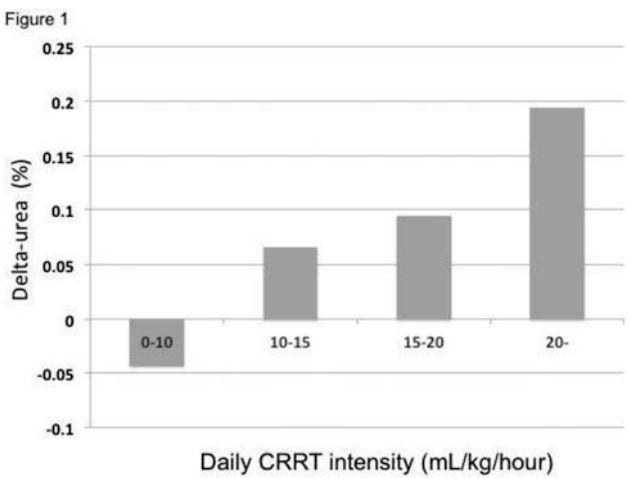
0180

HOW LOW IS TOO LOW? THE LOWER LIMIT OF INTENSITY TO CONTROL UREMIA DURING CONTINUOUS RENAL REPLACEMENT THERAPY

H. Yasuda[1], S. Uchino[2], Japanese Society of Education for Physicians and Trainees in Intensive Care (JSEPTIC)

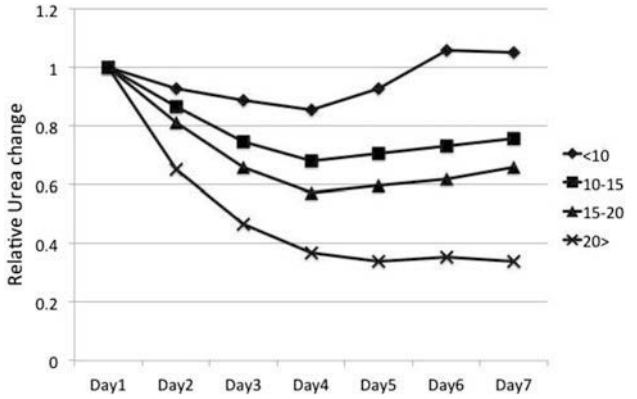
[1]Kameda Medical Center, Intensive Care Medicine, Chiba, Japan, [2]Jikei University School of Medicine, Intensive Care Medicine, Department of Anesthesiology, Tokyo, Japan

INTRODUCTION. The optimal intensity of continuous renal replacement therapy (CRRT) for acute kidney injury (AKI) in the ICU is unclear. Randomized controlled trials have shown that there was no advantage of high intensity for hospital mortality (>35 ml/kg/h) [1, 2]. However, although 20 or 25 ml/kg/h has been suggested to be the lower limit of intensity during CRRT, only limited information is available to support this threshold.
OBJECTIVES. The aim of this study is to determine the lower limit of intensity to control uremia during CRRT.
METHODS. This is a multicenter retrospective study of adult AKI patients (older than 18 years) treated with CRRT in one of the 14 ICUs in 12 centers in Japan between January 2010 and December 2010. Patients were divided into four groups (less than 10 (≤10), 10–15, 15–20 and more than 20 (>20) ml/kg/h) to study the effect of different CRRT intensity on clearance of creatinine and urea, according to the daily intensity and average intensity.
RESULTS. In the daily intensity analysis, a total of 1102 observations in 339 patients were included. Each group included 254 (23.1 %), 470 (42.7 %), 239 (21.7 %), and 137 (12.4 %) data points, respectively. Creatinine and urea increased only in the "≤10" group, and decreased as the daily intensity increased in the other groups (Fig. 1). In the average intensity analysis, a total of 316 patients were included. Each group included 64 (20.3 %), 138 (43.7 %), 68 (21.5 %), and 46 (14.6 %) patients, respectively. Decrease in creatinine and urea became larger as the average intensity became higher (Fig. 2). Creatinine and urea did not decrease only in the "≤10" group. Hospital mortality in each group was 54.7, 55.1, 51.5 and 65.2 %, respectively. CRRT intensity was not related to hospital mortality in multivariable logistic regression analysis.



Delta urea in the daily intensity

Figure 2



Relative urea change in the average intensity

CONCLUSIONS. We found that the lower limit of intensity to control uremia during CRRT seemed to be somewhere between 10 and 15 ml/kg/h. We also found that CRRT intensity was not related to hospital mortality.

REFERENCE(S) 1. Bellomo R, Cass A, Norton R, et al. Intensity of continuous renal-replacement therapy in critically ill patients. N Engl J Med. 2009;361:1627–38. 2. Palevsky PM, Zhang JH, O'Connor TZ, et al. Intensity of renal support in critically ill patients with acute kidney injury. N Engl J Med. 2008;359:7–20.

0181

EARLY ACUTE KIDNEY INJURY IN POSTOPERATIVE SEVERE SEPSIS/ SEPTIC SHOCK SEPTIC ADMITTING TO GENERAL SURGICAL INTENSIVE CARE UNIT

S. Kongsayreepong[1], P. Nitikaroon[1]

[1]Siriraj Hospital, Mahidol University, Anesthesiology, Bangkok, Thailand

INTRODUCTION. Acute kidney injury (AKI) is a common complication found in post-operative period. Despite some information was reported about AKI in the postoperative critically ill patient but still more information is needed especially in the postoperative patient with severe sepsis/septic shock and the controversies in fluid resuscitation.

OBJECTIVES. Evaluate the incidence, risk factors and outcome of early AKI in postoperative severe sepsis/septic shock patient on admission to the general surgical ICU.

METHODS. Approval from Siriraj IRB, this prospective observational study was performed in 196 major adult (>18 years) postoperative noncardiac patients with severe sepsis/septic shock on admission to the 14 beds, closed general surgical ICU during January–November 2012. The following data were collected: patient demographic data, ASA physical status, co-morbidity, type and urgency of surgery, type of anesthesia, preoperative and the first 72 h laboratory data, amount of bleeding, type and amount of fluid, blood and blood component replacement, average intraoperative and the first 72 h mean arterial blood pressure. Outcome including ICU length of stay, ventilator days, ICU and 90 day mortality were also collected. Early AKI was defined as the highest AKIN stage occurred within the first 3 days of ICU admission.

RESULTS. 56 % of postoperative severe sepsis/septic shock developed AKI (AKIN-I 10 %, AKIN II 75.4 %, AKIN III 74.5 %). This predictive factors were : male ($p = 0.03$), Apache-III score ≥40 ($p < 0.001$), ASA class III–IV ($p = 0.001$), baseline expected GFR ≤40 ml/min/1.73 m^2 ($p < 0.001$), serum albumin at ICU admission <2.1 g/dL ($p = 0.014$), hemoglobin level ≤9 g/dl ($p < 0.001$), intra-operative hypotension ($p < 0.001$) and 6 % HES (Voluven®) >14 cc/kg/day ($p = 0.002$). The patients who had fluid overload tend to have more AKI ($p = 0.07$). Multiple logistic regression showed independent risk factors of AKI: male ($p = 0.004$),Apache-III score ≥40 ($p = 0.006$), baseline expected GFR ≤40 ml/min/1.73 m^2 ($p < 0.001$), intra-operative hypotension ($p = 0.03$), hemoglobin level ≤9 g/dL at ICU admission ($p = 0.001$), serum albumin at ICU admission day 1 less than 2.1 g/dL ($p = 0.01$), 6 % HES >14 cc/kg/day ($p = 0.006$). In addition, patients who received 6 % HES >14 cc/kg/day did not have volume overload, received more RRT ($p = 0.003$) and had higher 90 days mortality ($p < 0.001$).

CONCLUSIONS. The incidence of early AKI in postoperative severe sepsis/septic shock surgical patients admitting to general surgical ICU is 56.1 %. The septic surgical patients with risk factors should be closely observed to prevent AKI and 6 % HES (Voluven®) >14 cc/kg/day increase risk for developing AKI, RRT, and 90 day mortality in septic surgical patients.

REFERENCE(S). Medve L, Gondos T. Epidemiology of postoperative acute kidney injury in Hungarian intensive care units: an exploratory analysis. Ren Fail. 2012;34:1074–8.

0182

ANALYSIS OF PREOPERATIVE AND OPERATIVE PREDICTORS OF ACUTE KIDNEY INJURY IN CARDIAC SURGERY. A MULTICENTRE STUDY

E. Curiel Balsera[1], V. Olea Jimenez[1,2], J. Muñoz Bono[1], A.C. Sánchez-Rodríguez[3], F. Dios-Torronteras[4], A. Reina-Toral[5], R. Rivera Fernandez[1], ARIAM Adult Cardiac Surgery

[1]Carlos Haya Regional University Hospital, Intensive Care Unit, Málaga, Spain, [2]Galvez Hospital, Intensive Care Unit, Málaga, Spain, [3]Puerta del Mar Hospital, Intensive Care Unit, Cádiz, Spain, [4]Reina Sofia Hospital, Intensive Care Unit, Cordoba, Spain, [5]Virgen de las Nieves Hospital, Intensive Care Unit, Granada, Spain

INTRODUCTION. Cardiac surgery poses a significant risk of acute kidney injury (AKI) and this cause worse outcome.

OBJECTIVES. Analyze predisposing factors to develop AKI in postoperative of cardiac surgery.

METHODS. Prospective, observational and multicentre study of patients admitted in ICU after major cardiac surgery in 13 hospitals of Spain.

Clinical and epidemiological besides intraoperative factors were analyzed for developing AKI. AKI was defined as double levels of creatinine if it was normal previously, or above 3.5 mg/dl if it was between 1.2–2.2 or need for renal replacement therapy (RRT).

We used Chi square test and student-t test for univariate analysis and binary logistic regression for multivariate analysis, with p value <0.05.

RESULTS. We included 7,276 patients with 63.91 ± 12.45 years old and 61.1 % of male gender and mean EuroSCORE of 5.86 ± 3.14. 9.6 % developed AKI as defined (2.5 % needed RRT). Multivariate analysis showed that AKI was related to previous renal failure (OR 1.79, CI 1.46–2.19), surgical risk evaluated with EuroSCORE (OR 1.14, CI 1.11–1.17), bypass time greater than 120 min (OR 2.05, CI 1.74–2.41), timing of surgery (Scheduled OR 1, urgent OR 1.43 and emergent 1.74), statins before surgery OR 0.83 (0.70–0.97) and diuretics use before surgery OR 1.42 (1.19–1.69). Neither perioperative transfusion nor other chronic treatments were related to AKI.

CONCLUSIONS. AKI is a serious complication after cardiac surgery with poor outcomes. Chronic renal failure and use of diuretics increase risk for it, as timing and length of surgery. Statins seems to have a protective effect that could be reviewed.

REFERENCE(S). Stafford-Smith M, Shaw A, Swaminathan M. Cardiac surgery and acute kidney injury: emerging concepts. Curr Opin Crit Care. 2009;15(6):498–502.

GRANT ACKNOWLEDGMENT. Josele Benitez-Parejo (ARIAM Secretary)

0183

HALF-DAY COURSE COULD ALLOW JUNIOR OPERATORS TO ASSESS DOPPLER-BASED RENAL PERFUSION

D. Schnell[1], M. Reynaud[2], M. Venot[3], A.-L. Le Maho[4], M. Dinic[2], M. Beaulieu[2], G. Ducos[3], J. Terreau[2], F. Zeni[2], E. Azoulay[3], F. Meziani[1], J. Duranteau[4], M. Darmon[2]

[1]Strasbourg University Hospital, Medical ICU, Strasbourg, France, [2]Saint-Etienne University Hospital, Medical-Surgical ICU, Saint-Etienne, France, [3]Saint-Louis University Hospital, Medical ICU, Paris, France, [4]Bicétre University Hospital, Surgical ICU, Le Kremlin-Bicétre, France

INTRODUCTION. Doppler-based renal resistive index (RI) measurement is rapid, non-invasive, and repeatable in critically ill patients [1, 2]. This promising monitoring tool may help in detecting early renal dysfunction or evaluating its reversibility [1, 2]. Renal Doppler is however be operator-dependant and little information is available concerning its feasibility and reproducibility in critically-ill patients.

OBJECTIVES. To compare performance of junior (residents or fellow without previous experience of renal Doppler) and senior operators when assessing renal perfusion using both a semi-quantitative color-Doppler scale and RI.

METHODS. Prospective multicenter study performed in three ICUs.

Juniors were provided with a specific half-day course including location of the kidney, assessment of renal perfusion through color-Doppler and measurement of RI.

Acute kidney injury (AKI) was defined according to the AKIN definition. Transient AKI was defined as AKI with a cause of renal hypoperfusion and recovery within the first 3 days following inclusion.

Intra-renal RI was calculated as (peak systolic velocity − end-diastolic velocity)/peak systolic velocity.

Semi-quantitative renal perfusion was assessed using a previously published but never evaluated semi-quantitative scale ranging from 0 (absence of renal perfusion) to 3 (renal vessels identifiable until the arcuate arteries in the entire field of view).

RESULTS. 69 mechanically ventilated patients aged of 57 y.o. (39–68) were included. Failure to obtain RI was noted in a single patient (junior operator).

Doppler-based RI as assessed by senior and junior operators were closely correlated ($r^2 = 0.64$ [95 % CI 0.48–0.76]). Systematic bias across operators was negligible (−0.001), although precision of the measures was limited (95 %CI +0.105 and −0.107).

Semi-quantitative renal perfusion as assessed by senior and junior operators were closely correlated ($r^2 = 0.61$ [95 % CI 0.45–0.74]). Systematic bias was negligible (−0.29) and precision of measure was poor (95 % CI +0.98 and −1.04). RI and semi-quantitative renal perfusion were correlated ($r^2 = 0.25$ [95 % CI 0.09–0.43]; $P < 0.0001$). Of the 21 patients with AKI, 11 had a transient AKI (16 %), nine had a persistent AKI (13 %). A single patient died before the third day and could not be classified. RI and semi-quantitative assessment displayed a good diagnostic performance to diagnose persistent AKI (AUC ROC curve of respectively 0.84 [95 % CI 0.73–0.97] and 0.87 [0.77–0.97]).

CONCLUSIONS. Our results suggest that renal perfusion monitoring could be easily performed by inexperienced operators following a half-day course. Both techniques displayed a good accuracy but a limited precision.

Both RI and semi-quantitative scale had a good performance to diagnose persistent AKI, although the limited number of patients with AKI in this study preclude any firm conclusions.

REFERENCE(S). 1. Lerolle et al. Intensive Care Med. 2006. 2. Schnell et al. Intensive Care Med. 2012.

0184

RENAL EFFECTS OF LEVOSIMENDAN IN CARDIAC SURGERY PATIENTS: A RETROSPECTIVE ANALYSIS

F. Balzer[1], S. Treskatsch[1], J. Braun[1]

[1]Charité, University Medicine Berlin, Department of Anesthesiology and Intensive Care Medicine, Berlin, Germany

INTRODUCTION. Actual guidelines recommend levosimendan as an ultima ratio therapy in patients suffering heart failure [1, 2]. In this context, recent experimental and clinical data suggest a benefit of levosimendan on the kidney function.

OBJECTIVES. This retrospective, single center, matched-pairs analysis aimed to investigate whether administration of levosimendan was associated with improved renal function in cardiac surgery patients.

METHODS. After IRB approval, we analyzed electronic records of patients that underwent cardiac surgery between 01/01/2007 and 31/12/2011 and were admitted to our intensive care unit (ICU) for postoperative observation (n = 4,365). Thereof, 1,095 patients did not present with a preexisting renal insufficiency defined as preoperative creatinine plasma level >2 mg/dl. In this cohort, 42 patients received 12.5 mg levosimendan as a single administration in a rate of 0.1 μg/kg/min on the day of operation due to a severely reduced left ventricular global systolic function and signs of a low cardiac output syndrome ("levosimendan group"). We matched these patients based on their SAPS admission score on ICU (score ± 5) to the ones that did not receive levosimendan (n = 1,049) ("control group").

RESULTS. Patients in the levosimendan group presented significantly more frequently with pulmonary hypertension ($p = 0.009$) (Table 1). Plasma creatinine was significantly higher in the levosimendan group on the first postoperative day ($p = 0.005$) (Fig. 1). Thereafter, we did not recognize a significant difference in plasma creatinine in all patients of both groups regardless if continuous renal replacement therapy (CRRT) was applied or not. Patients of the levosimendan group presented significantly more often with acute kidney injury postoperatively—defined as at least one postoperative creatinine plasma level >1.5 times ($p < 0.001$) and/or need for CRRT ($p < 0.001$). Also, the duration of CRRT was significantly longer in the levosimendan group (Table 2). There was no difference in total urine output per day from postoperative day 0–4 in patients not requiring CRRT between groups.
CONCLUSIONS. In the here presented perioperative cohort, levosimendan was probably given to more severely ill patients. Despite an early start of the levosimendan treatment, no measureable renal effect was found. The incidence of AKI and CRRT were higher in the levosimendan group.
REFERENCE(S). 1. Carl M, Alms A, Braun J, et al. S3 guidelines for intensive care in cardiac surgery patients: hemodynamic monitoring and cardiocirculary system. Ger Med Sci. 2010;8:Doc12. 2. Mcmurray JJ, Adamopoulos S, Anker SD, et al. ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC. Eur J Heart Fail. 2012;14(8):803–69.

Table 1 Morphometric and demographic data

	Control (n = 46)	Levosimendan (n = 46)	p value
Age (years)	60.8 ± 1.9	65.5 ± 1.5	0.967
BMI (kg/m^2)	27.4 ± 4.3	27.0 ± 4.4	0.640
Coronary artery disease	35	37	0.804
COPD	8	14	0.143
Peripheral vascular disease	12	12	1.000
Atrial fibrillation	19	26	0.229
Pulmonary arterial hypertension*	10	22	0.009
Arterial hypertension	29	22	0.118
Diabetes mellitus	25	28	0.804

Table 2 Outcome parameters

	Control (n = 46)	Levosimendan (n = 46)	p value
Preoperative plasma creatinine (mg/dl)	1.12 ± 0.3	1.17 ± 0.3	0.427
Admission SAPS ICU overall	45.9 ± 16	46.0 ± 16	0.985
Incidence AKI (%)*	33	78	<0.001
Incidence Hemodialysis (%)*	24	65	<0.001
Duration of hemodialysis (h)*	0 (0–1,457)	36.1 (0–3,229)	<0.001

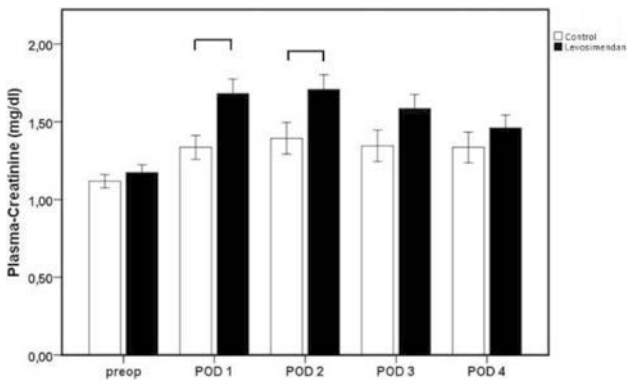


Fig. 1

0185
OUR EXPERIENCE WITH MARKERS OF EARLY RENAL TUBULAR DAMAGE

M. Mazar[1], V. Ivancan[1], I. Segotic[1], Z. Colak[1], R. Gabelica[1], G. Rajsman[1], S. Uzun[1], S. Konosic[1]

[1]Clinical Hospital Center Zagreb, Zagreb, Croatia

INTRODUCTION. Cardiac surgery procedures on children are customary performed with the use of extracorporeal circulation. Despite substantial technical and biomedical improvements, undesirable effects on normal physiological functions still occur following cardiopulmonary bypass (CPB). Renal damage is one of them, due to diminished renal blood flow, loss of pulsatile flow, hypothermia, atheroembolism, and a generalized inflammatory response [1]. In order to effectively prevent and (or) treat renal damage, it is important to detect renal injury early. In order to do so, we can use highly specific markers of early renal tubular damage: low molecular weight protein alpha-1-microglobulin (α1M), and lysosomal enzyme *N*-acetyl-β-D-glucosaminidase (NAG) [2].
OBJECTIVES. To compare estimation of *N*-acetyl-β-D-glucosaminidase (NAG) and alpha-1-microglobulin (α1M) in urine with the use of routine clinical tests (BUN, creatinine concentration) in early diagnosis of renal damage in children undergoing cardiopulmonary bypass.
METHODS. This study was approved by the Ethic Committee of the Clinical Hospital Centre Zagreb and written informed consent was obtained from parents or legal guardians of all the children who participated in the study. 37 children, with preoperative normal renal function, undergoing cardiopulmonary bypass (for more than 90 min in duration) were included in the study. Baseline urine (for NAG and α1M analysis) and blood (for BUN and creatinine analysis) samples were obtained prior to beginning of CPB. The subsequent urine samples were obtained immediately after surgical procedure, and then 12 and 24 h postoperatively, during the ICU stay.
RESULTS. NAG concentrations were significantly higher compared to baseline values for all postoperative measurements, immediately after surgical procedure ($p \leq 0.001$), 12 h ($p = 0.007$) and 24 h postoperatively ($p \leq 0.001$). α1M concentrations were significantly higher in all postoperative measurements (immediately after surgical procedure ($p \leq 0.001$), 12 h ($p = 0.007$) and 24 h postoperatively ($p \leq 0.001$). BUN and creatinine concentrations showed no significant difference between baseline and postoperative values.
CONCLUSIONS. Postoperative proximal tubular dysfunction is present in most children subjected to cardiopulmonary bypass for the purpose of cardiac surgery procedures. Estimation of NAG and α1M urine concentrations can supplement routine clinical perioperative tests in early diagnosis of renal injury, while there is still only subclinical renal damage.
REFERENCE(S). 1. Abu-Omar Y. Cardiopulmonary bypass and renal injury. Perfusion. 2006;21(4):209–13. 2. Jung K. Urinary enzymes and low molecular weight proteins as markers of tubular dysfunction. Kidney Int. 1994;46:S 29–33.
GRANT ACKNOWLEDGMENT. Conflicts of interest: none declared.

0186
RHABDOMYOLYSIS AND ACUTE KIDNEY INJURY: INCIDENCE, TREATMENTS AND OUTCOMES IN THE ICU

N. Chakkalakal[1], R. Taylor[1], G. Marshall[1], M. Healy[1], C.J. Kirwan[1,2], J.R. Prowle[1,2]

[1]Barts Health NHS Trust, Adult Critical Care Unit, London, UK, [2]Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, UK

INTRODUCTION. Rhabdomyolysis (RM) after traumatic or non-traumatic muscle cell disruption is considered an important cause of acute kidney injury (AKI). Clinical treatments are often directed at limiting the nephrotoxicity of myoglobin, however, in critically ill patients AKI is often multifactorial as hypovolaemic shock, systemic inflammation and sepsis commonly co-exist with RM. Little prospective evidence exists to guide clinicians in their treatment of RM.
OBJECTIVES. To understand the incidence of RM, its association with AKI and mortality in a high-risk ICU population.
METHODS. A retrospective clinical audit of all patients with biochemical evidence of significant RM admitted to a 44 bed mixed adult critical care unit servicing a level 1 trauma centre over a 6 month period in 2012. Creatine Kinase (CK) was measured daily in critical care admissions, and patients with any CK value of >5,000 IU/L were studied. We recorded the incidence of AKI by KDIGO criteria (creatinine and urine) and RM-directed clinical interventions.
RESULTS. 71 patients had at least one CK measurement of >5,000 and 36 (52 %) had a CK of >5,000 for 3 or more days. 39 patients (55 %) developed AKI, of whom 19 (27 %) needed renal replacement therapy (RRT). The most common diagnostic category associated with elevated CK was poly-trauma (59 %), however this was less frequent (42 %) in patients requiring RRT. Need for RRT was strongly associated with risk of death (79 vs. 15 %, $p < 0.0001$). 10 patients received high volume haemofiltration (HVHF—median prescribed dose 72 ml/h/kg ideal body weight), 6 on the first day of CK >5,000 and the remainder within 48 h, HVHF was commenced at a median of day 2 in ICU (range 1–3), in these patients median peak CK was 62,899. 9 of 10 patients who received HVHF died in the ICU. Nine patients with AKI (median peak CK 6876) received conventional volume haemodiafiltration, of whom six died; in seven of nine these patients timing of RRT (median day 5, range 2–13) was not temporarily related to elevated CK.

Patients with CK >5,000 in ICU

	No AKI (n = 32)	AKI 1-3 no RRT (n = 20)	RRT (n = 19)
Age (median, range)	35 (16–69)	50 (17–88)	53 (24–85)
Male sex	81 %	70 %	74 %
Trauma	63 %	70 %	42 %
Medical	31 %	10 %	32 %
Surgical	6 %	20 %	26 %
APACHE 2 score (median, range)	10 (6–30)	11 (7–17)	17 (10–34)
Peak CK (IU/L) (median, range)	10,606 (5,016–212,200)	7,845 (5,055–150,000)	45,851 (5,003–344,300)
iv Fluid (ml) in 24 h after CK >5,000 (median, range)	1,770 (0–7,987)	2,444 (0–7,927)	2,767 (750–11,000)
Hospital mortality	9 %	25 %	79 %

CONCLUSIONS. We saw biochemical evidence of muscle injury in approximately 10 % of critical care admissions and 20 % of patients requiring RRT. In those not needing RRT outcomes were good, however requirement for RRT was associated with very high mortality. Despite prompt application of HVHF in patients with RM associated AKI, 90 % died with multi-organ failure. Prospective assessment of treatments for RM associated AKI in the ICU is likely to be confounded by small patient numbers, cases of AKI unrelated to RM and high risk of death associated with extra-renal pathology.

0187
THE PREDICTORS OF ACUTE KIDNEY INJURY (AKI) IN PATIENTS WITH RHABDOMYOLYSIS

L. Marchenkova[1], I. Aleksandrova[1], S. Rei[1], M. Ilyinskiy[1], V. Kiselev[1], G. Berdnikov[1]

[1]Research Institute for Emergency Medicine named after N.V. Sklifosovsky, Department Endotoxicosis, Moscow, Russian Federation

INTRODUCTION. Rhabdomyolysis is a syndrome of skeletal muscle cell damage, leading to the release of various intracellular muscle constituents. Acute kidney injury (AKI) is the most common potentially lethal complication of rhabdomyoloysis. It develops in 13–50 % of patients with rhabdomyolysis [1, 2].

OBJECTIVES. The aim of the study was to retrospectively determine the predictors of acute kidney injury in patients with rhabdomyolysis.
METHODS. 213 patients (17 F, 196 M) with rhabdomyolysis admitted to the ICU of our institute between 2002 and 2009 were evaluated. Mean age was 38.5 ± 14.1 years (range 17–74 years). The median time interval between the onset of injury and admission was 2.0 (1.0; 4.0) days. Area of soft tissue injury ranged from 5 to 50 % of body surface, on average 19.0 ± 8.8 %. The serum concentration of myoglobin on admission was 1,958.0 (449.2; 11,078.0) ng/ml. The serum creatinine level was 408.0 (180.0; 629.9) μmol/l.
RESULTS. One hundred seventy-nine patients (84 %) were diagnosed with AKI. A significant correlation was found between AKI and the area of soft tissue injury ($r = 0.414$, $p = 0.000$) as well as serum myoglobin ($r = 0.204$, $p = 0.001$).
Optimum cutoff levels (by ROC curve analysis) were of area of soft tissue injury ≥12 % (sensitivity 0.827; 1-specificity 0.294), and serum myoglobin level ≥1,000 ng/ml (sensitivity 0.702; 1-specificity 0.267). Areas under the curves (AUC) are shown in table.

Area under the curve for AKI diagnosis

Variable	Area under curve	Standard error	95 % CI
Area of soft tissue injury	0.795	0.042	0.712–0.878
Myoglobin level	0.788	0.054	0.693–0.904

CONCLUSIONS. The area of soft tissue injury and myoglobin level could be used to predict the development of acute kidney injury in patients with rhabdomyolysis.
REFERENCE(S). 1. Bosch X, Poch E, Grau JM. Rhabdomyolysis and acute kidney injury. N Engl J Med. 2009;361(1):62–72. 2. Khan FY. Rhabdomyolysis: a review of the literature. Neth J Med. 2009;67(9):272–83.

0188
IMPLEMENTATION OF A PROTOCOL-DRIVEN TARGETED RESUSCITATION BUNDLE IN PEDIATRIC SHOCK DECREASES ACUTE KIDNEY INJURY AND IMPROVES OUTCOMES

A. Akcan Arikan[1], E.A. Williams[2], J.M. Graf[2], C.E. Kennedy[2], B. Patel[3], A.T. Cruz[3]

[1]Baylor College of Medicine, Sections of Pediatric Critical Care Medicine and Renal, Houston, USA, [2]Baylor College of Medicine, Section of Pediatric Critical Care Medicine, Houston, USA, [3]Baylor College of Medicine, Section of Pediatric Emergency Medicine, Houston, USA

INTRODUCTION. Acute kidney injury (AKI) is very common in critically ill pediatric patients (pts) and increases morbidity and mortality. Recent advances in the standardized definition and stratification of AKI and modalities of renal support have not improved patient outcomes. 30 % of pediatric patients in cardiorespiratory failure have AKI on ICU admission, emphasizing the need for early identification and timely intervention. Sepsis with associated hemodynamic instability causes nearly 50 % of all ICU AKI. Early goal directed resuscitation has improved sepsis outcomes in both adults and children.
OBJECTIVES. We investigated the incidence of AKI before and after institution of a protocol- driven resuscitation bundle ("shock protocol"(SP)) in the emergency department (ED) [1].
METHODS. Retrospective review of children with clinical sepsis and hemodynamic instability admitted to ICU from ED before (2009 (PRE)) and after (2010 (POST)) implementation of SP at a tertiary care children's hospital. AKI was defined by pRIFLE creatinine criteria [2].
RESULTS. 202 patients (PRE n = 98, POST n = 104) were included, 53 % males, mean age 7.7 ± 5.6 years, mean PELOD 8.9 ± 12.7, mean PRISM 5.3 ± 13.9. There were no differences in age, gender, presence of preexisting conditions, PRISM or PELOD scores between PRE and POST groups. 41 % (n = 83) of all patients had AKI. AKI decreased after SP implementation (54 % in PRE vs 29 % in POST, $p < 0.001$). Gentamicin (G) was part of the SP; however, less AKI was seen in the gentamicin group (G 31 % vs no G 52 %, $p = 0.003$). Four patients in PRE had renal replacement therapy (RRT) vs none in POST ($p = 0.04$); 10 pts (10 %) in PRE died vs 3 (3 %) in POST. SP was independently associated with decreased AKI when controlled for age, gender, gentamicin use, and PELOD (OR 0.27, 95 % CI 0.13 - 0 0.56). POST pts had shorter ICU and hospital LOS (1.9 ± 2.3 vs 4.5 ± 7.6, $p < 0.01$, 6.3 ± 5.1 vs 15.3 ± 16.9, $p < 0.001$). In multivariate analyses, SP was independently associated with shorter ICU and hospital LOS when controlled for AKI and PELOD ($p = 0.02$, $p < 0.001$, respectively).
CONCLUSIONS. Implementation of a protocol-driven targeted resuscitation bundle in the ED decreased AKI and need for RRT, as well as ICU and hospital LOS and mortality.
REFERENCE(S). 1. Cruz AT, Perry AM, Williams EA, Graf JM, Wuestner ER, Patel B. Implementation of goal-directed therapy for children with suspected sepsis in the emergency department. Pediatrics. 2011;127(3):758–66. 2. Akcan Arikan A, Zappitelli M, Loftis LL, Washburn KK, Jefferson LS, Goldstein SL. Modified RIFLE criteria in critically ill children with acute kidney injury. Kidney Int. 2007;71(10):1028–35.

0190
WORSENING OF RENAL FUNCTION FOLLOWING HEART SURGERY FOR ACTIVE INFECTIVE ENDOCARDITIS: INCIDENCE, RISK FACTORS AND PREDICTION BASED ON *SUPER LEARNING*

R. Pirracchio[1,2,3], M. Legrand[4,5], M. Petersen[3], M. van der Laan[3], J.N. Fabiani[6], B. Cholley[1], J.L. Mainardi[7]

[1]Hôpital Européen Georges Pompidou, Anesthesiology and Critical Care, Paris, France, [2]Unité INSERM UMR-S 717, Biostatistiques et Informatique Médicale, Paris, France, [3]University of California at Berkeley, Biostatistics, School of Public Health, Berkeley, USA, [4]Hôpital Lariboisière, Anesthesiology and Critical Care, Paris, France, [5]Unité INSERM UMR-S 942, Hôpital Lariboisière, Paris, France, [6]Hôpital Européen Georges Pompidou, Cardiovascular Surgery, Paris, France, [7]Hôpital Européen Georges Pompidou, Microbiology, Paris, France

INTRODUCTION. Cardiac surgery is frequently needed in patients with infective endocarditis (IE). Acute kidney injury (AKI) is frequent in this setting and is associated with poor outcomes.
OBJECTIVES. The purpose of the study was to determine the risk factors for post-operative AKI in patients who underwent cardiac surgery for IE.
METHODS. Retrospective, non-interventional study of prospectively collected data (2000–2010) including the patients with IE and cardiac surgery with cardio-pulmonary bypass. The primary outcome was the development or the progression of AKI in the post-operative period based on the AKIN definition. We used an ensemble machine learning ("Super Learning") to develop a predictor of AKI based on 36 standard risk factors and evaluated its performance using cross-validated Areas Under the Receiver Operating Curve (AUROC). The SuperLearner (SL) algorithm uses a cross-validation procedure to combine a user-specified set of candidate prediction algorithms. We estimated adjusted variable importance measures for each of a candidate set of risk factors using Targeted Maximum Likelihood Estimation (TMLE).
RESULTS. Two-hundred and two patients were included, of which 91 (45 %) experienced a worsening in their renal function after surgery. Sixty-five (32.2 %) patients presented an AKI before surgery while 120 (59.4 %) patients presented an AKI in the postoperative period. Twenty patients (9.9 %) required a renal replacement therapy during the post-operative ICU stay and 30 (14.8 %) died during their hospital stay. The *Super Learner* weighted estimator achieved the best prediction performances with estimated AUROC of 0.760 [0.694–0.826]. The following variables were found to be significantly associated with renal function impairment, after adjustment for other risk factors: multiple surgery (OR 4.16, 95 % CI 2.98–5.80, $p < 0.001$), pre-operative anemia (OR 1.89, 95 % CI 1.34–2.66, $p < 0.001$), transfusion requirement during surgery (OR 2.38, 95 % CI 1.55–3.63, $p < 0.001$), and the use of a nephrotoxic agent: vancomycin (OR 2.63, 95 % CI 2.07–3.34, $p < 0.001$), aminoglycosides (OR 1.44, 95 % CI 1.13–1.83, $p = 0.004$) or contrast iodine (OR 1.70, 95 % CI 1.37–2.12, $p < 0.001$). Age over 65 y/o was found to be associated with less impairment in the renal function (OR 0.41, 95 % CI 0.30–0.57, $p < 0.001$). Postoperative but not preoperative AKI was associated with hospital mortality.
CONCLUSION. The *Super Learner* succeeded in finding the optimal combination of prediction algorithms, that maximized the prediction performances. In association with TMLE, it helped to identify multiple surgery, anemia, transfusion and nephrotoxic agents as major risk factors for worsening of renal function after cardiac surgery for acute endocarditis.

Quality issues and ICU economics: 0191–0204

0191
TRAINEE DELIVERED EDUCATION: MEETING THE NEEDS OF TODAY'S NOVICE INTENSIVISTS

M. Armstrong[1], J. Gross[1], M. Barenco[2], N. Arul[2], P. Nandabalan[1], D. Walker[1]

[1]University College London Hospital, London, UK, [2]University College London, London, UK

INTRODUCTION. Early recognition, assessment and appropriate management of critically ill patients is essential to improve clinical outcomes. However, variation exists in junior doctors' approach to acutely unwell patients and their understanding of ICU practice [1]. The Temple report [2] makes several recommendations to ensure service environment based training is both safe and of high quality. These include the use of simulation and technologies, where patients are not at risk, to accelerate learning. At our institution, a one-day lecture and practical based introductory course is held bi-annually that aims to address these issues guiding new doctors in core aspects of intensive care practice.
OBJECTIVES. To assess impact of an introductory ICU course, designed to increase knowledge and understanding of critical illness and insight into intensive care practice.
METHODS. Junior doctors who attended the most recent course completed pre and post course MCQ papers each of 15 questions. Half the course were asked to complete paper A and the remaining half paper B before the course. Papers were then switched over for the post course MCQs, which were completed at the end of the day.
Feedback was obtained at the end of the day and via a follow-up questionnaire sent out 6 weeks later to evaluate the course's impact on approach to managing acutely unwell patients and ICU practice.
RESULTS. Mean scores for paper A pre and post course were 12.70 (37) and 13.11 (45) respectively ($p = 0.08$).
For paper B, pre and post course mean scores were 11.95 (44) and 12.64 (37) respectively ($p = 0.01$), showing a 4.6 % increase.
Overall there was a 4 % improvement in scores of all the candidates between the start of the day and the end ($p = 0.002$).
On the day feedback scored good or excellent overall in 83 % of cases. 6 weeks later, response rate was 47 %. Of those who responded, 95 % thought the course had helped them in their approach to managing acutely unwell patients and was either moderately or very useful to their clinical practice. Furthermore, 97 % thought that the course gave them moderate or very useful insight into ICU.
CONCLUSIONS. Providing a one-day introductory course for newly qualified doctors with little or no ICU experience improves their knowledge and approach to managing acutely unwell patients and gives them a useful insight into intensive care, which was sustained 6 weeks post course. Improvement in knowledge was demonstrated although further scope exists to increase discriminatory power of the validation tool and include questions with a wider range of difficulty.
REFERENCES. 1. Kelly D. Knowledge of medical students and newly qualified doctors concerning the specialty of intensive care medicine. J Intensive Care Soc. 2011;12:98–106. 2. Time for training—a review of the impact of the European Working Time Directive on the quality of training Professor John Temple; 2010. http://www.mee.nhs.uk/PDF/14274%20Bookmark%20Web%20Version.pdf

0192
LISTENING TO THE WARNING: DOES DELAY IN ACTIVATION OF CRITICAL CARE OUTREACH TEAMS IMPACT PATIENT CARE?

B. Tillmann[1], M. Klingel[2], S. McLeod[2], S. Anderson[1], W. Haddara[3], N. Parry[4]

[1]London Health Sciences Centre, Department of Medicine, Division of Emergency Medicine, London, Canada, [2]London Health Sciences Centre, Division of Emergency Medicine, London, Canada, [3]London Health Sciences Centre, Department of Medicine, London, Canada, [4]London Health Sciences Centre, Department of Surgery, London, Canada

INTRODUCTION. The Modified Early Warning System (MEWS) consists of criteria to identify when Critical Care Outreach Teams (CCOT) should be activated for hospital inpatients. Recent literature suggests that the use of MEWS as a means of CCOT activation has led to a decrease in morbidity [1], specifically in acute medical admissions [2]. However, there is often a delay between when a patient meets MEWS criteria and when CCOT is activated [2].
OBJECTIVES. The primary objective of this study was to determine if the delay in CCOT activation had an impact on inpatient morbidity and mortality. A secondary objective was to examine if outcomes differed between surgical and medical inpatients.
METHODS. This was a retrospective review of new CCOT activations over a 4-year study period (June 2007 to August 2011). CCOT delay was defined as the time from which MEWS criteria was met to the time CCOT was activated. Patient outcomes were compared between those with a CCOT delay of <1 h to those with a delay of >1 h. Outcomes included transfer to the intensive care unit (ICU), ventilation in ICU and in-hospital mortality. Proportional differences were assessed by the Pearson χ^2 statistic and logistic regression models were used to determine the association between admitting service and morbidity.
RESULTS. There were 3,133 unique activations during the study period. 2,160 (68.9 %) activations were <1 h of the patient meeting MEWS criteria and 973 (31.1 %) were >1 h. Patients with a CCOT delay >1 h were more likely to be admitted to ICU compared to patients with a delay <1 h (47.5 vs 41.5 %; Δ 6.0 %, 95 % CI 2.2, 9.8) and higher mortality was seen in the group with a delay >1 h (34.8 vs. 29.4 %; Δ 5.4 %, 95 % CI 1.8, 9.0). When activation was delayed >6 h mortality increased to 37.8 % (Δ 8.4 %; 95 % CI 2.8, 13.9). After adjusting for delay, surgery patients were just as likely to be transferred to ICU (adjusted OR 0.96, 95 % CI 0.83, 1.10) but more likely to be ventilated while in ICU (adjusted OR 1.38, 95 % CI 1.10, 1.73). Medical patients however were twice as likely to suffer in-hospital mortality (adjusted OR 1.94, 95 % CI 1.66, 2.27).
CONCLUSIONS. A delay in CCOT activation >1 h was associated with increased in-hospital mortality and ICU admissions. Furthermore, once CCOT is activated, surgical patients appear to do better than medical patients. As such, quality improvement initiatives to decrease CCOT delay should be derived.
REFERENCE(S). 1. Moon A, Cosgrove JF, Lea D, et al. An eight year audit before and after the introduction of modified early warning score (MEWS) charts, of patients admitted to a tertiary referral intesive care unit after CPR. Resuscitation. 2011;8(2):150–4. 2. Donohue LA, Endacott R. Track, trigger and teamwork: communication of deterioration in acute medical and surgical wards. Intensive Crit Care Nurs. 2010;26(1):10–17.
GRANT ACKNOWLEDGMENT. No grants were associated with this research.

0193

THE FACE OF ILLNESS: ANALYSING FACIAL EXPRESSIONS IN CRITICAL ILLNESS IN CONJUNCTION WITH THE FACIAL ACTION CODING SYSTEM (FACS)

J.L. Gross[1], J.M. Cuesta[2], S. Crawford[3], M.M. Devaney[3], M.I. Madrigal-Garcia[4]

[1]Royal Free Hospital, Intensive Care Unit, London, UK, [2]North Middlesex University Hospital, Intensive Care Unit, London, UK, [3]Royal Free Hospital, Patient-At-Risk and Resuscitation (PARRT), London, UK, [4]Londres Psychology Practice, London, UK

INTRODUCTION. Assessment of critically ill patients not only involves observing changes in physiological parameters but also looking at the patient as a whole including the face. Remarkably facial information has never previously been quantified. The stress response might explain the link between critical illness, emotions and changes in facial expression, which itself may be measured and quantified by the Facial Action Coding System (FACS) [1, 2]. Moreover, there is an intimate association between the stress response and the endorphin releasing system associated with pain. The FACS describes facial expression by action units (AUs). The six basic areas of emotion (anger, happiness, fear, disgust, sadness and surprise) and pain have each been associated with a series of AUs [3].
OBJECTIVES. To investigate the prevalence of the six basic emotions and the pain-AUs most commonly associated with critical illness.
METHODS. A prospective survey for all new outreach referrals of "at-risk" patients over forty consecutive days. Components of the survey included a Numerical Rating Scale (NRS, range 0–5) for each basic emotion perceived by outreach staff by looking at the face only and selecting pictures from the FACS manual that displayed either an AU associated with pain (AU 4, 6, 7, 9, 10, 43) or control. The severity of illness was assessed with the number of acute deterioration triggers that the patient met (out of a possible 11). Severe and moderate illness was defined as the patient meeting 3 or more or 2 or less triggers respectively.
RESULTS. 82 patients were assessed in a tertiary teaching hospital. Mean age was 66.2 (range 18–91) years. Emotions that scored highest were fear, pain and sadness (mean scores (SD) 1.4 (1.4), 1.4 (1.4) and 1.0 (1.3) respectively). Mean scores (SD) for other emotions were: anger 0.6 (1.1), happiness 0.3 (0.8), disgust 0.6 (1.0) and surprise 0.6 (1.3). Although fear and pain were more commonly described in more severe compared with moderate illness, differences were not significant between the 2 groups. A positive moderate correlation ($r = 0.22$, $p < 0.05$) was found between fear and the number of triggers identified. For AU's associated with pain, AU4 (58.5 %), AU7 (48.7 %) and AU43 (42.6 %) were most commonly selected, but the differences were not significant. Surprisingly, the control images for AUs 6, 9, and 10 were significantly chosen more frequently than the AU associated to them (Table 1).

Table 1 Pain AUs (*percentage below 50 % chance)

	Frequency (control/AU)	Percentage (control/AU)	95 % confidence intervals for AU
AU4 (eyebrow lowering)	32/48	39/58.5	44.1–71
AU6 (cheek raising)	63/17	76.8/20.7	10.7–33*
AU7 (lid tightening)	41/40	50/48.7	34.8–61.9
AU9 (nose wrinkling)	72/9	87.8/10.9	3.9–21.52*
AU10 (upper lip raising)	69/11	84.1/13.4	5.5–24.51*
AU43 (eyes closing)	47/35	57.3/42.6	30–55.3

CONCLUSIONS. Pain, fear and sadness are the most represented emotions in critical illness. Further research is needed to accomplish the identification of facial expressions and critical illness.
REFERENCE(S). 1. Cuesta JM, Singer M. Crit Care Med. 2012;40:3283–9. 2. Ekman P, Friesen WV, Hager JC. Facial action coding system. Salt Lake City; 2002. 3. Ekman P. Emotions revealed. New York: Times Books; 2003.
GRANT ACKNOWLEDGMENT.
Patient-at-risk-and-resuscitation team (PARRT), Royal Free Hospital.
FACS editorial for granting permission of AU pictures.

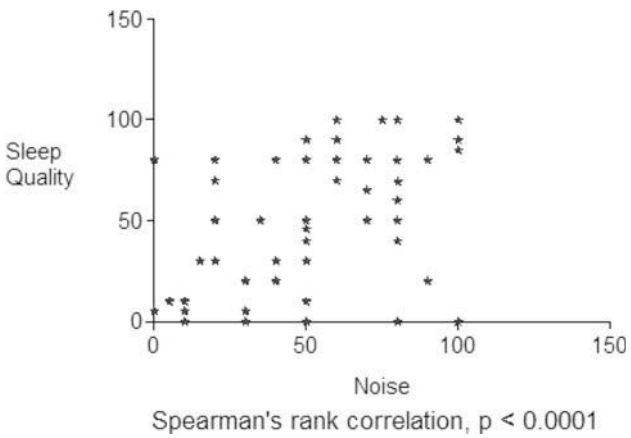
0194

ASSESSMENT OF NOISE AND QUALITY OF SLEEP IN ICU USING THE MODIFIED RICHARD CAMPBELL SLEEP QUESTIONNAIRE: A SURVEY OF PATIENTS' PERCEPTION AND EXPERIENCE IN ICU

M. Shyamsundar[1], J. Hughes[1], T. Morgan[1], I. Rechner[1], A. Walden[1]

[1]Royal Berkshire Hospital, ICU, Reading, UK

INTRODUCTION. Delirium is a frequent adverse event in the critically ill [1] and is associated with longer ICU stay, increased costs [2] and mortality [3] leading to worse clinical outcomes. An association between disturbed sleep and delirium is suggested in the ICU. Fragmented sleep is multifactorial with a demonstrated link to noise [4]. Measurement of sleep quality using the Richard Campbell Sleep Questionnaire (RCSQ), 5-item questionnaire measuring the patients' perception of quality of sleep, has been validated in critical care [5]. This has been modified in studies to include a sixth question measuring the patients' perception of noise in ICU. The association of patients' perception of noise to the other components of sleep quality measure using the modified RCSQ has not been studied.
OBJECTIVES. The objectives were to 1. Assess noise in our ICU in relation to the WHO guidelines; 2. Assess the quality of sleep in patients using the modified RCSQ and 3. To study the association between perceived noise level and quality of sleep measured using the modified RCSQ.
METHODS. Patient perceived sleep quality and noise was assessed over 4 weeks in patients staying for >24 h using the modified RCSQ. Noise levels were collected by the patient and at a central location over 24 h. Pearson's correlation coefficient or its non-parametric equivalent was used to assess association between patient perceived noise level and perceived sleep quality.
RESULTS. The maximum noise level reached 85db and 96db during night and day respectively and average noise levels were 63db and 73db during night and day respectively. Thirty three patients completed 74 questionnaires and their perceived quality of sleep was poor with an average rating of 48 over the five components of RCSQ. Patients also felt that the ICU was moderately noisy with a score of 54. For the first time we have shown that there is a good association between patients' perception of environmental noise and their sleep quality (Spearman $r = 0.5$, Figure).



Association of sleep quality and ICU noise level

CONCLUSIONS. We have shown that the average and peak noise levels in our ICU were significantly higher than WHO guidelines and associated with poor sleep quality of patients during their stay in ICU. For the first time our study has demonstrated the validity of this modified RCSQ in ICU patients by demonstrating the association between patients' perception of noise and sleep quality. The role of patient protection from environmental noise to improve critical care outcomes needs to be assessed in a multicentre trial and the modified RCSQ can be used as a valuable tool to assess the impact of the intervention in improving their quality of sleep.
REFERENCE(S). 1. McNicoll L, et al. J Am Geriatr Soc. 2003;51(5):591–8. 2. Milbrandt EB, et al. Crit Care Med. 2004;32(4):955–62. 3. Ely EW, et al. JAMA. 2004;291(14):1753–62. 4. Uğraş GA, et al. Tohoku J Exp Med. 2007;212(3):299–308. 5. Richards KC, et al. J Nurs Meas. 2000;8(2):131–44.
GRANT ACKNOWLEDGMENT. N/A.

0195

COST EVALUATION OF A COMPUTER-ASSISTED GLUCOSE REGULATION PROGRAM IN THE INTENSIVE CARE UNIT

E. Zwiers[1], M. Hoekstra[1], I.C.C. Van der Horst[1], M.W. Nijsten[1], W. Dieperink[1]

[1]University of Groningen, University Medical Center Groningen, Department of Critical Care, Groningen, The Netherlands

INTRODUCTION. In line with current guidelines, glycemic control (GC) has been implemented in many intensive care units (ICU). In our ICU glucose is regulated by an

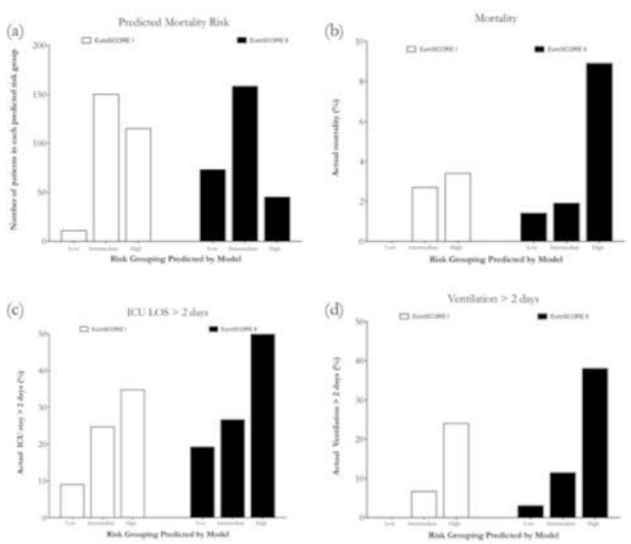
advanced computerized decision support system that uses point-of-care blood glucose measurements and time-variant sampling intervals since 2005 [1]. This system called Glucose Regulation for Intensive Care Patients (GRIP), is a freely available computer-assisted glucose control protocol system which is effective, feasible and safe despite relatively few glucose measurements. Still it has been indicated that implementation of GC is associated with considerable costs.
OBJECTIVES. To determine the costs of GC as performed by a clinically optimized system.
METHODS. We estimated the costs of our computer-assisted GC in a mixed ICU (45 beds) in a university medical center by determining all materials and equipment involved, as well as personnel costs. All glucose measurements were achieved on a point-of-care blood gas analyzer (ABL 700 or 800 series, Radiometer, Copenhagen, Denmark).
RESULTS. In 2,800 patients GRIP reduced median glucose levels from 8.3 mmol/l (6.9–9.8) to 6.6 (6.0–7.4) at 24 h (target range 4.0–7.5 mmol/l). The variable costs of glucose management were €6.38 per measurement, the fixed costs of glucose measurements were €5.55 per patient per day. For our ICU the costs of glucose regulation with 5.9 measurements per patient per day were €43.19 euro (5.9 * €6.38 + €5.55). In a scenario where the program would use more frequent glucose measurements, as the majority of published glucose regulation protocols do (i.e. 12–18 measurements/day), this amount increased to €80–€120 per patient per day.
CONCLUSIONS. Glycemic control as performed by a computer-assisted program cost an estimated €43.19 per day per patient. The major cost-determining factor was the number of point-of-care glucose measurements. This effective simple technology necessary to reach set goals, comes at a considerable cost. Of course, the effectiveness results in undetermined favourable outcomes. Therefore, we consider it important to evaluate costs in addition to clinical benefit.
REFERENCE(S). 1. Vogelzang M, Loef BG, Regtien JG, van der Horst IC, van Assen H, Zijlstra F, Nijsten MW. Intensive Care Med. 2008;34(8):1421–7.

0196

PREOPERATIVE RISK STRATIFICATION AND CRITICAL CARE RESOURCES: IMPROVED PREDICTION OF VENTILATOR DAYS AND LENGTH OF CRITICAL CARE STAY WITH EUROSCORE II

R.A. O'Leary[1], A. Haren[1], K. Byrne[1], R. Ni Mhuircheartaigh[1], B. Marsh[1]

[1]Mater Misericordiae University Hospital, Dept of Intensive Care, Dublin, Ireland
INTRODUCTION. Resource allocation in intensive care is complex, involving a variety of unpredictable variables. Anticipating prolonged ICU stay on the basis of patient risk profiles would assist in resource allocation and planning.
The European System for Cardiac Operative Risk Evaluation (EuroSCORE) was published in 1999 and yields a predicted mortality risk (%) [1]. It has also been shown to correlate with prolonged ICU stay [2].
Prospective evaluation of the model's performance has shown that it now overestimates mortality. Recognising improved surgical and perioperative practice, the EuroSCORE II model was introduced in 2012 [3].
OBJECTIVES. The aim of this study was to compare the performance of EuroSCORE I and II in predicting ventilator days and length of critical care stay in elective cardiac surgery patients.
METHODS. EuroSCORES I and II, in-hospital mortality and ICU length of stay (LOS) were recorded from June 2012. From January 2013 the number of ventilator days was also recorded.
RESULTS. In-hospital mortality and ICU LOS were recorded for 276 patients. Of these, ventilator days were recorded for 132 patients. Mean (SD) EuroSCORE I was 6.7 (8.4) % and EuroSCORE II was 2.9 (3.1) %. Actual overall mortality was 2.3 %.
Each model was used to assign patients to mortality risk groups (low <1 %, intermediate 1–5 %, high >5 %).
EuroSCORE II assigned significantly fewer patients to the high risk group than EuroSCORE I (Fig. 1a).
Mortality, ICU LOS >2 days and mechanical ventilation >2 days were all better predicted by the newer model.
EuroSCORE II performed better than EuroSCORE I in the prediction of actual mortality (Fig. 1b) [intermediate:high = 2.7 %:3.4 % (I), 1.9 %:8.9 % (II)], ICU LOS >2 days (Fig. 1c) [intermediate:high = 24.7 %:34.8 % (I), 26.6 %:51.1 % (II)] and mechanical ventilation >2 days (Fig. 1d) [intermediate:high = 6.7 %:24 % (I), 11.4 %:38 % (II)].



Comparison of EuroSCORE I and II

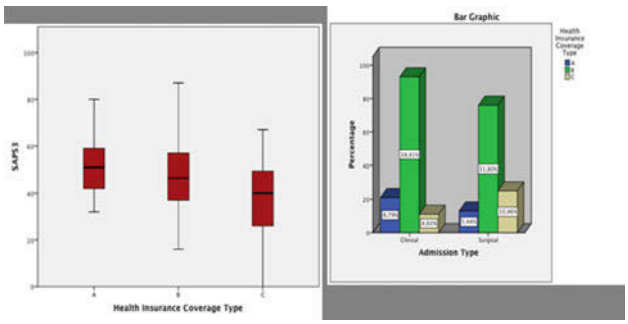
CONCLUSIONS. Our study highlights the potential of this mortality risk stratification system to be extended to anticipate utilisation of limited critical care resources and the importance of continuing to update such models as practice and outcomes improve.
REFERENCE(S). 1. Nashef SA, et al. European system for cardiac operative risk evaluation. Eur J Cardiothorac Surg. 1999;16:9–13. 2. Nilsson J, et al. EuroSCORE predicts intensive care unit stay and costs of open heart surgery. Ann Thorac Surg. 2004;78:1528–34. 3. Nashef SAM, et al. EuroSCORE II. Eur J Cardiothorac Surg. 2012;41:734–44.

0197

IS THERE ANY RELATIONSHIP BETWEEN THE SEVERITY OF CRITICAL PATIENTS ASSESSED BY USE OF THE SIMPLIFIED ACUTE PHYSIOLOGY SCORE 3 (SAPS3) AND THEIR TYPE OF HEALTH INSURANCE COVERAGE?

R.V. Gomes[1], W.A. Martins[2], A.R. Felipe[3], M.A.D. Mattos[3], M. Assad[3], P.M.M. Nogueira[3], M.L. Toscano[3], C.N.D. Barros[3], F.F. Miranda[3], L.A.D.A. Campos[3]

[1]Hospital Unimed Rio, Intensive Care, Rio de Janeiro, Brazil, [2]Hospital Unimed Rio, Research, Rio de Janeiro, Brazil, [3]Hospital Unimed Rio, Rio de Janeiro, Brazil
INTRODUCTION. The severity and costs of patients (pts) admitted to intensive care units (ICU) have increased. Therefore, assessing the relationship between the health insurance coverage type and patients' severity seems to be fundamental.
OBJECTIVE. To assess the impact of the health insurance coverage type on the SAPS3 value, mortality, and length of hospital and ICU stays.
METHODS. From January 3rd to April 3rd, 2013, 240 pts admitted to the ICU of a tertiary hospital were retrospectively assessed from an Oracle database. They were divided into three groups based on their health insurance coverage type as follows: group A, high cost; group B, intermediate cost; and group C, low cost. A descriptive analysis was performed and followed by Chi square test and Fisher exact test to assess the differences between the groups regarding categorical variables (death, clinical or surgical admission, Charlson comorbidities). To assess the difference between the groups regarding the numerical variables, ANOVA was used and followed by post hoc analysis with Bonferroni adjustment for the normally distributed variables (SAPS3), while the Kruskal–Wallis test was used for the nonparametric variables (Sequential Organ Failure Assessment score, age, length of ICU stay, length of hospital stay).
RESULTS. The SAPS3 value (form completed for 170 pts) was significantly different between the groups A, B and C ($p = 0.004$) (boxplot below). The Bonferroni test showed that the difference was significant between B and C ($p = 0.004$) and between A and C ($p = 0.03$). The other numerical variables showed no significant difference. Regarding the categorical variables, group C had a significantly higher number of surgical pts ($p = 0.013$) (bar graph below) and lower mortality ($p = 0.029$), but no difference was observed regarding the presence of Charlson [1] comorbidities.



SAPS 3

CONCLUSION. Patients of low cost health insurance coverage have a significantly lower first-hour SAPS3, which is partially explained by the higher number of surgical cases among them. Comparing with data from the literature (2), our group C pts showed lower mortality.
REFERENCES. 1. Charlson ME, Pompei P, Ales KL, Mackenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation* 1. J Chron Dis. 1987;40(5):373–83. 2. Lyon SM, Benson NM, Cooke CR, Iwashyna TJ, Ratcliffe SJ, Kahn JM. The effect of insurance status on mortality and procedural use in critically ill patients. Am J Respir Crit Care Med. 2011;184(7):809–15.

0198

ACUTE RESPIRATORY VIRAL INFECTION IN PREGNANT: ESTIMATION OF THE SEVERITY OF STATE CRITERIA AND INDICATIONS FOR HOSPITALIZATION IN ICU

O. Khomenko[1], R. Tkachenko[2], M. Pylypenko[2]

[1]Kiev City Centre Reproductive and Perinatal Medicine, Anesthesiology and ICU, Kiev, Ukraine, [2]National Medical Academy Postgraduate Education named by P.L. Shupyk, Kiev, Ukraine
INTRODUCTION. Influenza is often complicated by developing of pneumonia in pregnant women. The highest level of mortality from influenza in these patients occurs in the third trimester of pregnancy [1].
OBJECTIVES. To improve treatment efficiency and outcome of pregnant with severe acute respiratory viral infection, complicated by pneumonia it is still necessary to unify criteria patients' severity of state and indications for intensive care unit (ICU) hospitalisation.
METHODS. To assess the sensitivity and specificity of the scores CRB-65 and IDSA/ATS that are used for estimation of patients with community acquired pneumonia (CAP)

[2, 3] we have retrospectively analyzed medical histories of 3 groups of pregnant and postpartum women with severe influenza A H1N1. Group 1 was 49 patients from all over Ukraine who died during the influenza A H1N1 epidemy (2009–2010); group 2 was matched 22 survived patients who were treated in the ICU in the Kiev City Centre Reproductive and Perinatal Medicine during 2009–2013; group 3–70 hospitalized patients who didn't required admission in ICU. In some cases the blood gases analysis were not available and PaO_2 we calculated from the data of SpO_2 by the algorithm introduced by of Kelman [4].
RESULTS. Among all 139 patients CRB-65 score has shown low sensitivity in mortality prognosis (4 % on the day of hospitalization and 6 % on the day admission to the ICU) but high specificity according mortality (100 % during hospitalization and 91 % specificity during admission to the ICU). The sensitivity of the presents of the "big and small" criteria of IDSA/ATS score in prediction of mortality was higher—34 % during hospitalization and 66 % during admitting to the ICU and its specificity—97 % during hospitalization and 68 % during admission to the ICU.
CONCLUSIONS. Our data suggest that the "big and small" criteria of IDSA/ATS are informative and should be used for estimation of the severity of state and evaluation of indications for hospitalization in ICU during an all period of the disease. The simpler scale CRB-65 could be used for screening patients at the outpatient and admission room. The sensitivity of CAP scale for determining the severity state and criteria for ICU transferring is found to be unsatisfied and future research in this area has to be conducted.
REFERENCE(S). 1. Torres A. Pandemic influenza caused by A(H1N1) in pregnant women. Gynecol Obstet Mex. 2010;78(2):121–7. 2. Liapikou A, Ferrer M, Polverino E, et al. Severe community-acquired pneumonia: validation of the infectious Diseases Society of America/American Thoracic Society Guidelines to Predict Intensive Care Unit Admission. Clin Infect Dis. 2009;48:377–85. 3. Fine M, Auble T, Yealy D, et al. A prediction rule to identify low-risk patients with community-acquired pneumonia. N Engl J Med. 1997;336:43–50. 4. Kelman G. JAP. 1966;21(4):1375.

0199
LONG-TERM ADMISSION TO THE INTENSIVE CARE UNIT: A DESCRIPTIVE ANALYSIS OF COSTS AND OUTCOMES

S. Rodriguez Villar[1], R. Barrientos Vega[2], R. Barrientos Yuste[3], O. Rice[1]

[1]Queen's Elizabeth Hospital, Critical Care Medicine, London, UK, [2]Hospital Virgen de la Salud, Critical Care Medicine, Toledo, Spain, [3]Madrid Care Centre for the Disabled, Madrid, Spain
INTRODUCTION. The quality of resources that are nowadays available to Intensive Care Services, allows the healing and survival of patients suffering more and more serious and complex health state. However, the main diagnosis together with the failure of other organs, often prolong the stay of patients in our units and, as a result, increase morbidity and mortality, as well as they generate higher involved cost level.
OBJECTIVE. To assess outcomes in long-term patients at a multi-purpose ICU (Intensive Care Unit), with follow-ups carried out at one-year post-discharge, with a view to calculating the costs incurred by the hospital in relation to the benefits gained.
MATERIALS AND METHODS. Of 3,639 patients consecutively admitted over the course of 3 years to ICU, 235 (6.5 %) were assessed for the purposes of the study, having spent a period exceeding 20 days in intensive care. The survey tool used was a Minimum Data Set (MDS) designed in the ICU in which the study was carried out. The length of ICU stay and hospital stay following discharge from ICU were calculated and, 1 year post-discharge, the patient/next of kin was contacted in order to carry out a follow-up survey regarding the patient's survival and functional status (according to GOS-E scale). Co-morbidity was assessed according to the Charlson score.
RESULTS. The 235 patients under study had an mean length of stay of 37 days, occupied 34 % of the ICU beds available and used up 29 % of the ICU's economic resources (10,992,500 €). Their stay on hospital wards was of a mean of 33 days. Mortality in ICU and on hospital wards was 40 % higher amongst patients of greater age, APACHE II score and Charlson index. Mortality rates were triple in neurosurgical patients. In those discharged from hospital, at the one-year follow-up, there was a mortality rate of 25 %. Only 21 % recovered an acceptable functional status.
CONCLUSIONS. Mortality rates in long-term ICU patients are high, both during their hospital stay and in the first year post-discharge. They do not exhibit a good level of recovery and use up a large proportion of economic resources. The development of assessment scales and protocols which would adjust expenditure according to probable outcome should perhaps be taken into consideration.
REFERENCES. 1. Friedrich J, Wilson G, Chant C. Long-term outcomes and clinical predictors of hospital mortality in very long stay intensive care unit patients: a cohort study. Crit Care. 2006;10:R594. 2. Sricker KH, Cavegen R, Takala J. Does ICU length of stay influence quality of life? Acta Anaesthesiol Scand. 2005;49:975–36. 3. Heyland DK, Konopad E, Noseworthy TW. Is it "Worthwhile" to continue treating patients with a prolonged stay (<14 days) in de ICU? Chest. 1998;114:192–8.
Financial support, including any institutional departmental funds, was not sought for this study.

0200
STS RISK SCORE: DOES IT REALLY WORK IN OUR PATIENTES?

M. Perez Cheng[1], J. Gonzalez Robledo[1], P. Vazquez Paredes[1], L. Sanchez Montori[1], V. Sagredo Meneses[1], J.J. Marin Salazar[1], J.M. Gonzalez Santos[1], A. Rodriguez Encinas[1]

[1]Complejo Asistencial Universitario de Salamanca, Salamanca, Spain
INTRODUCTION. The STS score was developed within the largest clinical cardiac surgery data registry in the world and tries to asses not only the mortality risk but also major morbidity endpoints.
OBJECTIVES. This study is aimed to validate different endpoints of the STS score: prolonged ventilation greater than 48 h, renal dysfunction or failure requiring dialysis, any cardiac surgery, prolonged hospitalization more than 14 days and operative mortality.
METHODS. Data for all patients undergone heart surgery at the University Hospital of Salamanca, Spain, between 2008 and 2011 were retrospectively collected. We included those interventions which meet the criteria of the STS, and collected data from days of mechanical ventilation, renal failure, reoperation, length of stay and mortality. Data were analyzed with SPSS v17.0.
RESULTS. We retrospectively analyzed the records of 826 patients who underwent cardiac surgery. The median age was 73 ± 9.88 (range 23–87 years). Most patients were men (78.1 %). A valve procedure without coronary artery bypass was performed in 33 % of the cases, a coronary artery bypass grafting-only operation in 46 % and valve procedure with CABG in 19 %. Patients had a median ICU stay of 4.73 ± 3 days and 0.3 ± 5.47 days of mechanical ventilation. The incidence of renal failure was 8.1 %, of re-operation 3.8 %, and mortality 6.1 %. The discriminatory power of STS score was analyzed by ROC curves. There were no significant statistics differences in the need of re-operation with an AUC of 0.46 (95 % confidence interval 0.36–0.58). The best results were in predicting renal failure, with an AUC of 0.8 (95 % confidence interval 0.75–0.85), and prolonged mechanical ventilation with an AUC of 0.77 (95 % confidence interval 0.71–0.82). In terms of mortality, the AUC was 0.75 (95 % confidence interval 0.68–0.82) and prolonged length of stay AUC 0.73 (95 % confidence interval, 0.67–0.68).
CONCLUSIONS. The STS scale seems an attractive model because it not only predicts surgical risk for mortality, but also takes into account other relevant end-points in post-operative cardiac surgery. However we found certain limitation in the fact that it can't be used in ascending aorta procedures, tricuspid valve and multiple valve replacements. As for its performance in the end-points we have analyzed, it has had acceptable results, especially in terms of prolonged mechanical ventilation and renal failure, but not significant in predicting the need of reoperation.
REFERENCE. 1. Caceres M, et al. A short history of the society of thoracic surgeons national cardiac database: perceptions of a practicing surgeon. Ann Thorac Surg. 2010;89:332–9.

0201
FREQUENT ATTENDANCE AT OUR EMERGENCY DEPARTMENT: OVERCONSUMPTION?

I. Brümmer[1], J.J.M. Ligtenberg[2], J.C. ter Maaten[2], CAPE Research Institute, UMCG

[1]UMCG, Emergency Department, Groningen, The Netherlands, [2]UMCG, Emergency and Internal Medicine, Groningen, The Netherlands
INTRODUCTION. In previous studies, Emergency Department (ED) frequent users were defined as visiting the ED >4 to >10 times per year. In these studies frequent attendance was associated with poor access to quality primary care, poor socioeconomic background, psychosocial, psychiatric or chronic illness, increased mortality, overall high health service use and high admission rates. Suggested solutions were to improve living standards and coping mechanisms of these patients.
This is the first study regarding frequent ED users in The Netherlands. The study is performed at the ED of the University Medical Center Groningen (UMCG), where most ED patients are referred by a primary care physician, ambulance or specialist. We were interested to know if the above findings are applicable to our situation.
OBJECTIVES. To investigate the incidence and characteristics of frequent users of the ED of the UMCG.
METHODS. Using the ED computer registration database, all patients were identified presenting to the hospital ED more than 4 times in a one-year period from the 1st of January to the 31st of December 2010. Medical records were reviewed to determine the reason for repeated ED visits.
RESULTS. In 2010 a total of 32665 visits were made to the ED, of which 1,503 visits by 254 frequent users. Most of the frequent users visited the ED five times, only ten patients visited the ED more than ten times. The mean age of frequent users was 50.6 years, of all ED-patients 42.1 years, both with a standard deviation of ±20 years. Frequent users were self-referred less frequently than other ED-visitors ($P < 0.001$) and were more often admitted to hospital ($P < 0.001$). Top reasons for frequent attendance were: abdominal pain (14.7 %); dyspnea (10.9 %); collapse/palpitations (10.7 %); extremity problem (8.6 %); infection/abscess (7.7 %); and chestpain (7.3 %).
CONCLUSIONS. Frequent users of the ED of the UMCG tend to be older, come less often unreferred and are more often admitted to the hospital than the average ED visitor. Very few patients are admitted to the ED more than ten times a year. Our group of frequent ED-users differs from those in hospitals and countries where most patients are self-referred. Frequent attendance in our population is not due to overconsumption and poor access to good quality primary care but is often related to a chronic illness, e.g. chronic abdominal conditions, COPD, atrial fibrillation, and coronary heart disease. Our frequent users need a different approach from those in most previous studies.

0202
UNPLANNED INTENSIVE CARE UNIT ADMISSIONS: ARE WE ADHERENT TO GUIDELINES?

V. Metaxa[1,2], D. Garcia-Rodriguez[1], I. Carrasco[1], D. Mateo[1]

[1]Newham University Hospital, London, UK, [2]King's College Hospital NHS Foundation Trust, London, UK
INTRODUCTION. Recognizing acutely deteriorating patients in hospital wards is often delayed or managed inappropriately, resulting in late referral to critical care, avoidable intensive care unit (ICU) admissions and unnecessary patient deaths. These patients often show deteriorating vital signs for several hours before experiencing a serious adverse event. Local implementation of 'track and trigger' systems, early involvement of an outreach team, as well as daily review by a consultant are some of the measures proposed by the National Institute of Clinical Excellence and the Academy of Medical Royal Colleges, in an attempt to increase patient safety and provide high quality of care [1, 2].
OBJECTIVES. We aimed to estimate the adherence of hospital staff to national guidelines and ascertain whether it influenced admission severity scores and clinical outcome.
METHODS. We retrospectively reviewed all unplanned ICU admissions from August 2011 to September 2012 in our unit. Data on demographics, admission diagnosis, Acute Physiology and Chronic Health Evaluation (APACHE) II and Modified Early Warning (MEWS) score, physician and outreach team involvement, and outcome were collected.
RESULTS. The mean age of admitted patients was 64 years/age with median APACHE and MEWS scores 17 and 4 respectively. The most common reasons for admission were post-operative complications (26 %), circulatory collapse (24 %) and respiratory failure (23 %). Only 16 % and 21 % of the patients have been reviewed by the ward consultant 6 and 24 h prior to ICU admission respectively. Almost half (46 %) of the acutely deteriorating patients were not seen by the outreach team 6 h prior to admission and 36 % of them were never referred to ICU. ICU and hospital mortality were 19 and 11 % respectively. No statistically significant difference was found in admission severity scores and clinical outcome between patients with timely and delayed review by outreach services and senior physicians ($p < 0.05$).
CONCLUSIONS. Despite clear national standards for in-hospital patient care, we found a low compliance with published guidelines. Further implementation strategies, continuous education and reinforcement are necessary both for medical and nursing staff in order to recognize the deteriorating patients and timely refer them to outreach teams and senior physicians.

REFERENCE(S). 1. Centre for Clinical Practice at NICE (UK). Acutely Ill Patients in Hospital: Recognition of and Response to Acute Illness in Adults in Hospital [Internet]. 2007; NICE Clinical Guidelines, No. 50. http://www.ncbi.nlm.nih.gov/books/NBK45947/. 2. Academy of Medical Royal Colleges. Seven day consultant present care; 2012. http://aomrc.org.uk/publications/reports-a-guidance.html.

0203

PERI-INTUBATION PHYSIOLOGIC ADVERSE EVENTS IN HIGH RISK VASCULAR SURGERY PATIENTS

R. Green[1], M.B. Butler[1]

[1]Capital District Health Authority, Division of Critical Care, Halifax, Canada

INTRODUCTION. Endotracheal intubation (ETI) is a necessary procedure in patients requiring vascular surgery. During ETI, a common goal is to maintain physiologic stability and avoid adverse events.

OBJECTIVES. The goal of this study is to evaluate the incidence of physiologic adverse events within a vascular surgery population during ETI.

METHODS. A structured chart audit was performed of adult patients intubated for a vascular surgery procedure at a quaternary centre over a 3-year period. Patients were identified and data collated from multiple electronic databases. Data not available electronically was abstracted from the patient chart by a trained co-investigator.

Adverse events in the peri-intubation period evaluated included: • Hypoxia (SaO_2 <80 %)
• Hypertension (SBP >180 mmHg, or MAP >110 mmHg)
• Tachypnea (>30 respirations per min) and bradypnea (<10 respirations per min)
• Tachycardia (>120 beats per minute) and bradycardia (<50 bpm)
• The rate of occurrence of post-intubation hemodynamic instability, defined as a decrease in systolic blood pressure (SBP) to ≤80 mmHg, or a decrease in SBP of ≥20 % from baseline, or a decrease in mean arterial pressure to ≤50 mm Hg, or the initiation of any vasopressor medication at any time in the 15 min following intubation.

We also evaluated if having an increasing number of adverse events intraoperatively was associated with an increased incidence of poor patient outcomes such as: • In-hospital mortality
• Post-op hemodialysis requirements
• Post-op ventilator requirement
• Post-op vasopressor requirement
• Requirement for ICU admission

To account for overall patient outcome, we also assessed a composite end-point of any the above events occurring.

RESULTS. Overall, 1395 patients underwent a vascular surgery procedure between 2007 and 2009. The mean age of the patients was 67.4 years and 63.7 % of patients were male (888/1,395). 67.03 % of patients were generally unhealthy, being assessed as an ASA level of 3 or higher. The incidences of adverse events were: hypoxia (16.8 ± 1.9 %), hypertension (61.6 ± 2.5 %), PIHI (60.0 ± 2.6 %), tachycardia (6.2 ± 1.5 %), bradycardia (21.2 ± 2.3 %), tachypnea (14.5 ± 1.8 %) and bradypnea (5.5 ± 1.1 %). The associations of increasing the number of intraoperative adverse events by one that were: mortality (OR = 1.42, P < 0.001, CI = (1.20, 1.67)), vasopressor requirement (OR = 1.84, P < 0.001, CI = (1.51,2.22)), ventilator requirement (OR = 2.02, P < 0.001, CI = (1.76, 2.34)), hemodialysis requirement (OR = 1.84, P = 0.029, CI = (1.06, 3.17)), ICU requirement (OR = 1.83, P < 0.001, CI = (1.62, 2.08)) and the composite outcome (OR = 1.72, P < 0.001, CI = (1.54, 1.93)).

CONCLUSIONS. In a vascular surgery population, we observed a high rate of peri-intubation physiologic adverse events. Incurring an increased number of adverse events is associated with an increase in poor patient outcome. Further investigation is warranted in evaluating associations between adverse events and patient outcomes in the vascular surgery population.

0204

REDESIGNING THE INTENSIVE CARE UNIT DISCHARGE PROCESS: A QUALITY HEALTHCARE IMPROVEMENT PROJECT

B. Johnston[1], S. Anwar[1]

[1]University Hospital of Wales, Critical Care Directorate, Cardiff, UK

INTRODUCTION. Patients that are discharged from the ITU commonly have complex medical issues and require on going mutli-disciplinary input. These patients also have an increased incidence of morbidity and mortality compared to the general patient population. It is vital that the discharge process for these patients occurs in a structured and organised fashion for all disciplines including doctors and nurses. Once they arrive on a general ward there should be a timely review of these patients by the responsible physicians. A failure in any of these processes leads to poor exchange of information, which in turn leads to increased morbidity and mortality. It is also why many patients are readmitted to the ITU, which is associated with poor outcomes and increased costs. NICE has recognised this and has published guidelines for the transfer of patients from critical care to wards (CG50)0 [1].

METHODS. We undertook a prospective audit of patients discharged from a large 30 bed ICU in a tertiary referral centre for compliance with NICE guidelines. We also sent out an anonymous computerised questionnaire to trainee doctors to determine how many had been responsible for review of patients discharged from ICU and their experience of transition of care between the ITU and the ward.

RESULTS. 69 % of patients discharged from ICU had a formal structured handover with 62 % having a written handover plan, easily located within medical notes. The remainder of the discharges were either misplaced or lost during the transfer process. 75 % of trainee doctors reviewing patients that had been discharged had received a verbal handover. An average time from discharge to ward review of patients was 3–4 h. Trainee doctors were concerned about reviewing patients discharged from ICU with the majority finding discharge summaries useful.

CONCLUSIONS. An electronic standardised proforma for ITU discharges was created which once completed was automatically uploaded to the electronic patients records systems to improve accessibility. A paper copy was also printed off and included in the notes. Patient's observations were recorded and transferred from ITU observation charts onto charts used on wards before discharge to ensure documentation was transferable and trends appreciated.

REFERENCE(S). Acutely ill patients in hospital: recognition of and response to illness in adults in hospital; 2007. Clinical guidelines CG50. National institute of health and care excellence.

Update on antibacterial therapies: 0205–0218

0205

PHYSIOLOGIC VARIABLES AND PHARMACOKINETICS OF IMIPENEM DURING EVLP: A SINGLE CENTER TRANSPLANTATION EXPERIENCE

V. Fanelli[1], A. Costamagna[1], P. Persico[1], G. Rotondo[1], L. Mascia[1], S. Corcione[2], L. Baietto[2], A. D'Avolio[2], P.P. Terragni[1], F.G. De Rosa[2], R. Bonato[3], L. Del Sorbo[4], R. Boffini[3], M. Rinaldi[3], V.M. Ranieri[1]

[1]University of Turin, Anesthesia and Critical Care Medicine, Turin, Italy, [2]University of Turin, Medical Science, Infectious Disease Clinic, Turin, Italy, [3]University of Turin, Cardiothoracic Surgery, Turin, Italy, [4]University of Toronto, Interdepartmental Division of Critical Care, Toronto, Canada

INTRODUCTION. Normothermic acellular ex vivo lung perfusion (EVLP) is a promising and feasible strategy to overcome the problem of donor lung shortage. According to the "Toronto EVLP protocol", lungs are ventilated and perfused with a buffered dextran containing extracellular-type solution with addition of methylprednisolone, imipenem and heparin. There is a growing body of evidence showing wide variations of drugs concentrations, including antibiotics, during extracorporeal circulation, which may affect outcome. To our knowledge, the variations of drugs concentration during EVLP are unknown.

OBJECTIVES. To evaluate time course of imipenem concentration during EVLP. We hypothesized that imipenem concentration decreases in lung perfusate over time.

METHODS. Eight lungs from brain dead donors, which did not meet criteria for lung transplantation, underwent to at least 4 h of EVLP into the XVIVO™ (Vitrolife) chamber. Lungs were perfused with 2 liters of buffered dextran containing extracellular-type solution (Steen Solution™) with addition of 500 mg of methylprednisolone, 500 mg of imipenem-cilastatin and 3000 UI of heparin. Flow rate was set at 40 % of the estimated donor cardiac output. Lungs were ventilated with a tidal volume of 7 ml/kg of donor ideal body weight, PEEP of 5 cmH_2O and FiO_2 of 0.21. Lungs were considered eligible for transplantation through a combination of physiologic variables as dynamic compliance, pulmonary vascular resistances, PaO_2/FiO_2 and visual inspection. Imipenem concentration in lung perfusate was measured by high-performance liquid chromatography (HPLC). Data are expressed as mean ± SE. Statistic. Repeated Measures ANOVA, *p < 0.05 vs T1.

RESULTS. See Table 1. Time course of Imipenem concentrations and physiologic variables during EVLP.

Table 1

	t1	t2	t3	t4	t5
Imipenem concentration (mg/l)	102 ± 17	80 ± 13*	77 ± 11*	71 ± 8*	49 ± 11*
PaO_2/FiO_2 ratio ($mmHg/\%O_2$)	434 ± 27	481 ± 24	469 ± 30	471 ± 19	495 ± 25
Dynamic compliance (ml/cmH_2O)	77 ± 8	81 ± 10	72 ± 6	73 ± 6	72 ± 14
Pulmonary vascular resistance (dyne s cm^{-5})	189 ± 48	242 ± 53	259 ± 51	255 ± 46	267 ± 68

* p < 0.05 vs T1

Table 2 Donors and transplantation characteristics of lungs that underwent to EVLP

Age	
Median	44
Range	31–63
Last PaO_2/FiO_2 before retrieval	209 ± 32
Cold ischemic time (min)	231 ± 27
Number of successful reconditioning	5

CONCLUSIONS. The concentration of Imipenem progressively decreased over time, reaching half of initial value after 5 h of EVLP. The dramatic reduction of imipenem over time could be explained by absorbtion of drug into lung tissue, oxygenator membrane, leukocytes filter. Further studies to evaluate whether imipenem concentration are appropriate during EVLP are warranted.

REFERENCE(S). Cypel M, et al. Normothermic ex vivo lung perfusion in clinical lung transplantation. N Engl J Med. 2011;364(15):1431–40.

GRANT ACKNOWLEDGMENT. Italian Ministry of Health, Ricerca Finalizzata 2010.

0206

IMPACT OF 1 YEAR APPLICATION OF SELECTIVE DECONTAMINATION OF THE DIGESTIVE TRACT (SDD) IN A MIXED INTENSIVE CARE UNIT (ICU) IN A UNIVERSITY TERTIARY-CARE HOSPITAL

C. Sánchez Ramírez[1], M. Cabrera Santana[1], M.A. Hernández Viera[1], L. Caipe Balcazar[1], J.L. Romero Luján[1], S. Hípola Escalada[1], N. Sangil Monroy[2], A. Bordes Benitez[3], P. Saavedra Santana[4], S. Ruiz Santana[1]

[1]University Hospital of Gran Canaria Dr Negrín, Intensive Care Unit, Las Palmas de Gran Canaria, Spain, [2]University Hospital of Gran Canaria Dr Negrín, Pharmacy Department, Las Palmas de Gran Canaria, Spain, [3]University Hospital of Gran Canaria Dr Negrín, Microbiology Department, Las Palmas de Gran Canaria, Spain, [4]Las Palmas of Gran Canaria University, Mathematics and Informatics Department, Las Palmas de Gran Canaria, Spain

INTRODUCTION. SDD is an antimicrobial prophylaxis proposed to reduce the incidence of severe infections of lower airways [1]. Despite of the evidence its use remains controversial.

OBJECTIVES. To prospectively evaluate the impact after 1 year of SDD application to prevent nosocomial infections.

METHODS. This study was conducted in a 30-bed-medical-surgical ICU. All consecutive patients admitted to the ICU from October 1, 2011 to September 30, 2012 expected to require tracheal intubation for longer than 48 h were given SDD (SDD study group) with a 4-day course of intravenous cefotaxime, plus enteral polymixin E, tobramycin, amphotericin. B in an oropharyngeal paste and in a digestive solution. Oropharyngeal and rectal swabs were obtained on admission and once weekly. Diagnostic samples were obtained if clinically indicated. Nosocomial infections were diagnosed by CDC criteria. We compared all patients admitted to ICU who acquired nosocomial ICU infections from October 1, 2010 to September 30, 2011 (non-SDD control group) to SDD study group. In both groups, categorical variables were summarized as frequencies and percentages and the continuous ones as means and standard deviations (SD) when the data followed the normal distribution or medians and interquartile ranges (IQR) when they did not. The percentages were compared using the test of Chi square test or Fisher exact test, means with the t-test and medians with the Wilcoxon test for independent samples. For each one of the acquired infections (catheter-related and other secondary bacteremias, pneumonia and urinary infections) the incidences per 1,000 days of exposure in each cohort and the corresponding relative risks were obtained using the Poisson regression. Statistical significance was set at $p \leq 0.05$.The data were analyzed using PASW statistical software (SPSS, Chicago, IL, USA).

RESULTS. Results are shown in Tables 1, 2 and 3.There were not statistical significant differences between both groups in type of ICU admission or isk factors for infections. Patients with SDD had significantly less ESBLs and ARB infections We had also a significant reduction in nosocomial pneumonias, urinary tract infections and other secondary bacteremias rates in SDD group versus non SDD. There was no any infection by Clostridium difficile. There was a notorious decrease on the defined antibiotics daily doses (DDD)/100 ICU stays during SDD protocol application for colistin, tobramycin, amikacin, imipenem, meropenem, and ciprofloxacin, with a saving cost of 28.451,78 euros.

CONCLUSIONS. After 1 year applicating SDD a significant reduction in nosocomial pneumonia, urinary infections and secondary bacteremias rates, together with a significant decrease of ARB infections and antibiotic consumption was shown compared to the non-SDD group.

REFERENCE. 1. Baxby D, et al. Selective decontamination of the digestive tract; 13 years on, what it is and what it is not. Intensive Care Med. 1996;22:699–706.

	SDD*		P
	Yes N = 55	No N = 110	
Age, years	57.9 ± 18.5	59.6 ± 15.8	.539
Male / female, %	72.7 / 27.3	68.2 / 31.8	.548
Apache-II	22.5 ± 7.2	21.2 ± 7.6	.282
Glasgow Coma Score	14 (8 ; 15)	15 (8 ; 15)	.106
Trauma patients, n (%)	8 (14.5)	17 (15.5)	.878
Days in ICU	118 (47 ; 156)	62 (40 ; 111)	.241
Deaths, n (%)	15 (27.3)	35 (31.8)	.549
Coronary patients, n (%)	8 (14.5)	19 (17.3)	.655
Emergency surgery, n (%)	24 (43.6)	33 (30.0)	.082
Previous surgery, n (%)	10 (18.2)	22 (20.0)	.781
Inmunosupresión, n (%)	5 (9.1)	7 (6.4)	.525
Neutropenia, n (%)	1 (1.8)	3 (2.7)	1
Parenteral Nutrition, n (%)	17 (30.9)	26 (23.6)	.316
Prior 48 hours antibiotics use, n (%)	8 (14.5)	28 (25.5)	.110
Renal replacement therapy, n (%)	19 (34.5)	34 (30.9)	.637
Intraventricular catheter, n (%)	7 (12.7)	11 (10.0)	.596
ORSA, n (%)	1 (1.8)	3 (2.7)	1
ESBLs , n (%)	8 (14.5)	39 (35.5)	.005
Pseudomonas, n (%)	7 (12.7)	10 (9.1)	.469
Gram negative ARB, n (%)	1 (1.8)	12 (10.9)	.062
Acinetobacter, n (%)	3 (5.5)	13 (11.8)	.193
Enterococcus vancomicyn ARB, n	0	0	-
Shock, n (%)	37 (67,3)	51 (46,4)	.011
Nº primary and catheter related bacteremias, n (%)	17 (30,9)	25 (22,7)	.422
Nº other secondary bacteremias , n (%)	18 (23,6)	43 (30)	.752
Nº pneumonias, n (%)	28 (49,1)	43 (53,6)	.736
Nº urinary infections, n (%)	14 (25,5)	34 (28,2)	.464
Nº ARB infections, n (%)	18 (32,7)	61 (55,5)	.017

[*Table 1. Univariate analysis*] (*) The cohorts of study are consecutive. ORSA: oxacillin resistant Staphylococcus Aureus; :ESBL Extended spectrum betalactamase; ARB: antibiotic resistant bacteria.

Table 1 Univariate analysis

		SDD		
	NO N=110	YES n=55	P	RR(95%CI)
Primary and catheter-related bacteremia / 1000 days of CVC	3.725	1.615	.122	0.620(0.338;1.137)
Other secondary bacteremia / 1000 days in ICU	4.686	1.951	.002	0.416(0.240;0.722)
Nosocomial pneumonia / 1000 days of MV	10.308	4.435	.001	0.430(0.276;0.672)
Urinary infection / 1000 days of urinary catheter	3.905	1.615	.005	0.414(0.222;0.771)

Table 2 Nosocomial infection rates

ICU sections	Section 1		Section 2		Section 3	
SDD	NO	YES	NO	YES	NO	YES
Tobramycin	4,23	1,32	3,41	1,3	2,68	1,07
Amikacin	3,1	1,5	0,78	0,42	0,4	1,21
Ceftazidime	1,68	3,75	2.18	2,64	1,62	0,9
Ciprofloxacin	3.15	2,15	4,5	3,12	5,2	4,39
Meropenem	26,19	22,8	1.69	1,9	15,21	17,76
Imipenem	13,3	4,8	6,1	3,2	6.14	2,20
Vancomicyn	0.83	1,67	5.6	2,47	0.8	0,81
Colistin	15,27	8,76	2,2	0	1,7	2,02

Table 3 DDD/100 ICU stays

0207

DEVELOPMENT OF A NOMOGRAM, FOR PRESCRIPTION OF VANCOMYCIN IN CONTINUOUS PERFUSION, IN AN INTENSIVE CARE UNIT

J.P. Baptista[1], J. Pimentel[1]

[1]Centro Hospitalar e Universitário de Coimbra, Intensive Care Unit, Coimbra, Portugal

INTRODUCTION. Rapid achievement of therapeutic levels of antibiotics is essential to decrease morbidity and mortality in at-risk patients, particularly in the critical care setting. Vancomycin (V) is frequently administered by continuous infusion to treat severe infections caused by Gram-positive bacteria. This mode of administration frequently results in sub-therapeutic drug levels during the first few days of therapy.

OBJECTIVES. The aim of this study was to create a tailored V dosing nomogram for the first 24 h, within a large range of measured creatinine renal clearance (CLCr), for use in critically ill patients treated with continuous perfusion (CP).

METHODS. Critically ill patients who were treated with V on CP between October 2011 and December 2012 were prospectively identified. Drug clearance was calculated from the ratio between the infusion rate (within Day 0) and respective serum concentration on the first day of treatment (Day 1). The CLCr was measured for a period of 8 h. The therapeutic goal was a serum V concentration of 25 μg/mL. Linear regression was used to define an equation for dosing calculation.

RESULTS. We evaluated 79 patients of whom 66 % were male, with a mean age of 57.8 years in which trauma was the leading cause of admission (44.3 %).The lung was the most frequent source of infection (58 %). The median of loading, 24 h perfusion and total V dosing was 14.3 mg/kg, 1,935 and 3,160 mg, respectively. The average interval between loading dose and therapeutic drug monitoring was 19 h (9–44). The medians of serum Cr (Day 0) and the average of 8 h-CLCr (Day 1) were 0.68 (0.4–1.75) mg/dL and 127 (27–350) mL/m/1.73 m^2, respectively. Twenty-nine patients (37 %) had 8 h-CLCr above 130 mL/m/1.73 m^2. The average renal clearance of V was 5.12L/h. We found a good correlation between 8 h-CLCr and the clearance of V ($R = 0.81$, $p < 0.01$, Fig. 1). The final formula for calculation of the amount of V (g/d) to be perfused on the first day was: $(0.02 \times CLCr + 2.3) \times 0.6$. This formula allowed us to develop a practical nomogram covering a wide range of values of CLCr (Fig. 2).

CONCLUSIONS. It is feasible to develop a nomogram at the bedside using simple pharmacokinetic concepts. This nomogram allows us to optimize and modulate the dose of vancomycin in the first days of treatment, which is particularly useful in the subset of patients with high vancomycin renal clearance.

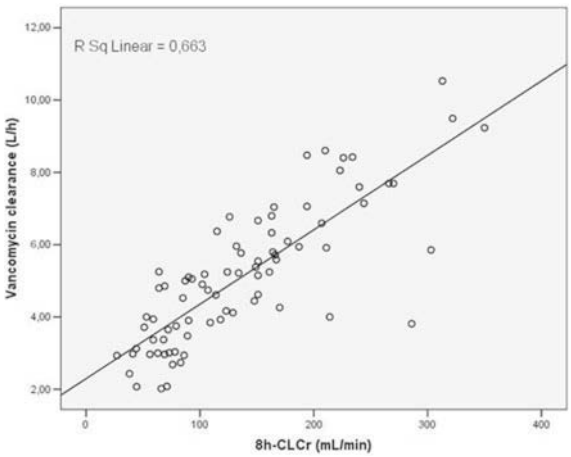


Fig. 1

8h-CLCr (mL/min)	Vancomycin dosing (g/d)
30	1,8
50	2.0
75	2.3
100	2.6
125	3.0
150	3.3
175	3.6
200	3.9
225	4.2
250	4.5
275	4.8
300	5.2
350	5.8

Fig. 2

REFERENCE(S). 1. Baptista JP, et al. Augmented renal clearance in septic patients and implications for vancomycin optimisation. Int J Antimicrob Agents. 2012;39(5):420–3. 2. Pea F, et al. Prospectively validated dosing nomograms for maximizing the pharmacodynamics of vancomycin administered by continuous infusion in critically ill patients. Antimicrob Agents Chemother. 2009;53(5):1863–7.

0208

LINEZOLID CONTINUOUS INFUSION IN OBESE PATIENTS WITH NOSOCOMIAL PNEUMONIA

G. De Pascale[1], S. Fortuna[2], L. Montini[1], A. Occhionero[1], R. Festa[1], S. Marsili[1], M. Biancone[1], F. Antonicelli[1], P. De Santis[1], E.S. Tanzarella[1], S.L. Cutuli[1], M.A. Pennisi[1], P. Navarra[2], M. Antonelli[1]

[1]Sacro Cuore Catholic University, Policlinico A. Gemelli, Department of Anesthesiology and Intensive Care, Rome, Italy, [2]Sacro Cuore Catholic University, Policlinico A. Gemelli, Institute of Pharmacology, Rome, Italy

INTRODUCTION. Linezolid is one of the preferred antibiotics for the treatment of nosocomial pneumonia(NP) where methicillin-resistant *Staphylococcus aureus* (MRSA) involvement is supposed. T > MIC (time with serum-site concentrations higher than the minimum inhibitory concentration) exceeding 85 % and $AUC_{0–24}$/MIC ratio more than 80 h are the pharmacokinetic/pharmacodynamic (PK/PD) parameters that predict clinical efficacy.
OBJECTIVES. Compare the PK profile of linezolid administered by intermittent (II) or continuos infusion(CI) for the treatment of critically ill obese patients with suspected MRSA NP.
METHODS. All obese patients(body mass index [BMI] >30) with suspected MRSA NP, admitted to the 18 bed ICU of our University Hospital between April 2011 and June 2012, were randomized to receive II (600 mg every 12 h) or CI (1,200 mg/daily after a 600 mg loading dose). Blood samples and miniBALs were collected after sixth doses.
RESULTS. During the study period 14 patients were enrolled: seven in each group. Mean SAPSII score, SOFA score and BMI were 51 ± 12, 7 ± 3 and 34 ± 3, respectively. In 71.5 % of patients NP diagnosis was microbiologically confirmed and Gram-positive germs were isolated in 7 cases (50 %). Enrolled patients were ventilated for a mean time period of 22.5 ± 18 days and 50 % of them were in septic shock. Overall ICU mortality rate was 22 %.Patients in II group showed median (IQR) peak and trough plasmatic concentrations of 9.4 mcg/mL (7.1–20.8) and 1.4 mcg/mL (0.8–2.7), respectively. Only one patient (15.3 %) reached an $AUC_{0–24}$/MIC (2 mcg/mL) ratio more than 80 h. Patients in CI group showed a median (IQR) steady-state plasmatic concentration of 6 mcg/mL (4.8–9.5); four of these reached (57 %) the above PK/PD target. Comparing the two groups, patients undergoing CI showed significantly higher values of $AUC_{0–24}$ (190 h [118.3–241] vs 96.4 h [76–163.5], $p = 0.03$), of %T >MIC (2 mcg/mL) (100 [100–100] vs 76.1 [64–98.7], $p = 0.01$) and of %T >MIC (4 mcg/mL) (100 [85.7–100] vs 44 [28.5–75.7], $p = 0.01$]). Similar differences were obtained considering unbound linezolid concentrations with the exception of %T >MIC (4 mcg/mL) (64.2 [0–100] vs 21.9 [12.6–23.1], $p = 0.65$]. Linezolid lung penetration exceeded 100 % of plasmatic concentrations in all cases where respiratory samples were available.
CONCLUSIONS. Despite the optimal pulmonary penetration, linezolid plasmatic concentrations may be suboptimal in obese critically ill patients treated by II. CI would be able to overlap this limit but clinical studies are needed in order to confirm these preliminary PK data.
REFERENCE(S). Dryden MS. Linezolid pharmacokinetics and pharmacodynamics in clinical treatment. J Antimicrob Chemother. 2011;66 Suppl 4:iv7–iv15.

0209

ANTIBIOTIC DE-ESCALATION IN SEVERE SECONDARY PERITONITIS

R. Jiménez[1], A. Ortín[1], S. Rebollo[1], S. Moreno[1], L. Herrera[1], L. Tárraga[1], A. Ojados[1], M. Galindo[1], A. Fernández[1], J. Murcia[1], J.M. Castillo[1], M.J. Del Amor[2], M. Viqueira[2], M.M. Ortíz[2], J.M. Artero[2], M.D. Rodríguez[1], J.M. Allegue[1]

[1]Hospital General Universitario Santa Lucía, Intensive Care Unit, Cartagena, Spain, [2]Hospital General Universitario Santa Lucía, Microbiology Department, Cartagena, Spain

INTRODUCTION. Antibiotic de-escalation (reducing the antibiotic spectrum when microbiological results are available) has been recommended to reduce flora selection pressure. Its use in secondary peritonitis, frequently a polymicrobial infection, has been barely studied.
OBJECTIVES. To assess risks and benefits of antibiotic de-escalation in secondary peritonitis related severe sepsis and septic shock.
METHODS. We reviewed clinical charts from patients admitted to our Unit (medical-surgical 18-bed ICU) with severe sepsis or septic shock due to secondary peritonitis, during the last 3 years. We studied surgical complications, reinfection and development of multidrug-resistant microorganisms (MDRM), taking into account the use or not of de-escalation therapy. Statistics: variables expressed as proportions, mean or median as appropriate; comparison of groups using Chi square, Fisher test, *t*-Student or *U*-Mann–Whitney as appropriate. Statistic significance if $p < 0.05$.
RESULTS. 94 patients was included. Microbiological information was available in 70 cases (74.5 %) and de-escalation was applied in 19 patients (20.2 %) Baseline characteristics was similar between those patients in which de-escalation was made and those in which not (67 [95 % CI 60.3–71.5] vs 68 [65.5–71] years p 0.44, APACHE II 19 [15.4–22.5] vs 20.4 [18.6–22.1] p 0.46, Mannheim peritonitis index 28 [22.7–33] vs 26.5 [25–28.4] p 0.51, Charlson comorbidity index 1 [IQR 0–2] vs 2 [0–3] p 0.08, septic shock at admission 63.2 % vs 54.7 p 0.5).
Antibiotic de-escalation was not associated with higher rates of reintervention (35.3 vs 25.7 %, p 0.42), tertiary peritonitis (44.4 vs 43.2, p 0.93) or reinfection (6.3 vs 6.3, p 0.74) and superinfection (6.3 vs 8.3, p 0.63).
On the other hand, applying de-escalation did not reduce the appearance of MDRM (17.6 % vs 15.5, p 0.54).
Length of ICU stay [8 (IQR 4–14) vs 8 days (3.7–17.2), p 0.5] and hospital stay [19 (11–30) vs 22.5 days (11–38.2), p 0.59] were comparables and no differences in mortality was observed (35.3 vs 39.2 %, p 0.77) between both groups.
CONCLUSIONS. Antibiotic de-escalation, according to our data, appears to be a safe strategy in patients with severe secondary peritonitis regarding rates of reinfection and surgical outcomes. No reduction in multiresistant organisms occurrence was found.
REFERENCES. 1. Gomes et al. De-escalation of antimicrobial treatment for adults with sepsis, severe sepsis or septic shock. Cochrane Database Syst Rev. 2010;CD007934. 2. De Waele et al. De-escalation after empirical meropenem treatment in the intensive care unit: fiction or reality? J Crit Care. 2010;25(4):641–6. 3. Heenen et al. Antibiotic strategies in severe nosocomial sepsis: why do we not de-escalate more often? Crit Care Med. 2012;40:1404–9.

0210

AZITHROMYCIN DOES NOT AFFECT MORTALITY AMONG PATIENTS WITH SEVERE SEPSIS: A PILOT RANDOMIZED CONTROLLED TRIAL

M.I. Restrepo[1], E.M. Mortensen[2], P. Faverio[3], A. Arango[3], G. Waterer[4], R. Wunderink[5], J. Rello[6], I. Martin-Loeches[7], A. Rodriguez[8], J. Blanquer[9], O. Sibila[10], E. Laserna[11], P.J. Marcos[12], F. Sanz[13], C. Luna[14], S. Aliberti[15], T. Houlihan[3], A. Anzueto[1]

[1]UTHSCSA, STVHCS-ALM, San Antonio, USA, [2]UT Southwestern, Dallas, USA, [3]UTHSCSA, San Antonio, USA, [4]University of Western Australia, Perth, Australia, [5]Northwestern University, Chicago, USA, [6]Vall d'Hebron University Hospital, Barcelona, Spain, [7]Corporació Sanitaria Parc Tauli Experience, Barcelona, Spain, [8]Joan XXIII University Hospital, Tarragona, Spain, [9]Hospital Clinic Universitari Valencia, Valencia, Spain, [10]Hospital de la Santa Creu i Sant Pau, Barcelona, Spain, [11]Hospital Comarcal de Mollet, Mollet del Valles, Spain, [12]Complejo Hospitalario Universitario de A Coruna, A Coruña, Spain, [13]Consorci Hospital General Universitari, Valencia, Spain, [14]Hospital de Clinicas, Universidad de Buenos Aires, Buenos Aires, Argentina, [15]University of Milan-Bicocca, Monza, Italy

INTRODUCTION. Azithromycin (AZ) clinical benefit in patients with severe community acquired pneumonia and bacteremic pneumococcal pneumonia is under heavy scrutiny due to safety issues. Limited data are available regarding the efficacy of AZ in critically ill patients with severe sepsis.
OBJECTIVES. We aimed to assess the efficacy of azithromycin on short- and long-term mortality in a pilot randomized control trial (RCT) in severe septic patients.
METHODS. This open-label RCT compared azithromycin/standard of care (AZ/SOC) vs. standard of care (SOC) in patients with severe sepsis (with at least one organ failure) at two tertiary teaching hospitals. Intent to treat (ITT) analysis included patients that received at least one dose of AZ (total 500 mg/day intravenously x 5 days) or one SOC medication. Exclusion criteria were immunosuppression, allergy to macrolides, QTc prolongation >500 ms and concomitant medications that prolong QT. Clinical outcomes were short-term mortality (ICU, in-hospital and 30 days) and long-term mortality (at 180 and 365 days).
RESULTS. We randomized 51 subjects in the ITT analysis ($n = 24$ in AZ/SOC vs. $n = 27$ in SOC group). Demographic and clinical characteristics were similar among groups. Short-term mortality measured during ICU stay occurred in 11 % of the SOC vs. 12 % in the AZ/SOC group ($p = 0.9$), 15 vs. 12 % during hospitalization ($p = 0.8$), and 11 vs. 17 % at 30 days ($p = 0.3$), respectively. Long-term mortality was higher among SOC (29 %) vs. AZ/SOC (24 %) subjects ($p = 0.7$) at 180 days and 48 vs. 32 % at 365 days ($p = 0.3$), respectively.
CONCLUSIONS. In a pilot randomized open label controlled trial the use of AZ in addition to SOC was not associated with short- and long-term mortality when compared to SOC alone. Larger RCTs are needed to assess the clinical efficacy of AZ among critically ill patients.
REFERENCE(S). 1. Ray WA, et al. Azithromycin and the risk of cardiovascular death. N Engl J Med. 2012;366:1881–90. 2. FDA Drug Safety Communication: Azithromycin (Zithromax or Zmax) and the risk of potentially fata heart rhythms. Warning announcement; 2013.
GRANT ACKNOWLEDGMENT. MI Restrepo time is awarded thru a Career Development Award Grant (Award Number K23HL096054) from the National Heart, Lung, and Blood Institute.

	SDD*		P
	No N = 58	Yes N = 40	
Age, years	56.4 ± 17.4	56.8 ± 16.2	.910
Male / Female, %	79.3 / 20.7	52.5 / 47.5	.005
Apache-II	20.5 ± 6.0	18.4 ± 6.6	.103
Glasgow Coma Score	8 (6 ; 12)	8 (6 ; 11)	.813
Trauma patients, n (%)	26 (44.8)	15 (37.5)	.470
Days in ICU	24.5 (17 ; 32)	24.5 (18.5 ; 31)	.490
Deaths, n (%)	13 (22.4)	7 (17.5)	.553
Coronary patients, n (%)	2 (3.4)	0	.512
Emergency surgery, n (%)	24 (41.49	18 (45.0)	.722
Previous surgery, n (%)	11 (19.0)	14 (35.0)	.074
Previous abdominal surgery, n (%)	9 (15.5)	13 (32.5)	.048
Immunosupression, n (%)	0	0	-
Neutropenia, n (%)	0	0	-
Parenteral Nutrition, n (%)	1 (1.7)	2 (5.0)	.565
Prior 48 hours antibiotic use, n (%)	30 (51.7)	6 (15.0)	< .001
Renal replacement therapy, n (%)	5 (8.6)	4 (10.0)	.816
Intraventricular catheter, n (%)	17 (29.3)	18 (45.0)	.111
ORSA, n (%)	0	1 (2.5)	.408
ESBL, n (%)	2 (3.4)	2 (5.0)	1
Pseudomonas, n (%)	0	0	-
Gram negative ARB, n (%)	0	2 (5.0)	.164
Acinetobacter, n (%)	3 (5.2)	4 (10.0)	.439
Clostridium difficile, n (%)	0	0	-
Enterococcus vancomicyn ARB, n	0	0	-
Shock, n (%)	16 (27.6)	22 (55.0)	.006

(*) SDD: Selective digestive tract decontamination.
ORSA: Oxacilin Resistant Staphylococcus Aureus. ESBL: Extended Spectrum Betalactamase. ARB: Antibiotic resistant bacteria.
(**) The cohorts of study are consecutive.

Table 1 Univariate analysis

0211
SELECTIVE DECONTAMINATION OF THE DIGESTIVE TRACT (SDD) EFFECTS ON NOSOCOMIAL INFECTIONS IN A NEUROTRAUMATIC INTENSIVE CARE UNIT (ICU) IN A TERTIARY-CARE HOSPITAL

M. Cabrera Santana[1], V. Peña Morant[1], C. Sánchez Ramírez[1], S. Hípola Escalada[1], J.L. Romero Luján[1], N. Sangil Monroy[2], A. Bordes Benítez[3], A. Padrón Mujica[1], P. Saavedra Santana[4], S. Ruiz Santana[1]

[1]University Hospital of Gran Canaria Dr Negrín, Intensive Care Unit, Las Palmas de Gran Canaria, Spain, [2]University Hospital of Gran Canaria Dr Negrín, Pharmacy Department, Las Palmas de Gran Canaria, Spain, [3]University Hospital of Gran Canaria Dr Negrín, Microbiology Department, Las Palmas de Gran Canaria, Spain, [4]Las Palmas of Gran Canaria University, Mathematics and Informatics Department, Las Palmas de Gran Canaria, Spain

INTRODUCTION. SDD is an antimicrobial prophylaxis proposed to reduce the incidence of infections of lower airways and mortality (1).
OBJECTIVES. To prospectively evaluate the impact of 1 year of SDD application to prevent nosocomial infections in a neurotraumatic ICU.
METHODS. This study was conducted in a 10 bed-neurotrauma-ICU. All consecutive neurotraumatic patients admitted to the ICU from April 1, 2012 to March 30, 2013 expected to require tracheal intubation for longer than 48 h were given SDD (SDD study group) with a 4-day course of intravenous cefotaxime, plus enteral polimixin E, tobramycin, amphotericin. B in an oropharyngeal paste and in a digestive solution. Oropharyngeal and rectal swabs were obtained on admission and once weekly. Diagnostic samples were obtained if clinically indicated. Nosocomial infections were diagnosed by CDC criteria. We compared all patients admitted to ICU who acquired nosocomial ICU infections from January 1, 2010 to December 31, 2010 (non-SDD control group) and SDD study group. In both groups, categorical variables were summarized as frequencies and percentages and the continuous ones as means and standard deviations (SD) when the data followed the normal distribution or medians and interquartile ranges (IQR) when they did not. The percentages were compared using the test of Chi square test or Fisher exact test, means with the *t* test and medians with the Wilcoxon test for independent samples. For each one of the acquired infections with a relative number of cases (catheter-related and other secondary bacteremia, pneumonia associated to mechanical ventilation, urinary, tracheobronchitis and pneumonia no associated to mechanical ventilation) the incidences per 1,000 days of exposure in each cohort and the corresponding relative risks were obtained using the Poisson regression. Statistical significance was set at $p \leq 0.05$. The data were analyzed using PASW statistical software.
RESULTS. Results are shown in Tables 1, 2 and 3. There were not statistical significance differences between both groups in demographic data. The patients with nosocomial infections had significantly more shock events in SDD. Patients in the non-SDD group had significantly more prior to admission 48 h antibiotic treatment, versus SDD group. We also had a significant reduction in nosocomial pneumonias and nearly significant in other secondary bacteremia rates in SDD group. There was neither any infection by Clostridium difficile nor any increase of ARB infections in SDD group.
CONCLUSIONS. After 1 year applicating SDD in neurotraumatic-ICU a significant reduction in nosocomial pneumonia and a nearly significant reduction of secondary bacteremia rates, without an increase of ARB infections was shown compared to the non-SDD group.
REFERENCES. Liberati A, D'Amico R, Pifferi S, et al. Antibiotic prophylaxis to reduce respiratory tract infections and mortality in adults receiving intensive care. The Cochrane Database Syst Rev 2009:CD000022.

		SDD*		P
		No N = 58	Yes N = 40	
Nº Primary and catheter bacteremias, n (%)				.301
	0	57 (98.3)	37 (92.5)	
	1	1 (1.7)	3 (7.5)	
Nº Secundary bacteremias, n (%)				.282
	0	44 (75.9)	34 (85.0)	
	1	11 (19.0)	6 (15.0)	
	2	3 (5.2)	0	
Nº Nosocomial pneumonias, n (%)				.066
	0	27 (46.6)	28 (70.0)	
	1	27 (46.6)	11 (27.5)	
	2	4 (6.9)	1 (2.5)	
Nº Urinary infections, n (%)				.067
	0	57 (98.3)	36 (90.0)	
	1	1 (1.7)	4 (10.0)	
Nº ARB infections, n (%)				.326
	0	53 (91.4)	33 (82.5)	
	1	3 (5.2)	6 (15.0)	
	2	1 (1.7)	1 (2.5)	
	3	1 (1.7)	0	
Nº Fever syndrome				.750
	0	51 (87.9)	36 (90.0)	
	1	7 (12.1)	4 (10.0)	
Nº Catheter infections				1
	0	57 (98.3)	40 (100)	
	1	1 (1.7)	0	
Nº Not MV pneumonias				.650
	0	53 (91.4)	38 (95.0)	
	1	4 (6.9)	2 (2.0)	
	2	1 (1.7)	0	
Nº Tracheobronchitis				.284
	0	51 (87.9)	32 (80.0)	
	1	7 (12.1)	8 (20.0)	
Nº Other infections				1
	0	57 (98.3)	39 (97.5)	
	1	1 (1.7)	1 (2.5)	
Nº Phlebitis				.512
	0	56 (96.6)	40 (100)	
	1	2 (3.4)	0	
Nº Infections without source				.049
	0	58 (100)	36 (90.0)	
	1	0	3 (7.5)	
	2	0	1 (2.5)	
Nº Soft tissues infections				.408
	0	58 (100)	39 (97.5)	
	1	0	1 (2.5)	

(*) SDD: Selective digestive tract decontamination.
MV: Mechanical ventilation. ARB: Antibiotic resistant bacteria.
(**) Every infection in a patient has been considered as different episodes.

Table 2 Nosocomial infections univariate analysis

	SDD *			
	No N = 58	Yes N = 40	P	RR (95% CI)
N° pneumonias/ 1000 days of MV	13.52	5.96	0.012	0.441 (0.233 ; 0.834)
N° urinary infection/1000 days of urinary catheter	0.324	1.434	0.183	4.426 (0.495 ; 39.6)
N° primary or catheter related bacteremia/ 1000 days of CVC	0.423	1.365	0.310	3.228 (0.336 ; 31.02)
N° other secundary bacteremias/ 1000 days in ICU	5.258	2.119	0.056	0.403 (0.159 ; 1.022)
N° not MV pneumonia / 1000 days in ICU	1.856	0.706	0.237	0.381 (0.077 ; 1.885)
N° tracheobronchitis / 1000 days in ICU	2.165	2.825	0.607	1.305 (0.473 ; 3.598)

N°: number
MV: Mechanical ventilation. **CVC:** Central vein catheter.

Table 3 Nosocomial infection rates

0212
EMERGENCE OF LINEZOLID-RESISTANT COAGULASE-NEGATIVE STAPHYLOCOCCUS IN AN INTENSIVE CARE UNIT

B. Lobo Valbuena[1], B. Balandín Moreno[1], B. Orden Martinez[2], E. García Sanz[3], R. Martínez Ruiz[2], I. Sánchez Romero[2], F. Román Alonso[4], M.Á. Romera Ortega[1], M. Valdivia de la Fuente[1], N. Martínez Sanz[1]

[1]H. U. Puerta de Hierro Majadahonda, Intensive Care Unit, Madrid, Spain, [2]H. U. Puerta de Hierro Majadahonda, Clinical Microbiology, Madrid, Spain, [3]H. U. Puerta de Hierro Majadahonda, Hospital Pharmacy, Madrid, Spain, [4]Centro Nacional de Microbiología Instituto Carlos III, Madrid, Spain

INTRODUCTION. Linezolid (LNZ) is a useful therapy for infections due to multidrug resistant Gram positive bacteria. Outbreaks of LNZ-resistant coagulase-negative staphylococci (LRCNS) have been reported in ICU patients worldwide. Although LNZ resistance among CNS is extremely rare, it seems to be an emerging problem.
OBJECTIVES. To analyze the epidemiologic and clinical features of an outbreak of LRCNS in a 22-bed ICU.
METHODS. Observational study of ICU patients with infection or colonization by LRCNS in a 600-bed teaching hospital (2010–2012). Demographic data, comorbidities, APACHE II, antibiotic exposure, invasive procedures, site of infection or colonization, ICU LOS, and mortality were recorded. Susceptibility study was performed by broth microdilution and E-test. The presence of *cfr* gen was studied by PCR. LNZ ICU utilization data (2009–2012) was obtained from the Hospital Pharmacy. Defined daily dose (DDD) of LNZ was 1,200 mg.
RESULTS. We detected 42 isolates in 42 patients. The isolates were identified as *S. epidermidis* (36 cases) and *S. hominis* (6), and were recovered from blood (33 cases), urine (6), catheter (2) and peritoneal fluid (1); most of them were not associated with clinical infection. All isolates were resistant to LNZ (MIC > 4 mg/L) but were found to be susceptible to vancomycin, teicoplanin, and daptomycin. Molecular study showed *cfr*-mediated LNZ resistance in 45 % of the tested isolates. Most patients were male (81 %), the mean age was 61 years. The main diagnosis at ICU admission was respiratory failure (43 %), stroke (17 %), trauma (12 %) and shock (12 %), 33 % of them were immunodepressed. Mean APACHE II score 22.5 and mean ICU LOS 43 days. 41 had central venous and urinary catheter, and most of them received mechanical ventilation (38), parenteral nutrition (12) or renal replacement therapy (8); 20 patients required surgery or other invasive procedures. The mean ICU LOS before LRSCN isolation was 34 days, and a high proportion of patients had received antimicrobials in the previous month: LNZ in 37 (mean duration 11.8 days), carbapenems in 21, and other beta-lactam in 16. LRCNS was associated with clinical infection in only 5 patients (12 %): catheter-related bacteremia (2), urinary infection (2), and primary bacteremia (1) treated successfully with alternative antimicrobials. Overall ICU mortality was 29 %. Mean LNZ DDD/100 patient-days was 13.4 with no statistical difference from 2009 to 2012.
CONCLUSIONS. LRSCN have emerged in Spain in critically ill patients with common risk factors for nosocomial infection such as invasive procedures and antibiotic exposure. Most isolates represent colonization, being less frequent the appearance of clinical infection. All isolates remained susceptible to alternative antimicrobials such as glycopeptides and daptomycin. The appearance of LRSCN has important implications for the empirical use of LNZ in critically ill patients.

0213
CLINICAL PROFILE OF COAGULASE-NEGATIVE STAPHYLOCOCCI OUTBREAK RESISTANT LINEZOLID

M.E. Yuste[1], R. Fernandez[1], S. Narbona[1], R. Ramírez[1], M. Muñoz[1], F. Acosta[1]

[1]Granada University, Granada, Spain

INTRODUCTION. Since clinical introduction of linezolid, the emergence of resistant strains has remained relatively rare. When resistance does occur, it is seen most commonly in coagulase-negative staphylococci and enterococci. Resistance may arise during therapy, especially in deep-seated infections treated over prolonged courses. Most isolates of this type in both enterococci and staphylococci have mutations at the site of action, in the central loop of domain V of the 23S rRNA; the most common of these mutations is G2576T. The product of this gene is a methyltransferase that modifies adenosine at position 2,503 in the 23S rRNA, which is located in the drug binding site.
OBJECTIVES. Describe clinical features of an outbreak of *S. hominis* subsp. hominis methicillin resistant to linezolid resistance and reduced susceptibility to glycopeptides and study this genetic alteration.
METHODS. We studied 10 isolates from blood cultures of *S. hominis* subsp. hominis by E test for antibiotic susceptibility study (nine in ICU and one in the emergency area) of patients admitted in our hospital between 01/11/07 and 01/03/08. Was collected sex, average age, origin and place of patient isolates, presence or absence of sepsis and antibiotic treatments (AB) previous intra UCI mortality, sensitivity to AB.
RESULTS. 50 % were male with a mean age of 66 years. 40 % came from specific area in hospital and were treated entirely with empirical broad spectrum antibiotics including linezolid or vancomycin. The rest came from home, spent an average of 24 h of observation with AB start and only 10 % were not prescribed. All isolates except one were in ICU. They all attended to severe sepsis/septic shock. The cause of 40 % of the isolates with septic shock was abdominal, 50 % associated ventilator pneumonia or nosocomial pneumonia and in 1 case was with no focus. 40 % of patients had linezolid as broad spectrum, levofloxacin 40, 50 % glycopeptides 60 % carbapenem. Domain V of the 23S RNA gene was amplified and detected mutations conferring resistance to linezolid, all isolates were resistant to oxacillin, gentamicin, levofloxacin, linezolid and cotrimoxazole and susceptible to daptomycin and tigecycline and nine of the isolates were resistant to erythromycin and clindamycin showing heterogeneous resistance to glycopeptides. The mortality of patients with these isolates intra UCI was 50 %.
CONCLUSIONS. In our hospital, there are isolates of *Staphylococcus* species with proven resistance to linezolid. We think of them when we have to treat an infection caused by them.
REFERENCES. Potoski BA, Adams J, Clarke L, Shutt K, Linden PK, Baxter C, Pasculle AW, Capitano B, Peleg AY, Szabo D, Paterson DL. Epidemiological profile of linezolid-resistant coagulase-negative staphylococci. Clin Infect Dis. 2006;43(2):165–71.
GRANT ACKNOWLEDGMENT. Microbiology Unit HS. Cecilio. Granada.

0214
ICU-ACQUIRED INFECTION AND ANTIBIOTIC USE. IMPACT OF FOCUS OF INFECTION

M. Palomar[1], X. Nuvials[2], F. Alvarez Lerma[3], P. Olaechea[4], J.J. Otal[5], M.P. Arenilla[3], M. Catalan[6], R. Jimeno[7], I. Seijas[8], ENVIN-HELICS Study Group

[1]H U Arnau de Vilanova, ICU, Lleida, Spain, [2]H U Arnau de Vilanova, Lleida, Spain, [3]H Mar, Barcelona, Spain, [4]H Galdakao, Galdakao, Spain, [5]H Vall Hebron, Barcelona, Spain, [6]H Doce de Octubre, Madrid, Spain, [7]H La Fe, Valencia, Spain, [8]H Cruces, Bilbao, Spain

INTRODUCTION. The ATB prescription varies by source of infection.
OBJECTIVES. To study the antibiotic (ATB) use for ICU-acquired infection (ICU-NI), according to focus.
METHODS. Incidence, prospective, multicenter, observational study ENVIN-HELICS, period: April to July 2012. Patients admitted to the participating ICUs and ATB (number, duration—mean—and total days of ATB) and their indications were documented. The ICU-NI were classified as MV associated pneumonia (VAP), tracheobronchitis (TQB), catheter-associated urinary tract infection (UTI), unknown origin bacteremia (UB), catheter-related bacteremia (BRC), bacteremia secondary to other foci (BSOF) and others (O). Statistical analysis: Comparison between groups, Kruskal–Wallis.
RESULTS. There were a total of 19,521 patients who received 26,768 ATB, with 171,128 days of treatment (DOT). To treat ICU-NI, 5553 ATB (20.7 % of total) were prescribed during 45,909 ATB-days (26.8 % of total) with a mean DOT of 8.2 days.

Infections:	NAV	TQB	UTI	UB	CRB	BSOF	O	ALL
ATB, N	1161	1128	451	198	230	243	2142	5553
ATB (%)	20.9	20.3	8.12	3.56	4.14	4.37	38.61	100
ATB Days	10188	8793	2910	641	2101	3503	18414	45909
DOT (mean)	8.7	7.8	6.4	8.2	8.6	9.1	8.6	8.2

Table 1

To treat ICU-NI, the most used ATB N (%) and mean days of treatment were:
1-Piperacillin-Tz 737 (13.2) 7.9 days; 2-Meropenem 634 (11.4) 9.4 days; 3-Linezolid 538 (9.6) 8 days; 4-Vancomycin 338 (6) 7.8 days; 5-Ciprofloxacin 324 (5.8) 7.6 days; 6-Amicacyn 280 (59 6.7 days;7-Levofloxacin 271 (4.8) 7.1 days; 8-Amoxicillin-Clavulanate 266 (4.7) 5.8 days; 9-Fluconazole 262 (4.7) 9.1 days and 10-Imipenem-Cilastatin 178 (3.2) 8.6 days.
This distribution, with small variations, was maintained to treat both, VAP TQB, while in the case of UTI, and CRB UB usage patterns were different.
CONCLUSIONS. Despite the recent reduction of rates, respiratory infections are the main reason for ATB use to treat ICU-NI, while the lower impact corresponded to UTI and bacteremia of unknown origin. Management of VAP and TQB was similar, although treatment was slightly shorter in TQB. To reduce ATB use, we should optimize treatment of respiratory infections.
GRANT ACKNOWLEDGMENT. Pfizer.

0215
BARRIERS TO VANCOMYCIN INFUSION USE: A NATIONAL SURVEY

A.S. Ekanayaka[1], T. Whitehouse[2]

[1]University of Birmingham Medical School, Birmingham, UK, [2]Queen Elizabeth Hospital Birmingham, Anaesthesia and Critical Care, Birmingham, UK

INTRODUCTION. Use of vancomycin within the Intensive Care Unit (ICU) to treat methicillin-resistant *Staphylococcus aureus* (MRSA) pneumonia is less favoured in some

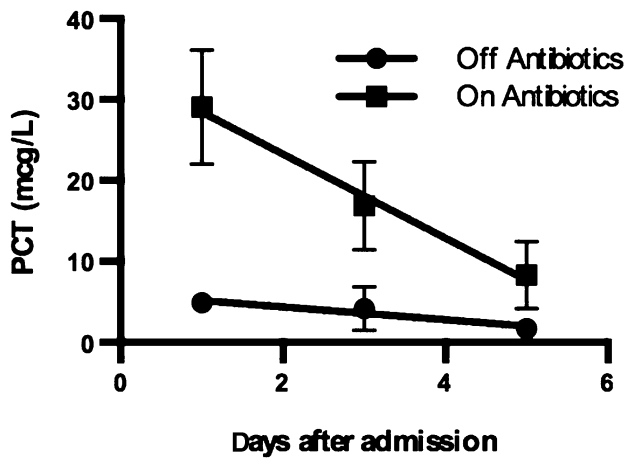
countries after the suggestion that intermittent vancomycin administration was inferior to Linezolid for bacterial cure.[1]
Vancomycin delivered by intermittent administration has traditionally been used but continuous infusion may offer several advantages in terms of convenience and improved AUC/MIC ratio (the optimisation of which improves vancomycin efficacy).[2]
METHODS. Telephone survey of ICU staff in all English acute trusts.
RESULTS. 80 of 156 ICUs responded to this survey (51 % response). Vancomycin was used as first line therapy in 68 (85 %) units. In the other 12 ICUs, linezolid and teicoplanin were the most common alternatives. The most common reasons for not using vancomycin as first line therapy were microbiology advice or local protocol (11 ICUs) with 3 ICUs that were concerned about side effects and 1 ICU stating decreased efficacy.
Where vancomycin was used, intermittent administration was used more frequently (57.4 vs. 42.6 %). The main reasons for this were a lack of protocol (36 ICUs [53 %]), microbiology advice (8 [12 %]). 6 ICUs cited the lack of evidence for continuous infusion. Only one ICU was concerned about an increased risk of renal failure.
DISCUSSION. The finding of improved clinical response rates to linezolid[1] has yet to be tested in a direct comparison with vancomycin infusion but the Infectious Disease Society of America recommends linezolid as first line treatment for MRSA pneumonia.[3] It is surprising that 85 % of English ICUs used vancomycin first line.
The majority of ICUs used intermittent administration of vancomycin. The main reason for this was a lack of protocol. Renal failure or side effects were of concern to 1.25 % of all ICUs surveyed.
CONCLUSION. Dissemination of a working vancomycin infusion protocol would improve take up of this mode of delivery.
REFERENCES. 1. Wunderink RG et al., Linezolid in methicillin-resistant *Staphylococcus aureus* nosocomial pneumonia: a randomized, controlled study. Clin Infect Dis. 2012;54(5):621–9. 2. Wysocki M et al. Continuous versus intermittent infusion of vancomycin in severe Staphylococcal infections: prospective multicenter randomized study. Antimicrob Agents Chemother. 2001;45(9):2460–7. 3. Management of patients with infections caused by methicillin-resistant *Staphylococcus aureus*: Clinical Practice Guidelines by the Infectious Diseases Society of America (IDSA). Clin Infect Dis. 2011;52:1–38.
GRANT ACKNOWLEDGMENT. This study was not funded.

0216

A MULTIDISCIPLINARY TEAM (MDT) APPROACH IS AS GOOD AS PROCALCITONIN AT DETERMINING WHETHER A PATIENT SHOULD BE ON ANTIBIOTICS IN SEPSIS

A. Race[1], F. Arif[1], A. Myers[1], K. Sheng-Kok[1], C. Pillay[1], P. Morgan[1]

[1]East Surrey Hospital, Anaesthetics/ICU, Redhill, UK
INTRODUCTION. Continuing antibiotics longer than necessary is expensive, can result in adverse events and add to the increasing problem of antibiotic resistance. Procalcitonin (PCT) is a biomarker used to differentiate SIRS from sepsis. It has a sensitivity of 88 % and a specificity of 81 % compared with CRP (75 % sensitivity, 67 %) and may be used to guide antibiotic prescribing in ICU[1–3].
OBJECTIVES. We compared our multidisciplinary team (MDT) decision-making process (a formal board-room discussion amongst intensive care physicians, microbiologists, physiotherapists, dieticians and nurses) with the gold standard procalcitonin assay at determining appropriate antibiotic use.
METHODS. 38 patients admitted with acute sepsis or septic shock were enrolled. Patient demographics, temperature, blood pressure, inotropic requirements, ventilatory support, WCC and CRP were documented on days 1, 3, and 5 of ICU admission. All subsequent antibiotic plans and any changes were documented. PCT samples were also taken on these days but investigators were not aware of the results.
RESULTS. A graph of PCT concentration (PCTc) for those patients taken off antibiotics at MDT and those requiring further treatment at day 1, 3 and 5, is found in Figure 1.0. Performing a best-fit analysis, statistically, two *separate* populations ($p = 0.02$) were found: $r^2 = 0.91$ (off antibiotics at MDT) and $r^2 = 0.99$ (further antibiotic cover required). This suggests that our MDT process is as good as a PCTc assay at deciding when antibiotics should be stopped. Interestingly, at initial presentation, those that went on to have antibiotics discontinued at MDT had a mean PCTc of 4.9 (2.5–7.3 95 % CI) and those presenting with a PCTc within two standard deviations of this value were likely to require only 48 h of antibiotics; those requiring a longer course had a mean initial PCTc of 29.1 (15.1–43.1 95 % CI) mcg/L ($p = 0.02$.).
Finally, we found a PCTc < 0.5 mcg/L at admission was 90.9 % sensitive but 29.4 % specific at predicting whether antibiotics would be stopped before day 5. This equates to an odds ratio of 0.24 (0.024–2.4 95 % CI $p = 0.23$).



Procalcitonin against days since admission

Table 1 Various cutoffs for procalcitonin

Level (mcg/L)	Condition
<0.5	Infection
0.5–2.0	Moderate risk of severe sepsis
2.0–10	Likely risk of severe sepsis
>10	Severe sepsis or septic shock

CONCLUSIONS. Our MDT process appropriately identifies those patients that should and should not receive further antibiotic therapy, *blindly* of any specific biomarker, for example PCT. We also suggest that the PCT level may be used to determine the *length* of antibiotic use.
REFERENCES. 1. http://www.procalcitonin.com. 2. Balci C, Sungurtekin H, Gürses E, Sungurtekin U, Kaptanoglu B. Usefulness of procalcitonin for diagnosis of sepsis in the intensive care unit. Crit Care. 7(1):85–90. doi:10.1186/cc1843. PMC 154110. PMID 12617745. 3. Jones AE, Fiechtl JF, Brown MD, Ballew JJ, Kline JA. Procalcitonin test in the diagnosis of bacteremia: a meta-analysis. Ann Emerg Med 50(1):34–41. doi:10.1016/j.annemergmed.2006.10.020. PMID 17161501.

0217

TRADITIONAL INFLAMMATORY MARKERS DO NOT GUIDE APPROPRIATE ANTIBIOTIC USE IN ICU

A. Race[1], F. Arif[2], A. Myers[2], K. Sheng-Kok[2], C. Pillay[2], P. Morgan[2]

[1]East Surrey Hospital, Anaesthetics, Redhill, UK, [2]East Surrey Hospital, Anaesthetics/ICU, Redhill, UK
INTRODUCTION. Continuing antibiotics longer than necessary is expensive, can result in adverse events and add to the increasing problem of antibiotic resistance. We recently showed that our multidisciplinary team (MDT) process appropriately identifies those patients that should and should not receive further antibiotic therapy, blindly against the biomarker procalcitonin (PCT)[1]. PCT is being used to differentiate SIRs from sepsis and severe sepsis[2–3]. It has a sensitivity of 88 % and a specificity of 81 %, unlike CRP which has a sensitivity of 75 % and specificity 67 %. PCT and is used to guide antibiotic prescribing in ICU[2–3].
OBJECTIVES. We compared our MDT decision-making process (a formal board-room discussion amongst intensive care physicians, microbiologists, physiotherapists, dieticians and nurses) with traditional inflammatory markers to determining appropriate antibiotic use.
METHODS. 38 patients admitted with acute sepsis or septic shock were enrolled. Patient demographics, temperature, blood pressure, inotropic requirements, ventilatory support, WCC and CRP were documented on days 1, 3, and 5 of ICU admission. All subsequent antibiotic plans and any changes were documented. PCT samples were also taken on these days but investigators were not aware of the results.
RESULTS. Serum CRPs (mg/L) in those taken off antibiotics at MDT, and those requiring further antibiotic treatment are compared in Figure 1.0. They do not form separate populations at a $p = 0.74$ level and the pooled slopes are poorly correlated at $r^2 = 0.11$ and 0.01, respectively. This confirms that CRP is a poor isolated biomarker in sepsis.

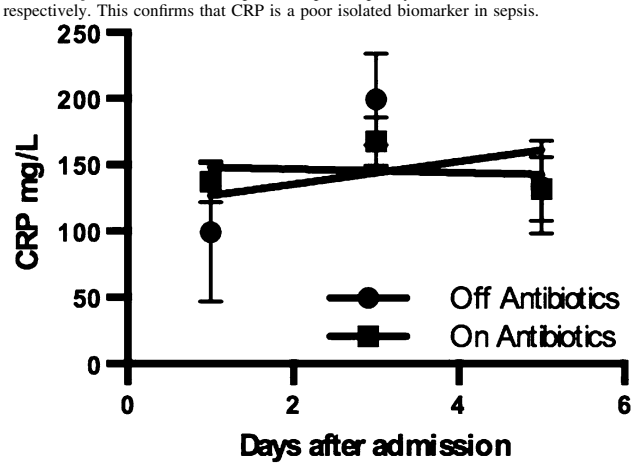


Figure 1.0

The WCCs ($\times 10^2$ cells/microL) in those taken off antibiotics, and those requiring further antibiotic treatment are compared in Figure 2.0. Again, they do not form separate populations at a $p = 0.65$ level and the pooled slopes are poorly correlated at $r^2 = 0.52$ and 0.01, respectively.

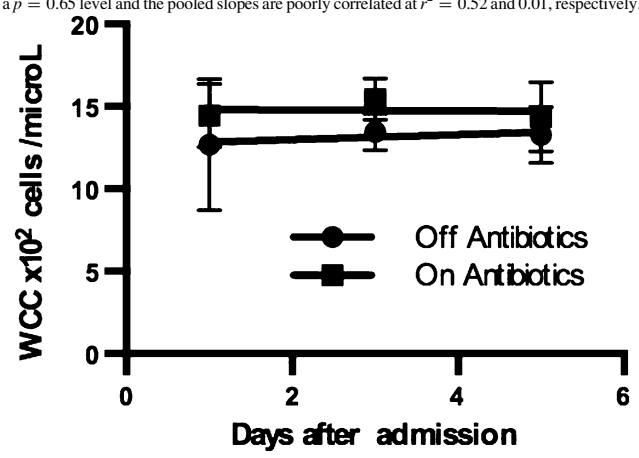


Figure 2.0

Finally, temperatures (°C) in those taken off antibiotics, and those requiring further antibiotic treatment are compared in Figure 3.0. Again, they do not form separate populations at a $p = 0.76$ level and the pooled slopes are poorly correlated at $r^2 = 0.98$ and 0.36, respectively.

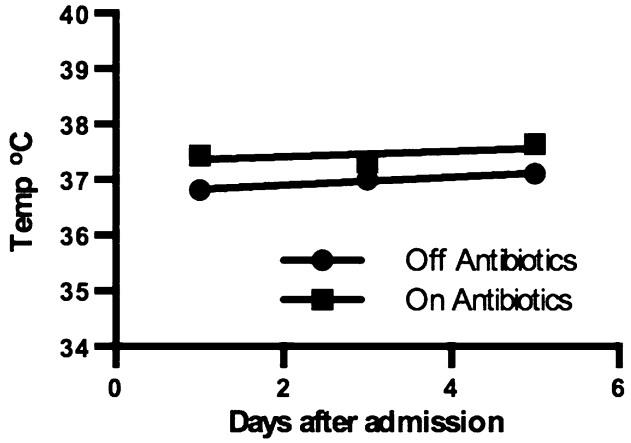


Figure 3.0

CONCLUSIONS. The traditional inflammatory markers CRP, WCC and temperature are poor individual indicators of appropriate antibiotic use. However, as we have shown recently, an MDT approach and/or procalcitonin is a good way of determining when to discontinue antibiotics[1].

REFERENCES. 1. A MDT approach is as good as procalcitonin at determining whether a patient should be on antibiotics in sepsis. Race et al. (to be published). 2. http://www.procalcitonin.com. 3. Balci C, Sungurtekin H, Gürses E, Sungurtekin U, Kaptanoglu B. Usefulness of procalcitonin for diagnosis of sepsis in the intensive care unit. Crit Care. 7(1):85–90. doi:10.1186/cc1843. PMC 154110. PMID 12617745.

0218

MOLECULAR TYPING OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA) ISOLATES FROM PATIENTS WITH SEVERE SEPSIS IN ANESTHESIA INTENSIVE CARE UNIT

B. Yelken[1], N. Erkasap[2], B. Bayram[3], T. Us[4], S. Ekemen[1], M. Özkurt[2], F.G. Aslan[4]

[1]Eskisehir Osmangazi University, Medical Faculty, Anestesiology and Critical Care Medicine Department, Eskisehir, Turkey, [2]Eskisehir Osmangazi University, Medical Faculty, Physiology Department, Eskisehir, Turkey, [3]Mugla Sıtkı Kocman University, Vocational School of Health Services, Medical Laboratory Skills, Mugla, Turkey, [4]Eskisehir Osmangazi University, Medical Faculty, Microbiology Department, Eskisehir, Turkey

INTRODUCTION. Sepsis is caused by the immune system's response to a serious infection, most commonly bacteria in the blood, urinary tract, lungs, skin, or other tissues. One of the bacteria causes sepsis is methicillin-resistant *Staphylococcus aureus* (MRSA) which is a problem in intensive care units worldwide. Detection of MRSA carriers on admission to the intensive care unit is an important component of strategies for controlling the spread of MRSA and preventing sepsis.

OBJECTIVES. The aim of this study was to make a molecular typing of MRSA on the basis of coagulase gene polymorphism and RAPD-fingerprinting from severe sepsis patients in anesthesia intensive care unit.

METHODS. Blood samples were collected from patients with severe sepsis which has occured in anesthesia intensive care unit treatment over a 3 months period. In 7 of these blood samples MRSA was identified. The isolates were characterised for restriction fragment length polymorphism (RFLP) of the coagulase gene. A variable region of the coagulase gene was amplified using the polymerase chain reaction (PCR) followed by *Alu*I restriction enzyme digestion. RAPD-fingerprinting was performed by using DAF4 and M13 primers.

RESULTS. A total of 2 different RFLP strains were observed. The similarity level was at the 0 % between these patterns. Unlikely 4 strains were observed by RAPD-fingerprinting method. The similarity level was at the 80 % between the most distant and 35 % between the nearest strains.

CONCLUSIONS. In this study it seems there is a spread of strains in the studied intensive care unit. To identify origins of MRSA, samples from intensive care unit environment, from the hands of staff may be isolated for molecular typing. Thus after the disinfection of the origins of MRSA, spread of MRSA and infections like sepsis in intensive care unit due to MRSA could be prevented.

REFERENCES. 1. Kotsaki A, Giamarellos-Bourboulis EJ. Molecular diagnosis of sepsis. Expert Opin Med Diagn. 2012;6:209–19. 2. Haddadin AS, Fappiano SA, Lipsett PA. Methicillin resistant *Staphylococcus aureus* (MRSA) in the intensive care unit. Postgrad Med J. 78:385–392 (2002).

Metabolic issues in the ICU: 0219–0232

0219

SERUM THIAMIN CONCENTRATION IS NEGATIVELY CORRELATED WITH LACTATE LEVELS IN SURVIVORS OF SEPTIC SHOCK

A.L. Gut[1], N.A. Costa[1], M.S. Dorna[1], L.M. De Stefano[1], P.S. Azevedo[1], L.A.M. Zornoff[1], S.A.R. Paiva[1], M.F. Minicucci[1]

[1]Botucatu Medical School, UNESP, Department of Internal Medicine, Botucatu, Brazil

INTRODUCTION. Thiamine deficiency can be present in 20 % of patients in ICU. This deficiency is considered to be an uncommon source of lactic acidosis in septic patients. An elevated serum lactate level is associated with morbidity and mortality [1]. Increased levels of thiamine, increases the activity of glutathione peroxidase (GPx), a major component of cellular antioxidant system [2].

OBJECTIVES. To determine the influence of serum thiamine concentrations on lactate levels, glutathione peroxidase (GPx) activity, length of hospital stay, length of ICU stay and ICU mortality in patients with septic shock.

METHODS. This prospective study included all patients with septic shock on admission or during ICU stay, over the age of 18, admitted to one of the 3 ICUs of the Botucatu Medical School, from January to August 2012. Demographic information, clinical evaluation and blood samples were taken within the first 72 h of the patient's admission or within 72 h after septic shock diagnosis for laboratory analysis, serum thiamine and GPx activity determination. The level of significance was set at 5 %.

RESULTS. : One hundred and eight consecutive patients were evaluated. The mean age was 57.5 ± 16.0 years, 63 % were male and 54.6 % died in ICU. The frequency of thiamine deficiency was 71.3 %. Neither the serum thiamine concentration nor the erythrocyte GPx activity was associated with mortality in septic shock patients. Thiamine levels were also not associated with GPx activity ($r = 0.141$, $p = 0.165$). In addition, thiamine levels were not associated with serum lactate in the 108 patients with septic shock ($r = -0.074$, $p = 0.444$). However, vitamin B1 levels were negatively associated with lactate in patients who survived ($r = -0.311$, $p = 0.029$). In the regression models analysis, vitamin B1 levels were not associated with ICU mortality or with the length of the ICU or hospital stay.

CONCLUSIONS. Thiamine deficiency is common in septic shock patients. Furthermore, thiamine was negatively associated with lactate levels in survivors of septic shock.

REFERENCES. 1. Wacharasint P, Nakada TA, Boyd JH, et al. Normal-range blood lactate concentration in septic shock is prognostic and predictive. Shock. 2012;38:4–10. 2. Gioda CR, de Oliveira Barreto T, Prímola-Gomes TN, et al. Cardiac oxidative stress is involved in heart failure induced by thiamine deprivation in rats. Am J Physiol Heart Circ Physiol. 2010;298:H2039–45.

SUPPORT. CAPES.

0220

POSITIVE MUSCLE-TO-SERUM LACTATE GRADIENT REVEALS THAT SKELETAL MUSCLE IS A LEADING SOURCE OF LACTATE DURING SEPTIC SHOCK

M. Abdelhakim[1], D. Mayssa[1], S. Walid[1], H. Zied[1], L. Iheb[1], F. Mustapha[1]

[1]Military Hospital of Tunis, Anesthesia & Intensive Care, Tunis, Tunisia

INTRODUCTION. The origin of the sepsis-induced hyperlactatemia is still imperfectly understood and controversal [1, 2].

OBJECTIVES. The aim of our study was to assess muscular lactate by microdialysis during septic shock and its association with blood lactate.

METHODS. We have conducted a preliminary prospective study. We included septic shock patients hemodynamically optimized according to international recommendations. All patients met the ACCP/SCCM consensus criteria for sepsis. A Microdialysis catheter was inserted in the femoral quadriceps. Interstitial fluid samples were collected every 6 h for 5 days. The determination of muscular lactate was performed by the CMA 600 analyzer (CMA/Microdialysis AB, Sweden). We also performed a dosage of concomitant blood lactate. The daily mean values of MD measurements and blood lactate were calculated for each patient. The study population was divided into two groups according to hospital mortality.

RESULTS. We have included twelve patients with septic shock. Mortality rate was 50 %. Demographics were comparable between groups except for age [66 ± 9 vs. 41 ± 12; dead patients vs. survivors; respectively; $p = 0.002$]. Pneumonia was the major cause of septic shock (10 patients). We analysed 167 blood samples and 162 muscular lactate. There was a gradient between muscle and arterial levels of lactate. Muscular lactate concentrations were consistently higher than the arterial levels (P□0.05) during the first 4 days of the study.

CONCLUSIONS. Our data suggest that Muscle is likely to be a major contributor to the increase in lactate production during septic shock.

REFERENCES. 1. Michaeli B, Martinez A, Revelly JP, Cayeux MC, Chiolero RL, Tappy L, Berger MM. Effects of endotoxin on lactate metabolism in humans. Crit Care. 2012;16:R139. 2. Levy B, Gibot S, Franck P, Cravoisy A, Bollaert PE. Relation between muscle Na_K_ATPase activity and raised lactate concentrations in septic shock: a prospective study. Lancet. 2005;365:871–875.

0221

METABONOMIC PROFILE ON PATIENTS WHO DIED WITH SEVERE SEPSIS AND SEPTIC SHOCK AND ITS EVOLUTION DURING ADMISSION IN THE INTENSIVE CARE UNIT

M. García Simón[1], J.M. Morales Tatay[2], D. Monleón Salvado[3], V. Modesto i Alapont[4], A. Jordá Miñana[1], L. Palacios Gamir[1], J. Blanquer Olivas[1]

[1]Hospital Clínico y Universitario, Critical Care Medicine, Valencia, Spain, [2]Central Investigatión Unit Medicine, University, Valencia, Spain, [3]Investigation Fundation on Clinic Hospital, Valencia, Spain, [4]Hospital Universitario La Fe, Valencia, Spain

INTRODUCTION. Sepsis evolution is a dynamic process that includes many metabolic changes. At the present time, one of the best tools to measure metabolite profiles in biological samples is High-resolution H^1NMR spectroscopy in conjunction with statistical pattern recognition. This scientific approach is called "Metabonomics".

OBJECTIVES. Obtaining a molecular NMR metabonomic profile of urine from intensive care unit (ICU) patients with severe sepsis (SE) and septic shock (SS) with a potential predictive value and to observe the evolution of this profile during admission.

METHODS. The study was conducted on patients admitted to the ICU of the Clinic Hospital of Valencia (Spain). NMR was used to analyze the urine of 67 patients (34 with SE and 33 with SS) on admission and to observe the evolution of the metabolic profile obtained we got urine after 48 h, at 72 h and at discharge or day of death. NMR spectra were obtained for each sample on a Bruker AVANCE 600 of 14.1 Tesla. These spectra were analyzed using multivariate analysis (PLS-DA) and peak integration. The relevant spectral regions were quantified in arbitrary units (relative spectral area) and averages standard deviations and statistical significance by Student's t test, were calculated.

RESULTS. NMR spectra of urine show signals of 50 metabolites. The multivariate analysis PLS-DA revealed metabolic differences between patients who died (PD) and surviving (PS) on the day of admission. These differences include, among others, the relative levels of ethanol (PD 14 ± 2 PS 9.5 ± 0.9, p-value 0.036), phenylalanine (PD 5.7 ± 0.7, PS 12 ± 1 p-value 0.007), arginine (PD 6.2 ± 0.8, PS 10.3 ± 0.9, p value 0.016), and hippurate (PD 3 ± 0.7, PS 0.67 ± 0.07 p value 8e−5), glucose (PD 1.6 ± 0.3, PS 0.53 ± 0.06 p value

8e−5), methionine + glutamine (PD 18.5 ± 0.9, PS 32 ± 3 p value 0.029), unknown (PD 11 ± 2, PS 7.2 ± 0.9 p value 0.05). The variation of this profile is different depending on the outcome of patients (Figure 1: Time changes of metabolites in exitus and control patients. Means and standard deviations of metabolites with the highest statistical significance in control (dashed lines) and in exitus patients (solid lines). Sample collected: (A) within the first 24 h after admission, (B) 48 h later, (C) 72 h later, and finally (D) the day when patient was discharged from ICU or death was expected within the next 24 h).

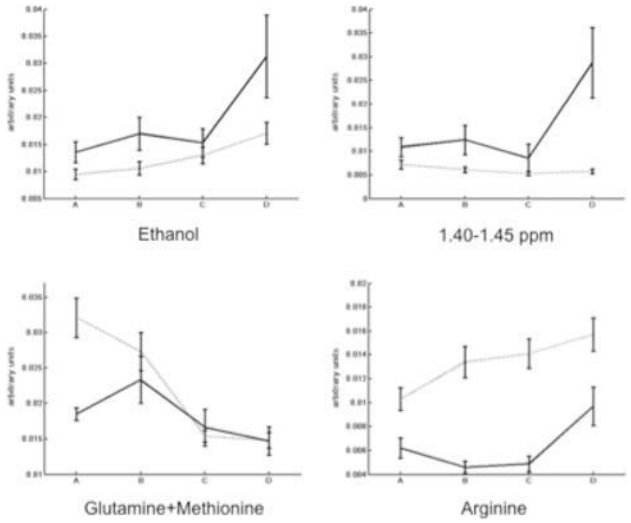
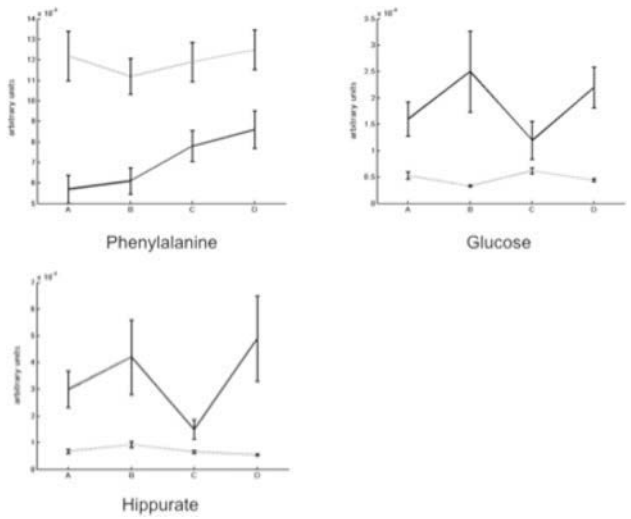


Figure 1 Time changes of metabolites in exitus an



Continuation of the table 1

CONCLUSIONS. The metabolic profile of urine from ICU patients with severe sepsis and septic shock is different in patients who die and those who survive as well as the evolution of this profile.

REFERENCES. 1. Zhong-ying L, Ping-bo X, et al. A metabonomic approach to early prognostic evaluation of experimental sepsis by 1H NMR and pattern recognition. NMR Biomed. 2009;22(6):601–8. 2. Izquierdo-García JL, Nin N, Ruı′z-Cabello J, et al. A metabolomic approach for diagnosis of experimental sepsis. Intensive Care Med. 2011;37:2023–32.

0222

ASSESSMENT OF THE SKELETAL MUSCLE METABOLISM IN PATIENTS WITH SEPTIC SHOCK BY MEANS OF MUSCULAR MICRODIALYSIS

M. Abdelhakim[1], L. Mohamed Anis[1], H. Zied[1], N. Mourad[1], F. Mustapha[1]

[1]Military Hospital of Tunis, Anesthesia & Intensive Care, Tunis, Tunisia

INTRODUCTION. In vivo microdialysis (MD) is a bedside advanced technique for immediate analysis of markers of cell injury and metabolites in the interstitial fluid.

OBJECTIVES. The aim of our study was to assess the muscular energetic metabolism by microdialysis and its association with mortality in septic shock patients.

METHODS. We have conducted a preliminary prospective study. We included septic shock patients hemodynamically optimized according to international recommendations. All patients met the ACCP/SCCM consensus criteria. A Microdialysis catheter was inserted in the femoral quadriceps. Interstitial fluid samples were collected every 6 h for 5 days. The determination of muscular lactate, pyruvate, glycerol and glucose was performed by the CMA 600 analyzer (CMA/Microdialysis AB, Sweden). The lactate/pyruvate (L/P) ratio was automatically calculated. We also performed a dosage of concomitant blood lactate and glucose. The daily mean values of MD and blood measurements were calculated for each patient. The study population was divided into two groups according to hospital mortality. Statistic analysis: Mann–Whitney test & Chi square: Comparisons between groups. Quantitative variables were expressed as mean ± standard deviation or median (Interquartile range) as appropriate.

RESULTS. We have included twelve patients with septic shock. Mortality rate was 50 %. Demographics were comparable between groups except for age [66 ± 9 vs. 41 ± 12; dead patients vs. survivors; respectively; p = 0.002]. Pneumonia was the major cause of septic shock (10 patients). We analysed 167 blood samples and respectively 162, 153,165 and 166 muscular lactate, pyruvate, glycerol and glucose samples. Muscular lactate is higher than blood lactate during all the study period. Tissue glucose was significantly higher among dead patients compared with survivors at the second day. The lactate/pyruvate ratio is most high at the first day of the study. Glycerol kinetics is similar in the two groups. We also find, comparing all the data, blood lactate and blood glucose were significantly higher in dead patients.

CONCLUSIONS. The muscular glucose and lactate assessed by microdialysis tool are associated with mortality. These two tissue metabolites may reflect the metabolic alterations and microcirculatory dysfunction induced by septic shock. MD seems to be a safe and promising tool in monitoring metabolic alterations during septic shock and in predicting mortality in critically ill patients.

0223

THE RELATIONSHIP BETWEEN OBESITY, NUTRITIONAL STATUS AND MORTALITY IN THE CRITICALLY ILL

M.K. Robinson[1], K.M. Mogensen[2], J.D. Casey[3], C.K. McKane[4], T. Moromizato[5], J.D. Rawn[1], K.B. Christopher[5]

[1]Brigham and Women's Hospital, Department of Surgery, Boston, USA, [2]Brigham and Women's Hospital, Department of Nutrition, Boston, USA, [3]Brigham and Women's Hospital, Department of Medicine, Boston, USA, [4]Brigham and Women's Hospital, Department of Nursing, Boston, USA, [5]Brigham and Women's Hospital, Renal Division, Boston, USA

INTRODUCTION. There is uncertainty in the literature regarding a potential association between obesity and outcomes in critical illness.

OBJECTIVES. We hypothesized that in the critically ill the association between obesity and mortality is dependent on the presence of malnutrition.

METHODS. We performed a single center observational study between 2004–2011 of patients treated in medical and surgical ICUs in Boston. We studied 6,518 critically ill patients, age ≥18 years, who received a standardized evaluation by a registered dietitian from 10 days prior to critical care initiation to 2 days after. The exposure of interest was Body Mass Index (BMI) determined at the time of dietitian consultation from the estimated dry weight or admission weight. BMI was categorized a priori as <18.5 (underweight), 18.5–24.9 (normal/referent), 25–29.9 (overweight), ≥30 (obese). Malnutrition diagnoses were categorized into non-specific malnutrition, protein-calorie malnutrition or no malnutrition. The primary outcome was all cause 90-day mortality determined by the Social Security Death Master File. Associations between BMI groups and mortality were estimated by bivariable and multivariable logistic regression models.

RESULTS. In the cohort, 31 % were overweight and 28 % were obese. Nonspecific malnutrition was present in 56 %, and specific malnutrition was present in 12 %. The 90-day mortality rate was 26.6 %. Patients with obesity have a decreased risk of 90-day mortality:
underweight 90-day mortality OR = 1.14 (95 % CI 0.87–1.49; p = 0.34);
overweight 90-day mortality OR = 0.94 (95 % CI 0.82–1.08; p = 0.36);
obese 90-day mortality OR = 0.77 (95 % CI 0.66–0.89; p < 0.001),
all relative to patients with normal BMI, adjusted for age, gender, race, medical vs. surgical patient type, Deyo–Charlson index, vasopressor use and sepsis. There is confounding of the obesity–mortality association on the basis of malnutrition.
Additional adjustment of the obesity–mortality association for the presence of malnutrition attenuates the obesity–mortality association:
underweight 90-day mortality OR = 0.78 (95 % CI 0.58–1.04; p = 0.09);
overweight 90-day mortality OR = 1.04 (95 % CI 0.90–1.20; p = 0.58);
obese 90-day mortality OR = 0.90 (95 % CI 0.77–1.05, p = 0.17);
all relative to patients with normal BMI.
Further, in a subset of obese patients (n = 1,822), those with malnutrition have increased mortality: OR 90-day mortality 1.86 (95 % CI 1.44–2.39; p < .0001); relative to those without malnutrition, fully adjusted.

CONCLUSIONS. In a large population of critically ill adults, an association between improved mortality and obesity is confounded by malnutrition status. Obesity does not appear to be associated with improved outcome once adjustment is made for malnutrition status. Finally, obese patients with malnutrition have worse outcomes than obese patients without malnutrition.

0224

METABOLIC INFLEXIBILITY OF SKELETAL MUSCLE IN ICU PATIENTS

N. Rehfeldt[1], T. Wollersheim[1], A. Assmann[2], M. Krebs[1], K. Mai[2], M. Boschmann[3], S. Spuler[3], C.D. Spies[1], J. Spranger[2], S. Weber-Carstens[1]

[1]Charité-Universitätsmedizin Berlin, Department of Anesthesiology and Intensive Care Medicine Campus Charité Mitte and Campus Virchow-Klinikum, Berlin, Germany, [2]Charité-Universitätsmedizin Berlin, Department of Endocrinology, Berlin, Germany, [3]Charité-Universitätsmedizin Berlin, Experimental and Clinical Research Center, a Joint Cooperation between the Charité-Universitätsmedizin Berlin and the Max Delbrück Center for Molecular Medicine, Berlin, Germany

INTRODUCTION. Significant decrease of insulin sensitivity was observed in intensive care unit (ICU) patients 1 week after ICU admission. Simultaneously skeletal muscle of ICU patients showed impaired metabolic responsiveness to stimulation with insulin and glucose.[1] Mechanisms and degree of recovery during ICU stay are unknown.

OBJECTIVES. To investigate time course of systemic insulin sensitivity and local glucose metabolism in skeletal muscle of critically ill patients.

METHODS. 30 patients with sequential organ failure assessment (SOFA) scores ≥8 on 3 of 5 consecutive days after ICU admission were included into this prospective, observational study. 4 healthy volunteers served as control subjects. Hyperinsulinemic euglycemic clamp (HEC) and simultaneous microdialysis in vastus lateralis muscle were assessed on median day 7 and day 17 after admission in ICU patients (125 mU/m^2/min insulin) and once in healthy controls (40 mU/m^2/min insulin). Insulin sensitivity index (ISI) was calculated as glucose infusion rate per serum insulin level during steady state of HEC. Insulin effects on muscle metabolism are expressed as relative change of microdialysis metabolite concentrations during maximal insulin stimulation compared to values before stimulation with insulin. Nonparametric tests were used for statistical analyses. Results are expressed as median and (25th/75th percentiles). Ethic vote (Charité EA2/061/06).

RESULTS. During 2nd HEC on day 17 of ICU stay ISI of ICU patients recovered significantly compared to ISI of 1st HEC on day 7, but remained way below the level of healthy controls. In healthy volunteers muscle interstitial lactate, pyruvate and glycerol concentrations as well as lactate/pyruvate-ratio changed in course of HEC whereas in ICU patients no such alterations were observed during early or late HEC. Median SOFA-score between 1st and 2nd HEC was significantly lower than between ICU admission and 1st HEC [8.8 (6.0/10.0) vs. 10.8 (9.5/11.5) p = .002].

	healthy controls	ICU patients 1st HEC (day 7)	ICU patients 2nd HEC (day 17)	p_a	p_b	p_c
ISI (mg/kg/min)/(mU/l)	.1033 (.0870/.1111)	.0198 (.0163/.0246)	.0285 (.0218/.0572)	<.001	.004	.003
lactate muscle relative change	1.26 (1.14/1.41)	1.06 (.96/.25)	1.07 (.83/1.31)	.034	n.s.	n.s.
pyruvate muscle relative change	2.84 (2.06/3.15)	1.11 (.92/1.21)	1.05 (.80/1.19)	<.001	.002	n.s.
lactate/pyruvate-ratio muscle relative change	.48 (.46/.58)	1.09 (.88/1.21)	.99 (.83/1.30)	<.001	.001	n.s.
glycerol muscle relative change	.26 (.13/.42)	.88 (.77/.95)	.90 (.60/.96)	<.001	.005	n.s.

n.s.= not significant, p_a = ICU patients 1st HEC vs. healthy controls, p_b = ICU patients 2nd HEC vs. healthy controls, p_c = ICU patients 1st HEC vs. ICU patients 2nd HEC

Table 1

CONCLUSIONS. Skeletal muscle of ICU patients revealed the same impaired metabolic flexibility in response to insulin on day 17 as on day 7[1] after ICU admission. Despite slight recovery of systemic insulin sensitivity and severity of critical illness during ICU stay, no improvement of insulin stimulated skeletal muscle metabolism was observed. Our data indicate that amelioration of systemic insulin sensitivity in course of critical illness depend upon other mechanisms than enhanced metabolic responsiveness of skeletal muscle to insulin.

REFERENCES. 1. Weber-Carstens, S. et al. Critical illness myopathy and GLUT4 significance of insulin and muscle contraction. Am J Respir Crit Care Med. 2013;187:387–396.

GRANT ACKNOWLEDGMENT. Funded by DFG, KFO 192, WE 4386/1-2.

0225

ELECTRICAL MUSCLE STIMULATION REDUCES PROTEIN DEGRADATION IN SKELETAL MUSCLE DURING CRITICAL ILLNESS

T. Wollersheim[1], M. Krebs[1], K. Haas[1], J. Woehlecke[2], J. Hamati[2], D. Lodka[2], C. Olbricht[1], C. Langhans[2], C. Kleber[3], S. Labeit[4], J. Spranger[5], J. Fielitz[2], S. Weber-Carstens[1]

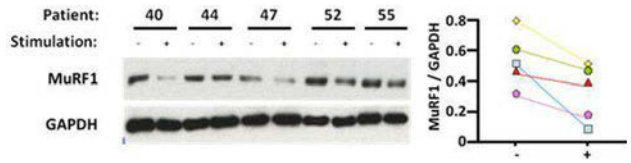
[1]Charité-Universitätsmedizin Berlin, Anesthesiology and Operative Intensive Care Medicine, Berlin, Germany, [2]Experimental and Clinical Research Center (ECRC), Berlin, Germany, [3]Charité-Universitätsmedizin Berlin, Center for Musculoskeletal Surgery, Berlin, Germany, [4]Universitätsmedizin Mannheim, Mannheim, Germany, [5]Charité-Universitätsmedizin Berlin, Endocrinology, Diabetes and Nutrition, Berlin, Germany

INTRODUCTION. Skeletal muscle protein degradation is a common and significant complication in critically ill patients affecting the disease course. The ubiquitin proteasome system significantly abolishes myosin by the muscle specific E3-ligase MuRF-1.

OBJECTIVES. We investigated the effects of electrical muscle stimulation (EMS) to protein degradation and association to maintenance of muscle fiber in early critical illness.

METHODS. We included 5 mechanically ventilated, critically ill patients (SOFA score ≥8 at 3 within 5 days after ICU admission) to an intra-individual controlled intervention trial. Starting from day one at ICU admission we performed daily unilateral EMS to one randomized lower limb for 12 days, the unstimulated leg serving as control. Bilateral surgical muscle biopsies (*M. vastus lateralis*) were obtained at day 12 after ICU admission. We quantified MuRF-1 gene expression and protein content. Muscle fiber diameter was measured for type-I and type-II fibers by histological analyses. Non-parametric tests were performed. Data shown as mean ± SD. Ethic vote (Charité EA2/061/06).

RESULTS. Muscle fiber diameter for type-II but not for type-I were significantly greater at the stimulated leg than in the intra-individual control (already published[1]). Although gene expression for MuRF-1 was not significantly different, MuRF-1 protein content was significantly lower on the stimulated (0.34 ± 0.19) compared to the unstimulated (0.55 ± 0.17) muscle (p = .043).



Western blot MuRF1

CONCLUSIONS. 12 days of daily EMS in critically ill patients decreases the protein content of the muscle specific E3-ligase MuRF-1 and is associated with maintenance of type-II muscle fibers.

REFERENCES. 1. Weber-Carstens, S. et al. Critical illness myopathy and GLUT4 significance of insulin and muscle contraction. Am. J. Respir. Crit. Care Med. 2013;187:387–396.

GRANT ACKNOWLEDGMENT. Funded by DFG, KFO 192, WE 4386/1-2.

0226

NUTRITIONAL ASSESSMENT AND MORTALITY IN SEVERE SEPSIS AND SEPTIC SHOCK

M.-V. de la Torre-Prados[1,2], A. Garcia-de la Torre[2,3], N. Zamboschi[1,2], C. Trujillano-Fernandez[1,2], J. Perez-Vacas[1,2], A. Puerto-Morlan[1,2], E. Camara-Sola[1,2], A. Vallejo-Baez[1,2], A. Garcia-Alcantara[1,2]

[1]Hospital Universitario Virgen de la Victoria, Intensive Care Medicine, Malaga, Spain, [2]IBIMA Institute, Malaga, Spain, [3]Hospital Universitario Puerto Real, Cadiz, Spain

INTRODUCTION. Malnutrition is widespread among patients with severe sepsis and septic shock; and it is associated to increased mortality, hospital stay and re-admission rate.

OBJECTIVES. To analyze the prevalence of malnutrition in severe sepsis and septic shock admitted in Intensive Care Unit (ICU) and evaluate the relationship between the different grades of malnutrition and mortality.

METHODS. From October 2008 until May 2010, a prospective cohort study of 150 patients >17 years without limitation of therapeutic effort, was developed. The nutritional parameters were measured in the first 24 h after the onset of severe sepsis or septic shock. For the nutritional status assessment we followed Spanish Society of Parenteral and Enteral Nutrition (SENPE) recommendations that consider mild malnutrition: albumin (ALB) = 3–3,5 g/L, prealbumin (PREALB) = 12–15 mg/dL, total linfocites (TL) = 1,200–1,600/mm^3 and Cholesterol (CHOL) = 140–180 mg/dL. Moderate malnutrition: ALB = 2.5–2.9 g/L, PREALB = 7–11 mg/dL, TL = 800–1,200/mm^3 and CHOL = 100–139 mg/dL and severe malnutrition: ALB < 2.5 g/L, PREALB < 7 mg/dL, TL < 800/mm^3 and CHOL < 100 mg/dL. Descriptive and comparative statistical analysis was performed using SPSS version 15.0 (SPSS Inc., Chicago, IL, USA).

RESULTS. 150 consecutive patients with severe sepsis (16 %) or septic shock (84 %) were analyzed. The median age was 64 years old; 60 % were men, with APACHE II of 25.48 ± 6.72 and SOFA of 9.7 ± 3.19. The average UCI stay was 10 ± 5.7 days and 28-days mortality 22.7 % (n = 34). The profile of death patients were men (64.7 %, n = 22), with significantly higher average age (63 vs. 57 years; p = 0.049), as well as clinical severity scores, APACHE II (29.8 vs. 24.1; p < 0.001) and SOFA (12.1 vs. 8.9; p < 0.001) and major dysfunction organs (4.6 vs. 3.6; p < 0.001). About 85 % of ours patients showed malnutrition, descriptive statistics of the studied variables are showed in Table 1. The Table 2 describes the relationship between nutritional parameters and mortality. All biomarkers studied had lower values in the non-survivors group, these differences were significant in CHOL (100 mg/dl vs. 144 mg/dL; p = 0.028).

Nutritional status assessment

	Normal values n (%)	Mild malnutrition n (%)	Moderate malnutrition n (%)	Severe malnutrition n (%)
Linfocites/mm3	17 (11.3)	30 (19.6)	38 (25.5)	65 (43.6)
ALB (g/dL)	13 (8.6)	27 (18)	39 (26)	70 (46.4)
PREALB (mg/dL)	16 (10.7)	18 (11.4)	48 (32.1)	68 (45.7)
CHOL (mg/dL)	15 (10)	25 (16.7)	54 (36)	56 (37.3)

Nutritional status and mortality

	Survivors (n = 116) median [IQR]	Non-survivors (n = 34) median [IQR]	p
Linfocites/mm3	850 [670–1,300]	810 [500–1,180]	0.697
ALB (g/dL)	2 [1.8–2.78]	1.76 [1.5–2.31]	0.195
PREALB (mg/dL)	7.48 [5–11.5]	7.27 [4.5–11.1]	0.124
CHOL (mg/dL)	114 [87–149.7]	100 [65.5–124.5]	0.028

CONCLUSIONS. The nutritional parameters had lower values in the non-survivors group, being compatible with more serious malnutrition. An adequate intake of nutrients in severe sepsis and septic shock could prevent the development of secondary complications such as organ failure and mortality.

REFERENCES. 1. Heyland DK, Dhaliwal R, Jiang X, Day AG. Identifying critically ill patients who benefit the most from nutrition therapy: the development and initial validation of a novel risk assessment tool. Crit Care. 2011;15:R268. doi:10.1186/cc10546.

0227

THE ASSOCIATION OF HOSPITAL ADMISSION SERUM ALBUMIN AND POST-HOSPITAL DISCHARGE MORTALITY IN ICU SURVIVORS: A REGISTRY BASED COHORT STUDY

J.D. Casey[1], T. Moromizato[2], F.K. Gibbons[3], K.B. Christopher[2]

[1]Brigham and Women's Hospital, Department of Medicine, Boston, USA, [2]Brigham and Women's Hospital, Renal Division, Boston, USA, [3]Massachusetts General Hospital, Pulmonary and Critical Care Medicine, Boston, USA

INTRODUCTION. Hypoalbuminemia has been associated with worse outcomes, including mortality, in critically ill patients, however whether baseline albumin at critical care initiation has prognostic implications in ICU survivors has not been studied.

OBJECTIVES. We hypothesized that low albumin at hospital admission would be associated with increased mortality following hospital discharge in critically ill patients who survive hospitalization.

METHODS. We performed a two center observational study of patients treated in medical and surgical ICUs in Boston. We studied 14,162 patients, age 18 years or older, who received critical care within 48 h of hospital admission between 1997 and 2007 and survived hospitalization. The exposure of interest was the earliest serum albumin measured within 48 h of hospital admission and categorized a priori in as ≤2.5, 2.5–3.5, 3.5–4.5 and >4.5 mg/dl. The primary outcome was all cause mortality in the 30 days following hospital discharge. Secondary outcomes included 90-day and 365-day mortality following hospital discharge. Mortality was determined using the US Social Security Administration Death Master File and 365 day follow-up was present in all cohort patients. Associations between serum albumin and mortality were estimated by bivariable and multivariable logistic regression models. Adjustment included age, race, gender, Deyo–Charlson Index, patient type (medical versus surgical), sepsis and number of organs with acute failure.

RESULTS. The serum albumin at hospital admission was a robust predictor of all cause mortality following discharge and remained so following multivariable adjustment. Patients with an admission albumin of 2.5–3.5, have an OR for mortality in the 30 days following hospital discharge of 2.90 (95 % CI 2.35–3.57; P < 0.001) and an adjusted OR of 2.17 (95 % CI 1.75–2.69; P < 0.001) relative to patients with admission albumin of 3.5–4.5. Patients with an admission albumin of <2.5 have an OR for mortality in the 30 days following hospital discharge of 6.20 (95 % CI 4.42–8.69; P < 0.001) and an adjusted OR of 5.45 (95 % CI 3.76–7.90; P < 0.001) relative to patients with admission albumin of 3.5–4.5. Similar significant robust associations post multivariable adjustments are seen with death by days 90 and 365 post-discharge. Estimating the receiver operating characteristic curve AUC shows that hospital admission albumin has moderate discriminative power for mortality 30-days following hospital discharge (AUC = 0.70; 95 % CI 0.69–0.72), and moderate

discriminative power for mortality 90-days following hospital discharge (AUC = 0.70; 95 % CI 0.68–0.71).
CONCLUSIONS. In patients treated with critical care who survive hospitalization, a low serum albumin at the time of hospital admission is a robust predictor of all cause patient mortality following hospital discharge.

0228
RAPID MYOSIN LOSS IN INTENSIVE CARE UNIT ACQUIRED WEAKNESS

T. Wollersheim[1], J. Woehlecke[2], M. Krebs[1], J. Hamati[2], D. Lodka[2], C. Langhans[2], A. Luther-Schroeder[1], K. Haas[1], T. Rathke[1], C. Kleber[3], C. Spies[1], S. Labeit[4], M. Schuelke[5], S. Spuler[2], J. Spranger[6], S. Weber-Carstens[1], J. Fielitz[2]

[1]Charité-Universitätsmedizin Berlin, Anesthesiology and Operative Intensive Care Medicine, Berlin, Germany, [2]Experimental and Clinical Research Center (ECRC), Berlin, Germany, [3]Charité-Universitätsmedizin Berlin, Center for Musculoskeletal Surgery, Berlin, Germany, [4]Universitätsmedizin Mannheim, Mannheim, Germany, [5]Charité-Universitätsmedizin Berlin, NeuroCure Clinical Research Center, Berlin, Germany, [6]Charité-Universitätsmedizin Berlin, Endocrinology, Diabetes and Nutrition, Berlin, Germany

INTRODUCTION. Intensive care unit (ICU) acquired weakness (ICUAW) mediated by myosin loss, is a common and significant complication in critically ill patients affecting the disease course. Clinically the weakness is getting present when patients awake from sedation. Time course of myosin loss has not been investigated.
OBJECTIVES. To investigate changes in myosin content in skeletal muscle for slow and fast type of myosin heavy chain (MyHC) during the disease course of critically ill patients.
METHODS. Controlled, prospective, monocentric observational study. We included 22 mechanically ventilated, critically ill patients (SOFA score ≥8 at 3 within 5 days after ICU admission). A surgical muscle biopsy (*M. vastus lateralis*) from 5 healthy controls and twice (median day 6 and 15 after ICU admission) from ICU patients were obtained. We quantified myosin protein (MyHC slow and MyHC fast) content by Western blot ($n = 22$ first and second each). Investigating Medical-Research-Council (MRC) score. Non-parametric tests were performed. Data shown as median (25th/75th percentile). Ethic vote (Charité EA2/061/06).
RESULTS. 16 patients got adequate awake for the first time at median day 14 (12/20) and revealed ICU-acquired weakness with a median MRC-score of 3.1 (2.9/3.4). A significant decrease of myosin content of ca. 50 % for slow and ca. 90 % for fast myosin was found already in the first biopsy at median day 6 (4/8) in critically ill patients compared to healthy controls. Between first and second biopsy myosin contents did not changed significantly any more.
CONCLUSIONS. A massive and very early loss of fast and slow myosin characterizes ICUAW. Rapid myosin loss and unchanged low levels of myosin between first and second biopsy concentrates time course of important pathophysiological mechanisms of ICUAW within days or hours after onset of critical illness. Furthermore it makes clear that preventive interventions have to start that early.
GRANT ACKNOWLEDGMENT. Funded by DFG, KFO 192, WE 4386/1-2.

0229
CHOLESTATIC LIVER DISEASE PROVOKES SKELETAL MUSCLE WASTING DESPITE STIMULATION OF TRANSLATION INITIATION, DECREASED AUTOPHAGY, ACTIVATION OF YES ASSOCIATED PROTEIN (YAP) AND PROTEASOMAL SIGNAL ACTIVATION IN MICE

M. Desai[1,2], S.J. Koo[2,3], Z. Eblimit[2,3], A. Suryawan[2,3], J. Silva[1,2], J.A. Coss-Bu[1,2], T. Nguyen[1,2], T. Davis[2,3], R.A. Orellana[1,2,3]

[1]Critical Care Section, Texas Children's Hospital, Houston, USA, [2]Baylor College of Medicine, Pediatrics, Houston, USA, [3]USDA/ARS Children's Nutrition Research Center, Houston, USA

INTRODUCTION. Skeletal muscle wasting is common co-morbidity in adults and children with cholestatic liver diseases and contributes directly to fatigue, exercise intolerance, poor quality of life and lack of productivity. Even though malnutrition, metabolic derangements and inflammatory mediators induced by liver disease are thought to cause myopathy, the molecular mechanisms that drive skeletal muscle atrophy during cholestasis and bile acid (BA) excess is unknown.
OBJECTIVES. To elucidate the molecular mechanisms that drive the atrophy in skeletal muscle, especially in cholestasis and bile acid (BA) excess. We hypothesize that cholestasis induces muscle atrophy by directly depressing translation initiation pathways, making it distinct from pathways induced by nutritional aberrancies.
METHODS. Biliary fibrosis and cholestasis was induced in 6–8 week old male C57BL/6 J mice by feeding a 0.1 % 3,5-diethoxycarbonyl-1, 4-dihydroxychollidine (DDC) supplemented diet for 3 weeks and compared with isocaloric chow fed mice (n = 6/group). Mice underwent live imaging (dual energy X-ray absorptiometry [DEXA] scanning) and exercise tolerance testing. Serum was analyzed for biochemical evidence of liver injury, bile acid levels, glucose and insulin levels under fasting conditions. Quadriceps muscle was analyzed by histology and for key mediators regulating muscle translation and degradation. Statistical analysis by Student t test, $p < 0.05$ was considered significant.
RESULTS. We found that DDC fed mice had 1/3 less food intake, had a lower body weight (17 ± 0.6 vs. 25 ± 0.5 g), lean (11.4 ± 0.8 vs. 16.1 ± 0.4 g) and fat mass (2.3 ± 0.1 vs. 3 ± 0.2 g) and demonstrated early fatigue on the treadmill (8.7 ± 2 vs. 18.8 ± 2 min) compared to controls, recapitulating human disease. Serum analysis demonstrated liver injury (ALT: 958 ± 88 vs. 31 ± 6 u/L), cholestasis (conjugated bilirubin: 9.2 ± 2 vs. 0.02 ± 0.01 mg/dl) and cholanemia (BA levels: $1{,}000 \pm 250$ vs. 7 ± 1 μmol/L). Fasting serum glucose (60 ± 5 vs. 150 ± 15 mg/dl) and serum insulin levels (0.15 ± 0.01 vs. 0.53 ± 0.01 ng/L) were lower in DDC fed mice than controls. Quadriceps muscle mass was lower in DDC fed mice compared to controls (0.05 ± 0.006 vs. 0.14 ± 0.01 g). Cholestatic mice had 3 fold higher phosphorylation rates of AKT, 4EBP-1 and eIF4G, while phosphorylation rates of AMPK, eIF2α, YAP, LC3 and MuRF1 was half compared to controls.
CONCLUSIONS. These findings suggest that cholestasis induces skeletal muscle wasting despite activation of anabolic pathways, evidenced by stimulation of translation initiation, and suppression of autophagy and protein degradation signaling in skeletal muscle. High levels of circulating bile acids could be the potential candidate mechanism that drives skeletal myopathy and wasting.
REFERENCES. 1. Desai et al. Hepatology. 2010;51(6):2097–107. 2. Orellana et al. Pediatr Res. 2008;64(5):505–10.
GRANT ACKNOWLEDGMENT. 1) Baylor College of Medicine, Pediatric Critical Care Internal Funding, 2) P30DK056338 (MSD).

0230
FEASIBILITY OF ELECTRICAL MUSCLE STIMULATION IN CRITICALLY ILL PATIENTS DURING TIME COURSE OF INTENSIVE CARE TREATMENT

M. Krebs[1], K. Haas[1], T. Wollersheim[1], F. Balzer[1], N. Carbon[1], R. Mörgeli[1], M. Goll[1], G. Sonomdagva[1], C. Olbricht[1], J. Malleike[1], F. Nehls[1], S. Weber-Carstens[1]

[1]Charité-Universitätsmedizin Berlin, Anesthesiology and Operative Intensive Care Medicine, Berlin, Germany

INTRODUCTION. Critical illness myopathy (CIM) and loss of muscle mass are major side-effects during intensive care unit (ICU) treatment. Electrical muscle Stimulation (EMS) is nowadays investigated to avoid CIM and to maintain muscle mass of critically ill patients.
OBJECTIVES. To investigate whether differences of evoked muscle contractions of upper and lower extremities exist during course of critical illness. To investigate whether septic shock and inflammation influence excitability and capability of induced muscle contraction with EMS.
METHODS. We investigated retrospectively a cohort of 35 ventilated, critically ill patients (SOFA score ≥8 at 3 within 5 days after ICU admission). Patients were prospectively treated with daily, 20 min each muscle group seven times a week. Achievement of muscle contraction of *M. vastus lat* was recorded up to day 15. Adverse events were recorded when occurring. Retrospectively, we analyzed the success rates of evoked muscle contraction with EMS in critically ill patients.
RESULTS. 35 patients were included in this analysis. In 452 patient days, 322 EMS sessions (71 %) were performed. In sum, during the first 15 days of ICU stay, contraction of *M. vastus lat* was achieved in 75–100 % of the performed sessions in 5 (14.3 %) patients, in 51–75 % in 4 (11.4 %) patients and 26–50 % in 2 (5.7 %) patients. In 1–25 % a contraction was evoked with EMS in 8 (22.9 %) patients. In the majority of 16 (45.7 %) patients, a muscle contraction was not possible to evoke. Rate of success of evoked muscle contraction declined from 58.5 % at day one, 46.4 % at day 5, 26.7 % at day 10 and dropped to a success rate of 10 % at day 15. Patients with absent evoked muscle contraction by EMS, showed a higher severity of illness, indicated by admission SAPSII (61.5 (43.3/74.8) vs. 49 (41/58) $p = 0.056$) and a higher SOFAmax (16 (12/17.5) vs. 13 (10/18) $p = 0.095$) during the 15 days of intensive care treatment. Age, BMI, sex, leucocytes and catecholamine do not statistically influence the ability to evoke muscle contraction with EMS in critically ill patients. No adverse event was recorded during 322 electrical stimulation sessions in all patients.
CONCLUSIONS. Success rate of evoked muscle contraction with EMS declines during time of critical illness. Severity of illness seems to influence ability of evoked muscle contraction of *M. vastus lat*.
GRANT ACKNOWLEDGMENT. Funded by DFG, KFO 192, WE 4386/1-2.

0231
EVALUATION OF TEMPORAL MITOCHONDRIAL FUNCTION *IN VITRO* IN PATIENTS WITH ORGAN FAILURE: A PROSPECTIVE OBSERVATIONAL PILOT STUDY

M. Chakraborty[1], A. Hickey[2], J. Macdonald[1], L. Newby[3], D. Sim[4], A. Phillips[2], J. Windsor[1]

[1]University of Auckland, Department of Surgery, Auckland, New Zealand, [2]University of Auckland, School of Biological Sciences, Auckland, New Zealand, [3]Auckland City Hospital, Auckland, New Zealand, [4]Victoria University of Wellington, Wellington, New Zealand

INTRODUCTION. Septic organ failure is associated with decreased mitochondrial respiration (MR)[1], but what happens in multiple organ dysfunction syndrome (MODS) due to other causes is unknown. The decrease in MR is thought to play a significant role in septic organ failure but whether it is causal is not known because temporal MR in sepsis or MODS has never been studied in patients.
OBJECTIVES. The primary objective was to measure temporal MR in septic and non septic organ failure (OF) and compare with healthy volunteers (HV, n = 15). The secondary objectives were to assess other mitochondrial function (MF) and correlate MR with sequential organ failure assessment (SOFA).
METHODS. After regional ethics approval, patients with OF[2] and: (i) septic shock[2] (S, n = 15) or ii) shock from other causes[2] (NS, n = 11) were prospectively recruited from ICU at Auckland City Hospital. MR, mitochondrial superoxide (SO), and adenine-triphosphate (ATP) from peripheral blood mononuclear cells were measured daily during the first week and once at 3 weeks in patients and once from HV. MR was measured with high resolution respirometry using a substrate uncoupler inhibitor titration (SUIT) protocol. Significance was established at $P < 0.05$ and a repeated measure ANOVA for temporal MF and ANOVA for comparison with HV were used.
RESULTS. The pattern of MR was similar in S and NS over days ($P > 0.05$) with decreased oxidative phosphorylation through complex I and II (CI + II OXPHOS) and electron transport system capacity (ETS) compared to HV. In S, CI, II OXPHOS was decreased by 43 % at 4 days ($P = 0.002$) and by 30 % at 3 weeks ($P = 0.03$) compared to HV. In NS, CI, II OXPHOS ($P = 0.003$) was decreased by 49 % at 3 days compared to HV. Additionally, ETS capacity was decreased by 23 % at 3 days ($P = 0.03$) and 25 % at 5/6 days ($P = 0.007$) compared to HV in S. ATP was decreased by 52 % in S at day 2 and by 45 % in NS at day 3 compared to HV ($P < 0.05$ for both). SO increased by 66 and 78 % at day 1 for S and NS respectively and preceded decreases in MR ($P < 0.05$ for both). MR correlated with SOFA scores in S and NS from day 3 onwards (d3: $r = -0.651$, $P = 0.006$).
CONCLUSIONS. MR dysfunction occurred in S and NS after increases in SO and temporal MR was similar in all OF. MR correlated with severity of MODS from day 3 onwards. Since MR did not decrease until day 3 in S and NS, MR dysfunction is unlikely to be the proximal cause of OF [ACTRN12612000047897].
REFERENCES. 1. Brealey D, Brand M, et al. Association between mitochondrial dysfunction and severity and outcome of septic shock. Lancet. 2002;360:219–23. 2. Bone RC,

Balk RA, et al. Definitions for sepsis and organ failure and guidelines for the use of innovative therapies in sepsis. The ACCP/SCCM Consensus Conference Committee. American College of Chest Physicians/Society of Critical Care Medicine. Chest J. 1992;101(6):1644–55.
GRANT ACKNOWLEDGMENT. Health Research Council of New Zealand. University of Auckland. Auckland District Health Board.

0232
ASSOCIATION BETWEEN ARDS AND HOSPITAL MALNOURISHMENT IN THE INTENSIVE CARE SETTING: RESULTS FROM THE PARIS STUDY: A ONE-DAY PREVALENCE MULTICENTER OBSERVATIONAL STUDY

H. Monte-Coelho Neto[1], A. Pontes-Arruda[1], V.D.A. do Ceará[1], A.P. Lima[1], A.P. Magalhães-Júnior[1], D. Guimarães[1], H.P. Moreira[1], F.E. Mendonça-Neto[1], B. Furtado-Lima[1], L.G. de Castro[1], J.H. Militão[1], M.F. Colares[2], M. Martins[2], I.S. Bonfim[3]

[1]Christus University Center, School of Medicine, Fortaleza, Brazil, [2]Hospital Fernandes Távora, Fortaleza, Brazil, [3]Hospital Regional do Cariri, Juazeiro do Norte, Brazil
INTRODUCTION. Malnutrition is a debilitating and highly prevalent condition in the acute hospital setting, with international studies reporting rates of approximately 40 %. Malnutrition is associated with many adverse outcomes including depression of the immune system, impaired wound healing, muscle wasting, longer lengths of hospital stay, higher treatment costs and increased mortality. Unfortunately there is little data regarding the possible associations between Acute Respiratory Distress Syndrome (ARDS) and hospital malnourishment.
OBJECTIVES. To conduct a multicenter 1-day prevalence study in Brazilian ICU's to evaluate the incidence of malnourishment in accordance with the Subjective Global Assessment and it's association with incidence of ARDS.
METHODS. After institutional review board approval was obtained data from all ICU patients in 30 ICU's in 15 Brazilian hospitals were collected during a single day in April 2012. All relevant parameters were collected in loco using patients' original medical records. Each patient was evaluated by a trained professional who fulfill the subjective global assessment form with the available data and also by conducting interviews when necessary. Predicted body weigh was calculated in loco using a standard and validated equation. ARDS was defined using the Berlin definitions [1]. Categorical variables were compared between the two groups using the χ^2 test or Fisher's exact test as appropriate. Quantitative normally distributed variables between the groups were compared using an unpaired two-sample *t*-test. For quantitative non-normally distributed data, the nonparametric Wilcoxon rank-sum test was used. Normality was assessed by using the Shapiro–Wilk test.
RESULTS. Data from 207 patients were collected. The three populations were considered well balanced in terms of their baseline characteristics and also severity scores. 35.3 % of the evaluated patients (n = 73) were considered adequately nourished, 38.6 % moderately malnourished (n = 80), and 26.1 % severely malnourished (n = 54). A total of 51 patients were considering as having ARDS in accordance with the Berlin definitions. Incidence of ARDS was significantly higher in the population of patients considered either moderately or severely malnourished (29.1 %, n = 39) as compared to those considered adequately nourished (16.4 %, n = 12) ($p < .0001$).
CONCLUSIONS. The present study identified a positive association between hospital malnourishment and increased risk of developing ARDS in the intensive care setting. This may not only represent an important impact over clinical outcomes but also a potentially important financial burden to the healthcare system due to the increased needs for hospital resources in order to treat diseases such as ARDS.

Biomarkers in sepsis: 0233–0246

0233
EARLY PROCALCITONIN KINETICS MAY INDICATE EFFECTIVE EMPIRICAL ANTIBIOTIC THERAPY WITHIN HOURS AFTER STARTING TREATMENT (A PILOT STUDY)

D. Trasy[1], M. Nemeth[1], A. Osztroluczki[1], K. Tanczos[1], N. Oveges[1], P. Hankovszky[1], Z. Molnar[1]

[1]University of Szeged, Department of Anesthesiology and Intensive Therapy, Szeged, Hungary
INTRODUCTION. Starting antibiotic (AB)-therapy early in critically ill patients with suspected infection is of utmost importance with significant effect on survival [1]. However, there is very little to help the clinician whether the empirical AB-treatment is effective or not. Procalcitonin (PCT) is a reliable sepsis marker with short half life and with good predictive value for bacteremia [2].
OBJECTIVES. Our aim was to investigate whether PCT-kinetics within the first 24 h after starting empirical AB-therapy could indicate that the chosen ABs are effective or not.
METHODS. All patients on a tertiary intensive care unit, in whom the clinician considered the need of empirical AB-therapy (based on the clinical picture, fever, leucocytosis and PCT), were recruited. The choice of ABs was determined by our local protocol based on the Infectious Disease Society of America guidelines [3]. PCT levels were measured 8 hourly (T_0, T_8, T_{16}, T_{24}) and then daily (T_2–T_5). Microbiological tests were performed to identify microorganisms and their AB-resistance. Based on these results patients were grouped post hoc into „effective" (E) and „ineffective" (IE) groups. Statistical analysis was performed by Kruskal–Wallis, Mann–Whitney and Chi square tests, as appropriate.
RESULTS. Out of 112 patients infection was proven in 85 cases. Therapy was found to be effective in 68 (80 %) and ineffective in 17 (20 %) cases. Mortality was significantly lower in the E-group as compared to the IE-group: 19 vs. 53 %, p = 0.007. Although PCT kinetics was similar in both groups, with an increasing tendency during the first 24 h, however, at T_{16} and T_{24} a PCT increase of <70 % as compared to the baseline value (T_0) had 84 % positive predictive value with 80 % sensitivity and 41 % specificity (p = 0.059) indicating effective AB-treatment.
CONCLUSION. Our preliminary results detected a signal, according to which PCT kinetics within the first 16–24 h of treatment may help the clinician in evaluating the adequacy of empirical AB-therapy in critically ill patients. The completion of the study on the planned 200 patients is required to come to the final conclusions.
REFERENCES. 1. Kumar A, et al. Crit Care Med. 2006;34:1589–96. 2. Müller F, et al. Chest. 2010;138:121–9. 3. IDSA Guidelines. http://www.idsociety.org/Organ_System/.

0234
PROCOAGULANT MICROPARTICLES AS BIOMARKERS OF SEPTIC SHOCK-INDUCED EARLY DISSEMINATED INTRAVASCULAR COAGULOPATHY: A NEW APPROACH OF CELL-BASED HEMOSTASIS ACTIVATION

X. Delabranche[1], J. Boisramé-Helms[1], A. Berger[1], P. Asfar[2], Y. Mootien[3], F. Lanza[4], L. Grunebaum[5], F. Toti[6], F. Meziani[1]

[1]Hôpitaux Universitaires de Strasbourg, Réanimation Médicale-Nouvel Hôpital Civil, Strasbourg, France, [2]CHU d'Angers, Réanimation Médicale et Médecine Hyperbare, Angers, France, [3]CH de Mulhouse, Réanimation Médicale, Mulhouse, France, [4]Etablissement Français du Sang-Alsace, UMR S949 Inserm, Strasbourg, France, [5]Hôpitaux Universitaires de Strasbourg, Laboratoire d'Hématologie-Hôpital de Hautepierre, Strasbourg, France, [6]Université de Strasbourg, UMR 7213 CNRS-Faculté de Pharmacie, Illkirch, France
INTRODUCTION. During septic shock disseminated intravascular coagulopathy (DIC) may contribute to multiple organ failure. Microparticles (MPs) are sub-micronic plasma membrane fragments released from stressed cells behave as circulating procoagulant components. Clinical trials aiming at hemostasis control failed to improve patients' survival except in patients with DIC in post hoc analyses.
OBJECTIVES. To study circulating MPs as early biomarkers of DIC during septic shock.
METHODS. 92 patients with septic shock were enrolled in 3 medical ICU. Hemostasis was evaluated at admission (D1), and at D2, D3 and D7. Early DIC was diagnosed according to JAAM 2006 criteria during the first 24 h to define three groups of patients: DIC at D1, DIC at D2 and no DIC. To assess cellular injuries, total (PhtdSer-MPs), platelet (GPIb-MPs), leukocyte (CD11a-MPs) and endothelial (CD105-MPs) MPs were quantified by prothrombinase assay. Soluble (s) E-selectin, sP-selectin, platelet glycoprotein V (sGPV) and prothrombin fragments 1 + 2 (F1 + 2) were quantified by ELISA. Repeated measures were analyzed with ANOVA, linear mixed model and two-way ANOVA with post hoc analysis when recommended.
RESULTS. Early DIC was diagnosed in 30 patients at D1, and 10 at D2 and was characterized by higher SAPS2 and SOFA ($p < 0.05$ vs. no DIC). Bacteremia was associated with a greater DIC occurrence ($p = 0.01$).
In patients having DIC at D2, D-dimers and platelet count were higher than observed in patients with DIC at D1 ($p < 0.05$) while thrombin generation (F1 + 2) was significantly enhanced prior DIC diagnosis ($p < 0.05$ DIC at D2 *vs.* no DIC). PhtdSer-MPs were in the same range (15 nM eq. PhtdSer) in all patients. We evidenced that patients developing DIC at D2 were already characterized by endothelial cell (CD105-MPs and sE-selectin) and leukocyte (CD11a-MPs/leukocyte ratio) activation before or at time of DIC diagnosis ($p < 0.05$ vs. no DIC) when platelet activation is only detected once DIC is present. Soluble GPV (sGPV) was assessed as indicator of platelet activation by thrombin and sGPV/platelet ratio was significantly elevated in DIC at time of diagnosis ($p < 0.05$ DIC at D1 vs. DIC at D2 and no DIC). Interestingly, sGPV/platelet ratio was increased at D3 in patients having DIC at D1 but also at D2. sP-selectin/platelet ratio followed a similar pattern and was in the normal range in patients not having JAAM-diagnosed DIC. GPIb-MPs were strongly correlated to platelet count ($p < 0.05$). Altogether, these data possibly mirror the endothelial dysfunction in DIC and suggest that these parameters have a diagnosis value for the early detection of DIC in patients with unclear clinical and biological context.
CONCLUSION. During septic shock, hemostasis is greatly activated and procoagulant MPs are increased. Endothelial-derived microparticles are relevant biomarkers of septic shock-induced DIC prior JAAM diagnosis and could prove useful in patients' stratification for new trials.

0235
KIDNEY FUNCTION AFFECTS SERUM LEVELS OF PROCALCITONIN IN SEPSIS

M.E. Herrera-Gutiérrez[1], D. Arias-Verdu[1], R. Lozano-Saez[1], M. Arrebola-ramirez[2], M.-J. Diez-de-los-Rios-Carrasco[2], G. Seller-Perez[1]

[1]University Hospital Carlos Haya, ICU, Malaga, Spain, [2]University Hospital Carlos Haya, Laboratory, Malaga, Spain
INTRODUCTION. A possible interference between acute kidney injury (AKI) and serum levels of procalcitonin (PCT) has not been studied in detail but due to the high frequency of AKI in sepsis, this possibility could be of clinical relevance.
OBJECTIVES. To evaluate a possible relation between kidney function and serum PCT levels in sepsis.
METHODS. Prospective cohorts comprising patients admitted to our unit with diagnosis of sepsis. Clinical data were registered for the first 3 days of stay and serum PCT (μg/mL) was measured. KDIGO status was computed using serum creatinine and diuresis. Creatinine clearance was measured in 2-hour samples of urine. Analysis of correlation, Chi-square, ANOVA and T Student test were used for a signification of 95 %. The Ethics Committee of our centre approved the study.
RESULTS. 129 out of 131 patients recruited were included in the study and 117 survived the first 3 days and were included in the final analysis, aged 56.8 ± 16.7 years, 41.2 % female. Apache II at admission was 23.9 ± 7.7 and SOFA 12.2 ± 5.1. Median stay 11.7 days. Percentage of patients in KDIGO-0 raised from 29.8 % the first to 68.3 % the third day, in KDIGO-1 lowered from 25.2 to 4.9 %, for KDIGO-2 from 19.8 to 1.6 % and for KDIGO-3 did not change (25.3 %). CRRT was initiated in 31.1 % (25.6 % the first 3 days).
PCT levels were statistically higher in patients with AKI and this difference was maintained for the 3 days of study.

PCT and KDIGO

	Day one p 0.001	Day two p 0.001	Day three p 0.07
KDIGO 0–2	25.6 ± 36.9	12.7 ± 19	9.4 ± 17.3
KDIGO 3	63.8 ± 76.3	41.9 ± 53.4	33.9 ± 51.7

but this difference was noted independently of the presence of a worsening or improving AKI. PCT rose as the KDIGO stage increased.

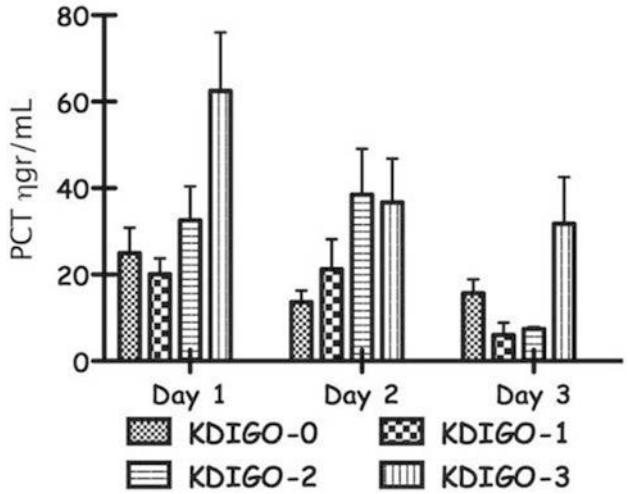


Fig. 1 PCT and KDIGO stage

Higher levels of PCT were also detected for patients under CRRT (day 3, 15 ± 27.3 vs 31.7 ± 57.8, $p < 0.05$).
A significant but not strong correlation was noted between creatinine clearance and PCT levels (Pearson −0.13, p 0.012).

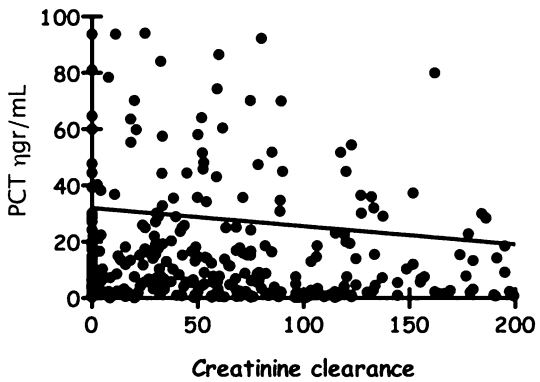


Fig. 2 Correlation between PCT and creatinine clearance

CONCLUSIONS. The presence of AKI conditions a raise in PCT levels in septic patients. This effect could be in part explained by a direct relation with kidney function but could also be due to a specific role of PCT as marker of kidney damage.

0236
EARLY LEVELS OF PROCALCITONIN AS GUIDE FOR SEPSIS MANAGEMENT

G. Seller-Perez[1], D. Arias-Verdu[1], R. Lozano-Saez[1], M.-J. Diez-de-los-Rios-Carrasco[2], M. Arrebola-Ramirez[2], M.E. Herrera-Gutiérrez[1]

[1]University Hospital Carlos Haya, ICU, Malaga, Spain, [2]University Hospital Carlos Haya, Laboratory, Malaga, Spain

INTRODUCTION. The role of procalcitonin (PCT) as marker on infection and as a guide for antibiotic management is not definitively demonstrated.
OBJECTIVES. To evaluate usefulness of early serum PCT levels as a marker of the adequacy of the antimicrobial regime.
METHODS. Prospective cohorts comprising patients admitted to our unit with diagnosis of sepsis. Clinical data were registered for the three first days of stay and serum PCT (μgr/mL) and protein C reactive (PCR, mg/L) were measured. Clinical status of infection and mortality at 28 days were also registered. Chi square, ANOVA and T Student test were used with a signification of 95 %. The Ethics Committee of our centre approved the study.
RESULTS. We recruited 131 patients, and included in the study 129. Of these, 117 survived the first 3 days and were included in the analysis, aged 56.8 ± 16.7 years, 41.2 % female. Apache II at admission 23.9 ± 7.7 and SOFA 12.2 ± 5.1. Median stay 11.7 days. Source of infection was abdominal in 44.3 %, respiratory 22.1 %, urinary tract 12.2 %, catheter 0.8 % an other 20.6 %. No microorganism was detected in 34.4 %, bacterial 61.8 %, viral 2.3 % and fungal 1.5 %. Overall in-hospital mortality was 38.9 % (34.4 % at 28 days, all in the ICU). Treatment was considered adequate in 69 % of the cases with positive cultures.
PCT and PCR levels in days 1–3 were similar when a bacteria or no isolation where found.

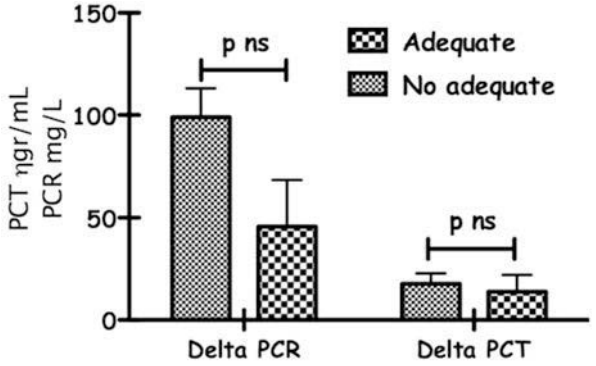


Fig. 1 Changes of PCT and PCR depending of the adequacy of the antibiotic regime

Fungal infections had lower PCT levels (3.0 ± 3.8 vs 21.8 ± 42.6 in bacterial) but due to the low number of cases (two) statistics were not significant. Viral infections presented significantly higher levels of PCR the third day (517.3 ± 288.2 vs 240.2 ± 127.1 in bacterial, $p < 0.05$) but not for PCT.
Changes of PCT these first 3 days were not affected by treatment adequacy (Δ-PCT 13.8 ± 43.1 when adequate vs 17.7 ± 26.8).

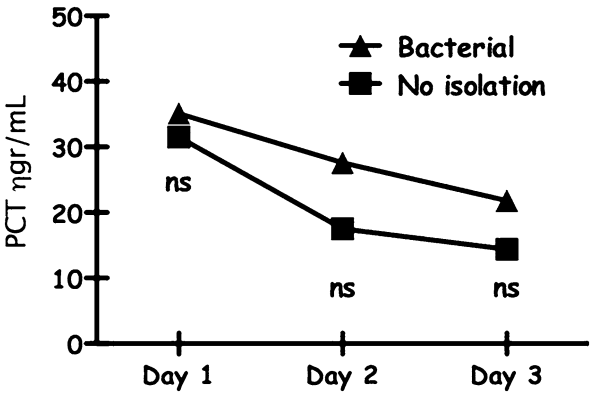


Fig. 2 Serum PCT according to the isolations

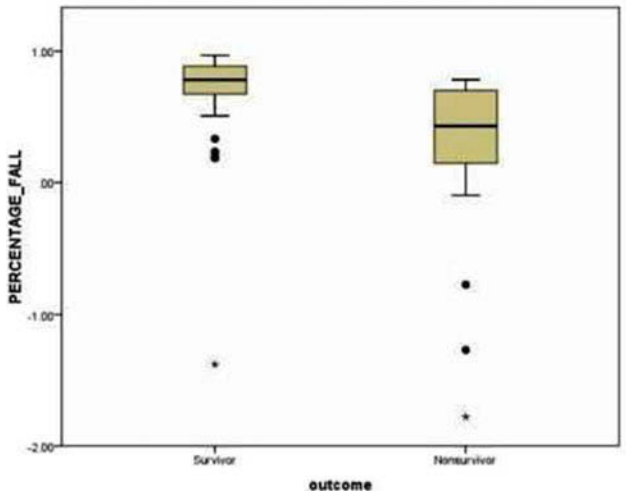
PCR, lactate, base deficit and SOFA were related to 28-day mortality but PCT did not show a significant relationship.
CONCLUSIONS. In our series early PCT levels were not related to the adequacy of the antibiotic regime and don't seem useful for decision-making in the early stages of the septic process. PCT did not behave as a good marker of prognosis in our population.

0237
EVALUATION OF PROGNOSTIC VALUE OF PROCALCITONIN IN CRITICALLY ILL PATIENTS WITH SEVERE SEPSIS/SEPTIC SHOCK

B. Poddar[1], M. Gurjar[1], S. Singh[2], A. Aggarwal[2], A. Baronia[1], R. Singh[1], A. Azim[1]

[1]Sanjay Gandhi Postgraduate Institute of Medical Sciences, Critical Care Medicine, Lucknow, India, [2]Sanjay Gandhi Postgraduate Institute of Medical Sciences, Clinical Immunology, Lucknow, India

INTRODUCTION. Prognostication of patients with sepsis is important. Among the various inflammatory markers, procalcitonin (PCT) seems to be promising in assessing the prognosis of critically ill patients with sepsis.
OBJECTIVES. To correlate serum PCT level on the day of inclusion in the study (D0) and its change after 72 h of enrolment (D4) with mortality in critically ill patients with severe sepsis/septic shock.
DESIGN. Prospective observational study setting: General purpose ICU of a tertiary care teaching Institute Patients: Patients with severe sepsis or septic shock admitted between March 2011 and April 2012 included; projected sample size is 200. D0 defined as the day of admission to the ICU with severe sepsis or septic shock. Measurements: Serum PCT measured on D0 and D4 by chemiluminescence immunoassay (BRAHMS PCT kit). Demographic and clinical profile, severity of illness scores, relevant laboratory tests and cultures noted. Change in PCT values from D0 to D4 was correlated with the primary outcome, i.e., 28 day mortality. Ethical clearance obtained from Institute ethics committee. SPSS 15 used for statistical analysis.
RESULTS. 98 patients with severe sepsis/septic shock admitted; 89 included in the analysis (11 excluded). 10 patients were <15 years of age; the median age of patients >15 years was 47 (range 16–79); 56 (62 %) were male. 58 (65 %) patients had community acquired infections; the commonest primary diagnosis was pneumonia (19 patients). 75 (84 %) patients were in septic shock and 14 were in severe sepsis. The median APACHE II score in adults was 17 (range 6–41), PRISM III score in children 8 (4–22) and SOFA score in all patients 12 (3–22).
48 (54 %) patients survived at 28 days (survivors). Among the severity scores and perfusion markers, median SOFA score and arterial lactate differed significantly among survivors(S) and non-survivors (NS) [SOFA 10 vs 14 in S and NS, $p < 0.01$; lactate 15.8 mg/dL vs 24.3 mg/dL in S and NS, $p < 0.01$ respectively]. The median PCT was 6.19 ng/ml (range 0.19–100) on D0 and 3.68 ng/ml (range 0.06–100) on D4. The median PCT values on D0 were 7.81 and 5.8 ng/ml in S and NS ($p = 0.42$) and 2.11 and 9 ng/ml on D4 in S and NS ($p = 0.028$) respectively. The median PCT difference (D0 minus D4) was 7.58 ng/ml (range −0.9 to 87.1) in S and 1.52 ng/ml (range −14.5 to 57) in NS ($p = 0.013$). Percentage fall in PCT [(D0 − D4/D0) × 100] is shown in Fig 1.



Percentage fall in PCT among S and NS ($p < 0.01$)

The C-statistic of percentage fall in PCT from D0 to D4 to predict mortality was 0.86 (95 % CI 0.76–0.94) with 50 and 70 % fall predicting 28 day mortality with sensitivity and specificity 87 and 60 %, and 72 and 74 % respectively. % fall in PCT also correlated with secondary outcomes in the form of ventilator-free days ($p < 0.01$), vasoactive drugs free days ($p < 0.01$) and dialysis sessions ($p = 0.03$) required.

CONCLUSIONS. In critically ill patients with severe sepsis/septic shock, change (fall) in PCT correlates with outcome, not PCT at admission.

0238

PROADRENOMEDULLIN, PROGNOSTIC SCORES AND MORTALITY IN SEVERE SEPSIS AND SEPTIC SHOCK

M.-V. de la Torre-Prados[1,2], A. García-de la Torre[2,3], C. Trujillano-Fernández[1,2], A. Enguix[2,4], J. Pérez-Vacas[1,2], N. Zamboschi[1,2], A. Puerto Morlan[1,2], F. Cota-Delgado[1,2], A. García-Alcántara[1,2]

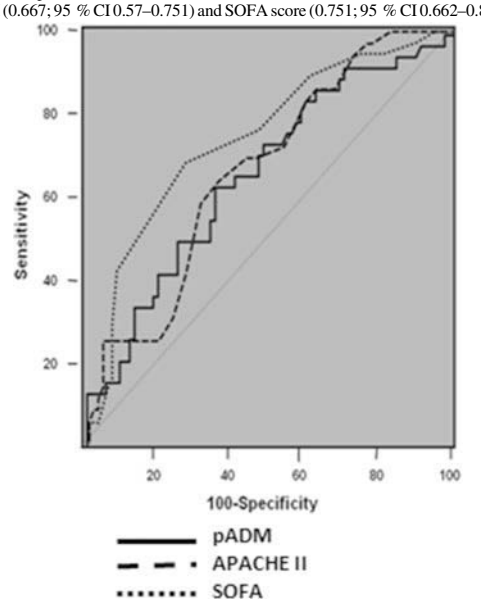
[1]Hospital Universitario Virgen de la Victoria, Intensive Care Medicine, Malaga, Spain, [2]IBIMA Institute, Malaga, Spain, [3]Hospital Universitario Puerto Real, Clinical Chemistry Laboratory, Cadiz, Spain, [4]Hospital Universitario Virgen de la Victoria, Clinical Biochemistry Laboratory, Málaga, Spain

INTRODUCTION. Measurement of biomarkers is a potential approach to early prediction of mortality in severe sepsis or septic shock.

OBJECTIVES. The purpose of this study was to evaluate the prognostic value of mid-regional proadrenomedullin (pADM) to compare it with physiological scores.

METHODS. A cohort study of 117 adult patients with severe sepsis, according to the Surviving Sepsis Campaign, and admitted to the intensive care unit (ICU) analyse demographic, clinical parameters and pADM were studied during 1 year; pADM was measured in the first 24 h after the onset of severe sepsis or septic shock, using a homogeneous sandwich immunoassay with fluorescent detection (time-resolved amplified cryptate emission (TRAC), KRYPTOR. The descriptive and comparative statistical analysis was performed using the statistical software packages SPSS version 15.0 (SPSS Inc., Chicago, IL, USA) and Med Calc® 9.2.1.0.

RESULTS. We analyzed 117 consecutive episodes of severe sepsis (15 %) or septic shock (85 %). The median age of the patients was 64 (inter-quartile range, 53–72) years; the main sources of infection were: respiratory tract (46 %) and intra-abdomen (21 %). The 28-day mortality was 32.5 %. The profile of death patients had a significantly higher average age (64.7 vs. 57.6 years; $p = 0.024$), pADM (3.7 vs. 2.05; $p = 0.02$) as well as clinical severity scores, APACHE II (26.6 vs. 23; $p = 0.006$) and SOFA (11.6 vs 9.2; $p < 0.001$). The area under the curve (AUC) for p-ADM was 0.677; 95 % CI 0.59–0.77, which was similar to the AUCs for APACHE II (0.667; 95 % CI 0.57–0.751) and SOFA score (0.751; 95 % CI 0.662–0.826), fig. 1.



ROC curves of pADM, APACHE II and SOFA and 28-mort

CONCLUSIONS. The protein pADM is an important prognostic biomarker in sepsis, similar to APACHE II and SOFA scores.

REFERENCES. 1. Pezzilli R, Barassi A, Pigna A, et al. Time course of proadrenomedullin in the early phase of septic shock. A comparative study with other proinflammatory proteins. Panminerva Med. 2012;54:211–7.

0239

INCREASE IN PROCALCITONIN KINETICS MAY BE A GOOD INDICATOR OF STARTING EMPIRICAL ANTIBIOTIC TREATMENT IN CRITICALLY ILL PATIENTS (A PILOT STUDY)

M. Nemeth[1], D. Trasy[1], A. Osztroluczki[1], K. Tanczos[1], A. Lovas[1], Z. Molnar[1]

[1]University of Szeged, Department of Anaesthesiology and Intensive Therapy, Szeged, Hungary

INTRODUCTION. Starting antibiotic (AB)-therapy early in critically ill patients with suspected infection is of utmost importance with significant effect on survival [1]. However, the rate of inadequate AB-therapy is still very high (20–90 %), mainly due to the uncertainties and difficulties, which surrounds infection and sepsis diagnosis in the critically ill [2]. Procalcitonin (PCT) is a reliable sepsis marker, but results about its usefulness in initiating antimicrobials are conflicting [3, 4].

OBJECTIVES. Our aim was to investigate the predictive value of 24 h PCT-kinetics before starting empirical AB-therapy in intensive care patients as an indicator of the presence of bacterial infection.

METHODS. All patients on a tertiary intensive care unit, in whom the attending physician considered the need of empirical AB-therapy (based on the clinical picture, fever, leucocytosis and PCT-kinetics), were recruited. PCT levels were measured immediately before the initiation of ABs (T_0), 8 hourly (T_8, T_{16}, T_{24}) and then daily (T_2–T_5). In those patients who have already been treated on the intensive care unit, PCT value from the previous day (T_{-1}) was also recorded. Microbiological tests were performed to identify microorganisms and their AB-resistance. Data are presented as median and interquartile range, statistical analysis was performed by Kruskal—Wallis, Mann–Whitney.

RESULTS. Out of the 112 patients who fulfilled the inclusion criteria, infection was proven in 85 cases. In 54 patients PCT was available from the day before inclusion into the study (T_{-1}), of whom 38 (71 %) had proven infection, 13 (24 %) had no proven infection, and 3 (5 %) had to be excluded due to death within 24–48 h. There was no significant difference at T_{-1}, but there was significant difference ($p < 0.05$) in the PCT-levels at T_0 between patients who had, as compared to patients who did not have infection (Fig. 1).

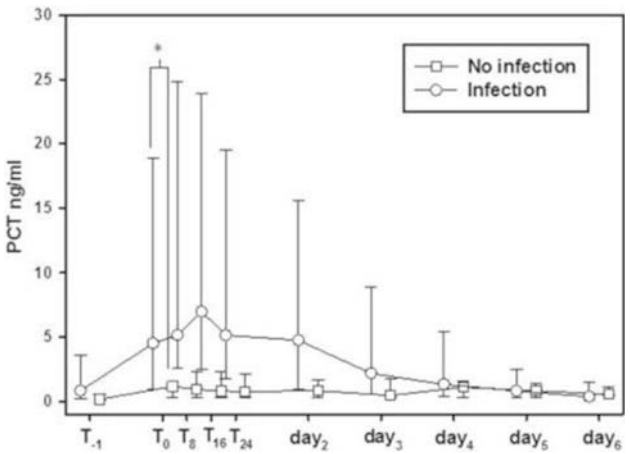


Fig. 1

CONCLUSION. Our preliminary results showed significantly greater PCT increase in those patients in whom the attending physician suspected infection and eventually it was proven as compared to those in whom infection could not be proven. To determine the best cut-off value for percent increase in PCT levels to predict infection, the completion of the study is required.

REFERENCES. 1. Kumar A, et al. Crit Care Med. 2006;34:1589. 2. Mettler J, et al. BMC Infect Dis. 2007;7:21. 3. Bouadma L, et al. Lancet. 2010;375:463. 4. Layois N, et al. Crit Care Med. 2012;40:2304.

0240

SEMI-QUANTITATIVE PCT TEST IS MORE BENEFICIAL WHEN CONSIDERING THE SITES OF INFECTION

M. Takahito[1], K. Shirai[1], N. Matsumaru[1], R. Tanizaki[2], N. Yamada[1], T. Doi[1], S. Yoshida[1], I. Toyoda[1], S. Ogura[1]

[1]Gifu University Graduate School of Medicine, Department of Emergency and Disaster Medicine, Gifu, Japan, [2]National Center for Global Health and Medicine, Disease Control and Prevention Center, Shinjuku, Japan

INTRODUCTION. Procalcitonin (PCT) is a well-known biomarker for the diagnosis of bacterial infections and sepsis. Early diagnosis can help immediate initiation of the definitive treatments and early administration of antibiotics. Semi-quantitative PCT is valuable in intensive care settings because of the quick outputs. Therefore, we evaluated the usefulness of semi-quantitative PCT tests. We also analyzed how different sensitivity becomes with respect to the sites and bacterial species infected.

OBJECTIVES. To evaluate how useful the semi-quantitative PCT test is in intensive care settings. Our objectives also include to demonstrate the importance of the consideration about the infection sites when interpreting the test results.

METHODS. We investigated 266 cases that bacterial infections were clinically suspected and PCT concentrations were semi-quantitatively measured. Those measurements were compared with the results of the bacteriological examination. We used PCT semi-quantitative kit (B.R.H.A.M.S, Berlin, German), and our cut-off value was set to 1 + (0.5 ng/ml). The data were corrected from the patients more than 15 years old and admitted in Advanced critical care center and intensive care unit at Gifu University Hospital from April 2009 to July 2010.
RESULTS. As the demographic characteristics, we could not find significant differences in ages, gender, and underlying diseases. Out of 266 cases, 130 cases had bacterial infections, and 136 cases did not. From the semi-quantitative PCT measurements, 99 cases were measured to be positive (sensitivity 76.1 %, positive likelihood ratio 2.03), and 85 cases to be negative (specificity 62.5 %, negative likelihood ratio 0.49). Analyzing sensitivity values depending on the infection sites, very high value was found in the intra-abdominal infection and urinary tract infection. On the other hand, the soft tissue infection was calculated only 59.4 %.

Table 1 Results of semi-quantitative PCT test

	Infection −	Infection +
PCT−	85	31
PCT+	51	99
Total	136	130

Table 2 Sensitivity for the infectious diseases

	PCT+	PCT−	Sensitivity
Pneumoniae	20	5	80.0 %
BSI	31	11	73.8 %
CRBSI	30	7	81.1 %
Intra-abdominal infection	13	0	100 %
Urinary tract infection	11	1	91.7 %
Soft tissue infection	19	13	59.4 %

CONCLUSIONS. From our data, the semi-quantitative PCT test did not show the clinically significance. One of the rationals can be derived from the large difference of sensitivity for the infection sites. We also found that the infections of gram negative bacteria resulted in higher sensitivity than those of gram positive bacteria (results are not shown here). We assume that the low sensitivity of the soft tissue infection is reflected from the low sensitivity of gram positive bacteria. Knowing its limitation, semi-quantitative PCT test becomes an even greater help in clinical practice at the intensive care unit.
REFERENCES. 1. Becker KI, Snider R, Nylen ES. Procalcitonin assay in systemic inflammation, infection, and sepsis: clinical utility and limitations. Crit Care Med. 2008;36:941–952. 2. Jung B, Embriaco N, Roux F, et al. Microbiological data, but not procalcitonin improve the accuracy of the clinical pulmonary infection score. Intensive Care Med. 2010;36:790–798.

0241
PROCALCITONIN KINETICS IN SEPTIC PATIENTS WITH AND WITHOUT ACUTE KIDNEY INJURY

D. Muñiz[1], M. Aranda[1], M. Romero[1], A.F. Perez[1], G. Rialp[1], L. Socias[1], M. Borges[2], B. De Dios[2], A. Del Castillo[1], C. Forteza[1], A. Garcia[1], L. Gutierrez[2], A. Mendiguren[1], O. Perez[1], R. Poyo-Guerrero[1], C. Rubert[1], A. Socias[1], P. Ibañez[1]

[1]Hospital Son Llatzer, Intensive Care Unit, Palma de Mallorca, Spain, [2]Multidisciplinary Sepsis Unit, Intensive Care Unit, Palma de Mallorca, Spain

INTRODUCTION. Procalcitonin (PCT) is a useful biomarker for the diagnosis of sepsis and for monitoring its evolution. Most of septic patients admitted in the intensive care unit (ICU) have multiorganic failure that usually includes an acute kidney injury (AKI), however it is not well assessed if the presence of AKI may interfere in PCT kinetics.
OBJECTIVES. To determine PCT peak plasmatic values (PCTp), time to reach PCTp and PCT clearance during the first 48 h in septic patients with good outcome, and compare the group with AKI and the group without AKI.
METHODS. 105 ICU patients with severe sepsis or septic shock were prospectively included between the 1st November 2012 and 4th April 2013. 45 patients with known autoimmune diseases, thyroid neoplasias or chronic renal disease, need of renal replacement therapy and septic bad outcome were excluded. AKI was defined according to the Kidney Disease Improving Global Outcome (KADIGO) guidelines (1). PCT clearance was defined as the percentage of reduction of the PCTp. Statistical analysis was performed with χ^2 test and U Mann–Whitney test, as required. Data are expressed as percentages or mean ± standard deviation. $p < 0.05$ was considered of significance.
RESULTS. 60 patients were included for analysis. Results are shown in the following tables.

Table 1

	AKI (n = 15)	No AKI (n = 45)	p
Gender, female, n (%)	3 (20)	15 (33)	0.329
Age (years)	79 ± 12	69 ± 16	0.035
SAPS3 (points)	66 ± 16	53 ± 12	0.010
Immunosuppression, n (%)	5 (33)	13 (29)	0.745
PCTp (ng/ml)	31 ± 52	18 ± 37	0.025
Time to reach PCTp (days)	1.9 ± 0.8	2.1 ± 1.5	0.862

PCT clearance

	AKI (n = 15)	No AKI (n = 45)	p
PCTp at inclusion, (n)	(4)	(14)	
PCT clearance after 24 h (%)	26 ± 21	35 ± 24	0.396
PCT clearance after 48 h (%)	61 ± 17	60 ± 21	0.947
PCTp at 24 h, (n)	(3)	(3)	
PCT clearance after 24 h (%)	33 ± 19	31 ± 17	0.946
PCT clearance after 48 h (%)	74 ± 5	66 ± 21	0.386

CONCLUSIONS. Among septic patients with good outcome, AKI is associated with greater PCTp values. However, no differences have been observed in the clearance of PCTp within the first 48 h in our patients.
REFERENCES. Ad-hoc working group of ERBP. A European Renal Best Practice (ERBP) position statement on the Kidney Disease Improving Global Outcomes (KDIGO) Clinical Practice Guidelines on Acute Kidney Injury: Part 1: definitions, conservative management and contrast-induced nephropathy. Nephrol Dial Transplant. 2012; 27(12):4263–72.

0242
DYNAMICS OF C-REACTIVE PROTEIN AND PROCALCITONIN IN PATIENTS WITH ISCHEMIC STROKE IN THE EARLY DEVELOPMENT OF VENTILATOR-ASSOCIATED PNEUMONIA

A. Gritsan[1], N. Dovbysh[2], A. Gazenkampf[1], A. Danilovich[2]

[1]Krasnoyarsk State Medical University, Krasnoyarsk Regional Hospital, Anaesthesiology and Intensive Care, Krasnoyarsk, Russian Federation, [2]Krasnoyarsk Regional Hospital, Anaesthesiology and Intensive Care, Krasnoyarsk, Russian Federation

OBJECTIVE. To assess the dynamics of C-reactive protein, determined by semi-quantitative procalcitonin test (PCT) in patients with ischemic stroke in the early development of VAP.
MATERIALS AND METHODS. A total of 37 patients with ischemic stroke in the middle cerebral artery, which was held ventilator due to severe cerebral insufficiency. Patients were divided into 2 groups: Group 1–18 patients, with the assessment of the translation on the ventilator on a scale GCS = 7.3 ± 1.2 points, who developed early VAP 2 group—19 patients, with the assessment of the translation on the ventilator on a scale GCS = 7.5 ± 1.1 points—without the development of VAP. The diagnosis of VAP was made on the basis of criteria proposed by the ACCP. VAP in Group 1, diagnosed at 3.7 ± 0.6 day from the start of mechanical ventilation (MV). All patients RGOGK admission, following the transfer of MV, in group 1 when VAP developed. Assessment of the level of C-reactive protein (normal up to 5 mg/L) were performed on admission (stage 1), on day 2 (stage 2) from the beginning of the underlying disease, with the development of VAP (group 1, 3 stage) or after 3 days of the start of stroke (group 2), and in the dynamics on the third (Stage 4), the 7th day from the date of VAP (stage 5).
In the 1st group also performed PCT set B • R • A • H • M • S PCT-Q VAP (Stage 3) and in the dynamics on the third (Stage 4), day 7 (stage 5) from the time of VAP.
RESULTS. At 1 and 2 stages C-reactive protein levels between the groups were not significantly different (48.9 ± 26.3 and 41.9 ± 36.1; 88.9 ± 26.03 and 92.3 ± 36.8 respectively). However, in group 1 when a VAP levels of C-reactive protein increased to 212.2 ± 31.8, while the second group on the 3rd level, he has averaged 45 ± 16.1. Later on stages 4 and 5 in the first group CRP value was equal to 181.1 ± 35.1 and 144.5 ± 28.8 respectively.
Procalcitonin levels in group 1 is amended as follows: the development of VAP (Stage 3) in 1 (5.6 %) case, it was more than 10 ng/ml in 12 (66.6 %) patients—in the range of 0.5–2 ng/ml, and in 5 (27.8 %)—<0.5 ng/ml.
Stage 4 in 8 (44.4 %) patients of group 1 procalcitonin varied in the range from 0.5 to 2 ng/ml in 9 (50.0 %) patients was <0.5 of LHR/ml, and only 1 (5.5 %) was >10 ng/ml, and on day 7, the figure ranges from 0.5 to 2 ng/ml was observed in 5 (27.8 %) patients and in 13 (72.2 %) cases— <0.5 ng/ml.
CONCLUSIONS. For patients with ischemic stroke is characterized by elevated levels of C-reactive protein, an acute phase of the disease. In uncomplicated (without VAP) has been a reduction in C-reactive protein after 3 days from the start of the disease, and the development of early VAP marks an increase of c-reactive protein levels to an average of 212 mg/l. Thus, in our view, the dynamics of C-reactive protein, and not the use of PCT may be a more accurate diagnostic marker for early VAP in patients with ischemic stroke.

0243
ROLE OF PROCALCITONIN (PCT) TO GUIDE ANTIBIOTIC THERAPY IN CRITICALLY ILL PATIENTS WITH SUSPECTED SEPSIS ON A GENERAL INTENSIVE CARE UNITS: A PILOT STUDY

T. Banerjee[1,2], V. Anumakonda[3]

[1]Brighton and Sussex University Hospital NHS Trust, Brighton, UK, [2]Medway Maritime Hospital, ITU, Gillingham, UK, [3]Brighton and Sussex University Hospital NHS Trust, ITU, Brighton, UK

INTRODUCTION. Procalcitonin (PCT) has emerged as the most studied and promising sepsis biomarker. It correlates with progress of septic insult in critically ill patients.
OBJECTIVES. A pilot study to assess role of PCT in antibiotic prescribing decisions in critically ill patients admitted to two Intensive care units (ICU) at Royal Sussex University Hospital NHS trust and Medway Maritime hospital NHS trust. Thus explore applicability of PCT amongst septic cohort in a university and district general hospital settings.
METHODS. In our study, PCT was measured either in the laboratory by quantitative Enzyme Linked Fluorescent Assay or PCT-Q semi quantitative assay as a point of care test. A 100 consecutive PCT value were collected prospectively. The data was retrospectively analysed using SPSS20.
Data collected included demographics, PCT values, APACHE II scores, change in antibiotics and outcome. Patients with PCT ≤ 0.5 micrograms/litre were prescribed no antibiotics or stopped or de-escalated in the absence of strong clinical or microbiological indicators of infection.
RESULTS. Mean age, APACHE II score were 59.08 years, 20.5 ± 2.5 respectively. 73, 26 and 1 % were medical, surgical and gynaecological admissions respectively. 73 patients were tested on first day of admission to ICU. Antibiotic prescriptions were changed based on PCT test in 87 cases (p value = 0.001). 2 patients had fungal infections. Positive and negative predictive value at 0.99 and 1.01 at PCT = 0.25 g/l.
CONCLUSIONS. Procalcitonin guidance reduces antibiotic use when used to discontinue antibiotics in adult ICU patients in both university and district general hospitals settings and to ration, initiate or discontinue antibiotics in patients with bacterial infections.
There was obvious cost effectiveness of PCT, reduced incidence of drug-associated diarrhoea, MRSA and drug resistant strains in addition to improving our diagnostic ability in critically ill patients.
Future research should compare PCT guidance with antibiotic stewardship programs, consequences of reduction in antibiotic use for antibiotic resistance and for adverse events of antibiotic therapy.
REFERENCES. 1. Savitri Kibe, Kate Adams and Gavin Barlow et al. Diagnostic and prognostic biomarkers of sepsis in critical care. J Antimicrob Chemother. 2011;66 Suppl. 2. Uzzan B, Cohen R, Nicolas Pet al. Procalcitonin as a diagnostic test for sepsis in critically ill adults and after surgery or trauma: a systematic review and meta-analysis. Crit Care Med.

2006;34(7):1996–2003. 3. L. Boudama et al. Use of procalcitonin to reduce patients' exposure to antibiotics in intensive care units (PRORATA trial): a multicentre randomised controlled trial. Lancet. 2010;375(9713):463–74.

0244

USEFULNESS OF PROCALCITONIN, ADRENOMEDULLIN AND ATRIAL NATRIURETIC PEPTIDE FOR PROGNOSTIC AFTER CARDIOPULMONARY BYPASS IN CHILDREN: PRELIMINARY RESULTS

I. Jordan[1], P. Corniero[2], Y. Calzada[2], E. Esteban[1], M. Balaguer[1], D. Vila[1], J. Velasco[3], F.J. Cambra[1]

[1]Sant Joan de Déu Hospital, PICU, Barcelona, Spain, [2]Sant Joan de Déu Hospital, Pediatrics, Barcelona, Spain, [3]Sant Joan de Déu Hospital, Laboratory, Barcelona, Spain

INTRODUCTION. Procalcitonin (PCT), adrenomedullin (ADM), and atrial natriuretic peptide (ANP) are biomarkers with a non defining role as prognostic indicators after cardiopulmonar by-pass (CPB) in children.

OBJECTIVES. To describe the values of PCT, ADM and ANP in patients admitted to the Pediatric Intensive Care Unit (PICU) of a tertiary hospital after CPB. To determine the prognostic usefulness of these biomarkers in terms of morbidity and mortality. To correlate mean values of PCT, ADM and ANP among them.

METHODS. Prospective observational study conducted from July-2012 to February-2013. Inclusion criteria: Children aged 1 month to 16 years admitted to the PICU after CPB. Exclusion criteria: children younger than 1 month, rheumatologic diseases, cardiac surgery without BCP and no acceptance of informed consent. Variables analyzed: age, sex, cause of admission, PRISM3, mechanical ventilation (MV) and/or inotropes, hospital and PICU length of stay and y PCT, ADM and ANP.

RESULTS. Patients included: 96, males 55 (57.3 %) and mean age 2.67 ± 3.9 years. Mechanical ventilation was required in 43 (44.7 %) of patients and 36 (37.5 %) needed inotropic infusion. One patient died (1.04 %). Biomarkers have been analyzed in 75 patients, currently as preliminary results. Mean values at admission: PCT 4.4 ± 14.8 ng/ml (range 0.1–122), ADM de 1.77 ± 1.68 nmol/L (range 0.27–6.7) and ANP 458.50 ± 624.22 nmol/L (range 63.87–2,443.0). PCT, ADM and ANP values at admission were significantly higher in patients with MV: 16.65 ± 39.70 vs 0.79 ± 0.66 p 0.019; 2.74 ± 2.15 vs 1.04 ± 0.67 p = 0.048; 766.41 ± 543.45 vs 227.57 ± 235.22 p = 0.047, respectively. Respect to patients who needed inotropes, mean values were also higher: 19.60 ± 33.70 vs 0.88 ± 1.2 p = 0.020; 2.96 ± 2.00 vs 0.99 ± 0.48, p = 0.014; 839.77 ± 613.45 vs 172.54 ± 138.15 p = 0.040, respectively. There was a significant correlation among PCT, ADM and ANP values (R 0.58 p = 0.047). Mean biomarkers values were higher but not statistical significant in those patients with a PICU length of stay >4 days: 12.62 ± 33.6 vs 2.05 ± 4.7 p = 0.373; 2.37 ± 2.06 vs 1.11 ± 0.81 p = 0.086; 660.82 ± 610.37 vs 235.94 ± 176.51 p = 0.122, respectively. ROC curves with cut-off will be updated with all data analyzed.

CONCLUSIONS. ADM, PCT and ANP are biomarkers that seems to be useful as prognosis indicators in children after CPB.

REFERENCES. 1. Abella R et al. Adrenomedullin alterations related to cardiopulmonary bypass in infants with low cardiac output syndrome. Matern Fetal Neonatal Med. 2012;25(12):2756–61. 2. Samy K et al. N-terminal pro-brain natriuretic peptide identifies patients at risk for occurence of postoperative atrial fibrillation in cardiac surgery with cardiopulmonary bypass. Ann Card Anaesth. 2012;15(3):199–205.

GRANT ACKNOWLEDGMENT. Thermo Fisher Scientific (kitts support).

0245

CLINICAL IMPACT OF COMPENSATORY ANTI-INFLAMMATORY RESPONSE SYNDROME (CARS) BIOMARKERS IN A COLOMBIAN COHORT OF SEVERE SEPSIS PATIENTS

F. Jaimes[1], H. Gomez[2], N. Hoyos[1], J. Londoño[1], C.D. Niño[1], A.L. Cuervo[1], M.T. Rugeles[2]

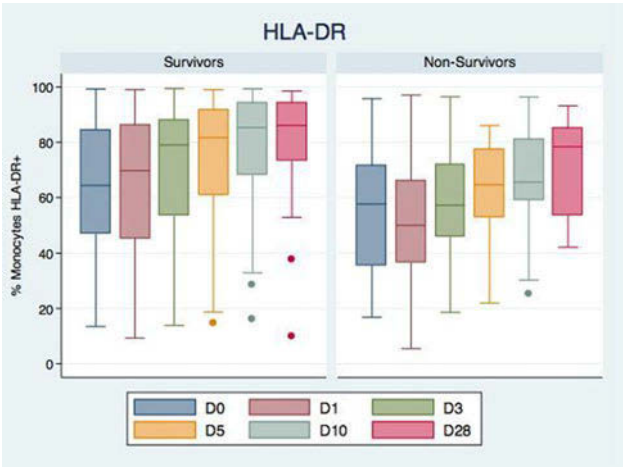
[1]Universidad de Antioquia, Internal Medicine and GRAEPIC, Medellin, Colombia, [2]Universidad de Antioquia, Immunovirology Group, Medellin, Colombia

INTRODUCTION. It is believed that some susceptible hosts are prone to a pro-inflammatory state after encounter with a pathogen, yet some of them develop an immunoparalysis state while sepsis progresses. There is not a single study describing all the immune dysfunctions attributed to CARS or their biological dynamics across the time course of the infection in the same cohort of septic patients.

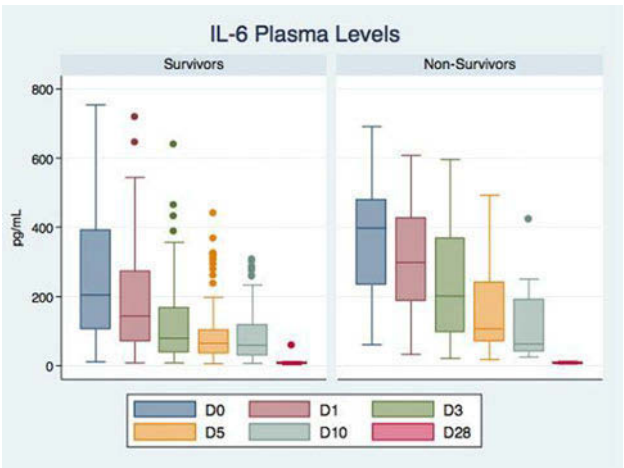
OBJECTIVES. To make a complete immunological characterization of CARS in patients with severe sepsis and to explore the relationship between these immunological changes and the clinical outcomes of 28-day mortality and secondary infections.

METHODS. A prospective observational study was conducted in 5 intensive care units from a teaching hospital and enrolled 148 patients with severe sepsis. At days 0, 1, 3, 5, 10, and 28, we determined the expression of HLA-DR in monocytes as well as apoptosis and proliferation index in T lymphocytes by flow cytometry. We measured TNF-α, IL-6, IL-1β, IL-10, and TGF-β levels in both, plasma and cell culture supernatants of peripheral blood mononuclear cells by ELISA at the same time points. We performed Cox with time-dependent covariates and competing-risk regressions to determine if changes over time in immunological variables were related to survival and to the development of secondary infections, respectively.

RESULTS. The cohort had a median age of 66.5 years (IQR 51.5–75.5) and median APACHE II and SOFA scores of 15 (IQR 11–20) and 5 (IQR 4–7), respectively. The 28-day mortality rate was 30.8 % (n = 45) and 23 patients (15.5 %) develop a nosocomial infection. An adjusted multivariate analysis showed that a constant daily increase of the percentage of monocytes HLA-DR + lowers hazard of death [HR 0.98; 95 % CI 0.97–0.99 per each percentage point]. Age [HR 1.03; 95 % CI 1.01–1.05 per each year], unceasing SOFA scores [HR 1.18; 95 % CI 1.09–1.28 per each daily point], and sustained high plasma levels of IL-6 [HR 1.003; 95 % CI 1.001–1.006 per each pg/mL] increase the risk of dying. None of the variables analyzed were associated with incidence of secondary infections.



Survival and HLA-DR progression



Survival and IL-6 progression

CONCLUSIONS. Although slopes of non-survivors differed from survivors for some of the immunological variables analyzed, only a distinct behavior in percentage of monocytes HLA-DR + and plasma levels of IL-6 influenced survival after controlling for confounders. Our findings do not support the sepsis-induced immunosuppression theory in terms of increased risk of secondary infections. Instead, monitoring changes over time in the percentage of monocytes HLA-DR + and IL-6 plasma levels might be used as prognostic biomarkers and as potential targets for immunomodulation.

GRANT ACKNOWLEDGMENT. COLCIENCIAS (Grant # 111551928175) and "Sostenibilidad del Grupo Inmunovirologia y del Grupo Academico en Epidemiologia Clinica 2013–2014, Universidad de Antioquia".

0246

NTPROBNP: PATTERN AND EVOLUTION DURING INITIAL BURNT RESUSCITATION

M. Irazábal[1], M. Sanchez[1], L. Fernandez[1], I. Pozuelo[1], P. Millan[1], C. Guallar[1], A. Garcia de Lorenzo[1]

[1]Hospital Universitario La Paz, Intensive Care Unit, Madrid, Spain

INTRODUCTION. The plasma concentration of natriuretic peptide type B (NT-proBNP) is a good indicator of cardiac preload. It has been suggested to be a marker of hydration after severe burns and to predict outcome in critically ill patients.

OBJECTIVE. The aim of this study was to characterize the dynamics of the NTproBNP during initial resuscitation and it relation with urine output and hemodynamics in critically burnt.

METHODS. A retrospective analysis including all burnt patients with >20 % total surface area (TBSA) involved and electrical injuries, who were admitted in our ten-bed tertiary Burn Unit from October 2008 through March 2012.

The samples of serum NTproBNP were taken every 8 h during the first 3 days. Demographic data included: age, gender, mechanism of burn, ABSI, SOFA, presence of shock, acute kidney injury (AKI) and mechanical ventilation (MV). Resuscitation was initiated with Ringer's lactate at 4 ml/kg/TBSA and it was corrected to achieve MAP, urine output and blood lactate levels targets. For hemodynamic monitoring, we used a transpulmonary thermodilution method which can provide measures of cardiac index (CI), intrathoracic blood volume (ITBV) and extravascular lung water (ELWI).

Continuous variables were presented as means and standard deviations. Categorical data were summarized as absolute frequencies and percentages. Evolution and their estimated effects were analyzed using mixed models. A p value <0.05 was considered statistically significant.

RESULTS. The inclusion criteria were met by 132 patients. Mean age was 48 years (SD 18). Male gender was more prevalent (74.2 %). Most frequent burn mechanism was flame

(87.9 %) followed by electrical (4.5 %). Mean TBSA and ABSI were 35 % (SD 22.1)) and 8.23 (SD 2.6) respectively. 41 patients (31.1 %) developed renal dysfunction, 32 patients (34.2 %) ARDS and 90 patients (68.2 %) shock. MV was required in 99 patients (75 %). Mean ICU stay was 27.3 days (SD 21.8). Mean urine output was 1,2 ml/kg/h (SD 0.6) and the mean resuscitation volume in the first 24 h was 5.3 ml/kg/TBSA (SD 8). Organ dysfunction measured as SOFA were 3.6 (SD 3.0) at admission; 4.3 (SD 3.0) at 24 h; 4.9 (SD 3) at 48 h and 5.1 (SD 3.1) at 72 h. Global Mortality was 23 %.
The levels of NTproBNP were: 116 (SD 387); 173 (SD 710); 183 (SD 311); 280 (SD 721); 310 (SD 769); 376 (SD 1.033); 434 (SD 961); 475 (SD 1.030); 590 (SD 1.104) and 482 (SD 596) at admission and 8, 16, 24, 32, 40, 48, 56, 64 and 72 h; respectively.
NTPROBNP increased along with the increasing measure of ITBV (p 0.001; IC 0.3–0.7). Also, there was no statistically significant difference between NTproBNP and urine output, CI or EVLW.
CONCLUSION. Progression of NTproBNP levels appears to be influenced by initial resuscitation, reaching a peak at 48 h after admission. However, reposition of blood volume measured by ITBV, may have a similar effect; but it must be considered that is probably multifactorial.

Patient-centred outcomes: 0247–0260

0247
THROMBOPROPHYLAXIS AND MORTALITY IN CRITICALLY ILL PATIENTS

D.O. Stanescu[1], P. García Olivares[1], A.M. Hernangómez[1], M. Del Valle[2], G. Buitrago[2], M.A. Estévez[1], F.J. Sagra[1], C. Ramírez[1], C. Caciano[1]

[1]H.G.U. Gregorio Marañón, Intensive Care Unit, Madrid, Spain, [2]H.G.U. Gregorio Marañón, Radiology Unit, Madrid, Spain

INTRODUCTION. Although the introduction of prophylactic measures in critically ill patients has decreased the incidence of thromboembolic venous disease, its impact on mortality remains uncertain.
OBJECTIVES. The purpose of this study was to describe practices for preventing venous thromboembolic (VTE) disease in critically ill patients and to identify associations between prophylactic measures used and mortality.
METHODS. Prospective, observational study of patients admitted at ICU for at least 72 h, between September 2011 and June 2012. We excluded those patients admitted with diagnosis of VTE disease and those with anticoagulant therapy prior or during admission. We recorded patients' demographic characteristics, cause of admission, severity scores, risk factors of haemorrhage, requirement of mechanical ventilation and hemodynamic support as markers of illness severity, risk factors of VTE disease and methods of prophylaxis.
Quantitative variables were expressed as mean ± SD or median with interquartile range and qualitative variables as percentages. The univariate analysis between prophylaxis methods was performed using Student *t*-test for continuous variables and Chi squared test or Fisher exact test for categorical variables. Multivariable logistic regression was used to estimate the risk of death associated with prophylaxis methods after adjustment for possible confounding factors.
RESULTS. Two hundred of the 552 patients admitted in ICU were included. Some method of prophylaxis was used in 185 patients (92.5 %), including pharmacologic prophylaxis with low molecular weight heparin (LMWH) in 115 (58 %), mechanical prophylaxis with intermittent pneumatic compression devices (IPCD) in 55 (26 %), and both methods in 15 (7.5 %).
In univariate analysis patients with mechanical prophylaxis had higher severity scores, risk of bleeding (thrombocytopenia and coagulopathy), need of mechanical ventilation and hemodynamic support (table 1).

Table 1

	Pharmacologic prophylaxis	* Mechanical prophylaxis	** Combined prophylaxis	Significance
Age	62 ± 15	54 ± 14	60 ± 16	* p < 0.01 ** NS
APACHE	19 ± 7	18 ± 8	23 ± 8	*,** NS
SOFA	6 ± 3	8 ± 5	9 ± 4	*,** P < 0.00
Thrombocytopenia	0.9 %	37 %	0 %	* p < 0.00 ** NS
Coagulopaty	0 %	11 %	0 %	* p < 0.00 ** NS
Mechanical ventilation	61 %	82 %	100 %	*,** P < 0.00
Hemodynamic support	27 %	54 %	53 %	*,** P < 0.03
Number of VTE risk factors	3 ± 1	5 ± 1	5 ± 1	*,** P < 0.00
VTE disease	1.7 %	5.5 %	0 %	*,** NS

ICU mortality rate was higher in those patients who received mechanical prophylaxis: 38.8 % (21/55) compared to those who received pharmacologic prophylaxis 23.5 % (27/115) (RR 2.01; 95 % CI 1.01–4.03) or both 26.7 % (4/15) (RR 1.65; 95 % CI 1.11–5.45). Mortality rate was similar between the two groups that received LMWH (RR 1.18; 95 % CI 0.35–4.03).
In multivariate analysis after adjusting for demographic characteristics, cause of admission, severity scores, risk factors of haemorrhage, requirement of mechanical ventilation, hemodynamic support and risk factors of VTE disease, none of the prophylactic methods used was associated with a decrease of mortality: Pharmacologic prophylaxis OR 1.91; 95 % CI 0.80–4.60; Mechanical prophylaxis OR 0.52; 95 % CI 0.20–1.33; Both methods OR 1.22; 95 % CI 0.75–5.75.
CONCLUSIONS. In our study none of VTE prophylaxis measures used was associated with a decrease of mortality. The apparent increase in mortality of patients with mechanical prophylaxis would be related to a greater severity of patients.

0248
CIRCULATING MITOCHONDRIAL DNA AND THE SURVIVAL OF PATIENTS WITH SEVERE SEPSIS OR SEPTIC SHOCK

S.-G. Wu[1], K.-P. Chung[2], C.-J. Yu[2]

[1]National Taiwan University Hospital Yun-Lin Branch, Department of Internal Medicine, Douliou, Taiwan, Republic of China, [2]National Taiwan University Hospital, Department of Laboratory Medicine, Taipei, Taiwan, Republic of China

INTRODUCTION. Mitochondrial dysfunction is one important mechanism proposed for MODS development in severe sepsis and septic shock. In animal model, significant mitochondrial injury, including swelling and loss of membrane integrity, was observed in hepatocytes during sepsis [1]. The structural change was associated with mitochondrial dysfunction, presented as defective oxidative phosphorylation and decreased oxygen consumption. Mitochondrial dysfunction, with decreased ATP production and anti-oxidative capacity, was also demonstrated in skeletal muscle from septic patients [2]. Recently, studies have evaluated the survival significance of circulating mitochondrial DNA, possibly released from damaged mitochondria, in patients with severe sepsis or septic shock [3–5]. However, the results from these studies were inconsistent.
OBJECTIVES. We evaluated the correlation between circulating mitochondrial DNA and plasma cytokine concentrations, and validated whether the circulating mitochondrial DNA has survival significance in patients with severe sepsis or septic shock.
METHODS. During Oct 2010 to Mar 2012, consecutive patients were screened in six medical ICUs. 10 mL blood were collected at the time of ICU admission. After centrifugation of the blood, the plasma supernatant was collected for DNA extraction. The amount of plasma mitochondrial DNA was measured by quantitative PCR. The primers were as previously described [3]. The plasma cytokines, including TNFa, IL6, IL8, and IL10, were measured.
RESULTS. 115 patients were enrolled, and 59.1 % were male patients. The average age was 71.1 years. The average APACHE II and SOFA scores were 24.5 ± 7.7 and 9.4 ± 3.8, respectively. Eighty-one patients (71.4 %) had septic shock. The circulating mitochondrial DNA was not associated with APACHE II score ($P = 0.209$), SOFA score ($P = 0.115$), or plasma concentrations of TNFa ($P = 0.115$), IL6 ($P = 0.050$), and IL10 ($P = 0.054$) (by Spearman's rank order test). There was a weak correlation between circulating mitochondrial DNA and IL8 concentration ($r = -0.233$, $P = 0.012$ by Spearman's rank order test). The 28-day mortality was 27.8 %. The non-survivors did not have significantly higher circulating mitochondrial DNA compared to the survivors ($P = 0.183$).
CONCLUSIONS. The circulating mitochondrial DNA was not significantly associated with disease severity and 28-day mortality in severe sepsis or septic shock. Therefore, circulating mitochondrial DNA may not be an effective biomarker for evaluating disease severity and predicting survival in severe sepsis or septic shock.
REFERENCES. 1. Crouser ED, et al. Crit Care Med. 2002;30:276–84. 2. Brealey D, et al. Lancet. 2002;360:219–23. 3. Kung CT, et al. J Transl Med. 2012;10:130. 4. Saukkonen K, et al. Clin Chem. 2008;54:1000–7. 5. Puskarich MA, et al. Shock. 2012;38:337–40.

0249
WOMEN WITH LOW CARDIAC OUTPUT AFTER CARDIAC SURGERY SHOW A HIGHER RISK OF DEATH THAN MEN

J. Fernández[1], S. González[1], A.G. Tubío[1], P. López[1], A. Baluja[1], I. Vidal[1], S. Varela[1], J. Álvarez[1]

[1]Complexo Hospitalario Universitario Santiago de Compostela, Anestesioloxía, Reanimación e Tratamento da Dor, Santiago de Compostela, Spain

INTRODUCTION. The low cardiac output syndrome is a quite frequent complication in cardiac surgery patients (about 20 % of incidence) with a mortality around 17–20 %. Perhaps the most significant genetic difference among healthy humans is gender, and it may have an important influence in patients' prognosis and outcomes.
OBJECTIVES. The aim of our study was evaluate the influence of gender in the 28-day outcome of patients with low cardiac output after cardiac surgery.
METHODS. Patients underwent cardiac surgery admitted in our intensive care unit between 2003 and 2011 were reviewed. Data were recovered from medical charts and digital record system. Those with low cardiac output (cardiac index <2.2 L/min/m^2) were included in our study according to inclusion and exclusion criteria. Multivariate logistic regression and Cox regression analysis were calculated. Statistical models were adjusted for age, kind of surgery, the use of pulmonary artery catheter, EUROSCORE II and APACHE II score (at arrival to our unit) in order to assess the impact of the gender on 28-day mortality.
RESULTS. 895 patients were included in the study. 566 (63.24 %) were men and 329 (36.76 %) were women. Observed global mortality was 18.88 % (169 events). 76 events in male group (13.43 %) and 93 in female group (28.23 %). The adjusted Cox regression showed a Hazard ratio = 1.91 (p < 0.001; CI 95 % 1,388–2,629) and logistic regression showed a OR = 2,842 (p < 0.001; CI 95 % 1.804–4.477) for female gender.
CONCLUSIONS. Our study shows the female gender separately associated with a higher 28-day mortality in patients with low cardiac output after cardiac surgery. Risk of death was 1.91 times higher in women for each moment of the study. Further investigation is required for identifying gender-specific risk factors in order to an optimal management of these patients.
REFERENCES. 1. Saxena A, Dinh D, Smith JA, Shardey G, Reid CM, Newcomb AE. Sex differences in outcomes following isolated coronary artery bypass graft surgery in Australian patients: analysis of the Australasian Society of Cardiac and Thoracic Surgeons cardiac surgery database. Eur J Cardiothorac Surg. 2012;41:755–62. 2. Blasberg JD, Schwartz GS, Balaram SK. The role of gender in coronary surgery. Eur J Cardiothorac Surg. 2011;40:715–21. 3. De Cocker J, Messaoudi N, Stockman BA, Bossaert LL, Rodrigus IER. Preoperative prediction of intensive care unit stay following cardiac surgery. Eur J Cardiothorac Surg. 2011;39:60–7. 4. Mebazaa A, Pitsis AA, Rudiger A, Toller W, Longrois D, Ricksten SE et al. Clinical review: practical recommendations on the management of perioperative heart failure in cardiac surgery. Crit Care. 2010;14:201.
GRANT ACKNOWLEDGMENT. None of the authors has any relation that would pose a conflict of interest.

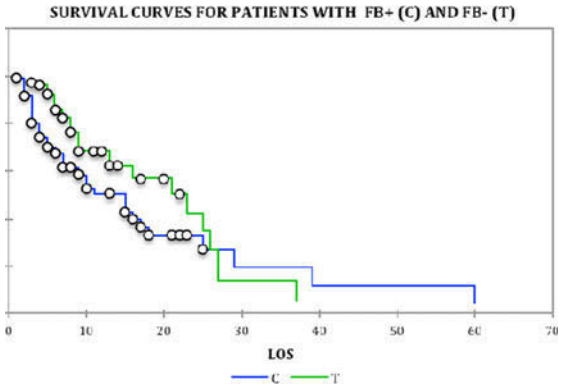
0250
POSITIVE DAILY FLUID BALANCE AS AN INDEPENDENT PREDICTOR OF MORTALITY IN CRITICALLY ILL PATIENTS

L. Nogueira[1], C.C. Pereira[1], P. Tadeu[1], S. Silva[1], J.G. Silva[1], F. Santos[1], M.J. Fernandes[1], E. Lafuente[1]

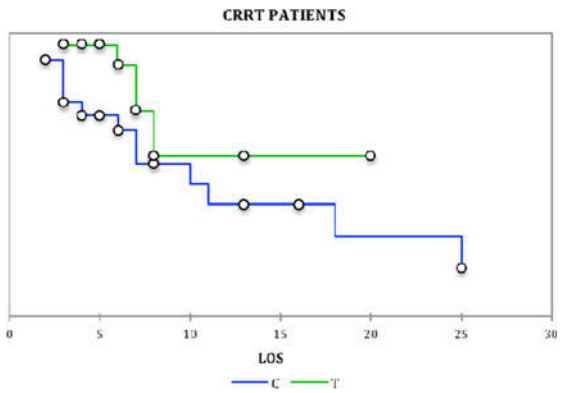
[1]Centro Hospitalar do Tamega e Sousa, Penafiel, Portugal

INTRODUCTION. Fluid overload has been linked to weaning outcomes in critically ill patients [1]. It has been suggested that positive fluid balance, a potentially modifiable variable, is associated to increased mortality in patients with acute kidney injury [2]. Negative fluid balance 48 h after admission appears to improve survival at 28 days in critically ill patients [3].
OBJECTIVES. We study how the daily fluid balance during the first 5 days at the ICU relates with survival.
METHODS. We conducted a retrospective cohort study in a level 2 ICU at a community hospital. We collect data from all patients admitted in the ICU from the 1st of January 2011 to 31st of December 2012. Those who died or have been discharged within 24 h after admission were excluded. Data was collected from the patients individual ICU file and using the PICIS® software data records. We collected demographic data, SAPS II score, indication for admission, fluid balance and diuresis of the first 5 days at ICU. The RIFLE admission score were calculated. ICU and in-hospital mortality were the primary outcome.

RESULTS. 314 patients were included, the median age was 59.8 ± 17.1 years and 61.4 % were male. Median SAPS II score was 46.4 ± 19 and 30.5 % of patients died. According to admission RIFLE grade 65.9 % had no renal risk, 7.6 % risk (R), 9.8 % injury (I) and 16.2 % failure (F). 43.6 % had a negative fluid balance in at least 3 in the 5 days. For patients with negative fluid balances we found a relative mortality reduction of 12.8 % that increased to 31.5 % in patients undergoing continuous renal replacement therapy (CRRT). The improvement in survival rate for the population with negative fluid balance was statistical significant with a p log-Rank of 0.002.



Survival curves



CRRT patients

CONCLUSIONS. We observed a reduction in relative mortality of 12.8 % in patients who had negative fluid balances at least 3 in the first 5 days at ICU. That was more evident in patients undergoing CRRT (31.5 %). In this study the patients with persistent positive fluid balances had a higher risk of dying.

REFERENCES. 1. Anupama U, et al. Fluid balance and weaning outcomes. Intensive Care Med. 2005;31:1643–7. 2. Bagshaw SM, et al. Fluid balance as a biomarker: impact of fluid overload on outcome in critically ill patients with acute kidney injury. Crit Care. 2008;12(4):169. 3. Cuartero M, et al. Negative fluid balance 48 h after admission improves survival at 28 days in critically ill patients. Crit Care. 2012;16(Suppl 1):P241.

0251
CLINICAL PRACTICE APPROACH OF VENOUS THROMBOEMBOLIC PROPHYLAXIS IN CRITICAL ILL PATIENTS IN MADRID (SPAIN)

P. García Olivares[1], J.E. Guerrero[1], M.L. Tomey[1], D.O. Stanescu[1], A.M. Hernangómez[1], G. Buitrago[2], M. Del Valle[2]

[1]H.G.U. Gregorio Marañón, Intensive Care Unit, Madrid, Spain, [2]H.G.U. Gregorio Marañón, Radiology Unit, Madrid, Spain

INTRODUCTION. Critically ill patients are at high risk of morbidity and mortality caused by venous thromboembolic (VTE) disease. There are limited data describing current VTE prophylaxis protocols in Spain.

OBJECTIVES. The purpose of this study was to assess current practice of VTE prophylaxis in patients admitted to Intensive Care Units (ICUs) in Madrid (Spain).

METHODS. We conducted a cross-sectional observational, multicenter study of VTE prophylactic measures used in patients admitted to ICU, through an electronic survey, in the third week of March 2012. Following data were collected: ICU size (number of beds available/number of patients admitted), types of patients (medical, surgical, and trauma), relevant information about VTE prophylaxis (use or not of thromboprophylaxis, prophylactic methods used, pharmacological prophylaxis contraindication and its reasons, among others), use of specific prophylaxis protocol, VTE prophylaxis based on risk factors and use of ultrasound for VTE screening in high-risk patients.

Due to the characteristics of the study only a descriptive analysis was performed. The results of quantitative variables were expressed as mean ± SD, if the distribution was normal, or as median with interquartile range, if the distribution wasn't normal. Qualitative variables were expressed as percentages.

RESULTS. Two hundred and thirty-four patients of 18 ICUs were included definitely in the study (18 patients with anticoagulation therapy were excluded), with median of 14 beds (8–20) and 10 patients (7–17) per ICU. The causes of patients admission were: 60 % (153/252) medical pathology, 32 % (81) surgical pathology and 8 % (18) traumatic pathology. 18 % (42/234) of patients didn't receive any prophylaxis, and most of them (61 %) had pharmacological prophylaxis contraindication. In 11 of the 18 ICUs (61 %) existed one or more patients without VTE prophylaxis (median 2 patients; IQR 0–4). Half of ICUs didn't use specific prophylaxis protocol. Of the 192 patients (82 %) receiving prophylaxis, 84 % (161/192) received pharmacological prophylaxis, 14 % mechanical prophylaxis and 2 % combined prophylaxis. Low molecular weight heparin (LMWH) was the only pharmacological prophylaxis used, with majority use of enoxaparin (16 of 18 ICUs). In patients with mechanical prophylaxis (27/192) antiembolic stockings were the most common used (63 %). Pharmacological prophylaxis contraindications were reported in 20 % (46/234) of patients (median 1 patient/ICU; IQR 0–4). The most frequent causes of pharmacological prophylaxis contraindications were: thrombocytopenia (28 %) and recent haemorrhage (26 %). Ultrasound screening for VTE in high-risk patients was used only in 4 ICUs (22 %).

CONCLUSIONS. Our study showed a poor application of VTE prophylaxis in critically ill patients. This was more pronounced in those patients with pharmacological prophylaxis contraindication. Mechanical prophylaxis and combined prophylaxis were not used frequently.

0252
VIP STATUS AND OUTCOMES OF CRITICAL CARE

K.A. Lee-Sarwar[1], F.K. Gibbons[2], K.B. Christopher[3]

[1]Brigham and Women's Hospital, Department of Medicine, Boston, USA, [2]Massachusetts General Hospital, Pulmonary and Critical Care Medicine, Boston, USA, [3]Brigham and Women's Hospital, Renal Division, Boston, USA

INTRODUCTION. Very Important Person (VIP) status has been postulated to alter physician care patterns and potentially patient outcomes. Whether VIP status has prognostic implications for critical care outcomes has not been studied.

OBJECTIVES. We hypothesized that VIP status would be associated with increased mortality in critically ill patients.

METHODS. We performed a two center observational study of patients treated in medical and surgical intensive care units in Boston. We studied 44,323 patients, age 18 years or higher, who received critical care between 1997 and 2007. The exposure of interest, VIP status was considered to be present if communicated to the registration administrator by the patient's physician. VIP status is recorded as a demographic at the hospitals under study. The primary outcome was all cause mortality in the 30 days following critical care admission. Secondary outcomes included 90-day mortality. Mortality was determined using the US Social Security Administration Death Master File and 365 day follow-up was present in all cohort patients. Associations between VIP status and mortality were estimated by bivariable and multivariable logistic regression models. Adjustment included age, race, gender, Deyo–Charlson Index, patient type (medical versus surgical), sepsis and number of organs with acute failure.

RESULTS. VIP status was present in 8.6 % of cohort patients. The mean (SD) age of VIP patients was 51.7 (18.4) years while the mean (SD) age of non-VIP patients was 58.3 (16.3) years. There were no significant differences in sepsis or bloodstream infection rates in patients with and without VIP status. The 30 and 90-day mortality rates were 12.5 and 16.4 % respectively. The all cause 30-day mortality rates for patients with and without VIP status were 7.1 and 13.0 % respectively. In cohort patients, VIP status was a robust predictor of all cause mortality and remained so following multivariable adjustment. Patients with VIP status have an OR for 30 day mortality of 0.52 (95 % CI 0.46–0.59; $P < 0.001$) and an adjusted OR of 0.51 (95 % CI 0.45–0.59; $P < 0.001$) relative to patients without VIP status. Patients with VIP status have an OR for 90 day mortality of 0.53 (95 % CI 0.47–0.59; $P < 0.001$) and an adjusted OR of 0.53 (95 % CI 0.47–0.59; $P < 0.001$) relative to patients without VIP status. In patients with available socioeconomic data in the form of neighborhood poverty rate ($n = 34,806$), the OR for 30 day mortality is 0.52 (95 % CI 0.45–0.60; $P < 0.001$) relative to patients without VIP status when adjusted for age, race, gender, Deyo–Charlson Index, patient type (medical versus surgical), sepsis, number of organs with acute failure and neighborhood poverty rate.

CONCLUSIONS. In a large population of adults with critical illness, VIP status is a robust predictor of improved all cause mortality. It is unclear if patient- and or system-level issues account for the improvement in outcomes observed.

0253
THE MORTALITY OF ADULT INTENSIVE CARE UNIT IN TURKEY USING THE APACHE II AND SOFA SYSTEMS

Ç. Kaymak[1], İ. Şencan[2], S. İzdeş[3], A. Sarı[4], H. Yağmurdur[5], D. Karadaş[6], D. Gökmen[7]

[1]Ankara Training and Research Hospital, Ministry of Health, Anaesthesiology and Reanimation, Intensive Care Unit, Ankara, Turkey, [2]Ministry of Health, General Director of Healthcare Services, Ankara, Turkey, [3]Atatürk Training and Research Hospital, Ministry of Health, Anaesthesiology and Reanimation, Intensive Care Unit, Ankara, Turkey, [4]Ministry of Health, Chairman of Direction and Control Department, Ankara, Turkey, [5]Numune Training and Research Hospital, Ministry of Health, Intensive Care Unit, Ankara, Turkey, [6]Ministry of Health, Direction and Control, Ankara, Turkey, [7]University of Ankara, Biostatistic, Ankara, Turkey

INTRODUCTION. The outcome in critically ill patients regarding with prognosis has many background effect of risk factors such as age, gender, severity of illness, co-morbidities, diagnosis, and response to therapy. In intensive care unit (ICU), the clinical and institutional results have increased the need for outcome examination and guidance regarding efficient utilization.

OBJECTIVES. The aim of this study was to evaluate ICU performance using risk-adjusted ICU mortality rates nationally and length of ICU stay, assessing at patients who died or had been discharged from the ICU. For this purpose, this study was to analyze APACHE II and SOFA database, containing detailed clinical and physiological information and mortality of critically ill patients at secondary and tertiary referral ICU in Turkey.

METHODS. This study was conducted in all ICU on the same period. The clinical data were collected concurrently for each patient contained demographic details, diagnostic category leading to ICU admission, location before ICU admission. All enrolled patients were followed up until discharge or death in the current ICU admission. The ratio of observed and expected mortality, and standardized mortality were recorded for individual patients. We also calculated the APACHE II scores during the first 24 h following ICU admission, and the APACHE II and SOFA scores for conducted day in ICU.

RESULTS. A total of 4,188 patients were enrolled in this study, including 690 in total ICU. The mean (±standard deviation) age of patients was 68.88 ± 19.05 and 54 % of them were male. The mean first day APACHE II scores was 20.09 ± 8.79. The mean APACHE II and SOFA scores conducted day were 18.20 ± 8.69 and 6.14 ± 3.8 respectively. The ICU's mortality rate was 46.3 %, and mean predicted mortality was 37.2 % for APACHE II. The

standardized mortality ratio was 1.28 (95 % CI 1.21–1.31). The mean unadjusted length of ICU stay was 21.10 (median: 8), varied from 1 to 872 days.
CONCLUSIONS. Our results was based on subset consisting of 690 ICU's admissions for the time period in our database. There was a wide difference in outcome for patients admitted to different ICU's, severity of illness using risk adjustment methods. In addition, the high mortality rate in patients that are mechanically ventilated could be related to comorbid diseases, high infection rates and older ages.
REFERENCES. 1. Knaus WA, et al. Crit Care Med. 1985;13:818–29. 2. Markgraf R, et al. Crit Care. 2001;5:31–6. 3. Rothen HU, et al. Intensive Care Med. 2007; 33:1329–36. 4. Ferreira FL, et al. JAMA. 2001;286:1754–58.

0254
PREOPERATIVE ANEMIA AND POLYCYTHEMIA ARE ASSOCIATED WITH A HIGHER IN-HOSPITAL MORTALITY IN NON-CARDIAC SURGERY PATIENTS

D.M. Baron[1], H. Hochrieser[2], B. Metnitz[3], A. Rhodes[4], R.P. Moreno[5], R.M. Pearse[6], P. Metnitz[1], on behalf of the EuSOS Investigators

[1]Medical University of Vienna, Department of Anesthesia, General Intensive Care and Pain Management, Vienna, Austria, [2]Medical University of Vienna, Center for Medical Statistics, Informatics, and Intelligent Systems, Vienna, Austria, [3]Austrian Center for Documentation and Quality Management in Intensive Care Medicine, Vienna, Austria, [4]St Georges Healthcare NHS Trust and St Georges University of London, St Georges Hospital, Intensive Care Medicine, London, UK, [5]UCINC, Hospital de São José, Centro Hospitalar de Lisboa Central, EPE, Lisbon, Portugal, [6]Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, UK

INTRODUCTION. Preoperative anemia is associated with adverse outcomes after cardiac surgery. Postoperative outcomes in patients undergoing non-cardiac surgery are less well established.
OBJECTIVES. We evaluated the effect of preoperative anemia on in-hospital morbidity and mortality in patients undergoing major non-cardiac surgery using data from the European Surgical Outcomes Study.
METHODS. Patients of this 7-day cohort study were enrolled in April 2011. Consecutive patients aged 16 years and older undergoing inpatient non-cardiac surgery in 498 hospitals across 28 European nations were included and followed up for a maximum of 60 days. The primary endpoint was in-hospital mortality. Secondary outcome measures were admission to intensive care (ICU), use of mechanical ventilation, and initiation of inotropes or vasopressors within 24 h after surgery. Anemia was defined as mild (hemoglobin (Hb) 11–12.99 g/dl in men and 10–11.99 g/dl in women) or moderate/severe (Hb $<$ 11 g/dl in men and $<$10 g/dl in women). Similarly, polycythemia was defined as mild (Hb 17–18.49 g/dl in men and 16–17.49 g/dl in women) or moderate/severe (Hb $\geq$ 18.5 g/dl in men and $\geq$17.5 g/dl in women). A χ^2 test was used to compare categorical variables, with a p-value $<$0.05 considered as significant.
RESULTS. We enrolled 46,539 patients in the study. Due to missing values, 11,028 patients were excluded from analysis. From the 35,511 patients analyzed, 17,973 (50.6 %) were women. Preoperative anemia was present in 5,564 (31.7 %) male and in 4,868 (27.1 %) female patients, whereas preoperative polycythemia was detected in 332 (1.9 %) male and in 173 (1.0 %) female patients. In-hospital mortality was 3.4 % in men and 3.1 % in women. Preoperative anemia and polycythemia were associated with higher in-hospital mortality. Following surgery, 1,806 (10.3 %) men and 1,208 (6.7 %) women were admitted to ICU. Patients with preoperative anemia or polycythemia were more frequently admitted to ICU than those with normal Hb concentrations. Preoperative anemia and polycythemia were associated with an increased used of invasive mechanical ventilation as well as inotropes or vasopressors within 24 h after surgery.

Mortality and intensive care outcomes in men

Men	Anemia		Normal	Polycythemia	
	Moderate/severe	Mild		Mild	Moderate/severe
Total patients (n)	2,408	3,156	11,642	315	17
In-hospital mortality	9.2 %	3.8 %	2.2 %	1.0 %	5.9 %
Admitted to ICU	24.7 %	12.6 %	6.7 %	8.6 %	11.8 %
Mechanical ventilation	14.6 %	5.8 %	2.2 %	4.1 %	11.8 %
Inotropes/ vasopressors	11.7 %	5.2 %	1.8 %	2.5 %	11.8 %

Mortality and intensive care outcomes in women

Women	Anemia		Normal	Polycythemia	
	Moderate/severe	Mild		Mild	Moderate/severe
Total patients (n)	1,333	3,535	12,932	154	19
In-hospital mortality	9.0 %	4.2 %	2.2 %	3.9 %	0 %
Admitted to ICU	20.0 %	10.4 %	4.4 %	4.6 %	15.8 %
Mechanical ventilation	10.8 %	4.6 %	1.4 %	2.0 %	5.3 %
Inotropes/ vasopressors	8.3 %	4.1 %	1.2 %	3.3 %	15.8 %

CONCLUSIONS. This study has shown that preoperative anemia and polycythemia are associated with worse outcomes in patients undergoing non-cardiac surgery.
REFERENCES. 1. Musallam KM et al. Lancet. 2011;378:1396–407. 2. Pearse RM et al. Lancet. 2012;380:1059–65.
GRANT ACKNOWLEDGMENT. European Society of Intensive Care Medicine and European Society of Anaesthesiology.

0255
EARLY RISK FACTORS FOR NON-SURVIVAL IN DROWNING VICTIMS IN CRITICALLY ILL PATIENTS

E. Assink-de Jong[1], M.R. Douma[1], R.H. Driessen[1], M.C. de Waard[1], A. Beishuizen[1], A.R.J. Girbes[1]

[1]VU University Medical Center, Intensive Care, Amsterdam, The Netherlands

INTRODUCTION. Drowning is defined as the process of primary respiratory impairment from submersion or immersion in a liquid medium. Worldwide drowning accounts for approximately 500,000 deaths per year.[1] Although the advances in critical care continue, morbidity and mortality in drowning victims remains high.
OBJECTIVES. The aim of this study was to evaluate the early risk factors for non-survival and the influence of several clinical variables in near drowning victims admitted to the intensive care unit.
METHODS. A retrospective observational study was done to analyse all drowning patients admitted to our adult Intensive Care Unit of the VU University medical center Amsterdam from February 2001 until June 2012. Patients were traced using computerized queries of the patient data management system (MetaVision®, Tel Aviv, Israel). Patient records were reviewed for demographics, severity of disease (APACHE II), drowning data, clinical and diagnostic tests, treatment and outcome. Patients were classified into two groups: survival and non-survival during hospital admission. All tests were two-sided and P-value $<$0.05 was considered statistically significant.
RESULTS. Forty nine patients were retrieved and analysed. The in hospital mortality rate was 39 % (19 patients died). Patients who survived were significantly younger of age (33 [23–51] vs 51 [33–72] years; $P < 0.05$). Patients who did not survive showed on admission a lower base-line pH-value compared with survivors (6.72 $\pm$ 0.31 vs 7.07 $\pm$ 0.26; $P < 0.0001$) and a higher lactate level (17.5 [9.9–27.8] vs. 9.0 [3.0–15.3] mmol/l; $P < 0.001$). On arrival in the ER a lower body temperature was observed in the non-survivors vs survivors (31.8 °C [29.8–32.9] vs 33.3 °C [31.0–35.6]; $P < 0.05$). Ninety percent of the non-survivors suffered from a post-drowning cardiac arrest vs 52 % of the survivors. ($P < 0.01$). Furthermore non-survival was accompanied by a higher need for mechanical ventilation (100 vs 76 %; $P < 0.05$). Patients with a high APACHE II-score and a high SOFA-score on day 1 and 2 of admission showed a significant higher mortality.
CONCLUSIONS. Our cohort of adult drowning victims is characterized by a high mortality rate reflecting the severity of a drowning incident. By univariate analysis we identified prominent early risk factors for non-survival in a drowning accident. These were old age, a low base-line pH, a high level of lactate on arrival in the ER, cardiac arrest and the need for mechanical ventilation. A lower body temperature did not seem to have a protective role in case of survival.
REFERENCE(S) Peden M, McGee K, Sharma K. The injury chart book: a graphical overview of the global burden of injuries. Geneva: World Health Organization; 2002.

Patient characteristics

	Non-survival	Survival	p-value
Patients	19 (39 %)	30 (61 %)	
Age	51 [33–72]	33 [23–51]	$<$0.05
Gender (male)	17 (90 %)	25 (83 %)	0.69
BMI	24.5 [21.5–29.2]	24.7 [23.2–26.8]	0.75
Drowning			
Estimated duration (min)	12.3 $\pm$ 7.6	8.8 $\pm$ 7.5	0.20
Fresh water (opposed to brackish or salt)	15 (94 %)	23 (100 %)	0.41
Canal water	3 (50 %)	5 (39 %)	1.00

Findings and treatment

Findings on admission	Non-survival	Survival	P-value
Bodytemperature (°C)	31.8 [29.8–32.9]	33.3 [31.0–35.6]	$<$0.05
Cardiac arrest	17 (90 %)	13 (52 %)	$<$0.01
pH	6.72 $\pm$ 0.31	7.07 $\pm$ 0.26	$<$0.0001
Lactate (mmol/l)	17.5 [9.9–27.8]	9.0 [3.0–15.3]	$<$0.001
Treatment			
Mechanical ventilation	19 (100 %)	22 (76 %)	$<$0.05
Inotropic therapy on admission	16 (84 %)	21 (70 %)	0.32
CVVH during admission	5 (31 %)	4 (15 %)	0.27

0256
ELEVATED C-REACTIVE PROTEIN LEVELS AT ICU DISCHARGE AS PREDICTOR OF ICU-READMISSION AND IN-HOSPITAL MORTALITY IN PATIENTS WITH A PROLONGED ICU STAY

S.S. Gulcher[1], N.A. Bruins[1], W.P. Kingma[1], M.J. Schultz[2], E.C. Boerma[1]

[1]Medical Center Leeuwarden, Intensive Care Unit, Leeuwarden, The Netherlands, [2]Academic Medical Center, University of Amsterdam, Intensive Care Unit, Amsterdam, The Netherlands

INTRODUCTION. Before ICU discharge, an adequate patient-evaluation is needed to detect individuals as high risk for unfavorable outcome. A pro-inflammatory status may be a potential risk factor in this respect. Several studies have been performed to evaluate the use of C-reactive protein (CRP) as a marker of post ICU prognosis (1). Results are seemingly conflicting, but may be hampered by inadequate power for specific ICU populations.
OBJECTIVES. Aim of the study was to test the hypothesis that elevated CRP levels at ICU discharge are associated with increased risk of ICU readmission and in-hospital mortality in patients with a prolonged ICU-stay.
METHODS. A single center retrospective cohort study was performed in an 18-bed mixed medical/surgical ICU. Patients discharged alive from ICU with at least 48 h ICU length of stay were evaluated and divided in two levels of CRP at discharge: 'High CRP' ($\geq$75 mg/L) and 'low CRP' ($<$75 mg/L). Primary outcome was the difference in inverse outcome (ICU readmission and/or in-hospital mortality) between groups. Applicable tests for comparison

between groups were used. Multivariate logistic regression analysis was used to identify variables independently associated with inverse outcome.
RESULTS. Baseline characteristics are shown in Table 1. N = 998. Inverse outcome (readmission and mortality) was significantly higher in the 'high CRP' group in comparison to the 'low CRP' group, (17.9 % versus 10.1 %; = 0.001). Compared to the 'low CRP' group, patients in the 'high CRP' group had a readmission rate of 13.1 % versus 7.4 %; p = 0.003. The post ICU mortality rate in the 'high CRP' group was 6.9 %, respectively 4.7 % in the 'low CRP'; p = 0.13. Hospital mortality in patients readmitted to the ICU was significantly higher than in the non-readmitted patients (20 % versus 4.3 %; p < 0.001). In a multivariate analysis CRP at discharge ≥75 had an odds ratio for inverse outcome of 1.7 [1.1–2.5], p = 0.01.

Table 1 Baseline characteristics

	All (n = 998)	'High CRP' (n = 375	'Low CRP' (n = 623)	P-value
Age, years	66 [56–75]	66 [56–75]	66 [56–75]	0.35
Male sex (%)	62 %	61 %	62 %	0.92
APACHE II score admission	19 [15–24]	18 [14–22]	19 [15–25]	<0.001
Predicted mortality on admission (%)	27 [12–53]	21 [10–41]	32 [14–57]	<0.001
SOFA croe admission	7.2 (2.9)	6.7 (2.9)	7.5 (2.9)	<0.001
CRP admission (mg/L)	66 [10–178]	57 [7–170)	72 [15–180]	0.05
Medical admission type (%)	43 %	31 %	50 %	<0.001
Planned surgical admission type (%)	31 %	42 %	25 %	<0.001
Urgent surgical admission type (%)	26 %	27 %	25 %	<0.001

CONCLUSIONS. A high CRP concentration (≥75 mg/L) within 24 h before ICU discharge is associated with a higher risk of inverse post-ICU outcome.
REFERENCE(S) Ho et al. C-reactive protein concentration as a predictor of in-hospital mortality after ICU discharge: a prospective cohort study. Intensive Care Med. 2008, 34(3):481–7.

0257
DIFFERENT DOSES OF ANTI-INFLAMMATORY LIPIDS WHEN TREATING PATIENTS WITH SYSTEMIC INFLAMMATION ARE ASSOCIATED WITH SIGNIFICANT DIFFERENCES IN CLINICAL OUTCOMES

F.E. Mendonça-Neto[1], A. Pontes-Arruda[1], B. Furtado-Lima[1], L.G. de Castro[1], J.H. Militão[1], V.D.A. do Ceará[1], H. Monte-Coelho Neto[1], A.P. Lima[1], A.P. Magalhães-Júnior[1], D. Guimarães[1], H.P. Moreira[1]

[1]Christus University Center, School of Medicine, Fortaleza, Brazil
INTRODUCTION. Clinical trials have reported the effects associated with the use of anti-inflammatory lipids in the treatment of patients suffering from systemic inflammatory diseases such as sepsis, ALI and ARDS [1–7], however they are not unanimous in their findings. Some published trials demonstrated improvement in several outcomes such as intensive care days, mechanical ventilation days, reduction in the development of new organ dysfunctions and reduction in the 28-days all-cause mortality, while others were unable to demonstrate such benefits.
OBJECTIVES. To conduct a systematic analysis of the doses of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), the two main pharmaconutrients of fish oil, used in clinical trials performed in the in critically ill population of patients and their association with the reported differences in clinical outcomes.
METHODS. Searches of MEDLINE, EMBASE, Cochrane, and NIH databases were performed. Differences in the doses of EPA and DHA were assessed using the Chi-square test, or Fisher's exact test if appropriate. All p values were two-tailed. A p < 0.05 was considered statistically significant. All computations were performed using SAS v. 8.2 software (SAS Institute, Cary, NC, USA).
RESULTS. Seven studies were included in this systematic analysis (n = 1,048 patients). Significant differences were observed in terms of overall fatty acid intake when comparing the four positive studies [1–3.5] with the three negative trials [4, 6–7]. Main level of EPA administered in the positive studies was 5.45 g/day whereas this was much higher (8.06 g/day) in the negative trials (p = 0.03). The mean administered intake of DHA was 2.4 g/day for the positive trials and 4.5 g/day for the negative trials.
CONCLUSIONS. Published clinical trials performed so far with anti-inflammatory lipids showing negative results were also associated with significantly higher doses of EPA and DHA. Since elevated doses of these lipids may lead to immunosuppression these differences in the fatty acid intake may help explain potential differences observed in terms of clinical outcomes in the published literature.
REFERENCE(S) 1. Gadek J et al. Crit Care Med. 1999;27:1409–20. 2. Singer P et al. Crit Care Med. 2006;34:1033–8. 3. Pontes-Arruda A et al. Crit Care Med. 2006;34:2325–33. 4. Grau-Carmona T et al. Clin Nutr. 2011;30:578–84. 5. Pontes-Arruda et al. Crit Care. 2011;15:R144–R158. 6. Stapleton RD et al. Crit Care Med. 2011;39:1655–62. 7. Rice TW et al. JAMA. 2011;306:1574–81.

0258
APACHE II, APACHE IV, AND SAPS II SCORE: WHICH SCORE SHOULD BE USED AS A BENCHMARKING IN CRITICALLY ILL TRAUMA PATIENTS?

A. Hasanin[1], A. Eladawy[1], S. Farouk[1], H. Mostafa[1], A. Lofty[1], R. Magdy[1], M. Aly[1], M. Khaled[1], M. Farrag[1], A. Mukhtar[1]

[1]Cairo University, Department of Anesthesia and Critical Care Medicine, Cairo, Egypt
INTRODUCTION. Benchmarking and quality control program are considered nowadays the standard of care in the management of critically ill patients. Acute Physiology and Chronic Health Evaluation (APACHE) II has been proven to be a useful predictor in critically ill injured patients. More recently, APACHE IV and Simplified Acute Physiology Score (SAPS) II were developed for benchmarking ICU performance.
OBJECTIVES. Is to compare the ability of APACHE II, APACHE IV, and SAPS II score in outcome prediction in a prospective cohort of critically ill trauma patients.
METHODS. The study was conducted in surgical trauma adult intensive care at a tertiary care center. All patients admitted to ICU from January 2012 to March 2013 were enrolled in the study. The area under the receiver operating characteristic curve (AUROC) was used to determine the predictive value of each score. The observed mortality rates were compared with predicted mortality rates for all scoring systems and standardized mortality ratio (SMR) was determined.
RESULTS. 163 patients were available for analysis. The overall mortality observed was 54 (33 %). APACHE IV was the best predictor of mortality; AUROC 0.79, 95 % CI (0.72–0.87) versus AUROC 0.72, 95 % CI (0.69–0.85) for APACHE II, and AUROC 0.75, 95 % CI (0.68–0.823) for SAPS II score. The predicted mortality of APACHE IV score was significantly less than APACHE II and SAPS II score; 5 (3–13 %), 26 (15–39 %), 11 (3–26 %) respectively p < 0.001. The mean SMR for APACHE IV score was 2.2 versus 1.1 for APACHE II and 1.7 for SAPS II score. In sub-group of patients with head injury, AUROC for APACHE IV was 0.91 versus 0.77 for APACHE II and 0.825 for SAPS II score.
CONCLUSIONS. APACHE IV is better in predicting mortality outcome in critically ill trauma patients than APACHE II and SAPS II scores. Using APACHE II score benchmarking may over estimate the ICU performance.

0259
OUTCOMES FROM LAPAROTOMY AND CRITICAL CARE WORKLOAD WITH OR WITHOUT PERIOPERATIVE ADMISSION TO THE CRITICAL CARE UNIT

S. Churchill[1], M.B. Muthuswamy[2]

[1]Royal Gwent Hospital, Dept of Anaesthesia & Intensive Care Medicine, Newport, UK, [2]Royal Gwent Hospital, Dept of Anaesthetics & Intensive Care Medicine, Newport, UK
INTRODUCTION. Laparotomies are one of the commonest high-risk surgeries routinely performed in acute hospitals. The mortality rate for this group exceeds that of cardiac surgical patients and consumes significant critical care resources (1). There is clearly a need to improve their outcomes which might stretch resources.
OBJECTIVES. Our hospital has one of the lowest critical care unit (CCU) capacities across the UK (2.5/100,000 population) and some of the highest DTOCs (delayed transfers of care), 68 % of all our admissions were DTOCs—938 lost days/year. We also have one of the lowest elective admission rates, 10–15 %, partly due to hesitancy for bed-booking for fear of cancellations from a lack of critical care capacity. We set out to find the CCU admission rates for these patients having laparotomies (elective and emergency) across surgical subspecialties (general surgery, urology, vascular and gynae-oncology) and compare their mortality with or without CCU admission. We were also interested to find the incidence of AKI (Acute Kidney Injury) using this as a surrogate marker for the presence of any acute organ dysfunction postoperatively. We also analysed the workload of the critical care outreach team to see if lower elective admissions might mean more work at a later day.
METHODS. We used the theatre database to identify all eligible patients to be included in the study and collected data over a month, November 2012. We prospectively followed them up for up to 60 days.
RESULTS. There were 73 patients included in the study, 26 of them having elective and 47 having emergency laparotomies, the majority being general surgeries (53 %). The mean age of these patients were 70 years, but was 76, 80 and 83 years for patients developing AKI, who were still in-patients and who died, respectively. The CCU admission rate was 10 % for elective surgeries but more than half of all emergency laparotomies were admitted to CCU. The mean CCU length of stay was 10 days. The 60-day mortality rate was 4 % overall but 13.6 % for emergency general surgeries, the biggest subgroup (30 % of all laparotomies). The incidence of AKI was >50 % for Urology patients but 16 % in non-Urological surgeries, 2/3rds of who were admitted to the CCU and 1/3rd went to the ward postoperatively. None of the patients who ended up in the ward postoperatively triggered an outreach referral/CCU admission later.
CONCLUSIONS. This study pointed out that the elective CCU admission rate was indeed low in our hospital at 10 %, but it did not translate to increased referrals to critical care later. The incidence of AKI was higher in Urology but it probably reflects the nature of the disease and the area of surgery. All the patients who developed AKI in the wards were probably managed well as they did not end up in the CCU after.
REFERENCE(S) 1. The Royal College of Surgeons of England. The higher risk general surgical patient: towards improved care for a forgotten group. http://www.rcseng.ac.uk.

0260
PREDICTORS OF NEUROLOGICAL OUTCOME IN PATIENTS WITH THERAPEUTIC HYPOTHERMIA

L.K. Gupta[1,2], D. Gupta[3], A. Gupta[4], K. Hassan[5]

[1]Regional Medical Center of San Jose, Hospitalist/Intensivist Group, San Jose, USA, [2]Geisinger Medical Center, Department of Critical Care, Danville, USA, [3]UCLA, Los Angeles, USA, [4]Harker, San Jose, USA, [5]Regional Medical Center of San Jose, Intensivist, San Jose, USA
INTRODUCTION. Mild therapeutic hypothermia (MTH) increases survival and improves neurological outcome in post cardiac arrest (CA) patients after successful resuscitation. Prognostication in patients with CA who have received MTH is very complicated. Acute Physiology and Chronic Health Evaluation (APACHE) IV is a successful scoring system for assessing the severity of illness and prognosis of ICU patients and has been validated for mortality outcome. We tried to assess APACHE IV scores and other factors like early induction time, time to target temperature, presence of Co-morbidities, Neuron Specific Enolase (NSE) levels, Electrolyte imbalances, EEG abnormalities and complications arising from MTH which may likely influence the patient's outcome.
OBJECTIVES. The objective of this study was to validate and to assess the performance of APACHE IV benchmark for patients admitted with cardiac arrest receiving MTH. We aimed to evaluate the accuracy of APACHE IV score in predicting mortality, ICU Length Of Stay (LOS) and Hospital LOS. This study also investigated the pattern of electrolyte abnormalities, coagulopathy, seizures and other variables and observed for their association with survival outcome.
METHODS. This is a retrospective data analysis of 77 Post-CA patients admitted in a tertiary care medical–surgical 34 bed ICU from Jan 2009–April 2013 who received MTH using inner-cool catheter. They were treated based on standard MTH protocol. The MTH protocol aiming at a target temperature of 33.0 °C, maintained for 24 h and then gradually re-warmed at a rate of ~0.5 °C/h. NSE was measured at 24, 48 and 72 h. Mortality and

neurological outcome were evaluated by Pittsburg Cerebral Performance Score (CPC) at the time of discharge.
RESULTS. 77 patients were included in the study with an average age of 62 years, of which 72 % were male and 28 % were females with observed mortality of 54 %. Among the 77 patients, 46 % survived and they were correlated with the APACHE IV and CPC score. Core target temperatures were reached at an average of 150 min. There was no significant difference in Observed Mortality Rates when compared with Predicted Mortality Rates or in Observed LOS from data review and Predicted LOS from APACHE IV scoring systems.
CONCLUSIONS. The present study demonstrates that the APACHE IV system performs accurately in our patients with MTH and can be utilized in predicting mortality and LOS in our population.
REFERENCE(S) 1. Zimmerman JE, et al. Crit Care Med. 2006;34:1297–1310. 2. Kherallah M, et al. Chest. 2008;134:112003S.

Cardiac arrest & therapeutic hypothermia: 0261–0274

0261
SURVEY ON CURRENT PRACTICES FOR NEUROLOGICAL PROGNOSTICATION AFTER CARDIAC ARREST

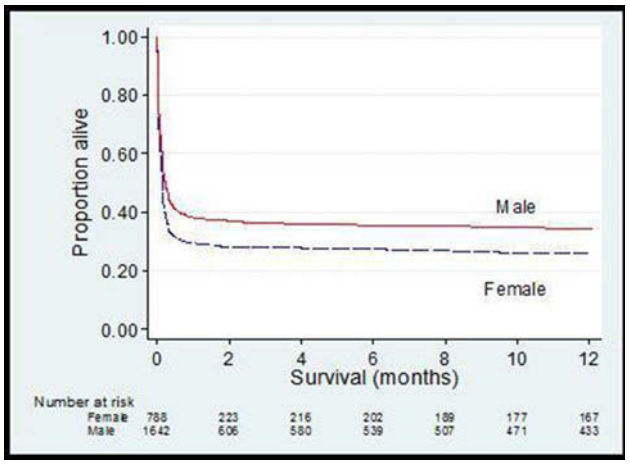
H. Friberg[1], T. Cronberg[1], M. Dünser[2], J. Duranteau[3], J. Horn[4], M. Oddo[5]

[1]Lund University, Lund, Sweden, [2]Salzburg General Hospital and Paracelsus Private Medical University, Salzburg, Austria, [3]Hôpital de Bicêtre, Le Kremlin-Bicêtre, Paris, France, [4]Academisch Medisch Centrum, Amsterdam, The Netherlands, [5]Lausanne University Hospital, Lausanne, Switzerland
INTRODUCTION. Guidelines for coma prognostication after cardiac arrest are not clearly defined and current practices differ substantially between and within countries, and between hospitals. In addition, therapeutic temperature management and sedation alter prognostic accuracy, thereby further complicating prognostic assessment.
OBJECTIVES. The aim of this survey was to investigate the current practice and timing of neurological prognostication in comatose cardiac arrest patients in European ICUs.
METHODS. An anonymous questionnaire with a total of 27 questions was distributed to ESICM members during September and October 2012. Questions were divided in three categories; background data (10 questions), clinical data (11 questions) and decision-making and consequences (6 questions).
RESULTS. A total of 1,025 respondents answered the survey with highest participation from the UK, France and Switzerland and with 20 % of respondents practicing outside of Europe. The compliance among the respondents was good with almost all questionnaires (>90 %) being complete. Overall, 22 % answered that they had national recommendations, with the highest percentage (>80 %) in the Netherlands. Concerning hypothermia utilization, 61 % of the respondents claimed to use it for a majority of comatose patients, 15 % for a majority of ventricular fibrillation (VF)-patients, 13 % for a majority of out-of-hospital cardiac arrest patients with VF, and 11 % do not use hypothermia. Only 20 % of respondents declared having specific protocols for neurological prognostication in patients receiving hypothermia. The large majority of respondents (79 %) recognized that neurological examination is not enough to predict outcome. Consequently, 76 % used additional tools for coma prognostication, intermittent EEG, CT-scan and evoked potentials being the most common ones. Poor prognosis was defined as cerebral performance category (CPC) 3–5 by 58 % and as CPC 4–5 by 39 % of respondents. There was significant variability regarding withdrawal of care: when prognosis was considered to be poor, 73 % of respondents actively withdraw care, while 20 % still would not stop care; 7 % did not know.
CONCLUSIONS. National recommendations for prognostication after cardiac arrest are rare and few physicians (20 %) use specific protocols to prognosticate neurological outcome in patients treated with hypothermia after cardiac arrest. Most respondents consider a neurological examination insufficient to predict outcome and that additional tools are necessary; EEG, CT and evoked potentials are the ones most commonly used. Uncertainty regarding neurological prognostication and decisions on level of care is significant among ICU-physicians.
GRANT ACKNOWLEDGMENT. This survey was endorsed by the ESICM.

0262
WOMEN WITH OUT-OF-HOSPITAL CARDIAC ARREST ARE LESS LIKELY TO RECEIVE THERAPEUTIC HYPOTHERMIA AND MORE LIKELY TO DIE THAN MEN: SWEDISH NATIONWIDE COHORT STUDY

M. Banck[1], U. Heller[2], C. Samuelsson[1], C.-J. Wickerts[3], F. Sjöberg[4], S. Walther[2], on behalf of the Swedish Intensive Care Registry

[1]Hallands Hospital Halmstad, Department of Anaesthesia and Intensive Care, Hamstad, Sweden, [2]Linköping University, Department of Medicine and Health, Division of Cardiovascular Medicine, Linköping, Sweden, [3]Danderyd Hospital and Karolinska Institutet, Division of Anaesthesia and Intensive Care and Department of Clinical Sciences, Stockholm, Sweden, [4]Linköping University, Department of Clinical and Experimental Medicine, Linköping, Sweden
INTRODUCTION. Therapeutic hypothermia (TH) for neuroprotection after cardiac arrest is widely practiced today. Gender inequity has previously been documented in cardiac care.
OBJECTIVE. To examine survival and use of TH following out-of-hospital cardiac arrest with special reference to gender equity.
METHODS. The Swedish Intensive Care Registry (http://www.icuregswe.org) was examined to identify cases with out-of-hospital cardiac arrest during 2008–2012 using the following two criteria:
(1) location prior to ICU-admission being the hospital emergency room.
(2) principal ICU-diagnosis being cardiac arrest. The use of TH, the association between TH and survival and the association between gender and survival were investigated using multivariable logistic regression.
Adjusted results were controlled for the influence of age, gender, SAPS3 probability of death, cerebral responsiveness on admission and presence of co-morbidities.
RESULTS. We identified 2,350 admissions with out-of-hospital cardiac arrest, out of which 43.7 % received TH. The use of TH was associated with improved 30-day survival: crude odds ratio (OR) 1.92 (95 % CI 1.63–2.28) adjusted OR 2.29 (1.87–2.80). Male gender was associated with an increased likelihood of receiving TH: crude OR 1.62 (1.36–1.93), adjusted OR 1.67 (1.40–2.01) and with an increased 30 day survival rate: crude OR 1.47 (1.23–1.77), adjusted OR 1.36 (1.10–1.68).



Survival after out-of-hospital cardiac arrest

CONCLUSIONS. Our study indicates that therapeutic hypothermia was associated with increased survival in patients with out-of-hospital cardiac arrest and that therapeutic hypothermia was inequitably used in Sweden with respect to gender. When severity of illness and age were controlled for, female gender appeared independently associated with less use of therapeutic hypothermia. The improved survival in men indicates undertreatment in women, which may be a consequence of gender bias.
GRANT ACKNOWLEDGMENT. The Swedish Intensive Care Registry is partly funded by grants from the Executive Committee of Swedish Quality Registries.

0263
ANTIBIOTIC PROPHYLAXIS IS SUPERIOR TO SELECTIVE ANTIBIOTIC THERAPY IN PATIENTS TREATED WITH THERAPEUTIC HYPOTHERMIA AFTER OUT-OF-HOSPITAL CARDIAC ARREST

D. Bongaerts[1], B. Hendriks[1], B. Gordts[2], M. Malbrain[3], P. Rogiers[1], R. Nieuwendijk[1]

[1]ZNA Middelheim, Intensive Care, Antwerpen, Belgium, [2]ZNA Middelheim, Microbiology, Antwerpen, Belgium, [3]ZNA Stuivenberg, Intensive Care, Antwerpen, Belgium
INTRODUCTION. Therapeutic hypothermia (TH) has become the standard of care in the management of out-of-hospital cardiac arrest (OHCA). Pneumonia is very common after OHCA possibly related to aspiration prior to hospital admission. TH reduces the immunity and increases the risk of infection without the classical signs of infection delaying the start in antibiotic therapy.
OBJECTIVES. The aim of our study was to determine a possible benefit of antibiotic prophylaxis in OHCA-patients versus presumptive clinical diagnosis of pneumonia before initiating empirical antibiotic treatment.
METHODS. A prospective interventional study in a 36-bed ICU of a tertiary hospital. 27 out of 36 OHCA-patients during a 4 month period were randomized in a prophylactic (PA; $n = 10$) and a therapeutic antibiotic group (TA; $n = 17$). The PA group received amoxycillin-clavulanic acid or cefuroxim upon admission in the ICU (started within 6 h after admission). In the TA group empiric antibiotic therapy was started based on the presumptive clinical diagnosis of pneumonia (purulent endotracheal aspirate (ETA)/radiographic infiltrate in the lungs/fever/inflammatory biochemical parameters). The following variables were recorded: length of stay (LOS) ICU, LOS hospital, mortality, duration of ventilation (DV), C-reactive protein, procalcitonin serum levels and ETA cultures.
RESULTS. In-ICU mortality in the PA group was 40 vs 29.4 % in the TA group ($p = ns$). In the PA group DV and LOS hospital were significantly shorter (8.3 ± 6.9 vs 14.7 ± 8.9 days, $p < 0.05$; 16.2 ± 10.5 vs 29.6 ± 17.7 days; $p < 0.05$ resp) and a trend towards shorter LOS ICU was observed (9.7 ± 9.3 vs 18.4 ± 11.1 days; $p = 0.123$). In the survivors DV and LOS hospital were significantly shorter in the PA group (3.6 ± 2.1 vs 25.5 ± 9.3 days, $p < 0.05$; 15 ± 4.8 vs 36.3 ± 16.3 days, $p < 0.05$ resp) and a trend towards shorter LOS ICU was observed (12.5 ± 11.4 vs 20.4 ± 11.6 days, $p = 0.2$). In the TA group antibiotics were started after a mean of 3.4 ± 0.6 days. There were significantly less positive ETA cultures after 24 h in the PA group (10 vs 70 %; $p < 0.05$) and after >72 h (40 vs 88 %; $p = 0.06$). Modification of antibiotic therapy was more frequently needed in the TA group (40 vs 76.5 %; $p = 0.058$).
CONCLUSIONS. There was a reduction in duration of ventilation and LOS hospital in OHCA-patients receiving antibiotic prophylaxis. This may be caused by earlier effective antibiotic therapy. Pathogenic microorganisms were isolated less frequently in ETA cultures from PA patients and antibiotic regimens had to be adapted less frequently than in the TA patients. This may be due to a shorter duration of ventilation and less secondary infections in the PA group. A larger randomized study seems indicated.

0264
POST-ANOXIC SEIZURE IS AN INDEPENDENT RISK FACTOR OF EARLY-ONSET PNEUMONIA IN POST-CARDIAC PATIENTS TREATED WITH THERAPEUTIC HYPOTHERMIA

J.S. Cho[1], Y.S. Lim[1], J.H. Woo[1], J.H. Jang[1], H.C. An[1], H.J. Yang[1]

[1]Gachon University Gil Medical Center, Emergency and Critical Care Medicine, Incheon, Republic of Korea
INTRODUCTION. Pneumonia is a most common complication of post-cardiac arrest patients treated with therapeutic hypothermia (TH). However, there was few study about risk factors related to early-onset pneumonia in those patients.
OBJECTIVES. We investigated risk factors associated with the development of early-onset pneumonia within 7 days after admission in survivors of out-hospital cardiac arrest (OHCA) treated with TH.

METHODS. 123 patients receiving TH following OHCA between January 2008 and December 2010 were enrolled. Study populations were categorized as "pneumonia present" [P (+)] and "pneumonia absent" [P (−)] contingent upon the development of pneumonia during the first 7 days of admission. Risk factors related to the development of pneumonia and outcome were determined.
RESULTS. 59 patients (48.0 %) developed early-onset pneumonia and most common pathogen was MSSA. [P (+)] patients had lower APACHE II score (22 vs. 26, $p = 0.04$), longer duration of central venous catheter (8.85 vs. 5.14 days, $p < 0.001$), nasogastric tube (11.12 vs. 3.76 days, $p = 0.01$), mechanical ventilation (MV) (9.27 vs. 3.69 days, $p < 0.001$) and intensive care unit stay (9.99 vs. 4.99, $p < 0.001$) and, higher rate of enteral feeding (66.1 vs. 35.9 %, $p = 0.001$), tracheostomy (52.5 vs. 17.2 %, $p < 0.001$) and post-anoxic seizure (62.7 vs 39.1 %, $p = 0.01$). In multivariate logistic regression analyses, the occurrence of post-anoxic seizure (OR, 2.749; 95 % CI 1.059–7.136, $p = 0.038$) and the duration of MV (OR, 1.325; 95 % CI 1.154–1.522, $p < 0.001$) were independently associated with the development of pneumonia. The development of pneumonia had no significant association with mortality in survival analysis (log rank test, $p = 0.145$).
CONCLUSIONS. Post-anoxic seizure and prolonged MV were independently associated with the development of early-onset pneumonia. We should give more attention to the development of pneumonia in patients with post-anoxic seizure and provide prompt diagnosis and treatment.

0265
FACTORS ASSOCIATED WITH ACUTE KIDNEY INJURY IN PATIENTS AFTER CARDIAC ARREST TREATED WITH THERAPEUTIC HYPOTHERMIA

S.H. Kim[1], C.S. Yoon[1], K.N. Park[1], S.M. Choi[1]

[1]The Catholic University of Korea, Seoul St. Mary's Hospital, Emergency Department, Seoul, Republic of Korea

INTRODUCTION. Acute kidney injury (AKI) caused renal ischemic-reperfusion injury occurs in patients after cardiac arrest. AKI is a consistent and powerful predictor of in-hospital mortality, and is associated with an increase in hospital length of stay, hospital costs, and resource utilization. We investigate risk factors associated with AKI after cardiac arrest treated with TH.
OBJECTIVES AND METHODS. We performed an observational cohort study of patients aged more than 18 years, who were successfully resuscitated following cardiac arrest and treated with TH by our institutional protocol from March 1, 2009 to May 31, 2012. The patients who were previous end-stage renal disease or pre-existing AKI on renal replacement therapy, and have no available biochemical results within 12 h after cardiac arrest were excluded in this study. AKI was categorized using the peak and estimated baseline serum creatinine, into: (i) no AKI, (ii) risk of AKI, (iii) kidney injury, (iv) kidney failure; according to the RIFLE criteria.
RESULTS. 136 patients after cardiac arrest were treated with TH during study period. Among them 130 patients were included in the final analysis. 27 of 130 patients (20.7 %) had AKI class injury/failure during first 3 days of hospitalization after cardiac arrest. On multivariate binary logistic regression analysis, the event of cardiogenic shock (OR, 5.949, 95 % CI 1.401–25.271, $p = 0.016$), higher serum lactate level at 6 h (OR, 1.335, 95 % CI 1.023–1.744, $p = 0.034$) after ROSC and the cumulative dose of epinephrine during resuscitation (OR, 4.347, 95 % CI 1.040–18.164, $p = 0.044$) were independently associated with AKI.
CONCLUSIONS. The development of AKI after CA was associated with hemodynamic status during therapeutic hypothermia and serum lactate after ROSC. Theses associated risk factors for AKI after CA could be useful in clinical decision making, resources utilization, and outcome prediction.
REFERENCE(S) 1. Adler C, Reuter H, Seck C, Hellmich M, Zobel C: Fluid therapy and acute kidney injury in cardiogenic shock after cardiac arrest. Resuscitation. 2013;84(2):194–9. 2. Chua HR, Glassford N, Bellomo R. Acute kidney injury after cardiac arrest. Resuscitation. 2012;83(6):721–7. 3. Bellomo R, Ronco C, Kellum JA, Mehta RL, Palevsky P. Acute dialysis quality initiativew: acute renal failure—definition, outcome measures, animal models, fluid therapy and information technology needs. In: The Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group. Crit Care. 2004;8(4):R204–12. 4. Moore EM, Nichol AD, Bernard SA, Bellomo R. Therapeutic hypothermia: benefits, mechanisms and potential clinical applications in neurological, cardiac and kidney injury. Injury. 2011;42(9):843–54. 5. Mattana J, Singhal PC: Prevalence and determinants of acute renal failure following cardiopulmonary resuscitation. Arch Intern Med. 1993;153(2):235–9.

0266
COAGULATION EFFECTS OF MILD THERAPEUTIC HYPOTHERMIA IN POST CARDIAC ARREST PATIENTS

B.-L. ten Tusscher[1], A.C. Brinkman[1], M.C. de Waard[1], A.R. Girbes[1], A. Beishuizen[1]

[1]VU Medical Center, Intensive Care, Amsterdam, The Netherlands

INTRODUCTION. Mild therapeutic hypothermia (MTH) improves neurological outcome and survival in patients successfully resuscitated after cardiac arrest (CA), however the effect on coagulation is uncertain. Temperatures below 33 °C profoundly affect synthesis and kinetics of clotting enzymes, thrombin generation, plasminogen activator inhibitors and causes dysfunction of platelets. On the other hand ischemia–reperfusion leads to inflammation with concomitant activation of coagulation. Although externally cooled blood of healthy volunteers showed in vitro increasingly impaired clotting times (CT) with decreasing temperatures, in post CA patients treated with MTH only slightly prolonged CT at 32 °C was demonstrated. In both studies samples were analyzed at 37 °C, which may lead to underestimating possible coagulopathy.
OBJECTIVES. Investigate the effect of MTH on coagulation in post CA patients tested at the body (target) temperature of 32 °C and compared with baseline samples and measurements performed at 37 °C.
METHODS. 18 consecutive ICU patients after out-of-hospital CA of cardiac etiology treated with MTH were included after obtaining written informed consent. Coagulation was tested at 4 time-points during and after MTH using thromboelastography (ROTEM), a point-of-care test using whole blood assessing the viscoelastic properties of the blood clot during formation and lysis. Baseline blood samples, immediately collected upon ICU arrival, were analyzed at 37 °C. The second and third samples, were collected at target temperature (32 °C) and at the end of the cooling phase respectively. The last sample was drawn after rewarming when the patient returned to normal temperature.
RESULTS. Upon reaching target temperature Extem and Intem CT were significantly increased compared to baseline, with a further deterioration after 24 h of MTH. After rewarming Extem and Intem CT decrease below baseline values (figure 1). Maximum clot formation (MCF), in both Extem, Intem and Fibtem only mildly decreased when 32 °C was reached, which persisted after 24 h of hypothermia.
Extem and Intem CT measured at 32 °C compared to 37 °C was significantly elongated: 12.8 ± 1.6 s ($P < 0.001$) and 41.7 ± 10.1 s ($P = 0.001$) respectively. MCF shows only slightly thinner clot formation when analyzed at 32 °C compared to 37 °C. We did not observe any hyperfibrinolysis.

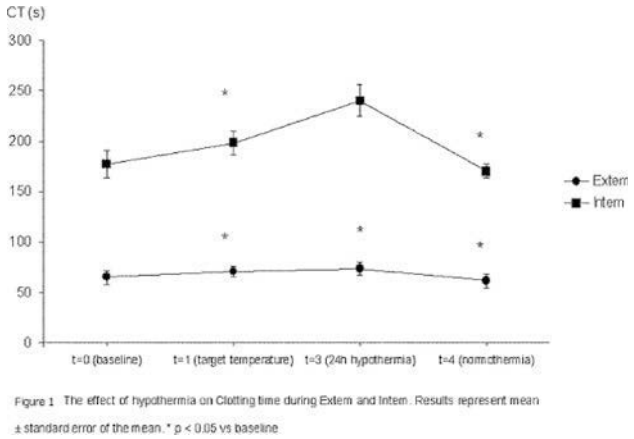


Figure 1 The effect of hypothermia on Clotting time during Extem and Intem. Results represent mean ± standard error of the mean. * p < 0.05 vs baseline

Fig. 1 The effect of hypothermia on clotting time during Extem and Intem. Results represent mean ± standard error of the mean. * $p < 0.05$ vs baseline

CONCLUSIONS. MTH clearly alters coagulation as measured by thromboelastography, especially clotting time. These alterations are underestimated when samples are analyzed at 37 °C instead of actual patient temperature. All observed CT and MCF values (both at 32 and 37 °C) remain within reference range. The effect of MTH on coagulation seems thereby negligible in post CA patients, possibly because the effect of MTH is counteracted by concomitant activation of coagulation caused by ischemia–reperfusion.

0267
A FIVE-YEAR RETROSPECTIVE REVIEW OF IMPLEMENTATION OF THERAPEUTIC HYPOTHERMIA FOLLOWING ADULT CARDIAC ARREST USING AN ENDOVASCULAR CLOSED LOOP TEMPERATURE CONTROL SYSTEM

T. Renninson[1], M. Barnard[2], B.N. Jordan[3], W. Jewell[4], J. Paddle[4], A. Bailey[5]

[1]North Bristol NHS Trust, Intensive Care, Bristol, UK, [2]Derriford Hospital, Intensive Care, Plymouth, UK, [3]North Bristol NHS Trust, Emergency Department, Bristol, UK, [4]Royal Cornwall Hospital, Intensive Care, Truro, UK, [5]University of Plymouth, Centre for Health and Environmental Statistics, Plymouth, UK

INTRODUCTION. We describe the 5-year experience of induction and maintenance of therapeutic hypothermia (TH) using the Alsius Coolguard™. TH improves outcome following out-of-hospital VF/VT cardiac arrest. It may also be beneficial for other rhythms or in-hospital cardiac arrest [1]. There is a paucity of evidence to indicate which cooling technique is preferable.
OBJECTIVES. To undertake a comparative analysis of Alsius Coolguard™ technology against other cooling methods with regard to temperature control (primary outcome) and 28 day mortality (secondary outcome).
METHODS. Adult patients receiving CPR and thermoregulation following cardiac arrest from 2006 to 2011 were identified using the ICNARC, ICU and Core database. Data were collated from case notes and ICU charts. Ethical approval was sought but not necessary.
RESULTS. 198 patients were identified (68.7 % male, median age: 67 years). 88.4 % suffered out-of-hospital cardiac arrest. 68.2 % were admitted to ICU. 74.8 % of these had TH. The Alsius Coolguard™ was used in 75.2 % of cases. The remainder were cooled using ice packs and cold saline. The median length of ICU stay was 3 days. All patient 28-day mortality was 74.7 %. 28-day mortality for the Alsius Coolguard™ group was 59 %. In the Alsius Coolguard™ group, 29.5 % had at least one documented temperature >38 °C during the rewarming phase compared with 45.5 % in others. In patients rewarmed at >0.5 °C per hour, 69.6 % had a temperature >38 °C during or immediately following rewarming, compared with 25 % if the rate was <0.5 °C per hour, Fisher exact $p = 0.0006$. Additional statistical analysis was performed examining primary and secondary outcomes using Fisher's exact tests and logistic regression analysis, but due to small size of sub-groups the analyses of these outcomes failed to reach statistical significance.
CONCLUSIONS. Our study confirms that the Alsius Coolguard™ is an effective means of instituting TH in cardiac arrest survivors. The Alsius Coolguard™ reduces incidence of pyrexia during or immediately after rewarming compared to simple techniques. This is clearly desirable as pyrexia 2–3 is known to associate with unfavourable outcome. We found that irrespective of cooling method, if the rewarming rate was >0.5 °C per hour then pyrexia was more likely.
REFERENCES. 1. Nolan JO, Morley PT, Vanden Hoek TL et al. Therapeutic hypothermia after cardiac arrest: an advisory statement by the advanced life support task force of ILCOR. Circulation. 2003;108:118–21. 2. Takasu A, Saitoh D, Kaneka N et al. Hyperthermia: is it an ominous after cardiac arrest? Resuscitation. 2001;49:273–7. 3. Zeiner A, Holzer M, Sterz F et al. Hyperthermia after cardiac arrest is associated with an unfavourable neurologic outcome. Arch Intern Med. 2001;161:2007–12.

0268
INSULIN SENSITIVITY IN OUT OF HOSPITAL CARDIAC ARREST PATIENTS TREATED WITH HYPOTHERMIA

F.S. Taccone[1], J.-C. Preiser[1], A. Sah Pri[2], G.M. Shaw[3], G. Chase[2], T. Desaive[4]

[1]Erasme University Hospital, Department of Intensive Care, Brussels, Belgium, [2]University of Canterbury, Center of Bioengineering, Mechanical Engineering, Christchurch, New Zealand, [3]Christchurch School of Medicine and Health Sciences, Department of Intensive Care, Christchurch, New Zealand, [4]Research Unit on Bioengineering and Biophysics, GIGA-Cardiovascular Sciences, Liege, Belgium

INTRODUCTION. Therapeutic hypothermia (TH) is widely recommended to treat out-of-hospital cardiac arrest (OHCA) patients; however, cooling may significantly contribute to worsen stress-induced hyperglycemia, which has been associated with poor outcome in this setting.

OBJECTIVES. This study analyzes insulin sensitivity (SI) profiles of OHCA patients undergoing TH to assess its impact on glucose metabolism.

METHODS. Clinically validated model-based SI was identified using data from 20 OHCA patients (total of 710 h of observation) admitted to the Christchurch Hospital ICU of Christchurch (New Zealand), immediately treated with TH after admission. Blood glucose (BG) control was provided using Specialised Relative Insulin-Nutrition Titration (SPRINT, targeting 4.0–6.1 mmol/L. Data was divided into TH period (≤35 °C) and normothermia after (>35 °C) periods. The impact on SI was assessed by: (1) median SI for each period; (2) per-patient median [IQR] SI area under the cumulative distribution function (CDF) curve (AUCi_SI), as a measure of the range of SI in each period; (3) area under the CDF of normalized hourly percentage changes in SI (AUCi_ %DSI) for each period, as a measure of hour-to-hour variability.

RESULTS. Patients had between 15 and 24 h in each temperature period and the two periods were contiguous. When in TH, patients had higher BG levels (6.1 [5.1–7.3] mmol/L) than in the normothermia phase (5.40 [4.7–6.2] mmol/L ($p < 0.05$). Median SI were 1.93×10^{-4} [$1.12 - 3.38 \times 10^{-4}$] and 3.60×10^{-4} [$2.12–6.48 \times 10^{-4}$] L/mU min, respectively ($p < 0.001$). Per-patient analysis showed a lower SI for TH than normothermia period (1.57×10^{-4} [$0.92 - 2.55 \times 10^{-4}$]vs. 3.11×10^{-4} [$2.17 - 4.90 \times 10^{-4}$] L/mU min) ($p < 0.001$). Per-patient AUCi_SI was 4.82×10^{-4} [$3.20 - 7.22$] $\times 10^{-4}$] in TH and 10.1×10^{-4} [$4.03 - 19.7 \times 10^{-4}$—$p < 0.05$) in the normothermia, whereas per-patient AUCi_ %DSI were 7.72 [3.92–12.64] and 3.34 [2.57–5.85] ($p < 0.001$), respectively.

CONCLUSIONS. OHCA patients treated with TH showed a higher resistance to insulin and had a higher hour–hour SI variability when compared to the normothermia phase. This would imply a greater need for insulin administration and more frequent changes in insulin dosing to maintain safe glycemic control and avoid hypoglycemia during cooling.

0269
NT-PROBNP IN POST-CARDIAC ARREST PATIENTS TREATED WITH MILD THERAPEUTIC HYPOTHERMIA

M.C. de Waard[1], B. Smit[1], A.M.E. Spoelstra de Man[1], A.R.J. Girbes[1]

[1]VU University Medical Centre, ICaR-VU, Department of Intensive Care, Amsterdam, The Netherlands

INTRODUCTION. Mild therapeutic hypothermia (MTH) is nowadays an established treatment to limit neurological injury and improve survival in patients who have been successfully resuscitated after cardiac arrest (CA). Despite the apparent appropriateness of MTH, the mortality rate remains high in patients with return of spontaneous circulation (ROSC) and full recovery is still as low as 6–23 % in survivors. There has not yet been an accurate, independent biomarker to reliably predict survival. B-type natriuretic peptide (BNP) was found to provide both prognostic and diagnostic value in various cardiovascular diseases, also for survival to hospital discharge in patients with ROSC. However, many studies showed NT-proBNP to be more stable and accurate than BNP.

OBJECTIVE. Measure NT-proBNP levels and its possible usefulness as a predictor of outcome in post-CA patients treated with MTH.

METHOD. NT-proBNP levels were measured in post-CA patients who were non-invasively cooled using body wraps (Medi-Therm®, Gaymar). Patients were treated according to a standard MTH protocol aiming at target temperature of 32.5 °C which was maintained for 24 h where after the patients were gradually re-warmed to normothermic temperature at a rate of ≤0.5 °C/h. Plasma samples were obtained before cooling was started, during the maintenance phase and at the end of re-warming. Patient characteristics were retrospectively collected from the patient data management system (Metavision, Tel Aviv, Israel).

RESULTS. 272 patients were admitted to the ICU after CA from 2008 to 2013. NT-proBNP levels were measured at baseline, before cooling started, in 229 patients and these patients were subsequently included in the analysis. Mean age was 63 ± 15 years, 72 % of the patients were male and 52 % of the patients survived to discharge. Baseline NT-proBNP levels were 3,305 ± 7,433 ng/l (mean ± SD), with a wide range from 6 to 70,000 ng/l and a median value of 812 ng/l (IQR = 224–2,883). NT-proBNP levels were independent of the phase of MTH. Apache II score, lactate and age were significantly higher and the incidence of VF as first detected rhythm and body temperature at admission were significantly lower in non-survivors in comparison to the survivors. Patients who died before discharge had significantly higher baseline, peak and delta NT-proBNP levels compared to survivors. After dividing the data in 4 groups of patients according to the quartiles of baseline NT-proBNP level, patients with highest NT-proBNP levels were more likely to die before discharge (table). No significant difference was observed in baseline cardiac Troponin T (cTnT) release between the groups.

CONCLUSION. High NT-proBNP plasma concentrations on admission are associated with high mortality in patients with ROSC after CA.

Patient characteristics and data

	Survivors	Non-survivors	P-value
VF, n (%)	97 (71)	54 (40)	<0.001
CVD, n (%)	56 (41)	59 (44)	ns
OHCA, n (%)	120 (88)	112 (83)	ns
Age (years)	59 ± 13	68 ± 15	<0.001
First temperature (°C)	35.1 ± 1.0	34.6 ± 1.2	<0.001
ApacheII score	29.5 ± 6.9	35.3 ± 6.9	<0.001
pH	7.29 ± 0.08	7.27 ± 0.12	ns
Lactate	2.66 ± 2.13	4.72 ± 3.88	<0.001

Data are mean ± SD, or number and percentages

NT-proBNP and cTnT data

	Survivors	Non-survivors	P-value
Baseline cTnT (ug/l)	1.227 ± 3.117	1.281 ± 3.144	ns
Baseline NT-proBNP (ng/l)	1,465 ± 2,936	5,260 ± 9,892	<0.001
Peak NT-proBNP (ng/l)	2,807 ± 4,295	7,779 ± 12,681	<0.001
Delta NT-proBNP (ng/l)	1,650 ± 2,736	3,678 ± 8,429	0.027
Q1 Baseline NT-proBNP (ng/l)	115 ± 59	91 ± 57	ns
Q2 Baseline NT-proBNP (ng/l)	438 ± 172	459 ± 138	ns
Q3 Baseline NT-proBNP (ng/l)	1,558 ± 580	1,744 ± 674	ns
Q4 Baseline NT-proBNP (ng/l)	6,678 ± 5,524	12,488 ± 13,239	0.022

Data are mean ± SD, or number and percentages
Baseline before start cooling, *peak* highest value, *delta* difference between highest and baseline value. *Q* quartile

0270
SURVIVORS AFTER CARDIAC ARREST AND HYPOTHERMIA TREATMENT-FUNCTION AND SATISFACTION IN THE FIRST 6 MONTHS

E. Wallin[1], I.-M. Larsson[1], M.-L. Kristoferzon[2], S. Rubertsson[1]

[1]Uppsala University, Department of Surgical Sciences, Anaesthesiology & Intensive Care, Uppsala, Sweden, [2]Faculty of Health and Occupational Studies, Department of Health and Caring Sciences, University of Gävle, Gävle, Sweden

INTRODUCTION. The purpose of resuscitation and subsequent hypothermia treatment is to regain the health the patient had before the cardiac arrest. The effect can be classified in different ways: survival, time of survival and quality of life (QoL) (1). The life after cardiac arrest survival are affected and described as severe fatigue, feelings of anxiety and/or depression, increased dependency in activity of daily life (ADL) and decreased QoL. (2) The aim of the study was to describe differences over time regarding functional outcome, physical and cognitive function of survivors after cardiac arrest treated with hypothermia and also to examine survivors' life satisfaction 6 months after cardiac arrest and gender differences.

OBJECTIVES. A prospective study including 40 cardiac arrest survivors admitted to three Swedish hospitals between 2008 and 2012.

METHODS. Participants were studied from intensive care unit discharge to one and 6 months after cardiac arrest. In addition to cerebral performance category (CPC), participants were asked to answer questionnaires regarding activities in daily life (Barthel Index), cognitive function (Mini Mental State Examination) and life satisfaction (LiSat-11).

RESULTS. At discharge from intensive care unit 9 (22.5 %) participants were defined with bad functional outcome (CPC 3–4). CPC improved over time and at 6 month all participants were estimated with good functional outcome (CPC 1–2). At 1 month participants were impaired but they improved over time in their activities in daily life and cognitive function. Satisfaction with "life as a whole" was seen in 72.5 %.

CONCLUSIONS. Cardiac arrest survivors are satisfied with life as a whole despite a severe illness which has impaired their physical and cognitive function but seemed to improve over time. To predict patients' functional outcome in early stages is difficult and cerebral performance category alone is not sufficient to assess patients function. The healthcare team needs to work interdisciplinary and furthermore get a consensus of the instruments that best can reflect physical and cognitive function to specify the rehabilitation.

REFERENCE(S) 1. Cummins RO, Chamberlain D, Hazinski MF, Nadkarni V, Kloeck W, Kramer E, et al. Recommended guidelines for reviewing, reporting, and conducting research on in-hospital resuscitation: the in-hospital 'Utstein style'. American Heart Association. Circulation. 1997;95(8):2213–39. PubMed PMID: 9133537. 2. Moulaert VR, Wachelder EM, Verbunt JA, Wade DT, van Heugten CM. Determinants of quality of life in survivors of cardiac arrest. J Rehabil Med. 2010;42(6):553–8. PubMed PMID: 20549160.

GRANT ACKNOWLEDGMENT. The authors thank the Department of Surgical Sciences, Anaesthesiology & Intensive Care, Uppsala University, for institutional grants and funds from The Uppsala University Hospital.

0271
THE DIFFERENCE BETWEEN TEMPERATURES MEASURED IN BLADDER AND OESOPHAGUS IN PATIENTS TREATED WITH MILD INDUCED HYPOTHERMIA

A. Markota[1], M. Palfy[2], A. Stožer[3], A. Sinkovič[1]

[1]University Medical Centre Maribor, Medical Intensive Care Unit, Maribor, Slovenia, [2]Medical Research Department, Maribor, Slovenia, [3]Faculty of Medicine, University of Maribor, Maribor, Slovenia

INTRODUCTION. Mild induced hypothermia (MIH) is an established treatment strategy for comatose survivors of cardiac arrest. The goal of the induction phase of mild induced hypothermia is to rapidly cool the patient's core body temperature to 32–34 °C. Despite widespread use of MIH it remains unclear what is the optimal method to measure body temperature [1].

OBJECTIVES. The main goal of this study was to compare the dynamics of temperature changes measured in oesophagus and urinary bladder in comatose adult survivors of cardiac arrest undergoing MIH.

METHODS. We performed a prospective study in a 12 bed adult medical intensive care unit in comatose adult survivors of nontraumatic cardiac arrest admitted from January to April 2012. The cooling technique was infusion of normal saline at a target rate of 100 ml/min, volume 30 ml/kg bodyweight and temperature 4 °C. Cold fluid infusion was terminated when the measured temperature from either of the probes reached 33.9 °C. Factorial repeated measures ANOVA was used to determine the effect of time and temperature probe position on temperature readings. Paired temperature readings from bladder and oesophageal probes were collected from 8 patients. Temperature readings were recorded every 5 min for 95 min (20 readings).

RESULTS. Target temperature was achieved in 33 ± 15 min in the oesophagus and in 63 ± 15 min in the bladder ($p = 0.006$). A significant main effect of time on temperature

readings ($F(1.80, 12.59) = 48.70$, $p < 0.001$) and of temperature probe position on temperature readings ($F(1, 7) = 38.04$, $p < 0.001$) was observed. The interaction effect between time and temperature probe position was also significant ($F(1.745, 12.22) = 4.47$, $p = 0.039$), indicating different trends in temperature readings depending on temperature probe position. Additionally there was a significant quadratic trend for differences between two measurement types ($F(1, 7) = 19.61$, $p = 0.003$), reflecting that temperature readings in the oesophagus decrease more quickly and stabilize sooner than temperatures measured in the bladder (Figure 1).

CONCLUSIONS. Our results indicate that oesophageal temperature measurements show a faster response rate compared to temperature measured in the bladder during the induction phase of MIH. We recommend that oesophagus and not the bladder be used as the primary site for temperature probe positioning during the induction phase of MIH.

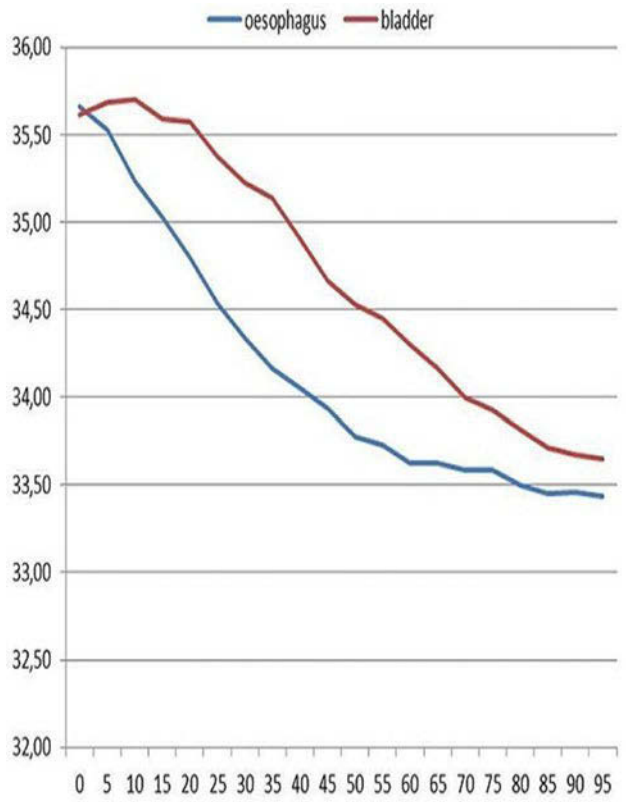


Figure 1

REFERENCE(S) 1. Deakin CD, Nolan JP, Soar J, et al. European Resuscitation Council Guidelines for Resuscitation 2010 Section 4. Adult advanced life support. Resuscitation. 2010;81:1305–52.

0272

EFFECTS OF MILD THERAPEUTIC HYPOTHERMIA ON ELECTROCARDIOGRAPHIC PARAMETERS AMONG POST-CARDIAC ARREST PATIENTS DUE TO ACUTE MYOCARDIAL INFARCTION

C.G. Sebastian[1], J. Elcano[1]

[1]The Medical City, Pasig, Philippines

BACKGROUND. Although therapeutic hypothermia has arisen as a key component in the post-cardiac arrest care, its potential detrimental effects should be considered such as its arrhythmogenic potential particularly among post-cardiac arrest patients secondary to myocardial infarction.

OBJECTIVES. The Mild Therapeutic Hypothermia (TH) in patients after cardiac arrest due to Acute Myocardial Infarction (THAMI) study assessed the safety and efficacy of TH in improving over-all hospital survival among post-cardiac arrest patients due to myocardial infarction (MI). This study evaluated the electrocardiographic and arrhythmogenic potential of TH among post-cardiac arrest patients due to acute MI using electrocardiographic parameters.

METHODS. This is a prospective cohort subanalysis of THAMI study involving post cardiac arrest MI patients from March to December 2012. A total of 22 patients (68 % male, mean age 64.34 ± 13), 12 underwent TH and 10 maintained on normothermia, were included. Measures of arrhythmogenic potential of TH was determined using electrocardiographic parameters such as heart rate, PR interval, QRS complex, QT interval, corrected QT (QTc), RR interval, P/QRS ratio, Osborn wave, and presence of arrhythmia.

RESULTS. Baseline clinical characteristics and demographics were not significantly different between the two groups. QTc prolongation in TH group showed a significant trend during TH (528 ± 12.2, p value = 0.03) compared to normothermia group. With regards to development of arrhythmia, no significant difference was noted between the two groups (p-values = 0.05–1.00). Comparison of p-values in TH group through time [baseline vs. 24 h (TH) vs. 48 h (rewarming) vs. 72 h] also showed no statistically significant difference [p-values of 1.00 (atrioventricular block, right bundle branch block, premature atrial conduction, junctional rhythm, ventricular fibrillation), 0.78 (atrial fibrillation, ventricular tachycardia), and 0.21 (premature ventricular conduction)].

CONCLUSIONS. This study showed significant QTc prolongation during TH but did not show any noteworthy tendency to develop hemodynamically significant arrhythmias among post cardiac arrest MI patients.

0273

SERUM PROCALCITONIN AND S-100B PROTEIN AS PREDICTORS OF THE NEUROLOGICAL OUTCOME IN POST-CARDIAC ARREST PATIENTS TREATED WITH THERAPEUTIC HYPOTHERMIA

Y.S. Lim[1], J.H. Jang[1], J.S. Cho[1], J.H. Woo[1], H.C. An[1], H.J. Yang[1]

[1]Gachon University Gil Medical Center, Emergency and Critical Care Medicine, Incheon, Republic of Korea

INTRODUCTION. Serum procalcitonin (PCT) and S-100B protein have been reported to be useful biomarkers in predicting neurological outcome of patients with return of spontaneous circulation (ROSC) after cardiac arrest (CA). However, there was no study which investigated both PCT and S-100B simultaneously in patients treated with therapeutic hypothermia (TH).

OBJECTIVES. To assess the time course and the prognostic value of serial serum PCT and S-100B in post-CA patients treated with TH.

METHODS. We performed a prospective cohort study during 2 years. Serum PCT, S-100B, CRP and WBC were measured at 0, 24, 48 and 72 h after ROSC and compared in patients with good (CPC 1–2) and bad (CPC 3–5) neurological outcome, assessed at 1 month with cerebral performance categories (CPC). ROC analyses for the prediction of a bad outcome and linear mixed effect model for repeat measurements were performed.

RESULTS. A total of 104 patients (30 patients with a good CPC and 74 patients with bad CPC) treated with TH were enrolled. Patients with a bad outcome had significantly higher both PCT and S-100B protein level at all time points than patients with good outcome. Serum PCT had a peak level at 24 h and S-100B had a peak level at 0 h after ROSC. There was significant group-by-time interaction for PCT ($p < 0.001$), but not for S-100B ($p = 0.304$). Serum PCT > 1.15 ng/ml at 72 h (AUC 0.827, sensitivity 74.1 %, specificity 84.6 %) and S-100B > 0.19 μg/dl at 24 h (AUC 0.930, sensitivity 73.2 %, specificity 100 %) were best cut off points for predicting a bad outcome. The combination of PCT and S-100B value at 24 h showed high predictive value for a bad outcome, but, lower than those of S-100B. PCT level were not significantly different between patients with early-onset pneumonia and without pneumonia.

CONCLUSIONS. Although S-100B was a better predictive biomarker than PCT, serum PCT is also an useful biomarker for predicting a bad neurological outcome in post-CA patients treated with TH.

0274

COMPARISON OF COOLING TECHNIQUES TO INDUCE LIGHT-MODERATE HYPOTHERMIA IN THE IMMEDIATE CARE POST CARDIOPULMONARY RESUSCITATION

C. Lluch Candal[1], B. Sánchez[1], B. Ateca[1], S. Quintana[1], I. Sandalinas[1], R. Ferrer[1]

[1]Hospital Universitario Mutua Terrassa, Universidad de Barcelona, Intensive Care Medicine, Terrassa, Spain

INTRODUCTION. Light-moderate hypothermia (32–34 °C) (LMH) for 12–24 h in the immediate care post cardiopulmonary resuscitation (CPR) have demonstrated a neurological improvement and an increased survival in patient in coma after suffering a cardiac arrest (CA) with ventricular fibrillation (VF) (1) and LMH has been included in the current recommendations of cardiopulmonary post-resuscitation treatment.(2).

OBJECTIVES. To evaluate the performance of an hydrogel-coated water-circulating cooling surface (Artic Sun ®) vs the conventional measures for induction of LMH in patients in coma after CA.

METHODS. Retrospective cohort study. We included all consecutive patients who have been induced LMH after a CA during two time periods: (1) From 01/01/2008 to 09/30/2011 was the first group (Conventional therapy: external and internal cooling with ice, fan, intravenous cold serums, stomach and bladder washings with cold water) and (2) From 10/1/2011 to 03/01/2013 was second group (Arctic Sun®). We compared the clinical characteristics, treatments administered and mortality between the two groups. Statistical analysis: Descriptive statistics including percentages, means, standard deviations, confidence intervals for categorical or continuous variables. To compare variables between the two periods was used student's t test or Chi-square as appropriate.

RESULTS. 27 patients were included, 14 in the first group and 13 in the second group. There are not statistically significant differences between the groups in age [first period 62.1 (10.1) years vs 59.5 (12.7) years], male sex [first period 12 (85.7 %) vs 10 (76.9 %)], APACHE II [first period 24.2 (6.8) vs 26.2 (5.8)], SOFA [first period 10.1 (3.8) vs 9.2 (2.8)] nor comorbidities. Differences were found in the location, timing and causes of the CA (Table 1). There were not statistically significant differences in terms of assistance times of CA until the onset of LMH. Execution times of LMH using Arctic Sun® were significantly faster (Table 2). We didn't found differences in terms of safety and outcome variables between the 2 periods (Table 3).

CONCLUSIONS. In our experience, LMH with new devices do not reduce complications and do not improve outcome. On the other hand, LMH is technically faster, easier and more effective with the Arctic Sun® device.

REFERENCE(S) 1. Hypothermia after Cardiac Arrest Study Group. Mild therapeutic hypothermia to improve the neurologic outcome after cardiac arrest. N Engl J Med. 2002;346:549–56. 2. Mary Ann Peberdy, et al. Post-cardiac arrest care: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2010;122:S768–S786.

Table 1

	First group (n = 14)	Second group (n = 13)	P value
Extrahospital CA (%)	7 (50)	12 (92.3)	0.053
Asystole first rhythm (%)	10 (71.4)	5 (38.5)	0.082
VF/TV first rhythm (%)	4 (28.6)	8 (61.5)	0.082
Coronariography (%)	3 (20)	9 (69.2)	0.017
Ischemic etiology (%)	4 (28.6)	10 (76.9)	0.245

Table 2

	First group (n = 14)	Second group (n = 13)	P value
Interval CA-first assistance, min (SD)	7.92 (16.5)	4 (6.1)	0.42
Interval CA-RPE, min (SD)	20.86 (15.2)	31,6 (16.3)	0.079
Interval first assistance-onset hypothermia, min (SD)	238.5 (153.9)	290.7 (121.8)	0.355
Interval RPE-onset hypothermia, min (SD)	218.1 (144.2)	263.2 (113.4)	0.384
Interval onset hypothermia-target temperature, min (SD)	456.9 (313.3)	156.9 (157.4)	0.005
Reheating time, min (SD)	658.33 (501.81)	521.54 (196.55)	0.003
Stable temperature in hypotermia	9 (64.3)	12 (92.3)	0.179
Failure in achieving hypothermia	4 (28.6)	0	0.015
Withdrawal of hypothermia (%)	5 (33.3)	2 (15.4)	0.38

Table 3

	First group (n = 14)	Second group (n = 13)	P value
Hypokalemia	3 (21.4)	6 (46.2)	0.048
Sepsis (%)	3 (21.4)	1 (7.7)	0.593
Renal failure (%)	3 (21.4)	1 (7.7)	0.593
Seizures (%)	6 (42.8)	3 (23.1)	0.411
Lethal arrhythmia (%)	5 (35.7)	1 (7.7)	0.180
Hospital mortality (%)	11 (78.5)	9 (69.2)	0.678
Limitation of treatment (%)	8 (57.4)	8 (61.5)	1
GOS = 1–2 in survivors (%)	3 (100)	4 (100)	0.678

Arrhythmias, thrombosis & cardiovascular infections: 0275–0288

0275
SUITABILITY, SAFETY AND EFFICACY OF VERNAKALANT FOR NEW ONSET ATRIAL FIBRILLATION IN CRITICALLY ILL PATIENTS

A. Rudiger[1], A. Breitenstein[2], M. Arrigo[1], S. Salzberg[3], D. Bettex[1]

[1]University Hospital Zurich, Institute of Anesthesiology, Zurich, Switzerland, [2]University Hospital Zurich, Department of Cardiology, Zurich, Switzerland, [3]University Hospital Zurich, Department of Cardiac Surgery, Zurich, Switzerland

INTRODUCTION. Vernakalant (Brinavess®) is an atrium specific multichannel blocker for the treatment of new onset atrial fibrillation (AF). This study investigates the suitability, safety and efficacy of this novel antiarrhythmic drug in critically ill patients.

METHODS. The study was performed in the cardio-surgical intensive care unit (ICU). All patients with new AF were screened for in- and exclusion criteria according to the manufacturers' recommendations. Magnesium was substituted prior to the study drug infusion, if the plasma level was <1.0 mmol/l. Included patients were treated with 3 mg/kg of vernakalant over 10 min and, if unsuccessful, a second dose of 2 mg/kg. Serial blood pressure measurements were recorded for 2 h after treatment. Results are given as numbers (percentages) or median (range).

RESULTS. A total of 191 patients with new onset AF were screened. Of these 159 (83 %) were excluded due to haemodynamic instability (59 %), self-limiting AF (9.9 %), persistent AF (6.8 %), atrial flutter (5.8 %), intra-venous amiodarone treatment (5.8 %), myocardial infarction (3.7 %) or long QT interval (2.6 %). Vernakalant was administered to 32 (17 % of the screened) patients with the following baseline characteristics: Age 74 (36–86) years, male gender 69 %, SAPS 37 (18–64), bypass surgery 56 %, valve surgery 28 %, vascular surgery 28 %, left ventricular ejection fraction 57 (35–80) %, heart rate 110 (65–150) to 127 (70–163) bpm, potassium 4.8 (4.0–5.2) mmol/l, magnesium 0.9 (0.8–2.3) mmol/l, CRP 123 (2–312) mg/l. Mean arterial blood pressure at baseline was 67 (54–90) mmHg and did not decrease significantly during the 120 min observation period. Lactate and ScvO2 were 1.1 (0.6–2.1) mmol/l and 63 (49–75) %, respectively, and did not deteriorate significantly during the observation period. Adverse events included nausea (n = 1), bradycardia (n = 2) and hypotension (n = 2). Twenty-six (78.8 %) patients required a second dose. Within 6 h, 17 (53 %) patients converted to sinus rhythm, but 5 of them had a relapse of AF during the following 6 h observation period.

CONCLUSIONS. Applying the strict in- and exclusion criteria provided by the manufacturer, only a minority of postoperative ICU patients with new onset AF qualified for vernakalant. The drug was well tolerated and converted half of the patients to sinus rhythm. Further research is needed to identify the ideal candidates for vernakalant.

0276
EVALUATION OF RISK FACTORS IN INFECTIVE VALVE ENDOCARDITIS POSTOPERATIVE PATIENTS

L. Muñoz[1], A.I. Tejero[1], D. Janeiro[1], S. Miguel[1], E. Velasco[1], M. Rodríguez[1], M. Carnero[2], M.J. Jiménez[1]

[1]Hospital Clínico San Carlos, Intensive Medicine, Madrid, Spain, [2]Hospital Clínico San Carlos, Cardiac Surgery, Madrid, Spain

INTRODUCTION. Infective endocarditis is a serious disease that is often diagnosed with a considerable delay and has a high mortality rate. Several preoperative determinants could influence the prognosis and mortality of patients after valve replacement surgery.

OBJECTIVES. The aim of the study was to describe the preoperative determinants of mortality after surgical treatment of native or prosthetic valve endocarditis at a single institution.

METHODS. Retrospective study from a prospective database of all patients admitted after surgical treatment of endocarditis from 2005 to 2012.

We recorded demographic data, comorbidities, microbiologic analysis, antibiotic treatment, time to surgery, Euroscore, clinical preoperative, intraoperative and postoperative variables, native (NVE) or prosthetic (PVE) valve endocarditis, ICU and postoperative lenght of stay (LOS) and morbimortality.

Qualitative variables are expressed as totals and percentages, quantitative variables as mean ± SD and median (interquartile range, IR). Univariate and multivariate logistic regresion analysis were performed. Risk estimated with Odds ratio (OR) with confidence interval 95 %. α error 0.05.

RESULTS. A total of 143 patients. Age 63 ± 13. Male 58.7 %. DM 26.6 %, HTA 53.8 %, Renal failure 24.5 %, vasoactive support 5.7 %, preoperative glycemia 122 ± 73, antibiotic treatment 98.6 %, type of pathogen: streptococcus 29 %, staphylococcus. coagulase negative (SCN) 22.5 %, SAMS 21.7 %, SAMR 0.7 %, funghi 1.4 %, negative cultures 16 %, time to surgery 9 ± 12 days, Euroscore, 9 (7–12), NVE 80 %. PVE 20 %, extracorporeal circulation time 103 min ± 86. ICU LOS 2 (1–5), postoperative LOS 16 (8–39). Global mortality 21 %. Mortality by microorganism: streptococcus 27 %, SAMS 26 %, SAMR 100 %, SCN 9.7 %, funghi 1.4 %, negative cultures 18 % ($p > 0.05$).

In the univariate analysis the variables associated with mortality were: HTA $p = 0.003$, OR 3.8 (1.5–9.5), vasoactive support $p = 0.001$, OR 12.9 (2.4–68), renal failure $p = 0.001$, OR 4.3 (1.8–10), shock $p = 0.001$, OR 6.1 (1.9–5.3), left ventricular disfunction $p = 0.001$, OR 6 (2–18), prolonged mechanical ventilation $p = 0.001$, OR 6.4 (2.6–15), postoperative sepsis $p = 0.001$, OR 17 (4.9–58).

In the multivariate analysis the variables independently associated with mortality were:HTA $p = 0.04$, OR 3.8 (1–14), renal failure $p = 0.04$, OR 3 (1–9.3), vasoactive support $p = 0.006$, OR 28 (2.5–304), Euroscore >5 $p = 0.04$, OR 3 (1–8), glycemia >115 $p = 0.01$, OR 4.3 (1.4–13). The predictive model has a sensitivity 83 % and specificity 75 %. ROC curve area 0.870 (0.8–0.9).

CONCLUSIONS. In our serie microorganism, PVE or time to surgery were not associated with higher mortality. HTA, preoperative renal failure, shock, hiperglycemia and Euroscore >5 were good predictors of mortality after surgery of endocarditis.

0277
ULTRASENSITIVE TROPONIN AS INDICATOR OF MAGNITUDE IN PULMONARY THROMBOEMBOLISM

M. Recuerda Núñez[1], V. Pérez Madueño[1], Á. Estella García[1], M. Jaén Franco[1], M. Gracia Romero[1], J. Sánchez Ruiz[1], M.C. Castillo Castillo[1], F. Valenzuela Sánchez[1]

[1]Hospital Jerez, Cádiz, Spain

OBJECTIVES. The utility of markers such as troponin in the estimation of right ventricular dysfunction has been well documented in the management of pulmonary embolism (PE). Recently has been introduced ultrasensitive troponin in clinical practice. The aim of the study is to evaluate the relationship between ultrasensitive troponin levels and ventricular dysfunction and to describe the clinical characteristics and prognosis of patients admitted to the ICU with pulmonary thromboembolism.

RESULTS. 28 consecutive patients were analyzed, 11 men and 17 women. The mean age was 55 ± 15 years. The average stay in the ICU was 5.3 ± 3.8 days. The APACHE II at admission was 11.5 ± 7.5.

METHODS. (One third of methods): Prospective observational study conducted in a medical–surgical ICU of 17 beds. The study period was from January 2011 to January 2013. We included patients admitted to the ICU with the diagnosis of pulmonary embolism. The variables analyzed were age, sex, APACHE II at ICU admission, duration of mechanical ventilation, ultrasensitive troponin plasma levels, NT-proBNP, and lactic acid. Radiological findings were collected on CT and transthoracic echocardiography.

The patients, 32.1 % required vasoactive medications. 28.6 % required mechanical ventilation. In 46.4 % systemic thrombolysis was performed in the acute phase. Mortality was 17.9 %. Ultrasonography showed right ventricular involvement and/or pulmonary hypertension in 53.6 % of patients with chest CT. Massive TEP was observed in 25 %. We compared the ultrasensitive troponin and NT-proBNP according objectified findings on echocardiography, the mean levels of ultrasensitive troponin in the group with standard echocardiography were 11.34 ± 17 ng/L and 75.4 ± 84.4 ng/L in that we observed right ventricular dysfunction. The pro-BNP levels were 1,389 ± 1,112.4 pg/ml (standard echocardiography) and 5,524.2 ± 8,071 pg/ml (right ventricular dysfunction).

CONCLUSIONS. Ultrasensitive Troponin is a useful parameter for evaluate the estimated right ventricular dysfunction by echocardiography in pulmonary thromboembolism.

0278
RESISTANT HYPERTENSION IN THE INTENSIVE CARE UNIT

J. Muñoz-Bono[1], V. Olea-Jiménez[1], B. Pérez-Villardón[2], M.A. Barbancho Fernández[3], E. Curiel-Balsera[1], J.M. Mora-Ordóñez[1]

[1]Carlos Haya Regional University Hospital, Intensive Care Unit, Málaga, Spain, [2]Carlos Haya Regional University Hospital, Deparment of Cardiology, Málaga, Spain, [3]Carlos Haya Regional University Hospital, Málaga, Spain

INTRODUCTION. Resistant or refractory hypertension (rHTA) is a clinical problem in the patients admitted in the Intensive Care Units (ICU). Sometimes the management represents a challenge for the clinician.

OBJECTIVES. Aim of this study was to evaluate the main causes involved in rHTA of the patients admitted in our intensive care unit.

METHODS. Observational and prospective study of the patients admitted in the intensive care unit with criteria of refractory hypertension from January 2009 to January 2011. All patients were performed a standard test battery (blood analysis and urine, chest X-ray, electrocardiogram, echocardiogram and abdominal ultrasound) and other specific studies (hormone study, polysomnography, isotopic nephrogram, angioresonance, renal arteriography).

RESULTS. The study population included 172 patients. The majority (65 %) were admitted to the ICU in the context of cardiac pathology. We found that the kidney disease was the most common cause for rHTA (34.4 %) including chronic kidney failure, renovascular hypertension, glomerulonephritis, polycystic disease. The second place was for drugs (30.6 %), nonsteroidal antiinflammatory drugs (NSAIDs) remained the most frequent drug-induced hypertension, others drugs found were corticosteroids, oral contraceptives, ciclosporin and anabolic steroid. Central causes of hypertension represented the 17.8 %, emphasizing the morbid obesity, obstructive sleep apnea, intra-axial hemorrhage or intracranial hypertension. Endocrino-metabolics causes were presented in 11.7 %: hypothyroidism, hyperaldosteronism hypoaldosteronism, hyperthyroidism, hyperparathyroidism, cushing's syndrome, bilateral adrenal hyperplasia, licorice abuse, lead poisoning. Other responsible causes were pregnancy (3.9 %) and aortic coarctation (1.7 %).

CONCLUSIONS. In the most of the case the rHTA has a specific etiology but specialized studies are needed. We propose a model of a multidisciplinary team envolved in the diagnosis because it provides an early diagnosis, allows the start of an appropriate treatment and can also help to identify the factors of decompensation.

0279
IS AUTOMATED BRACHIAL CUFF MEASUREMENT OF ARTERIAL PRESSURE LESS ACCURATE IN CASE OF ARRHYTHMIA?

F. Reminiac[1], S. Faiz[2], M. Martin[3], A.-S. Crouzet[3], S. Ehrmann[1,4], R. Cinotti[3], X. Capdevila[5], K. Asehnoune[6], Y. Blanloeil[3], B. Rozec[3], T. Boulain[2], K. Lakhal[3]

[1]CHRU de Tours, Service de Réanimation Polyvalente, Tours, France, [2]Hôpital de la Source, Centre Hospitalier Régional d'Orléans, Réanimation Médicale Polyvalente, Orléans, France, [3]CHU Laënnec, Réanimation Chirurgicale Polyvalente, Nantes, France, [4]Inserm UMR 955, Equipe de Biomécanique Cellulaire et Respiratoire, Créteil, France, [5]CHU Lapeyronie, Réanimation Médico-Chirurgicale, Montpellier, France, [6]CHU Hôtel Dieu, Réanimation Chirurgicale, Nantes, France

INTRODUCTION. In case of arrhythmia, the beat-to-beat variation of arterial pressure may impair the accuracy of automated cuff measurements. Indeed, this oscillometric device relies on the detection of arterial wall oscillations. Despite its widespread use in intensive care units, even in arrhythmic patients, the accuracy of automated brachial cuff measurements is unknown.
OBJECTIVES. To determine, in critically ill patients, whether brachial cuff measurements are really less reliable in case of arrhythmia as compared to regular rhythm to detect hypotension or response to cardiovascular therapy.
METHODS. Consecutive patients with arrhythmia and carrying an arterial catheter were prospectively included in this multicenter study. After each arrhythmic inclusion, a regular rhythm patient was included. A 2nd inclusion was possible in case of change in the cardiac rhythm.
Three pairs of invasive and brachial cuff (Philips® MP70) measurements of mean arterial pressure (MAP) were averaged. Some patients underwent a 2nd set of measurements, after a cardiovascular intervention (passive leg raising, volume expansion, initiation of/increase in catecholamine infusion: per attending physician) allowing the assessment of MAP changes.
RESULTS. Brachial cuff measurement of blood pressure never failed among the 193 inclusions in 173 patients. Arrhythmic patients (n = 96) [atrial fibrillation 87 %] were similar to patients in regular rhythm (n = 97) for MAP (median 74 [IQR 67–83] vs 77 [70–87] mmHg), SAPSII (44 [30–58] vs 47 [26–59]), arm circumference (30 [27–33] vs 30 [27–33] cm), mechanical ventilation (79 vs 83 %), site of arterial catheter (radial: 84 vs 87 %) [all $p > 0.05$]. However, arrhythmic patients differed from regular rhythm patients for characteristics that may affect oscillometric measurements accuracy: body mass index (28 [24–31] vs 26 [22–29] kg/m^2), age (69 [60–77] vs 62 [52–71] years) and the presence of acute circulatory failure (n = 70 [73 %] vs n = 51 [53 %]) [all $p < 0.01$].
Agreement between invasive and brachial cuff measurements of MAP was similar in arrhythmic and regular rhythm patients: mean bias 0 ± 7 [limits of agreement −14/14] mmHg vs. 3 ± 7 [−12/18] mmHg, respectively (Bland–Altman analysis).
Hypotension: the detection of patients with an invasive MAP < 65 mmHg was reliable with brachial cuff during arrhythmia: AUC = 0.91 (0.84–0.96). In patients with a regular rythme, AUC was 0.98 (0.93–0.99).
Response to therapy (>10 % increase in invasive MAP among patients with acute circulatory failure) was also accurately detected with the brachial cuff during arrhythmia: AUC = 0.91 (0.77–0.98). In patients with a regular rhythm, AUC was 0.99 (0.87–1).
CONCLUSIONS. These preliminary results suggest that 1) arrhythmia does not impair the agreement of automated cuff measurements of MAP with invasive measurements and 2) that it allows identifying patients with a MAP < 65 mmHg or change in MAP > 10 % after hemodynamic intervention, with a clinically relevant performance.

0280
INCIDENCE AND RISK FACTORS OF NEW ONSET ATRIAL FIBRILLATION IN NON-CARDIAC INTENSIVE CARE UNIT PATIENTS

A. Margariti[1], S.S. Makrygiannis[1], D. Rizikou[1], M. Labakis[1], D. Mermigkis[1], K. Katsifa[1], I. Laspiti[1], A. Prekates[1]

[1]Tzanio General Hospital of Pireas, ICU, Pireas, Greece

INTRODUCTION. Atrial fibrillation (AF) is thought to be a relatively common arrhythmia in the setting of non-cardiac intensive care unit (ICU). However, data concerning AF deriving from such populations are scarce. Additionally, it is unclear which of the wide spectrum of AF risk factors are relevant to the ICU setting.
OBJECTIVES. The aim of our study was to evaluate the incidence of new-onset AF and investigate the factors that contribute to its occurrence in ICU patients.
METHODS. We prospectively studied all patients admitted to our ICU for an 1-year period. Patients admitted for brief postoperative monitoring, patients with chronic or intermittent AF and AF present upon admission, were excluded. A number of conditions incriminated as AF risk factors from demographics, medical history, present disease, cardiac echocardiography as well as circumstances of AF onset, were recorded.
RESULTS. The study population consisted of 139 patients (92 male). AF was observed in 14,4 % of them. Thirty percent of septic patients manifested AF. Age ($p < 0.001$), arterial hypertension ($p = 0.047$), systemic inflammatory response syndrome ($p < 0.001$), sepsis ($p < 0.001$), left atrial size ($p = 0.04$) and diastolic dysfunction ($p = 0.043$) were significantly associated with the occurence of AF. Patients manifesting AF were frequently hypovolaemic (30 %), had electrolyte disorders (40 %) as well as elevated and rising serum C-Reactive Protein (70 %).
CONCLUSIONS. A significant fraction of ICU patients manifest AF. The risk-factors of interest for the ICU patients might be considerably different than those of the general population and other subgroups.

0281
VENOUS THROMBOEMBOLIC DISEASE IN CRITICAL ILL PATIENTS

A.M. Hernangómez[1], P. García Olivares[1], D.O. Stanescu[1], M. Del Valle[2], G. Buitrago[2], C. Bocanegra[1], M. Díaz[1], L. Tang[1], I.A. De Sousa[1]

[1]H.G.U. Gregorio Marañón, Intensive Care Unit, Madrid, Spain, [2]H.G.U. Gregorio Marañón, Radiology Unit, Madrid, Spain

INTRODUCTION. Critically ill patients have an increased risk of venous thromboembolic (VTE) disease. There are few studies to evaluate the risks and benefits of a VTE prophylaxis.
OBJECTIVES. The purpose of this study was to determine the incidence of venous thromboembolic disease (VTE) in critical patients and to analyze its relationship with prophylactic methods used.
METHODS. Prospective, observational study conducted between September 2011–June 2012. All patients admitted to ICU > 72 h were included. Patients with prior VTE and anticoagulant therapy were excluded. A bilateral lower extremity compression ultrasound study was made in common femoral, proximal deep femoral and popliteal veins, within first 48 h of ICU admission, twice weekly, and whenever VTE was clinically suspected. A chest CT scan was performed in patients with deep vein thrombosis (DVT) and suspected pulmonary embolism (PE). VTE prophylaxis methods used were: low molecular weight heparin (LMWH), intermittent pneumatic compression devices (IPCD) and combined prophylaxis (CP). Demographic data, severity scores, risk factors for DVT, DVT prophylactic methods, development of DVT and PE, and outcome were collected. Categorical data was presented as percentages and continuous data as mean ± SD or median (interquartile range). The relationship between prophylactic methods and VTE disease was analyzed using Fisher exact test.
RESULTS. Two hundred patients were included. 61 % were male. The mean age was 60 years (45–75), with Charlson Index 1 (1–3). Severity scores: APACHE II 19 ± 8, SOFA 7 ± 4. Patology of ICU admission: infectious (35 %), neurological (28.5 %) and respiratory (16.5 %). 64 % of patients required mechanical ventilation (11 days; 5–21) and 39 % vasopressor therapy (3 days; 2–6). ICU stay was 10 days (10–21) and hospital stay 27 days (15–59). ICU mortality was 27 % and hospital mortality 34 %.
The median Number of VTE risk factors prior to ICU admision was 3 (1–4): age (68 %), high blood pressure (47 %), chronic obstructive pulmonary disease (21 %) and neoplasia (15 %). The median number of VTE risk factors associated with ICU was 4 (3–5): immobility (96 %), sedation and mechanical ventilation (68 %), neuromuscular blockade (17 %) and femoral catheter (9 %). Median of ultrasound studies made was 2 (1–4).
VTE prophylactic methods used were: LMWH 58 %, IPCD 27 % and CP 8 %. Incidence of DVT was1.5 % (3/200), all cases were in common femoral vein, with one related to catheter. Incidence of PE was 1.5 % (3/200), only one association with DVT. Overall incidence of VTE was 2.5 % (5/200).
There were no differences in the incidence of VTE disease related to prophylactic method used: LMWH vs. IPCD 1.7 vs. 4.3 % (RR 0.39; CI 0.06–2.39); LMWH vs. CP 1.7 vs. 0 % (RR 0.98; CI 0.96–1.01); IPCD vs. CP 4.3 vs. 0 % (RR 0.94; CI 0.88–1.01).
CONCLUSIONS. In our study we found a low incidence of VTE disease with the prophylactic methods used. None of prophylactic methods used was related to a higher incidence of VTE disease.

0282
RELAPSE AND THROMBOTIC COMPLICATIONS OF ATRIAL FIBRILLATION IN INTENSIVE CARE UNIT PATIENTS. CLINICAL AND ECHOCARDIOGRAPHIC CORRELATES

D. Rizikou[1], M. Labakis[1], A. Margariti[1], S. Vangelis[1], S. Makrygiannis[1], K. Sakellaridis[1], I. Laspiti[1], A. Prekates[1]

[1]Tzanio General Hospital of Pireas, ICU, Pireas, Greece

INTRODUCTION. Atrial fibrillation (AF) is a common arrhythmia also observed in critically ill patients. Though, it has not been thoroughly investigated in non-cardiac intensive care units (ICU). There is reason to believe that AF epidemiology might be different in ICU patients. In this context, there are scant data concerning the frequency of occurrence, relapse and complications of AF in these patients, and their clinical significance has not been clarified.
OBJECTIVES. By this study, we aimed to investigate AF relapse and complications especially in relation to a number of clinical factors as well as echocardiographic findings.
METHODS. We prospectively studied all patients admitted to a single ICU for a period of 12 months. Patients admitted for brief postoperative monitoring, patients with chronic, intermittent AF and AF present upon admission, were excluded. A wide spectrum of clinical factors known to cause or trigger AF were recorded. Echocardiographic study was performed in all cases. Death during hospitalization in ICU was reported for all patients.
RESULTS. The study population consisted of 139 patients (92 male). Twenty of them manifested AF. In two cases AF caused hemodynamic instability. Successful cardioversion was achieved in all of the patients. A 50 % of patients relapsed within the period of their stay in ICU. Relapse was observed in a median time of 48 h. However, failure to maintain sinus rhythm was not related to increased ICU mortality ($p = 0.6$). Thrombotic complications were observed in 5 % of patients, where low molecular weight heparin could not be administered due to clinical condition. Diastolic dysfunction as estimated by echocardiographic study before the index AF episode was the most potent predictor of relapse ($p = 0.02$).
CONCLUSIONS. Relapse of AF seems to be quite frequent and occurs rather shortly following the first event, in ICU patients. Nevertheless, it doesn't seem to bear prognostic information regarding short-term clinical outcome. Thrombotic complications are fairly rare probably due to the widespread use of prophylactic anticoagulation in ICUs.

0283
DETECTION OF ATRIAL FIBRILLATION IN PACEMAKER CLINIC AND IMPROVEMENT ANTITHROMBOTIC THERAPY

C. Salazar Ramirez[1], F. Cota Delgado[1], M. Carballo Ruiz[1], L. Ruiz del Fresno[1], A. Garcia Alcantara[1], M.V. De la Torre Prados[1]

[1]Hospital Virgen de la Victoria, Intensive Care Unit, Malaga, Spain

INTRODUCTION. Pacemakers are implanted for intensivist who provide care for patient who have these devices. The prevalence of atrial fibrillation in patient with pacemaker is high and studies in patients with little or no awareness of their arrhythmia condition indicate that unrecognized and untreated AF may cause congestive heart failure, increased risk of cerebrovascular accident and increased mortality.
OBJECTIVES. To identify the clinical characteristics of patients with atrial fibrillation in patients with pacemakers.
METHODS. Were included all patients seen in pacemaker clinic during the year 2012 in this prospective study, assessing the risk of stroke in patient with non-rheumatic atrial fibrillation by CHADS2 scale or CHA2DS2VASc, risk of bleeding (HAS-BLED), indication for anticoagulation and contraindications.
RESULTS. Of the 273 patients who came to the center for a pacemaker checkup over the course of the year 2012, 71 (26 %) had displayed atrial flutter or AF at some point during follow-up with a median monitoring period of 6 years. Of these, 27 (38 %) already has a documented history of AF at the time of implant. In the 44 (62 %) who developed AF after pacemaker implantation, arrhythmia was detected using electrocardiogram and by detection of mode-switching episodes. The pacemaker was implanted in response to atrioventricular

block in 55 %, sinus node disease in 8 % and slow AF in 38 %. In 52 patients (73 %) a VVI/R pacemaker was initially implanted, while the remaining 19 (26 %) recieved a type of pacemaker that maintains AV synchrony (DDD/R) CHADS2 score were calculated for 71 patients which showed that a high percentage of patients were at high risk of embolism (85 % CHADS2 $\geq$ 2). Patients with CHADS2 $<$ 2 were analysed with CHA2DS2VASc. All patients with CHADS2 $\geq$ 2, 48 % were under anticoagulation, 32 % were taking antiplatelets and 20 % without antithrombotic therapy.
CONCLUSIONS. of the most relevant observations in this study is the high proportion of patients with permanent pacemakers, who developed atrial flutter or AF during follow-up, 26 %. More than 85 % had a CHADDS2 score $\geq$2, however only 32 % of them receive anticoagulant treatment. Age was a negative factor for the decision of anticoagulation. Clinical profile were the pacing mode (VVI/R, hypertension and age).
CONCLUSIONS. Pacemaker-detected AF is very common and clinic is an excellent opportunity to conduct appropiate treatment as has been suggested clinical practice guidelines.
REFERENCE(S) Cabrera et al. Pacemaker clinic: an opportunity to detect silent atrial fibrillation and improve antithrombotic treatment. Europace. 2011;13(11).

0284
PROLONGED BRADYCARDIA AND ASYSTOLE IN HIGH SPINAL CORD INJURY PATIENTS: RISK FACTORS AND MANAGEMENT

N. Shaikh[1], A. Raza[2], Y. Hanssens[3], M.F. Malmstrom[1]

[1]Hamad General Hospital, Anesthesia and Intensive Care, Doha, Qatar, [2]Hamad General Hospital, Neurosurgery, Doha, Qatar, [3]Hamad General Hospital, Clinical Pharmacy Services, Doha, Qatar
INTRODUCTION. High spinal cord injury (HSCI) is one of the devastating traumatic injuries. Eighty percent of these patients are young male, and 93 % of them will have major neurological disabilities having great financial impact on patient′s family as well as the health care system. There is paucity of literature about prolonged bradycardia in HSCI patients.
OBJECTIVES. To evalaute the prevalence, duration, risk factors, precipitating factors for prolonged bradycardia, and its association with pneumonia, positioning or endotracheal suction in the HSCI patients.
METHODS. All patients who were admitted to the intensive care unit (ICU) of Hamad General Hospital, a tertiary hospital, with spinal cord injury above level of dorsal (D4) were enrolled in this study. Data collected include: patient's demographic data, mechanism, level and type of spinal injury, associated injuries, injury severity score (ISS), spinal shock, vasopressors used, time of occurrence of bradycardia, treatment of bradycardia, chest X-ray finding at the occurrence of bradycardia, relation of bradycardia with endotracheal suctioning or position of the patient, ICU stay, tracheostomy, any other complications and outcome.
RESULTS. During the study period (from January 2004 through December 2009), 138 patients were admitted to the ICU with HSCI. The majority of patients were male (96 %). The most frequently associated injury in these patients was skeletal fractures (38.4 %) and most common complication was pneumonia 56 (41 %). Forty five patients (33 %) had prolonged bradycardia; 87 % of these patients had pneumonia when bradycardia occurred, 53.4 % of them had asystole, 77.8 % required tracheostomy. 40 (29 %) of total HSCI patients had spinal shock at admission, 29 (21 %) patients of them had bradycardia at the time of endotracheal suctioning whereas 27 (20 %) patients developed bradycardia at the time of position. Majority of the patients were managed conservatively. Those HSCI patients who developed prolonged bradycardia, their ISS score was statistically higher compared to the HSCI patients without prolonged bradycardia (43.5 $\pm$ 14 vs 34.4 $\pm$ 16.6, p = 0.02). ICU stay (38.8 $\pm$ 29 vs 9.6 $\pm$ 11.9, p = 0.001) and hospital stay (63 $\pm$ 55 vs 27 $\pm$ 34, p = 0.002) were also found significantly higher compared with those HSCI patient without prolonged bradycardia. Multivariate analysis showed that hypotension on admission (OR = 10.66, 95 % C.I. 2.8–40.6, p = 0.001), pneumonia (OR = 3.5, 95 % CI 0.9–14.0, P = 0.05) and tracheostomy (OR = 6.3, 95 % C.I. 1.67–23.5, p = 0.006) were the risk factors for the development of prolonged bradycardia in HSCI patients.
CONCLUSIONS. Prolonged bradycardia was significantly associated with higher incidence of asystole. Endotracheal suctioning and positioning of HSCI patients were significant provocative factors for prolonged bradycardia whereas, hypotension on admission, pneumonia and tracheostomy played major role for the development of prolonged bradycardia in these patients.

0285
YEARS OF MYOPERICARDITIS. FOLLOW-UP AT 50 MONTHS

M. Recuerda Núñez[1], S. Gamaza Chulian[1], J. León Jiménez[1], V. Pérez Madueño[1], Á. Estella García[1], L. Pérez-Bello Fontaina[1], M. Jaén Franco[1], J. Sánchez Ruiz[1]

[1]Hospital Jerez, Cádiz, Spain
OBJECTIVES. The pericarditis represent 5 % of emergency visits and 0.1 % of patients hospitalized for ischemic chest pain. Between 15 and 35 % have elevated cardiac biomarkers (myopericarditis). Our aim was to analyze the characteristics and outcomes of patients hospitalized for myopericarditis.
METHODS. We included patients admitted to our hospital with acute myopericarditis viral or idiopathic between January 2001 and December 2011, excluding those of traumatic origin, and postoperative infarction. We recorded clinical, electrocardiographic, echocardiographic and evolution.
RESULTS. A total of 66 patients (95 % male, mean age 29.8 $\pm$ 9.7 years) were included, with 40.9 % of smokers. The main symptom was chest pain in 98.5 % of cases, fever was detected in 48.5 % and pericardial rub in 3 %. Electrocardiographic abnormalities were observed in 98.5 %, the most frequent was diffuse ST segment elevation (93.9 %). The echocardiographic pericardial effusion rate was 13.8 %, with only one case of massive pericardial effusion. 92.4 % of patients were treated with NSAIDs, and only one patient was treated with corticosteroids. After a mean follow-up of 50 months, the recurrence rate was 10.3 %, without objectifying any case of dilated cardiomyopathy or constrictive. One patient had cardiac tamponade and only one recorded case of hospital cardiac death, no other deaths in monitoring.
CONCLUSIONS. The myopericarditis is a frequent condition, which predominantly affects young males. His long-term prognosis is excellent, with recurrent pericarditis the most common complication.

0286
PREDICTORS OF PACEMAKER IMPLANTATION IN PATIENTS EVALUATED AT A SYNCOPE UNIT

M.A. Ramirez-Marrero[1], M.A. Roldan-Jimenez[1], M. Cano-Garcia[1], I. Vegas-Vegas[1], D. Gaitan-Roman[1], J.A. de la Chica-Sanchez[1], M. de Mora-Martin[2]

[1]Hospital Carlos Haya, Cardiology, Malaga, Spain, [2]Hospital Carlos Haya, Malaga, Spain
INTRODUCTION AND OBJECTIVES. Syncope is a common clinical entity in emergencies. It requires early prognostic stratification, as it might be a life-threatening situation and for this reason, syncope units are created (S.U.). Our goal is to evaluate the factors associated with its cardiogenic origin and its need for pacemaker implantation.
MATERIALS AND METHODS. A prospective analysis of all patients consecutively evaluated at a S.U., from June 2009 to April 2012 was performed. Clinical and epidemiological variables, performed diagnostic tests, etiological diagnostic of the syncopal episode and the need for pacemaker implantation were studied. A follow-up with a mean of 8 months in all patients was completed.
RESULTS. We included 401 patients, mean age 56.6 $\pm$ 20.7 years, 206 (48.6 %) males. 17 (6.2 %) patients required permanent pacemaker implantation for cardiogenic syncope episodes. These patients compared to those with non-cardiogenic syncope showed an older age (72.2 $\pm$ 12.4 vs. 55.6 $\pm$ 20.7 years, p = 0.001), male gender predominance (70.6 vs. 29.4 %, p = 0.06), higher comorbidity (1.5 $\pm$ 0.7 vs. 0.6 $\pm$ 1.2, p = 0.03), higher percentage of pathological baseline EKG (82.3 vs. 17.7 %, p = 0.0001) and lower frequency of previous prodromes (5.9 vs. 94.1 %, p = 0.0001). After adjustment, male sex and a pathological baseline EKG predicted the cardiogenic origin and the need of pacemaker implantation in these patients (OR 1.7, 95 % CI 0.97–4.9 and OR 8.55, 95 % CI, 2.19–12.34, respectively), while the existence of prior prodromes turned out to be a protective factor instead (OR 0.03, CI 95 %, from 0.004 to 0.25).
CONCLUSIONS. Syncope units allow risk stratification of patients who have suffered an early syncopal episode. The cardiogenic origin of this entity is not negligible. The need for permanent pacemaker implantation was associated with a pathological baseline EKG and with male gender, being more rare with the onset of prior prodromes.

0287
STEMI AND YOUNG PEOPLE. ANALYSIS OF RISK FACTORS

J. Muñoz-Bono[1], G. Jiménez-Pérez[1], E. Curiel-Balsera[1], M.D. Fernández-Zamora[1], M.J. Chaparro-Sánchez[2], G. Quesada-García[1]

[1]Carlos Haya Regional University Hospital, Intensive Care Unit, Málaga, Spain, [2]Carlos Haya Regional Hospital, Intensive Care Unit, Málaga, Spain
INTRODUCTION. Recently has been analyzed the epidemiology of acute myocardial infarction (AMI) among different population groups. In young adults may be characteristics that could be different from those of older population. It is unknown whether having an AMI at an early age implies a worse long-term prognosis and whether clinical management should be different from that used in older patients.
OBJECTIVES. Aim of this study was to evaluate the influence of the cardiovascular risk factors in young patients admitted in the intensive care unit with STEMI and if there is any difference with patients older than 45 years.
METHODS. Prospective multicenter study of risk factors of patients with STEMI included in the database ARIAM-Andalusia from 1-January-2008 to 31-December-2012. We compared these risk factors in patients older and younger than 45 years. To compare the percentages we used the Chi square and the significance level was established at 95 %.
RESULTS. We included a total of 11,575 patients, of whom 10.1 % were younger than 45 years. Analysis of risk factors shows these results:

Cardiovascular risk factors

	<45 años	>45 años	p
Hypertension	294 (25 %)	5,454 (52.4 %)	<0.0001
Diabetes Mellitus	84 (7.1 %)	2,838 (27.3 %)	<0.0001
Dyslipidemia	421 (35.8 %)	4,294 (41.3 %)	<0.0001
Smoker	896 (76.2 %)	4,073 (39.2 %)	<0.0001
Obesity	250 (21.3 %)	1,895 (18.2 %)	0.012

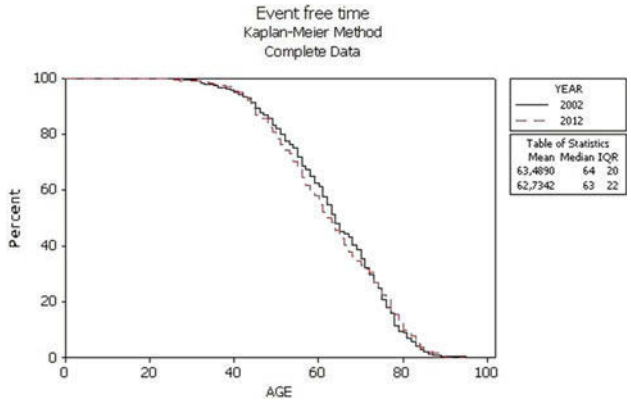
After analyze the risk factors by sex, males <45 years admitted with STEMI are more smokers (72 vs39 % p < 0.001), suffer less hypertension (27 vs 54.3 % p < 0.0001) and less diabetes (7.8 vs. 29.1 % p < 0.001). In case of women <45 years also are more smokers (62.5 vs 12.6 % p < 0.0001) and suffer less dyslipidemia (23.2 vs 46.5 %, p < 0.0001).
CONCLUSIONS. Smoking appears to be the risk factor more related to the incidence of STEMI in "young patients under 45 years".
REFERENCE(S) 1. Awad HH, McManus DD, Anderson FA Jr, Gore JM, Goldberg RJ. Young patients hospitalizad with an acute coronary syndrome. Coron Artery Dis. 2013;24(1):54–60. 2. Pellaton C, Monney P, Ludman AJ, Schwitter J, Eeckhout E, Hugli O, Muller O. Clinical features of myocardial infarction and myocarditis in young adults: a retrospective study. BMJ Open. 2012;2(6): e001571.
GRANT ACKNOWLEDGMENT. ARIAM database researchers.

0288
TRENDS IN CARDIOVASCULAR RISK FACTORS AND AGE OF FIRST CORONARY EVENT PRESENTATION. AN ICU EPIDEMIOLOGICAL STUDY

J. Cebrián[1], J. Ruíz[2], E. Villarreal[1], K. Vacacela[1], E. Parreño[1], J. Bonastre[1]

[1]Hospital Universitario y Politécnico La Fe, ICU, Valencia, Spain, [2]Hospital General de Castellón, ICU, Cartellón, Spain
INTRODUCTION. In spite of the fact the roughly only a half of coronary artery syndromes (CAS) are admitted in ICU, this remains, in our country, a good place to study trends and changes in age of presentation and coronary risk factors (CRF) associated.
OBJECTIVES. Our aim is to compare the prevalence of the main CRF and age of first coronary event (FCE) presentation between years 2002 and 2012.
METHODS. We compared all FCE event admitted in our ICU in two different periods (years 2002 and 2012). We analyse the prevalence of the main CRF (hypertension, dislipemia, smoking habit, diabetes and peripheral artheriopathy) and the age of presentation. Diagnosis was made by using simple clinical criteria recorded in medical files. Descriptive statistics uses percents (qualitative variables) and medians and interquartil range for

quantitative data. To analyze between group differences we have used Chi squared analysis for categorical data and complete (non censored) Kaplan–Meier method with Log-Rank test for age variable. *Minitab* statistical packet was used. We have performed the analysis for the whole data and separately for gender.
RESULTS. A number of 278 patients were admitted in the year 2002 and 240 in 2012 without significative changes in gender (22.3 vs 19.7 % women), hypertension (49.6 vs 50.4 %), smoking habit (40.3 vs 45.8 %) or diabetes (28.4 vs 22.1 %). On the other hand, dislipemia shows a significant raise (32.7 vs 41.3; p = 0.045). In the female group smokers show a non significant increase in frequency (11.3 vs 21.7 %). Median age of presentation for the whole data in 2002 was 64 years (IQR 20) whereas in 2012 was 63 years (IQR 22) (NS). See graph:



Event time free

CONCLUSIONS. The age of the first CAS presentation has not changed in the studied period. In fact, the only significant change among CRF, is an increase in the prevalence of dislipemic patients. In spite of not statistical significance, among the female group, there are a very important increase in smoking habit.

Fluid management in perioperative intensive care: 0289–0301

0289

THE IMPACT OF NORMAL SALINE AND LACTATED RINGERS SOLUTION ON PATIENT OUTCOMES IN HIGH-RISK VASCULAR SURGERY PATIENTS

R.S. Green[1], M.B. Butler[1]

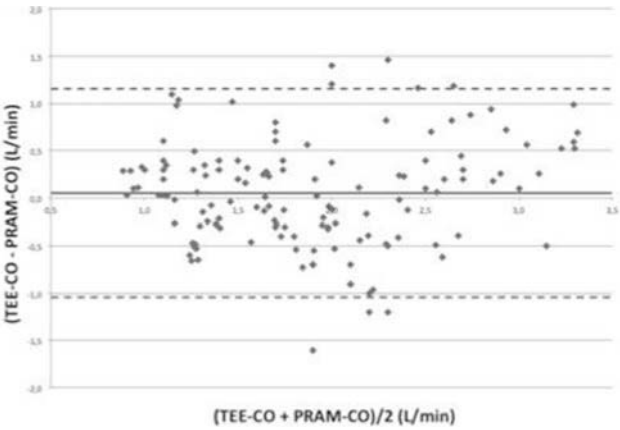
[1]Capital District Health Authority, Division of Critical Care, Halifax, Canada
INTRODUCTION. Crystalloid solutions are administered to the majority of patients who undergo general anesthesia in the operating theatre.
OBJECTIVES. The goal of this study is to determine the impact of Normal Saline (NS) and Lactated Ringer's solution (LR) on vascular surgery patient outcomes.
METHODS. A structured chart audit was performed of adult patients intubated for a vascular surgery procedure at a Canadian quaternary care centre. Patients were identified and data collated from multiple electronic databases. Data not available electronically was abstracted from the patient chart by a co-investigator.
Patients were separated into three groups: those who exclusively received Normal Saline (NS; n = 158), Lactated Ringers solution (LR; n = 419) and a combination of both (NS-LR; n = 207). To determine the association of each solution with adverse outcomes we recorded in-hospital mortality, vasopressor days, inotropes days, hemodialysis days and length of ICU stay. We controlled for confounding factors such as initial co-morbidity and procedure urgency. To evaluate for overall outcome we assessed a composite end-point of in-hospital mortality, ventilator days, inotrope days and length of ICU stay with a multivariate analysis. The NS group was considered baseline.
RESULTS. 784 patients received crystalloid solutions from 2007 to 2009. The groups were similar in age (P = 0.141), the NS-LR group was more likely to be male (P = 0.0005) and have a lower ASA level (ASA $\geq$ 2; P = 0.0027).
On univariate analysis, LR patients had decreased mortality (OR = 0.45, P = 0.013, CI = {0.24, 0.85}), ICU admission (OR = 0.26, P < 0.0001, CI = {0.17, 0.42}), post-op vasopressor requirement (OR = 0.27, P < 0.0001, CI = {0.14, 0.50}), post-op ventilator requirements (OR = 0.21, P < 0.0001, CI = {0.13, 0.34}), hemodialysis requirement (OR = 0.09, P = 0.034, CI = {0.01, 0.632}) and the composite end-point (OR = 0.27, P < 0.0001, CI = {0.18, 0.41}). The NS-LR group (NS-LR group), was more likely to require admission (OR = 2.08, P = 0.0009, CI = {1.35, 3.22}) and achieve our composite end-point (OR = 1.82, P = 0.006, CI = {1.19,2.78}).
Controlling for confounding factors, patients receiving LR was associated with decreased ICU admission (OR = 0.27, P < 0.0001, CI = {0.16, 0.46}), post-op vasopressor requirements (OR = 0.39, P = 0.014, CI = {0.18, 0.82}), post-op ventilator requirements (OR = 0.24, P < 0.0001, CI = {0.13, 0.41}), hemodialysis requirement (OR = 0.04, P = 0.034, CI = {0.0006, 0.47}) and the composite end-point (OR = 0.30, P < 0.0001, CI = {0.18, 0.49}). The NS-LR combination was associated with an increase in ICU admission (OR = 2.05, P = 0.005, CI = {1.24, 3.43}) and the composite end-point (OR = 2.07, P = 0.005, CI = {1.25, 3.44}).
CONCLUSIONS. Compared to NS, LR in vascular surgery patients was associated with a decrease in adverse outcomes. Further research is required to elucidate the effect of crystalloid solution choice on patient outcomes.
GRANT ACKNOWLEDGMENT. Partial funding from a Clinician Scientist Award, Dalhousie University, Faculty of Medicine.

0290

PRESSURE RECORDING ANALYTICAL METHOD FOR MEASURING PERIOPERATIVE CARDIAC OUTPUT IN PEDIATRIC CARDIAC SURGERY: A VALIDATION STUDY

L. Brisard[1,2], M. Videcoq[1], M. Fernandez[1], O. Amrani[1], L. Berard[1,2], A. De Windt[1], C. Lejus[1,2]

[1]CHU de Nantes, Hôtel-Dieu H.M.E, Department of Anesthesiology and Intensive Care Medicine, Nantes, France, [2]University of Nantes, Laboratory of Experimental of Simulation in Intensive Medicine of the University of Nantes (LESiMU de Nantes), Nantes, France
INTRODUCTION. Cardiac output (CO) monitoring is important during pediatric congenital cardiopathy surgery. Doppler transesophageal echocardiography (TEE) remains the most valuable technique in perioperative settings. Pressure recording analytical method (PRAM) uses arterial pressure waveform analysis to continuously measure CO [1]. This minimally invasive hemodynamic method was assessed in pediatric intensive care unit but shown controversy results according range of body surface area (BSA) [2, 3]. The relevance of the method and the pediatric algorithm remains to be assessed in perioperative setting.
OBJECTIVES. We assessed agreement of PRAM method and TEE in measuring perioperative cardiac output during cardiac congenital surgery in children.
METHODS. Observational, prospective and single center study. After approval from the local ethic committee (GNEDS), Thirty-six children (median [25th–75th percentiles]): sex ratio 14 m/22 f, age 6 years [4 months–15 years]; weight 17.8 kg [11–32 kg]; body surface area (BSA) 0.74 m^2 [0.50–1.11]) were included. Three to seven measures were simultaneous realize, with TEE (aortic diameter following by continuous wave-Doppler signal across the aortic valve in a transgastric TEE imaging plane) and PRAM pediatric algorithm (Mostcare®; Vytech Health®, Padova, Italy) after sternal closure. Linear correlations, Bland–Altman analysis and percentage of error (method of Critchley–Critchley) were performed according to BSA (mix and BSA < 1.10 m^2).
RESULTS. 173 paired measurements were compared. The mean CO (SD) was 2.5 (1.4) l/min with TEE-CO and 2.3 (1.4) l/min with PRAM-CO. The mean bias was 0.2 l/min with agreements limits −2.4 and 2.8 l/min. Pearson's correlation was 0.29 giving a percentage error of 108 %. In the group with median BSA < 1.10 m^2 (n = 26, 131 measures), mean CO was 1.9 (0.7) l/min with TEE-CO and 1.8 (0.6) l/min with PRAM-CO. The mean bias was 0.03 l/min with agreements limits −1.06 and 1.13 l/min. Pearson's correlation was 0.64 giving a percentage error of 60 % (figure 1).



Bland–Altman analysis in children with BSA < 1.10 m^2

CONCLUSIONS. Percentage errors between PRAM and TEE were significant regardless of age and BSA. These results did not support the use of the Mostcare® monitor for the determination of CO in perioperative pediatric cardiac surgery setting with the current pediatric algorithm.
REFERENCE(S) 1. Romano et al. Crit Care Med. 2002;30:1834–41. 2. Calamendrei et al. Pediatr Crit Care Med. 2008;9:310–2. 3. Saxena et al. Br J Anaesth. 2013;3:425–31.

0291

A COMPARISON OF THE PREDICTIVE ACCURACY OF THE PERIOPERATIVE MAJOR ADVERSE CARDIAC EVENTS BETWEEN BRAIN NATRIURETIC PEPTIDE AND MICROALBUMINURIA IN ELDERLY PATIENTS UNDERGOING HIP FRACTURE SURGERY

Y. Terao[1], S. Matsumoto[1], A. Sakai[1], M. Okada[1], M. Fukusaki[1], K. Sumikawa[2]

[1]Nagasaki Rosai Hospital, Anesthesia, Sasebo, Japan, [2]Nagasaki University School of Medicine, Anestheiology, Nagasaki, Japan
INTRODUCTION. Elderly hip fracture patients often have multiple comorbidities and are at increased risk of perioperative major adverse cardiac events (MACE), and 5 % of patients died in hospitalisation after surgery. The brain natriuretic peptide (BNP) is noticed as a predictor of MACE and mortality in high-risk patients undergoing hip fracture surgery. Microalbuminuria (MA) is also associated with cardiovascular disease and mortality.
OBJECTIVES. The aim of this study was to compare the predictive accuracy of MACE between BNP and MA in elderly patients undergoing hip fracture surgery.
METHODS. This study was approved by Institutional Research and Ethics Committee and informed consent was obtained from patients or patients' relatives. Consecutive 59 patients aged 75 or older undergoing hip fracture surgery from July 2011 to September 2011 were enrolled in this study. Blood was sampled on the day of surgery and the first postoperative day (1POD) and 3POD for measurement BNP and Troponin I (TnI). Urine was sampled on the day of surgery, 1POD and 3POD for measurement of urinary microalbuminuria/creatinine ratio (MACR). A diagnostic threshold of TnI for myocardial injury was set as >0.03 ng/L. The MACR values <30 mg/g are considered normal. TIn the perioperative period, MACE was recorded. Myocardial injury, perioperative heart failure, tachyarrhythmia and hypotension requiring inotropes were defined as MACE. For identification of the BNP cut-off value that best predicted MACE, a receiver operating characteristic (ROC)

curve was used and the area under curve was calculated. Results were expressed as median with interquartile range. Intergroup comparisons were performed with Mann–Whitney U test, Fisher's exact test or Chi square test. Multivariate logistic regression analysis was used to identify clinical variables predictive of MACE and mortality. Significance was determined as P value of <0.05.
RESULTS. Nineteen patients (32 %) had MACE. There were significant differences in age, gender, BNP, C reactive protein and serum creatinine between patients with and without MACE, but not in MACR. BNP of the 1POD (BNP1) was the best predictor of MACE according to the ROC curve analysis (the area under the ROC: 0.82), and BNP1 ≧67 pg/mL was set as the cut-off value for significance. BNP1 ≧67 pg/mL had a sensitivity of 74 % and a specificity of 80 % for predicting MACE with likelihood ratio of 3.68. In multivariate logistic regression analysis, BNP1 ≥ 67 pg/mL was an independent predictor of MACE (Odds ratio 6.1; 95 % confidence interval 1.0–35.9, P < 0.05).
CONCLUSIONS. These results showed that BNP of the 1POD would be an independent predictor of MACE in elderly patients undergoing hip fracture surgery.
REFERENCE(S) 1. Anesthesiology 2012;117:72–92. 2. Br J Anaeth 2009;103:206–12. 3. Lancet 2010;375:2073–82.
GRANT ACKNOWLEDGMENT. This study was supported, in part, by research funds to promote the hospital functions of Japan Labor Health and Welfare Organization.

0292
EARLY SERIAL LACTATE MEASUREMENTS ARE VALUABLE IN PREDICTING POSTOPERATIVE COMPLICATIONS AFTER MAJOR ABDOMINAL SURGERY

J. Velickovic[1], I. Palibrk[1], M. Djukanovic[1], U. Batranovic[2], D. Velickovic[1]

[1]Clinical Center of Serbia, Belgrade, Serbia, [2]Institute for Pulmonary Diseases of Vojvodina, Sremska Kamenica, Serbia
INTRODUCTION. Postoperative complications (POC) are burden for health system. They increase morbidity and mortality as well as costs. Timely recognition of patients at risk and consecutive measures could improve postoperative outcome. Lactate monitoring has been used for outcome prediction in critically ill, septic patients and after cardiac surgery. Its significance in abdominal surgery has not been specifically evaluated.
OBJECTIVES. Our goal was to determine the incidence of hyperlactatemia following major abdominal surgery and to evaluate its impact on POC and outcome. It was also studied whether single or serial lactate measurements serve better as prognostic marker.
METHODS. Prospective observational study was conducted in a tertiary hospital from September till December 2012 in patients undergoing major abdominal surgery expected to spend at least 24 h in the ICU following surgery. Blood samples were obtained on admission, 4, 12 and 24 h after surgery and lactate values were performed by a gas analyzer (upper normal range 1,6 mmol/l). Lactate area (mmol × h/l) representing cumulative lactate values was calculated afterwards. During patient follow-up until discharge, occurrence and type of POC (Dindo-Clavien ≥ II grade) were recorded as well as the length of hospital stay. SPSS 19 was used for statistical analysis. ROC curves were constructed to determine prognostic value of different lactate measurements.
RESULTS. During study period, a total of 188 patients were included. The overall incidence of hyperlactatemia (lactate ≥1.6 mmol/l) was 69.9 % and the mean lactate values for 0,4,12,24 h were 2.14 ± 1.69,2.45 ± 1.94,1.29 ± 0.92,1.33 ± 1.27 mmol/l, respectively. Mean lactate area was 40.15 ± 24.10 mmol × h/l. The overall rate of POC was 34,4 %, and they were most frequent after pancreatic surgery. Patients with POC had significantly higher lactate values in all time points ($p < 0.001$), as well as higher lactate area (51.33 ± 21.42mmolxh/l vs. 33.37 ± 16.75mmolxh/l; $p < 0.001$). ROC curve sensitivity and specificity analysis revealed that lactate area had the highest POC discriminative power (AUC = 0.77, 95 % CI = 0.64–0.85). The cut-off point derived from the ROC curve for lactate area was 33.5mmolxh/l and the relative risk for POC in patients with lactate area higher than 33.5mmolxh/l was 1.88 (95 % CI 1.56–2.43). A positive correlation was found between all lactate measurements and lactate area and the length of hospital stay and mortality. ($p < 0.01$).
CONCLUSIONS. Hyperlactatemia is common after major abdominal surgery. Early postoperative lactate values obtained during 24 h following major abdominal surgery have shown predictive value for POC. Serial lactate measurement during the first 24 h postoperatively and calculation of lactate area was shown to be superior over single lactate measurements in prediction of POC.

0293
PROGNOSTIC VALUE OF PREOPERATIVE LEFT VENTRICULAR FILLING PRESSURE BY DOPPLER ECHOCARDIOGRAPHY AFTER KIDNEY TRANSPLANTATION

D.-M. Jang[1], S.-S. Choi[1], J.-G. Song[1], G.-S. Hwang[1]

[1]Asan Medical Center, University of Ulsan College of Medicine, Department of Anesthesiology and Pain Medicine, Seoul, Republic of Korea
INTRODUCTION. It has been reported that left ventricular (LV) filling pressure has a prognostic value for mortality and cardiovascular death in patients with end-stage renal disease (ESRD). The early mitral inflow velocity (E) to peak mitral annulus velocity (E′) ratio (E/E′ ratio) has been shown as a non-invasive and accurate predictor of LV filling pressure. However, little is known about the prognostic implication of E/E′ ratio in patients after kidney transplantation (KT).
OBJECTIVES. We evaluated the prognostic value of E/E′ ratio on clinical outcomes (graft patency, acute rejection, overall survival and cardiovascular death) in patients after KT.
METHODS. Between January 2007 and December 2010, 637 recipients underwent KT were included in this retrospective study. According to E/E′ ratio, patients were divided into groups with E/E′ ratio ≤15 and E/E′ ratio >15. Clinical outcomes were compared between patients after adjusting differences in patient characteristics by using inverse probability of treatment weighting (IPTW) and propensity score (PS) matching analysis.
RESULTS. Of the 637 patients, 522 patients (82 %) had E/E′ ratio ≤15, and 115 (18 %) patients had E/E′ ratio >15. After adjusting for IPTW (except age and LV mass index), the E/E′ ratio >15 was independently associated with of graft patency [Hazard ratio (HR): 4.24; 95 % confidence interval (CI): 2.19 to 8.21; $P < 0.001$], overall survival (HR: 5.17; 95 % CI 2.59 to 10.33; $P < 0.001$), and cardiovascular death (HR: 40.79; 95 % CI 5.72 to 290.95; $P < 0.001$). However, after PS analysis was used for the patients matching (73 matched pairs of patients) including age and LVMI, there was no statistically significant difference in graft patency (HR: 1.4; 95 % CI 0.44 to 4.41; P = 0.566), acute rejection (HR: 1.00; 95 % CI 0.88 to 1.13; P = 1.00), overall survival (HR: 1.75; 95 % CI 0.512 to 5.98; P = 0.372), and cardiovascular death (HR: 2.00; 95 % CI 0.18 to 22.05; P = 0.572).
CONCLUSIONS. Our data suggest that preoperative LV filling pressure assessed by the E/E′ ratio shows no prognostic implication on clinical outcomes in patients who undergo KT.
REFERENCE(S) 1. Wang AY, Wang M, Lam CW, Chan IH, Zhang Y, Sanderson JE. Left ventricular filling pressure by Doppler echocardiography in patients with end-stage renal disease. Hypertension. 2008;52(1):107–14. 2. Arjona Barrionuevo JD, Gonzáles Vargas-Machuca MF, Gómez Pulido F, Gil Sacaluga L, Gentil Govantes MA, Martínez-Martínez A. Transthoracic echocardiographic findings in patients with chronic kidney disease awaiting kidney transplantation. Transplant Proc. 2010;42(8):3123–5.

0294
CONTINUOUS NON-INVASIVE ARTERIAL PRESSURE (CNAP) MEASUREMENT: COMPARING THE CNAP DEVICE TO THE NON-INVASIVE BLOOD PRESSURE ARM CUFF DURING SURGERY

J.K. Khera[1], S. Solangasenathirajan[1], M. Jones[1], M. Jonas[2]

[1]University of Southampton, Southampton, UK, [2]Southampton University Hospital Trust, Southampton, UK
INTRODUCTION. Non Invasive Blood Pressure (NIBP) is usually measured oscillometrically using a brachial cuff. However this only provides intermittent data, and consequently has been shown to miss the detection of >20 % of hypotensive episodes during surgery.[1] The CNAP provides beat-to-beat non-invasive haemodynamic monitoring and a real-time pressure waveform without the complications of an arterial line. CNAP, when compared to NIBP, has been shown to significantly identify more hypotensive episodes and to be better at detecting rapid BP changes during anaesthesia.[2] However, more research is needed to investigate the agreement between the CNAP and NIBP.
OBJECTIVES. To investigate how the Mean Arterial Pressure (MAP) derived from the CNAP monitor compare with NIBP arm cuff in an intraoperative setting.
METHODS. Twenty-one trauma and orthopaedic patients (ASA I-III) undergoing surgery were enrolled in this prospective study. All patients required a NIBP arm cuff, set at 3 min intervals. After induction, the CNAP was applied on the arm contralateral to the NIBP. Systolic, diastolic and mean arterial pressures were simultaneously recorded every 3 min from both monitors. Bland–Altman statistical analysis for assessing bias and limits of agreement was performed for the MAP.
RESULTS. 1,170 MAP measurements were recorded and analysed. Analysis of the first time-point from each patient showed a strong association between NIBP and CNAP ($r = 0.79$, $p < 0.0001$). The mean difference (bias), defined as NIBP–CNAP, was −3.33 mmHg with a SD of 6.99 mmHg. The clinical validation limits are 5 ± 8 mmHg (ISO81060-2). The overall mean MAP was 73 mmHg; giving a 5 % bias ± 19 % limits of agreement, well within the 30 % limits. The calculated limits of agreement (bias ± 1.96SD) between NIBP and CNAP MAP measurements were −17.04 to +10.38 mmHg. Individual patient data analysis demonstrated a bias ranged from −8.81 to +14.78 mmHg, with a SD between 2.80 and 12.51 mmHg.
CONCLUSIONS. The CNAP is able to provide an accurate and continuous assessment of BP in an intra-operative setting. The continuous, non-invasive properties of the CNAP makes it applicable to patients whom invasive monitoring is not indicated but would be of benefit, such as in orthopaedic surgery.
REFERENCES. 1. Ilies C, Kiskalt H, Siedenhans D, Meybohm P, Steinfath M, Bein B, et al. Detection of hypotension during Caesarean section with continuous non-invasive arterial pressure device or intermittent oscillometric arterial pressure measurement. Br J Anaesth. 2012;109(3):413–9. 2. Siebig S, Rockmann F, Sabel K, Zuber-Jerger I, Dierkes C, Brünnler T, et al. Continuous non-invasive arterial pressure technique improves patient monitoring during interventional endoscopy. Int J Med Sci. 2009;6(1):37–42.
GRANT ACKNOWLEDGMENT. The Research and Development Department at the University Hospital Southampton NHS Foundation Trust. Equipment was provided by LiDCO.

0295
EFFECTS OF PERI-OPERATIVE FLUID THERAPY WITH SYNTHETIC COLLOIDS ON PATIENT RELEVANT OUTCOMES IN PATIENTS WITH LIVER SURGERY

O. Bayer[1], Y. Sakr[1], B. Kabisch[1], D. Schwarzkopf[2], A. Kortgen[1,2], C. Hartog[1,2], N.C. Riedemann[1,2], U. Settmacher[3], K. Reinhart[1,2]

[1]Jena University Hospital, Department of Anesthesiology and Intensive Care Medicine, Jena, Germany, [2]Jena University Hospital, Center for Sepsis Control & Care, Jena, Germany, [3]Jena University Hospital, Department of General, Visceral and Vascular Surgery, Jena, Germany
INTRODUCTION. Tetrastarch (HES 130) and gelatin are commonly used for fluid therapy in the peri-operative setting. However, their safety in the surgical setting is inadequately assessed. A prospective sequential analysis in cardiac surgical patients showed that compared to crystalloids the need of renal replacement therapy (RRT) was greater after tetrastarch and gelatin [1].
OBJECTIVES. To assess the effects of peri-operative fluid therapy with synthetic colloids—6 % HES 130/0.4 and 4 % gelatin—on patient relevant outcomes.
METHODS. Prospective before and after study in patients with major liver surgery. Patients with pre-operative RRT were excluded. Fluid therapy was recorded in the operation theatre and during the postoperative ICU stay. The synthetic colloid group (SynColl-Group) comprised patients from a period during which 6 % HES 130/0.4 was the primary colloid (2004–2006) and a period where this synthetic colloid was replaced by gelatin 4 % (2006–2008). The crystalloid group (Crys-Group) consisted of patients from 2008 to 2010 who received only crystalloids after synthetic colloids were completely abandoned in our institution.
RESULTS. Of 488 patients with liver surgery, 206 patients received synthetic colloids (n = 96 HES, n = 84 gelatin, n = 26 HES and gelatin) and 282 received only crystalloids. Baseline characteristics were nearly similar at admission (table). Patients in both groups received mostly major liver resections (≥4 segments). Median cumulative doses were 8.3

[IQR 7.1–17.4] ml/kg HES and 8.3 [6.5–14.3] ml/kg gelatin. Patients in the SynColl-group had a higher need for RRT (5.8 vs. 1.1 %, $p = 0.003$), hospital mortality (7.8 vs. 3.2 % $p = 0.036$) and a longer ICU stay (24 [22–46] h vs. 24 [21–26] h, $p = 0.029$. Fluid balance was more positive in the Crys-Group (median 25 [IQR 8–44] ml/kg body weight vs. 11 [−4 to 32] ml/kg in the SynColl-Group ($p < 0.001$).

CONCLUSIONS. This study does not support the notion that fluid therapy with synthetic colloids is superior to crystalloids. Results support the recommendation that synthetic colloids should be only used after their efficacy and safety has been demonstrated in prospective randomized clinical trials [2].

REFERENCE(S) 1. Bayer et al.: Peri-operative fluid therapy with tetrastarch and gelatin in cardiac surgery—a prospective sequential analysis. Crit Care Med 2013 (in press). 2. Reinhart et al.: Consensus statement of the ESICM task force on colloid volume therapy in critically ill patients. Intensive Care Med. 2012;38(3):368–83.

GRANT ACKNOWLEDGMENT. O. Bayer is supported by an unrestricted grant of the Thuringian Ministry of Cultural Affairs (Landesprogramm ProExzellenz; PE 108-2), the Foundation of Technology, Innovation and Research Thuringia (STIFT) and the German Sepsis Society (GSS). No further external funding was obtained in support of this analysis.

Table 1 Baseline characteristics

	SynColl-Group, median [IQR]	Crys-Group, median [IQR]	p
Age, years	61 [52–69]	62 [55–70]	0.920
Baseline creatinine, μmol/l	83 [73–101]	79 [67–95]	0.010
SAPS2-Score	25 [18–34]	23 [16–32]	0.133
SOFA-Score	3 [2–5]	3 [2–5]	0.438

0296

POST-OPERATIVE OPTIMISATION OF THE HIGH RISK SURGICAL PATIENT: IMPLEMENTATION IN A BUSY DISTRICT GENERAL HOSPITAL WITH LIMITED CRITICAL CARE RESOURCES

E.C. Bullen[1], A. Parsons[1]

[1]Croydon University Hospital, London, UK

INTRODUCTION. Older patients with multi-morbidity undergoing major surgery have a higher risk of death than the normal population. This subgroup accounts for 12.5 % of procedures but >80 % of deaths (1). In the EuSOS study only 5 % of patients were electively admitted to critical care, and unplanned admissions were associated with a higher mortality. 73 % of all deaths never received critical care (4).

Post-operative intervention to achieve an oxygen delivery index of 600 ml/min/m^2 may improve outcome in these patients (2), and this strategy has been recommended by specialist advisory groups (5).

Whilst feasible in specialist centres with abundant critical care resources, these strategies may be difficult to achieve in smaller general hospitals with limited equipment.

We designed an evidence based post-operative optimisation protocol for high-risk patients using the clinical definition described by Tote & Grounds (3). We disseminated it to all anaesthetic and critical care staff.

OBJECTIVES. To identify how many patients met criteria for optimisation, how many were referred, and how many were admitted. In patients admitted, we audited the quality of optimisation and whether DO2i targets were met.

Of those patients not referred or refused admission we identified how many were subsequently admitted due to deterioration.

METHODS. Ongoing prospective audit from January 2013, currently 20 patients.

RESULTS. 14 patients (70 %) were referred to critical care, and 12 (60 %) received a bed. 2 patients who met criteria but were not referred to critical care were later admitted due to clinical deterioration.

Of the patients admitted for optimisation, 4 (33 %) did not receive cardiac output monitoring, 33 % had LIDCO Plus or LIDCO Rapid monitoring, and 33 % had central venous pressure monitoring. Fluid loading was not performed optimally and no patient achieved the DO2i target of >600 ml/min/m^2.

CONCLUSIONS. Referral and admission to critical care of high risk surgical patients is essential to reduce morbidity and mortality. Difficulties arise in smaller UK hospitals where critical care beds and equipment are limited. Nursing and medical staff need continued education to adhere to guidelines which represent a significant change to their current clinical practice.

REFERENCE(S) 1. Pearse R, et al. Identification and characterisation of the high-risk surgical population in the United Kingdom. Crit Care. 2006;10(3):R81. 2. Pearse R et al. Early goal-directed therapy after major surgery reduces complications and duration of hospital stay. A randomised, controlled trial Crit Care 2005;9(6):R687–R693. 3. Tote SP, Grounds. Performing perioperative optimization of the high-risk surgical patient. British Journal of Anaesthesia 2006;97(1):4–11. 4. Pearse R, et al. Mortality after surgery in Europe: a 7 day cohort study. Lancet 2012;380(9847):1059–65. 5. Modernising Care for Patients Undergoing Major Surgery, Improving Surgical Outcomes Group.

0297

LEFT VENTRICULAR AFTERLOAD AND CONTRACTILITY ESTIMATED NON-INVASIVELY BY PULSE WAVE ANALYSIS IN PATIENTS WITH AORTIC VALVE STENOSIS

F. Franchi[1], G. Baldini[1], C. Fanelli[1], L. Muzzi[1], E. Tucci[1], K. Donadello[2], F.S. Taccone[2], B. Biagioli[1], S. Scolletta[1]

[1]University of Siena, Siena, Italy, [2]Erasme University Hospital, Bruxelles, Belgium

INTRODUCTION. Background and Goal of Study: In subjects with aortic valve stenosis myocardial contractility changes in relation to variations in left ventricular (LV) afterload. Arterial pressure measurements are often used as an indicator of LV afterload. The aortic augmentation index (Aix %, augmented systolic pressure adjusted to pulse pressure) is an indirect indicator of LV afterload. It reflects the different morphology between peripheral and central pressure wave. Aix can be estimated with applanation tonometry (AT), a non-invasive technique that provides information on arterial vascular tone, and hence LV afterload. AT is capable of assessing also dP/dt (mmHg/msec), which is an indirect index of LV performance (i.e., myocardial contractility).

OBJECTIVES. The goal of this study was to evaluate how aortic valve replacement (AVR) could influence Aix and dP/dt values.

METHODS. We studied 15 patients with aortic valve stenosis undergoing AVR. AT (Sphygmocor—AtCor Medical, Australia) was used to estimate AT-derived parameters from the radial artery at three times: (T1), preoperative; (T2), ICU admission; (T3) ICU discharge. The values of Aix and dP/dt were collected at each time.

RESULTS. Patients (mean age 64 ± 12; male/female = 13/2) had a normal preoperative ejection fraction (57 ± 9 %) and a EuroScore of 6 ± 2. Aix at T1 was 29 ± 9 % and it reduced significantly at T2 (13 ± 16 %; $p < 0.05$). Conversely, Aix remained quite stable at T3 (16 ± 17 %; p = n.s.). dP/dt showed a significant increase from T1 to T2 (614 ± 165 vs 787 ± 211 mmHg/msec, respectively; $p < 0.05$). At T3, dP/dt did not show further improvements (744 ± 177; p = n.s.).

CONCLUSIONS. Our findings demonstrated that after AVR there is a significant reduction in LV afterload: Aix changes might be considered as an "early indicator" of this phenomenon. Also, myocardial contractility (dP/dt) improves after AVR, possibly in relation to the physiological "re-established arterial-ventricular coupling". Although quite operator dependent AT seems a useful technique that allows evaluating the effect of AVR on LV afterload and contractility.

0298

POSTOPERATIVE HYPERLACTATEMIA. MECHANISMS AND ROLE FOR ADRENERGIC ACTIVITY IN ELECTIVE OPEN COLON SURGERY

E. Tobar[1], J. Godoy[2], M. Abedrapo[3], J.L. Llanos[3], C. Luengo[1], C. Romero[1], G. Hernández[4], J.L. Navarro[1]

[1]Universidad de Chile, Departamento de Medicina Interna, Unidad de Paciente Critico, Santiago de Chile, Chile, [2]Universidad de Chile, Departamento de Anestesiologia y Reanimacion, Santiago de Chile, Chile, [3]Universidad de Chile, Departamento de Cirugía, Santiago de Chile, Chile, [4]Pontificia Universidad Católica de Chile, Departamento de Medicina Intensiva, Santiago de Chile, Chile

INTRODUCTION. Increased blood lactate levels have been associated with significant morbidity and mortality independent of the presence of shock or organ failure in critical care patients. Postoperative hyperlactatemia is also related to worse outcomes although some of its involved mechanisms are potentially different from those involved in shock status.

OBJECTIVES. To explore preoperative, intraoperative and postoperative factors associated to postoperative hyperlactatatemia in older patients undergoing elective open colectomy.

METHODS. We enrolled older patients with indication of elective open colectomy. Informed consent was obtained from patients and protocol was approved by IRB. Standard hemodynamic monitoring was started before anesthetic induction including mean arterial pressure (MAP), heart rate, arterial oxygenation and urine output. In addition, global perfusion assessed by continuous central venous oxygen saturation ($ScvO_2$, Presep catheter, Edwards ®) and intermitent lactate levels were monitored during surgical procedure and the first 24 postoperative hours. All surgical and anesthetic procedures were standardized to minimize potential confounding factors. Patients were managed with balanced intravenous and inhalatory anesthesia guided to BIS 45–65 and postoperative pain was controlled with i.v. and epidural analgesia. Associations between baseline characteristics, intraoperative and postoperative data with lactate levels were evaluated using U Mann Withney Test. Correlations were made using Spearman test. All analysis were bilateral, with p value <0.05.

RESULTS. We enrolled 28 patients, ages 72 (67–80) years, female 17 (60.7 %). Baseline: albumin 3.6 (2.8–4.0) g/dl, hematocrit 34.4 (30.1–37.9) %, lactate 1.1 (0.9–1.2) mEq/L. Surgical time was 146 (11–186) min. MAP was 77 (72–84) mmHg intraoperative. Regarding perfusion, intraoperative ScvO2 83 (75–87) %, 11 patients (39 %) had $ScvO_2$, below 70 % during surgery, and 71 % had values below 70 % during postoperative. Seventeen patients (60,7 %) had lactate values higher than 2.1 mEq/L, from which 7 cases (25 %) were >4 mEq/L. Parameters associated to high lactate levels were: surgical time (161 (127–222 *vs* 111 (90–145); p 0.009), total ephedrine intraoperative dose (48 (33–69) mg vs 18 (5–32) mg; p 0.002), and the median value of intraoperative $ScvO_2$ (79 (71–84) vs 87 (84–89) %; p 0.002). Lactate's peak values were directly correlated to the total dose of ephedrine during surgical procedure (rho = 0.591; p 0.001), but not to intraoperative MAP or the amount of fluids administrated.

CONCLUSIONS. These preliminary results suggest that high postoperative lactate levels might be related to different mechanisms, including hypoperfusion and external adrenergic stimulation. Among these, adrenergic stimulation with vasoactive drugs as ephedrine seems to play a predominant role.

GRANT ACKNOWLEDGMENT. Fondecyt Initiation into research 11100246 Chilean gov.

0299

RESPIRATORY VARIATION IN PULSE PRESSURE: APPLICABILITY IN A FRENCH MEDICAL INTENSIVE CARE UNIT

A. Neuschwander[1], A. Bouglé[1,2], F. Daviaud[1], G. Géri[1], T. Morichau-Beauchant[1], S. Bourcier[1], J. Charpentier[1], A. Cariou[1,2]

[1]Hopital Cochin, Réanimation Médicale, Paris, France, [2]Université Paris Descartes, Paris, France

INTRODUCTION. Fluid management is a daily concern in intensive care. It has been advocated that dynamic parameters such as pulse pressure variation (PPV) are the best predictors of fluid responsiveness. However their applicability requires specific conditions[1] that could be challenged by changes in practice regarding sedation and mechanical ventilation. It has been recently observed that among 12,308 surgical patients, only 23 % met all the criteria.[2]

OBJECTIVES. The objective of our study was to assess the applicability of PPV in patients admitted to a medical intensive care unit (MICU).

METHODS. Fluid challenge was at the discretion of the physician. A prospective questionnaire was filled after all consecutive fluid challenge over a 2 month period. The following conditions of application were screened: intubation, sedation, neuromuscular blockers (NMB), mechanical ventilation, controlled or spontaneous breathing, tidal volume, positive end expiratory pressure (PEEP), normal sinus rhythm, indwelling arterial catheter.

Data are expressed as median for quantitative variables and percentage of all patients for qualitative variables. This study was approved by the ethical committee of SRLF.
RESULTS. Between January and February 2013, 307 patients were admitted in the MICU. 147 questionnaires were obtained, concerning 105 patients. Median age was 70 (58–78), Body mass index 25,8 kg/m^2 (23.4–29.4) and SAPS II on arrival 50 (33–67). Saline (88 %) and Ringer lactate (7 %) were used for fluid challenge, volumes varying from 250 ml (6 %), 500 ml (55 %) to 1,000 ml (39 %). Incidence of conditions of applications for the whole population are as follows: intubation 82 %(76–88), sedation 52 % (44–60), NMB 19 % (13–25), controlled MV 61 % (53–69), normal sinus rhythm 63 % (55–71), tidal volume 8 ml/kg of ideal body weight 6 % (2–10), PEEP between 5 and 10 cm H20 69 % (62–76) and arterial line 70 % (63–77). All conditions of application were met by 4 % (1–7) of patients, this proportion increased to 24 % (17–31) regardless of tidal volume and level of PEEP.
CONCLUSIONS. This monocentric survey seems to confirm that only a low proportion of patients fulfill criteria for correct use of VPP. If these results are confirmed in a larger multicentric cohort their usefulness as predictors to guide goal directed fluid resuscitation should be reassessed in a more representative population of current practice.
REFERENCE(S) 1. Michard F, et al. Relation between respiratory changes in arterial pulse pressure and fluid responsiveness in septic patients with acute circulatory failure. Am J Respir Crit Care Med. 2000;162:134–8. 2. Maguire S, Rinehart J, Vakharia S, Cannesson, M. Respiratory variation in pulse pressure and plethysmographic waveforms: intraoperative applicability in a North American Academic Center. Anesth Analg. 2011;112:94–96.

0300
CARDIAC OUTPUT AND EXTRAVASCULAR LUNG WATER MEASUREMENTS BY TRANSPULMONARY THERMODILUTION IN MONOPULMONARY GRAFT

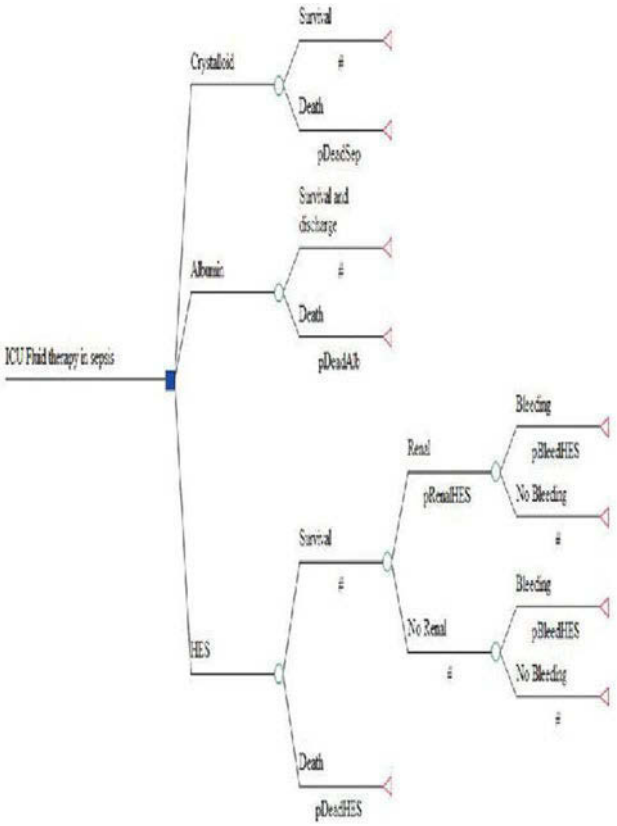
A. Tran-Dinh[1], G. Dufour[1], P. Piednoir[1], P. Augustin[1], P. Montravers[1], M. Desmard[1]

[1]Bichat University Hospital, Paris, France
INTRODUCTION. Postoperative management of lung transplantation is a hemodynamic and respiratory challenge. It is essential to have reliable monitoring tools to optimize the support of these patients.
OBJECTIVES. The aim of this study was (1) to compare 2 methods of measurement of cardiac index (CI) by transpulmonary thermodilution (TPTD, PiCCO^R) and pulmonary artery catheter (PAC); (2) to characterize pulmonary edema by the measure of extra vascular lung water index (EVLWI), pulmonary vascular permeability index (PVPI) and occluded pulmonary artery pressure (OPAP).
METHODS. Monocentric, prospective, observational study on monopulmonary transplantations conducted from April 2012 to February 2013. Patients receiving ECMO were excluded. Measurements were performed within 48 h post-transplantation in sedated and mechanically ventilated patients with a ratio $PaO_2/FiO_2 < 300$ mmHg. EVLWI and PVPI were measured by TPTD and OPAP by CAP. Values of CI were compared by a Bland–Altman method and by a Pearson's correlation ($p < 0.05$).
RESULTS. Ten patients were included (4 pulmonary emphysema, 4 idiopathic pulmonary fibrosis, 1 silicosis, 1 hypersentivity pneumonitis). 21 pairs of measurements of CI were performed. Median CI measured by CAP was 2.4 l/min/m^2 [1.77–3.88] and by TPDP was 3.27 l/min/m^2 [2–5.04]. CI measurements by TPDP and CAP were significantly correlated ($r = 0.82$; $p < 0.0001$). The Bland–Altman analysis has a bias of 0.75 l/min/m^2 with a standard deviation of 0.36 l/m^2/min. Median EVLWI = 12 ml/kg [9–24], PVPI = 2.4 ml/kg [1.6–4.7], OPAP = 9.5 mmHg [7–17]. All patients had a chest X-ray compatible with pulmonary edema. No patient had pleural effusion or atelectasis. All OPAP measurements were <18 mmHg. EVLWI was significantly correlated with OPAP ($r = 0.76$; $p = 0.0009$).
CONCLUSIONS. This is the first study investigating the PiCCO^R monitoring in post-monopulmonary graft. CI measured by TPTD and CAP were correlated. TPTD overestimated CI compared with CAP. These results are in agreement with those published in non-transplanted ICU patients[1]. All the patients had radiologic signs and EVLWI measurements evocative of pulmonary edema. PVPI values, in agreement with those found in ARDS[2], and low OPAP measurements suggested acute lung injury. EVLWI were significantly correlated with OPAP. In monopulmonary graft, "non-high" OPAP measurements seemed to be associated with increased pulmonary edema.
REFERENCE(S) 1. Intensive Care Med. 1999;25(8):843–6. 2. Crit Care. 2012;16:R232.

0301
CHOICE OF COLLOID FLUID THERAPY IN SEPTIC PATIENTS: A COMPARATIVE COST-EFFECTIVENESS ANALYSIS OF CRYSTALLOID, ALBUMIN AND HYDROXYETHYL STARCH

A. Farrugia[1,2], M. Bansal[3]

[1]University of Western Australia, Surgery, Perth, Australia, [2]Australian NNational University, Centre for Health Stewartship, Canberra, Australia, [3]Plasma Protein Therapeutics Association, Global Access, Annapolis, USA
INTRODUCTION. Fluid resuscitation with colloids is widely used in intensive care for septic patients. The choice of fluid is controversial, with evidence of improved outcomes with albumin being tampered by the perceived additional cost of this fluid compared to synthetic colloids.
OBJECTIVES. Assessment of cost-effectiveness of fluid therapies in sepsis through a decision analysis model comparing the use of crystalloid, albumin and hydroxyethyl starch in severe septic patients in intensive care.
METHODS. A commercial software (TreeAge) was used to populate a decision tree comparing the cost, effectiveness and morbidities of the three fluid treatments (Figure).



Decision tree for fluid treatments

Indirect comparison through network meta-analysis of relevant and unretracted studies was used to provide inputs, including mortality and morbidity. Fluid-associated morbidities included renal and haemostatic dysfunction. All crystalloid, hydroxyethyl starch and albumin preparations wereassumed to be bio-equivalent within each class of these therapies. Effectiveness in the model was measured as life years gained relative to life expectancy using standard of care as derived from the Nationwide Inpatient Sample (NIS), Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality [the "HCUPNet"].
RESULTS. The outcomes of the model show that therapy with albumin dominates therapy with hydroxyethyl starch, resulting in longer life expectancy and lower costs. A total medical cost of $18,199 was derived for therapy with crystalloid, $18,469 for albumin and $24,196 for hydroxyethyl starch. 0.23 life years were gained with albumin and 0.45 life years were lost with hydroxyethyl starch relative to crystalloid. One way sensitivity analysis indicated that the costs of the fluids had little influence on the model, but the cost of renal replacement therapy was strongly influential (**Table**).

Sensitivity analysis for cost inputs

Variable	Range ($)	Fluid treatment	Total cost/life year (low)$	Total cost/life year (high)$
Cost of renal replacement therapy	76,540 – 306,160	Crystalloid	9,086	9,086
		Albumin	8,259	8,259
		Hydroxyethyl Starch	13,775	19,639
Cost of albumin	250–1,000	Crystalloid	9,086	9,086
		Albumin	8,259	8,259
		Hydroxyethyl Starch	15,457	15,457
Cost of treatment of bleeds	1,193–2,693	Crystalloid	9,086	9,086
		Albumin	8,259	8,259
		Hydroxyethyl Starch	15,450	15,470

CONCLUSIONS. Albumin may be a more cost-effective treatment than hydroxyethyl starch or crystalloid, on the basis of its safety and efficacy profile, when the total medical costs involved in treating sepsis with fluids are considered.
REFERENCE(S) Farrugia A, Martin G, Bult M. Colloids for sepsis: effectiveness and cost issues. Crit Care Emerg Med. 2013;515–526.

Liver injury and intestinal failure: 0302–0315

0302

EFFECTIVENESS OF ANTI-INFLAMMATORY LIPIDS DELIVERED USING ENTERAL NUTRITION IN THE TREATMENT OF CRITICALLY ILL PATIENTS WITH SYSTEMIC INFLAMMATION

D. Guimarães[1], A. Pontes-Arruda[1], H.P. Moreira[1], F.E. Mendonça-Neto[1], B. Furtado-Lima[1], L.G. de Castro[1], J.H. Militão[1], V.D.A. do Ceará[1], H. Monte-Coelho Neto[1], A.P. Lima[1], A.P. Magalhães-Júnior[1]

[1]Christus University Center, School of Medicine, Fortaleza, Brazil

INTRODUCTION. The use of anti-inflammatory lipids has been extensively investigated in the treatment of critically ill patients, in special for those suffering from systemic inflammatory diseases such as ALI, ARDS and sepsis. Several trials reported the effect of this approach but they are not unanimous in their findings (1–5). In such situation a meta-analysis of the available evidence is of pivotal importance to determine the possible benefits of using anti-inflammatory lipids in the critically ill population of patients.

OBJECTIVES. To perform a meta-analysis trials comparing evaluating the use of anti-inflammatory lipids to determine the effectiveness of this approach in critically ill patients.

METHODS. Searches of MEDLINE, EMBASE, Cochrane, and NIH databases were performed. Outcome measures included 28-days mortality, ventilator and ICU-free days, and development of new organ failures. Effects were calculated using a random effects model. Results were analyzed combining studies using the same methodology (continuous enteral feeding with EPA + GLA + Antiocidants).

RESULTS. Five studies were included in this meta-analysis (n = 686 patients). Studies using similar methodology were associated with significant reduction in mortality (OR = 0.58; 95 % CI 0.36–0.95; p = 0.03), reduction in the risk of developing new organ failures (OR = 0.25; 95 % CI 0.15–0.43; p < 0.0001), reduced time on mechanical ventilation (SMD = 0.75; 95 % CI 0.36–1.15; p = 0.0001) and reduced ICU stay (SMD = 0.79; 95 % CI 0.02–1.55 p = 0.04).

CONCLUSIONS. This evaluation showed that when comparing studies using similar methodologies and doses, the use of EPA + GLA is associated with reduction in the 28-days all-cause mortality, development of new organ dysfunctions, and less time at the ICU and using mechanical ventilation.

REFERENCE(S) 1. Gadek J et al. Crit Care Med. 1999;27:1409–20. 2. Singer P et al. Crit Care Med. 2006;34:1033–38. 3. Pontes-Arruda A et al. Crit Care Med. 2006;34:2325–33. 4. Grau-Carmona T et al. Clin Nutr. 2011;30:578–584. 5. Pontes-Arruda et al. Crit Care.2011;15:R144–R158.

0303

INFECTION COMPLICATIONS AND PATTERN OF BACTERIAL RESISTANCE IN LIVING DONOR LIVER TRANSPLANTATION: A MULTICENTER EPIDEMIOLOGICAL STUDY IN EGYPT

A. Mukhtar[1], M. Hussein[2], A. Abdelaal[3], G. Obayah[1], H. Dabbous[4], I. Fawzy[4], M. El-Meteini[4]

[1]Cairo University, Anesthesia, Cairo, Egypt, [2]Theodor Bilharz Research Institute, Anesthesia, Cairo, Egypt, [3]Beni Suef University, Anesthesia, Cairo, Egypt, [4]Ain Shams University, Cairo, Egypt

INTRODUCTION. Infection post liver transplant is the one of the most devastating complications with attributable mortality up to 50 % [1], Several risk factors increase the risk of infection post liver transplant including complexity of the operation, poor general condition of the patients and the use of immunosuppressant drugs.

OBJECTIVES. Because the data that addressed the prevalence and pattern of infection post LDLT is scarce in Egypt, we conducted this study to quantify the incidence, risk factors, and outcome of patients associated with infection post-LDLT in 3 hospitals in Egypt.

METHODS. This was a retrospective, multicentre study, conducted by reviewing the medical records of 315 patients who underwent LDLT from January 2006 to April 2011 at three transplant centers in Egypt.

RESULTS. A total of 311 patients enrolled in the study, 283 (91 %) were males and 28 (9 %) were females with a mean age of 48 ± 8 years. 147 (47 %) of patients developed infectious complication after liver transplant with 416 episodes of infection that were documented within 3 months after transplantation. Biliary tract was the most common site of infection; 169 (40.6 %) followed by abdominal infection 129 (31 %), then pneumonia 44 (10.6 %), blood stream infection 39 (9.6 %), and lastly UTI 30 (7 %). The rate of gram negative infection was higher than the gram positive infection (310 (74 %) vs 87 (21 %)) p < 0.001. Overall, 75 % of all gram negative isolates were multidrug resistance including 90 % (30 of 33 isolates) of *Acinetobacter baumanii*, 76 % (84 of 110 isolates) of *Pseudomonas aeruginosa*, 57 % (46 of 79 isolates) of *Klebsiella*, and 53 % (37 of 69 isolates) of *E. coli* species. Significant independent risk factor for infection were portal vein thrombosis (OR 2.5, p = 0.04) and Biliary complications (OR 6.8, p < 0.001).

CONCLUSIONS. Our data showed that early biliary complications were the independent risk factor of bacterial infection. Early endoscopic retrograde cholangiography intervention may be warranted in these patients.

REFERENCE(S) 1. Rubin RH. The direct and indirect effects of infection in liver transplantation: pathogenesis, impact, and clinical management. Curr Clin Top Infect Dis 2002;22:125e54.

0304

OBSERVATIONAL STUDY: RADIATION DOSES IN PANCREATIC PATIENTS IN INTENSIVE CARE

J. Selfridge[1], T. Quasim[1], R. Appleton[2]

[1]Glasgow Royal Infirmary, Anaesthetics and Intensive Care, Glasgow, UK, [2]Southern General Hospital, Anaesthetics and Intensive Care, Glasgow, UK

INTRODUCTION. The gold standard for monitoring and investigation of pancreatic necrosis is computed tomography. Glasgow Royal Infirmary ICU is the tertiary referral centre for the West of Scotland Pancreatic service. These pancreatic patients often have multiple abdominal CT scans. Evidence from epidemiological studies, mainly from the survivors of the atomic bomb, provide data on the cancer risk of ionizing radiation.

OBJECTIVES. The goal of our study was to identify the frequency patients admitted to the ICU with acute pancreatitis are exposed to ionizing radiation and their effective radiation dose.

METHODS. Using key search terms patients for the study were identified in the GRI ICU's Wardwatcher database. Patients were 16 years and older and admitted to GRI ICU from the 1st March 2008 to the 1st of March 2010 for treatment of acute pancreatitis or its complications. Using the Patient Archiving and Communication System (PACS), patients' radiological records were searched and if 2 or more abdominal CTs had been performed, the patients were included in the study. CT scans which included the abdomen, between March 2008 and November 2012, were reviewed and the Dose Length Product (DPL) collected and converted to effective dose. Data was analysed using excel spreadsheets.

RESULTS. Sixteen patients were identified for the study however DPL could be retrieved for only 11. Of the 11 patients included, the median number of CT scans was 14 per patient (range 3–39) with a median value DPL in mGy/cm of 17,999.7 (range 3,686.1–33,209.5). The total DLP per patient was then converted to effective dose (mSv) using the conversion factor of 0.015. The median total effective dose of patient exposure was 226.61 mSv with a range of 55.29–498.14.

CONCLUSIONS. Although Lifetime Attributable Risk (LAR) of cancer is more complicated than effective dose exposure, Brenner et Al (1) quoted any dose in excess of 100 mSv as having epidemiological evidence of increased cancer risk. Age at which exposure occurs is an important factor as shown by Smith-Bindman (2), who quote a LAR of 4 cancers per 100 patients when a 21 year old female is exposed to 31mSV during a CT abdomen/pelvis. Ten patients in our study had an effective dose greater than 100 mSv. Epidemiological evidence shows they are at increased cancer risk but the exact LAR is unknown. Should we be trying to reduce the exposure to ionizing radiation for these patients especially following study by Ball et al. (3), who concluded that management plans were often unchanged following CT imaging?

REFERENCE(S) 1. Brenner et al. Cancer risk attributable to low doses of ionizing radiation. PNAS. 2003;24:13761–66. 2. Smith-Bindman et al. Radiation dose associated with common computed tomography examinations and the associated LAR of cancer. JAMA. 2009;169:2078–86. 3. Ball et Al. Radiation dose from computed tomography in patients with necrotizing pancreatitis. J. Gastrointestinal Surg. 2010;14:1529–35.

0305

STRESS ULCER PROPHYLAXIS VERSUS PLACEBO IN CRITICALLY ILL PATIENTS. A SYSTEMATIC REVIEW OF RANDOMIZED CLINICAL TRIALS WITH META-ANALYSIS AND TRIAL SEQUENTIAL ANALYSIS

M. Krag[1], A. Perner[1], J. Wetterslev[2], M.P. Wise[3], M. Hylander Møller[1]

[1]Copenhagen University Hospital-Rigshopitalet, Department of Intensive Care, 4131, Copenhagen, Denmark, [2]Copenhagen University Hospital-Rigshopitalet, Copenhagen Trial Unit, Centre for Clinical Intervention Research, Copenhagen, Denmark, [3]University Hospital of Wales, Dept. of Adult Critical Care, Cardiff, UK.

INTRODUCTION. Stress ulcer prophylaxis in adult critically ill patients is considered a standard of care [1], however the quality of evidence supporting its use has been questioned in recent years [2].

OBJECTIVES. To assess the effects of stress ulcer prophylaxis versus placebo or no treatment in adult critically ill patients.

METHODS.

Data sources: We searched Cochrane Library, Medline, and Embase to March 2013, and hand searched reference lists of other trials and systematic reviews.

Study selection: Eligible trials were randomized clinical trials comparing proton pump inhibitors or histamine 2 receptor antagonists with either placebo or no treatment in adult critically ill patients in the intensive care unit. Trials were included irrespective of language and publication status. A total of 393 trials met the initial selection criteria.

Data extraction and syntheses: Two reviewers independently assessed studies for inclusion and extracted data on methods, interventions, outcomes, and risk of bias. The Cochrane Collaboration methodology was used. Risk ratios with 95 % confidence intervals were estimated.

Main outcomes and measures: The predefined outcome measures were all-cause mortality, gastrointestinal bleeding, and nosocomial pneumonia.

RESULTS. Twenty trials (n = 1,971) were included; all were judged as having high risk of bias. There was no statistically significant difference in mortality (fixed effect: relative risk 1.00, 95 % confidence interval 0.84 to 1.20; P = 0.87; I^2 = 0 %) or nosocomial pneumonia (random effects: relative risk 1.23, 95 % confidence interval 0.86 to 1.78; P = 0.28; I^2 = 19 %) between stress ulcer prophylaxis patients and the no treatment/placebo patients. These findings were confirmed in trial sequential analyses. With respect to gastrointestinal bleeding, a statistically significant difference was found in the conventional meta-analysis (random effects: relative risk 0.44, 95 % confidence interval 0.28 to 0.68; P = 0.01; I^2 = 48 %), however trial sequential analysis (TSA adjusted 95 % confidence interval 0.18 to 1.11) and subgroup analyses of trials with lower risk of bias could not confirm this finding.

CONCLUSIONS. This systematic review with meta-analyses and trial sequential analyses demonstrated that the evidence for the use of stress ulcer prophylaxis in adult critically ill patients is unproven. There is no firm evidence for a benefit or harm of stress ulcer prophylaxis on all-cause mortality, gastrointestinal bleeding, and pneumonia as compared to placebo or no treatment.

REFERENCE(S) 1. Dellinger RP, Levy MM, Rhodes A, et al. Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock: 2012. Crit Care Med. 2013;41:580–637. 2. Krag M, Perner A, Wetterslev J, Moller MH. Stress ulcer prophylaxis in the intensive care unit: is it indicated? A topical systematic review. Acta Anaesthesiol Scand 2013 (Epub ahead of print).

0306

CHOLESTATIC DISEASE RELATED TO PARENTERAL NUTRITION: COMPARATIVE STUDY OF TWO LIPID EMULSIONS

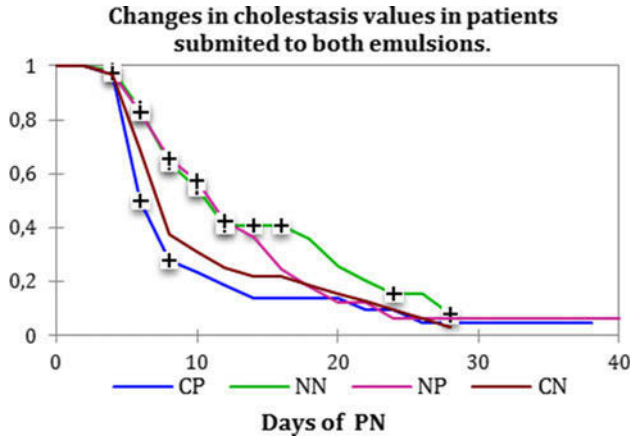
S. Pereira[1], S. Da Silva[1], J.P. Tadeu[1], F. Santos[1], J.G. Silva[1], M.J. Fernandes[1], E. Lafuente[1]

[1]Centro Hospitalar do Tamega e Sousa, ICU, Penafiel, Portugal

INTRODUCTION. Parenteral Nutrition (PN) associated liver disease, particularly cholestasis, is common with its long term use (1, 2), but seldom described on the critical care setting. Inclusion of fish oil in parenteral nutrition provided to septic ICU patients has been associated with improved gas exchange and a trend towards reduced length of hospital stay (LOS) (3). Evidence from animal models and several case reports in pediatric population suggests that fish oil may influence PN cholestasis (1, 2).

OBJECTIVES. To study the cholestatic liver disease (CLD) incidence related to PN in critically ill patients, by comparing the impact of two different lipid emulsions.

METHODS. We conducted a retrospective, analytic study, in a cohort of patients admitted in an ICU, from the 1st January 2006 to the 31st December 2012, with PN for more than 72 h. Between 2006 and 2008 a soybean MCT/LCT based lipid emulsion (Group1-G1) was used, and between 2010 and 2012 an Ω3/Ω6 (Group2-G2). Beyond demographic data, we analysed the motif of admission, LOS, SAPS II and outcome. We considered laboratory variations from total bilirubin (Bi), alkaline phosphatase (AF), γ-glutamyl transferase, and transaminases between admission and after 72 h as indicators of CLD. We compared both groups and studied the possible correlation between the type of emulsion used and CLD. Descriptive values are presented as means and standard deviation, using t-test for assessment of statistical significance, Log Rank (Mantel–Cox) test was used to correlate both samples and the hypothesis of cholestasis.
RESULTS. 157 patients were included, with mean age 60.1 ± 14.6 years, 66.2 % males, admitted mainly for schedule surgery (51.5 %). Sepsis was present in 66.8 %, with SAPS II 43.8 ± 17.8 and LOS of 13.1 ± 10.1 days. G1 accounted for 58.5 % and G2 41.5 %. Global mortality was 22.9 % (22.8 % G1; 23 % G2). Increasing of Bi and AF was higher in G1 (p0.0001). Cholestasis was found to have a significant reduction in G2, with a log Rank of 0.006.



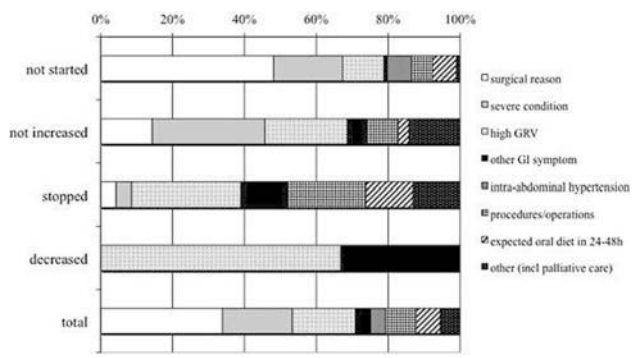
Changes in cholestasis values

CONCLUSIONS. This study exhibits a reduction in CLD, evaluated after 72 h of PN, at the group Ω3/Ω6 based lipid emulsion. There were no mortality differences between the groups.
REFERENCE(S) 1. Venecourt-Jackson E, et al. Successful treatment of parenteral nutrition-associated liver disease in an adult by use of a fish oil-based lipid source. Nutrition. 2013; 29: 356–358. 2. Puder M, et al. Parenteral fish oil improves outcomes in patients with parenteral nutrition associated liver injury. Ann Surg. 2009;250(3):395–402. 3. Barbosa et al. Effects of a fish oil containing lipid emulsion on plasma phospholipid fatty acids, inflammatory markers, and clinical outcomes in septic patients: a randomized, controlled clinical trial. Crit Care. 2010;14:R5.

0307

THE REASONS FOR INSUFFICIENT ENTERAL FEEDING IN INTENSIVE CARE PATIENTS: A SINGLE-CENTRE PROSPECTIVE OBSERVATIONAL STUDY

M. Kuslapuu[1], K. Jõgela[2], J. Starkopf[2], A. Reintam[2]
[1]Tartu University Hospital, General ICU, Tartu, Estonia, [2]Tartu University Hospital, Tartu, Estonia
INTRODUCTION. Meeting caloric targets with enteral nutrition (EN) during critical illness is always desirable, but often not achieved (1).
OBJECTIVES. We aimed to identify the main reasons underlying insufficient EN.
METHODS. The reasons to withhold, discontinue or decrease EN as well as not to increase insufficient EN were documented daily during this 3-month study. Decisions regards EN were made and the reasons defined by the doctors, and documented by the nurses. Insufficient EN was considered present when EN was <60 kcal/h.
RESULTS. Adequacy of EN was assessed in 395 (47 % of total) patient-days. In 165 (44 % of assessed, 20 % of all) patient-days the EN was insufficient. In 63 % of these days the feeding was not started, in 14 % it was stopped, in 2 % decreased, and in 21 % the insufficient EN was not increased. The reasons for respective decisions are presented on Figure 1.



The reasons for different decisions regards EN

EN was mostly prescribed by ICU doctors (88 %) and rarely by surgeons. EN was not started mainly on surgical reasons, in 62 % of them after recent gastrointestinal surgery, in 20 % due to acute abdominal pathology needing further investigations/interventions and 10 % cases due to prescribed active nasogastric aspiration. In 57 % of the cases this decision was valid on day 3 or later after ICU admission.
The main reason not to increase suboptimal EN was severe condition, most often (78 %) defined as shock with noradrenaline or adrenaline infusion >0.1 microgram/kg/min. Other critical conditions included acidosis, or were not specified.
High gastric residual volume (GRV) was the main reason to decrease (67 %) or stop EN (30 %). The median GRV considered high was 500 (interquartile range 400–600) ml. Decisions to reduce EN were rare, in case of problems EN was rather stopped.
CONCLUSIONS. The main reasons for insufficient enteral nutrition in intensive care patients were recent GI surgery, shock and large gastric residual volumes. EN is still commonly withheld for several days after GI surgery, whereas shock prohibits EN to be increased towards the target. EN could be improved by training and acceptance of more liberal policy of EN.
REFERENCE(S) 1. Alberda C et al. Intensive Care Med. 2009;35:1728–37.

0308

ELECTROMAGNETIC SENSOR (CORTRAK) OR SELF ADVANCING TUBE (TIGER 2): AN AUDIT TO DETERMINE WHICH INSERTION TECHNIQUE FOR NASO-JEJUNAL FEEDING TUBES IS MOST APPROPRIATE FOR CRITICALLY ILL PATIENTS

Z.J. Beardow[1], S.C. Elliot[1]
[1]Leeds Teaching Hospitals NHS Trust, Critical Care, Leeds, UK
A major barrier for jejunal feeding in critically ill patients is the timely insertion of naso-jejunal (NJ) tubes. Endoscopic or fluoroscopic placements are specialised procedures and can lead to placement delay. Two contemporary bedside insertion techniques for NJ tubes are in use across the UK. An audit was designed to compare these two tubes, Cortrak™ and Tiger 2™. Ten tubes were inserted (five in each group) and data collected.

Pre insertion data

	CORTRAK	TIGER 2
Patient intubated	3	2
Patients with tracheostomies	2	0
Naso-gastric tube in situ	4	3
Sedated patients	2	1
Pro-kinetics given	1	1
Referral time (h) (mean ± SD)	14.6 ± 14.7	8.2 ± 8.95

Biographics and referral data

	CORTRAK	TIGER 2
Mean age ± SD (years)	60 ± 14.43	68 ± 12.34
Gender ratio (m:f)	4:1	3:2
Hospital area	3 ICU 2 Ward	2 ICU 1 HDU 1 Ward
ICU days (mean ± SD)	5.4 ± 8.14	3 ± 4.47
Mean BMI ± SD	24.4 ± 2.30	25.4 ± 4.15
Specialities	1 general surgery 1 general medical 1 gastr surgery 1 resp medicine 1 cardiac	3 general surgery 1 general medicine 1 gastro-surgery
Primary diagnosis	1 cardiac problem 1 sepsis 1 pneumonia 1 pancreatitis 1 stomach cancer	2 sepsis 2 pancreatitis 1 bowel obstruction
Referral reason	3 not absorbing 1 pseudo-obstruction 1 vomit/large aspirates	2 not absorbing 1 pseudo-obstruction 1 unable to scope 1 vomit/large aspirates
NG fed days (mean ± SD)	5.1 ± 8.14	0.6 ± 0.89

RESULTS. Cortrak™ tube had a 100 % success rate and Tiger 2™ an 80 % rate. Insertion times were shorter in the Cortrak™ group (Cortrak™ 67.48 ± 55.24 min versus Tiger 2™ 247.8 ± 157.23 min). Ease of insertion, using a Visual Analogue Scale (VAS), showed a much lower difficulty score in Cortrak™ group (Cortrak™ 27.8 mm ± 34.4 vs 55 mm ± 32.9 Tiger 2).

Insertion data

	CORTRAK	TIGER 2
Insertion time (min ± SD)	67.48 ± 55.24	247.8 ± 157.23
Air insufflated	80 %	0 %
Success rate	100 %	80 %
Ease of insertion VAS (mm ± SD)	27.8 ± 34.4	55 ± 32.9
Number of tubes inserted	5	5

CONCLUSIONS. Whichever method is used, the patients' nutritional needs are met more readily using either of the bedside NJ insertion methods than by using the standard methods of insertion used at the Hospital Trust. Both of the tubes exhibit characteristics which may be useful in different circumstances or diagnosis. The Cortrak™ system is better at reducing the need for Xrays, but requires a skilled person to insert it. The Tiger 2™ tube insertion may possibly be incorporated into a bedside nurses' existing routine. The Cortrak™ provides useful visual feedback throughout the placement whilst the Tiger 2™ tube is either correctly placed or not. The Cortrak™ system was much quicker at achieving correct

placement than the Tiger 2™. The Tiger 2™ tube requires peristalsis to propel it through the stomach whereas the Cortrak™ does not. In both groups referral times were shorter than with standard insertions, enabling a patient to begin feeding much earlier. Despite the failure of one Tiger 2 ™ tube it is considered that both tube insertion methods are acceptable methods of correctly placing NJ tubes. It is argued that both tubes should be available in clinical practice, in order that they may be selected as seen appropriate for each individual patient.

Thanks to Merck and Cook for donation of the NJ tubes.

0309

DIFFERENCE OF PROGNOSTIC VALUE AMONG HEPATIC FUNCTION INDICES IN SEPTIC PATIENTS

G. Sun[1], J. Chen[1], B. Ouyang[1], M. Chen[1], C. Cai[1], P. Wang[1], L. Ke[2], Q. Wang[3], Y. Zhang[4], Q. Lei[3], X. Hu[1], X. Guan[1]

[1]The First Affiliated Hospital, Sun Yat-Sen University, SICU, Guangzhou, China, [2]Cancer Center of Sun Yat-Sen University, Guangzhou, China, [3]The Sixth Affiliated Hospital, Sun Yat-Sen University, Guangzhou, China, [4]The Third Affiliated Hospital, Sun Yat-Sen University, Guangzhou, China

INTRODUCTION. Liver is an important organ during sepsis. Hepatic function is able to predict the outcome.

OBJECTIVES. Our purpose is to compare prognostic value of different hepatic function indices during sepsis.

METHODS. Septic patients in SICU of our hospital from May 2011 to Feb 2012 were recruited. Cases with history of liver/bile disease or surgery were excluded. Variety of hepatic function indices were measured on admission. Parameters from other organs, APACHE-II score and SOFA score were also recorded. T-test, ROC curve analysis and logistic regression were performed to compare the prognostic value among hepatic function indices. End points included hospital discharge, ICU discharge, ventilator withdrawal and survival within 30d.

RESULTS. 75 cases entered the study. APACHE-II scores were 17.3 ± 8.34 and SOFA scores were 11.8 ± 9.19. Cases who were discharged from hospital had higher PDR-ICG (0.234/min vs 0.177/min, $p = 0.014$) than those who were not. Cases who were discharged from ICU or ventilator had higher CHE (3,329 vs 2,731 U/L, $p = 0.049$ and 3,328 vs 2,716 U/L, $p = 0.045$ respectively) and lower TB (17.6umol/L vs 33.5umol/L, $p = 0.025$ and 17.6umol/L vs 34.0umol/L, $p = 0.021$ respectively) than those who were not. Survivors had lower TB (18.8umol/L vs 36.5umol/L, $p = 0.016$) and GGT (57.0U/L vs 124U/L, $p = 0.049$) than non-survivors.

P value of independent T-test mean comparison

	Hospital discharge	ICU discharge	Ventilator withdrawal	Surviving
PDRICG	**0.014**	0.086	0.142	0.525
CHE	0.189	**0.049**	**0.045**	0.582
GGT	0.180	0.07	0.075	**0.049**
TB	0.097	**0.025**	**0.021**	**0.016**
ALT	0.366	0.572	0.557	0.364

In ROC analyses, PDR-ICG was able to predict hospital (sensitivity = 69.1 %, specificity = 80.0 %, $p = 0.001$) and ICU discharge (sensitivity = 73.0 %, specificity = 57.9 %, $p = 0.044$). CHE (sensitivity = 78.4 %, specificity = 47.4 %, $p = 0.042$ and sensitivity = 77.8 %, specificity = 46.2 %, $p = 0.041$ respectively) and GGT (sensitivity = 62.2 %, specificity = 71.1 %, $p = 0.044$ and sensitivity = 61.1 %, specificity = 69.2 %, $p = 0.050$ respectively) were able to predict ICU discharge and ventilator withdrawal. TB was able to predict survival (sensitivity = 75.0 %, specificity = 48.9 %, $p = 0.027$).

P value of ROC analysis

	Hospital discharge	ICU discharge	Ventilation withdrawal	Surviving
PDRICG	**0.001**	0.044	0.071	0.413
CHE	0.253	**0.042**	**0.041**	0.521
GGT	0.217	**0.044**	**0.050**	0.112
TB	0.231	0.069	0.129	**0.027**
ALT	0.959	0.232	0.352	0.523

In uni- and multivariate logistic regression, higher TB was associated with lower ventilation withdrawal rate ($p < 0.001$); higher GGT was associated with lower survival rate ($p = 0.005$).

P value of uni- and multivariate log regression

	ICU discharge	Ventilator withdrawal	Surviving	
PDRICG	0.015 0.354	0.083 0.568	0.138 < 0.001	0.518 0.062
CHE	0.184 0.329	0.049 0.263	0.044 0.918	0.575 0.688
GGT	0.175 0.636	0.068 0.376	0.073 0.993	**0.048 0.005**
TB	0.095 0.004	0.025 0.15	**0.021 < 0.001**	0.016 0.241
ALT	0.359 0.522	0.566 0.703	0.551 0.963	0.357 0.751

CONCLUSIONS. In sepsis PDR-ICG was associated with hospital and ICU discharge, and CHE was associated with ICU discharge and ventilator withdrawal, and GGT and TB were associated with ICU discharge, ventilator withdrawal and survival. These differences were due to different indications of hepatic function indices during sepsis.

REFERENCE(S) 1. Kramer L, Jordan B, et al. Incidence and prognosis of early hepatic dysfunction in critically ill patients-a prospective multicenter study. Crit Care Med. 2007;35(4):1099–104. 2. Kortgen A, Paxian M, et al. Prospective assessment of hepatic function and mechanisms of dysfunction in the critically ill. Shock. 2009;32(4):358–65. 3. Huang YH, Yang YL, et al. Hepcidin protects against lipopolysaccharide-induced liver injury in a mouse model of obstructive jaundice. Peptides. 2012;35(2):212–7.

GRANT ACKNOWLEDGMENT. 5010 clinical research program grant of Sun Yat-sen University.

0310

OUTCOME PREDICTORS IN CIRRHOTIC PATIENTS ADMITTED TO AN INTENSIVE CARE UNIT

C. Pereira[1], M. Rodrigues[2], I. Aragão[1], G. Campello[1]

[1]Hospital de Santo António-Centro Hospitalar do Porto, Porto, Portugal, [2]Hospital Divino Espírito Santo, Ponta Delgada, Portugal

INTRODUCTION. Cirrhotic patients admitted to intensive care units are perceived as having poor prognosis, particularly in the presence of advanced liver failure, cirrhotic complications and concurrent dysfunction of other organs. An improvement of mortality over time has been described, but it remains high despite intensive support.

OBJECTIVES. To evaluate independent factors associated with ICU mortality in cirrhotic patients admitted to Intensive Care Unit (ICU).

METHODS. Retrospective cohort study of all patients with liver cirrhosis, diagnosis through clinical and/or imaging studies, admitted between 1/1/10 to 31/12/12 in a mixed ICU at a tertiary, university hospital. Association of independent variables with ICU mortality was studied through logistic regression models. Statistical analysis was performed using SPSS® v20.0 for Windows®.

RESULTS. During the study period 1,159 patients were admitted in the ICU of those 59 had liver cirrhosis (5 %). The mean age of this subgroup was 57 ± 12 years, 80 % were men. The most frequent etiology for cirrhosis was alcohol (66 %), followed by mixed (alcohol and virus) in 17 %. The main diagnoses at admission were septic shock (32 %), hypovolemic shock (22 %) and gastrointestinal bleeding (14 %). The mean scores of SAPS II, SOFA 24 h, MELD and Child-Pugh were, respectively, 56 ± 17, 9 ± 3.5, 17 ± 7 and 9 ± 1.8. In this group of patients, 88 % had evidence of portal hypertension and the most frequent complications were: ascites (64 %), hepatic encephalopathy (49 %) and upper gastrointestinal bleeding (37 %). Regarding organ dysfunction support: 93 % required mechanical ventilation, 56 % vasopressor therapy and 15 % renal replacement therapy. ICU mortality rate was 51 %. General ICU population mortality rate was 29 %. In the univariate analysis variables significantly associated with ICU mortality were: SAPS II (OR 1.1, $p < 0.01$), SOFA 24 h (OR 1.4, $p < 0.01$), vasopressor therapy (OR 13.1, $p < 0.01$) and ascites (OR 6.2, $p < 0.01$). Those with a clinical or statically significant association with mortality were included in a multivariate model, that retained SAPS II score (OR 1.1 per point, $CI_{95\ \%} = 1.04–1.16$), vasopressor therapy (OR 9.3 per point, $CI_{95\ \%} = 1.8–47.3$) and ascites (OR 6.9 per point, $CI_{95\ \%} = 1.2–39.3$).The model had a very good discrimination power with an AUROC of 0.92. The occurrence of upper gastrointestinal bleeding and hepatic encephalopathy were not associated with worse prognosis in this patient′s group.

CONCLUSIONS. Cirrhotic patients represent a very small proportion of ICU admissions. ICU mortality was almost double than in general ICU population. Factors independently associated ICU mortality in this group were: SAPS II, vasopressor therapy and ascites.

REFERENCE(S) 1. Cholongitas E, et al.; Risk factors, sequencial organ failure assessment and model for end-stage liver disease scores for predicting short term mortality in cirrhotic patients admitted to intensive care unit. Aliment Pharmacol Ther. 2006;23:883–893.

0311

MICROCIRCULATORY REACTIVITY IN PATIENTS WITH DECOMPENSATED LIVER CIRRHOSIS

E. Colombaroli[1], K. Donadello[1], N. Al Jaridi[1], T. Gustot[2], S. Scolletta[1], L. Gottin[3], J. Creteur[1], J.-L. Vincent[1], F.S. Taccone[1], D. De Backer[1]

[1]Erasme University Hospital, Intensive Care Department, Brussels, Belgium, [2]Erasme University Hospital, Hepatology Department, Brussels, Belgium, [3]Azienda Ospedaliera Universitaria Integrata, Università degli studi di Verona, Intensive Care Department, Verone, Italy

INTRODUCTION. Cirrhosis is tipically associated with a hyperdynamic pattern, similar to sepsis. Although microcirculatory disturbances are common in sepsis, they have not been well studied in cirrhosis.

OBJECTIVES. To study the relationship between muscular microvascular function and the levels of mean arterial pressure (MAP) in critically ill patients with decompensated liver cirrhosis.

METHODS. Thenar muscle oxygen saturation (StO2) and muscle tissue hemoglobin index (THI) were continuously measured by a tissue spectrometer (InSpectra™ Model 650, Hutchinson Technology Inc, MN) in decompensated cirrhotic patients. In 35 patients, 27 (77 %) male, 56 [49–62] years, median APACHE II score on ICU admission 17 [16–20], and SOFA score on the day of enrolment 10 [8–13]; 23 patients (65 %) were Child Pugh C. Vaso-occlusive tests (VOT) (upper limb ischemia induced by a rapid pneumatic cuff inflation around the upper arm) were performed for all of them within 24 h from ICU admission. The following variables were recorded: StO2, THI, the slope of the decrease in StO2 during the occlusion (desc slope; %/s), the slope of the increase in StO2 following the ischemic period (asc slope; %/s), and muscle O2 consumption (nirVO2) expressing in arbitrary units using the following formula: −(Descending slope) × [(Basal THI + Min THI/2)]. We also pre-defined patients' categories as those receiving or not vasopressor agents (VP) or in those having a mean arterial pressure (MAP) ≤ or >70 mmHg. Data are presented as median [ranges] and count (percentage).

RESULTS. Of the 35 patients, 21 (60 %) were in severe sepsis/septic shock and 22 (63 %) patients were treated with vasopressors (noradrenaline or terlipressin). ICU mortality was 49 %. Median MAP was 76 [68–81] mmHg. NIRS values showed high StO2 (84.3 [80–88] %, and normal THI values (10.7 [8.7–13]), altered desc slope (−0.19 [−0.25 to (−0.14)] and asc slope 1.27 ([0.79–2.03]) values. There was no correlation between MAP (range 50–107 mmHg) and NIRS variables in the global cohort of patients. Nevertheless, we found a weak although significant correlation between asc slope and MAP among patients without VP ($r^2 = 0.07$; $p = 0.04$). In this subgroup of patients, StO2 was significantly lower in those ($n = 4$) with MAP ≤ 70 [50–70] mmHg when compared to the others ($n = 9$) [72–107 mmHg] (78 [62–81] vs. 86 [81–90], $p = 0.02$), with a trend also for lower asc slope ($p = 0.07$). On the other hand, among patients with MAP > 70 mmHg, we found lower desc slope (−0.16 [−0.19/−0.14] vs. −0.25 [−0.28/−0.14], $p = 0.01$) and nirVO2 (90 [71–104) vs. 143 [115–189], $p = 0.02$) among those treated with VP when compared to those without VP.

CONCLUSIONS. In decompensated cirrhotic patients, tissue oxygen saturation is related to MAP, unless they are treated with VP. The presence of shock and/or the use of vasopressors may influence microvascular reactivity and muscle oxygen consumption, especially when MAP is higher than 70 mmHg.

0312
OBSTACLES IN ACHIEVING EARLY ENTERAL NUTRITION

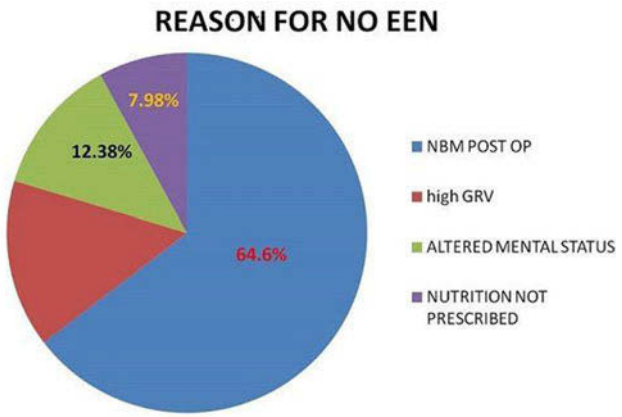
M. Kharbanda[1], S. Sinha[1], S. Todi[1]

[1]Amri Hospitals, Critical Care, Kolkata, India

OBJECTIVES. Evidence in literature suggests that enteral nutrition should be commenced in all critically ill patients within 24–48 h as far as possible. We aimed to assess the reasons in process compliance which act as obstacles in achieving this goal.

METHODS. This study was conducted in a 33 bedded medical surgical ICU from January 2010 to December 2010. We prospectively collected the data of all patients admitted during the study period.In our study EEN was defined as enteral nutrition commenced within 24 h after ICU admission.

RESULTS. 1,880 patients were admitted during this period of whom 645 were eligible to receive EEN. In 532 patients (82.48 %), EEN was achieved within 24 h. The most common causes of withholding EEN were: 1) Nil by mouth after surgery (surgeon′s discretion)—73 patients (64.60. %), high gastric residual volumes—17 patients (15.04 %), altered mental status (risk of aspiration)—14 patients (12.38 %), Nutrition not prescribed—9 patients (7.98 %).



CONCLUSIONS. It is possible to achieve early enteral nutrition in a majority of critically ill patients. Prolonged fasting after surgery seems to be the biggest obstacle in achieving more compliance. Nursing education about gastric residual volume needed to stop nutrition may further enhance compliance to EEN.

0313
IS PARACETAMOL SAFE TO USE IN PATIENTS ADMITTED TO LIVER INTENSIVE CARE UNITS?

A.L. Carver[1], Z. Mrevlje[1], J. Wendon[1]

[1]King's College Hospital NHS Foundation Trust, Institute of Liver Studies, London, UK

INTRODUCTION. Paracetamol (acetaminophen) is a widely used analgesic and antipyretic drug. Although it has a favourable safety profile when taken at therapeutic doses, at higher doses it is hepatotoxic [1]. Theoretically, patients with liver pathology could be at an increased risk of paracetamol-induced liver injury. While there is a mounting body of evidence for its safe use in patients with stable liver disease, there is a paucity of research into its safe use in the more acute setting [2].

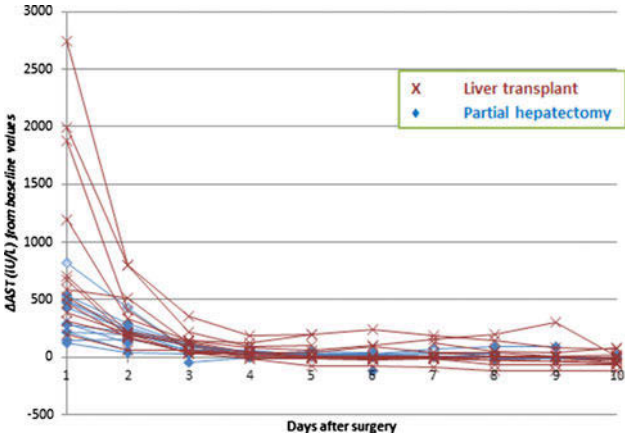
OBJECTIVES. A prospective observational audit looking at the effect of paracetamol on the liver function tests (LFTs) of patients who have undergone a partial hepatectomy or an orthotropic liver transplantation (OLT).

METHODS. International-normalised ratio (INR), aspartate aminotransferase (AST), alkaline phosphatase (ALP), gammaglutamyltransferase (γ-GT) and bilirubin were monitored for 10 days postoperatively. The average alcohol intake, comorbidities and medications including chemotherapy were noted. AST elevations from baseline were calculated. AST elevations immediately following surgery are to be expected. Subsequent elevations of >40 IU/L were analysed in the context of other LFTs as well as any clinically significant events that occurred at that time. This threshold was chosen since AST levels are permitted to fluctuate by 40 IU/L according to the AST reference range (10–50 IU/L).

RESULTS.

	OLT	Partial Hepatectomy
Patients	13	12
Right lobe resections		6
Male	9	6
Mean age	50	61
Ethnicity	Caucasian (12) Mixed (1)	Caucasian (10) Indian (1) Black African (1)
Alcohol (units/week)	0 (n=13)	0 (n=11) 20-25 (n=1)
Primary liver diagnosis	– Hepatitis B cirrhosis(1) – Alcoholic liver disease cirrhosis (2) – Polycystic liver disease (1) – Hepatitis C cirrhosis (1) – VOD related liver disease (1) – Sub-acute seronegative liver failure (1) – Cryptogenic cirrhosis and granulomatous hepatitis (1) – Congenital hepatic fibrosis (1) – HCC on a background of: – Hepatitis B (1) – Hepatitis C (1) – Alcoholic liver disease (1) – Non-alcoholic Steatohepatitis (1)	– Cholangiocarcinoma (2) – HCC hepatitis C (1) – Metastases: – Neuroendocrine tumour (2) – Sigmoid colon (3) – Rectum (3) – Unknown origin (1)

Patient demographics



Post-operative ΔAST from baseline values

AST levels dramatically rose immediately after surgery and then subsequently fell, returning to within 3 times the upper limit of normal (50 IU/L) by day three in most cases. This initial rise was 2.8 times greater in the OLT group, presumably reflecting the degree of insult each operation imposed on the liver. Secondary AST elevations occurred in 4 OLT patients and 2 hepatectomy patients with the mean dose of paracetamol received prior to this being 2.3 g over 4 days and 2.5 g over 7 days respectively. All 4 OLT patients concurrently experienced acute cellular rejection (ACR). 3 of these resolved the following day with treatment, suggesting that ACR was the cause. In the hepatectomy group, of the 2 that had secondary AST elevations, one was associated with neutrophilia. 5/6 patients who experienced secondary AST elevations and 10/19 who did not, were male. No other patient factors were associated with secondary AST elevations.

CONCLUSIONS. 2/25 patients had an otherwise unexplained AST rise which could be related to paracetamol. Further work is required to examine the metabolism of paracetamol in patients following liver surgery. We plan to conduct a randomised control trial looking at the effect of paracetamol versus a control on LFTs, an analysis of hepatic glutathione levels and a study on paracetamol pharmacokinetics.

REFERENCE(S) 1. Lee WM, Acute liver failure. Semin Respir Crit Care Med. 2012;33(1):36–45. 2. Benson GD, Koff RS, Tolman KG. The therapeutic use of acetaminophen in patients with liver disease. Am J Ther. 2005;12(2)133–41.

0314
IMPACT OF DELAYED DEFECATION ON OUTCOME IN CRITICALLY ILL PATIENTS

S. Fukuda[1], T. Miyauchi[1], M. Fujita[1], K. Kaneda[1], Y. Oda[1], T. Nakahara[1], M. Todani[1], Y. Kawamura[1], R. Tsuruta[1]

[1]Yamaguchi University Hospital, Advanced Medical Emergency and Critical Care Center, Ube City, Japan

INTRODUCTION. Critically ill patients can become constipated for various reasons, including the use of sedatives and narcotics, and sympathetic stimulation from stress and invasion. A recent study demonstrated a tendency for constipation in patients in the Intensive Care Unit (ICU), and suggested that delayed defecation was associated with increased infection rates and prolonged period of mechanical ventilation and ICU stay [1]. However, the risk factors for delayed defecation and its impact on outcome remain unclear.

OBJECTIVES. To evaluate the risk factors associated with delayed defecation in ICU patients, and investigate the relationship between delayed defecation and outcome.

METHODS. This study was a retrospective single-center analysis conducted in the ICU of a university hospital. Data were obtained from the medical records of all patients aged 18 years or older who were admitted to the ICU for at least 7 days between January and December 2011. Patients who had defecated within 6 days of admission were assigned to the 'early defecation' group; those after 7 days were assigned to the 'late defecation' group. Variables associated with defecation were compared between the two groups, and the risk factors for delayed defecation were analyzed.

RESULTS. A total of 189 and 98 patients were assigned to the early defecation and late defecation groups, respectively. No significant difference was found between the two groups in terms of age, gender, or APACHE II score. Compared with the early defecation group, patients in the late defecation group received longer periods of mechanical ventilation, more surgeries, and were administered more vasopressors, narcotics, and sedatives. In surviving patients, ICU stay was significantly longer in the late defecation group than in the early defecation group [median (interquartile range), 12 (8–19) vs. 15 (9–23) days, $p = 0.021$]. Multivariate logistic regression analysis demonstrated that independent risk factors for delayed defecation were surgery [odds ratio (OR) 2.378; 95 % confidence interval (CI) 1.281–4.416, $p = 0.006$], use of sedatives [OR 2.47; 95 % CI 1.329–4.59, $p = 0.004$], use of narcotics [OR 2.26; 95 % CI 1.086–4.7, $p = 0.029$], late initiation of enteral nutrition [OR 1.973; 95 % CI 1.064–3.659, $p = 0.031$], and late laxative use [OR 3.241; 95 % CI 1.59–6.606, $p = 0.001$].

CONCLUSIONS. Surgery and administration of sedatives or narcotics were identified as risk factors for delayed defecation, which was associated with prolonged ICU stay. The present results suggest that early use of laxatives and early initiation of enteral nutrition could improve delayed defecation and decrease the length of ICU stay.

REFERENCE(S) 1. Gacouin A, Camus C, Gros A. Constipation in long-term ventilated patients: Associated factors and impact on intensive care unit outcomes. Crit Care Med. 2010;38:1933–8.

0315
ASSOCIATION BETWEEN BLOOD ALCOHOL CONCENTRATION AND MORTALITY IN CRITICAL ILLNESS

C.R. Stehman[1], T. Moromizato[2], C.K. McKane[3], K.M. Mogensen[4], F.K. Gibbons[5], K.B. Christopher[2]

[1]Brigham and Women's Hospital, Departments of Emergency Medicine and Surgery, Boston, USA, [2]Brigham and Women's Hospital, Renal Division, Boston, USA, [3]Brigham and Women's Hospital, Department of Nursing, Boston, USA, [4]Brigham and Women's

Hospital, Department of Nutrition, Boston, USA, [5]Massachusetts General Hospital, Pulmonary and Critical Care Medicine, Boston, USA
INTRODUCTION. Biological data shows that acute alcohol administration improves experimental ischemia re-perfusion injury and subsequent organ dysfunction.
OBJECTIVES. In this study we hypothesized that the blood alcohol concentration (BAC) at hospital admission would decrease the risk of 30-day mortality in critically ill patients.
METHODS. We performed a two center observational study of patients treated in medical and surgical intensive care units in Boston, Massachusetts. We studied 11,850 patients, age ≥18 years, who received critical care between 1997 and 2007. The exposure of interest was the BAC determined in the first 24 h of hospital admission and categorized a priori as BAC < 10 mg/dL (below level of detection), 10–80, 80–160 and >160 mg/dL. The primary outcome was all cause mortality in the 30 days following hospital admission. Secondary outcomes included 90-day and 365-day mortality following hospital admission. Mortality was determined using the US Social Security Administration Death Master File and 365 day follow-up was present in all cohort patients. Adjusted odds ratios were estimated by multivariable logistic regression models with inclusion of covariate terms thought to plausibly interact with both BAC and mortality. Adjustment included age, gender, race (white, non-white), type (surgical versus medical), Deyo–Charlson index, and acute organ failure.
RESULTS. 30-day mortality of the cohort was 13.7 %. Compared to patients with BAC levels <10 mg/dL, patients with levels ≥10 mg/dL had lower odds of 30-day mortality; for BAC levels 10–79.9 mg/dL the OR was 0.53 (95 % CI 0.40–0.70), for BAC levels 80–159.9 mg/dL it was 0.36 (95 % CI 0.26–0.49), and for BAC levels ≥160 mg/dL it was 0.35 (95 % CI, 0.27–0.44). Following multivariable adjustment, the OR (95 % CI) of 30-day mortality was 0.93 (0.69–1.24), 0.74 (0.53–1.02), and 0.65 (0.50–0.83), in patients with BAC of 10–79.9, 80–159.9, ≥160 mg/dL respectively compared to those with BAC < 10 mg/dL. Additional adjustment for sepsis, chronic liver disease, or trauma did not materially alter the point estimates. When the cohort was analyzed with sepsis as the outcome of interest, the multivariable adjusted odds of sepsis in patients with BAC 80–160 mg/dL or >160 mg/dL were 0.72 (0.50–1.04) or 0.68 (0.51–0.90) respectively compared to those with BAC < 10 mg/dL. Further, in a subset of patients with blood cultures drawn (n = 4,065), the multivariable adjusted odds of bloodstream infection in patients with BAC 80–160 mg/dL or >160 mg/dL were 0.53 (0.27–1.01) or 0.49 (0.29–0.83) respectively compared to those with BAC < 10 mg/dL.
CONCLUSIONS. Analysis of 11,850 adult patients showed that having a detectable BAC at hospitalization was associated with significantly decreased odds of 30-day mortality following critical care. Further, BAC > 160 mg/dL at hospitalization is associated with significantly decreased odds of developing sepsis and bloodstream infection.

ECMO update: 0316–0329

0316

CHARACTERIZATION OF THE PROCALCITONIN RESPONSE CURVE FOLLOWING INITIATION OF EXTRACORPOREAL MEMBRANE OXYGENATION

L.A. DeLuca[1], A.B. Williams[1], L.R. Stoneking[1], C. Smith[2], K.R. Denninghoff[1], S. Elliott[3], D. Wolk[4], D.J. Novak[4], R. Meyer[3]
[1]University of Arizona, Department of Emergency Medicine, Tucson, USA, [2]University of Arizona, Department of Cardiothoracic Surgery, Tucson, USA, [3]University of Arizona, Department of Pediatrics, Tucson, USA, [4]University of Arizona, Department of Pathology, Tucson, USA
INTRODUCTION. Procalcitonin (PCT) is a quantitative serum inflammatory marker that rises within hours of bacterial infection incrementally with disease severity, and rapidly clears from the blood with appropriate treatment. Extracorporeal membrane oxygenation (ECMO) is similar to cardiopulmonary bypass (CPB), which produces a systemic inflammatory response secondary to blood contact with foreign, non-physiologic surfaces. Several studies of CPB patients have found a transient rise in PCT, peaking 24–48 h postoperatively, and approaching baseline within 5 days. ECMO patients have significant risk of developing sepsis and are especially fragile with tightly controlled physiology, impairing the physician's ability to monitor for classic physiological signs of sepsis. Early identification of sepsis in ECMO patients could result in earlier treatment and reduced morbidity and mortality.
OBJECTIVES.
1. To determine if a reliable baseline PCT response-curve can be characterized for non-septic ECMO patients.
2. To determine whether septic ECMO patients have predictably higher PCT levels than non-septic patients.
METHODS. An observational prospective design was used for this study. Discarded blood samples were used to measure baseline PCT levels prior to initiating ECMO and again on days 1, 2, 3 and 4. Medical records, labs, cultures, and imaging were reviewed until patient discharge or death to identify patients with sepsis or serious bacterial infections (SBI).
RESULTS. Twelve (12) patients have been enrolled, with complete response curves for six (6) patients. We observe a rapid and transient rise in PCT when ECMO is initiated in non-septic patients, with initial PCT responses sometimes the current thresholds used to identify sepsis (2.0 ng/mL). PCT appears to rapidly clear in patients who remain on ECMO and are not septic, and continues to rise in patients who go on to develop SBI. Patients already septic when initiating ECMO have a more pronounced PCT response, which rapidly clears when infection is treated.
CONCLUSIONS. PCT results in the first 1–2 days of ECMO should be interpreted with caution due to the transient elevation observed to occur with initiation of ECMO therapy. There is a clear difference in PCT between septic and non-septic patients on ECMO. Serial assays may be useful to confirm the diagnosis of sepsis and to confirm response to antibiotic therapy.
REFERENCE(S) 1. Aouifi et al. Br J Anaesth. 1999;83(4):602–7. 2. Celebi et al. Intensive Care Med. 2006;32(6):881–7. 3. Delannoy et al. Crit Care. 2009;13(6):R180. 4. Gendrel et al. Pediatr Infect Dis J. 1999;18(10):875–81. 5. Jebali et al. Anesthesiology. 2007;107(2):232–8. 6. Luzzani et al. Crit Care Med. 2003;31(6):1737–41. 7. Müller et al. Chest. 2010;138(1):121–9. 8. Simon et al. Clin Infect Dis. 2004;39(2):206–17.
GRANT ACKNOWLEDGMENT. Arizona Emergency Medicine Research Center Seed Grant.

0317

USE OF EXTRACORPOREAL LIFE SUPPORT (ECLS) AFTER HEART TRANSPLANTATION IN MECHANICALLY BRIDGED PATIENTS

L. De Gendt[1], K. De Decker[1], N. De Neve[1], B. Stockman[1], J. Verbeke[1]
[1]OLV Aalst, Intensive Care, Aalst, Belgium
INTRODUCTION. Cardiopulmonary failure after heart transplantation (HTX) is often treated with mechanical circulatory support (MCS) to prevent multi-organ failure and early death. In an overall HTX population 5–13 % of patients are supported with ECLS.
OBJECTIVES. The use of post-transplant ECLS is less documented in the subpopulation of patients 'bridged to transplant'. We retrospectively reviewed our transplanted ventricular assist device (VAD) patients.
METHODS. From 2009 untill 2012 fifteen VADs were implanted. After exclusion of those still on support, 60 % of the remaining patients were transplanted, of which 4 needed ECLS post-HTX. We compared our data with those reported in the literature. A pubmed search, using the search terms '(ECMO OR ECLS) AND (heart transplantation) AND (VAD)' was performed.
RESULTS. None of the HTX patients without prior VAD support developed cardiopulmonary failure versus 1/7 (14 %) and 3/8 (37,5 %) in LVAD and BIVAD patients respectively. All 4 received ECLS support (peripheral/central access = 3/1). The mean age was 55 years and the median duration of support was 7 days. Revision for tamponade and hemodialysis were necessary in all 4 patients. 2 patients suffered from serious vascular complications for which surgery was necessary. 1 patient died. Weaning was successful in 3 patients (75 %), whom were all discharged from the hospital. They are still alive at 3 years of follow-up without any long term sequellae.
Only in 4 articles (1–4), dealing with ECLS post-HTX, the amount of bridged patients was mentioned separately. The incidence of cardiopulmonary failure is higher (11–25 %) than in the general HTX population. Weaning percentages, survival to discharge and duration of support range from 66–90, 50–75 and 4–7 days respectively. However, these outcome data are never described for bridged patients separately.
CONCLUSIONS. The incidence of post-HTX cardiopulmonary failure is higher in VAD patients than in non-bridged patients. Comparing support and outcome with available literature data is difficult, as this subpopulation of patients was never discussed separately before.
REFERENCE(S) 1. Listijono D.R. et al. Usefulness of extracorporeal membrane oxygenation for early cardiac allograft dysfunction. J Heart Lung Transplant 2011;30:783–9. 2. Marasco S.F. et al. Early institution of mechanical support improves outcomes in primary cardiac allograft failure. J Heart Lung Transplant 2005;24:2037–42. 3. D'Allesandro C, et al. Extra-corporeal membrane oxygenation temporary support for early graft failure after cardiac transplantation. Eur J Cardiothorac Surg 2010;37:343–9. 4. Marasco SF, et al. Extracorporeal membrane oxygenation in primary graft failure after heart transplantation. Ann Thorac Surg. 2010;90:1541–47.

0318

CIRCULATORY SUPPORT BY VA ECMO (VENOARTERIAL EXTRACORPOREAL MEMBRANE OXYGENATION): CANNULATION TYPES AND RELATED COMPLICATIONS

M.A. Solla Buceta[1], A.I. Hurtado Doce[1], M.J. García Monge[1], L. Seoane Quiroga[1]
[1]A Coruña University Hospital, A Coruña, Spain
INTRODUCTION. Related complications with cannulation in patiens supported by VA ECMO are associated with high morbidity and mortality. In the Literature is well-defined that central cannulation is associated with increasing risk of bleeding and peripheral cannulation is associated with increased risk of isquemia. Surgical technique and type of device support are associated with increased risk of early infection. The most common technique in peripheral cannulation consists of the introduction a retrograde cannula through the femoral artery, which is associated with a distal anterograde cannula to improve lower limb perfusion; however this technique continues having major complications, so new strategies of cannulation are being developed.
OBJECTIVES. To analyze the incidence of complications in patiens supported by VA ECMO type peripheric cannulation, attending to the surgical technique used in arterial cannulation. Bleeding complications are collected (major bleeding defined by TIMI criteria during the first 24 h of support), infectious complications (primary bacteriemia or infection/dehiscence of the surgical wound), and lower limb ischemic complications.
METHODS. Cohort descriptive study of all patients in cardiogenic shock supported by VA ECMO (peripheric cannulation) from 31/12/2010 to 01/03/2013. Ischemic, infectious and bleeding complications were collected. Group with retrograde cannula associated to anterógrade perfusion cannula was compared with the group with dacron graft termino-lateral (Fusion®8 mm). Baseline characteristics of each group were described according to demographic variables (gender, age), etiology and clinical implantation variables; later the incidence of bleeding complications, infectious and ischemic lower limb were analized.
RESULTS. During study period 14 patient in cardiogenic shock supported by VA ECMO were included. Periferic cannulation was realized in 12 patients: 7 (58,3 %) with retrograde cannula associated to anterograde perfusion cannula and 5 (41,7 %) with Dacron graft termino-lateral. Baseline characteristics are described in Table 1 and complications registred in Table 2.

Table 1

	Retrograde cannula associated with anterograde perfusion cannula	Dacron graft termino-lateral
Patients	7	5
Middle age	55.6 ± 10.3	58.4 ± 8.6
Male sex	57 %	80 %
Ischemic heart disease	42.8 %	100 %
Thrombocytopenia <100,000	28.6 %	20 %
Dual antiplatelet therapy	42.9 %	80 %
Previous IABP	85.7 %	80 %
IABP ÷ ECMO support	33 %	100 %
Average time support	9.3 ± 5.9 median 10	14.6 ± 11.1 median 11

Table 2

Complications	Retrograde cannula associated with anterograde perfusion cannula	Dacron graft termino-lateral
Major bleeding	2 (33.3 %)	4/5 (80 %)
Surgical revision for bleeding	2	2
Primary bacteriemia or catheter associated	1/7 (14.3 %)	No case
Infection/dehiscence wound	2 (28.6 %)	2 (40 %)
Lower limb ischemia	5 (71.4 %)	No case
Resolution of ischemia	Embolectomy: 2 cases changing of anterograde perfusion cannula: 2 cases removal of ECMO: 1 case	

CONCLUSIONS. The incidence of complications associated with VA ECMO cannulation remains high. This register contains a higher percentage of ischemic complications associated with retrograde cannula insertion through the femoral artery without dacron graft, despite antegrade perfusion cannula was placed. In contrast, bleeding complications are more frequent in patients with Dacron graft cannulation. Because of the small sample size and absence of homogeneity between groups we can not generalize these results.

REFERENCE(S) 1. Lamb KM, et al. Preparation and technical considerations for percutaneous cannulation for veno-arterial extracorporeal membrane oxygenation. J Card Surg. 2013;28:190–192. 2. Lee SH, et al. Factors predicting early and long-term survival in patients undergoing extracorporeal membrane oxygenation (ECMO). J Card Surg. 2012;27:255–263.

0319

TWO-YEAR RADIOLOGICAL RESULTS OF POSTOPERATIVE EDEMA IN PEDIATRIC CARDIAC PATIENTS TREATED WITH EXTRACORPOREAL MEMBRANE OXYGENATION (ECMO)

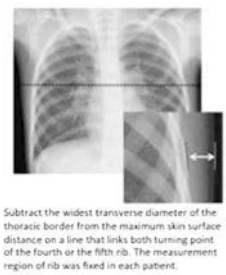
T. Sugiura[1], Y. Fujita[1], K. Sobue[1]

[1]Nagoya City University, Nagoya, Japan

INTRODUCTION. Technical advances in both surgical and perioperative management have resulted in dramatic improvements in outcomes for pediatric patients with complex congenital heart disease[1, 2]. However, postoperative mechanical support is still indispensable in some patients[3]. ECMO has been used as an effective way to prolong extracorporeal circulation in complex congenital heart disease patients who demonstrate medically refractory hemodynamic deterioration postoperatively. During ECMO support, severe systemic edema has been quite frequently observed.

OBJECTIVES. Clinicians continue to use the roentgenographic heart size because the baseline cardiothoracic ratio is associated with increased mortality in chronic heart failure patients. We evaluated whether roentgenographic systemic edema during ECMO was associated with cardiosurgical outcomes.

METHODS. We conducted a retrospective study of pediatric cardiac surgery patients with ECMO postoperatively. An index of systemic edema (I_E) defined as the skin thickness, which indicated swelling in the tissue under the skin, was measured on a chest roentgenogram. The patients were divided into two groups, survivors (Group S) and non-survivors (Group NS), and data including I_E, surgical factors and postoperative factors were evaluated statistically (two-way repeated measure ANOVA, t test).



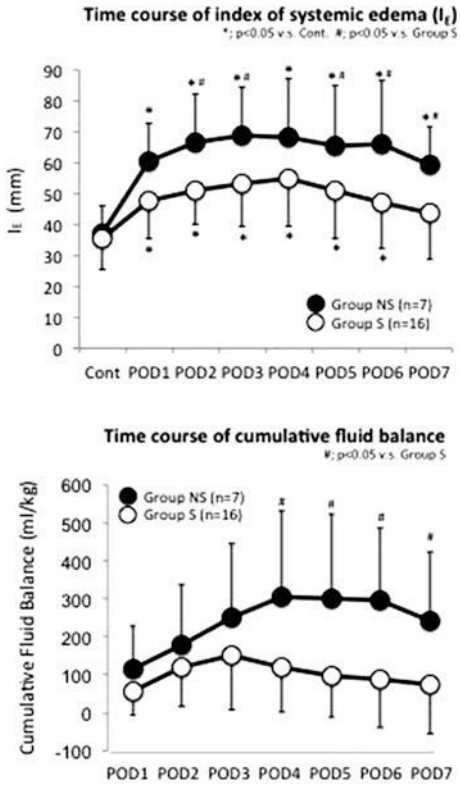
The method for determining index of systemic edema

RESULTS. Twenty-three patients were included. Overall long-term survival was 65 %, with 16 patients being successfully weaned from ECMO. In NS, ages (8.1 ± 6.0 months) and body weights (6.1 ± 2.0 kg) were lower than in S (20.1 ± 21.6 months, 8.4 ± 3.6 kg).

Patient characteristics in group non-survivors

No.	Age (mth)	Weight (kg)	Diagnosis	Operative procedure	ECMO indication	ECMO (days)	IE max (mm)
1	2	5.4	HLHS	Norwood, Glenn	Hypoxia	9	90.9
2	15	5.8	cAVSD	PA plasty, BT shunt	Hypoxia	11	59.3
3	8	6.2	Truncus	RV-PA conduit, BTshunt	Arrhythmia	16	51.0
4	9	7.6	HLHS	Norwood	Hypoxia	15	85.0
5	7	6.4	SRV, DORV, PS	AVVR repair, ASD creation	Arrhythmia	15	87.6
6	0	3.2	TGA, DORV, PS	Jatene	Low cardiac output	10	87.1
7	16	9.4	TOF	ICR	Low cardiac output	9	78.2

No significant difference was seen in operating time, CPB time or aortic cross-clamp time. The peak value of I_E (S, 54.9 ± 15.4; NS, 68.9 ± 15.5 mm) was observed on POD4 and POD3, respectively. While the I_E on POD7 was improved and returned to the level of $I_{E\ cont}$ in S (35.5 ± 10.2 mm), the I_E in NS was increased compared with $I_{E\ cont}$ throughout the entire period of measurement postoperatively (37.1 ± 9.0 mm). The I_E in NS was increased compared with that in S during the postoperative period, except on POD1 and POD4.



Figure

The time course of cumulative fluid balance was different between groups from POD4. The measured daily amounts of wound drain and peritoneal dialysis demonstrated significant increase and the amount of urine demonstrated significant decrease in NS, despite the cumulative total outlet not being different between groups. While, in terms of the amount of blood transfusion, a significant increase was identified in NS, as well as the cumulative total intake being increased in NS.

CONCLUSIONS. The thickness and the duration of significant edema during ECMO were clearly increased in non-survivors. These results suggest that the thickness of edema assessed in chest X-P could be one of the predictors of prognosis during ECMO.

REFERENCE(S) 1. Prsa et al. Pediatrics 2010. 2. Fixler et al. Circulation 2010. 3. Bartlett et al. Trans Am Soc Artif Intern Organs 1976.

0320

A THEORETICAL MODEL OF OXYGEN DELIVERY DURING VENO-VENOUS EXTRACORPOREAL MEMBRANE OXYGENATION (ECMO)

M. Giani[1], A. Zanella[1], V. Scaravilli[1], N. Patroniti[1], A. Pesenti[1]

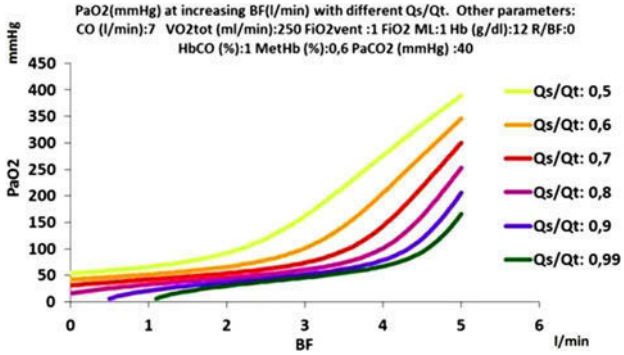
[1]Ospedale San Gerardo Nuovo dei Tintori, University of Milano-Bicocca, Department of Experimental Medicine, Monza, Italy

INTRODUCTION. Many variables determinate oxygenation during veno-venous extracorporeal membrane oxygenation (vv-ECMO) in the context of severe hypoxia due to acute respiratory insufficiency. The role and interaction of such variables are complex and often unintuitive.

OBJECTIVES. In this study we describe a theoretical model which describes and predicts blood oxygenation during vv-ECMO.

METHODS. A mathematical model of blood oxygen content and delivery was derived from well-known equations, the independent variables were: total oxygen consumption (VO_2tot, ml/min), cardiac output (CO, l/min), extracorporeal blood flow (BF, l/min), extracorporeal recirculation fraction (R/BF, %), natural lung shunt fraction (Qs/Qt, %), oxygen fractions of ventilator (FiO_2vent, %) and membrane lung (FiO_2ML, %), hemoglobin (Hb, g/dl). We compiled an interactive spreadsheet to generate specific output graphs.

RESULTS. The panel below is an example of output graphs: it shows arterial PO_2 (PaO_2, mmHg) at increasing BF with different Qs/Qt. VO_2TOT, CO, FiO_2vent, FiO_2ML and $PaCO_2$ (mmHg) were constant.



PaO_2 at increasing BF with different Qs/Qt

CONCLUSIONS. This theoretical model may primarily be employed as a didactic tool; however, it may also guide intensivists dealing with challenging vv-ECMO scenarios.

0321
MECHANICAL COMPLICATIONS OF EXTRACORPOREAL MEMBRANE OXYGENATION

M. López Sánchez[1], M.I. Rubio López[1], J.C. Rodríguez Borregán[1], C. González Fernández[1], F.J. Burón Mediavilla[1], M. Cordero Vallejo[1], J.A. Sarralde Aguayo[2]

[1]University Marqués de Valdecilla Hospital, Intensive Care Unit, Santander, Spain, [2]University Marqués de Valdecilla Hospital, Cardiovascular Surgery, Santander, Spain

INTRODUCTION. Mechanical complications (MC) of extracorporeal membrane oxygenation (ECMO) are those directly related to the ECMO circuit. Clot formation (in the oxygenator, circuit) is noted in 20.7–30 % patients and historically is the most common complication. Oxygenator failure is related in 17.1–18 % patients. Problems with the cannula are seen in 8.4–21.2 % patients.

OBJECTIVES. To describe complications related to the ECMO circuit: cannula, centrifugal pump and membrane oxygenator.

METHODS. Descriptive and retrospective study in a 22 beds intensive care unit (ICU) of a tertiary hospital center, between April 2008 and April 2013. Inclusion criteria: patients supported by ECMO for respiratory and/or cardiac failure. Components of Maquet ECMO system included: PLS© and HLS© membrane oxygenator, Rotaflow© and Rotassist© centrifugal pump, and Bioline© (albumin and heparin) coated circuits. Systemic anticoagulation with sodium heparin was used.

RESULTS. 37 patients were included. They were media age 44.64 (range 16–67) and 28 were men (75.27 %). Pneumonia was the principal indication of ECMO in 17 patients (45.94 %) and second indication was lung transplantation (LT) in 16 patients (43.24 %). In this setting, ECMO was used as bridge to LT, intraoperative respiratory and/or circulatory support and treatment of primary graft dysfunction. Others indications in miscellaneous group were: pulmonary contusion (n = 1), massive pulmonary thromboembolism (n = 1), cardiogenic and septic shock (n = 1) and massive bronchial fistula (n = 1). Twenty-five patients received venous–venous ECMO (67.56 %) and 12 patients were supported with venous-arterial ECMO. Cannulation site was ICU in 21 patients (56.75 %), and operating room in 12 patients. Femoro-femoral access was the principal approach. Six patients were managed without anticoagulation. Cannula-related problems were the most common complication with 8 cases (21.62 %): kinking (n = 4), malposition (n = 2), decannulation (n = 1) and cannula thrombosis (n = 1). Consequences of these complications were hypoxia in 4 patients with extreme bradycardia in 2 patients and recirculation in 2 patients. The second complication was oxygenator failure in 6 cases (16.21 %) with membrane replacement in all cases. Extreme bradycardia in 2 patients and cardiorespiratory arrest in one patient were the consequences. Others MC in this group were: pump failure (n = 2); oxygen source rupture (n = 1); lower limb ischemia secondary to perfusion cannula thrombosis (n = 1); jugular vein tear (n = 1); femoral artery tear (n = 1); inferior cava vein tear (n = 1); atrium rupture with cardiac tamponade (n = 1).

CONCLUSIONS. in our group, cannula-related problems were the most common MC (21.62 %). None of MC were cause of death in our patients with ECMO support.

REFERENCE(S) 1. Brodie D, Bachetta M. Extracorporeal membrane oxygenation for ARDS in adults. N Engl J Med. 2011;365:1905–14.

0322
SAFETY OF PERCUTANEOUS DILATATIONAL TRACHEOSTOMY IN PATIENTS ON EXTRACORPOREAL LUNG SUPPORT

S.A. Braune[1], S. Kienast[1], J. Hadem[2], O. Wiesner[3], D. Wichmann[1], A. Nierhaus[1], M. Simon[1], T. Welte[1], S. Kluge[1]

[1]University Medical Center Hamburg-Eppendorf, Department of Intensive Care Medicine, Hamburg, Germany, [2]Hannover Medical School, Department of Gastroenterology, Hepatology and Endocrinology, Hannover, Germany, [3]Hannover Medical School, Department of Respiratory Medicine, Hannover, Germany

INTRODUCTION. Performing percutaneous dilatational tracheostomy (PDT) in patients on extracorporeal lung support (ECLS) requiring therapeutic anticoagulation potentially carries an increased risk of periprocedural bleeding and/or circuit thrombosis.

OBJECTIVES. To evaluate the safety of PDT in severely critically ill patients on ECLS.

METHODS. Retrospective, observational study on all patients undergoing tracheostomy while on pumpless extracorporeal lung assist (avECLA) or extracorporeal membrane oxygenation (ECMO) in intensive care units of two university hospitals in Germany between 2007 and 2012.

RESULTS. A PDT was performed on 83 patients. The median platelet count, INR, and aPTT before tracheostomy were 132 x10^9/L (range 16–611), 1.1 (0.9–2.0), and 52 s (28–117), respectively. 10 patients (12.0 %) received a maximum of 3 bags of pooled platelets and 7 patients (8.4 %) received a maximum of 4 units of fresh frozen plasma before the procedure. In all patients intravenous heparin was briefly paused periprocedurally. No periprocedural clotting complication within the extracorporeal circuit was observed. In one patient (1.2 %) intraprocedural major stomal bleeding required conversion to a surgical tracheostomy. One pneumothorax (1.2 %) occurred post tracheostomy, which was successfully treated with a chest drain. Minor bleeding from the tracheostomy site occurred in 23 cases (27.7 %). No fatality was attributable to the tracheostomy.

CONCLUSIONS. The complication rates of PDT in patients on extracorporeal lung support were low and comparable to those of other critically ill patients. Performance of PDT by experienced operators and with careful optimization of the coagulation state is relatively safe and not contraindicated for this patient group.

0323
REFRACTORY VENTRICULAR FIBRILLATION AND SURVIVAL IN OUT-OF-HOSPITAL CARDIAC ARREST TREATED WITH EXTRACORPOREAL CARDIOPULMONARY RESUSCITATION

K. Maekawa[1], K. Tanno[1], M. Hase[1], E. Narimatsu[1]

[1]Sapporo Medical University, Trauma & Critical Care, Sapporo, Japan

INTRODUCTION. Cardiac arrest patients who present initially or subsequently with ventricular fibrillation (VF) and gain early successful defibrillation are known to have an increased survival. However, this has not been established in prolonged arrest patients treated with extracorporeal cardiopulmonary resuscitation (ECPR).

OBJECTIVES. To test the hypothesis that initially and repeatedly presenting VF before hospital arrival are associated with survival in ECPR patients.

METHODS. We performed an observational cohort study in a tertiary care hospital over 10 years (2000–2009). Adult ECPR patients with witnessed out-of-hospital cardiac arrests of cardiac origin and treated with hypothermia were included. ECPR was initiated at the discretion of the attending physician. Countershock was delivered with automated external defibrillators by emergency life-saving technicians (2000–2009) and citizens (2004–2009). We defined repeatedly presenting VF (i.e. refractory VF) as delivered shocks of 4 times or more before hospital arrival. Primary endpoint was a survival at 1 month after cardiac arrest.

RESULTS. Of 57 eligible patients, 44 (77.2 %) presented initially with VF, 24 (42.1 %) suffered refractory VF before hospital arrival, and 23 (40.4 %) survived at 1 month after cardiac arrest. Logistic regression analysis showed that refractory VF was significantly associated with survival at 1 month (adjusted odds ratio, 4.8; 95 % confidence interval, 1.2–19.6), however, initially presenting VF was of no significance. Kaplan–Meier analysis showed that patients with refractory VF were more likely to survive at 1 month than patients without refractory VF (14/24 [58.3 %] vs. 9/33 [27.3 %], log-rank p = 0.046).

CONCLUSIONS. Refractory VF, regardless of initial cardiac rhythm, was associated with better outcome in out-of-hospital cardiac arrest treated with ECPR. Patients with refractory VF may be appropriate candidates for receiving ECPR.

REFERENCE(S) 1. Sasson C, Rogers MA, Dahl J, et al. Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis. Circ Cardiovasc Qual Outcomes 2010;3:63–81. 2. Olasveengen TM, Samdal M, Steen PA, et al. Progressing from initial non-shockable rhythms to a shockable rhythm is associated with improved outcome after out-of-hospital cardiac arrest. Resuscitation 2009;80:24–9. 3. Maekawa K, Tanno K, Hase M, et al.: Extracorporeal cardiopulmonary resuscitation for patients with out-of-hospital cardiac arrest of cardiac origin: a propensity-matched study and predictor analysis. Crit Care Med. 2013;41:1186–96.

0324
COLISTIN LEVELS IN PATIENTS RECEIVING EXTRACORPOREAL MEMBRANE OXYGENATION WITH OR WITHOUT RENAL REPLACEMENT

S. Angermair[1], L. Wagner[1], U. Tröger[2], S.M. Bode-Böger[2], M. Deja[1]

[1]Charité-Universitätsmedizin Berlin, Berlin, Germany, [2]Otto-von-Guericke-Universität Magdeburg, Magdeburg, Germany

INTRODUCTION. The effect of extracorporeal therapies (Extracorporeal membrane oxygenation; *ECMO* and continious veno-venous hemofiltration; *CVVH*) on the serum concentration of intravenous Colistin is not well known. Rare data are available about colistin and renal replacement-therapies but to the best of our knowledge there are no data concerning Colistin and ECMO and in combination with CVVH, either. As an approach to this problem we analyzed arterial blood concentrations of colistin by therapeutic drug monitoring (TDM).

OBJECTIVES. To evaluate the interaction beetween extracorporeal theraphies and the serum levels of colistin in critically ill patients.

DESIGN. Observation.

SETTING. 24-bed university hospital ICU, nationwide ARDS referral centre including extracorporeal membrane oxygenation (ECMO).

METHODS. ECMO patients colonized respectively infected with KPC were observed. Two of these patients received an additional renal replacement (CVVH).

The patients achieved intravenous colistin only at the clinical discretion of the attending physician according to the MIC breakpoints suggested by EUCAST. Blood samples to measure the through levels of colistin were daily taken.

Three patients (1, 2, 4) received a loading dose of 9 Mio. colistimethate sodium (CMS), one patient (3) received 2 × 2 Mio units at the first day of treatment (day 0). After achieving the loading dose the application interval in all of these patients was set to 8 h. Usually the TDM results of colistin were available within 24 up to 96 h after taking the samples.

RESULTS. All patients, who achieved a loading dose reached the recommended trough level, one patient, who didn't achieved one, did not. After a loading dose the ECMO patients showed sufficient level (without renal failure) although the daily dose was reduced to 3 x 1.5 Mio units colistin.

One ECMO patient on CVVH showed toxic levels of colistin after a loading dose and 3x 3 Mio units colistin. Another ECMO patient on CVVH without loading dose and only 3x 1 Mio units Colistin did not reach recommended trough level up to day 5 of treatment (Tab. 1).

Pat with ECMO without renal failure				Pat with ECMO + CVVHD with renal failure			
Pat 1: 9 MIO/U Loading dose				Pat 3: without loading dose			
day	Dosage[1]	Colistin level[2]	creatinine[3]	day	dosage[1]	Colistin level[2]	creatinine[3]
d1	3 x 1,5	1,0	1,22	d1	3x1	0,1	1,46
d2	3 x 1,5	0,91	1,22	d2	3x1	1,3	1,51
d3	3x1,5	1,78	1,1	d3	3x1	0,89	1,48
d4	3x1,5	1,76	1,07	d4	3x1	0,29	1,31
d5	3x1,5	1,56	1,13	d5	3x1	0,88	1,42
Pat 2: 9 Mio/U Loading dose				Pat 4: 9 Mio/U Loading dose			
d1	3x1,5	1,21	1,22	d1	3x3	2,78	1,52
d3	3x1,5	1,46	1,20	d2	3x3	3,88	1,08
d4	3x1,5	1,14	1,29	d3	3x3	2,34	0,76
d5	3x1,5	1,15	1,28				

[1] Mio/U [2]trough level of Colistin in mg/dl [3]creatinine serum mg/dl

Tab. 1

CONCLUSIONS. A loading dose (9. Mio units) of Colistin is obligatory to reach the recommended trough level within 3 halftimes. But according to the measured trough level it is not necessary to increase the loading dose for ECMO patients without CVVH. To reach

trough level in ECMO patients without CVVH a reduced dose of Colistin was sufficient in these patients. For ECMO patients with CVVH is difficult to define a dosage and so the theraphy should be controlled with TDM. The monitoring results should therefore be availablie within at least 24 h in order to adjust the dosage. The recommendations in literature about the dosage of intravenous colistin seem to be inappropriate to achieve the targeted levels in patients without renal failure.

0325

MEROPENEM AND PIPERACILLIN PHARMACOKINETICS DURING EXTRACORPOREAL MEMBRANE OXYGENATION: A CASE–CONTROL STUDY

E. Antonucci[1], K. Donadello[1], S. Cristallini[1], M. Beumier[1], F. Jacobs[1], F. Cotton[1], J.-L. Vincent[1], F.S. Fabio Silvio Taccone[1]

[1]Hopital Erasme, Bruxelles, Belgium

INTRODUCTION. Infection is frequent in patients treated by extracorporeal membrane oxygenation (ECMO) and yet pharmacokinetics (PKs) of beta-lactams during ECMO have not been well studied. In critically ill patients, antimicrobial PKs are significantly altered and may result in subtherapeutic drug concentrations [1,2]. ECMO introduces additional confounding factors, which may further alter antibiotic concentrations.
OBJECTIVES. We hypothezised that meropenem (MERO) and piperacillin (PIP) PKs parameters are altered in critically ill patients treated with ECMO.
METHODS. We reviewed all patients in whom drug levels were measured during MERO or PIP therapy while on ECMO support (from January 2010 to December 2012). Drug concentrations were measured after 2 h from the onset of a 30-min perfusion and just before (trough, C_0) the next dose; PKs were estimated using a one-compartment model. Using a database of all patients having b-lactams level measurements, ECMO patients were matched with non-ECMO patients according to: (1) drug regimen; (2) renal function (i.e. similar measured creatinine clearance or similar intensity of therapy if on continuous renal replacement therapy); (3) total body weight; (4) Sequential Organ Failure Assessment (SOFA) score on the day of drug levels measurement. Drug concentrations were considered as adequate if drug levels remained between 4 and 8 times the clinical breakpoint of the minimal inhibitory concentration (MIC) for *Pseudomonas aeruginosa* during 50 % (PIP) or 40 % (MERO) of the dose interval.
RESULTS. A total of 41 drug levels (MERO = 27; PIP = 14) were obtained in 26 patients treated with ECMO (16 veno-venous and 9 veno-arterial) and 41 matched controls. Patients' characteristics are shown in the table. ECMO patients had higher ICU mortality (58 vs. 26 %), longer ICU stay and greater need of mechanical ventilation (93 vs. 66 %), but similar need for vasopressors (66 vs. 63 %) No significant differences were found between ECMO and non-ECMO patients in serum concentrations and in PKs variables: volume of distribution (0.38 [0.27–0.68] vs. 0.46 [0.33–0.79] L/Kg, p = 0.37), half-life time (2.6 [1.8–4.4] vs. 2.9 [1.7–3.7] h, p = 0.96) and total clearance (132 [66–200] vs 141 [93–197] ml/min, p = 0.52). This was also true when either MERO or PIP PKs were considered separately. The proportion of insufficient (13/41 vs. 12/41), adequate (15/41 vs. 19/41) and excessive (13/41 vs. 10/41) drug levels was similar in ECMO and control group, respectively.
CONCLUSIONS. MERO and PIP drug concentrations and their PKs are not altered by ECMO in critically ill patients.
REFERENCE(S) 1. Roberts DM. Crit Care. 2012. 2. Udy AA. Chest. 2012.

0326

DIFFERENT BEHAVIOR BETWEEN COPD AND ARDS PATIENTS IN THE RESPIRATORY DRIVE RESPONSE TO THE EXTRACORPOREAL CO_2 UNLOADING DURING SPONTANEOUS BREATHING

S. Crotti[1], E. Spinelli[1], N. Bottino[1], F. Polli[1], C. Chiurazzi[1], C. L'Acqua[1], A. Protti[1], L. Gattinoni[1]

[1]Ospedale Maggiore Policlinico, Milan, Italy

INTRODUCTION. Extracorporeal membrane oxygenation (ECMO) has been proposed as an alternative to mechanical ventilation in the treatment of acute respiratory failure with the objectives to correct respiratory gas exchanges and reduce respiratory distress. The use of ECMO in patients who are awake and spontaneously breathing has been described in COPD exacerbation[1] and as a bridge to lung transplantation, but no data exist about its application in the early phase of ARDS.
OBJECTIVES. The aim of this retrospective analysis is to evaluate whether the extracorporeal CO_2 removal by reducing the need to clear CO_2 by the native lung reduces respiratory distress in spontaneously breathing patients with COPD exacerbation and ARDS.
METHODS. Seven patients with COPD exacerbation and five patients with severe ARDS, who failed non invasive ventilation, underwent ECMO while maintaining spontaneous breathing in the early phase of respiratory failure. The ECMO parameters were set clinically. In both the COPD and the ARDS patients the ECMO Gas flow (GF) was progressively raised to increase extracorporeal CO_2 removal in the attempt to obtain a relief of the dyspnea and reduce the work of breathing. To evaluate respiratory drive responses we retrospectively compared the respiratory rate (RR) and tidal oesophageal pressure swings (ΔPes, an index of work of breathing) recorded at the lowest and the highest level of ECMO GF clinically set during the first 48 h.
RESULTS. COPD and ARDS patients revealed a different respiratory drive response to extracorporeal CO_2 removal. In the COPD population both RR and ΔPes significantly decreased increasing the ECMO GF (*paired Student t-test $P < 0.05$), while in the ARDS patients RR slightly reduced and ΔPes did not change with the increase of ECMO GF (see Table).

Respiratory parameters with different Gas flow

	COPD lowest GF	COPD highest GF	ARDS lowest GF	ARDS highest GF
GF (L/min)	2.8 ± 1.6	6.6 ± 3.6*	2.4 ± 0.7	7 ± 2.6*
RR (b/min)	25 ± 8	10 ± 4*	24 ± 4	20 ± 2
ΔPes (mmHg)	14.3 ± 6.4	5.1 ± 2.7*	12.0 ± 3.5	12.2 ± 4.8
pH	7.44 ± 0.05	7.47 ± 0.05	7.46 ± 0.04	7.45 ± 0.05
$PaCO_{2\ (mmHg)}$	44 ± 8	42 ± 12	38 ± 6	37 ± 6
$PaO_{2\ (mmHg)}$	110 ± 41	104 ± 45	79 ± 14	82 ± 25

CONCLUSIONS. In spontaneously breathing patients with acute respiratory failure, ECMO allows a control of respiratory drive in COPD exacerbation but not in ARDS. Further studies are needed to investigate whether different pathophysiological mechanisms of the underlying diseases explain this different behavior.
REFERENCE(S) 1. Crotti et Al. Artificial lung as an alternative to mechanical ventilation in COPD exacerbation. Eur Respir J. 38(1): 212–5.

0327

TWO YEARS OUTCOMES OF INFLUENZA A (H1N1)-ASSOCIATED ACUTE RESPIRATORY DISTRESS SYNDROME SURVIVORS TREATED BY EXTRACORPOREAL MEMBRANE OXYGENATION

M. Amsallem[1], A. Boucly[1], N. Bréchot[1], J.-L. Trouillet[1], A. Nieszkowska[1], A. Combes[1], J. Chastre[1], C.-E. Luyt[1]

[1]Groupe Hospitalier Pitié-Salpêtrière, APHP, Service de Réanimation Médicale, Paris, France

INTRODUCTION. Survivors of influenza A (H1N1)-associated acute respiratory distress syndrome (ARDS) treated with extracorporeal membrane oxygenation (ECMO) had psychological impairment and poor health-related quality of life (HR-QoL) 1 year after intensive care unit (ICU) discharge. No data exists on the persistence of these disabilities beyond 2 years.
OBJECTIVES. To evaluate quality of life and psychological outcomes of survivors of influenza A (H1N1)-associated ARDS treated by ECMO 2 years after ICU discharge.
METHODS. Thirteen survivors of influenza A (H1N1)-associated ARDS having required an ECMO and hospitalized in our ICU from October 2009 to February 2011 were evaluated in February 2013 during a phone-call interview. HR-QoL was evaluated using the SF-36 score, symptoms of posttraumatic stress disorder using the impact of event scale (IES) and anxiety and depression using the Hospital Anxiety and Depression (HAD) scale. HR-QoL was compared to the sex- and age- matched population. Patients were deemed at risk for post traumatic stress disorder (PTSD) if the IES score was above 30, and had signs of anxiety or depression when the corresponding HAD sub scores were above 10. Results are expressed as median [25–75th percentile].
RESULTS. At the time of influenza, patients were 39 years old [28–46], 7 (54 %) were women, 5 (38.5 %) were obese (BMI > 30 kg/m^2) and 3 (23 %) were pregnant. Two (15 %) had asthma, 3 (23 %) were smokers, and one had chronic respiratory insufficiency secondary to bronchopulmonary dysplasia. At ICU admission, median SAPS II was 59 [54–72] and PaO_2/FiO_2 ratio was 64 mmHg [52–114]. ECMO and MV duration were 25 days [10–51] and 34 days [15–75], respectively.
Patients were evaluated 35 [23.8–40] months after ICU discharge. As compared to their weight after ICU discharge, they gained 8 kg [2.8–19.5 kg]. Only one patient was an actual smoker. Eight out of the 10 patients who previously worked have returned to work, and 7 patients practiced sport at the time of evaluation whereas only 2 did before influenza. Nine (69 %) had no dyspnea or dyspnea on moderate or strenuous exertion, 3 (23 %) had dyspnea when walking, and one (patient with previous chronic respiratory insufficiency) had dyspnea during minimal activity. Their mean SF-36 domains differed significantly from the normative values of the matched population, with lower physical functioning (p = 0.005), general health (p = 0.0003) and vitality scores (p = 0.05), whereas their mean physical and mental composite scores were not different (p values of 0.06 and 0.09, respectively). No patient was at risk of PTSD. Two patients (5 %) showed symptoms of both anxiety and depression, reported by themselves to social concerns.
CONCLUSIONS. After 2 years, survivors of influenza A (H1N1)-associated ARDS having required an ECMO have no severe impairment in HR-QoL, and none are at risk of PSTD. However, 31 % have moderate-to-severe dyspnea. Lung function will be assessed more precisely in these patients.

0328

NO CORRELATION BETWEEN HEMOGLOBIN LEVEL AND SURVIVAL IN PATIENTS TREATED WITH EXTRACORPOREAL MEMBRANE OXYGENATION (ECMO)

J. Swol[1], V. Kalem[1], D. Buchwald[2], J. Strauch[3], T.A. Schildhauer[1]

[1]Berufsgenossenschaftliches Universitätsklinikum Bergmannsheil GmbH, Ruhr-Universität Bochum, Klinik und Poliklinik für Chirurgie, Bochum, Germany,
[2]Berufsgenossenschaftliches Universitätsklinikum Bergmannsheil GmbH, Ruhr-Universität Bochum, Klinik für Herz- und Thoraxchirurgie, Funktionsbereich Kardiotechnik, Bochum, Germany, [3]Berufsgenossenschaftliches Universitätsklinikum Bergmannsheil GmbH, Ruhr-Universität Bochum, Klinik für Herz- und Thoraxchirurgie, Bochum, Germany

OBJECTIVES. Prolonged usage of extracorporeal membrane oxygenation (ECMO) may induce multi-organ failure. The precise hemoglobin concentration to provide adequate oxygen delivery is controversial with limited evidence. Extracorporeal Life Support Organisation (ELSO) Guidelines Version 1.1 April 2009 recommend the ultimate goal of management with normal hematocrit equal or greater than 45 %. We evaluate the the relationships between hemoglobin concentration and early outcomes in patients undergoing ECMO.
METHODS. We analyzed retrospectively ELSO ECLS Registry Report and our ECMO center database for adults undergoing ECMO therapy from 01.01.2008 to 31.12.2012. Children older than 16 years old were included. We collected demographic data, outcome "weaned from ECMO" and "discharged from hospital", hemoglobin levels just before cannulation, on day 1 to day 5 on ECMO and just before decannulation.
RESULTS. From 01.01.2008 to 31.12.2012, 45 cases of ECMO were performed. 6 patients were female. Mean age was 52 ± 13 years old. Venoarterial ECMO was applied in 5 cases. Successful weaning from ECMO was achieved in 27 cases (60 %). Survival discharge rate was 22 cases (49 %). We followed the restrictive transfusion protocol accepting hemoglobin level about 8 g/dl if the patient was stable. Mean hemoglobin level (Hb) in the cumulative group was 9.86 ± 0.88 g/dl. Mean Hb in survivors was 9.79 ± 0.7 g/dl. Mean Hb in non-survivors group was 10.11 ± 1.02 g/dl. The Wilcoxon–Mann–Whitney test showed no significance between survivors and non-survivors group.
CONCLUSIONS. Anemia requires higher pump flow to achieve adequate perfusion and gas exchange, resulting in higher post pump pressures. Whether, this is relevant to the new generation of devices needs to be investigated. As well, further prospective multicentre

studies with a large group are needed to evaluate if the Hb level ultimately affects the outcome.

0329
AMOUNT OF BLOOD TRANSFUSIONS AND SURVIVAL IN PATIENTS RECEIVING EXTRACORPOREAL MEMBRANE OXYGENATION (ECMO)

V. Kalem[1], D. Buchwald[2], J. Strauch[2], S. Thomas[1], S. Justyna[1]

[1]University Hospital Bergmannsheil Bochum, Department of Surgery, Bochum, Germany, [2]University Hospital Bergmannsheil Bochum, Department of Cardiac and Thoracic Surgery, Bochum, Germany

INTRODUCTION. In patients receiving ECMO therapy due to acute respiratory distress syndrome (ARDS) the potential benefit of blood transfusions and the hemoglobin level to provide adequate oxygen delivery is still discussed. The Extracorporeal Life Support Organisation (ELSO) Guidelines recommend a hematocrit >40 % as it is expected to provide the most efficient extracorporeal blood flow, whereas in critical care patients without ECMO therapy a restrictive transfusion protocol is recommended.
OBJECTIVES. We evaluated the relationship between blood transfusions and early outcomes in overall survival in patients receiving extracorporeal membrane oxygenation therapy.
METHODS. We analyzed the ELSO ECLS Registry Report and retrospectively our ECMO center database for adults undergoing ECMO therapy from 01/01/2008 to 12/31/2012. Patients younger than 16 years were excluded. Demographic data (n = 45), outcome "weaned from ECMO", "survival discharge", number of transfused packed red blood cells (PRBC) before cannulation, during the course of ECMO support and after decannulation were assessed.
RESULTS. Mean age was 52 (39–65) years. 6 patients were female. Veno arterial ECMO was applied in 5 cases. Successful weaning from ECMO was achieved in 27 cases (60 %). Survival discharge was possible in 22 cases (49 %).
In the cumulative group the mean values of transfused PRBC were before cannulation 4,1 (SD 3,9), during the course of ECMO support 14,6 (SD 10,1) and after decannulation 3,2 (SD 3,6). In survivors mean values of transfused PRBC were before cannulation 3,6 (SD 3,4), during the course of ECMO support 10,5 (SD 6,6) and after decannulation 4,6 (SD 3,9). In non-survivors mean values of transfused PRBC were before cannulation 4,3 (SD 4,3), during the course of ECMO support 19,9 (SD 13,1) and after decannulation 1,3 (SD 2,1). The Wilcoxon–Mann–Whitney test showed no significance between survivors and non-survivors.
CONCLUSIONS. Although there was a non significant tendency for non-survivors to receive higher transfusion rates during the course of ECMO support, the amount of PRBC transfusions in a restrictive protocol had no influence on outcome in overall survival.

ARDS management & VILI: 0330–0343

0330
VENTILATOR INDUCED LUNG INJURY: IS TIDAL VOLUME TO BLAME?

D.T. Andreis[1], G.E. Iapichino[1], M. Monti[1], M. Milesi[1], B. Comini[1], P. Pugni[1], V. Melis[1], A. Protti[2], L. Gattinoni[1,2]

[1]Università degli Studi di Milano, Dipartimento di Fisiopatologia Medico-Chirurgica e dei Trapianti, Milan, Italy, [2]Fondazione IRCCS Ca' Granda-Ospedale Maggiore Policlinico, Dipartimento di Anestesia, Rianimazione ed Emergenza-Urgenza, Milan, Italy

INTRODUCTION. Lung overinflation may cause Ventilator-Induced Lung Injury (VILI) [1]. The same amount of gas can be inflated into the lungs using different combinations of Tidal Volume (V_T, dynamic deformation) and Positive End-Expiratory Pressure (PEEP, static deformation). Therefore, although V_T and PEEP can be "quantitatively" equivalent, they do differ in the way they inflate the lung.
OBJECTIVES. To clarify whether increasing V_T or PEEP equally increases the incidence of VILI.
METHODS. Healthy piglets, under general anesthesia and mechanical ventilation, underwent computed tomography (CT) for the measurement of initial lung weight and volumes, and were then ventilated for up to 54 h with a random combination of V_T and PEEP. Globally inflated volume (V_T + volume due to PEEP) never markedly exceeded Inspiratory Capacity (as verified on lung CT). At the end of the experiments, lungs were excised and weighted on a balance. Incidence of VILI (net increase in lung weight) was evaluated as a function of V_T (regardless of PEEP) or PEEP (regardless of V_T).
RESULTS. Forty-seven animals were studied; main findings are shown in figures.
Figures. Incidence of VILI (increase in lung weight) as a function of V_T (figure A) or PEEP (figure B). P values refer to χ^2 test.

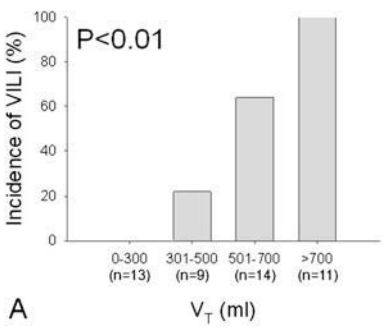


Figure A

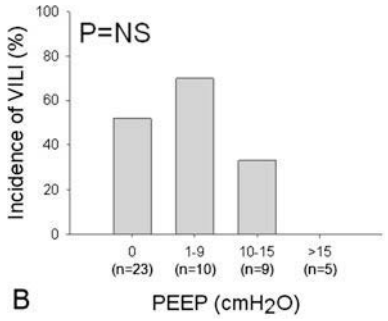


Figure B

CONCLUSIONS. Our preliminary results show that increasing V_T progressively increases the incidence of VILI, while increasing PEEP does not (suggesting that lung edema mainly develops as a function of dynamic lung deformation).
REFERENCE(S) 1. Dreyfuss D, Saumon G: Role of tidal volume, FRC, and end-inspiratory volume in the development of pulmonary edema following mechanical ventilation. Am Rev Respir Dis 1993;148:1194–1203.
GRANT ACKNOWLEDGMENT. This study was supported in part by an Italian grant provided by Fondazione Fiera di Milano for Translational and Competitive Research (2007, Luciano Gattinoni) and by GE Healthcare.

0331
SAFETY AND EFFICACY OF PRONE POSITIONING DURING VENOVENOUS EXTRA CORPOREAL MEMBRANE OXYGENATION IN SEVERE ACUTE RESPIRATORY DISTRESS SYNDROME

C. Guervilly[1], F. Xéridat[1], S. Hraiech[1], M. Adda[1], J.-M. Forel[1], A. Roch[1], L. Papazian[1]

[1]Aix-Marseille Univ, URMITE CNRS-UMR 6236, Hôpital Nord, Medical Intensive Care Unit, Marseille, France

OBJECTIVES. To assess the safety and efficacy of prone positioning (PP) during venovenous extra corporeal membrane oxygenation (VV ECMO).
METHODS. Prospective single center study in a university hospital in Marseille, France. Criteria for eligibility for PP during VV ECMO were the followings: $PaO_2 < 60$ mmHg despite fraction delivered by the oxygenator (FdO2) and by the ventilator (FiO_2) set at 100 % or injurious ventilation parameters with plateau pressure exceeding 30 cmH_2O despite the reduction of tidal volume to 2–3 mL/kg and the reduction of PEEP to 10 cmH_2O or failure of attempt to wean ECMO after at least 1 week of extra corporeal membrane oxygenation and presence of lung consolidations on chest ultrasonography.
RESULTS. Fifteen patients were included on a 2-year period. No complications affecting the ECMO circuit component were observed during the PP. PaO_2/FiO_2 has increased from 108 ± 42 to 159 ± 67 mmHg, p = 0.004 after 12 h of prone positioning and has persisted 6 h after coming back to the supine position (p = 0.02). Patients who had improvement in PaO_2/FiO_2 >20 % by PP were more frequently weaned from ECMO (7/9 either 78 %) than those who were not improved by prone position (2/6 either 33 %).
CONCLUSIONS. Our study on a small cohort of patient suggests that prone positioning could be proposed without majors risks in some specific patients under veno venous ECMO in particular those who remain hypoxemic or those who seem to be difficult to wean from ECMO.

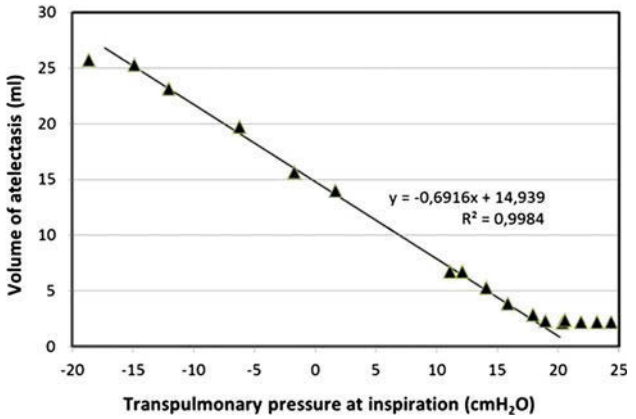
0332
PROPORTIONAL RELATION BETWEEN TRANSPULMONARY PRESSURE AND ATELECTASIS DURING ASSISTED AND SPONTANEOUS BREATHING AFTER WHOLE LUNG LAVAGE

C. Rylander[1,2], G. Perchiazzi[2,3], A. Vena[2,3], M. Gudmundsson[1], S. Derosa[2,3], G. Hedenstierna[2]

[1]Department of Anesthesia and Intensive Care, Sahlgrenska University Hospital, Gothenburg, Sweden, [2]Medical Sciences-Clinical Physiology, Uppsala University, Uppsala, Sweden, [3]Emergency and Organ Transplant, Bari University, Bari, Italy

INTRODUCTION. Weaning from ventilator support includes increased muscular effort of the patient, generating decreased intrapleural pressure and increased transpulmonary pressure. By this distending force, atelectasis, shunt and hypoxia are counteracted. If sufficient transpulmonary pressure could be detected during spontaneous breathing efforts, it might be used as a predictor of weaning success. However, the relation between transpulmonary pressure and airway closure/atelectasis during spontaneous breathing after lung injury has not been established.
OBJECTIVES. Analysis of the relation between transpulmonary pressure and atelectasis during assisted and spontaneous breathing after experimental injury from whole lung lavage.
METHODS. According to $P_{tp} = P_{aw} - P_{pl}$ where P_{tp} is transpulmonary pressure, P_{aw} is airway pressure, and P_{pl} is pleural pressure, we used esophageal balloons to measure P_{pl} in 9 anesthetised and spontaneously breathing pigs that had been subjected to whole lung lavage until PaO_2 was below 8 kPa with FiO_2 0.5. Initial ventilatory settings were pressure support (PS) 8 and PEEP 12 cmH_2O. A decelerating P_{tp} ramp was created in all pigs by decreasing airway pressure to zero in steps of 2 cmH_2O by lowering PS and PEEP. Then, in 6 of the pigs breathing without support negative airway pressure was created in steps of 4 to −24 cmH_2O by suction, representing a clinical situation of increased intrapleural pressure e.g. from elevated abdominal pressure. For each ramp level of pressure, the animals were left to breathe while dynamic computed tomography (CT) exposures were performed at a fixed juxtadiaphragmatic level. From reconstructed 5 mm scans, the volumes of atelectasis (HU −100/+100) and gas (HU 0/+1,000) within a region of interest (ROI) delineating the lung were calculated at end-inspiration and end-expiration.
RESULTS. Data are given as Mean (SD). As long as airway pressure was positive, the effects of breathing efforts were rather constant yielding tidal changes in: transpulmonary pressure 8.0 (1.63) cmH_2O, ROI gas volume 3.1 (0.70) ml and ROI atelectasis 0.7 (0.36) ml. With negative airway pressure, tidal swings in gas and atelectasis volume almost disappeared despite increased efforts with changes in transpulmonary pressure of 12.5 (2.02) cmH_2O. A transpulmonary pressure threshold of 20 cmH_2O for maximum recruitment was

seen, below which derecruitment was proportional until it reached its maximum at a transpulmonary pressure of −15 cmH_2O (fig).



Plot with linear regression see text

CONCLUSIONS. There is a proportional relation between transpulmonary pressure and the volume of atelectatic lung below a transpulmonary pressure of 20 cmH_2O, during constant inspiratory efforts in lung lavaged pigs breathing spontaneously. We did not observe any critical value of transpulmonary pressure indicating increased recruitment in this model.
GRANT ACKNOWLEDGMENT. The Swedish Medical Research Council (5315).

0333
EFFECTS OF PEEP AND TIDAL VOLUME ON THE RELIABILITY OF END-EXPIRATORY VOLUME MEASUREMENT WITH THE NITROGEN WASHOUT/WASHIN TECHNIQUE

J.-C. Richard[1,2], C. Pouzot[2], A. Morales[2], J.S. Torres[2], D. Ortega Munoz[2], M. Orkisz[2], B. Neyran[2], F. Lavenne[3], C. Guérin[1,2]

[1]Hôpital de la Croix Rousse, Lyon, France, [2]CREATIS UMR CNRS 5220-INSERM U 630, Lyon, France, [3]CERMEP-Imagerie du Vivant, Lyon, France

INTRODUCTION. End expiratory lung volume measurement by the nitrogen washout/washin technique (EELV-wowi) is now implemented in one ICU ventilator, and may help titrating PEEP during acute respiratory distress syndrome (ARDS). Validation of this technique has been previously performed using computed tomography (CT) as gold standard [1]. However, this technique requires that inhomogeneity in alveolar gas distribution remains constant throughout the measurement, a condition that may not be valid in ARDS patients mechanically ventilated with high PEEP levels, low tidal volumes (VT) and high respiratory rate (RR).

OBJECTIVES. The aim of this study was to evaluate the reliability of the EELV-wowi measurement at variable PEEP and VT, at high RR, using CT as gold standard during experimental ARDS.

METHODS. ARDS was performed in 14 piglets (28 ± 2 kg) by saline lavage. The animals were mechanically ventilated (Engström ventilator) using FiO_2 1, VT 10 ml/kg, RR 35/min and PEEP 0. A decremental PEEP trial was then performed from 20 to 2 cm H2O by 2 cm H2O steps with VT 6 ml/kg, and the animals were randomized into 3 PEEP groups based on best dynostatic compliance, best EELV-wowi during PEEP trial, or a PEEP-FiO_2 table. Finally, 7 levels of VT were applied at optimal PEEP (4 to 20 ml/kg), ranging from 100 to 625 mL. EELV was assessed by the wowi technique using pediatric sensors, and by CT (EELV-CT), in the following conditions: at baseline after ARDS onset, during the PEEP trial, 1 h after setting optimal PEEP, and during the variable VT trial.

RESULTS. EELV-wowi and EELV-CT were significantly correlated ($r = 0.79$, $p < 0.001$). Bias amounted to −250 mL (limits of agreement (LA) ranging from −718 to 219 mL). The correlation between EELV-wowi and EELV-CT was lowest for VT 4 ml/kg ($r = 0.17$, range 100–124 mL) and VT 5 mL/kg ($r = 0.64$, range 120–155 mL), and above 0.78 for VT ≥ 6 mL/kg. Restricting analysis to VT < 150 mL, correlation between EELV-wowi and EELV-CT was not statistically significant, and bias [LA] amounted to −368 [−1153 to 417] mL, while correlation was higher ($r = 0.86$, $p < 0.001$), bias lower (−234 ml), and LA narrower (−645 to 177 mL) for VT ≥ 150 mL. LA were narrowed to −566 to 67 mL using a mixed model to control for potential confounding variables (VT, PEEP level, EELV-CT at baseline) [2]. All explanatory variables and both the 2 and 3-way interactions were statistically significant. The interaction plot below demonstrate that the reliability of EELV-wiwo measurement is strongly influenced by VT, PEEP, and EELV at PEEP0, in particular for PEEP > 10 cm H2O, regardless the VT level. The reliability further decreases when high PEEP is combined to low VT, and EELV at PEEP0 is low.

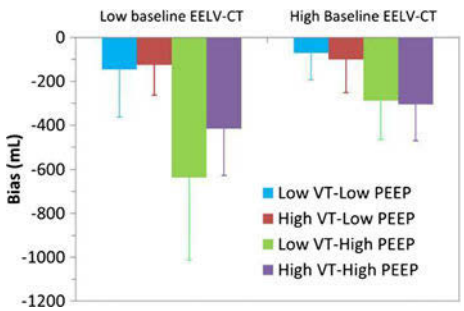


Fig 1

CONCLUSIONS. The reliability of EELV-wiwo is critically dependent on ventilator settings.

REFERENCE(S) 1. Chiumello D, et al. Crit Care. 2008;12(6):R150. 2. Myles PS, Cui JI. Br J Anaesth. 2007;99(3):309–11.

0334
C1-ESTERASE INHIBITOR DOES NOT ATTENUATE VILI IN A RAT MODEL OF *S. PNEUMONIAE* PNEUMONIA

F.M. de Beer[1,2], H. Aslami[1], M.J. Schultz[1,2], W.K. Lagrand[1,2]

[1]Acadamic Medical Center, University of Amsterdam, Laboratory of Experimental Intensive Care and Anesthesiology (LEICA), Amsterdam, The Netherlands, [2]Acadamic Medical Center, University of Amsterdam, Department of Intensive Care, Amsterdam, The Netherlands

INTRODUCTION. It is uncertain whether the complement system plays a role in the pathogenesis of ventilator-induced lung injury (VILI). We hypothesized that inhibition of the complement system by pretreatment with systemic infusion of plasma-derived human C1-esterase inhibitor (C1-INH) reduces pulmonary complement activation and subsequently attenuates VILI in a model of mechanical ventilation for *streptococcus pneumoniae* pneumonia.

METHODS. Male Wistar rats were intratracheally challenged with *S. pneumoniae* to induce pneumonia. After 40 h, rats were pretreated with C1-INH (200 U/kg) or placebo, and randomized to spontaneous ventilation, lung-protective ventilation (tidal volumes of 6 ml/kg) or lung-injurious ventilation (12 ml/kg). Respiratory parameters were monitored, and ventilation settings were adjusted if necessary, for 4 h. Bronchoalveolar lavage fluid (BALF) was collected and lung tissue was obtained for measuring levels of complement activation (C4b/c in BALF, expressed as the percentage of maximal activated plasma), injury (levels of total protein in BALF), and inflammation (levels of IL-1β, IL-6, CINC-3 and differential cell counts in BALF). Results are presented as median with their interquartile ranges.

RESULTS. *S. pneumoniae* pneumonia was characterized by bilateral macroscopic infiltrates and clinical signs of illness. Lung-protective as well as lung-injurious ventilation enhanced pulmonary complement activation (2.05 [0.61–2.35] and 1.47 [0.91–4.22]) compared with spontaneous ventilation (0.51 [0.47–0.63]), P = NS and $P < 0.05$ respectively. Lung-injurious ventilation but not lung-protective ventilation resulted in higher total protein levels in BALF ($P < 0.05$). Furthermore, both lung protective and lung injurious ventilation resulted in higher neutrophil counts in BALF ($P < 0.05$), and higher levels of IL-1β, IL-6, CINC-3 in BALF ($P < 0.05$, <0.05, and <0.01 vs. spontaneous ventilation, respectively). In rats treated with C1-INH, functional fraction of C1-INH was detectable in BALF. Treatment with C1-INH, however, neither affected pulmonary complement activation, both with lung-protective ventilation (1.41 [1.23–4.10] vs. 2.05 [0.61–2.35]; $P = 0.69$) and lung-injurious ventilation (0.95 [0.64–1.84] vs 1.47 [0.91–4.22]; $P = 0.17$). Parameters of lung injury and inflammation were also not affected by C1-INH pretreatment.

CONCLUSIONS. Ventilation enhances pulmonary complement activation in a model of *S. pneumoniae* pneumonia in rats. Systemic administration of C1-INH, in an attempt to reduce pulmonary complement activation, does not affect pulmonary complement activation and neither attenuates VILI.

0335
EFFECTS OF EARLY POSITIVE PRESSURE VENTILATION ON INCIDENCE OF OVERT AND OCCULT PNEUMOTHORACES AND CHEST TUBE NEED IN SEVERE BLUNT TRAUMA PATIENT

C. Maury[1], J. Charbit[1], B. Conte[1], J.-P. Roustan[1], I. Millet[2], P. Taourel[2], X. Capdevila[1]

[1]Département d'Anesthésie Réanimation Polytraumatologique, Hôpital Lapeyronie, Montpellier, France, [2]Département de Radiologie, Hôpital Lapeyronie, Montpellier, France

INTRODUCTION. Positive pressure ventilation (PPV) as risk factor of pneumothoraces (PTX) occurence and aggravation in trauma remains controversial.

OBJECTIVES. The main goal of this study was to assess the impact of early mechanical ventilation on PTX incidence (overt and occult), as well as early chest tube placement during initial management of severe blunt trauma patients.

METHODS. A retrospective review of consecutively admitted patients in our trauma intensive care unit between January 2005 and December 2009 was performed. All patients with blunt thoracic trauma (AIS ≥ 1) who had paired computed tomography (CT) and chest-X ray in the first hour following admission were included. Diagnosis of PTX, its overt or occult character (unvisible on chest-X-ray but diagnosed on CT scan), early PPV (prehospital or admission phase) and chest tube need were colligated. Size measurements of all PTXs not drained on admission were performed on CT scan (maximal thickness and height). Finally, risk factors of chest tube were sought after in a multivariate analysis to establish the influence of early PPV.

RESULTS. Five-hundred twenty-six patients met inclusion criteria, 395 (75 %) were male, mean age 37.9 ± 18.4 years, mean ISS 22.2 ± 16.2. Among them, 247 patients (47 %) received early PPV. A total of 313 patients (60 %) were diagnosed with at least one PTX including 194 (37 %) with occult PTX (OPTX). These incidences were slightly lower in early PPV group : 55 vs 64 % (P = 0.04) and 32 vs 41 % (P = 0.03), respectively. Conversely, the number of patients receiving a chest tube before CT scan was significantly higher in early PPV group (9 vs 4 % P = 0.01). No significant difference of maximal thickness or height was found on our imaging analysis between the 2 groups. Moreover, PTX rate requiring chest tube was not significantly influenced by early PPV, be it overt or occult (Table).

Rate of PTX requiring chest drainage

	Early PPV group	No early PPV group	Total	P value
Overall PTX	33 % (64/196)	25 % (58/233)	28 % (122/429)	0.08
Occult PTX	13 % (17/134)	6 % (11/162)	9 % (28/296)	0.08
Before CT scan	12 % (24/196)	6 % (14/233)	9 % (38/429)	0.024

Finally, multivariate analysis did not find early PPV as independent risk factor of chest drainage either.

CONCLUSIONS. Early PPV was not found to increase overall incidence of PTXs, their size or chest tube need during initial management of severe blunt trauma patients. However, early PPV might participate to early PTX worsening. Indeed, a higher incidence of chest tube placement before CT scan was found in early PPV group.

0336
EFFECTS OF INDIVIDUALIZED PEEP SETTING IN AN ACUTE RESPIRATORY DISTRESS SYNDROME MODEL WITH LOW RECRUITABILITY

D. Buchloh[1], S. Hammermüller[1], N. Carvalho[1], A. Beda[2], K. Noreikat[1], A. Rau[1], A. Carvalho[3], A. Beilicke[1], J. Haas[1], T. Muders[4], A. Reske[1], H. Wrigge[1]

[1]University of Leipzig, Anesthesiology and Intensive Care Medicine, Leipzig, Germany, [2]Federal University of Minas Gerais, Department of Electronic Engineering, Belo Horizonte, Brazil, [3]Federal University of Rio de Janeiro, Carlos Chagas Biophysics Institute, Rio de Janeiro, Brazil, [4]University of Bonn, Department of Anesthesiology and Intensive Care Medicine, Bonn, Germany

INTRODUCTION. Because tidal recruitment (TidalRec) and hyperinflation may cause Ventilator-Associated Lung Injury (VALI), different strategies with conflicting physiological rationales for mechanical ventilation (MV) of ARDS patients are proposed[1–4].

OBJECTIVE. To study lung function over 24 h in an ARDS model considered less responsive to lung recruitment[5–7] during different MV protocols: (1) ARDS network lower PEEP protocol (ARDSnet), (2) open lung concept (OLC) and (3) minimized heterogeneity of lung inflation according to electrical impedance tomography (EIT).

METHODS. After ARDS induction by tracheal hydrochloric acid instillation, pigs were ventilated with tidal volumes of 6 ml/kg. PEEP setting was randomized according to.
1) ARDSnet (n = 7)[1],
2) OLC (n = 7), or
3) EIT (n = 8).
For both, OLC and EIT, recruitment maneuvers and decremental PEEP trials were performed. In the OLC, PEEP was set 2 cmH_2O above the PEEP where PaO_2 ($FiO_2 = 1$) dropped by 10 % of its maximum[2]. For EIT, the regional ventilation delay index (RVD) was calculated and RVD[3]. Respiratory mechanics, gas exchange and whole-lung CT scans (static, end-expiratory and end-inspiratory) were acquired during 24 h. The distension index (%E2) was calculated using a volume-dependent elastance model[4]. Total lung volume and mass and the masses of differently aerated compartments (expressed as % of total mass) were calculated from CT by extrapolation[8]. TidalRec was calculated as the difference between the non-areated lung mass at expiration and inspiration; tidal hyperinflation was calculated accordingly (inspiration minus expiration). Data are given as median and interquartile (25th–75th) range. Kruskal–Wallis-Tests or, after data transformation, a General Linear Model was used for comparisons. We considered $P < 0.05$ significant.

RESULTS. ARDSnet PEEP (5 (5–10)) was significantly lower than OLC (18 (18–22)) or EIT (18 (18–22) cmH_2O) PEEP. Each group developed a characteristic and stable lung condition (no significant changes over time except for a significant shunt increase in the EIT group). Shunt, PaO_2/FiO_2, non-aerated lung, total elastance and TidalRec were significantly higher in the ARDSnet group. OLC and EIT groups did not differ significantly (all $P > 0.07$). Surrogates of hyperinflation showed very low signals (static or tidal hyperinflation always <1.5 % of lung mass) or did not differ between groups (%E2, $P = 0.8$).

Table 1

	Group	Baseline	ARDS	04 h	08 h	12 h	16 h	20 h	24 h
Shunt (%)	ARDS	13 (10–17)	27 (19–46)	21 (17–24)	17 (14–31)	23 (14–27)	23 (17–25)	23 (18–27)	22 (18–27)
Shunt (%)	OLC	17 (13–22)	58 (33–60)	9 (6–12)	8 (4–13)	9 (6–11)	9 (6–10)	9 (7–11)	9 (8–10)
Shunt (%)	EIT	16 (11–20)	41 (29–48)	6 (5–9)	7 (5–12)	7 (6–12)	8 (7–13)	16 (8–19)	10 (8–15)
Mnon (%)	ARDS	12 (6–39)	46 (31–62)	53 (46–68)	62 (51–72)	67 (62–74)	70 (55–82)	67 (58–71)	66 (50–73)
Mnon (%)	OLC	17 (13–31)	53 (50–56)	10 (5–23)	14 (5–28)	7 (5–15)	17 (4–23)	16 (4–24)	15 (4–25)
Mnon (%)	EIT	18 (15–24)	53 (50–59)	18 (10–23)	16 (9–23)	15 (9–21)	17 (11–22)	16 (11–20)	19 (13–21)
Tidal rec. (%)	ARDS	7.1 (3–23)	11 (6–22)	12 (7–33)	11 (7–23)	9 (2–27)	11 (6–41)	11 (7–13)	15 (9–38)
Tidal rec. (%)	OLC	6 (2–18)	10 (6–21)	3 (1–5)	2 (0–3)	2 (0–4)	2 (0–4)	3 (0–7)	2 (0–5)
Tidal rec. (%)	EIT	6 (0–8)	18 (10–27)	3 (3–5)	0 (0–4)	4 (2–6)	5 (0 –6)	3 (0–6)	4 (0–7)

CONCLUSION. Even for pulmonary ARDS after acid aspiration, which is focally distributed and considered less recruitable [6–8], early lung recruitment and individualized high PEEP improved lung volumes and function. Compared to the evidence-based ARDSnet protocol, surrogates of VALI seemed better balanced in the MV protocols including lung recruitment and individualized high PEEP.

REFERENCES. 1. Anonymous NEJM 2000. 2. Suarez-Sipmann F. CCM. 2007. 3. Muders T. CCM. 2012. 4. Carvalho AR. ICM. 2008. 5. Puybasset L. ICM. 2000. 6. Heuer J. Crit Care. 2012. 7. Ambrosio A. Anesthesiology. 2012. 8. Reske A. Crit Care. 2011.

0337
IMPACT OF DIFFERENT TRANSPULMONARY PRESSURES DURING MECHANICAL VENTILATION IN EXPERIMENTAL ACUTE RESPIRATORY DISTRESS SYNDROME

C.S. Samary[1], R.S. Santos[1], C.L. Santos[1], N.S. Felix[1], M.B. Ramos[1], C.S.N. Baez-Garcia[1], P.L. Silva[1], P. Pelosi[2], P.R.M. Rocco[1]

[1]Federal University of Rio de Janeiro, Carlos Chagas Filho Biophysics Institute, Rio de Janeiro, Brazil, [2]University of Genoa, Department of Surgical Sciences and Integrated Diagnostics, Genoa, Italy

INTRODUCTION. The use of low tidal volume (V_T) and respiratory system plateau pressure (Pplat, rs) lower than 30 cmH_2O has become the cornerstone of protective mechanical ventilation in acute respiratory distress syndrome (ARDS) patients, reducing ventilator-associated lung injury (VALI). However, the key variable in determining pulmonary stress is delta transpulmonary pressure (ΔP,L). Nevertheless, the importance of transpulmonary pressure as a VALI determinant is still controversial.

OBJECTIVES. To investigate the impact of of different levels of ΔP,L, generated by the combination of V_T and PEEP, on lung mechanics and histology in experimental ARDS.

METHODS. Thirty Wistar rats (344 ± 23 g) received *Escherichia coli* lipopolysaccharide (200 μg in 0.2 ml of saline) intratracheally. After 24 h, animals were sedated, anesthetized, paralyzed, and mechanically ventilated with the following parameters: $V_T = 6$ ml/kg, RR = 80 bpm, positive end-expiratory pressure (PEEP) = 3 cmH_2O and inspiratory fraction of oxygen (FiO_2) = 0.4. Baseline functional data were collected, and rats were randomly assigned to groups ventilated with low (7.5 cmH_2O), mean (10 cmH_2O), and high (12 cmH_2O) ΔP,L. Different combinations of V_T and PEEP were then applied: $\Delta P,L_{low}$: $V_T = 6$ ml/kg and PEEP = 3cmH_2O; $\Delta P,L_{mean}$: $V_T = 6$ ml/kg and PEEP = 9.5cmH_2O or $V_T = 13$ ml/kg and PEEP = 3cmH_2O; $\Delta P,L_{high}$: $V_T = 6$ ml/kg and PEEP = 11cmH_2O or $V_T = 20$ ml/kg and PEEP = 3cmH_2O. Animals were then ventilated for 1 h and lungs were removed for histology.

RESULTS. All groups showed oxygenation improvement, however, this benefit was more evident in $\Delta P,L_{mean}$ and $\Delta P,L_{high}$ groups ($p < 0.05$). $\Delta P,L_{low}$ resulted in higher alveolar collapse ($p < 0.05$). $\Delta P,L_{high}$ was always associated with alveolar hyperinflation, however combined with PEEP = 11 cmH_2O higher $PaCO_2$ was observed whereas with V_T=20 ml/kg normal levels of $PaCO_2$ were noted. $\Delta P,L_{mean}$ with PEEP = 9.5 cmH_2O, compared to $\Delta P,L_{low}$, yielded better oxygenation (550 ± 21 *vs.* 298 ± 59, respectively) and lower fraction area of alveolar collapse (25 ± 4 *vs.* 31 ± 2, respectively), with no hyperinflation. Compared to Pplat, rs, ΔP,L seems to closely reflect the alveolar hyperinflation.

CONCLUSIONS. In the present ARDS model, $\Delta P,L_{high}$ resulted in hyperinflation, $\Delta P,L_{low}$ led to alveolar collapse, whereas $\Delta P,L_{mean}$ with PEEP = 9.5 cmH_2O yielded improvement in lung histology. ΔP,L seemed to closely reflect lung stress when associated with low V_T and an appropriate PEEP level enough to avoid alveolar collapse and hyperinflation.

REFERENCE(S) 1. Petrucci, De Feo 2013.

GRANT ACKNOWLEDGMENT. PRONEX-FAPERJ, FAPERJ, CNPq, CAPES.

0338
MECHANISMS UNDERLYING PEEP-INDUCED LUNG RECRUITMENT IN INTUBATED HYPOXEMIC CRITICALLY ILL PATIENTS

N. Eronia[1,2], T. Mauri[2], G. Bellani[2], A. Coppadoro[2], A. Barletta[2], R. Marcolin[3], A. Pesenti[2]

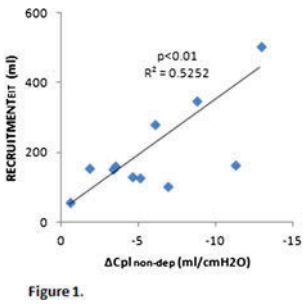
[1]University of Foggia, Dept. of Anesthesia and Intensive Care, Foggia, Italy, [2]University of Milan-Bicocca, Dept. of Health Science, Monza, Italy, [3]San Gerardo Hospital, Monza, Italy.

INTRODUCTION. Positive end expiratory pressure (PEEP) improves oxygenation and reduces lung strain and atelectrauma, also by inducing lung recruitment. Thus, estimating PEEP-induced recruitment might help identify optimal ventilation settings, but bedside methods to quantify lung recruitment are few and complex to be applied in daily clinical practice. Electrical impedance tomography (EIT) is a non invasive bedside technique that claims to track, over time, global and regional changes in ventilation, respiratory mechanics and end-expiratory lung volume (ΔEELV), from which recruitment may be calculated.

OBJECTIVES. We compared recruitment measured by EIT against the validated simplified helium-dilution technique and we analyzed correlations between regional PEEP effects and lung recruitment.

METHODS. We enrolled 12 intubated critically ill patients undergoing controlled mechanical ventilation, with $PaO_2/FiO_2 \leq 300$ at PEEP ≥ 5 cmH_2O. We applied on each patient's thorax an EIT monitor (Pulmovista500®, Dräger Medical GmbH, Lübeck, Germany) and applied two PEEP levels (clinical and clinical + 5 cmH_2O) for 20 min each. By EIT and Helium technique, we measured ΔEELV ($\Delta EELV_{EIT}$ and $\Delta EELV_{He}$, respectively) considering clinical PEEP as baseline and calculated recruitment as (measured ΔEELV − [respiratory system compliance × ΔPEEP]). We also collected regional EIT data, ventilation parameters and arterial blood gases.

RESULTS. Patients were 68 ± 10 year-old, ventilation days were 2 ± 1 and PaO_2/FiO_2 was 180 ± 62 mmHg at clinical PEEP (8 ± 2 cmH_2O). Six patients fulfilled ARDS criteria. At higher PEEP levels (13 ± 2 cmH_2O), in comparison to lower PEEP, $EELV_{He}$ and $EELV_{EIT}$ increased ($p < 0.001$), as well as PaO_2/FiO_2 (192 ± 60 mmHg vs. 209 ± 73 mmHg; $p < 0.05$) and airway pressures. PEEP-induced recruitment measured by Helium was 245 ± 202 ml and 232 ± 170 ml by EIT. The correlation between $\Delta EELV_{He}$ and $\Delta EELV_{EIT}$ was quite strong ($r = 0.88$; $p < 0.001$), as well as the correlation between recruited lung volumes measured by the 2 techniques ($r = 0.79$; $p < 0.01$). Regionally tidal ventilation reaching dependent lung areas increased (30 ± 8 vs. 35 ± 5 %; $p < 0.01$), while respiratory system compliance decreased both in non-dependent (38 ± 12 ml/cmH_2O vs. 31 ± 11 ml/cmH_2O, $p < 0.001$) and dependent lung regions (16 ± 4 ml/cmH_2O vs. 11 ± 4 ml/cmH_2O, $p < 0.001$). Interestingly, recruitment was correlated with decrease of non-dependent lung regions compliance ($r = 0.725$; $p < 0.01$) (Figure 1) and with increased tidal volume reaching dependent lung regions ($r = 0.85$; $p < 0.001$) (Figure 2).



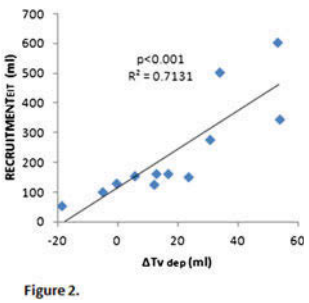


Figure 1 and 2

CONCLUSIONS. In hypoxemic critically ill patients undergoing mechanical ventilation, higher PEEP is associated with improved oxygenation and significant recruitment that can be fairly quantified by EIT technology. At higher PEEP compliance of non-dependent lung regions might decrease, inducing tidal volume redistribution towards dependent lung areas and re-aeration of collapsed alveoli.

GRANT ACKNOWLEDGMENT. UNIMIB.

0339
OPEN LUNG IN LATERAL DECUBITUS WITH DIFFERENTIAL SELECTIVE POSITIVE END-EXPIRATORY PRESSURE IN A PORCINE EXPERIMENTAL MODEL OF EARLY ACUTE RESPIRATORY DISTRESS SYNDROME

J.B. Borges[1], O. Ahlgren[1], M. Senturk[1], F. Suarez-Sipmann[1], G. Hedenstierna[2], A. Larsson[1]

[1]Uppsala University, Hedenstierna Laboratory, Department of Surgical Sciences, Section of Anaesthesiology & Critical Care, Uppsala, Sweden, [2]Uppsala University, Hedenstierna Laboratory, Department of Medical Sciences, Clinical Physiology, Uppsala, Sweden

INTRODUCTION. Hypothesized mechanisms of VILI include low-volume injury and overdistension. Low-volume injury encompasses local concentration of stresses in the vicinity of collapse in heterogeneously aerated lungs, predominating in dependent regions. Overdistension occurs in nondependent regions and is also potentiated in proportion to the degree of lung aeration inhomogeneity. Lateral decubitus, differential lung ventilation and

selective PEEP, compared with conventional ventilation, decreased venous admixture, had no deleterious effect on cardiac output and improved arterial oxygenation[1]. After maximum lung recruitment, lateral decubitus and differential lung ventilation may enable also the titration and application of optimum selective PEEP values for the dependent and the nondependent lungs (sPEEP), potentially attenuating important VILI mechanisms as well as drawbacks of global PEEP application (gPEEP).

OBJECTIVES. Our hypothesis was that sPEEP would promote better regional open lung and aeration distribution. We aimed at compare the effects of sPEEP vs. gPEEP on regional collapse and aeration distribution in an experimental model of ARDS.

METHODS. We established a one-hit injury ARDS-model in five piglets. Repeated lung lavages were applied till $PaO_2/F_IO_2 < 150$ mmHg. Then double-lumen tube replaced the tracheal tube and we initiated lateral decubitus. Differential ventilation was started using two synchronized ventilators. After maximum-recruitment maneuver, PEEP reduction trial was performed. The PEEP corresponding to maximum dynamic compliance was defined globally and for each individual lung. After new recruitment maneuver, two steps were performed in randomized order (15 min each): ventilation applying the gPEEP and the sPEEP. CT scans were acquired at end-expiration and end-inspiration. Two regions-of-interest comprising each individual lung parenchyma were manually drawn for the quantitative CT analysis. To assess aeration homogeneity we computed the upper/lower ratio in gas content (U/L = percent of the total gas content detected in the upper lung/percent of the total gas content detected in the lower lung).

RESULTS. sPEEP vs. gPEEP resulted in:

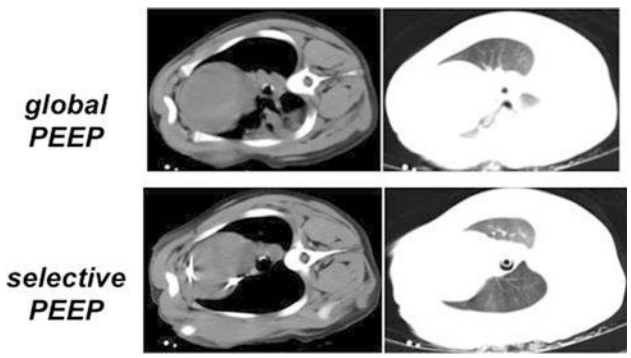
1) decrease in percent mass of collapse in the lower lung at expiratory-CT (19 ± 15 vs. 4 ± 5 %; $p = 0.03$);

2) decrease in U/L between the gPEEP-expiratory-CT and sPEEP-expiratory-CT (3.7 ± 1.2 vs. 0.8 ± 0.5; $p = 0.01$);

3) decrease in U/L between the gPEEP-inspiratory-CT and sPEEP-inspiratory-CT (2.8 ± 1.1 vs. 0.6 ± 0.3; $p = 0.01$).

CONCLUSIONS. By comparing with global-best compliance-PEEP, the association of the open lung approach with the ventilation concept of lateral decubitus, differential lung ventilation and selective-best compliance-PEEP promoted better reversion of airspace collapse and aeration inhomogeneity.

Reference 1. Baehrendtz S, Hedenstierna G. Differential ventilation and selective positive end-expiratory pressure: effects on patients with acute bilateral lung disease. Anesthesiology.1984;61:511–7.



Figure

0340

CONTINUOUS RECRUITMENT WITH AIRWAY PRESSURE RELEASE VENTILATION AND PRONE POSITION IN PATIENTS WITH SEVERE ACUTE RESPIRATORY DISTRESS SYNDROME

T.O. Mondragon Labelle[1], G.A. Magdaleno Lara[1], L. Torres Lopez[1], S.E. Zamora[1], D. Hernandez[1], M.A. Moreno[1], S. Leco[1], J.A. Carmona[1], M. Poblano[1]

[1]Hospital Juarez de Mexico, Intensive Care Unit, Distrito Federal, Mexico

INTRODUCTION. In patients with severe ARDS, an increase in the mean airway pressure is required to optimize and maintain the alveolar continuous recruitment. APRV mode allows to maximize and maintain the alveolar continuous recruitment during the respiratory cycle with control plateau pressures and with a greater airway mean pressure. The prone position favors the recruitment of dependent zones of pulmonary areas and it could improve the prognostic in patients with severe ARDS. APRV is used as a conventional ventilatory mode in our unit.

OBJECTIVE. To evaluate the utility of the combine recruitment therapy and the continuous recruitment, using APRV and prone position.

MATERIALS AND METHODS. Revision of the ICU files with severe ARDS diagnosis according to the Berlin classification, admitted between January 2011 and February 2013. Ventilatory modes previous to their admission was registered, PEEP was set according to a pressure–volume curve (Drager, Evita XL, Hamilton G5) and the patients were put in prone position. Only patients in whom APRV/Prone had been initiated in the first 24 h following their admission in the ICU were included. Pre prone, post prone, at 3, 24, 48 and 72 h, gasometric controls, ventilatory mechanics were carried out. Demographic characteristics, response to prone, variables of ventilatory mechanics, evaluation of gas exchange, days of mechanical ventilation, days in prone, length of stay in ICU, mortality, SOFA and APACHE II at admission were registered. The statistical analysis was carried out by means of ANOVA with SSPSV18.

RESULTS. 33 patients with APACHE II of 28 ± 6 with a predicted mortality of 63.9 % and SOFA of 11 ± 4 were included. The mean airway pressure achieved was 18.3 ± 4.433. The global mortality reported was 45 %. The patients remained in prone position 4.8 ± 2 days, with 13 ± 12 days in mechanical ventilation. The 10 patients who did not respond in the first 3 h responded in the next 24 h, and only 2 of them died (16 %). Continuos recruitment was present with these strategies after 3 h; we observed that those patients who had continuos recruitment after 24 h had a greater survival in comparison with those who did not. The most adverse prognostic factor was the presence of hypercapnia. In patients with adverse outcome we documented higher levels of CO2 at the time of admision.

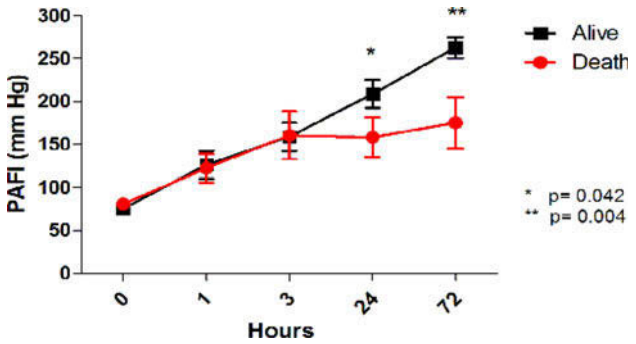


Fig. 1

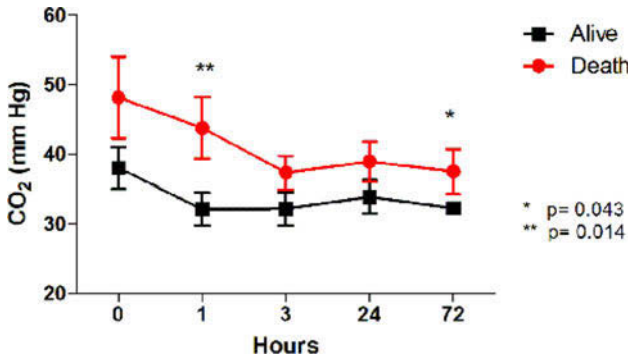


Fig. 2

CONCLUSION. The use of both strategies in a combine way can increase the continuous recruitment potential in patients with severe ARDS and prevent pulmonary damage caused by mechanical ventilation. We found that there is no direct relation between initial improvement in oxygenation and mortality and, even with a slow initial response, there is a possibility of continuous recruitment.

REFERENCES. 1. Jan OS, Paolo F, Gattinoni L et al. Prone ventilation reduces mortality in patients with acute respiratory failure and severe hypoxemia: systematic review and meta-analysis. Intensive Care Med. 2010;36:585–99.

0341

MECHANICAL VENTILATION GUIDED BY DEAD SPACE AND LOW STRESS IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME

A. Palacios[1], E. Monares[1], S. Sanchez[1], C. Meneses[1], R. Chaires[2], A. Torres[3], M.E. Camarillo[1], J. Franco[4]

[1]ABC Medical Center, Critical Care, Mexico, Mexico, [2]ABC Medical Center, Critical Care, Pulmonary Physiology, Mexico, Mexico, [3]ABC Medical Center, Orthopaedics, Mexico, Mexico, [4]ABC Medical Center, Critical Care, Chief Department, Mexico, Mexico

INTRODUCTION. There is sufficient evidence to establish that the slow flow pressure–volume curve (SFC) provides information on the size of the baby lung, which can be used to set a more correct tidal volume and plateau pressure and thus avoid stress and tension. The best PEEP may be titrated based on the lower dead space.

OBJECTIVES. To compare two alveolar-protective and open-lung ventilatory strategies in patients with acute respiratory distress syndrome (ARDS), one based on maintaining tidal volume at 6–4 ml/kg of ideal body weight (ARDS Network), plateau pressure <30 cmH_2O and positive end expiratory pressure (PEEP) set at the higher compliance (BD group) versus a strategy based on parameters obtained from the SFC, security levels of pressure and volume were set up according: Plateau pressure < upper inflection point. Tidal volume < Volume corresponding to the upper inflection point—volume corresponding to the lower inflection point. PEEP was set as the one who reported the lowest dead space.(LDE group).

METHODS. Mixed Intensive Care Unit (ICU). Nonrandomized prospective comparative study. Primary endpoint was the difference in mortality rates between the groups. Values presented in: Mean (± SD), Median (IQR, min–max) or number (%). Depending on variable type and distribution. Age in years 60.67 (± 17.05); 28 male patients and 17 female patients. Height in centimeters 164.36 (± 7.55); ARDS predicted body weight in kilograms 59.32 (± 8.38); Length of stay in days 22.76 (± 16.20); days of mechanical ventilation 10.36 (± 7.95); SOFA at day 1 (points) 13 (6, 0–16); Charlson score (points) 1 (2, 0–6). The patients were divided in two groups (BD and LDE) according to the ventilatory strategy used for treatment. 24 of them in the LDE group and 21 in the BD group. According to the definition of Berlin, 1 patient (2.2 %) had mild ARDS, 29 patients (64.5 %) had moderate ARDS and 15 patients (33.3 %) had severe ARDS.

RESULTS. On admission there was no difference in SOFA ($p = 0.11$), Charlson, ($p = 0.11$), Gajic ($p = 0.18$); tidal volume/ARDSNet weight ($p = 0.36$), plateau pressure ($p = 0.57$), PEEP ($p = 0.85$) or PaO_2/FiO_2 ($p = 0.34$). On Day 3 of mechanical ventilation, dead space was lower in the LDE group (0.57 [0.2–0.67]) compared to the BD group (0.667 [0.5–0.78]), $p < 0.001$. Lower mortality was recorded in the first group (8.3 vs. 42.9 %, $p = 0.007$), which represented a relative risk reduction of 81 % (95 % CI 0.05–0.63) and a number needed to treat to save a life of 2.89 (95 % CI 1.14–2.2).

Differences between groups of ventilatory strategy

Variables (N = 45)	Death space (n = 24)	Conventional (n = 21)	Δ	p value
Plateau day1 (cm/H_20)	25.4 (± 3.6)	26 (± 5.2)	0.6	0.567
Plateau day 3 (cm/H_20)	23.6 (± 4.9)	25.4 (± 5.4)	1.8	0.277
TV/Kg day 1 (ml/kg)	7.7 (± 1.67)	7.2 (± 1.84)	−0.5	0.355
TV/Kg day 3 (ml/kg)	6.8 (± 0.99)	7.4 (± 1.3)	0.6	0.087
Dead space day 1	0.599 (0.22, 0.24–0.79)	0.618 (0.22, 0.4–0.82)	0.014	0.509
Dead space day 3	0.57 (0.14, 0.2–0.67)	0.667 (0.11, 0.5–0.78)	0.097	<0.001
Static compliance day 1	37.32 (± 15.89)	31.64 (± 8.05)	−5.68	0.146
Static compliance day 3	41.97 (± 21.54)	47.21 (± 23.88)	5.24	0.443
Deaths (%)	2 (8.3)	9 (42.9)	7 (−34.6)	0.007

CONCLUSIONS. In this study group, guided the mechanical ventilation in order to achieve the lowest dead space showed a significant reduction in mortality compared to a strategy based on the best lung compliance. This information suggests that conduct a randomized multicenter study to confirm these findings must be a priority.

0342

EFFECTS OF PRONE POSITION VENTILATION ON OXYGENATION, HEMODYNAMICS, INFLAMMATION AND LUNG OEDEMA IN AN EXPERIMENTAL MODEL OF ACUTE RESPIRATORY DISTRESS SYNDROME

A.M.A. Bianchi[1], M.M. Reboredo[1], L.M.F. Lucinda[2], F.F. Reis[1], J.C.A. Oliveira[1], B.V. Pinheiro[1]

[1]Universidade Federal de Juiz de Fora, Pulmonary Research Laboratory, Juiz de Fora, Brazil, [2]Universidade Federal de Juiz de Fora, Center of Reproductive Biology, Juiz de Fora, Brazil

INTRODUCTION. Prone position is associated with physiologic and clinical benefits in acute respiratory distress syndrome (ARDS), but its role in the ventilator-induced mechanical injury (VILI) is not elucidated (1, 2).
OBJECTIVE. To investigate the effects of prone position on arterial blood gases, hemodynamics, lung inflammation and oedema, in an experimental acute respiratory distress syndrome.
METHODS. This prospective, randomized, controlled experimental study was conducted in the Pulmonary Research Laboratory of Federal University of Juiz de Fora, Brazil. Extrapulmonary ARDS was induced in Wistar rats by intraperitoneally *Escherichia coli* lipopolysaccharide injection. After 24 h, animals were anaesthetised and randomized into 2 groups: prone (n = 5) and supine (n = 5), according to the position they were ventilated during 1 h. Both groups were ventilated with volume-controlled ventilation mode, with tidal volume of 6 ml/kg, respiratory rate of 80 breaths/min, positive end-expiratory pressure of 5 cmH_2O, and fraction of inspired oxygen of 1. Arterial blood gases, mean arterial pressure (MAP), lung wet-to-dry (W/D) ratio, total and differential cell count in the bronchoalveolar lavage (BAL) were analyzed.
RESULTS. Prone position ventilation reduced lung inflammation measured by total cell and neutrophil counts in BAL. However, no impact was observed on oxygenation, hemodynamics or lung oedema.

Table 1 Baseline and 1-h results on both groups

	Supine		Prone	
	Baseline	1-hour	Baseline	1-hour
MAP (mmHg)	124 ± 16	112 ± 27	125 ± 10	116 ± 33
PaO_2 (mmHg)	265 ± 68	332 ± 55	251 ± 65	340 ± 44
PaCO2 (mmHg)	40 ± 6	50 ± 13	48 ± 26	62 ± 25
BAL total cell count (x100.000/ml)		1.58 ± 0.58		0.87 ± 0.34
BAL neutrophil count (x100.000/ml)		1.07 ± 0.36		0.36 ± 0.18*
W/D		4.37 ± 0.32		4.64 ± 0.39

*p < 0.05

CONCLUSIONS. In this experimental extrapulmonary ARDS model, prone position ventilation for 1 h, compared with supine position ventilation, was associated with lower inflammatory response, but without impact on arterial oxygenation, hemodynamic and lung oedema.
REFERENCE(S) 1. Abroug F, Ouanes-Besbes L, Dachraoui F, Ouanes I, Brochard L. An updated study-level meta-analysis of randomised controlled trials on proning in ARDS and acute lung injury. Crit Care. 2011;15(1):R6. 2. Chiumello D, Taccone P, Berto V, Marino A, Migliara G, Lazzerini M, Gattinoni L. Long-term outcomes in survivors of acute respiratory distress syndrome ventilated in supine or prone position. Intensive Care Med. 2012;38(2):221–9.
FINANCIAL SUPPORT: FAPEMIG/REDE TOXFAR.

0343

COMPARISON OF EXPERIMENTAL MODELS OF INDUCED DIRECT ACUTE LUNG INJURY IN RATS

L. Chimenti[1], F. Puig[2], M.N. Gomez[1], J. Tijero[1], J. López-Aguilar[1,2], T. Lebouvier[3], L. Blanch[1,2], A. Artigas[1,2]

[1]Critical Care Center, Corporació Sanitária i Universitária Parc Taulì-UAB, Sabadell, Spain, [2]Enfermedades Respiratorias, CIBER, Bunyola, Spain, [3]Surgical Intensive Care Unit, Pontchaillou University Hospital, Rennes, France

INTRODUCTION. Acute Respiratory Distress Syndrome (ARDS) is caused by a variety of pathological processes that may affect the lung either directly (pneumonia, aspiration, contusion) or indirectly (sepsis, trauma, bypass surgery). Direct acute lung injury (ALI) accounts for approximately 55 % of all ALI cases. Most animal models of ALI are based on clinical disorders that are associated with ALI/ARDS in humans, however none of them fully simulate the human disease.
OBJECTIVES. To compare different types of ALI animal models reproducing mechanisms which may injury the lung directly.
METHODS. Adult male Sprague–Dawley rats (225–250 g; n = 3 for group) underwent intratracheal administration of: 1) HCl (0.1 N, pH = 1.5) to mimic acid aspiration, 2) LPS (10 μg/g of rat) to mimic bacterial infection, 3) HCl and LPS as a potential synergistic double hit, 4) physiologic saline solution in control animals (n = 6). 5 h and 24 h after the injury the animals were sacrificed and bronchoalveaolar lavage fluid (BALF) inflammatory cells and BALF total proteins were assessed. Results were expressed as mean ± SD (ANOVA).
RESULTS. Simultaneous intratracheal administration of HCl and LPS or LPS alone significantly increased total neutrophil (PMN) BALF counts compared to control rats (0.5 ± 0.4 x 10^8 PMN cells) either at 5 h or 24 h (5 h, HCl + LPS: 12.3 ± 2.6 x 10^8 PMN cells, $p < 0.05$; LPS: 19.1 ± 6.6 x 10^8 PMN cells, $p < 0.001$; 24 h, HCl + LPS: 16.1 ± 2.4 x 10^8 PMN cells, $p < 0.001$; LPS: 32.2 ± 19.2 x 10^8 PMN cells, $p < 0.0001$). A mayor effect was observed in animals intratracheally injected with LPS compared to those ones administrated with HCl + LPS ($p < 0.001$). The increase of neutrophils in rats intratracheally instilated with HCl was not significative at all time points. Total BALF proteins were found to be significantly increased only in rats intratracheally administrated with LPS for 24 h ($p < 0.0001$ vs all groups).
CONCLUSIONS. Pulmonary experimental models of ALI induced by LPS or LPS in combination with HCl are more appropriated to reproduce the acute fase of ARDS compared to models using HCl alone.
GRANT ACKNOWLEDGMENT. FIS-PI12/02548 and Fundació Parc Taulí.

Diagnosis and treatment of VAP & CAP: 0344–0357

0344

MICROBIOLOGICAL FINDINGS AND ADEQUACY OF ANTIBIOTIC TREATMENT IN DROWNING-ASSOCIATED PNEUMONIA

E. Assink-de Jong[1], M.R. Douma[1], A. Beishuizen[1], M. Hoogewerf[2], A.E. Budding[2], M.C. de Waard[1], A.R.J. Girbes[1]

[1]VU University Medical Center, Intensive Care, Amsterdam, The Netherlands, [2]VU University Medical Center, Medical Microbiology and Infection Control, Amsterdam, The Netherlands

INTRODUCTION. Pneumonia is a potential life-threatening complication in drowning victims. It has been estimated that approximately 90 % of patients aspirate water during drowning[1,2]. Bacteria causing pneumonia in drowning victims are often waterborne or from oropharyngeal origin. Fungi have been described as a less common cause of pneumonia in drowning victims.[2]
OBJECTIVES. To identify micro-organisms causing drowning-associated pneumonia and compare these to micro-organisms cultured from locally retrieved water samples. With these two goals, we tried to confirm whether the spectrum of our empirical antimicrobial therapy, as part of standard care for drowning victims, adequately covers the detected micro-organisms.
METHODS. From 2001 until 2012 forthy nine drowning victims were admitted to the Intensive Care Unit. Within these 49 patients 18 developed pneumonia during the first week after admission. Samples of water where patients had drowned were retrieved and cultured. Findings were compared with cultures from tracheal aspirate or broncho-alveolar lavage (BAL) fluid.
RESULTS. *Aeromonas* spp. and *Staphylococcus aureus* were the predominantly found micro-organisms in patients developing drowning-associated pneumonia (table 1). Positive sputum and BAL fluid cultures were retrieved within 48 h of admission in 16 of the 18 patients with pneumonia. One patient developed *Aspergillus fumigatus* pneumonia and in one case a positive culture yielding *Flavobacterium odoratum* was found with unclear clinical significance. The predominantly used initial antibiotic regimen consisted of piperacillin plus tobramycin or ceftazidim. Antimicrobial therapy was adequately covering cultured micro-organisms in 16 of the 18 pneumonia patients (89 %). The majority of the micro-organisms cultured from sputum- or BAL cultures in pneumonia were also cultured from the water samples (table 2). In particular all three water sample cultures yielded *Aeromonas* spp. Three different species of *Aspergillus* were cultured from the different water sites. No resistance was seen for azoles among the *Aspergillus* spp.
CONCLUSIONS. In this study we found that *Aeromonas spp.* and *Staphylococcus aureus* are the most commonly cultured micro-organisms within patients admitted with drowning-associated pneumonia as well as directly from the water samples in the Amsterdam region. These water samples did not supply additional information on top of cultures from the patient in terms of antibiotic choice. However these cultures from nearby water areas confirmed the correct choice of antibiotics.
REFERENCE(S) 1. Ender PT, Dolan MJ. Clin Infect Dis. Pneumonia associated with near-drowning. Clin Infect Dis. 1997;25(4):896–907. 2. Tadié JM, Heming N, Serve E, Weiss N, Day N, Imbert A, Ducharne G, Faisy C, Diehl JL, Safran D, Fagon JY, Guérot E. Drowning associated pneumonia: a descriptive cohort. Resuscitation. 2012;83(3): 399–401.

Cultured micro-organisms from sputum or BAL fluid

Micro-organism	Count	Micro-organism	Count
Aeromonas spp.	9	*Streptococcus pyogenes*	1
Staphylococcus aureus	7	*Streptococcus pyogenes*	1
Pseudomonas spp.	3	*Citrobacter freundii*	1
Haemophilus influenzae	3	*Escherichia coli*	1
Streptococcus pneumoniae	2	Undetermined gram negative rod	1
Klebsiella spp	2	*Bacillus cereus*	1
Enterobacter cloacae	2	*Serratia marcescens*	1
Acinetobacter spp.	2	*Flavobacterium odoratum*	1
Stenotrophomonas maltophilia	2	*Aspergillus fumigatus*	1

Water samples from the Amsterdam area

	Canals	Lake	Ditch		Canals	Lake	Ditch
Aeromonas sobria	x	x	x	*Vibrio cholerae* (non-O1 type)		x	
Aeromonas salmonicida		x	x	*Bacillus cereus*	x	x	x
Aeromonas hydrophila/ caviae		x		*Enterococcus faecium*			x
Pseudomonas aeruginosa			x	*Staphylococcus aureus*			x
Escherichia coli			x	*Penicillium* spp.		x	
Klebsiella pneumoniae	x	x		*Zygomycetes*	x		
Shewanella putrefaciens	x			*Aspergillus niger*	x		
Proteus mirabilis	x			*Aspergillus fumigatus*	x		
Enterobacter cloacae	x			*Aspergillus nidulans*			x

0345

ANTI-VIRAL PROPHYLAXIS FOR PREVENTION OF CYTOMEGALOVIRUS (CMV) REACTIVATION IN IMMUNOCOMPETENT PATIENTS IN CRITICAL CARE

J. Millar[1], S.C. Park[1], N. Cowley[2], P. Moss[2], H. Osman[1], J.F. Bion[2]

[1]University Hospital Birmingham, Birmingham, UK, [2]University of Birmingham, Birmingham, UK

INTRODUCTION. Cytomegalovirus (CMV) is a common herpes virus. Once contracted, the virus is never completely cleared, and may reactivate when the immune system is suppressed. There is a body of evidence supporting the prophylactic use of antivirals for patients with compromised immune systems. Critically ill patients have been found to have compromised immune function. There is increasing evidence linking CMV reactivation with poor outcomes in patients in critical care.(1) Although there may be a rationale for prophylaxis in critically ill patients, this has not yet been assessed in a clinical trial and is not routine clinical practice.

OBJECTIVES. To determine prevalence of past exposure to CMV, and to assess the efficacy and safety of antiviral prophylaxis in critically ill patients, with a view to setting up a large multi-centre study with clinical endpoints.

METHODS. We have designed a prospective, randomised, open-label single centre feasibility study. Patients admitted to the Queen Elizabeth Hospital Birmingham ICU with past exposure to CMV, and identified to be at high risk of CMV reactivation are assessed for inclusion. Recruited patients are randomised to receive either high dose aciclovir, low dose ganciclovir or to enter the control group of usual care. Regular samples are taken from blood, urine, bronchial lavage, and throat swabs for assessment of CMV viral load using PCR. The primary end point is CMV reactivation in blood over the 28 days of analysis.

RESULTS. Recruitment began in February 2012, and is expected to conclude in December 2013. A total of 92 of the total 141 required patients have been recruited. 279 potentially eligible patients have been screened for CMV status. CMV serology was positive in 68.4 % of patients screened. As expected, positive CMV serology was significantly more common in older patients (33 % in patients $\leq$50 years, and 71 % in those >50 years, $p = 0.03$). No gender differences have been identified in CMV status ($p = 0.42$). Rates of refusal of consent for trial inclusion are currently 5.8 % at the screening stage, and 16 % for the interventional drug trial phase. Analysis of the data looking at effectiveness of antiviral CMV suppression will be performed when recruitment concludes.

CONCLUSIONS. Epidemiological work suggests that critically ill patients with past CMV exposure could benefit from antiviral prophylaxis to prevent reactivation. We are performing a feasibility study to establish drug efficacy and safety in critically ill patients. Rates of CMV seropositivity, and recruitment figures to date suggest that a multi-centre study with clinical endpoints is feasible. Rates of refusal to participate by family are relatively low at 16 %.

REFERENCE(S) 1. Limaye AP, Kirby KA, Rubenfeld GD, et al. Cytomegalovirus reactivation in critically ill immunocompetent patients. JAMA. 2008;300:413–22.

GRANT ACKNOWLEDGMENT. National Institute of Health Research, UK. Research For Patient Benefit programme.

0346

LACTONASE ABILITY TO REDUCE MORTALITY OF *P. AERUGINOSA* PNEUMONIA IN RATS

S. Hraiech[1], J. Hiblot[2], A. Roch[1], E. Chabrière[2], J.-M. Forel[1], C. Guervilly[1], M. Adda[1], L. Papazian[1], D. Raoult[2], F. Brégeon[2]

[1]Aix-Marseille Univ, URMITE CNRS-UMR 6236, Hôpital Nord, Réanimation des Détresses Respiratoires et Infections Sévères, Marseille, France, [2]URMITE UMR CNRS-IRD 6236, IFR48, Faculté de Médecine et de Pharmacie, Aix-Marseille Université, Marseille, France

INTRODUCTION. *Pseudomonas aeruginosa* is one of the most commonly implicated pathogens in nosocomial pneumonia. Pharmacological inhibition of bacterial virulence factors might be a promising therapeutic way. Acyl-Homoserine Lactones are one of the main molecules implicated in quorum sensing for *P.aeruginosa* and can be inactivated by SsoPox lactonase.

OBJECTIVES. We hypothesized that the inhibition of quorum sensing by the prophylactic use of SsoPox lactonase administered into the trachea could reduce the mortality of *P.aeruginosa* pneumonia in rats.

METHODS. To evaluate the tolerance of SsoPox, a first series of 24 Sprague–Dawley male rats were anesthetized with sevoflurane and received 250 μl of a solution containing either 0.1 mg/ml (n = 6), 1 mg/ml (n = 6) or 10 mg/ml (n = 6) of SsoPox or phosphate buffered saline (PBS) (control group, n = 6) administered by tracheal way after intubation. In each group, animal behavior, weight and survival was noted. Two animals of each group were sacrificed after 6, 24 and 48 h. Left lung was removed and preserved in formaldehyde for histological analysis.
Three other groups of 20 animals were infected by intra tracheal inoculation of 250 μl of a solution of PBS containing 10^8 CFU/ml of *P.aeruginosa.* At the same time, one group received 250 additional μl of PBS into the trachea (control group). The second group received 250 μl of SsoPox at a concentration of 1 mg/ml. The third group received 250 μl of SsoPox 3 h after the inoculation of bacteria. After infection and treatment, animals were observed for 48 h and spontaneous mortality and body weight were noted. Surviving animals were sacrificed after 48 h. After death, blood was sampled for culture. Right lung was removed and bacterial content was determined.

RESULTS. SsoPox was well tolerated and no animal died regardless to the dose inhaled. Animals that received SsoPox at the time of infection had a reduced mortality as compared to the control group (20 % versus (vs.) 75 % respectively; $p = 0.002$). Mean weight loss was also less important (11.3 vs. 20.4 g respectively; $p = 0.01$). However, median [interquartile range] lung bacterial count was not significantly different from control group (1.3×10^5 [$9 \times 10^3 - 10^6$] vs. 3×10^5 [$2 \times 10^3 - 10^6$] CFU/g of lung; p = NS). Bacteremia in animals treated at the time of infection was present in 35 % of animals vs. 50 % in the control group (p = NS).
In the group of animals that received SsoPox 3 h after the infection, mortality was of 50 % (p = NS vs control). Mean weight loss, lung bacterial count and incidence of bacteremia were not significantly different from control group.

CONCLUSIONS. Prophylactic use of lactonase decreased mortality of a *P.aeruginosa* acute pneumonia in rats and was well tolerated. Prevention of nosocomial pneumonia in mechanically ventilated patients by the use of SsoPox might be further investigated.

0347

EMPIRICAL ANTIBIOTIC THERAPY FOR NOSOCOMIAL PNEUMONIA IN THE ICU: COMPARISON OF SURVEILLANCE-GUIDED AND EMPIRICAL FLOWCHARTS

L. Saerens[1], L. De Bus[1], J. Boelens[1], J. Decruyenaere[1], P. Depuydt[1]

[1]University of Ghent, Ghent, Belgium

INTRODUCTION. Timely empirical antibiotic therapy which covers the responsible pathogens has been shown to improve outcome in nosocomial pneumonia (NP). In order to improve appropriateness and reduce unnecessary use of broad-spectrum drugs, empirical therapy has to be tailored to the local microbial flora. Guidance of empirical therapy by surveillance cultures (SC) has been shown to result in high rates of appropriate therapy with limited use of broad-spectrum antimicrobials (1, 2). Alternatively, designing empirical flowcharts closely matched to local epidemiology, as derived from diagnostic cultures, may reach the same goal.

OBJECTIVES. We aimed to compare a surveillance-guided flowchart (SGF) with a locally derived empirical flowchart (LDEF) in a cohort of microbiologically confirmed nosocomial pneumonia, in terms of rates of appropriate coverage and extensiveness of antimicrobial spectrum.

METHODS. In LDEF, proposed therapy consisted of amoxicillin-clavulanic acid/cefuroxim, piperacillin-tazobactam or meropenem according to the presence of clinical risk factors for antibiotic-resistant pathogens.
In SGF, proposed antibiotics were directed at pathogens found in endotracheal SC within 2–5 days preceding NP; in the absence of these, empirical therapy was proposed, upgraded in order to cover antibiotic-resistant pathogens found in other SC. SGF and LDEF proposed therapy were compared with therapy targeted to documented microbial etiology (TT). Extensiveness of antimicrobial spectrum of flowchart-proposed therapy was quantified by the number of steps along a scale of increasing antimicrobial spectrum, with TT as reference.

RESULTS. We tested flowcharts on a total of 256 episodes of NP. SGF and LDEF resulted both in 80 % appropriate coverage. Use of broad-spectrum drugs was more limited in SGF as compared to LDEF ($p < 0.001$). As compared to TT, extensiveness of SGF and LDEF were 1 and 3 steps, respectively. Especially, carbapenems were used in 16 % of SGF and 71 % of LDEF as compared to 3.5 % of TT.

CONCLUSIONS. Both LDEF and SGF arrived at 80 % rates of initial appropriate antimicrobial coverage, while SGF resulted in reduced use of broad-spectrum drugs. SGF may be a preferable strategy when implementing antibiotic stewardship programs.

REFERENCE(S) 1. Depuydt P, Benoit d, Vogelaers, et al. Systematic surveillance cultures as a tool to predict involvement of multidrug antibiotic resistant pathogens in ventilator-associated pneumonia. Intensive Care Med. 2008;34:675–82. 2. Michel F, Franceschini B, Berger P, et al. Early antibiotic treatment for BAL confirmed ventilator-associated pneumonia: a role for routine endotracheal aspirate cultures. Chest. 2007;127:589–97.

0348

THE PROGNOSTIC VALUE OF MUSCLE REGIONAL SATURATION INDEX (RSO2) IN SEVERE COMMUNITY-ACQUIRED PNEUMONIA (CAP)

L. Claverias[1], J. Marin-Corral[1], M. Magret[1], S. Trefler[1], M. Bodí[1,2], S. Pascual[2,3], J. Gea[2,3], A. Rodríguez[1,2]

[1]Hospital Universitari Joan XXIII, Intensive Care Unit, Tarragona, Spain, [2]CIBERes de Enfermedades Respiratorias (Instituto de Salud Carlos III), Bunyola, Spain, [3]Hospital del Mar, Servicio de Neumología, Barcelona, Spain

INTRODUCTION. CAP is an important cause of morbidity, mortality and increased health care costs. Mortality rate exceeds 20 % in immunocompetent patients admitted to the ICU despite appropriate antibiotic therapy. Increasing evidence suggests that regional estimates of skeletal muscle tissue perfusion/oxigenation by NIRS devices might early detect patients at risk of serious complications and have prognostic implications.

OBJECTIVES.
1) to determine the association between early brachioradialis rSO2 values and mortality,
2) to compare discrimination power on mortality of skeletal rSO2 and other standard variables of resuscitation and
3) to determine a rSO2 threshold that might be useful to detect patients at high risk of complications.

METHODS. A prospective, observational, controlled study was performed in a 30-bed medical-surgical ICU. Adult patients diagnosed of severe CAP were enrolled within 6 h to ICU admission. Information collected included demographic characteristics, APACHE II score, SOFA score and global hemodynamic variables. Serum lactate (SL) and base deficit (BD) were obtained as markers of resuscitation. An INVOS 5100 probe somasensor was placed on the medial forearm at a 5 cm distance distal to the elbow of each subject to obtain rSO2 measurements. All variables were determined at baseline, 12 h and 24 h after admission.

RESULTS. Twenty patients with CAP were enrolled. Mean APACHE II and SOFA scores were 15.0 and 4.0 points respectively, with an overall ICU mortality rate of 20 %. Non-survivors had a higher APACHE II score, greater need for invasive ventilation and higher frequency of shock respect to survivors. During the study period only brachioradialis rSO2 proved to be significantly lower in non-survivors at all times, and SL and BD were significantly different between survivors and non-survivors at 12 h and 24 h. According our previous data (1) we defined a cut-point of <60 % as a "low rSO2". Seven patients (35 %) had a baseline skeletal muscle rSO2 < 60 %, and four of them (51 %) died. All patients with rSO2 $\geq$ 60 % survived ($p = 0.007$). The AUROC showed consistent mortality discrimination at baseline (1.00;95 % CI 1.0–1.0, $p = 0.03$), 12 h (1.00;95 % CI 1.0–1.0, $p = 0.03$) and 24 h (0.97;95 % CI 0.89–1.0, $p = 0.006$) for brachioradialis rSO2 values.

CONCLUSIONS. We have established that forearm skeletal muscle rSO2 differs in patients with severe CAP according to outcome. We found that severe CAP patients with

brachioradialis muscle rSO2 < 60 % throughout the first 24 h in ICU had greater mortality rate than patients with rSO2 ≥ 60 % throughout this critical time.
REFERENCE(S) 1. Rodríguez A et al. Mortality and regional oxygen saturation index in septic shock patients: a pilot study. J Trauma. 2011;70:1145.
GRANT ACKNOWLEDGMENT. Partially supported by FIS PI10/01538.

0349
CULTURE-POSITIVE PLEURAL INFECTION DIAGNOSED IN WESTERN AUSTRALIAN INTENSIVE CARE UNITS (ICU)

E. Fysh[1,2], A. Yogendran[2], B. Roberts[1], S. Baker[1], I. Kay[3], A. Palermo[4], Y.C.G. Lee[2], A. Rosenstengel[2]

[1]Sir Charles Gairdner Hospital, Intensive Care, Perth, Australia, [2]Pleural Diseases Unit, Sir Charles Gairdner Hospital, Perth, Australia, [3]PathWest, Perth, Australia, [4]Fremantle Hospital, Intensive Care, Fremantle, Australia
INTRODUCTION. The incidence of pleural infection is rising and mortality rates remain high, especially in hospital-acquired cases (1). Few studies exist of pleural infection in mixed (surgical and medical) intensive care units (ICU). One single-centre, medical ICU study did suggest a different microbiology and even higher mortality—up to 40 % in this setting compared to 15 to 20 % for pleural infection overall (2). However, the incidence, microbiology and outcomes of pleural infections diagnosed while patients are in the ICU remain unclear. This is a significant hindrance to the advancement of patient care.
OBJECTIVES. To interrogate a large, multicentre database of culture-positive pleural fluid specimens and determine 1) the incidence, 2) microbiology, 3) need for surgery and 4) the mortality associated with culture-positive pleural infection diagnosed in two tertiary ICU's in Perth, Western Australia.
METHODS. All pleural fluid microbiology specimens from Western Australian public hospitals are processed by PathWest laboratories. The PathWest database was interrogated to find all patients with positive pleural fluid culture between 1st Jan 2006 and 31st Dec 2011. All patients located in the Sir Charles Gairdner and Fremantle Hospital ICU's when the specimens were taken were studied further. Clinical data regarding the four objectives were collected from the case records and analysed. Follow up was until discharge from hospital or death.
RESULTS.
Incidence: 9,176 patients were admitted to the two mixed medical/surgical ICU's over 6 years. 45 (0.5 %) patients had culture positive pleural fluid specimens whilst in intensive care. 40 of these had sufficient clinical data available to confirm clinical evidence of pleural infection. Mean (sd) APACHE II score of infection cohort was 21.7 (± 6.7). 12 (30 %) infections were parapneumonic, 13 (32.5 %) postsurgical, 5 (12.5 %) traumatic and 10 (25 %) from non-pulmonary sepsis.
Microbiology: 31 patients (77.5 %) grew gram positive organisms (19 Staphylococcus sp), 3 (7.5 %) gram negative, 2 (5 %) yeast, 1 (2.5 %) mycobacterium and 3 (2.5 %) had mixed organisms.
Surgery: 7 (17.5 %) patients underwent surgical decortication.
Mortality: 13 medically managed patients (32.5 %) died vs. 0 surgically treated patients ($p = 0.07$, Fischer Exact test).
CONCLUSIONS. 1) One in two hundred patients in intensive care suffered from culture-positive pleural infection. 2) Fewer than one third of pleural infections were parapneumonic. 3) Mortality remains unacceptably high.
REFERENCE(S) 1. Lisboa T, Waterer GW, Lee YCG. Pleural infection: Changing bacteriology and its implications. Respirology. 2011;16(4):598–603. 2. Tu CY, Hsu WH, Hsia TC et al. The changing pathogens of complicated parapneumonic effusions or empyemas in a medical intensive care unit. Intensive Care Med. 2006;32:570–6.

0350
EVOLUTION VENTILATOR ASSOCIATED PNEUMONIA IN OUR INTENSIVE CARE UNIT, AFTER PNEUMONIA ZERO PROGRAM IMPLEMENTATION

R. Fernandez[1], M.E. Yuste[1], R. Ramírez[1], J.C. Frías[1]

[1]Granada University, Granada, Spain
INTRODUCTION. In our country Spanish Society Of Intensive Medicine (SEMICYUC), have not proposed specific guidelines or recommendations about ventilator associated pneumonia (VAP) We have drafted rules for maintenance of the airway in mechanically ventilated patients.
OBJECTIVES. Describe a program to reduce ventilator-associated pneumonia (VAP) in the ICU of a 2nd level hospital and the evolution of our rates after implementation Pneumonia Zero Project (NZ).
METHODS. Implementation of NZ program: Pharmacy Service, prepared oral solution of chlorhexidine 2 % for oral cleaning. Were instituted mandatory measures for the prevention of VAP: training in airway management, strict hand hygiene and measures highly recommended intermittent aspiration of subglottic secretions.
Conduct training and educational campaign to professionals of ICU and anesthesia unit (112 professionals).
Data from the ENVIN registration: 01.04.11/31.12.12. VAP rates and incidence density (ID). We collected data from 1,750 patients admitted to the ICU (N 1,750). 7,742 days of stay, 2,811 days of mechanical ventilation (MV).
RESULTS. During the 3 months of educational campaign, 01/04/11–01/06/11 VAP rates were 2.75 per 100 patients admitted, 5.28 per 1,000 days of stay and 14.02 per 1,000 days of MV, far above objectives and national and community average (2.73 and 2.33 rates, DI-day stay by 4.99 and 4.12; DI VM 11.03 and 8.48 days, respectively). At the end of the campaign, the numbers from 01/06/11 to 01/12/11, declined sharply, with the rate of 1.06 per 100 patients, 2.51 per 1,000 days of stay 7.28 days going below national and Andalusian rates. In 2012, 01/01/12 to 01/12/12, we followed going down VAP figures with rates of 0.58 per 100 patients, DI per 1,000 days of stay of 1.32, DI VM 3.63 per 1,000 days. The rest of the country had much higher rates.
During the first year, the most common organism was A. Baumanii, while in 2012, were equally *S. aureus*, *P. aeruginosa* and *S. aureus* methicillin resistant (MRSA).
In educational campaign intervened nursing, nursing assistants, residents, specialists and other professionals with a total of 120 people. The group that scored top marks in the evaluation of medical specialists was 26.13.
CONCLUSIONS. Following the educational campaign and multidisciplinary effort, the DI of VAP has suffered a sharp decline, still well below the target of zero Pneumonia Project. The germ currently most frequently involved are VAP *S. aureus* and *S. malthopilla*.
REFERENCE(S) 1. Statistical data ENVIN-HELICS—Pneumonia Project Zero.
GRANT ACKNOWLEDGMENT. Dra Yuste, Dra Ramírez.

0351
SEVERE COMMUNITY ACQUIRED PNEUMONIA: IMPLEMENTATION OF POLYMERASE CHAIN REACTION DIAGNOSIS IN CLINICAL PRACTICE

R. Alzubaidy[1], S. Ehrmann[1], C. Lhommet[1], A. Joret[1], J. Mankikian[1], A. Guillon[1,2], E. Mercier[1], A. Legras[1], P.-F. Dequin[1], D. Perrotin[1], D. Garot[1]

[1]CHRU de Tours, Service de réanimation polyvalente, Tours, France, [2]Université François Rabelais, Faculté de Médecine, Centre d'Etude des Pathologies Respiratoires, INSERM U1100/EA6305, Tours, France
INTRODUCTION. Etiologic diagnosis of community acquired pneumonia (CAP) is challenging. Conventional diagnostic methods fail to identify a microorganism in up to half of patients. Polymerase chain reaction (PCR) diagnostic methods, progressively implemented into clinical practice, are susceptible to change the epidemiological visions of this severe disease and progressively change therapeutic paradigms.
OBJECTIVES. To assess the diagnostic consequences of implementing the RespiFinder SMART22® PCR into clinical practice at our center.
METHODS. We retrospectively reviewed all patients admitted to our 37-bed intensive and intermediate care unit with a diagnosis of CAP over the six month following implementation of the RespiFinder SMART22® into routine care at our center. This PCR tool enables identification of atypical respiratory bacteria (but not *S. pneumoniae*) so as 17 viruses. Data extraction comprised CAP diagnostic criteria, conventional microbiological analysis and respiratory PCR results, so as demographic and outcome data.
RESULTS. Ninety-eight patients were included in the study (age 63 ± 17, 62 % males, simplified acute physiology score II 37 ± 19, 48 % mechanical ventilation). PCR was performed on respiratory samples of 69 patients (67 nasopharyngeal aspirates, 5 bronchoalveolar lavages). Conventional diagnostic methods included culture of blood and respiratory samples, and urine antigen detection. Serological testing and viral immune-fluorescent analysis were not systematically performed. Overall a microbiological diagnosis could be made for 63 patients (64 %). 40 patients had at least one bacteria identified and 40 at least one virus (41 % of patients with a diagnosis, 58 % of PCR tested patients). Of those patients 17 (27 %) had a bacterial-viral co-infection. The most frequently identified bacteria was *S. pneumonia* (n = 26 [65 % of bacterial infections]), followed by *Mycoplasma pneumoniae* (n = 7 [17 %]) aside of 5 other bacteria. The most frequently identified virus was *Myxovirusinfluenzae A* (n = 15 [38 % of patients with a virus identified]), followed by *Bocavirus*, *Adenovirus* and *Rhinovirus* (n = 11 [28 %], 8 [20 %] and 8 [20 %] respectively), aside of 4 other viruses. *S. pneumoniae* and *Myxovirusinfluenzae A* were the most frequently organisms involved in co-infections. Among patients with a positive finding for *Myxovirus influenzae A*, only 5 (30 %) received an antiviral treatment. Overall intensive care unit mortality was 15 %, not significantly different according to microbiological findings.
CONCLUSIONS. The RespiFinder SMART22® was frequently positive in patients with severe CAP, thus confirming potential interest in this setting. In particular, identification of viruses and *Mycoplasma pneumoniae* was frequent. Those findings will have to be confirmed in prospective studies. Development of PCR diagnostic techniques for *S. pneumoniae*, the most frequent pathogen, will constitute a further challenge.

0352
VENTILATOR CARE BUNDLE REDUCED THE INCIDENCE OF VENTILATOR ASSOCIATED PNEUMONIA INDUCED BY MRSA BUT NOT *ACINETOBACTER BAUMANNII*: EPIDEMIOLOGICAL STUDY AND ANTIMICROBIAL RESISTANCE PATTERN

A. Mukhtar[1], A. Hasanin[1], S. Farouk[1], H. Mostafa[1], A. Lofty[1], H. Elazizi[1], A. Zaghlol[1], A. Gado[1], M. Botros[1], D. Ghaith[2]

[1]Cairo University, Department of Anesthesia and Critical Care Medicine, Cairo, Egypt, [2]Cairo University, Department of Clinical and Chemical Pathology, Cairo, Egypt
INTRODUCTION. Implementing ventilator care bundle (VCB) has been widely advocated in mechanically ventilated patients admitted to intensive-care unit (ICU) and is associated with a reduced risk of ventilator-associated pneumonia (VAP). The infection rate of Methicillin Resistant Staph Aureus (MRSA) and *Acinetobacter* species (spp) has become a significant concern in critically ill patients.
OBJECTIVES. We investigated whether implementation of a ventilator care bundle reduced the incidence of MRSA-VAP and *Acinetobacter* spp in a cohort of critically ill trauma patients and to test the in vitro resistance pattern of *Acinetobacter* spp.
METHODS. VCB was implemented after a 7 month baseline period. VAP rates, rates of MRSA and *acinetobacter* acquisition were prospectively recorded for 1 year. Minimum inhibitory concentrations (MICs) using the Epsilometer test (E-test) methodology were determined for *Acinetobacter* spp against imipenem, tigecyline, and colistin.
RESULTS. Application of VCB was associated with reduced incidence of VAP from 42 [95 % confidence interval (CI) 17–83] cases per 1,000 ventilator days in the pre-intervention period to 19 (95 % CI 11–34) cases per 1,000 ventilator days in the post-intervention period ($p = 0.04$). The rate of MRSA acquisition was significantly different in the pre-intervention group (27 %) and the post-intervention group (3.9 %). ($P < 0.001$). However, the incidence of *Acinetobacter* did not change from pre to post-intervention periods (7 (14 %), 13 (16.8 %)) respectively. *Acinetobacter* spp were significantly associated with late onset VAP. One-hundred percent of *Acinetobacter* spp. were carbapenem-resistant MIC > 32 mg/L. Tigecyline showed moderate activity against *Acinetobacter* spp. MIC of 11 isolates was less 2.0 mg/L. while 9 isolates were resistant (MIC range 4–12 mg/L). Colistin showed excellent activity against all *Acinetobacter* species (MIC range 0.016–1 mg/L).
CONCLUSIONS. Implementation of VCB reduced the incidence of VAP caused by MRSA but not by *Acinetobacter* spp. The late-onset pattern of *Acinetobacter pneumonia* acquisition may potentially explain this finding.
REFERENCE(S) 1. Fulbrook P, Mooney S. Care bundles in care: a practical approach to evidence-based practice. Nurs Crit Care. 2003;8:249–55.

0353
TRAJECTORY ANALYSIS OF CLINICAL VARIABLES TO IMPROVE DIAGNOSIS OF VENTILATOR ASSOCIATED PNEUMONIA IN PATIENTS WITH BRAIN INJURY

D.B. Antcliffe[1], K. Veselkov[2], J.T.M. Pearce[3], J. Kinross[4], A.C. Gordon[1]

[1]Imperial College, Section of Anaesthetics, Pain Medicine and Intensive Care, London, UK, [2]Imperial College, Section of Computational and Systems Medicine, London, UK, [3]Imperial College, MRC-NIHR Phenome Centre, London, UK, [4]Imperial College, Section of Biosurgery and Surgical Technology, London, UK
INTRODUCTION. Ventilator associated pneumonia (VAP) is a common complication of ventilation increasing ICU stay, duration of ventilation, and worsening outcomes. Current

diagnostics are inaccurate so morbidity and mortality remain high. Multivariate statistics developed for '-omics' sciences have yet to be applied to big clinical data sets, although they have potential to deliver accurate early personalised risk scores.
OBJECTIVES. To develop a novel computational patient trajectory methodology based on multivariate analysis of multiple clinical indices from a large ICU database for the diagnosis of VAP.
METHODS. Data was used from MIT's Multiparameter Intelligent Monitoring in Intensive Care (MIMIC) II database[1]. Patients with brain injuries were identified and those ventilated for >48 h were included. VAP was identified by text searches of discharge and radiology reports, patients not coded as having pneumonia acted as controls. Clinical Pulmonary Infection Scores (CPIS) were calculated daily, scores >6 confirmed VAP.
Median, mean and extremes of all clinical and laboratory parameters were extracted for 8 h windows of each ICU stay. Time points were aligned to when CPIS > 6 or when it was highest for VAP and control patients respectively. Differential trajectory analysis using generalised non-linear mixed effect models was applied to evaluate the mean time-related changes in individual parameters prior to VAP. Parameters with least missing data were used for multivariate trajectory visualisation and exploratory analysis. The *k*-nearest neighbour classifier was applied to classify patients based on multivariate trajectories.
RESULTS. VAP (n = 28) and control (n = 25) groups had similar mean age (61 v 66 years, p = 0.36), sex (57 v 56 % male p = 0.88), and time from the start of ventilation to point of alignment (6 v 5 days, p = 0.78). Mean ICU (19.7 v 7.8 days $p < 0.01$) and hospital stay (33.2 v 14.0 days, $p < 0.01$) were greater in the VAP group. 39 clinical parameters were extracted for each of 2,272 time points (range 10–125 per patient).
Differential trajectory analysis found the most discriminative parameters were temperature (p = 0.01), heart rate (p = 0.02), HCO3 (p = 0.003) and chloride (p = 0.05). Combining parameters from all time points into a *k*-nearest neighbour classifier based on multivariate trajectories allowed greater categorisation with an accuracy of 83 % across time points in the 72 h preceding the onset of VAP, as compared to the classification using trajectories of individual variables (60–70 %).
CONCLUSION. Real time analysis of ICU databases using a personalised patient trajectory methodology of regularly recorded clinical variables could potentially improve the early diagnostic accuracy of VAP.
REFERENCE(S) 1. Saeed, M et al. Crit Care Med. 2011;39:952–60.
FUNDING. This work was funded by the Imperial NIHR Biomedical Research Centre and the Imperial College Junior Research Fellowship Scheme. (D Antcliffe and K Veselkov contributed equally to this work).

0354
INCIDENCE OF VENTILATOR ASSOCIATED PNEUMONIA (VAP) IN ARDS. A MULTICENTER PROSPECTIVE EPIDEMIOLOGICAL STUDY IN A UNIVERSITY HOSPITAL

F. Thiollière[1], C. Dunouvion-Magnier[1], C. Guerin[2], H. Vallin[1], F. Wallet[1], J.-C. Richard[3], C. Magnin[4], T. Rimmele[5], C. Demaret[6], B. Delanoy[7], Z. Schmidt[8], O. Martin[4], R. Hernu[9], L. Baboi[10], V. Piriou[1], F. Daillet[11], O. Bastien[7], F. Aubrun[12], L. Argaud[13], B. Allaouchiche[5], L. Ayzac[14], A. Lepape[1], REALYS

[1]Hospices Civils de Lyon, CHU Lyon Sud, Soins Critiques, Pierre-Bénite, France, [2]Hospices Civils de Lyon, Hôpital de la Croix Rousse, Medical ICU, Lyon, France, [3]Hospices Civils de Lyon, Hôpital de la Croix Rousse, Réanimation Médicale, Lyon, France, [4]Hospices Civils de Lyon, Hôpital Edouard-Herriot, Anesthesia & ICU, Lyon, France, [5]Hospices Civils de Lyon, Hôpital Edouard-Herriot, Lyon, France, [6]Hospices Civils de Lyon, Hôpital Neurologique, Bron, France, [7]Hospices Civils de Lyon, Hôpital Cardiologique, Bron, France, [8]Hospices Civils de Lyon Hôpital de la Croix Rousse, Réanimation Chirurgicale, Lyon, France, [9]Hospices Civils de Lyon, Hôpital Edouard-Herriot, Réanimation Médicale, Lyon, France, [10]Hospices Civils de Lyon Hôpital de la Croix Rousse, Réanimation Médicale, Lyon, France, [11]Hospices Civils de Lyon, Hôpital Neurologique, Réanimation, Bron, France, [12]Hospices Civils de Lyon Hôpital de la Croix Rousse, Surgical ICU, Lyon, France, [13]Hospices Civils de Lyon, Hôpital Edouard-Herriot, Medical ICU, Lyon, France, [14]Hospices Civils de Lyon, Hôpital Henri Gabrielle, Saint Genis Laval, France
ARDS are characterized by important lung alterations associated to an impairment of local defences and a high frequency of VAP.
OBJECTIVES. Description of VAP frequency and characteristics in an ARDS cohort, according to ARDS severity.
METHODS. Prospective epidemiology study in the 10 adults ICUs of the University hospitals in Lyon, France over a 6-month period (March–September 2012). Diagnostic of VAP was performed by BAL or non bronchoscopic mini BAL in the intubated patients and is defined in this study by microbiological confirmation.
RESULTS. During the study period, 3,504 patients were admitted in the 10 ICUs, 268 (6.5 %) fulfilled the Berlin definition criteria for ARDS : 44 mild, 153 moderate and 71 severe ARDS. Infection was the most frequent etiology of ARDS with lung infection (including inhalation) in 197 patients and extra-pulmonary infections in 34 cases. The overall mortality was 34.7 %.

Results

	Mild SDRA (44)	Moderate SDRA (153)	Severe SDRA (71)	Overall (N = 268)
n VAP (first episode)	13	42	21	76
Invasive MV duration (days)	345	902	491	1,738
Attack rate of VAP first episode	29.5 %	27.5 %	29.6 %	28.4 %
Cocci G+	2	9	5	16
Enterobacteriacae	3	16	8	27
Other GNB	1	7	6	14
Antimicrobial treatment at sampling time	46.2 %	57.1 %	71.4 %	60.2 %
New antimicrobial treatment after receiving microbial results	100.0 %	92.9 %	81.0 %	90.1 %
Treatment duration of PAVM (days)	9.69 ± 3.45	9.74 ± 3.85	9.29 ± 4.67	

CONCLUSIONS. The incidence of VAP in ARDS is high, its diagnosis is difficult due to a already modified X-ray and rely on microbiological sampling, frequently performed during a previous antimicrobial treatment and is followed by a change in antimicrobial treatment in 90 % of cases.

0355
HIGHER PROGNOSTIC VALUE OF HYPOXEMIA THAN C-REACTIVE PROTEIN IN BACTEREMIC PNEUMOCOCCAL PNEUMONIA

R.C. Huerta Bravo[1], L. Palacios Gamir[1], A. Vargas Atehortua[1], J. Blanquer[1], CAPAVANT Study Group

[1]Hospital Clínico y Universitario de Valencia, Valencia, Spain
BACKGROUND. The marker of target organ injury in pneumonia may offer a more useful prognostic information that the use of biomarkers of systemic infection.
AIMS. To assess the accuracy of different biomarkers (PaO_2/FiO_2 vs C-Reactive Protein, CRP) in predicting complications and mortality in bacteremic pneumococcal pneumonia (CAP-SP).
METHODS. We analyzed the values of CRP and PaO_2/FiO_2 regarding pneumonia severity and the development of complications and mortality in a bacteremic pneumococcal pneumonia database. Means were compared with U Mann–Whitney test, and we performed analysis of variance (ANOVA) and ROC curves comparing both variables and outcomes.
RESULTS. We analyzed 117 patients of which 73.5 % (86 cases) presented with severe pneumonia (PSI IV-V). Complications were developed in 69 cases (58.9 %), and the most frequent were systemic and respiratory complications in 45 patients both (38.5 %), followed by the presence of septic shock (40 cases, 34.2 %) and ICU admission (28 patients, 23.9 %). Overall 30-day mortality was 34.2 % (40 patients). PaO_2/FiO_2 values worsened with PSI severity ($p < 0.01$) but CRP levels showed no differences between risk classes (p = 0.06). Patients with systemic and respiratory complications, septic shock and ICU admission had significantly lower levels of PaO_2/FiO_2, while no statistically significant differences in CRP values were found between patients who had a worse outcome compared to those who not (Table 1 and 2). The ability to predict complications and 30-day mortality was higher for PaO_2/FiO_2 vs CRP (AUC PaO_2/FiO_2 0.72 vs. CRP 0.49; $p < 0.01$) and AUC (PaO_2/FiO_2 0.67 vs. CRP 0.56; p = 0.004), respectively.
CONCLUSIONS. In our series of bacteremic pneumococcal pneumonia, PaO_2/FiO_2 is a more accurate biomarker than CRP in predicting complications and mortality.

		PaO2/FiO2 (median)	p
Systemic complications	No	285.7	
	Yes	241.9	<0.01
Septic shock	No	284.7	
	Yes	239.8	<0.01
Respiratory complications	No	297.6	
	Yes	238.1	<0.01
ICU admission	No	281	
	Yes	219.9	<0.01
Death	No	283.3	
	Yes	239.8	0.04

Table 1

		CRP (mg/dl)	p
Systemic complications	No	28.1	
	Yes	28.3	0.581
Septic shock	No	26.5	
	Yes	30.1	0.514
Respiratory complications	No	29.8	
	Yes	27.6	0.873
ICU admission	No	28.3	
	Yes	28.7	0.396
Death	No	30.1	
	Yes	26.6	0.266

Table 2

0356
CAN WE USE THE CPIS SCORE TO AID ANTIBIOTIC PRESCRIPTION IN SUSPECTED VENTILATOR ASSOCIATED PULMONARY INFECTIONS?

K. Macarthur[1], T. Szakmany[1]

[1]Royal Glamorgan Hospital, Anaesthesia, Critical Care and Theatres, Llantrisant, UK
INTRODUCTION. The Clinical Pulmonary Infection Score (CPIS) was developed as a tool to aid in the assessment, diagnosis and management of suspected ventilator associated pneumonia (VAP) (1, 2). We have evaluated it's usefulness in a general intensive care setting.
OBJECTIVES. On our ICU, no formal clinical pathway was used to detect possible development of VAP. We hypothesised that CPIS will be increased on prescription of new antibiotics for presumed new chest infection, whilst the patient is ventilated.
METHODS. We have retrospectively reviewed the charts of all ventilated patients who had longer mechanical ventilation than the median 5 days on our 10-bedded ICU. CPIS score was determined on day 1 and day 6 of mechanical ventilation and on every occasion when a new antibiotic was started. Reason for ICU admission, antibiotic therapy and microbiological sensitivities were also recorded.
RESULTS. Out of 56 patients 40 notes were available and analysed. We found that all patients admitted with pneumonia or other pulmonary infection had CPIS score >6 on Day 1. These patients had a mean (SD) CPIS 7.9 (1.8) on Day 6. Overall, on day 6 18/40 patients had CPIS > 6. 17 of these patients were on the original broad-spectrum antibiotics started on admission. There were 29 changes in antibiotic therapy. 26 of these changes were accompanied by CPIS of >6, giving CPIS < 6 a negative predictive value of 90 % for

change in antibiotic therapy. In one case antibiotic was changed without sensitivity and with low CPIS. The other two changes with low CPIS were due to new microbiology results. There were 8 antibiotic changes between day 7–10. In all of these cases CPIS already was >6 on Day 6.

CONCLUSIONS. In our retrospective cohort we have found that CPIS was a useful clinical descriptor of severity of pulmonary infection. Almost all antibiotic changes occurred with high CPIS. Furthermore we found that CPIS was already high on day 6 in all cases where antibiotic change was instituted between day 7–10 of mechanical ventilation. This could mean that serial monitoring of CPIS might help to improve diagnostic accuracy and could be used as a rule-out tool for broad spectrum antibiotic therapy in a general intensive care population (3).

REFERENCE(S) 1. Koening SM et al. Ventilator Associated Pneumonia: diagnosis, treatment and prevention Clin Microbiol Rev. 2006;19(4):637–57. 2. Fartoukh M, et al. Diagnosing pneumonia during mechanical ventilation: The clinical pulmonary infection score revisited. Am J Resp Crit Care Med. 2003;168(2):173–9. 3. Singh N, et al. Short course empiric antibiotic therapy for patients with pulmonary infiltrates in the Intensive Care Unit: a proposed solution for indiscriminate antibiotic prescription Am J Resp Crit Care Med. 2000;162(2):505–11.

0357

SURVEILLANCE STRATEGY AND PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA IN A TRAUMA ICU

A. Beane[1], L. Hill[2], J. Hadley[2], M. Millar[2], P. Zolfaghari[2]

[1]Royal London Hospital, Adult Critical Care Unit, London, UK, [2]Royal London Hospital, London, UK

INTRODUCTION. Ventilator associated pneumonia (VAP) is the most common nosocomial infection in patients receiving mechanical ventilation. It is associated with increased mortality, length of ICU stay and significant financial burden. Acquisition rates alongside compliance to so- called preventative care bundles have become a perceived indicator of quality and a benchmark in intensive care.

OBJECTIVES. In response to a recent UK wide point prevalence study, where the authors' unit showed higher than average rates of nosocomial infections, a multidisciplinary working party was established to reduce rates of ventilator associated pneumonias. We present the initial observational data obtained for our 44 bedded adult critical care unit.

METHODS. The objectives of the working party were (i) to identify a method of surveillance of VAP and ventilator associated tracheobronchitis (VAT), (ii) using a rigorous but pragmatic diagnostic criterion based on clinical, radiological and biochemical diagnostic tools, (iii) implementing a multidisciplinary educational program based on current VAP care bundle to increase compliance and improve quality of care, and (iv) to define the at risk population in our ICU as focus of future changes with more targeted care bundles and changes practice such as introduction of subglottic secretion drainage tracheal tubes.

Diagnosis of VAT was based on fever, increased/new purulent sputum, rising inflammatory markers (WCC/CRP), and VAP with addition of infiltrates on the chest radiograph, worsening oxygenation/PEEP requirements and systemic response to infection- SIRS criteria. Microbiological diagnosis was based on qualitative assessment of sputum samples or bronchoalveolar lavage. VAP surveillance involved daily review of antibiotics, their indication and length of treatment during the daily ward round. If VAP/VAT was diagnosed, response to treatment (changes in FiO_2, PEEP, inflammatory markers and SIRS response) were recorded daily for the next 5 days.

Surveillance data for both VAP diagnosis and care bundle compliance was collated using an electronic database utilising demographic data, LOS and mortality figures from ICNARC. Non-intubated or patients who were extubated within 24 h of admission were excluded.

RESULTS. Audit of preventative care bundle revealed wide variability in compliance, the standard of care delivered, and nurses' perception of the importance of preventative measures.

DEMOGRAPHICS	NO VAP	VAP
Age	46.87 (18-89)	53.75 (29-87)
Gender	M=39 F=15	M=14 F=3
Emergency admission	EM=50 EL=7	EM=17 EL=0
Pre hospital intubation	27	12
In hospital intubation	30	5
Early vs. late onset (>5days)	-	Early: 10 Late: 7
Admission category		
Trauma	13	10
Neuro ICU	7	2
Cardiac	12	1
Respiratory	10	3
Gastrointestinal	8	0
ENT	2	0
Renal	2	0
Metabolic	3	1
Length of stay (days)	9.1±7.1	9.2±7.5
Length of antibiotic use		6 ± 1.8
No. of advanced ventilation days	5.36± 4.8	10.76 ±5.0
Mortality (% of total)	19.298	17.647

Table 1

CONCLUSIONS. Emergency, pre-hospital intubation and trauma admission were significant risk factors for early VAP resulting in increased duration of ventilation. Continuous acquisition of this information will be used to improve quality of patient care, assess the impact of education programs on bundle compliance, microbiological management and introduce new prevention strategies in a complex trauma population.

Emergency medicine & resuscitation: 0358–0371

0358

IMPACT OF DIFFERENT VENTILATION MODALITIES ON LUNG VOLUMES AND PRESSURES DURING AUTOMATIC CHEST COMPRESSIONS: A BENCH STUDY

A. Lyazidi[1,2], N. Rey[1], R.L. Cordioli[1], J.M. Granier[1], B. Hengy[1], E. Akoumianaki[1], L. Suppan[3], M. Niquille[3], L. Brochard[1,2], J.C. Richard[1,2]

[1]University Hospital of Geneva, Intensive Care Unit, Geneva, Switzerland, [2]University of Geneva, Medical School, Geneva, Switzerland, [3]University Hospital of Geneva, Emergency Department, Geneva, Switzerland

INTRODUCTION. During cardio-pulmonary resuscitation (CPR), the ventilation strategy applied may affect tidal volume (Vt), minute ventilation (VE), lung volume and hemodynamics. Prolonged automatic compressions can also create lung injury. This bench study aimed to evaluate current recommendations for ventilation during CPR and to compare it to continuous flow insufflation (CFI) with positive pressure.

METHODS. In a lung test model specifically designed to allow chest compressions standardized with an automatic device (LUCAS®), we evaluated manual bag ventilation, volume controlled ventilation mode using Oxylog 3000-Drager® (respiratory rate at 10/min, Vt at 500 ml and zero end expiratory pressure). We also tested CFI set at 5 cmH_2O using CPR Boussignac ® tube (Vygon). Chest compressions were interrupted only during manual bag ventilation according to the recommended 30:2 ratio. We measured Vt, VE, intrathoracic pressure variations and dynamic reduction in end expiratory lung volume relative to functional residual capacity (FRC).

RESULTS. Surprisingly, minute ventilation was essentially due to the tidal volume mobilized during chest compressions (95 and 74 % of the total minute ventilation for manual bag ventilation and volume controlled ventilation respectively). The maximal minute ventilation and Vt were obtained during CFI. CFI was also associated with a smaller reduction in FRC and higher intrathoracic pressure variation compared to current recommendations (volume controlled and manual bag ventilation) (figure).

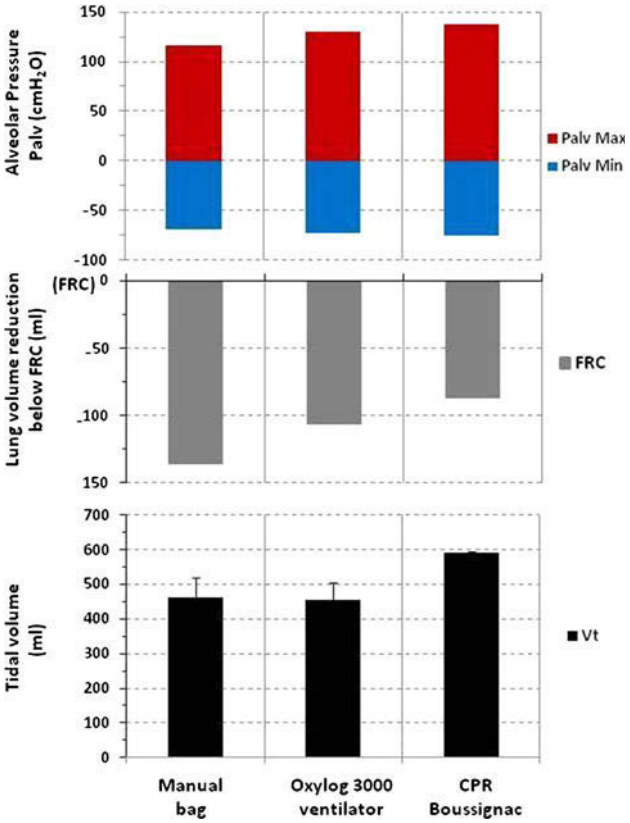


Figure Alveolar pressure variations, lung volume reduction below FRC and VT during CPR with different ventilation modalities

CONCLUSIONS. With current recommendations (Volume Controlled and Manual Bag Ventilation), ventilation was essentially due to chest compressions and took place entirely below FRC. Continuous flow insufflation was more efficient in terms of ventilation, FRC protection and intrathoracic pressure variation (driving pressure for circulation). These results show the predominant role played by chest compressions in terms of ventilation and suggest that ventilation with CFI should be considered for CPR.

GRANT ACKNOWLEDGMENT. This study was supported by a grant from Vygon.

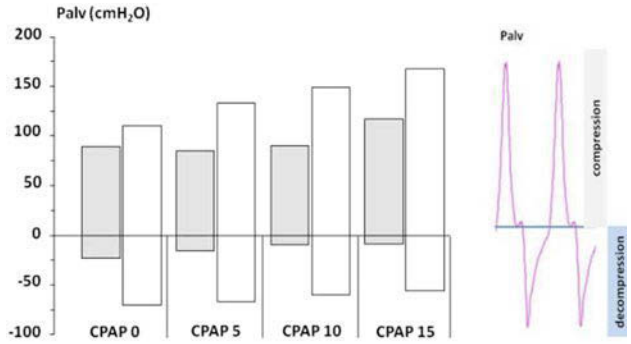
0359

VENTILATION AND CHEST COMPRESSIONS DURING CARDIO PULMONARY RESUSCITATION: SIMULATION WITH A SPECIFICALLY DESIGNED LUNG MODEL

R.L. Cordioli[1], N. Rey[1], L. Suppan[2], J.M. Granier[1], B. Hengy[1], E. Akoumianaki[1], M. Niquille[2], D. Savary[3], A. Lyazidi[1,4], L. Brochard[1,4], J.C. Richard[1,4]

[1]University Hospital of Geneva, Intensive Care Unit, Geneva, Switzerland, [2]University Hospital of Geneva, Emergency Department, Geneva, Switzerland, [3]Hospital Centre of Annecy, Emergency Department, Annecy, France, [4]University of Geneva, Medical School, Geneva, Switzerland

INTRODUCTION. During cardio pulmonary resuscitation (CPR), chest compressions (CC) can be done manually or by automated devices. Ventilation can be delivered in numerous ways. The effects on intra-alveolar pressures (P_{alv}, the driving forces for circulation), on reduction in lung volume during CC and on ventilation are difficult to study. We designed a specific thoracic bench model in order to describe these parameters during automatic and manual CC.
MATERIALS AND METHODS. We designed a specific lung model mimicking thoracic compartment behavior during CPR. Functional residual capacity (FRC) at atmospheric pressure was 1.5 L while compliance and resistance were 20 mL/cmH_2O and 8 cmH_2O/L/sec respectively. The specificity of this model is to allow measurements of tidal volumes (Vt) and lung volume changes in reference to FRC. We also measured P_{alv} during CC as a surrogate of circulatory driving forces. Manual CC were recorded with three experienced physicians at 100/min using a metronome while automatic chest compression were performed using Lucas® device at 100/min. Measurements were performed with airway pressure levels of 0, 5, 10, 15 cmH_2O obtained with endotracheal tube RCP Boussignac®. We compared Vt, changes in lung volumes, P_{alv} variations and its variability during both automated and manual CC at different levels of airway pressures.
RESULTS. V_T resulting from CC was 390 ± 30 ml during manual CC, and 560 ± 4 mL with automatic chest compressions with a variability of 8 and 1 % respectively. Lung volume during CPR remained entirely below FRC, even when 15 cm H_2O of airway pressure was applied. The minimal P_{alv} remained negative whatever the airway pressure and the CC modality. P_{alv} variations were significantly higher during automatic compared to manual CC (figure) with variability of 15 and 1 % respectively.



Figure

The figure represents P_{ALV} variations during manual (gray) and automatic (white) chest compressions according to the different airway pressure levels (left) and P_{ALV} recording during CC (right).
CONCLUSIONS. Our thoracic bench test allowed a precise assessment of the effects of automatic vs manual CPR in terms of intrathoracic pressure variation. Interestingly, intrathoracic pressure remains always negative during decompression. As expected, manual CC resulted in a significantly higher variability in terms of Vt and intrathoracic pressure variations.

0360
THE INVESTIGATION OF THE CHANGE OF SERUM PHOSPHOROUS LEVEL DURING THE SHOCK STATE

S. Uegaki[1], M. Hayakawa[2]

[1]Hokushin Hospital, Anesthesiology, Sapporo, Japan, [2]Hokkaido University Hospital, Emergency and Critical Care Medicine, Sapporo, Japan

INTRODUCTION. Phosphorus is the major intracellular anion. Hyperphosphatemia is an electrolyte abnormality that is commonly caused by decreased phosphate excretion, an increased intracellular to extracellular shift, or increased phosphate ingestion. However, few recognize that hyperphosphatemia is observed as a complication of the shock.
OBJECTIVES. To investigate the correlation between serum phosphorus level during the shock state and other electrolytes and blood data.
METHODS. This study retrospectively examined the patients admitted in the intensive care unit because of out of hospital cardiac arrest and return of spontaneous circulation by cardio pulmonary resuscitation between January 2001 to June 2012. Those that had no witness and had chronic renal failure or died within 24 h after admission were excluded. Serum phosphorus and calcium and magnesium and blood gas data were analyzed at the time of admission and 24 h after admission.
RESULTS. Thirty-eight patients were enrolled in this study. Their estimated time of cardiac arrest was 27.1 ± 9.2 min. Although the serum phosphorous level was markedly elevated just after the recovery of spontaneous circulation (7.3 ± 2.5 mg/dl), it was rapidly returned to normal following only correction of the primary cause (2.9 ± 1.1 mg/dl, $p < 0.01$) and no specific phosphate-lowering treatment. The serum lactate level was strongly correlated with the serum phosphorus level at the time of admission ($r = 0.758$).
CONCLUSIONS. Although there is no direct explanation for the association between hyperphosphatemia and lactate level, it is probably due to relative tissue ischemia. Hyperphosphatemia may result as a complication of shock. The treatment of shock results prompt correction of this problem. This dramatic change was probably related to intracellular to an extracellular phosphorous shift caused by metabolic acidosis. Physicians should be aware of these electrolyte disturbances in shock patients.
REFERENCE(S) 1. Thatte L, et al. Review of the literature: severe hyperphosphatemia. Am J Med Sci. 1995;310:167–74. 2. Oster JR, et al. Effect of acid–base status on plasma phosphorus response to lactate. Can J Physiol Pharmacol. 1984;62:939–42. 3. Geerse DA, et al.: Treatment of hypophospatemia in the intensive care unit: a review. Crit Care. 2010;14:R147.

	normal values	at admission	24hours after	correlation coefficient	partial regression coefficient**
Phosphorus (mg/dl)	2.5-4.7	7.3±2.5	2.9±1.1*		
cardiac arrest time (min)		27.1±9.2			0.276
pH		7.11±0.26	7.42±0.08*	0.71	
HCO_3^- (mmol/l)		16.3±5.4	23.4±4.3*		
Lactate (mmol/l)		9.5±5.7	3.1±3.1*	0.758	0.432
BUN (mg/dl)	2.0-22.0	22.6±15.8	23.3±14.7		
Cr (mg/dl)	0.6-1.1	1.1±0.6	1.0±0.6		
Ca (mg/dl)	8.7-10.3	8.6±0.7	8.3±0.7		
Mg (mg/dl)	1.5-2.4	2.5±0.7	1.9±0.4*	0.696	0.458

* paired t test $p<0.05$, ** multiple regression analysis, BUN: blood urea nitrogen, Cr: creatinin

Sample data

0361
APPROACHES OF MANAGEMENT OF CARDIAC ARREST IN HOSPITALIZED PATIENTS

J.J. Arias[1], A. Estella[1], V. Pérez[1], M. Recuerda[1], J.M. San Pedro[1], M. Jaen[1]

[1]Hospital del SAS de Jerez, Jerez, Spain

INTRODUCTION. Traditionally cardiac arrest (CA) has been treated by specialised In-hospital medical emergency teams (CRP-team). The incidence, time of attention and clinical outcome is not well known.
OBJECTIVES. To describe clinical profile of hospitalized patients with CA during admission and compare two periods, first, with an approach based in management of cardiac arrest exclusively by CPR-team and a second period after educational program based in cardiac arrest management by hospital staff trained after course and CPR team.
METHODS. Educational program was performed to healthcare staff of different specialities including residents, medical doctors and nurses. Implementation of cardiac arrest CODE 87 was in 2009 year. Consecutive patients admitted in hospital with cardiac arrest (IHCA) were included, patients admitted in ICU were excluded. Time of study was from December 2009 to December 2012. We compare the IHCA during first year (2010) versus IHCA during last year (2012) after formation of 265 health care providers (90 doctors and 175 nurses) following the organisation-wide adoption of the Advanced Life Support (ALS) course. Data were collected from the Utstein Style Registry of the in-hospital CPR. Number of cardiac arrest, times, mortality were recorded. Data were analysed by statistical program SPSS.18.
RESULTS. The total number of emergency alert calls during time ofe study were 83. Mean age was 61 ± 10 years, 60 %male and 40 % female. CA reanimated were 54: 39 vs 15. According to different time periods (2010 vs 2012) we observed a reduce of calling post-interventional period (educational program) : 55 vs 28. The time from collapse-to-start of basic life support (BLS) were similar <1 min (100 %) in both groups. There were a differences between times collapse-to-start of advanced life support (ALS) :4.2 vs 2.5 min. and time collapse-arrival CPR- team: 4 vs 1.6 min. We observed an improved in survival 23 vs 33 %. There was a temporal relationship between the proportion of staff who were ALS trained and outcome.
CONCLUSIONS. 1. The introduction of a simple and widespread educational programme was associated with a reduction in both the number of emergency alert calls in-hospital cardiac arrests and unsuccessful cardiopulmonary resuscitation attempts. 2. Early indications are that the establishment of RRTs has had a positive impact on mortality and patient outcomes.
REFERENCE(S) 1. Spearpoint KG, Gruber PC, Brett SJ. Impact of the Inmediate Life Support course on the incidence and outcome of in-hospital cardiac arrest calls: an observational study over 6 years. Resuscitation. 2009;80:638–43.

0362
FACTORS ASSOCIATED MORTALITY AFTER AORTIC VALVE SURGERY

M.R. Diaz[1], M. Colomo[1], M.S. Monsalve[1], M. Barranco[1], A. Reina[1], E. Aguayo[1]

[1]H.U. Virgen de las Nieves, Granada, Spain

INTRODUCTION. The surgical treatment of severe aortic valve is the only effective treatment currently recommended for this pathology. Identify factors of postoperative mortality, we could help improve the quality of our assistance.
OBJECTIVES. To determine the variables pre, peri and postoperative responsible for mortality in patients undergoing aortic valve replacement surgery in our environment.
METHODS. Retrospective study of patients undergoing aortic valve replacement surgery in our center (HUVirgen de las Nieves in Granada) for a period of 4 years (January 2008 to December 2011). We use the registry database of cardiac surgery within the panel care to heart disease in Andalucia (Spain).
RESULTS. A total of 323 patients, whose mean age was 68.3 ± 10.3, with 57 % male, with an ICU stay of 6 ± 9.3 days, euroscore an average score of 6 ± 2.2 points and a mortality rate of 11.5 %. Among the factors influencing the mortality found:
-Personal history: smoking, obesity, diabetes, hyperlipidemia, hypertension, renal disease and type (valve only or mixed).
-Surgical factors: clamping time, cardiopulmonary bypass time and type of bypass.
-Factors postsurgical: Mechanical ventilation <24 h, NIV and ICU readmission. When performing multivariate analysis the only statistically significant factor is obtained ICU readmission ($p < 0.05$).
CONCLUSIONS. In our country the main factor influencing the mortality of aortic valve surgery is the need for readmission to the ICU. Establish measures to prevent readmission to the ICU (give no high by pressure beds, monitoring patients in plant, etc.) could help improve the quality of care and reduce mortality in this disease.
REFERENCE(S) 1. Tjang YS, Grobbee DE, van Hees Y, Körfer R, van der Heijden GJMG. Predictors of mortality after aortic valve replacement. Eur J Cardiothorac Surg. 2007;32:469–74. 2. He GW, Acuff TE, Ryan WH, Douthit MB, Bowman RT, He YH, Mack MJ. Aortic valve replacement: determinants of operative mortality. AnnThorac Surg 1994;57:1140—6.

0363
OPTIMAL COOLING: THREE YEARS OF THERAPEUTIC HYPOTHERMIA

I. Edmond[1], G. Barker[1], J. Chantler[1]

[1]John Radcliffe Hospital, Adult Intensive Care Unit, Oxford, UK

INTRODUCTION. Therapeutic hypothermia (TH) following cardiac arrest is recommended by ILCOR post VF/VT arrest after two large RCT demonstrated improved survival and neurological outcome with mild hypothermia[1,2]. We audited the efficacy of TH following its implementation and the effects of teaching interventions along with changes in service.

METHODS. Between 2009 and 2012 we ran yearly audits assessing our use of TH in patients admitted to general adult ICU following cardiac arrest. Patients admitted post cardiac arrest were identified retrospectively using the unit information system. We recorded temperature readings, interventions, type and location of arrest and outcome.

RESULTS. In the first year 20 patients were admitted following cardiac arrest, 25 % post VF/VT arrest and 60 % out of hospital. In 2012 33 were admitted, 77 % post VF/VT arrest. In 2013 this figure climbed to 77 admissions, 80 % post VF/VT. There was a variable rate of in-hospital admissions (2012 10 %, 2013 25 %). The use of TH steadily changed during our observation period (09–10 25 %, 10–11 54 %, 11–12 29 %). Initial time to target was 5.5 h (09–10) which increased to 7.5 h (10–11) before falling to 3.8 h (11–12). The incidence of overshoot reduced over time (09–10 35 %, 10–11 18 %, 11–12 10 %). Of patients treated with TH, none died in year 1, 6 in year 2 (32 %) and 15 in year 3 (63 %).

CONCLUSIONS. Our experience of cooling over this period has demonstrated how simple interventions can optimise the delivery of TH. Following year 1, an educational programme was delivered to highlight problems with overcooling and re-warming. This subsequently reduced the incidence of re-warming overshoot but negatively impacted on achieving target temperature whilst cooling. Following year 2 a flowchart was added to aid bedside staff troubleshoot during both phases along with ongoing educational activity. The increase in mortality reflects change in practice as the cardiac ICU began admitting cases restricting the cohort our unit managed. Our results show TH is achievable using simple, inexpensive tools coupled with robust multidisciplinary teaching strategies. The steady increase of cases show post arrest admissions are becoming more common and the results of TTM will determine if this trend will continue.[3]

REFERENCE(S) 1. The Hypothermia After Cardiac Arrest Study Group. Mild therapeutic hypothermia to improve the neurologic outcome after cardiac arrest. N Engl J Med. 2002;346:549–56. 2. Bernard SA, Gray TW, Buist MD, et al. Treatment of comatose survivors of out-of-hospital cardiac arrest with induced hypothermia. N Engl J Med. 2002;346:557–63. 3. Target Temperature Management after Cardiac arrest (TTM). Clinicaltrials.gov identifier NCT01020916.

0364
A YOUNGER AGE IN CARDIAC ARREST PATIENTS: IS IT ASSOCIATED WITH BETTER SURVIVAL RATE ONLY, OR BETTER NEUROLOGICAL OUTCOME ALSO?

A.K. Gupta[1], M. Talegaonkar[1], R. Agrawal[1], A. Varma[1]

[1]Fortis Escorts Heart Institute, Critical Care Medicine, New Delhi, India

INTRODUCTION. It has been seen in past that a relatively younger age in cardiac arrest patients has been associated with better odds of survival. But till now there is not enough evidence that same trends are seen in terms of good neurological outcome also.

OBJECTIVES. Our objective was to investigate whether a younger age at the time of cardiac arrest is associated with better neurological outcome also, or a better survival only.

METHODS. In this retrospective study we reviewed medical records of all cardiac arrest patients (in-hospital or out of hospital arrest) in whom cardiopulmonary resuscitation was done at our hospital from 1st February 2011 to 31st January 2012 (12 months). The following information was collected: age of the patients at the time of arrest, and two outcome measures including: survival to hospital discharge and neurological outcome at the time of hospital discharge. Measure of good neurological outcome was cerebral performance category score 1 or 2 (CPC, 5 point scale; 1 = good cerebral performance, to 5 = brain death). Then we quantified the association of age with both the parameters of outcome i.e. survival to hospital discharge and good neurological outcome, by logistic regression analysis and calculated two-tailed p value using Fisher exact test.

RESULTS. Over a period of 12 months, there were 297 cardiac arrest patients. 104 patients (35 %) were of age <60 years while 193 patients (65 %) were ≥60 years. Overall, survival to hospital discharge was seen in 48 (16 %) patients, which was distributed as: 32/104 (30.76 %) patients of age <60 years, 16/193 (8.3 %) patients of age ≥60 years. Good neurological outcome was seen in 40 (13.47 %) patients, which was distributed as: 29/104 (27.88 %) patients of age <60 years, 11/193 (5.7 %) patients of age ≥60 years. When patients of age <60 years & ≥60 years were compared, survival to hospital discharge was substantially more likely if age of the patient was <60 years [odds ratio (OR) 4.91; 95 % confidence interval (CI) 2.54–9.50; $p < 0.0001$]. With a younger age (<60 years), we also observed increased odds of good neurological outcome [OR 6.39; 95 % CI 3.03–13.46] but this increase was not statistically significant [$p = 2.24$].

CONCLUSIONS. A younger age in cardiac arrest patients is associated with better odds of survival to hospital discharge as well as good neurological outcome, but association with good neurological outcome was not statistically significant.

0365
VENTRICULAR FIBRILLATION IN ICU

M. Recuerda Núñez[1], V. Pérez Madueño[1], Á. Estella García[1], M. Gracia Romero[1], J. Sánchez Ruiz[1], M. Jaén Franco[1], M.C. Castillo Castillo[1]

[1]Hospital Jerez, Cádiz, Spain

OBJECTIVES. Ventricular fibrillation is associated with a high mortality mainly related to the earliness of treatment. The aim of this study is to analyze the episodes of ventricular fibrillation and describe the prognosis and clinical characteristics of patients admitted to the ICU.

METHODS. Prospective observational study in a medical–surgical ICU of 17 beds. The study period was from January 2011 to December 2012. Consecutive patients admitted to the ICU after presenting ventricular fibrillation were included. The variables analyzed were age, sex, medical history, presence of acute coronary syndrome on admission, heart disease, need and number of defibrillation, vasoactive medication requirements, conducting treatments administered as systemic thrombolysis, DAI implantation. ICU mortality, development of neurological sequelae and mortality after discharge to the ward were analyzed.

RESULTS. A total of 33 patients were analyzed, 23 men and 10 women. The mean age was 64.1 ± 13.9 years. 60 % had hypertension and 45 % had ischemic heart disease. By 27 % was systemic thrombolysis for AMI and 30 % implanted coronary stent after it. Half of the patients studied needed vasoactive medications during their ICU stay. Was studied using transthoracic echocardiography dilated cardiomyopathy in 9 patients (27.3 %). ICD was implanted in 4 patients (12.1 %). 10 patients died in the ICU (30 %) having documented during admission in all of them, signs consistent with severe anoxic encephalopathy. Of the 23 patients who were discharged from the ICU 6 developed anoxic encephalopathy. Died in ward 7 (21 %).

CONCLUSIONS.

-Anoxic encephalopathy was the most frequently reported serious complication in our series of patients admitted with ventricular fibrillation and was associated with a high mortality.

-The mortality of patients admitted to the ICU with ventricular fibrillation is high and doubles after including the analysis of hidden mortality after discharge in ICU.

0366
HYPOTHERMIA TREATMENT IN ICU PATIENTS AFTER CARDIAC ARREST, RISK FACTOR LINKED TO MORBID-MORTALITY

J. Cabrera-Arrocha[1], P. Ravelo-Hernandez[1], E. Martin-Sanchez[1], F. Lübbe-Vazquez[1], C. Sanchez-Ramirez[1], P. Saavedra-Santana[2], S. Ruiz-Santana[1]

[1]Hospital Universitario de Gran Canaria Dr. Negrín, Intensive Care Unit, Las Palmas de Gran Canaria, Spain, [2]Universidad de Las Palmas de Gran Canaria, Mathematics Department, Las Palmas de Gran Canaria, Spain

INTRODUCTION. Cardiac arrest has tradiotinally required a great amount of ICU resources and has a high morbid-mortality. The last European Resuscitation Council Guidelines in 2010 included in the adult advanced life support the use of therapeutic hypothermia in comatose survivors of cardiac arrest initially associated with non shockable rhythms as well as shockable rhythms.

OBJECTIVES. To identify risk factors associated to morbid-mortality in ICU patients after cardiac arrest previous to starting hypothermia treatment.

METHODS. Longitudinal, prospective study in an adult neurocritical ICU, performed from January 2009 up to December 2012. Morbi-mortality was considered when GCS at hospital discharge was <14 or patient death. Demographic data, severity scores, Glasgow on admission and at ICU and hospital discharges, cardiovascular risk factors, brain CT scan findings (anoxia) and coronary artery disease diagnosed at coronariography, cardiac arrest type (extra/intra hospital), initial rhythm (shockable/non shockable), ICU and hospital lengths of stay, and hospital mortality were collected. Categorical variables are expressed as frequencies and percentages, and continuous variables as mean and SD (SD) when data followed a normal distribution, or as medians and interquartile range (IQR) (25th–75th percentile) range when distribution departed from normality. The percentages were compared using the Chi square test, the means by the t- test, and the medians by the Wilcoxon′s test. In order to identify risk factors that had an independent association to morbid–mortality those variables that showed statistical significance in the univariate analysis were introduced in a multivariate logistic regression analysis. A retrospective variable selection based on the Akaike information criterion was performed. The resulting model was summarized as p-values and 95 % CI. Statistical significance was set at $p < 0.05$. The data were analyzed using PASW statistical software (version 18.0, SPSS, Chicago IL).

RESULTS. A total of 28 out of 47 studied patients had morbid-mortality and 26 of them died. The variables that showed statistical significance in the univariate analysis were age, APACHE II, temperature during hypothermia (33–34 °C), signs of anoxia in brain CT scan and hospital lengths of stay. Variables independently associated to morbimortality group were age, considered per each year,
(OR = 0.28; CI 95 % = 1.010; 1.127; $p < 0.028$) and anoxia signs (OR = 10.97; CI 95 % = 2.00; 60.00;
$p = 0.006$).

CONCLUSIONS. Age and anoxia signs in the brain CT were independently significantly associated to a greater risk of hospital morbid-mortality, in patients who suffered cardiac arrest subjected to hypothermia.

0367
IMPLANTATION OF AN ENDOVASCULAR HYPOTHERMIA PROTOCOL AFTER CARDIAC ARREST IN A TERTIARY HOSPITAL

M. Rodríguez Gómez[1], E. Morales Sorribas[1], A.I. Tejero Redondo[1], L. Parro Herrero[1], M. Bringas Bollada[1], J.C. Martín Benitez[1], M. Sánchez García[1]

[1]Hospital Clínico San Carlos, Intensive Care, Madrid, Spain

INTRODUCTION. Neurological sequelae after cardiac arrest is of considerable concern. Controlled hypothermia is a proven method in recent years to improve the neurological prognosis in these patients.

MATERIALS AND METHODS. A prospective observational study on patients recovered after cardiac arrest in Hospital Clínico San Carlos (Madrid). Data collection was done over 3 years (January 2008–January 2011). Therapeutic hypothermia was performed according to the protocol of our hospital, using an intravascular catheter. Data are expressed as percentages (qualitative). Mean and standard deviation for normally distributed quantitative and interquartile range for non-normally distributed quantitative. The analysis was performed with the Student t test or the Mann–Whitney U test, and Chi^2 as the case may be.

RESULTS. Data was collected from 102 patients with recovered cardiac arrest. 72.5 % were male, the average age being 59 years (± 15.5). 81.4 % of the arrests were out-hospital; 63.7 % being in shockable rhythm (VF, pulseless VT) and 84.3 % of them had cardiovascular etiology. Cardiac arrest down time without support was 3 min (1–5), median time to return of spontaneous circulation was 15 min (4.5–21.5). Hypothermia was performed in 62.7 % of patients at 33 °C for 24 h. ICU stay was 8 days (1–16), with overall hospital mortality of 58.8 %. Of survivors, 83.3 % had a good neurological status at discharge (Glasgow Outcome Scale ≥4). In the hypothermia group, being diabetic or female was a risk factor for increased mortality ($p < 0.05$). Hypothermia was performed in younger patients as well as those with longer resuscitation times ($p < 0.05$). No differences in mortality or neurologic outcome due to hypothermia.

CONCLUSIONS. Hypothermia after cardiac arrest was performed on patients who were younger and had longer resuscitation times. No differences in mortality or neurologic status were noted, compared to non-hypothermia group, but since it is not a control group these results are not considered relevant. The incidence of mortality and neurological status is similar to other large previous studies.

0368
PREDICTORS OF POOR NEUROLOGICAL OUTCOME IN ADULT COMATOSE SURVIVORS OF CARDIAC ARREST TREATED WITH THERAPEUTIC HYPOTHERMIA: A SYSTEMATIC REVIEW AND META-ANALYSIS

S. D'Arrigo[1], C. Sandroni[1], C.W. Callaway[2], F. Cavallaro[1], T. Sanna[3], G. Della Marca[4], M. Biancone[1], J.P. Nolan[5]

[1]Catholic University of the Sacred Heart, Policlinico A. Gemelli, Department of Anaesthesiology and Intensive Care, Rome, Italy, [2]University of Pittsburgh, Department of Emergency Medicine, Pittsburgh, USA, [3]Catholic University of the Sacred Heart, Policlinico A. Gemelli, Department of Cardiology, Rome, Italy, [4]Catholic University of the Sacred Heart, Policlinico A. Gemelli, Department of Neurology, Rome, Italy, [5]Royal United Hospital, Department of vAnesthesia and Intensive Care Medicine, Bath, UK

INTRODUCTION. Postanoxic brain injury is common after cardiac arrest (CA). In 2006, a document from the American Academy of Neurology[1] identified a series of predictors of poor neurological outcome in comatose patients resuscitated from CA. However, that review was based only on evidence from patients not treated using therapeutic hypothermia (TH).
OBJECTIVES. To identify accurate predictors of poor neurological outcome in resuscitated comatose patients treated with TH, and to assess whether these differ from those identified in patients not treated with TH.
METHODS. Systematic review of prognostic accuracy studies. Sensitivity, specificity, false positive rates (FPR) and positive likelihood ratio for each predictor were calculated. Quality of evidence was evaluated according to the GRADE guidelines.
RESULTS. Thirty-six studies (2,273 patients) were included. The following indexes predicted poor outcome with 0 % FPR and an upper 95 % confidence interval (CI) limit <10 %: 1) a blood level of S-100B above 0.18–0.21 mcg/L during TH; 2) presence of electrographic seizures both during TH and after rewarming; 3) a combination of absent pupillary light and corneal reflexes plus a motor response no better than extension, or a neuron specific enolase (NSE) above 78.9 mcg/L, or a bilaterally absent N20 wave of somatosensory evoked potentials (SSEPs) after rewarming, All of these predictors, except SSEP were described only in 1 or 2 studies each. In 10/36 of these studies, the described predictors had been used for decisions to withdraw treatments. The biomarkers' thresholds associated with 0 % FPR varied largely and inconsistently.
CONCLUSIONS. In resuscitated comatose patients treated with TH, presence of electrographic seizures, absent brainstem reflexes, bilaterally absent N20 SSEP wave, and increased serum biomarkers are associated with poor neurological outcome with 0 % FPR and narrow CIs. The quality of this evidence is however lowered by the small size and low number of supporting studies, and from the lack of blinding. A prospective validation of these predictors using a multimodal approach is warranted.
REFERENCE(S) 1. Wijdicks et al. AAN Neurol. 2006.

0369
BASAL LIFE SUPPORT: AWARENESS, COMPETENCE, FEAR OF PANIC AND ALL IN ONE ALGORITHM

G. Briassoulis[1], A. Chatzimichali[1], E. Geromarkaki[1], M.D. Fitrolaki[1], V. Chatzidaki[1], T. Tavladaki[1], S. Ilia[1], E. Vasilaki[1], E. Blevrakis[1], P. Briassoulis[2], A.M. Spanaki[1]

[1]University of Crete, University Hospital, PICU, Heraklion, Greece, [2]APLS Provider, Athens, Greece

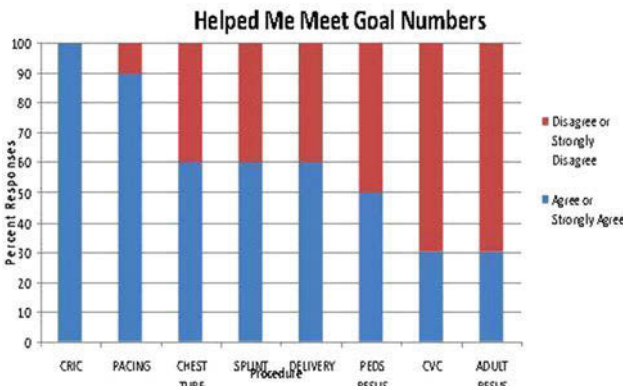
INTRODUCTION. Basic life support (BLS) seminars are increasingly gaining importance by successfully implementing new 2010 guidelines regarding cardiopulmonary resuscitation (CPR) skills and knowledge in health care professionals (HCP). Still, the outcome of an out-of-hospital cardiac arrest is bad, mostly due to lack of rescuers' skills or uncertainty imposed by different BLS algorithms.[1] Thus, junior HCP feel cardiac arrests are unsatisfactorily managed and experience high levels of stress during the procedure, often feeling they are inadequately trained for the task.[2]
OBJECTIVES. The goal was to compare trainees' attitudes to current BLS algorithms and its practical implementation and to assess their level of awareness and self-estimated competence in involved skills.
METHODS. Medical students, nurses, young physicians, and rescuers had to pass an ALSG-certified basal (PLS) or advanced (APLS) pediatric life support learning course based on the currently updated principles of cardiac arrest, CPR, BLS and defibrillation. The 160 successfully enrolled in our study HCP were then asked to fill up an anonymous questionnaire regarding awareness, attitudes, and skills involved in BLS, and to express their opinion regarding current guidelines.
RESULTS. Most HCP would use their skills in case an adult, child, or infant goes into cardiac arrest (98–100 %). Rescuers were less competent (84 %) in using a defibrillator compared to students (92 %), nurses (100 %), or physicians (99 %, $p < 0.08$) or intra-osseous needle (53 vs. 71 %, 91 %, 88 %, respectively, $p < 0.001$). Impressively, more than 1/3 of medical students (38 %) and 27 % of junior doctors (28 %) are afraid of being in panic during an arrest episode in contrast to nurses (9 %) of rescuers (16 %, $p < 0.05$). More females than males feel that current algorithms remain complicated (15 vs. 5 %, $p < 0.05$) or are afraid of exhibiting a black out episode (30 vs. 12 %, $p < 0.01$). Recertified candidates were convinced that BLS courses should be repeated twice (51 %) or once (46 %) a year compared to those taking a course for the first time (46 and 43 %), being afraid they might not remember the correct algorithm (13 vs. 5.6 %, $p < 0.08$). All candidates who had done APLS or any other advanced adult course in the past (ALS, TLS, ILS) believe that it is reasonable to substitute different (age or rescuer specific) BLS algorithms by all-in-one algorithm (everybody, everywhere), compared to those who had only successfully passed a PLS (82 %, $p < 0.01$).
CONCLUSIONS. Adequate BLS training should be a compulsory requirement for all HCP before full registration should be provided. Inclusion of PLS course in the undergraduate curriculum and APLS in the pediatric training will increase awareness and application of valuable life saving knowledge. Efforts aiming at further simplifying multiple algorithms into an all-in-one BLS might also be justified.
REFERENCES. 1. Resuscitation. 2008;76:318 2. J Eval Clin Pract. 2011;17:462.

0370
DEVELOPMENT AND ASSESSMENT OF AN INTEGRATED CURRICULUM IN CRITICAL CARE PROCEDURAL COMPETENCY AND RADIOGRAPHY FOR EMERGENCY MEDICINE RESIDENTS

K. Grall[1], L.R. Stoneking[1], L.A. DeLuca[1], A. Waterbrook[1], G. Pritchard[2], K. Denninghoff[1]

[1]University of Arizona, Department of Emergency Medicine, Tucson, USA, [2]University of Arizona, College of Medicine, Tucson, USA

INTRODUCTION. The practice of Emergency Medicine requires mastery of many Critical Care procedural skills. While these are frequently taught at the bedside, some skills (such as an emergent surgical airway) are rarely required in normal clinical practice. Competency for many procedures also includes analysis of radiographic images to determine proper tube/line placement or the avoidance of complications.
OBJECTIVES.
1. To develop a procedural curriculum that incorporates high-fidelity simulation with radiographic interpretation of corresponding images.
2. To determine the impact of the curriculum on resident procedural mastery.
METHODS. Thirteen sessions were created that integrated a 20-min introduction with an 80-min hands-on procedure lab and 20-min question/answer session. Hands-on labs consisted of 1–2 key procedure stations, one case-based learning station, and related imaging skills (plain radiographs or ultrasound). A survey was constructed by the Graduate Medical Education committee and distributed to residents via Survey Monkey, who responded anonymously. Residents were asked to assess their level of comfort with common and uncommon procedures, the impact of the procedure series on their performance, and about the integrated radiology module. All questions were on a four-point Likert scale (Strongly Agree, Agree, Disagree, Strongly Disagree).
RESULTS. Selected topics for the procedure series are described in Table 1. Of the 22 residents in the program, 11 returned surveys (50 % response rate). Residents universally indicated agreement that the procedure series improved their performance of common and uncommon procedures, their comfort with performing procedures, and their knowledge of indications of procedures. Residents expressed strong agreement that the procedure series improved their ability to meet target numbers for cricothyroidotomy (100 %), transvenous pacing (90 %), chest tubes (60 %), splinting (60 %), emergent delivery (60 %), and pediatric resuscitation (50 %). Residents agreed that their ability to interpret plain radiographs (60 %) and to check line/tube placement (70 %) were improved by the procedure series. Residents agreed that the procedure series improved their ultrasound diagnostic skills (70 %) and their ability to perform ultrasound guided procedures (70 %).



Resident assessment of procedure series goals

CONCLUSIONS. An integrated procedural/radiographic curriculum improved resident competency with critical care procedures. The integrated radiology module improved resident ability to utilize plain films and ultrasound in their practice.

Selected procedure series topics

Splinting (UE and LE on separate days)	Emergency/sports medicine
Chest tubes/pigtail catheters	Emergency medicine
Eye lab: canthotomy/slit lamp examination	Emergency medicine/ophthalmology
BiPAP basic/pressure ventilation	Emergency medicine/critical care medicine
Ventilator basics: common modes	Emergency medicine/critical care medicine
Central lines/transcutaneous pacing	Emergency medicine
Management of shock	Emergency medicine/critical care medicine
Emergent delivery/difficult deliveries	Emergency medicine/family medicine
Difficult airway lab/rescue airways	Emergency medicine/critical care medicine
Neonatal resuscitation	Emergency medicine

0371
DEVELOPMENT OF A HOSPITAL CREDENTIALING INSTRUMENT FOR EMERGENCY MEDICINE PHYSICIANS WHO HAVE COMPLETED FELLOWSHIP TRAINING IN CRITICAL CARE MEDICINE

L.A. DeLuca[1], F. Shirazi[1], J. Guisto[1], K. Denninghoff[1], J. Mosier[1], S. Whitmore[1], H. Meislin[1]

[1]University of Arizona, Department of Emergency Medicine, Tucson, USA

INTRODUCTION. An increasing number of Emergency Medicine (EM) physicians in the United States are pursuing fellowship training in Critical Care Medicine (CCM). As CCM training in the US has been historically limited to the specialties of medicine, surgery, pediatrics, and anesthesia, most hospitals have no mechanism for credentialing EM-CCM physicians.
OBJECTIVES. We describe the process our hospital system underwent to define and approve a credentialing instrument for EM-CCM intensivists.
METHODS. Existing CCM training requirements for medicine, surgery, anesthesia, and pediatrics were reviewed. Existing credentialing for each major CCM pathway were compared to existing the EM credentialing instrument to identify procedures that would require additional training and proctoring. A review of the literature was conducted to identify existing guidelines or literature relevant to training and proctoring requirements. Other CCM departments within the hospital system were engaged to review the evolving

credentialing instrument. A modified Delphi process was used, with repeated iterations until consensus was reached.
RESULTS. While duration of CCM fellowships varied from 1 to 3 years, the common element was 12 ICU months with a variety of elective experiences. Most fellowship experiences were 2 years long and included electives, research, or additional clinical training (such as nephrology or toxicology). Three special procedures were identified requiring additional training: fiberoptic bronchoscopy, percutaneous tracheostomy, and percutaneous gastrostomy (PEG). ACCP recommends 100 fiberoptic bronchoscopies and 20 tracheostomies, though only 31 % of programs offered training in performing tracheostomies, and only 28 % of those programs routinely met the goal number. Multiple studies confirmed the safety of percutaneous tracheostomy performed with bronchoscopic guidance. A standardized bronchoscopy curriculum demonstrated acquisition of basic bronchoscopy skills after 20 procedures. Literature review did not identify relevant studies for PEG training.
CONCLUSIONS. EM-CCM training programs should include a minimum of 12 months of time spent caring for ICU patients. Additional electives should be considered to prove a comparable duration of training to other CCM programs. EM physicians already possess most procedural skills required of intensivists because of their base training. Additional training and proctoring for bronchoscopy, tracheostomy, and PEG placement should be performed during the CCM fellowship experience.
REFERENCE(S) 1. Mayglothling JA, Gunnerson KJ, and Huang DT. Current practice, demographics, and trends of critical care trained emergency physicians in the United States. Acad Emerg Med. 2010;17:325–9. 2. DeLuca LA. Emergency medicine/critical care medicine and the need for a practice track: are we cutting off our certification at the root? Emerg Med. 2012.

Practical issues in CRRT: 0372–0385

0372
PHARMACOKINETICS OF DORIPENEM DURING HIGH VOLUME HAEMODIAFILTRATION IN SEPTIC SHOCK

K. Tamme[1,2], K. Oselin[2], K. Kipper[1], T. Metsvaht[1,2], J. Karjagin[1,2], K. Herodes[1], H.R. Kern[3], J. Starkopf[1,2]

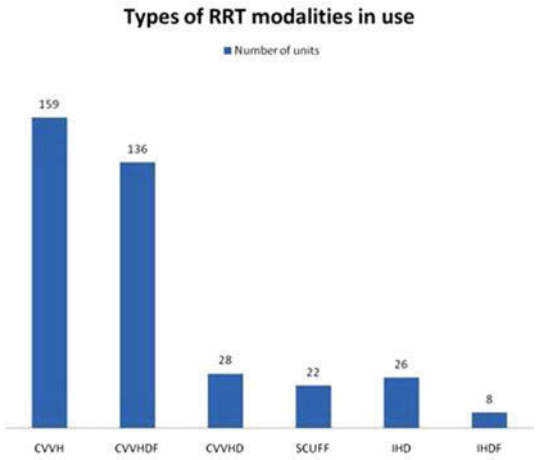
[1]University of Tartu, Tartu, Estonia, [2]Tartu University Hospital, Tartu, Estonia, [3]DRK Kliniken Berlin Köpenick, Berlin, Germany
INTRODUCTION. Doripenem (DOR), a new broad-spectrum antibiotic of the carbapenem class has been explored for the treatment of severe infections in intensive care patients requiring renal replacement therapy. For continuous venovenous haemodiafiltration significant, convective volume dependent removal of DOR has been shown. No data are available on high volume haemodiafiltration (HVHDF).
OBJECTIVES. The aim of the study was to describe the pharmacokinetics (PK) of DOR during HVHDF in patients with acute renal failure (ARF) due to septic shock.
METHODS. The prospective open-label single centre study included 9 patients requiring HVHDF for ARF caused by septic shock. A single dose of 500 mg of DOR was administered as 1 h infusion during HVHDF in addition to ongoing antibacterial therapy. HVHDF was conducted in Ultracontrol predilution mode. Arterial blood samples were collected before and at 30 or 60 min intervals for 8 h after the start of DOR administration (12 samples). DOR concentrations were determined by UHPLC-MS/MS. PK parameters for doripenem were calculated using noncompartmental analysis and classical compartmental models. Nonparametric superposition was used to simulate steady state (5^{th} dose) concentration–time data for various dosing regimens. Data generated from nonparametric superposition were analysed using noncompartmental analysis to calculate AUCτ and T % >MIC for each study subject. The PK analysis was carried out using the Phoenix WinNonlin ver 6.5 (Pharsight Corporation, CA).
RESULTS. Nine patients with mean (SD) age of 65.7 (13.3) y, APACHE II score of 16 (4) and SOFA score of 11 (2) were studied. Mean (SD) urine output during the sampling time was 259 (475) ml and mean HVHDF effluent rate 11.3 (3.7) L/h [169 (62) ml/kg/h]. In noncompartmental analysis DOR mean (SD) $T_{1/2}$ was 2.4 (0.5) h, Cmax 26.0 (8.2) μg/mL, Clast 2.5 (1.6) μg/mL, AUC_{inf} 71.5 (26.9) h*μg/mL, CLss 8.9 (3.4) L/h and Vss 28.6 (10.8) L. Exposition to doripenem was similar to that of subjects undergoing continuous venovenous haemodiafiltration[1]. The PK model that best fit the concentration–time data was a 2-compartment model. DOR doses of 250 mg q12 h; 500 mg q12 h and q8 h achieved 40 %fT > MIC 1 μg/mL in all cases, while the target for MIC 4 μg/mL was achieved in 1/9; 5/9 and 9/9 cases, respectively.
CONCLUSIONS. For bactericidal target attainment DOR doses of 250 mg q12 h appear appropriate during HVHDF. When more resistant bacteria are encountered, the doses may need to be increased to 500 mg q8 h.
REFERENCE(S) 1. Cirillo I et al. Influence of continuous venovenous hemofiltration and continuous venovenous hemodiafiltration on the disposition of doripenem. Antimicrob. Agents Chemother. 2011;55:1187–93.

GRANT ACKNOWLEDGMENT. The study was supported by Archimedes Foundation Project No. 3.2.1001.11-0032.

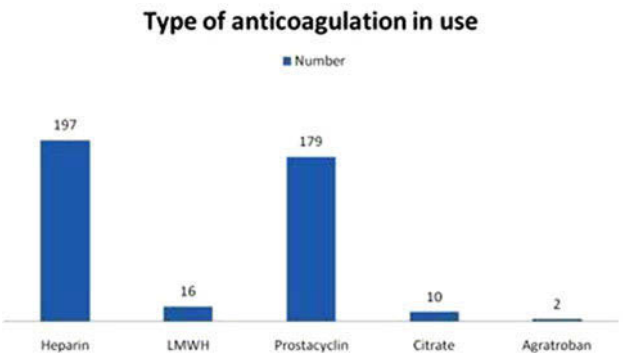
0373
SURVEY TO DETERMINE THE PREVALENCE OF REGIONAL CITRATE ANTICOAGULATION FOR RENAL REPLACEMENT THERAPY (RRT) IN INTENSIVE CARE UNITS IN THE UK

K. Poply[1], F.R. Shuaib[2], A.A. Bhamani[3], S. Saha[3]

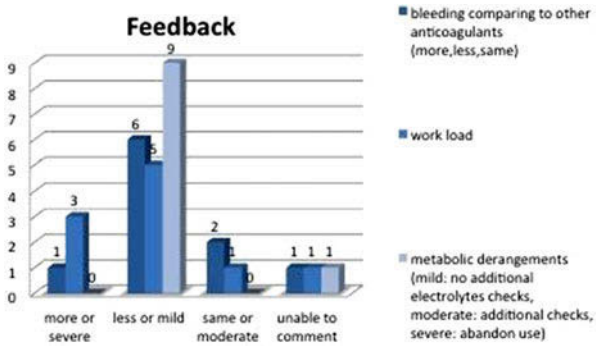
[1]Northwick Park Hospital, Anaesthetics and Intensive Care Medicine, Harrow, UK, [2]Northwick Park Hospital, Intensive Care Medicine, Harrow, UK, [3]Queens Hospital, Intensive Care Medicine, Essex, UK
INTRODUCTION. There is growing evidence that regional citrate is an effective method of anticoagulation for RRT in terms of reduced bleeding complications, prolonged filter life and minimal metabolic derangement. Though citrate use is not widespread, it has mainly been utilized in North American & European CRRT programmes.
This survey aims to review the use of citrate anticoagulation in RRT provided within ICU settings in the United Kingdom.
METHODS. A telephonic survey of 203 adult Intensive Care Units was carried out. A questionnaire was initially piloted in four units to determine its suitability. We aimed to contact the nurse in charge of each unit. If required, dedicated renal replacement nurses and senior medical staff were contacted to obtain further information.
OBJECTIVES. Our main objective was to determine the prevalence of regional citrate anticoagulation and obtain feedback related to its use. Data regarding machine type, mode of RRT, blood pump speed and exchange rate was also collected to gain a comprehensive overview of current practices.
RESULTS. Of the 203 units questioned, 97 %(n = 197) provided Renal Replacement Therapy. 81 % (n = 159) used CVVH whereas 69 %(n = 136) used CVVHDF. All 197 units in the survey used Heparin for anticoagulation. 91 % (n = 179) of these also used Prostacyclin for patients at a high risk of bleeding. Citrate was found to be established as a form of anticoagulation in 5 %(n = 10) of units questioned. However, 4 units were in the process of commencing citrate use, with a further 4 carrying out trials in order to determine its suitability. The most commonly used blood pump speed for citrate was <150 ml/min (100 %, n = 10), while for other anticoagulants it was 150–250 ml/min (92 %, n = 182).



Type of RRT modalities



Type of anticoagulants



Feedback

CONCLUSION. No national guidelines regarding the recommended mode of anticoagulation in intensive care RRT exist. Standard heparin is still the most common type of anticoagulation in use while Citrate use is relatively rare.
Nevertheless, overall feedback regarding citrate was positive. It would therefore, be advisable to look into establishing national guidelines in line with the best available evidence to encourage further use of citrate anticoagulation in RRT across the UK.
REFERENCE(S) 1. Hetzel GR, Schmitz M, Wissing H et al. Regional citrate vs systemic heparin for anticoagulation in critically ill patients on continuous venovenous haemofiltration: a prospective randomized multicentre trial. Nephrol Dial Transplant. 2011;26(1):232–9. 2. Zhang Z, Hongying N- Efficacy & safety of regional citrate anticoagulation in critically ill patients undergoing continuous renal replacement therapy. Intensive Care Med. 2012;38(1):20–8. 3. Mariano F et al. Citrate anticoagulation for

continuous renal replacement therapy in critically ill patients: success and limits. Int J Nephrol. 2011.
GRANT ACKNOWLEDGMENT. The authors would like to thank all the staff of the units surveyed for their time and co-operation.

0374
COMPARISON OF CYTOKINE REMOVAL BETWEEN TWO DIFFERENT MEMBRENE FILTER IN A PIG SEPSIS MODEL

A. Yamazaki[1], T. Tsubo[2], T. Miyasho[3], T. Goto[1]

[1]Hirosaki University Hospital, ME Center, Hirosaki, Japan, [2]Hirosaki University Hospital, ICU, Hirosaki, Japan, [3]Rakuno Gakuen University, Ebtsu, Japan

INTRODUCTION. Cytokine elimination during continuous hemodiafiltration (CHDF) largely depends on the character of the filter membrane. Polysulfone (PS) membrane has excellent filtrating capacity and polymethyl methacrylate (PMMA) membrane has strong adsorption capacity. Cytokines have been studied as main mediators which affect critically ill patients. However, cytokine elimination differences between membranes during CHDF have not been fully investigated.

OBJECTIVES. We studied the elimination of cytokines in PS and PMMA membrane filter during CHDF simultaneously.

METHODS. Piglets weighing 20–30 kg (n = 5) were anesthetized and endotoxin 40–50 μg/kg was administered. Toray hemofeel SH 1.0 (PS membrane) and Toray hemofeel CH 1.0SX (PMMA membrane) were used as hemofilters. CHDF with the PS membrane filter and with the PMMA membrane filter were performed from the same vascular access. The speed of the roller pump was adjusted to achieve 4 ml/kg/min (blood flow). The amount of purification, dialysate flow and fluid replacement flow were 40 ml/kg/h, 35 ml/kg/h and 5 ml/kg/h respectively. Samples were obtained for 6 h after endotoxin administration. Inlet plasma, outlet plasma and filtrate concentration of TNF-α, IL-1β, IL-4, IL-6, IL-8 and IL-10 were measured and each cytokine's clearance was calculated.

RESULTS. Endotoxin administration caused the elevation of inlet plasma concentrations in all cytokines we measured. The PS membrane filters eliminated cytokines dependent on their blood concentration and molecular weight. The PMMA membrane filters excrete little amounts of IL-1β, IL-6 and IL-10 to filtrate. Filtrate concentration of TNF-α, IL-4 and IL-8 in PMMA filter membranes increased after their plasma concentration decreased. However, the difference between filtrate concentration and plasma concentration was significant only in TNF-α (689 $\pm$ 192 pg/ml in filtrate and 278 $\pm$ 86 pg/ml in plasma at endotoxin 4 h) ($p < 0.05$).

CONCLUSIONS. These results confirm the filtration of PS and adsorption of PMMA membrane to eliminate cytokines. PMMA membrane filters showed desorption in addition to adsorption to eliminate TNF-α. Yamashita AC et al[1)] reported that adsorption of PMMA has the optimal molecular size at MW 25,000 (α-chymotripsinogen). Smaller α-cytochrome C (MW 12,400) showed much less adsorptive characteristics. Relative weak adsorptive character of monometric TNF-α (MW 17,500) to PMMA membrane may explain its desorption when its filtrate concentration changed.

REFERENCE(S) 1. Yamashita AC, et al. Contrib Nephrol 2010;166:112–8.

0375
PATIENT PARAMETERS AT DECISION TO INSTITUTE RENAL REPLACEMENT THERAPY

L.G. Young[1], A. Puxty[1]

[1]Glasgow Royal Infirmary, Intensive Care Unit, Glasgow, UK

INTRODUCTION. There is no clear consensus in current literature as to what constitutes early vs. late dialysis for Acute Kidney Injury (AKI), however current UK guidelines suggest renal replacement therapy (RRT) should be instituted before avoidable complications occur.

OBJECTIVES. The aim of this audit was to examine patient parameters at decision to institute RRT in a tertiary ICU.

METHODS. A retrospective analysis was made of prospectively collected data from two databases (Wardwatcher^{TM} and Carevue^{TM}) between March 2008 and September 2011. All AKI patients requiring RRT were included, and all had haemodialysis. Patients on long term RRT were excluded. Standard parameters for instituting RRT were assessed, including the presence/absence of oedema, acid base status, urea, creatinine and potassium, and urine output (in the 4 h preceding 1st dialysis).

RESULTS. One hundred and ninety-nine patients were included. Sepsis was the predominant cause of AKI in the majority of patients (n = 147, 74 %). Other causes included: burns (n = 9), primary renal failure (8), cardiac failure (8), rhabdomyolysis (7), haemorrhage (6), primary hepatic failure (6), pancreatitis and SIRS (6) and metformin associated lactic acidosis (2).

Table 1 Arterial blood gas and venous electrolyte samples prior to 1st dialysis session as mmol/l^{-1} (median + range)

H^+	BE	K^+	Urea	Creatinine
66.55 (26.2-159.7)	-7.4 (-28.2 – 18.5)	4.6 (2.9-8.6)	20 (0-560)	313 (64-951)

Dialysis was commenced on day 1 of ICU admission in 36.2 % of patients (n = 72) and day 2 in 21.6 % (n = 43). Twenty-five patients were documented as being oedematous (12.6 %), 21 were documented as having no oedema (10.5 %) but the presence of oedema was not documented in the remaining 76.9 %. The median total urine output in the four hrs preceding dialysis was 20mls (range 0–560 mls). One-hundred and seventy six of the 199 patients were ventilated at the time of 1st dialysis (median FiO_2 was 0.6 (0.21–1.0) with a median PEEP of 10 (5–18)). One-hundred and forty patients (70.4 %) were on vasopressors at the time of 1st dialysis (108 patients on single agent/30 on 2 agents/5 on 3 agents).

CONCLUSIONS. From our data it would appear that acid base derangement (in combination with multi-organ failure and oligo-anuria) is the predominant factor preceding RRT in our unit. Hyperkalaemia and uraemia were seen infrequently. This complies with UK Renal Association guidelines, which state that RRT "should be initiated once AKI is established and unavoidable but before overt complications have developed," [1] and suggests that early dialysis is favoured in our unit.

REFERENCE(S) 1. Lewington A, Kanagasundaram S. Clinical Practice Guidelines; Acute Kidney Injury. UK Renal Association 2011. 2. Karvellas et al. A comparison of early versus late initiation of renal replacement therapy in critically ill patients with acute kidney injury: a systematic review and meta-analysis. Crit Care 2011;15:R72.

0376
IONIZED CALCIUM, TOTAL CALCIUM AND CALCIUM RATIO DURING CITRATE BASED VENOVENOUS HEMOFILTRATION AND THE RELATION WITH HEMODYNAMIC STABILITY

A. Van der Wolk[1], R.J. Bosman[1], J.P.J. Wester[1], P.H.J. Van der Voort[1]

[1]OLVG Amsterdam, ICU, Amsterdam, The Netherlands

INTRODUCTION. Citrate is commonly used for continuous renal replacement therapy (CRRT). Since it provides regional anticoagulation it minimizes the risk of bleeding complications [1, 2]. Systemic accumulation of citrate can cause severe hypocalcaemia leading to hypotension and ultimately cardiac arrest. The total-to-ionized calcium ratio has proven to be specific in the detection of accumulation of citrate. A ratio below 2.3 is usually considered safe [3, 4].

OBJECTIVES. To evaluate the incidence and effect on hemodynamics of an elevated (>2.3) total-to-ionized calcium ratio during citrate-based CRRT.

METHODS. In a 26 months retrospective cohort of mixed medical/surgical patients data were collected from the patient data management system (Metavision, iMDsoft). All consecutive patients treated with citrate-based continuous venovenous hemofiltration (Ci-CVVH) were included. Baseline data were extracted. All paired measurements of ionized (iCa) and total calcium (tCa) levels were identified with total-to-ionized calcium ratio (ratioCa), dopamine and noradrenalin dose and mean arterial bloodpressure (ABPm) at that time point.

RESULTS. 286 patients with Ci-CVVH were identified with 6,644 paired calcium measurements. Mean APACHE IV was 0.57 (SD 0.30), SMR (ratioCa < 2.3) 0.41, SMR (ratioCa > 2.3) 0.58, mean age 66.9 (SD 11.8). The mean iCa level was 1.05 mmol/l (SD 0.15) and tCa 1.99 mmol/l (SD 0.18). The ratioCa was mean 1.90 (SD 0.15). In 101 timepoints the ratioCa was 2.3 or above. When ratioCa was below 2.3 ABPm was significantly higher (median 71.8 mmHg vs 66.2 mmHg; p = 0.001) and noradrenalin dose lower (median 0.05 vs 0.11 ug/kg/min; p = 0.002) and dopamine dose lower (median 2.1 ug/kg/min vs 4.2 ug/kg/min; p = 0.003) compared to ratioCa above 2.3. In the patients with ratioCa > 2.3 iCa was 0.88 (SD 0.11) and tCa 2.12 (SD 0.21). The local protocol prescribes to lower the dose of citrate when ratioCa is above 2.3 but this was executed in only 36 % of cases. In 2 cases severe hemodynamic instability was present leading to asystole. One of these was likely attributable to citrate toxicity.

CONCLUSIONS. Systemic citrate accumulation as evidenced by an elevated total-to-ionized calcium ratio during citrate-based CRRT is associated with a significantly lower mean arterial bloodpressure and significantly higher dopamine and noradrenaline dose. Severe hemodynamic events such as asystole attributable to citrate toxicity occur in <1 %.

REFERENCE(S) 1. Oudemans-van Straaten. Blood Purif. 2010;29:191–6. 2. Oudemans-van Straaten et al. Crit Care. 2011;15:202. 3. Meier-Kriesche et al. Crit Care Med. 2001;29:748–52. 4. Bakker et al. Clin Chem Lab Med. 2006;44:962–6.

0377
TOLERANCE AND METABOLIC EFFECTS OF A NOVEL LACTATE BUFFERED DIALYSIS AND SUBSTITUTION FLUID FOR CITRATE ANTICOAGULATED CONTINUOUS RENAL REPLACEMENT THERAPY

M. Balik[1], M. Zakharchenko[1], P. Leden[1], J. Rulisek[1], M. Otahal[1], H. Brodska[2]

[1]1st Medical Faculty, Charles University, Anaesthesia and Intensive Care, Prague, Czech Republic, [2]1st Medical Faculty, Charles University, Clinical Biochemistry, Prague, Czech Republic

INTRODUCTION. We designed a calcium free lactate buffered solution („Lactocitrate", Na 130, K 2.0, Cl 116, Mg 1.5, P 1.0, glucose 5.5, Na-lactate 18 mmol/l) for citrate (4 %TSC) anticoagulation.

OBJECTIVES. We presume that CRRT dosage of 2,000–3,000 ml/h is sufficient to avoid metabolic alkalosis and hypernatremia without restriction of blood flows (Qb) to 90–110 ml/min which would thus permit higher ultrafiltration if needed. A combination of lactate and citrate represents an acceptable bioenergetic gain (1) without losing lactate as a marker of oxidative metabolism. Fluid levels of Mg and P are sufficient to compensate daily losses without extra supplementation.

METHODS. In the ongoing 27 h cross-over observational study the patients have been allocated either to CVVHDF or CVVH with 4 %TSC and bicarbonate (20 mmol/l) bags. At cross-over to Lactocitrate the Qb is kept at 100 ml/min, CRRT dosage at 2,000 ml/h and the routine substitution of Mg and P ceases. At 9 h the Qb is increased to 150 ml/min with corresponding increase of 4 %TSC which is always titrated to maintain the postfilter Ca^{2+}< 0.4 mmol/l. At 18 h the CRRT dosage is increased to 3,000 ml/h. At 27 h patients return to bicarbonate bags. Monitoring includes indirect calorimetry and echocardiography at 9 h intervals. Exclusion criteria are arterial lactate >3 mmol/L, $FiO_2 > 0.80$.

RESULTS. We have so far analysed 20 (CVVHDF n = 11, CVVH n = 9) ventilated patients (APACHE II24.5 $\pm$ 5, SOFA9.8 $\pm$ 5). pH (7.41 $\pm$ 0.07 at start vs7.40 $\pm$ 0.07 at 9 h vs7.41 $\pm$ 0.08 at 18 h vs7.40 $\pm$ 0.08 at 27 h, $p > 0.05$) and other data (mmol/l) show no difference between modalities ($HCO_3$29.5 $\pm$ 4 vs27.6 $\pm$ 3 vs29.2 $\pm$ 4 vs27.1 $\pm$ 5, $p > 0.05$; Na144.5 $\pm$ 4 vs143.4 $\pm$ 4 vs143.9 $\pm$ 3 vs143.1 $\pm$ 4, $p > 0.05$). Arterial Ca index do not change regardless of the increased dosage of 4 %TSC after 9 h (287 $\pm$ 63 vs201 $\pm$ 30 ml/h, $p < 0.05$). Mg_{tot} increases (1.04 $\pm$ 0.17 vs1.20 $\pm$ 0.12 vs1.26 $\pm$ 0.11 vs1.29 $\pm$ 0.11, $p < 0.001$) and P stabilises within normal range (0.97 $\pm$ 0.57 vs1.02 $\pm$ 0.42 vs1.10 $\pm$ 0.35 vs1.05 $\pm$ 0.34). Arterial lactate increases (1.2 $\pm$ 0.5 vs1.7 $\pm$ 0.7 vs1.8 $\pm$ 0.6 vs1.9 $\pm$ 0.6, $p < 0.001$). Citrate (14.8 $\pm$ 3.2 vs16.6 $\pm$ 5.3 vs26.2 $\pm$ 8.6 vs22.4 $\pm$ 7.2 mmol/h) and lactate (−2.7 $\pm$ 1.2 vs25.5 $\pm$ 3.7 vs27.1 $\pm$ 4.5 vs37.1 $\pm$ 4.8 mmol/h) gains do not differ between CVVHDF and CVVH ($p > 0.05$ at all times). Total CRRT energetic gains are 12 $\pm$ 22 vs52 $\pm$ 28 vs75 $\pm$ 35 vs70 $\pm$ 33 kJ/h. The corresponding EE, RQ (0.77 $\pm$ 0.08 vs0.77 $\pm$ 0.08 vs0.77 $\pm$ 0.05 vs0.78 $\pm$ 0.06, $p > 0.05$), VO_2, VCO_2 and insulin dosage do not significantly change with the increasing load of citrate and lactate.

CONCLUSIONS. No significant homeostatic changes are observed and lactate levels are increasing yet within normal range. Mg mildly increases as well as P stabilises with no extra replenishment. Well utilised substrate load is up to 1,800 kJ/24 h.

REFERENCES. 1. Balik M, Zakharchenko M, Leden P, et al. Bioenergetic gain of citrate anticoagulated continuous hemodiafiltration—a comparison between two citrate modalities and unfractionated heparin, J Crit Care. 2013;28:87–95.
ACKNOWLEDGMENT. Supported from ESICM Stoutenbeek Award 2012.

0378

HEPARIN FOR CIRCUIT LONGEVITY IN CONTINUOUS RENAL REPLACEMENT THERAPY: ARE WE GETTING IT RIGHT?

J. Peh[1], M. Sarabia[1], R. Ondoy[1], M. Singh[1], B. Abifarin[1], J. Ball[2]

[1]St George's Healthcare NHS Trust, London, UK, [2]St George's Healthcare NHS Trust and St George's University of London, London, UK

INTRODUCTION. Unfractionated heparin (UFH) is commonly used as an anticoagulant to prolong the extracorporeal circuit life during continuous renal replacement therapy (CRRT). Length of time reported varies between 20 to 40 h when UFH is used (1, 3). Variations in guidelines differ across ICUs from the amount of UFH used to prime a filter, use of a bolus dose, dilution for continuous infusions and dosing algorithm to achieve a target range for activated partial thromboplastin time ratio (aPTTr). Algorithms have allowed a more efficient approach to empower nursing staff to lead the management of heparin infusions (1, 2). At our hospital, the management of UFH in CRRT was standardised in 2010 with local guidelines implemented across two ICUs (General and Cardiothoracic). Filter sets are usually changed every 72 h based on its licensed use.
OBJECTIVES. To review practice reflected through circuit longevity (72 h per filter) using UFH and observe the rate of over and under-anticoagulation based on a target aPTTr of 1.5–2.0.
METHODS. For 3 months in 2011 (April to June) and 2012 (October to December), patients on CRRT with heparin only were included in the audit. We did not review any patients who were on CRRT with no anticoagulation or on alternative anticoagulation such as epoprostenol. aPTTr values including sampling times were recorded. Time of a filter clotting was also recorded. Results of the first audit were analyzed. One recurrent issue noted was that a large number of patients only had one to two aPTTr readings in 24 h. Changes were made to the guidelines to emphasize sampling times and review of levels. An updated guideline was implemented in June 2012. Adherence was re-audited four months later.
RESULTS. There were 22 patients in each audit period. aPTTr values were recorded for all filters when UFH was used including when electively discontinued.

aPTTr values

	2011	2012
aPTTr interquartile range (min–max)	1.22–2.09 (0.7–4.28)	1.17–2.13 (0.8–>6)
aPTTr interquartile range prior to filter clotting (min–max)	1.01–1.38 (0.85–3.11)	1.02–1.87 (0.85–3.35)
No. aPTTr readings per 24 h	(=155)	(=252)
1	12 (=12)	21 (=21)
2	27 (=54)	29 (=58)
3	16 (=48)	28 (=84)
4	5 (=20)	16 (=64)
5	3 (=15)	5 (=25)
6	1 (=6)	0

In both audit periods, 28 % of readings were below target with 45 % above target. Mean circuit life was 42 h in 2011 with a longer circuit life of 50 h in 2012.
CONCLUSIONS. Clarity on sampling and review times in the guideline did not show a reduction in the incidence of over and under-anticoagulation but longer circuit life was noted in the second audit period. We conclude circuit longevity in our ICUs is on average 45 h. The guideline's algorithm was not adhered to. In practice the process of sending and reviewing blood results from the laboratory is not compatible with the timeliness of heparin dosing. Availability of near patient testing of blood samples can help improve efficiency in dosing. We are investigating the possibility of utilising thromboelastography to guide dosing of UFH (4).
REFERENCE(S) 1. Ostermann et al. Crit Care 2010;14:419. 2. Baldwin I, Fealy N. Semin Dial. 2009;22:189–93. 3. Brophy PD, Somers MJ et al. Nephrol Dial Transpl. 2005;20(7):1416–21. 4. Panigada et al. Crit Care. 2013;17(Suppl 2):P126.

0379

CITRATE-BASED ANTICOAGULATION IN PATIENTS WITH AKI IN THE INTENSIVE CARE UNIT: A SAFE AND EFFICACIOUS METHOD

F. Stucker[1], J. Pugin[2], J. Tattaw[1], B. Ponte[1], L. Brochard[2], P.-Y. Martin[1], P. Saudan[1]

[1]HUG, Nephrology, Geneva, Switzerland, [2]HUG, Intensive Care, Geneva, Switzerland

INTRODUCTION. A systemic anticoagulation is often required to prevent clotting of filter and extracorporeal circulation in ICU patients undergoing continuous renal replacement therapy (CRRT). A regional citrate-based anticoagulation (RCA) does not induce a systemic anticoagulation and prolongs the filter lifespan. Nevertheless metabolic side-effects have been associated with this therapy.
OBJECTIVES. We are conducting a randomized controlled trial with patients requiring CRRT to determine whether a RCA is more effective than heparin in terms of renal replacement delivered dose and safety profile.
METHODS. Patients: included if they are aged >18 years and have an AKI requiring CRRT. The exclusion criteria are: active hemorrhagic disorder, pregnancy, history of heparin-induced thrombopenia, consent form not obtained.
Randomized to either CRRT with RCA (Prismocitrate, Gambro) or classical heparin anticoagulation. Treatment is performed with Prismaflex machines (hemodiafiltration mode, overall RRT dose 30 ml/kg/h and filter change every 72 h). Primary endpoints: effective daily RRT dose (% of prescribed RRT dose) and filter lifespan. Secondary endpoints: survival at 28 days, number of hemorrhagical events requiring blood transfusions, severe metabolic complications (metabolic alcalosis with pH > 7.55, metabolic acidosis with pH < 7.25) hypocalcaemia (ionized calcium <1 mmol/l).
RESULTS. From October 2010 up to the end of March 2013, 206 patients were treated with CRRT, of whom 85 patients (41 %) were randomized. Exclusion criteria for those not included in this trial were active hemorrhagic disorders or severe thrombocytopenia (21 %), terminal liver failure (9 %), chronic maintenance dialysis (25 %) or others (45 %). Mean age was 62 ± 9 years, and 64.9 % were of male gender. Etiology of AKIs were medical (77 %), surgical (12 %) and posttraumatic (11 %). Mean CRRT duration was 5 ± 5 days. Effective daily RRT dose was 97 ± 8 % in the RCA group and 91 ± 12 % in the heparin group ($p = 0.009$). 28-days mortality was 23.8 % in the RCA group and 24.3 % in the heparin group. Electrolytes and acid–base disturbances were uncommon and transient in patients treated with RCA.
CONCLUSIONS. These preliminary results show that RCA in terms of effective daily delivered RRT dose is superior to heparin-based anticoagulation, which however does not translate into a 28-day survival improvement.

0380

DO INTENSIVE CARE PATIENTS REQUIRING RENAL REPLACEMENT THERAPY RECEIVE AN ADEQUATE DELIVERED DOSE? A TERTIARY CENTRE EXPERIENCE

C. Richardson[1], B. Tunnicliffe[1]

[1]Queen Elizabeth Hospital, Intensive Care, Birmingham, UK

INTRODUCTION. Acute Kidney injury (AKI) requiring renal replacement therapy (RRT) in intensive care is a frequent problem with high mortality. Effective RRT relies, amongst other things, on good vascular access and an extracorporeal circuit that functions correctly. Recent trials have demonstrated no added benefit in mortality outcomes with augmented versus standard prescribed doses for RRT[1, 2]. Evidence suggests a minimum prescribed dose of 25 ml/kg/h[3] aiming for a delivered dose of 20 ml/kg/h. This allows for operational difficulties and medical interventions. Despite this, prescribing the correct dose does not always ensure an adequate delivered dose potentially leading to sub-optimal RRT.
OBJECTIVES. A prospective observational audit was conducted to assess the prescribed and delivered dose in patients receiving haemofiltration in the intensive care units of a large tertiary hospital.
METHODS. Data was collected daily on patient demographics, RRT indication, RRT prescription and anticoagulation over a 2-week period during July 2012. Twenty-two patients received haemofiltration with 104 filtration days available for analysis. Analysis was carried out using SPSS. T-test was used for continuous parametric variables and Chi square for categorical variables.
RESULTS.

Demographic data

	N = 22	Range
Sex	M = 68 % F = 32 %	
Age in years ± SD	61 ± 16.26	20–82
APACHE II* score ± SD	16.7 ± 7.97	6–36
Pre-morbid mean GFR ml/min** ± SD	63.2 ± 20.9	35–90

* Out of 22 patients, 11 APACHE scores available
** Data available for 13 (59 %) patients.
Most of the ITU admissions were secondary to elective operations or sepsis. AKI was the main indication for RRT.

RRT prescription/delivered dose

	Mean + SD	Range
Prescribed dose	22.59 ml/kg/h ± 12.28	10.8–80 ml/kg/h
% of prescribed dose achieved	83 % ± 22.23 %	4–100 %
Delivered dose	18.70 ± 11.76 ml/kg/h	0.6–80 ml/kg/h

Upon further analysis of the mean delivered dose, out of 93 RRT days: 39 % received ≥20 ml/kg/h
8 % received 15–20 ml/kg/h
37 % received 10–14.9 ml/kg/h
16 % received <10 ml/kg/h
There was no difference in the percentage of prescribed dose achieved whether anticoagulation was used or not ($p = 0.995$). However, the mean percentage of prescribed dose achieved was lower when filter clotting problems existed as opposed to not (74 vs. 89.49 %). This difference was statistically significant ($p = 0.002$). Interestingly there was no association between filter clotting problems and not receiving anticoagulation in our data set ($p = 0.291$).
CONCLUSIONS. The percentage of prescribed dose achieved in our centre was suboptimal with a large variation in range. The actual delivered dose was also suboptimal with a sizeable proportion of filtration days having a very low delivered dose.
It is crucial for intensive care units to adopt RRT prescription protocols based on ideal patient body weight as well as undertake regular audit to monitor that the actual delivered dose is adequate.
REFERENCE(S) 1. The RENAL Replacement Therapy Study Investigators. N Engl J Med. 2009;361:1627–38. 2. The VA/NIH Acute Renal Failure Trial Network. N Engl J Med. 2008;359:7–20. 3. KDIGO clinical practice guidelines for acute kidney injury. Kidney Int Suppl. 2012;2(1).

0381

REGIONAL CITRATE ANTICOAGULATION FOR CONTINUOUS VENOVENOUS HEMOFILTRATION AND HEMODIAFILTRATION USING LACTATE AS BUFFER AND CALCIUM-CONTAINING DIALYSATE AND REPLACEMENT FLUID. EXPERIENCE IN 21 PATIENTS

R. Avila[1], E. Romero[2], N. Carrizo[1], J. Fuentes[2], V. Cordini[1], G. Bongiorni[2]

[1]Hospital Cullen, Santa Fe, Argentina, [2]Hospital Privado Centro Medico de Cordoba, Cordoba, Argentina

INTRODUCTION. Regional anticoagulation with citrate is an effective alternative to heparin in patients at high risk for bleeding. However, existing protocols require the use of calcium free solutions. To get adequate solutions in a developing country is a big challenge.
OBJECTIVES. To evaluate the citrate anticoagulation during CVVH and CVVHDF using an anticoagulant Citrate Dextrose Formula A (ACD-A) solution along with calcium containing dialysate and replacement fluid. Also to register the most frequently found complications during the procedures.
METHODS. We retrospectively reviewed the medical records of 21 patients at an intensive care unit of two tertiary-care institutions who had undergone citrate-based CVVHDF and CVVH using a dialysate and a replacement fluid both containing calcium. We used an ACD-A solution to perform anticoagulation and a SOLUFLEX-3075 solution (Na 140 mEq/l, Cl 109.5 mEq/l, Ca 3.5 mEq/l, Mg 1 mEq/l, Na lactate 35 mEq/l) for dialysate and replacement fluid. We evaluated the frequency of hemofilter clotting, hypocalcemia, metabolic alkalosis, metabolic acidosis, hyperlactatemia and citrate toxicity.
RESULTS. Continuous venovenous hemodiafiltration and CVVH were performed for a total of 76 days using 28 filters. Weighting mean hemofilter life span was 95.35 h (SD 58.5). No patients experienced symptomatic hypocalcemia and/or signs and symptoms of citrate toxicity. Twelve patients developed metabolic alkalosis; mean lactate was 5.32 (SD 5.77) mean total/iCa concentration 2.16 (SD 0.24).
CONCLUSIONS. In our research the citrate anticoagulation using calcium-containing solutions is not associated with increased hemofilter clotting. Due to higher doses of citrate used to keep the level of post-filter iCa and the content of lactate in the solutions the patients tended to develop metabolic alkalosis rapidly. The limited availability of suitable solutions in our country (only one) makes it difficult to avoid some complications during CRRT.
REFERENCE(S) 1. Gupta M, Wadhwa NK, Bukovsky R. Regional citrate anticoagulation for continuous venovenous hemodiafiltration using calcium-containing dialysate. Am J Kidney Dis. 2004;43:67–73. 2. Bellomo R: Bench-to-bedside review: Lactate and the kidney. Crit Care 2002;6:322–6.

0382
DIALYTRAUMA INCIDENCE IN PATIENTS TREATED WITH CONTINUOUS RENAL REPLACEMENT THERAPY

S.N. Capela[1], N.A. Velez[1], S. Pereira[1], P. Tadeu[1], S. Silva[1], M.J. Fernandes[1], J.G. Silva[1], F. Santos[1], A. Ferreira[1], E.M. Lafuente[1]

[1]Centro Hospitalar do Tamega e Sousa, UCIP, Penafiel, Portugal
INTRODUCTION. Continuous Renal Replacement Therapy (CRRT) is considered safe and effective (1). Its use is limited to critically and unstable patients. Dialytrauma is a concept used to describe the adverse effects of CRRT (1, 2).
OBJECTIVE. To analyse the operational characteristics of the CRRT identifying the events that contributed the most for the dialytrauma.
METHODS. Retrospective, quantitative and analytic study of the patients submitted to CRRT in the Intensive Care Unit (ICU) between 2005 and 2011. We analysed demographic data, reason for admission, length of stay, SAPSII, SOFA and condition at discharge from ICU. To study dialytrauma incidence we considered the type of technique, reason and duration, type and quantity of membranes used per patient, hypocoagulant, fluids and buffer, prescribed and effective dose in mL/Kg/h, fluid balance, diuresis and hypothermia related to the CRRT. We analysed the course of plasma markers: urea, creatinine, phosphorus, magnesium, total and ionized calcium, sodium, potassium, pH, bicarbonate, lactate, hematocrit, platelets, activated partial tromboplastin time and glucose. We assessed their relative weight for the incidence of dialytrauma using Student T Test, ANOVA and Logistic Regression.
RESULTS. We studied 237 patients, age 60.6 ± 14.4 years, 60.6 % male and length of stay of 12.8 ± 12.4 days in the ICU. Had surgical pathology 27 %, 70 % medical and 3 % trauma. SAPSII was 55.4 ± 18.5 and mortality in the ICU was 50.6 %. CVVHDF was used in 71.8 % and CVVHF in 28.2 %. The membrane ST150® was used in 95 %, the Oxiris® in 2 % and the Septex® in 3 %.
Each patient used in average 2.3 membranes and 92.3 h of treatment. Heparin was used in 45.5 %, citrate in 15.3 % and none in 39.2 %. The buffer was bicarbonate in 99.2 %, Hemosol BO® in 49.5 %, Prismasol® 4 in 36.5 % and Prisma 0 cal® in 24 %. The mean prescribed dosage was 38 mL/Kg/h. Hypothermia was present in 56.4 %. The dialytrauma related events that have shown statistical significance were: the reductions of phosphorus, pH, platelets and calcium. Negative fluid balance, maintenance of spontaneous diuresis and creatinine reduction were the data that appeared to have a positive effect on the final results.
CONCLUSIONS. Dialytrauma occurs quite often in the first hours of CRRT. In this study we found significant variations for some ions, even though none of them appeared to have influenced mortality. The results suggest that negative fluid balance and the maintenance of spontaneous diuresis contribute for better prognosis.
REFERENCES. 1. Moliner JM, Honore PM, Riera SI, Gutiérrez ME, Spapen HD: Handling continuous renal replacement therapy-related adverse effects in intensive care unit patients: the dialytrauma concept. Blood Purif. 2012;34:177–185. 2. Tomas E, Veigas E, Filipe E, Lafuente E: Electrolyte disturbances (Dialytrauma) of continuous renal replacement therapy: a 6 years retrospective study. Intensive Care Med. 2011;S1:S129.

0383
A NOVEL CALCULATOR IMPROVES HAEMODIAFILTRATION DELIVERY

D. Cottle[1], S. Mousdale[2], J. Overend[2]

[1]Lancashire Teaching Hospitals Foundation NHS Trust, Critical Care, Preston, UK, [2]East Lancashire Hospitals Trust, Critical Care, Blackburn, UK
INTRODUCTION. The optimal delivery of renal replacement therapy has been shown to improve survival in critical care patients. The optimal mode of delivery of delivery is less clear and the different machines available increase variations in practice. Therefore a daily prescription for patients who require RRT is an important marker of good clinical practice.
OBJECTIVES. To design an Excel spreadsheet that would:
- Be easy to use for the medical staff and present the nursing staff a series of values to enter on the haemofiltration machine (Prismaflex, Gambro ltd).
- Deliver consistent, accurate, evidence based haemodiafiltration.
- Deliver a filtration fraction (FF) <0.2.
- Improve the filter lifespan.

METHODS. We designed a calculator in an Excel spreadsheet based upon equations developed by Pisitkun et al. (1) and validated by Ricci et al. (2). These were rearranged and, in addition to some of our own calculations, give parameters for optimal haemodiafiltration. The doctor enters the patient's weight, haematocrit and the hourly fluid removal. There is a fixed blood flow rate of 160 ml min^{-1}, filtration fraction of 0.2 and predilution 500 ml h^{-1}. The calculator then gives the optimal convection and dialysate flow rates that ensure total clearance was 35 ml kg^{-1} h^{-1}.
Data was collected retrospectively from the Prismaflex data cards. Control data was collected in January 2012, and the data after the introduction of the calculator was collected in September 2012.
RESULTS. There were 14 filters used in January 2012 and 11 used in September 2012. The mean filter life increased from 15.2 h to 19.6 h. There was a marked reduction in the variation of dosing delivered (see Table 1). The January dose range was 6.3–67.1 ml kg^{-1} h^{-1} (mean 36.4 ml kg^{-1} h^{-1}), the September dose range was 24.8–48.3 ml kg^{-1} h^{-1} (mean 35.4 ml kg^{-1} h^{-1}). The number of patients with FF < 0.2 reduced from 43 to 9 %.

Comparison of January and September data

Parameter	January 2012	September 2012
Mean filter life (ml/h)	15.2	19.6
Min dose (ml/kg/h)	6.3	24.8
Max dose (ml/kg/h)	67.1	48.3
Mean dose (ml/kg/h)	36.4	35.4
FF > 0.2	43 %	9 %

CONCLUSIONS. We have improved and standardized RRT on our unit, ensuring the accurate delivery of a given dose and therefore adequate clearance. Filter life has improved as a result of reducing the FF and it has been well received by both medical and nursing staff. There is much less variation in delivery which can improve further as uptake of the prescription improves. A future reduction in delivery to 25 ml kg^{-1} h^{-1} can easily be incorporated into the calculations resulting in an immediate change in practice on the unit.
REFERENCE(S) 1. Pisitkun T, Tiranathanagul K, Poulin S, Bonello M, Salvatori G, D'Intini V, Ricci Z, Bellomo R, Ronco C. A practical tool for determining the adequacy of renal replacement therapy in acute renal failure patients. Contrib Nephrol. 2004;144:329–49. 2. Ricci Z, Salvatori G, Bonello M, Pisitkun T, Bolgan I, D'Amico G, Dan M, Piccinni P, Ronco C. In vivo validation of the adequacy calculator for continuous renal replacement therapies. Crit Care. 2005;9:R266–73.

0384
A PROSPECTIVE STUDY OF THE USE OF PRISMOCITRATE 18/0 SOLUTION FOR CONTINUOUS VENOVEONOUS HEMODIAFILTRATION IN CRITICALLY ILL PATIENTS

M.M.S. Lui[1], N.Y.Y. Leung[2], M.F. Lam[3], W.M. Chan[2]

[1]Queen Mary Hospital, Medicine, AICU, Hong Kong, Hong Kong, [2]Queen Mary Hospital, AICU, Hong Kong, Hong Kong, [3]Queen Mary Hospital, Medicine, Hong Kong, Hong Kong
INTRODUCTION. Regional citrate anticoagulation (RCA) is effective in prolonging filter function, and confers less risk of bleeding.(1) Commercial preparation of citrate pre-dilution solution facilitates wider use of RCA in critically ill patients. Previous studies using Prismocitrate 10/2 (Gambro) have reported the requirement of additional bicarbonate infusion to achieve better acid–base profile.
OBJECTIVES. To assess the safety of a protocol using Prismocitrate 18/0, a new formulation with altered citrate/citric acid content, as pre-dilution replacement solution coupled with calcium-free dialysate (Prism0 cal B22) for continuous venovenous hemodiafiltration in patients admitted to the Adult Intensive Care Unit (AICU).
METHODS. Asian medical patients admitted to the AICU of Queen Mary Hospital who are indicated for continuous renal replacement therapy were invited. Those with significant liver impairment or refractory septic shock, are excluded. The protocol adopted fixed flow rates of blood and Prismocitrate 18/0 (pre-dilution replacement) at 120 ml/min and 1,000 ml/min respectively. Dialysate (Prism0 cal B22) flow rate is adjusted according to body weight to achieve the recommended ultrafiltration dose of 30–35 ml/kg/h. Normal saline ran at 100 ml/h as the post-dilution solution. CVVHDF was performed using Prismaflex® machine with high flux filter (ST100, Gambro). Post-filter calcium levels targeted between 0.3–0.5 mmol/l. Calcium chloride 10 % was infused to keep serum ionized calcium level 1.0–1.0 mmol/l using a sliding scale. CVVHDF was stopped if pre-defined clinical target was achieved, or the filter clotted.
RESULTS. 31 subjects (16 males, 15 females, age 26–85) were recruited. The post-filter ionized calcium were consistent between 0.3–0.5 mmol/l. 23 of them completed the CVVHDF therapy without filter clotting, and the filter last 7–72 h. Filter clotting was reported in 3 subjects, after CVVHDF for 26, 38, 53 h respectively. Catheter malfunction were found in 2 of the cases with filter clotted. 5 subjects were withdrawn from the study after CVVHDF for 5, 12, 21 h, subsequent to clinical deterioration with the development of contraindications for citrate infusion. Among the cohort, no disturbance in sodium level or citrate accumulation was reported. No adverse events related to hypocalcemia, hypophosphatemia or hypomagnesemia were reported. Mild hypophosphatemia and hypomagnesemia developed mainly after prolonged CVVHDF (>24 h). No bleeding episodes were found during CVVHDF. No additional bicarbonate infusion was not required in all subject completed CVVHDF (n = 26).
CONCLUSIONS. The current CVVHDF protocol using Prismocitrate 18/0 as replacement solution is feasible and safe.
REFERENCE(S) 1. Zhang Z, Hongying N. Efficacy and safety of regional citrate anticoagulation in critically ill patients undergoing continuous renal replacement therapy. Intensive Care Med. 2012;38(1):20–8.

0385
CONTINUOUS RENAL REPLACEMENT THERAPY IMPLEMENTATION IN A CRITICAL CARE UNIT

Y. Diaz[1], A. Vázquez[1], M.P. Gracia[1], A. Zapatero[1], I. Dot[1], A.F. Villasboa[1], M. Basas[1], F.D. Vasco[1], S. Valles[1]

[1]Parc de Salut Mar, Hospital del Mar, Critical Care, Barcelona, Spain
INTRODUCTION. We can not say that the Continuous Renal Replacement Theraphy (CRRT) are better at inttermitent. In certain clinical situations, such as unstable critical patient, offer a number of advantages for its better hemodynamic tolerance, greater ability to remove fluids and immunomodulatory effect in septic patients.

OBJECTIVE. To evaluate the impact of implementing CRRT in the management and survival of patients with acute renal failure (ARF) in our unit.
METHOD. A prospective and descriptive study in one intensive care unit of 18 beds, which included all patients who developed ARF and required some type of renal replacement therapy, during 2010, which only had Intermittent Therapy (IT) and the year 2011 which were also used CRRT. We excluded patients with terminal chronic renal failure. We analyzed data from affiliation, length of stay in the ICU, APACHE II at admission and ARF criteria as parameters as creatinine, urea and oliguria (<400 ml/24 h) and need for vasoactive drugs at the beginning of the treatment and survival to discharge ICU.
RESULTS. In the year 2010 required renal replacement therapy 45 patients, 31 men and 14 women, mean age 61.8 ± 16.63, Apache II 23.5 ± 10 average stay of 13 ± 21 days, started renal replacement technique with a mean of 4.1 ± 12 days after admission to the ICU, with parameters of Cr 4.78 ± 3.4, Ur 173.8 ± 99.6, 80 % had oliguria, 62 % required vasoactive drugs at the time of starting the technique and were exitus 19 patients (42 %).
In 2011 we included 40 patients, 26 men and 14mujeres, mean age 62.2 ± 14.7, APACHE II 22.8 ± 6.5, with an average stay of 14.6 ± 15 days, renal replacement technique began with a mean of 2.5 ± 5.1 days since the patient was admitted to the ICU, with parameters of Cr 4.5 ± 3 Ur 179.2 ± 93.4, 80 % with oliguria, 45 % required vasoactive drugs at the time of starting the technique and were exitus 9 patients (20 %).
No significant differences in both groups regarding demographic data, clinical parameters, analytical or days of starting the therapy regarding the day of ICU admission (p NS). Revealed a trend without being statistically significant improvement in survival ($p = 0.05$).
CONCLUSIONS. In our unit, the implementation of CRRT has not changed substantially the management of ARF although we observed clear tendency to decrease the mortality of these patients.

Linking sepsis pathophysiology to outcomes: 0386–0399

0386

PROGNOSTIC VALUE OF FLUID BALANCE IN PATIENTS WITH SEVERE SEPSIS OR SEPTIC SHOCK

A. Acheampong[1], J.-L. Vincent[1]

[1]Free University of Brussels, ICU, Brussels, Belgium

INTRODUCTION. Fluid administration is an essential component of the management of severe sepsis or septic shock, but a positive fluid balance is associated with worse outcomes. We sought to better define the relation between fluid balance and outcome.
OBJECTIVES. Prognostic value of negative fluid balance in patient's outcome.
METHODS. We studied all patients who were treated for severe sepsis in our Dept of Intensive Care during a 1 year (2012) period.
RESULTS. Of a total of 173 patients, 59 were non survivors (NS) and 114 survivors (S). There were more patients with spontaneous diuresis in the S group (55.3 vs 20.3 %, $P < 0.001$) and more patients treated with diuretics (49.2 vs 30.7 %, $P = 0.017$) or renal replacement therapy NS 39.0 vs 15.8 %, $P = 0001$) in the NS group than in the S group. The main daily fluid volume was 4,122 ml for the NS vs 3,352 ml for the S. [1] The main daily output was 2,272 ml in the NS group vs 2,673 ml in the S group. The main daily fluid balance was in the NS group 1,850 ml in the NS group vs 679 ml in the S group. This was found regardless of the severity of organ dysfunction, as assessed by the SOFA score.
CONCLUSIONS. A positive daily fluid balance during the first 7 days of severe sepsis is associated with a higher rate of mortality. These observations are true regardless of the severity of the organ dysfunction.
REFERENCE(S) 1. Murphy CV, Garrett ES et al. The importance of fluid management in acute lung injury secondary to septic shock. Chest. 2009;136:102. 2. Vincent JL, Sakr Y et al. Sepsis occurrence ine acutely III patients investigators: sepsis in European intensive care units: results of the SOAP study. Crit Care Med. 2006;34:344–53. 3. Soren SH, Anders Perner A. Higher vs lower fluid volumes for septic shock: clinical characteristics and outcome in unselected patients in a prospective, multicenter cohort. Crit Care. 2012;16:R76. 4. Vincent J-L, Gerlach H: Fluid resuscitation in severe sepsis and septic shock: an evidence-based review. Crit Care Med. 2004;32:S451–S454. 5. Alsous F, Khamiees M, DeGirolamo A, et al. Negative fluid balance predicts survival in patients with septic shock: a retrospective pilot study. Chest. 2000;117:1749–54. 6. Rivers E et al. Early goal-directed therapy in the treatment of severe sepsis and septic shock. N Engl J Med. 2001;345:1368–77. 7. Boyd JH, Forbes J, Nakada TA et al. Fluid resuscitation in septic shock: a positive fluid balance and elevated central venous pressure are associated with increased mortality. Crit Care. 2011;39:259–65. 8. Moreno RP, Metnitz B, Adler L et al. Sepsis mortality prediction based on predisposition, infection and response. Intensive Care Med. 2008;34:496–504. 9. The safe study investigators: Impact of albumin compared to saline on organ function and mortality of patients with severe sepsis. Intensive Care Med 2010.
GRANT ACKNOWLEDGMENT. special thanks to Prof. Vincent JL, Njimi H.

0387

RISK ASSESSMENT OF MORTALITY IN PATIENTS WITH INCREASED LEVELS OF INTERLEUKIN 6 IN THE ACUTE PHASE OF SEVERE SEPSIS AND SEPTIC SHOCK

N.A. Velez[1], S. Capela[1], L. Nogueira[1], S. Pereira[1], S. Silva[1], M.J. Fernandes[1], J.G. Silva[1], F. Santos[1], E.M. Lafuente[1]

[1]Centro Hospitalar do Tamega e Sousa, UCIP, Penafiel, Portugal

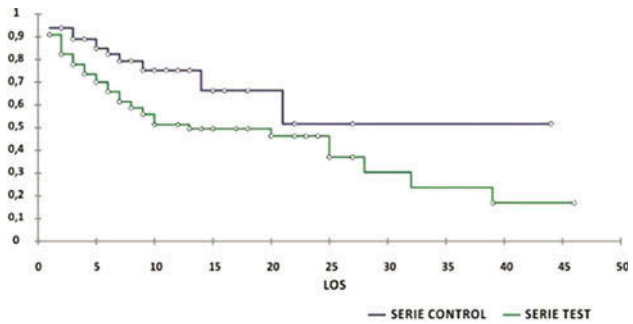
INTRODUCTION. Interleukin 6 (IL6) is a pro inflammatory cytokine that rises early in patients with severe sepsis and septic shock (1). Plasma IL6 is proportional to the severity of sepsis and can be correlated with mortality (2).
OBJECTIVE. To assess how the IL6 correlates with the mortality risk in patients with severe sepsis and septic shock.
METHODS. A retrospective, descriptive and quantitative study including patients with sepsis and septic shock (3), admitted in an intensive care unit (ICU) between 2009 and 2012. We analyzed: gender, age, reason for admission, length of stay, ICU and hospital mortality. The SAPSII was the standard predictor of mortality (4). The levels of Reactive Protein C (RPC), Protein C (PC) and IL6 during the first 72 h were correlated with the risk of mortality. Numerical data are presented as means and standard deviation. We used Student t test for statistic significance, logistic regression and Nelson Aalen for the mortality risk.
RESULTS.

Patients demographics and overall outcome

n = 201	A ± SD
Age	60.2 ± 15.3
LOS	7.9 ± 7.7
SAPSII24 h	52.6 ± 21.1
SOFA admission	9.7 ± 3.6
SOFA 72 h	8.7 ± 4
Septic shock (%)	65.7
ICU mortality (%)	7.26
Hospital mortality (%)	37.5

Correlation with mortality risk

n = 201	ROC	Odds (min–max)
IL-6 > 1,000	0.859	2.53 (1.40–4.55)
IL6 > 200	0.869	2.51 (1.29–4.90)
SAPSII	0.753	1.04 (1.02–1.06)
RPC	0.555	0.9 (0.9–1.0)
PC	0.667	0.97 (0.96–0.98)
Septic shock	0.865	2.26 (1.18–4.32)



Survival distribution function for IL6 > 1,000pg/ml

CONCLUSIONS. The found IL6 mortality threshold was above 200 pg/ml. Levels over 1,000 pg/ml correlated with increased early mortality. This study highlights the potential of using IL6 as an early indicator of prognosis in this group of patients.
REFERENCE(S) 1. Osuchowski M et al. Circulating cytokine/inhibitor profiles reshape the understanding of the SIRS/sepsis in CARS continuum and predict mortality. J Immunol. 2006;177:1967–74. 2. Oberholzer A et al. Plasma cytokine measurements augment prognostic scores of the outcome indicators in patients with severe sepsis. Shock. 2005;23(6):488–93. 3. Dellinger RP, et al. Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock: 2012. Crit Care Med. 2013;41(2):580–637. 4. Le Gall JR, Lemeshow S, Saulnier F. A New Simplified Acute Physiology Score (SAPS II) based on a European/North American Multicenter Study. JAMA. 1993;270:2957–63.

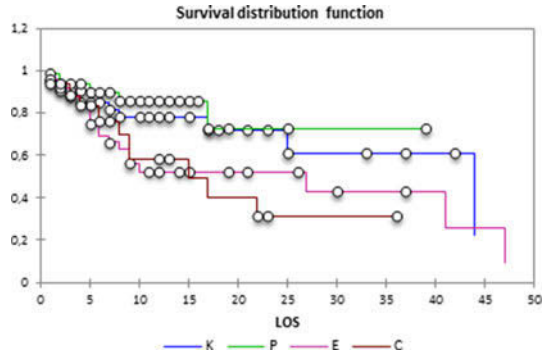
0388

CHOLESTEROL AND ITS RELATION WITH MORTALITY IN ICU PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK

P. Tadeu[1], L. Nogueira[1], C. Costa Pereira[1], S. Silva[1], M.J. Fernandes[1], J. Gomes da Silva[1], F. Santos[1], E. Lafuente[1]

[1]Centro Hospitalar do Tamega e Sousa, Penafiel, Portugal

INTRODUCTION. Multiple organ failure is a major cause of death in the intensive care unit (ICU). Even though we have a myriad of analytic data to help us, those may not always reflect metabolic dysfunction, severity of disease and risk of death in critically ill patients (1). In 1911, Chauffard et al. (2) had already noticed a relation between a decrease in serum cholesterol levels and in hospital mortality in febrile patients. Since then, a number of studies have described hypocholesterolemia in association with in hospital mortality (3).
OBJECTIVES. To evaluate the relationship between serum cholesterol and C Reactive Protein (CRP) at admission and at the 2nd routine analytic control with the ICU mortality in patients admitted with the diagnosis of severe sepsis or septic shock (4).
METHODS. A retrospective, descriptive, cohort study of patients admitted in the ICU, with severe sepsis or septic shock, from the 1st of January of 2009 to the 31st of December of 2012. Beside the demographic data—age and sex—we analysed the length of stay (LOS), serum cholesterol and CRP levels at admission and at the 2nd routine analytic control. We then analysed the relation between these and ICU mortality.
RESULTS. 225 patients, mean age 60.9 ± 15.1 years, 59.6 % males. 52.4 % had severe sepsis and 47.6 % had septic shock. Mean length of stay 8.5 ± 8 days. The relative mortality was 25.3 %. Low levels of cholesterol on admission were associated with increased mortality. Those who died had mean cholesterol of 75.9 mg/dL, while those who survived had mean of 94.7 mg/dL of cholesterol. This difference has shown significance ($p = 0.009$). The Kaplan–Meier curve revealed a tendency to reduce survival in groups with decreasing cholesterol and increasing CRP (E) and with decreasing cholesterol and CRP (C), being K the control group.



Cholesterol and CPR levels related to mortality

CONCLUSIONS. In this study we verified that low cholesterol levels on admission were related with higher mortality risk in patients with severe sepsis and septic shock. There was a tendency for increased mortality in those who have shown decreasing cholesterol levels from admission to 2nd routine analytic control. These results highlight the possibility of using admission cholesterol as a predictor of mortality in septic patients, needing further validation.

REFERENCE(S) 1. Fraunberger P, Nagel D, Walli AK. Seide Serum cholesterol and mortality in patients with multiple organ failure. Crit Care Med.2000;28(10):3574–5. 2. Chauffard A, Richet C, Grigaut A. La cholesterinemia au cours de la tuberculose pulmonaire. Compt Rend Soc Biol. 1911; lxx:276–7. 3. Windler E, Ewers-Grabow U, Thiery J, et al. The prognostic value of hypocholesterolemia in hospitalized patients. Clin Invest. 1994;72:939–43. 4. Bryan Nguyen H, et al. Severe sepsis and septic shock: review of the literature and emergency department management guidelines. Ann Emerg Med. 2006;48(1):28–54.

0389

POLYMORPHISM OF THE GHRELIN GENE (RS26802) LOWERS THE RISK OF SEVERE SEPSIS IN CRITICALLY ILL PATIENTS

S. Tsakiris[1], S.E. Orfanos[1,2], S. Spyridonidou[1], A.G. Vassiliou[1], E. Jahaj[1], S. Manolakopoulos[3], A. Kotanidou[1,4]

[1]Medical School of Athens University, 1st Department of Critical Care Medicine & Pulmonary Services, GP Livanos and M Simou Laboratories, Evangelismos Hospital, Athens, Greece, [2]Medical School of Athens University, 2nd Department of Critical Care, Attikon Hospital, Haidari, Greece, [3]Medical School of Athens University, 2nd Department of Internal Medicine, 'Hippokration' General Hospital, Athens, Greece, [4]Medical School of Athens University, 1st Department of Critical Care Medicine & Pulmonary Services, Evangelismos Hospital, Athens, Greece

INTRODUCTION. Ghrelin is an orexigenic hormone with anti-inflammatory properties that has been shown to exert protective effects in experimental animal models of sepsis. While multiple studies have been conducted on the association of haplotype-tagging single nucleotide polymorphisms (SNPs) of the preproghrelin gene to various clinical conditions, at present there is no data concerning the development of sepsis in ICU patients.

OBJECTIVES. The aim of this study was to evaluate a possible association between the corresponding population's most common haplotype-tagging SNP and sepsis.

METHODS. A total of 217 ICU patients (120 with sepsis, 97 without sepsis) were studied and compared to 106 healthy controls. Clinical, laboratory data, APACHE and SOFA scores were collected and serum samples from the time of admission were used to evaluate the association of the rs26802 [ghrelin A-501C] SNP with sepsis. The SNP was genotyped using TaqMan SNP Genotyping Assays (PCR).

RESULTS. Univariate comparisons indicate a statistically significant at the 10 % level difference between controls and patients with severe sepsis. Namely, at the 10 % level significantly less (52.2 %) patients with severe sepsis were either homozygous or heterozygous for the A-501C compared with controls (64.2 %). Moreover, the comparison between controls and patients that died in the hospital after severe sepsis showed that significantly less patients that died had the A-501C compared with controls (50.9 vs 64.2 % correspondingly). Multiple logistic regression models controlling for age, sex and APACHE scores, support the hypothesis that the presence of the A-501C is associated with a better prognosis. The strongest indication is for the association with severe sepsis (vs controls) were presence of the SNP is associated with lower risk (OR = 0.54) and is significant at the 10 % level ($p = 0.079$).

CONCLUSIONS. Our results indicate that preproghrelin gene SNP A-501C may exert a protective effect, lowering the risk for severe sepsis in ICU patients.

REFERENCES. 1. Campa D, Pardini B, Naccarati A, et al. Polymorphisms of genes coding for ghrelin and its receptor in relation to colorectal cancer risk: a two-step gene-wide case–control study. BMC Gastroenterol 2010;10:112.

GRANT ACKNOWLEDGMENT. The project was funded by the non-profit organization Thorax Research Centre for Intensive and Emergency Thoracic Medicine.

0390

ERYTHROCYTES SELENIUM CONCENTRATION IS PREDICTOR OF MORTALITY IN PATIENTS WITHSEPTIC SHOCK

A.L. Gut[1], N.A. Costa[1], B.L.B. Pereira[1], P.S. Azevedo[1], L.A.M. Zornoff[1], S.A.R. Paiva[1], M.F. Minicucci[1]

[1]Botucatu Medical School, UNESP, Department of Internal Medicine, Botucatu, Brazil

INTRODUCTION. Severe sepsis and septic shock are major healthcare problems, affecting millions of people around the world each year, and increasing in incidence [1]. During sepsis there is increased oxidative stress, with reduced body stores of selenium (Se) and lower activity of glutathione peroxidase (GPx1), with patient outcomes to multiple organ failure and death [2].

OBJECTIVES. To determine the influence of Se concentration in plasma, erythrocytes and erythrocyte GPx1 activity on length of hospital stay, length of ICU stay and ICU mortality in patients with septic shock.

METHODS. This prospective study included all patients with septic shock on admission or during ICU stay, over the age of 18, admitted to one of the 3 ICUs of the Botucatu Medical School, from January to August 2012. Demographic information, clinical evaluation and blood samples were taken within the first 72 h of the patient's admission or within 72 h after septic shock diagnosis for laboratory analysis, GPx activity, plasma and erythrocyte Se concentration. Categorical variables were analyzed by c^2 or Fisher exact test. Continuous variables were analyzed by Student's t test. For length of ICU or hospital stay prediction multiple linear regression was used. For mortality prediction multiple logistic regressions was performed. The level of significance was set at 5 %.

RESULTS. We evaluated 110 patients with a mean age of 58 ± 16 years and 63 % were male. The median length of ICU and hospital stay was 9 (5–15) and 18 (11–34) days respectively and ICU mortality rate was 55 %. Patients had an average plasma and erythrocytes Se concentration of 23.37 ± 8.99 and 32.83 ± 11.89 g/l respectively and the median GPx1 activity was 30.56 (23.98–38.41) U/gHb. All patients had Se deficiency, however, only 25 % had reduced GPxactivity. There was no association of plasma and erythrocytes Se concentration and GPxactivity with the length of hospital and ICU stay. Higher values of APACHE II, albumin and creatinine were associated with higher erythrocyte Se concentration. Regarding mortality, it was associated with higher lactate, urea, APACHE II and SOFA scores and lower values of albumin and length of hospital and ICU stay. In multiple logistic regression analysis adjusted for age, gender, and APACHE II the erythrocyte Se concentration was a predictor of mortality in patients with septic shock (OR: 0.922; 95 % CI 0.880–0.967; $P < 0.001$).

CONCLUSIONS. The erythrocyte Se concentration is a predictor of mortality in patients with septic shock.

REFERENCE(S) 1. Linde-Zwirble WT, Angus DC: Severe sepsis epidemiology: sampling, selection, and society. Crit Care. 2004;8:222-6 2. Heyland DK, Dhaliwal R, Suchner U, Berger M: Antioxidant nutrients: a systematic review of vitamins and trace elements in the critically ill patient. Int Care Med. 2005;(31):327–37.

GRANT ACKNOWLEDGMENT. SUPPORT: CAPES.

0391

INCREASED EXPRESSION OF LEUKOCYTES IMMUNOGLOBULIN-LIKE RECEPTOR B2 (LILRB2) MRNA PREDICTS SURVIVAL AFTER SEPTIC SHOCK

M.A. Cazalis[1], E. Cerrato[1], L. Cavé[1], F. Frager[1], V. Barbalat[1], A. Friggeri[2,3], M. Tournoud[4], A. Pachot[4], G. Monneret[3,5], F. Venet[1,5], A. Lepape[1,2]

[1]Joint Unit, 'Sepsis' Hospices Civils de Lyon-bioMérieux, Lyon, France, [2]Intensive Care Units, Centre Hospitalier Lyon-Sud, Pierre Bénite, France, [3]Joint Unit, Lyon, France, [4]bioMérieux, Marcy l'Etoile, France, [5]Immunology Laboratory, Hôpital Edouard Herriot, Lyon, France

BACKGROUND. Septic syndromes remain the leading cause of mortality in intensive care units. Patients rapidly develop immune dysfunctions which intensity and duration have been linked with deleterious outcome.

OBJECTIVES. In this study, we investigated whether early evaluation of septic patients' severity and risk of death through genomic biomarker measurement could predict mortality in septic shock patients.

PATIENTS AND METHODS. Fifty one septic shock patients (including 17 non-survivors at day 28) and 22 healthy donors were enrolled. PAXgene® tubes were collected at day 1 after the onset of shock. Genome wide expression analysis was performed using Affymetrix U133plus 2 GeneChip. Validation of gene expression was done using qRT-PCR in 262 septic shock patients (172 survivors and 90 non survivors).

RESULTS. LILRB2 was one of the most differentially expressed genes between survivors and non-survivors (Area Under the Curve = 0.84, p-value = 0.0002, Mann–Whitney test). Interestingly, LILRB1 mRNA level, another inhibitory LILR family member, showed good predictive value (AUC = 0.85, p-value = 0.0009). The two mRNA markers were well correlated ($R^2 = 0.86$, p-value <0.0001, Spearman correlation test). Importantly, the differential expression of LILRB2 between survivors and non-survivors was validated by qRT-PCR in a larger cohort of patients (Odds Ratio = 0.47, $p = 0.0028$). Survival curves confirmed that increased LILRB2 mRNA level was associated with decreased mortality after septic shock (Figure 1:Kaplan–Meier survival plots for patients with day 1 LILRB2 CNRQ values above the median (0.86) in thick and below the median in thin)—septic shock patients).

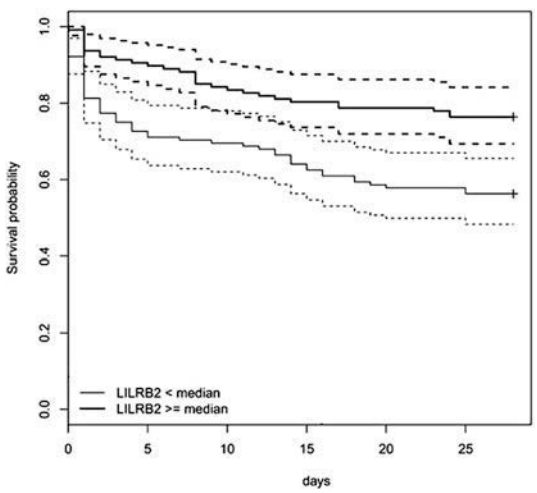


Fig 1 Kaplan–Meier analysis of septic shock

CONCLUSIONS. Increased LILRB2 mRNA expression significantly predicts survival after septic shock. LILRB2 is an inhibitor of the immune response though its preferential binding to HLA-G. Interestingly, increased soluble HLA-G concentrations has been described to be

associated with survival in septic shock patients (1). This suggests that increased LILRB2 level may play an important role in the negative feedback mechanisms that limit the process of inflammation during septic shock. This needs to be confirmed at the protein level with functional experiments. Thus, LILRB2 may be a reliable marker of appropriate regulation of the immune response and a robust predictor of good outcome in septic patients.
REFERENCE(S) 1. Monneret G, Voirin N, Krawice-Radanne I, Bohé J, Lepape A, Rouas-Freiss N, Carosella ED. Soluble human leukocyte antigen-G5 in septic shock: marked and persisting elevation as a predictor of survival. Crit Care Med. 2007;35(8):1942–7.

0392

TISSUE OXYGEN SATURATION INDEX (RSO_2) IN BRACHIORADIALIS (BR) AND DELTOID (D) MUSCLE. CORRELATION AND PROGNOSIS IN PATIENTS WITH RESPIRATORY SEPSIS

L. Claverias[1], J. Marín[1], I. Oliva[1], E. Cos[1], S. Rosich[1], C. Solé[1], M. Bodí[1,2], S. Trefler[1], S. Pascual[2,3], J. Gea[2,3], A. Rodríguez[1,2]

[1]Hospital Universitari Joan XXIII, Intensive Care Unit, Tarragona, Spain, [2]CIBERes de Enfermedades Respiratorias (Instituto de Salud Carlos III), Bunyola, Spain, [3]Hospital del Mar, Servicio de Neumología, Barcelona, Spain

INTRODUCTION. Near-infrared spectrometry (NIRS) is a non-invasive technique that indirectly provides information about the microcirculation state and it may be helpful in the management of the critically ill patients. However, to choose an appropriate application site for the determination of one of its variables is crucial because differences may exist in the sensitivity of underlying muscle groups and other anatomical structures to cardiovascular and oxygen delivery/uptake challenges.

OBJECTIVES.

1) To compare rSO_2 values obtained in two brachial muscles: deltoid (D) as proximal, and brachioradialis (BR) as distal muscles in septic patients with community-acquired pneumonia (CAP) and 2) To determine the association between those values and mortality.

METHODS. Prospective and observational study. Only patients with CAP and sepsis were included. In all of them, two probes were simultaneously placed on the brachioradialis (BR) and deltoid (D) muscles. rSO_2 measurements were obtained at baseline (ICU admission) and at 24 h, and both demographic variables and severity of the illness (APACHE II, SOFA) were registered. Chi square or Fisher's exact test (categorical variables) and *"t"* test or Mann–Whitney U test (continuous variables) were used. Pearson's correlation coefficient was used to assess the association between continuous variables. The consistency of the correlation was assessed using the interclass correlation coefficient (ICC). The predictive value of the variables for mortality was calculated through ROC curves.

RESULTS. Nineteen patients (mean age was 55 years, 73.3 % men) were included. Mean APACHE II and SOFA scores were 15.6 and 52.2 respectively, with an overall mortality rate of 21.1 %. The mean rSO_2 values at ICU admission and at 24 h were significantly higher in D than in BR muscle. Values obtained simultaneously in both upper limbs showed a strong and significant correlation and an adequate consistency: BR ($r = 0.95$; $p < 0.001$. ICC = 0.94; 95 % CI 0.90–0.96; $p < 0.001$) D ($r = 0.88$; $p = 0.01$. ICC = 0.88; 95 % CI 0.80–0.90; $p > 0.001$). Patients who died had rSO_2 values significantly lower than survivors at all times of the study. Mortality rate was 57 and 50 % for rSO_2 values <60 % in BR and D, respectively. All patients with $rSO_2 > 60$ % in BR survived, whereas 17.6 % with an rSO2 value >60 % in D died. Even though both muscles showed consistent mortality discrimination at admission, the AUROC curve prediction was better in BR (ROC = 1.0) than in the D (ROC = 0.9).

CONCLUSIONS. Both BR and D muscles are appropriate for measuring rSO_2 in patients with severe CAP and sepsis. However, the former location seems more discriminatory for predicting mortality. Our results reinforce the potential usefulness of the rSO_2 in the assessment of the severity and prognosis of critically ill patients.

GRANT ACKNOWLEDGMENT. Partially supported by FIS PI10/01538.

0393

PROGNOSTIC VALUE OF LIPOPOLYSACCHARIDE-BINDING PROTEIN (LBP) IN SEVERE SEPSIS AND SEPTIC SHOCK

S. Rebollo[1], P. Esteban[2], A. Hernando[2], R. Jiménez[1], A. Ortín[1], L. García de Guadiana[2], L. Tárraga[1], S. Moreno[1], A. Ojados[1], J.M. Castillo[1], M.D. Rodríguez[1], M. Viqueira[3], M.M. Ortíz[3], M.D. Albaladejo[2], J.M. Allegue[1]

[1]Hospital General Universitario Santa Lucía, Intensive Care Unit, Cartagena, Spain, [2]Hospital General Universitario Santa Lucía, Servicio de Análisis Clínicos, Cartagena, Spain, [3]Hospital General Universitario Santa Lucía, Microbiology Department, Cartagena, Spain

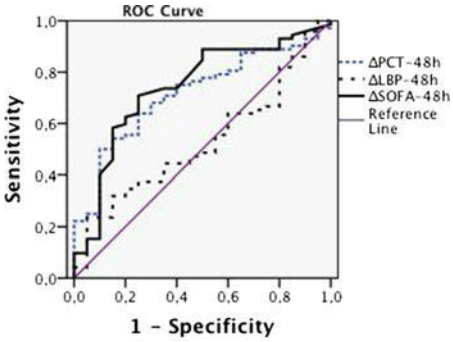
INTRODUCTION. Sepsis is the second leading cause of death among patients admitted to Intensive Care Units (ICU), with a mortality rate ranging 20 to 50 %. Biomarkers as procalcitonin allows early identification and monitoring evolution in this patients. Lipopolysaccharide-binding protein has been little studied as sepsis biomarker in adults.

OBJECTIVES. To evaluate the usefulness of basal LBP and LBP clearance in the first 48 h as a prognostic biomarker in patients with severe sepsis and septic shock, as compared with PCT.

METHODS. Prospective observational study including adults admitted to our ICU for severe sepsis/septic shock (2001 International Sepsis definitions Conference). Data regarding demographics, Acute Physiology and Chronic Health Evaluation II score (APACHE II), Sequential Organ Failure Assessment score (SOFA), data of infection, LBP (IMMULITE 2000 Siemens) and PCT (Roche Diagnostic) measurements on admission, at 48 h and their clearance in first 48 h (Δ−48 h) and patients outcomes (ICU mortality and length of stay) were compiled. Statistics: variables as proportions, mean or median as appropriate, comparisons using Chi square test, t-Student or U-Mann–Whitney as appropriate. Accuracy of PCT, LBP and SOFA to distinguish between survivors and nonsurvivors was expressed as areas under the receiver operating characteristic curve (ROC).

RESULTS. A total of 94 patients were collected. Of them, 20 died (21.3 %) Nonsurvivors were men in greater proportion (65 vs 42 %; p NS), were older than survivors (72.7 vs 64.1 years; p 0.001), Charlson index was higher (5.7 vs 3.8; p 0.004), and APACHE II too (25.9 vs 19.1; $p < 0.001$) No differences in proportion of severe sepsis or septic shock or medical vs surgical admission were observed. Nonsurvivors were under continuous renal replacement therapy in higuer rate (50 vs 21.6 %; p 0.012) Length of ICU and hospital stay was similar between survivors and nonsurvivors.

Areas under the receiver operating characteristic curve (COR) were as follows. Basal procalcitonin 0.627 (CI 95 % 0.49–0.76, p 0.082); basal LBP 0.538 (0.39–0.68, p 0.6); ΔPCT-48 h 0.706 (0.59–0.82, p 0.005)]; ΔLBP-48 h 0.53 (0.4–0.66; p 0.684) Change in SOFA for first 48 h showed an AUC of 0.741 (0.62–0.87; p 0.001).



ROC curves for Change in LBP, PCT and SOFA

CONCLUSIONS. In our study, no advantage of lipopolysaccharide-binding protein (LBP) over procalcitonin (PCT) was found to predict mortality in patients with severe sepsis or septic shock. PCT kinetics within the first 48 h shows a good diagnostic accuracy to predict patients outcome.

REFERENCES. 1. Karlsson S et al. Predictive value of procalcitonin decrease in patients with severe sepsis: a prospective observational study. Crit Care Med. 2010;14:R205. 2. Pavcnik-Arnol et al. Lipopolysaccharide-binding protein, lipopolysaccharide, and soluble CD14 in sepsis of critically ill neonates and children. Intensive Care Med. 2007;33:102.

0394

SERUM PRO-METALLOPROTEINASE 9 IS A PREDICTOR OF LENGTH OF ICU AND HOSPITAL STAY IN PATIENTS WITH SEPTIC SHOCK

A.L. Gut[1,1], N.A. Costa[1], A.F. Gonçalves[1], B.P.M. Rafacho[1], P.S. Azevedo[1], L.A.M. Zornoff[1], S.A.R. Paiva[1], M.F. Minicucci[1]

[1]Botucatu Medical School, UNESP, Department of Internal Medicine, Botucatu, Brazil

INTRODUCTION. The matrix metalloproteinases (MMPs) participate in fundamental processes, such as cell proliferation, differentiation, adhesion, migration, angiogenesis, apoptosis, and inflammation [1]. The increased expression of MMPs suggests that these proteases may influence the pathogenesis of endotoxemia in sepsis [2].

OBJECTIVES. Evaluate the serum activity of MMPs -2 and -9, length of hospital stay, length of ICU stay and mortality in patients with septic shock.

METHODS. This prospective study included all patients with septic shock on admission or during ICU stay, over the age of 18 y, admitted to ICU, from March to July 2012. Demographic information, clinical evaluation and blood samples were taken within the first 72 h of the patient's admission or within 72 h after septic shock diagnosis for laboratory analysis and MMP -2 and -9 activity. The activity of MMPs was performed by zymography. The level of significance was set at 5 %.

RESULTS. We evaluated 67 patients with a mean age of 56 ± 15 years, 66 % male, the median length of ICU and hospital stay was 9 (4–15) and 16 (10–29) days respectively and ICU mortality rate was 61 %. Higher values of APACHE II, SOFA, lactate and urea, and lower values of albumin, length of ICU and hospital stay were associated with ICU mortality. In univariate analysis serum activity of MMPs -2 and -9 were not associated with length of ICU, hospital stay and mortality in septic shock patients. However, in the regression models analysis when adjusted for sex, age, lactate and APACHE II, the activity of pro-MMP -9 was negatively associated with the length of ICU (coef: −0.016; p: 0.028) and hospital (coef: −0.015; p:0.041) stay, but was not associated with ICU mortality (OR:1.051; CI95 %: 0.950–1.163; p:0.332).

CONCLUSIONS. Serum activity of pro-MMP-9 was negatively associated with length of ICU and hospital stay in patients with septic shock.

REFERENCE(S) 1. Le NT, Xue M, Castelnoble LA and Jackson CJ. The dual personalities of matrix metalloproteinases in inflammation. Front Biosci. 2007;12:1475–87. 2. Vanlaere I and Libert C. Matrix metalloproteinases as drug targets in infections caused by gram-negative bacteria and in septic shock. Clin Microbiol Rev. 2009;22(2):224.

SUPPORT. CAPES.

0395

LACTATE CLEARANCE AND MORTALITY IN SEPTIC SHOCK PATIENTS WITH HEPATIC DYSFUNCTION

K. Jeon[1], Y.R. Kang[2], C.R. Chung[1], G.Y. Suh[1]

[1]Samsung Medical Center, Sungkyunkwan University School of Medicine, Department and Critical Care Medicine, Seoul, Republic of Korea, [2]Samsung Medical Center, Sungkyunkwan University School of Medicine, Division of Pulmonary and Critical Care Medicine, Department and Medicine, Seoul, Republic of Korea

INTRODUCTION. Lactate clearance is a useful predictor of mortality in septic shock patients. Lactate is cleared primarily by the liver, but patients with hepatic dysfunction may have impaired lactate clearance, even though they have a similar degree of tissue hypoperfusion to patients with normal liver function.

OBJECTIVES. We evaluated whether lactate clearance was also associated with in-hospital mortality in septic shock patients with hepatic dysfunction.

METHODS. This study enrolled 197 septic shock patients admitted to the intensive care unit between August 2009 and July 2010. Hepatic dysfunction was defined as serum total bilirubin >2 mg/dL. Lactate clearance is calculated on the basis of differences between initial serum lactate level and second lactate level over time interval of two values, which represents clearance rate per hour.

RESULTS. Of 197 patients with septic shock, 79 (40 %) are regarded as hepatic dysfunction. Serum lactate level was diminished by median rate of 0.92 % per hour (IQR, −5.91 to 2.49), which is lower than that of other 118 patients without hepatic dysfunction (1.95 %, IQR −1.26 to 4.00) ($p = 0.04$). Among 79 hepatic dysfunction patients, 48 patients died, showing 61 % of in-hospital mortality rate. But lactate clearance did not show any association with in-hospital mortality in a multivariate analysis (HR 0.991, 95 % CI

0.949–1.035, p = 0.69). Even after adjusting for the potential confounding factors, it still failed to show association with in-hospital mortality.
CONCLUSIONS. Lactate clearance could not be used as a predictor of in-hospital mortality in septic shock patients with hepatic dysfunction.

0396
IMMATURE GRANULOCYTES IN MICROBIAL INFECTION AND ITS ADVERSE SEQUALE IN THE INTENSIVE CARE UNIT

P.J. van der Geest[1], M. Mohseni[1], R. Brouwer[2], B. van den Hoven[1], A.B.J. Groeneveld[1]

[1]Erasmus Medical Center, Intensive Care, Rotterdam, The Netherlands, [2]Erasmus Medical Center, Clinical Chemistry, Rotterdam, The Netherlands
INTRODUCTION. Severe leukocytosis and the so called leftward shift with increasing band and immature neutrophils versus polymorphonuclear segmented cells are classical hallmarks of microbial infection. However, the predictive and diagnostic value of leukocytosis in patients in the intensive care unit (ICU) is poor, so that the search for better biomarkers is ongoing. One of those markers could be the IG percentage (percentage of immature granulocytes of the total white blood cells). The marker has been studied as predictor of microbial infection. However these data are limited and only a few studies evaluated this marker in critically ill patients in the ICU setting.
OBJECTIVES. To evaluate the predictive value of automated immature (vs mature) granulocyte count (IG percentage) in comparison with white blood cell counts (WBC) and C-reactive protein (CRP), for microbial infection, its invasiveness and severity, in the intensive care unit (ICU).
METHODS. In 46 patients admitted into the ICU, blood samples were collected at the day (0) of a clinical suspicion of microbial infection and at day 1 and 3 thereafter. The WBC, manual differential counts, IG percentage and CRP were determined. We defined microbial infections, blood stream infection and septic shock within 7 days after enrolment using the criteria defined at the International Sepsis Forum Consensus Conference on definitions of infection in the ICU.
RESULTS. Of the 46 patients, 31 patients had a confirmed infection by microbiological culture, 12 patients developed a bloodstream infection and 13 patients developed septic shock. The 28-day mortality was 48 % among the patients suffering from infection versus 28 % in the patients without having an infection, P = 0.16. The IG percentage and CRP increases with the invasiveness of confirmed microbial infection on day 0, 1 and 3. In patients with septic shock the values of IG percentage are higher for each day, compared with the IG percentage values in patients with infection. Receiver operating characteristic analysis for the prediction of microbial infection showed an AUC of 0.73 (P = 0.02) for IG percentage versus 0.74 (P = 0.01) for CRP and 0.66 (P = 0.10) for WBC. Combining the WBC, CRP and IG percentage for the prediction of microbial infection yielded an AUC of 0.93 (P < 0.01).
CONCLUSION. The IG percentage which can be collected routinely at no additional costs, is a useful adjunctive predictor of microbial infection, its invasiveness and severity in the ICU.

0397
VITAMIN D LEVELS AND ORGAN DYSFUNCTION IN PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK

F. Alves[1], L. Azevedo[1], F. Machado[1]

[1]Federal University of Sao Paulo, São Paulo, Brazil
INTRODUCTION. Several studies revealed that vitamin D is important in immunomodulation and regulation of inflammatory response. Nevertheless, vitamin D deficiency is rarely considered in critically ill patients.
OBJECTIVE. To compare the plasma levels of *25-hydroxy* vitamin D [25 (OH) D] in septic and *non-septic critically* ill patients and correlate these levels with the severity of organ dysfunction.
METHODS. We carried out a prospective observational study in critically ill patients with severe sepsis or septic shock within ≤48 h of organ dysfunction. Critically ill non-septic patients served as a control group. Plasma 25 (OH) D, ionized calcium and magnesium were measured within the first 48 h (D0) and after 7 days (D7) of septic organ dysfunction onset or at ICU admission in the control group. We determined the Sequential Organ Failure Assessment (SOFA) score, ventilator, inotropic and vasopressor-free days at 28 days, ICU and hospital mortality. We categorized the concentrations of 25(OH) as deficiency (≤20 ng/mL) and undetectable (≤10 ng/mL).[22] The correlation between baseline levels and SOFA score was assessed using Spearman correlation test. We also compared the levels obtained at D0 and D7 in patients with improvement or worsened SOFA score between these time points. A p value <0.05 was considered significant.
RESULTS. Thirty-four patients were enrolled with a median age of 51 years, being 28 % with severe sepsis and 72 % with septic shock and 18 % died. The prevalence of vitamin D deficiency was 89 %, with a median level of 7.9 ng/mL [25–75 percentile %] at D0 and 9.2 ng/mL [25–75 percentile %] at D7. About 68 % of patients with undetectable value of vitamin D at D0 were septic (p = 0.016). There was no statistical difference in the values of vitamin D between those who improved or not the SOFA score at D7, either in septic or control group. Nevertheless, lower 25 (OH) D levels at DO was significantly but weakly correlated with higher SOFA scores at baseline (r = 0.353; p = 0.04).
CONCLUSION. Vitamin D deficiency is highly prevalent in critically ill patients. Although lower levels were correlated with the degree of organ dysfunction we could not demonstrate any relationship with the progression of organ dysfunction in patients with severe sepsis or septic shock.
REFERENCES. 1. Braun A, Chang D, Mahadevappa K, Gibbons FK. Association of low serum 25-hydroxyvitamin D levels and mortality in the critically ill. Crit Care Med. 2011;39(4):671–7. 2. Watkins RR, Yamshchikov AV. The role of vitamin D deficiency in sepsis and potential therapeutic implications. J Infect. 2011. 3. Michael F. Holick, Neil C. Binkley, Heike A. Evaluation, treatment, and prevention of vitamin D deficiency: an endocrine society clinical practice guideline. J Clin Endocrinol Metab. 2011;96(7):0000–0000.
GRANT ACKNOWLEDGMENT. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

0398
MUSCULAR GLUCOSE ASSESSED BY MICRODIALYSIS AND BLOOD GLUCOSE CAN PREDICT MORTALITY IN SEPTIC SHOCK

M. Abdelhakim[1], H. Zied[1], N. Imen[1], R. Chihebeddine[1], L. Iheb[1], F. Mustapha[1]

[1]Military Hospital of Tunis, Anesthesia & Intensive Care, Tunis, Tunisia
OBJECTIVES. The aim of our study was to assess the muscular glucose by microdialysis and its association with mortality in septic shock patients.
METHODS. We have conducted a preliminary prospective study. We included septic shock patients hemodynamically optimized according to international recommendations.All patients met the ACCP/SCCM consensus. A Microdialysis catheter was inserted in the femoral quadriceps. Interstitial fluid samples were collected every 6 h for 5 days. The determination of muscular glucose was performed by the CMA 600 analyzer (CMA/Microdialysis AB, Sweden). We also performed a dosage of concomitant blood glucose. The study population was divided into two groups according to hospital mortality. Statistic analysis: Mann–Whitney test & Chi-square: Comparisons between groups. Quantitative variables were expressed as mean ± standard deviation or median (Interquartile range) as appropriate.
RESULTS. We have included twelve patients with septic shock. Mortality rate was 50 %. Demographics were comparable between groups except for age [66 ± 9 vs. 41 ± 12; dead patients vs. survivors; respectively; p = 0.002]. Pneumonia was the major cause of septic shock (10 patients). We analysed 167 blood samples and 166 muscular glucose samples. We found a positive association between muscular glucose, blood glucose and mortality. Tissue glucose was significantly higher among dead patients compared with survivors at the 54th hour. Comparing all data, muscular glucose (p = 0.02) and blood glucose (p = 0.007) were significantly higher in dead patients.
CONCLUSIONS. Our data suggest that muscular glucose assessed by microdialysis and blood glucose are associated with mortality in septic shock patients. Therefore, muscular glucose may reflect the metabolic alterations and microcirculatory dysfunction induced by septic shock.

0399
VALIDATION OF IMMATURE GRANULOCYTE AS A PREDICTOR FOR THE 28 DAY MORTALITY IN PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK

S.O. Ha[1], S.B. Hong[2], S.H. Park[3], S. Jang[3]

[1]University of Ulsan College of Medicine and Asan Medical Center, Emergency Medicine, Seoul, Republic of Korea, [2]University of Ulsan College of Medicine and Asan Medical Center, Pulmonary and Critical Care Medicine, Seoul, Republic of Korea, [3]University of Ulsan College of Medicine and Asan Medical Center, Laboratory Medicine, Seoul, Republic of Korea
INTRODUCTION. Recently, several studies for immature granulocyte (IG) in patients with sepsis revealed that IG was related with the severity of sepsis.
OBJECTIVES. In this study, we evaluated IG as a predictive marker in patients with severe sepsis or septic shock.
METHODS. This was a retrospective study for patients with severe sepsis and septic shock who admitted to medical intensive care unit of a tertiary care hospital for 4 months. The IG measured by Sysmex XE-2100 and other inflammatory markers such as C-reactive protein, lactate and procalcitonin were evaluated and compared for the 28 day mortality.
RESULTS. 85 patients with septic shock and 45 patients with severe sepsis were enrolled. In non-survivors group (n = 32, 24.6 %), APACHE II score ($p = 0.017$), use of continuous renal replacement therapy (CRRT) ($p = 0.002$) and septic shock ($p = 0.009$) were statistically higher than survivors group. APACHE II score (OR 1.099, $p = 0.008$) and IG (≥0.5 %) (OR 3.568, $p = 0.036$) predicted the 28 day mortality independently after adjusting septic shock, SOFA score, disseminated intravascular coagulopathy, use of CRRT and gender. However, IG (≥0.5 %) had low specificity 33.7 % and positive predicted value 30.1 % for mortality.
CONCLUSIONS. IG was more useful as a marker for the prediction of the 28 day mortality than other inflammatory markers in patients with severe sepsis or septic shock. But the well-designed additional prospective research is needed to decide the relevance of IG as a predictor for the 28 day mortality.
REFERENCE(S) 1. Tschaikowsky K, Hedwig-Geissing M, Braun GG, Radespiel-Troeger M. Predictive value of procalcitonin, interleukin-6, and C-reactive protein for survival in postoperative patients with severe sepsis. J Crit Care. 2011;26:54–64. 2. Nahm CH, Choi JW, Lee J. Delta neutrophil index in automated immature granulocyte counts for assessing disease severity of patients with sepsis. Ann Clin Lab Sci. 2008;38:241–6. 3. Park BH, Kang YA, Park MS, Jung WJ, Lee SH, Lee SK, et al. Delta neutrophil index as an early marker of disease severity in critically ill patients with sepsis. Bmc Infect Dis. 2011;11. 4. Seok Y, Choi JR, Kim J, Kim YK, Lee J, Song J, et al. Delta neutrophil index: a promising diagnostic and prognostic marker for sepsis. Shock. 2012;37:242–6. 5. Nierhaus A, Klatte S, Linssen J, Eismann NM, Wichmann D, Hedke J, et al. Revisiting the white blood cell count: immature granulocytes count as a diagnostic marker to discriminate between SIRS and sepsis—a prospective, observational study. BMC Immunol. 2013;14:8.

Focus on our patients: cancer & the elderly: 0400–0413

0400
ADMITTING VERY OLD PEOPLE (≥80 YEARS) IN ICU

C.E.G. Quintaneiro[1,2], C. Ferrão[2,3], C.C. Dias[4], I. Aragão[2], T. Cardoso[2]

[1]Hospital Distrital da Figueira da Foz, Internal Medicine, Figueira da Foz, Portugal, [2]Hospital de Santo António-Centro Hospitalar do Porto, Unidade de Cuidados Intensivos Polivalentes, Porto, Portugal, [3]Hospital de Santo António-Centro Hospitalar do Porto, Internal Medicine, Porto, Portugal, [4]Faculty of Medicine, University of Porto, Department of Health Information and Decision Sciences, Center for Research and Health Technologys and Information Systems (CINTESIS), Porto, Portugal
INTRODUCTION. Ongoing population aging creates a new and growing problem concerning ICU admission and resource management. There are not clear and consensual recommendations regarding the management of patients over 80 years old. Disagreement among medical teams on ICU admission is common related to patient age. Nevertheless there are several studies involving very old patients showing favorable outcomes at hospital discharge.
OBJECTIVES. To characterize very old population admitted in a mixed ICU along with the invasive therapeutics and long term outcome. Explore the relevance of age over the mortality in these patients.
METHODS. Retrospective cohort of all patients aged 80 or more admitted to ICU between January 2006 and October 2012. Variables associated with hospital mortality were studied in this population; those with a clear association in the univariate analysis (p-value <0.1) were selected for the multivariable analysis. The results of the multivariable models are

expressed as odds ratio (OR) with 95 % confidence interval ($CI_{95\ \%}$) and p-values. The calibration was tested using the Hosmer–Lemeshow goodness-of-fit test. The significance level was defined as $p < 0.05$. Data were analysed using SPSS, version 20 for Windows (Chicago, IL).

RESULTS. A total of 279 patients were included with a median age of 84 years old (82–86), 56 % were male (n = 155). Admission in ICU was mainly due to medical conditions (65 %; n = 180), followed by surgical conditions without trauma (24 %; n = 66), and trauma associated conditions (11 %; n = 30). Organ support included invasive mechanical ventilation in 90 % and vasopressor to inotropic support in 61 %. Mean SOFA score at 24 h was 8 ± 4 and mean SAPSII was 61 ± 16 predicting an hospital mortality of 70 %; the observed hospital mortality was 57 % leading to a SMR of 0.8. The absolute mortality was 31 % at 7 days, 55 % at 3 months and 58 % at 1 year. Variables significantly associated with hospital mortality were age, septic shock with multi-organ dysfunction, coma, SAPS II, SOFA score at 24 h, end-of-life decisions in ICU. When we include all of these variables along with sex in a multivariable analysis, the final model retained end-of-life decisions (OR = 12, $p < 0.001$), SAPS II (OR = 1.038 per point, $p = 0.15$) and coma (OR = 0.186, $p = 0.006$). Hosmer–Lemeshow goodness-of-fit test had a $p > 0.5$. The AUROC was 0.82.

CONCLUSIONS. Age was not independently associated with hospital mortality. SAPSII may overvalue age in its algorithm. Hospital mortality was determined by end-of-life decisions in ICU and severity of acute illness at ICU admission.

REFERENCES. 1. Nguyen Y-L, Angus DC, Boumendil A, Guidet B. The challenge of admitting the very elderly to intensive care. Ann Intensive Care. 2011;1:29. 2. Bagshaw, S. M. et al. Very old patients admitted to intensive care in Australia and New Zealand: a multicentre cohort analysis. Crit Care (London, England). 2009;13:R45.

0401

HOSPITAL AND LONG-TERM OUTCOMES OF CRITICALLY ILL ELDERLY PATIENTS

A. Mukhopadhyay[1], B.C. Tai[2], K.C. See[1], W.Y. Ng[2], T.K. Lim[1], S. Onsiong[3], S. Ee[4], M.J. Chua[4], P.R. Lee[4], M.L. Loh[4], J. Phua[1]

[1]National University Health System, Singapore, Singapore, [2]Saw Swee Hock School of Public Health, National University of Singapore, Singapore, Singapore, [3]The University of Sheffield, Sheffield, UK, [4]National University of Singapore, Singapore, Singapore

INTRODUCTION. Long-term outcomes of elderly patients (≥65 years) admitted to the intensive care unit (ICU) are not clearly determined.

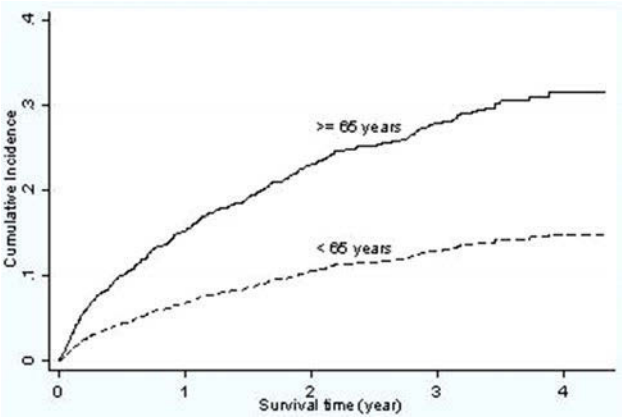
OBJECTIVES. Compare factors contributing to hospital and long-term mortality of elderly versus non-elderly patients admitted to a medical ICU (MICU).

METHODS. We prospectively studied consecutive adult patients (n = 1563) admitted over 28 months to the MICU. Mortality data was obtained from the National Registry. The competing risks regression model was implemented to determine independent factors related to the mortality in the hospital and following discharges.

RESULTS. 45.4 % patients were elderly. Overall, 414 (26.5 %) patients died in hospital (including 287 or 18.4 % who died in ICU) and 337 (21.6 %) died during 52 months following discharges respectively, with elderly patients having significantly higher mortality in all periods. Mechanical ventilation (sub-distribution hazard ratio, SHR 2.74), vasopressor use (SHR 2.56), neurological disease (SHR 1.77) and MPM II score (SHR 1.01) were related to hospital mortality regardless of age, while malignancy (SHR, haematological 3.65, non-haematological 3.4) and renal replacement treatment (RRT) before admission (SHR 2.21) were associated with significantly higher risk in the elderly. Long-term mortality was associated with the number of comorbidities especially amongst non-elderly. Low haemoglobin (SHR 0.94), airway disease (SHR 2.23) and malignancy (SHR haematological 1.11, non-haematological 2.31) were all related to increased risk of long-term mortality regardless of age.

MV analysis mortality after hospital discharge

	Adjusted SHR (95 % CI)			
	<65	p value	≥65	p value
Comorbidities				
2 to 3	2.34 (1.48–3.69)	<.0001	1.43 (0.75–2.71)	0.275
>3	5.01 (3.21–7.83)	<.0001	1.86 (1.02–3.40)	0.043
Haemoglobin	0.94 (0.90–0.98)	0.002	0.94 (0.90–0.98)	0.002
Airway disease	2.23 (1.57–3.15)	<.0001	2.23 (1.57–3.15)	<.0001
Maligancy				
Haematological disease	1.11 (0.63–1.94)	0.721	1.11 (0.63–1.94)	0.721
Non-haematological disease	2.31 (1.39–3.84)	0.001	2.31 (1.39–3.84)	0.001



Cumulative incidence of mortality after discharge

CONCLUSIONS. RRT before admission and malignancy contribute additional hospital mortality risk in elderly patients. During long-term follow up, number of comorbidities (age-related), low haemoglobin, airway disease and malignancy were significantly associated with mortality.

REFERENCE(S) 1. Boumendil A, Somme D, Garrouste-Org, Guidet B. Should elderly patients be admitted to the intensive care unit? Intensive Care Med. 2007;33:1252–62.

0402

VERY OLD PATIENTS ADMITTED TO INTENSIVE CARE: QUALITY OF LIFE AND AUTONOMY AFTER ICU DISCHARGE

C. Ferrão[1,2], C. Quintaneiro[2,3], C. Camila[4], I. Aragão[5], T. Cardoso[6]

[1]Hospital Geral de Santo António, Department of Medicine, Porto, Portugal, [2]Hospital de Santo António, Centro Hospitalar do Porto, Unidade de Cuidados Intensivos Polivalentes, Porto, Portugal, [3]Hospital Distrital da Figueira da Foz, Internal Medicine, Figueira da Foz, Portugal, [4]Statistician at Department of Health Information and Decision Sciences, Center for Research and Health Technologys and Information Systems (CINTESIS), Faculty of Medicine, University of Porto, Porto, Portugal, [5]Director of the Intensive Care Unit, Unidade de Cuidados Intensivos Polivalentes, Hospital Geral de Santo António, Porto, Portugal, [6]Internal Medicine Consultant at Intensive Care Unit, Unidade de Cuidados Intensivos Polivalentes, Hospital Geral de Santo António, Porto, Portugal

INTRODUCTION. The mean age of patients being admitted into intensive care is increasing with very old patients representing an important proportion. Some authors predicted an increase by 72 % in very old patient's admitted into intensive care in the next years[1].

OBJECTIVES. To describe quality of life and impact in self-care of ICU admission in the group of very old patients.

METHODS. Retrospective cohort study of all patients age ≥80 years admitted to a mixed ICU, in a tertiary, university hospital between 2006 e 2012. Detailed description of this cohort was made, including data from the follow-up regarding the subgroup that attended the outpatient clinic. Quality of life was evaluated using EQ-5D and functional status through the modified Rankin scale. Follow-up data was compared between three groups: <65, 66–79 and ≥80 years.

RESULTS. We included in the study 278 patients with a median age of 84 years (82–86), 56 % (n = 155) were males. The admission diagnosis was medical in 65 % (n = 180); surgical without trauma in 24 % (n = 66) and trauma with or without surgery in 11 % (n = 30). Mean SOFA score at 24 h was 8 ± 4; mean SAPSII score was 61 ± 16, predicting a hospital mortality of 70 % with an observed hospital mortality of 57 % (standardized mortality ratio 0.8). General ICU patients had a SMR of 0.9.

Fifty-one patients were evaluated in the outpatient clinic, 43 % reported new symptoms, but 51 % had already resumed previous activity. In the group of patients that did not resume previous activity 41 % said it was due to ICU admission. In this group 80 % remained independent in daily activities. Regarding quality of life only 4 % reported extreme problems with motility; 22 % with self-care; 23 % with usual activities; 2 % pain or discomfort and 8 % anxiety or depression. In the visual analogical scale they attribute to their health status a mean score of 56 ± 21, allowing the calculation of a QALY of 0.9 for a mean follow-up time of 7 months.

Comparing the three age groups: <65, 66–79 and ≥80 years, significant differences were observed between groups in what concerns extreme problems with motility (3 vs 4 vs 9 %, $p < 0.01$); self-care (8 vs 17 vs 30 %, $p < 0.01$); usual activity (17 vs 23 vs 30 %, $p < 0.01$); pain/discomfort (5 vs 4 vs 6 %, $p = 0.6$); anxiety/depression (13 vs 10 vs 11 %, $p = 0.4$).

Regarding health state in the day of outpatients clinic appointment they reported 73 (53–91), 63 (45–85), 59 (41–69) respectively ($p < 0.01$).

CONCLUSIONS. In the group of very old patients that survived ICU care more than half resumes previously activity at time of outpatient clinic appointment. This group of patients gained 1 year of life with quality.

REFERENCE(S) 1. Yên-Lan N et al. The challenge of admitting the very elderly to intensive care. Ann Intensive Care 2011;1:29. 2. Alexis Tabah et al. Quality of life in patients aged 80 years or over after ICU discharge. Crit Care 2010;14:R2.

0403

OUTCOME OF NON-ELECTIVE ADMISSIONS TO CRITICAL CARE IN PATIENTS AGED OVER 80

G. Dempsey[1], T. Astles[1]

[1]University Hospital Aintree, Department of Intensive Care Medicine, Liverpool, UK

INTRODUCTION. We live in an ageing population with evermore elderly patients being referred for Critical Care treatment. This is likely to be an Increasing problem.

Most literature in the area of elderly patients in Critical Care studies the over 65 s. In the over 80 s old cohort there is relatively little published outcome data on urgent unplanned admissions. de Rooij reported the outcomes of 578 patients over the age of 80, of which 249 were unplanned admissions. Surgical and medical hospital mortalities were 51 % & 56 % respectively and 12 month mortalities were 62 & 69 %.[1]

Roch reported on 299 medical patients with a 2-year follow up. Hospital mortality was 55 %, and 12-month mortality was 72 %.[2]

OBJECTIVES. To study the ITU, hospital and long-term outcome of non-elective patients aged over 80 years admitted to our Critical Care Unit, a 19 bedded mixed surgical & medical teaching hospital department.

METHODS. A retrospective search of the computerised ITU admissions database was performed for patients over 80 years of age admitted during 2010–12 confined to non-elective admissions.

Data pertaining to the first 24 h of the admission were sought from observation charts, blood results and admission clerking.

Data collected included the following:

- Demographics.
- APACHE II score.
- Physiological data.
- Chronic health evaluation as per ICNARC.
- Hospital discharge status.
- Post-discharge survival.

RESULTS. 3,858 patients were admitted to the Critical Care Unit in 2010–12. Of these, 491 (13 %) patients were aged over 80 years of age. 327 (8.5 %) were non-elective patients aged over 80. Chronic health status was similar in survivors and non-survivors.
Table 1 shows hospital mortality and 12-month survival. Table 2 shows acute physiological data and severity of illness markers for survivors and non-survivors.

Table 1

	Number	Hospital deaths	12-month survival (n = 236)
Surgical	114 (35 %)	48 (42 %)	40 (47 %)
Medical	213 (65 %)	115 (54 %)	37 (25 %)
Total	327	163 (50 %)	77 (33 %)

Table 2

	Survivors (n = 164)	Non-survivors (n = 163)	
APACHE 2 score	18	21	P < 0.001
Intubated	40 (24 %)	70 (43 %)	P = 0.01
$FiO_2 > 0.5$	55 (34 %)	104 (63 %)	P < 0.001
Creatinine >150 μmol/l	59 (36 %)	86 (53 %)	P = 0.02
pH < 7.25	22 (13 %)	74 (45 %)	P < 0.001
Noradrenaline >10 mcg/min	22 (13 %)	64 (39 %)	P = 0.004
Mean highest lactate (mmol/l)	2.6	4.3	P < 0.001

Figure 1 shows the Kaplan–Meier plot demonstrating survival in days for medical (Group 1) and non-elective surgical (Group 2) patients.

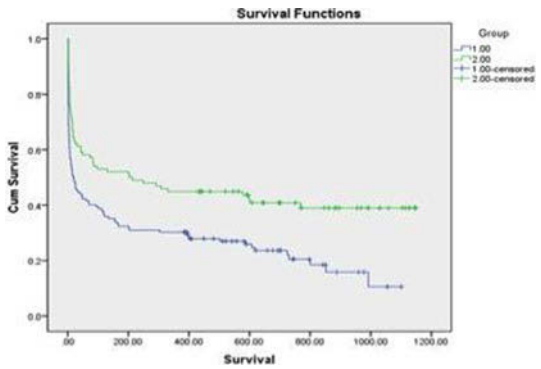


Figure 1

CONCLUSIONS. During the study period 8.5 % of admissions to our ITU were unplanned admissions in over 80 s. This cohort of patients has a high ITU mortality (35 %) and only 47 % survive to hospital discharge. There is a high on-going mortality following discharge especially in medical patient of whom only 25 % were alive at 12 months.
The main determinant of outcome appeared to be severity of acute illness rather than chronic health. Data from our institution is comparable with published outcomes for similar patient groups.
REFERENCE(S) 1. de Rooij, A. Govers, J. C. Korevaar. Short-term and long-term mortality in very elderly patients admitted to an intensive care unit. Intensive Care Med. 2006;32:1039–44. 2. Roch et al. Long-term outcome in medical patients aged 80 or over following admission to an intensive care unit. Crit Care. 2011;15:R36.

0404

INTENSIVE CARE UNIT (ICU) AND IN HOSPITAL AFTER ICU DISCHARGE MORTALITY OF 65 OR OVER AGED PATIENTS: RATES AND RISK FACTORS RELATED TO ICU ADMISSION CHARACTERISTICS

D. Lathyris[1], P. Tasioudis[1], S. Kechagias[1], F. Renta[1], E. Chassou[1], E. Antoniadou[1]

[1]Gennimatas General Hospital, Intensive Care Unit, Thessaloniki, Greece

INTRODUCTION. The mean age of ICU patients has considerably increased the last years [1]. Although, it is widely accepted that age alone is not a predictor of mortality in ICU patients, recent studies suggest that for patients aged 75 or older, age can be considered as an independent risk factor of ICU mortality [2].
OBJECTIVES.
a) To evaluate the influence of patient characteristics at the time of ICU admission (ICU admission risk factors), on ICU and on hospital (after ICU discharge) mortality (hospital mortality), of patients aged 65 and older and
b) to examine if the risk of death after ICU admission is more important in older patients.
METHODS. Retrospective, observational, single center study. The study was conducted in an 8-bed adult general ICU (January–December 2011). All patients ≥18 years hospitalized for ≥48 h were included. Patients were divided into four age groups: 18–64, 65–74, 75–84, 85 and above [1]. Characteristics on ICU admission were recorded: sex, APACHE II score, comorbidities, McCabe score, reason for ICU admission. ICU and hospital mortality were calculated. Univariate analysis for categorical variables was performed using Pearson's χ^2 test or Fisher test. Multivariable analysis of the time to ICU mortality was calculated by using Cox regression model. P value <0.05 was considered significant.
RESULTS. Two hundred forty four patients were included in the study, 85 in the 18–64 group, 67 in the 65–74, 75 in the 75–84 and 17 in the 85 and above group. ICU mortality rates were: 18/85 (21.2 %), 15/67 (22.4 %), 17/75 (22.7 %), 8/17 (47.1 %), (p = 0.165). In hospital mortality rates were 4/52 (7.7 %), 2/40 (5 %), 5/49 (10.2 %), 0/7 (0 %) (p = 0.78) for 18–64, 65–74, 75–84 and 85 and above groups, respectively. In multivariable analysis, patients ≥85 had greater risk of ICU mortality than patients aged 18–64 [Hazard Ratio (HR): 3.31; CI 95 %, 1.40–7.82; p:0.006]. No difference was observed between age groups 18–64, 65–74 and 75–84, regarding ICU mortality (HR: 1.10; CI 95 %, 0.55–2.18; p:0.79 and HR: 1.60; CI 95 %, 0.82–3.13; p:0.17, respectively). A trend was found that patients admitted with septic shock had greater risk of ICU mortality but results were not significant (HR: 1.75; CI 95 %, 0.97–3.15; p:0.06).
CONCLUSIONS. More than 53 % of the analyzed populations were categorized as old. It seems that oldest patients (≥85 years) have greater risk of death than younger ones and this should be taken into consideration when benchmarking outcomes between different ICUs. No conclusions could be reached regarding hospital mortality, as a result of the limited amount of events.
REFERENCE(S) 1. Boumendil A, Somme D, Garrouste-Orgeas M, Guidet B. Should elderly patients be admitted to the intensive care unit? Intensive Care Med. 2007; 33(7):1252–62. 2. Fuchs L, Chronaki CE, Park S, et al. ICU admission characteristics and mortality rates among elderly and very elderly patients. Intensive Care Med 2012;38(10):1654–61.

0405

EVOLUTION OF THE ADMISSIONS OF ELDERLY PATIENTS TO THE INTENSIVE CARE UNIT (ICU) IN A SECOND LEVEL HOSPITAL

M.R. Solano Vera[1], Á. Murillo Martín[1], A. Corrales Cruz[1], Ó.A. Hernández Parada[1], E. González Higueras[1], M.O. Castro Gallego[1], J.B. Araujo Alcántara[1], J.C. Pérez Llorens[1], M.Á. Garijo Catalina[1], M.P. Escuela Gericó[1], J.M. Añón Elizalde[1]

[1]Hospital Virgen de la Luz, Intensive Care, Cuenca, Spain

INTRODUCTION. The progressive aging of population is leading to an increase in demand for healthcare resources, including intensive care.
OBJECTIVES. To assess the trend of the admission of ≥85 year old patients to an ICU in a level 2 hospital from 2009 to 2012.
METHODS. We retrospectively analyzed the subgroup of ≥85 patients from a prospective database of admitted patients in our ICU. Variables: Sex, age, cause of ICU admission, complications, in-ICU mortality, ICU admission time and length of Mechanical Ventilation (MV).
RESULTS. From 2009 to 2012 121 patients were studied. The main results are shown in table 1. The percentage of patients ≥85 in relation to the total number of patients admitted to the ICU increased from 5.9 % in 2009 to 9.1 % in 2012. Average length of MV was 2.4 ± 1.6 days in 2009 and 5.6 ± 2.4 days in 2012. (Table 1).
CONCLUSIONS. There is an increase in the ICU admission of elderly population in the last 4 years, mainly post-surgical patients. During 2012 the ICU stay of these patients was longer, in relation to a higher severity of the admission causes.

Table 1

Years	n	Age	Mechanical Ventilation (n)	Days of ICU Admission	Surgical Patients (n)	Medical Patients (n)	Average APACHE II	In ICU mortality (%)
2009	25	86.4 ± 1.6	13	3.2 ± 2.6	12	13	14 ± 5.4	20 %
2010	26	87.3 ± 2.5	16	3.6 ± 3	15	1	13 ± 6.3	11 %
2011	32	88 ± 2.9	13	2.6 ± 2 **	15	8	12.6 ± 6*	12 %
2012	38	87.4 ± 2.4	27	6.1 ± 6 **	23	8	17.1 ± 7.7*	23 %

*p < 0.03 years 2011 and 2012 **p < 0.01 years 2011 and 2012

Not a statistically significant difference in mortality, age or length of MV

0406

OUTCOMES OF PATIENTS WITH CANCER REQUIRING VENTILATORY SUPPORT: RESULTS FROM A PROSPECTIVE MULTICENTER STUDY

L. Azevedo[1,2], P. Caruso[3], U.V.A. Silva[4], A. Torelly[5], E. Silva[6], E. Rezende[7], J.J. Netto[2], C. Piras[8], S. Lobo[9], M. Knibel[10], J.M.M. Teles[11], R. Lima[12], B. Ferreira[13], G. Friedman[5], A. Rea-Neto[14], F. Dal Pizzol[15], F.A. Bozza[16,17], J.I.F. Salluh[2,17], M. Soares[2,17], Brazilian Research in Intensive Care Network, BRICNet

[1]Hospital Sirio Libanês, Sao Paulo, Brazil, [2]Instituto Nacional de Cancer, Rio de Janeiro, Brazil, [3]Hospital AC Camargo, Sao Paulo, Brazil, [4]Fundação Pio XII-Hospital do Cancer de Barretos, Barretos, Brazil, [5]Santa Casa de Misericordia de Porto Alegre, Porto Alegre, Brazil, [6]Hospital Israelita Albert Einstein, Sao Paulo, Brazil, [7]Hospital do Servidor Público Estadual, São Paulo, Sao Paulo, Brazil, [8]Vitoria Apart Hospital, Vitoria, Brazil, [9]Medical School and Hospital de Base, Sao Jose do Rio Preto, Brazil, [10]Hospital Sao Lucas, Rio de Janeiro, Brazil, [11]Hospital Português, Salvador, Brazil, [12]Hospital Samaritano, Rio de Janeiro, Brazil, [13]Hospital Pasteur, Rio de Janeiro, Brazil, [14]Hospital de Clínicas da Universidade Federal do Paraná, Curitiba, Brazil, [15]Universidade do Extremo Sul Catarinense, Criciuma, Brazil, [16]Fundacao Oswaldo Cruz, Rio de Janeiro, Brazil, [17]D'Or Institute for Research and Education, Rio de Janeiro, Brazil

INTRODUCTION. Most of information about cancer patients with acute respiratory failure (ARF) in need for mechanical ventilation (MV) comes from single-center studies carried out in specialized cancer centers.
OBJECTIVES. To evaluate the characteristics, clinical course and outcomes of critically ill cancer patients requiring ventilatory support.
METHODS. Secondary analysis of a multicenter prospective cohort study conducted by the BRICNet (Brazilian Research in Intensive Care Network) in 28 Brazilian intensive care units (ICU) over two months during 2007. All adult cancer patients requiring ventilatory support [invasive MV or non-invasive ventilation (NIV)] for ≥24 h during the first 48 h of ICU admission were evaluated, excluding readmissions. Multivariate logistic regression was used to identify predictors of hospital mortality.
RESULTS. Out of the 717 patients admitted to the study ICUs, 263 (37 %) received ventilatory support. There were 227 (86 %) patients with solid tumors and 36 (14 %) patients had hematological malignancies. The most frequent types of cancer were lower gastrointestinal (13 %), lung (12 %), breast (9 %) and upper gastrointestinal (9 %). SAPS 3 was 64 ± 17 and SOFA was 11 ± 4 points, respectively. Main reasons for ventilatory support were severe sepsis (64 %), ARDS (30 %) and tumoral involvement (12 %). Invasive MV was used in 178 (68 %) patients and 85 (32 %) received NIV as initial ventilatory support. The rate of NIV failure with subsequent intubation for invasive MV was 53 % (n = 45). NIV failure was more frequent in patients with septic shock (P < 0.001), ARDS (P = 0.013) and respiratory rate ≥35 (P = 0.017). Hospital mortality rates were 67 % in all patients, 40 % in successful NIV, 69 % in NIV failure and 73 % in MV patients, respectively (P < 0.001). In multivariate analysis, medical admission [odds-ratio (OR) = 4.64

(95 % confidence interval, 2.22–9.71)], active underlying malignancy newly diagnosed [3.59 (1.28–10.10)], underlying malignancy in recurrence or progression [3.67 (1.25–10.81)], tumor as reason for ventilatory support [4.04 (1.30–12.56)], performance status 3–4 [2.39 (1.24–4.59)], NIV failure with subsequent MV [3.00 (1.09–8.18)], invasive MV [3.53 (1.45–8.60)] and SOFA score (each point, excluding respiratory domain) [1.15 (1.03–1.29)] were independently associated with hospital mortality. Hospital survival in patients with good performance status and without cancer recurrence or airway involvement was 53 %.

CONCLUSIONS. More than half of patients with cancer and good performance status admitted to general ICUs requiring ventilatory support survive. Conversely, ARF in patients with poor functional capacity, cancer progression and major tumoral airway involvement is associated with grim outcomes. Moreover, NIV should be used judiciously (and discouraged in patients with septic shock or ARDS), since NIV failure is associated with mortality and occurs in half of the patients.

GRANT ACKNOWLEDGMENT. CNPq, FAPERJ, INCA and BRICNet.

0407

THE USE OF INTENSIVE CARE IN PATIENTS WITH LUNG CANCER: A MULTINATIONAL MULTICENTER STUDY

M. Soares[1,2], A.-C. Toffart[3], J.-F. Timsit[3], G. Burghi[4], C. Irrazabal[5], N. Pattison[6], E. Tobar[7], B.F.C. Almeida[8], U.V.A. Silva[9], L.C.P. Azevedo[10], A. Rabbat[11], C. Lamer[12], A. Parrot[13], V.C. Souza-Dantas[2], F. Wallet[14], F. Blot[15], G. Bourdin[16], C. Piras[17], J.I.F. Salluh[1], É. Azoulay[18]

[1]D'Or Institute for Research and Education, Rio de Janeiro, Brazil, [2]Instituto Nacional de Cancer, Rio de Janeiro, Brazil, [3]Albert Michallon University Hospital, Grenoble, France, [4]Hospital de Clínicas, Montevideo, Uruguay, [5]Instituto Alexander Fleming, Buenos Aires, Argentina, [6]Royal Marsden Hospital, London, UK, [7]Universidad de Chile, Santiago, Chile, [8]Hospital AC Camargo, Sao Paulo, Brazil, [9]Fundação Pio XII-Hospital do Cancer de Barretos, Barretos, Brazil, [10]Hospital Sirio Libanês, Sao Paulo, Brazil, [11]Hotel Dieu, Paris, France, [12]Institut Mutualiste Montsouris, Paris, France, [13]Hopital Tenon, Paris, France, [14]Centre Hospitalier Lyon Sud, Pierre-Benite, France, [15]Institut Gustave Roussy, Villejuif, France, [16]Hôpital de la Croix Rousse, Lyon, France, [17]Vitoria Apart Hospital, Vitoria, Brazil, [18]Saint-Louis University Hospital, Paris, France

INTRODUCTION. Detailed information about lung cancer patients requiring admission to the intensive care units (ICU) is mostly restricted to single center studies including small number of patients.

OBJECTIVES. To evaluate the characteristics, clinical evolution and outcomes in crititcally ill lung cancer patients.

METHODS. Prospective multicenter study in 2011 including 449 [small-cell (SCLC) = 55; non-SCLC = 394)] consecutive patients admitted for >24 h to 22 ICUs in 6 countries from Europe and South America. Readmissions and patients in cancer remission >5 years were excluded. Logistic regression was used to identify predictors for hospital mortality.

RESULTS. Mean age was 64 ± 12 years and 59 % were medical admissions. 71 % had recent cancer diagnosis, 7 % were in cancer remission and 22 % in recurrence or progression. Overall, 62 % patients had extensive disease and 26 %, airway obstruction or compression by cancer. Anticancer treatment complications occurred in 50 (11 %) patients (neutropenia, 4 %; mucositis, 2 %; chemotherapy-related, 8 %; radiation therapy, 2 %). SAPS II was 46 ± 19 and SOFA was 6.0 ± 4.5 points, respectively. On the 1st ICU day, 239 (53 %) required ventilatory support [non-invasive ventilation (NIV), 16 %; mechanical ventilation (MV) after NIV failure, 7 %; firstline MV, 30 %] and 128 (29 %), vasoactive drugs. Hospital mortality in all patients was 39 %. Among ventilated patients, hospital mortality rates were 55 % in all patients, 40 % in successful NIV, 65 % in NIV failure and 61 % in MV patients. In multivariate analysis, medical admission [odds-ratio (OR) = 2.87 (95 % CI 1.70–4.84)], tumoral airway obstruction or compression [1.71 (1.03–2.82)], hospital stay prior ICU admission (per day) [1.32 (1.11–1.55)], SOFA score (per point) [1.07 (1.01–1.14)], NIV failure [3.22 (1.28–8.13)], MV [3.65 (2.04–6.54)] and performance status 3–4 [1.85 (1.00–3.40)] were associated with hospital mortality. The type of cancer and anticancer treatment complications were not associated with outcomes. Hospital survival in patients with recent diagnosis, without airway involvement and good performance status was 76 %. Anticancer treatments were instituted in 25 (6 %) patients during ICU stay and 56 % of them were discharged alive.

CONCLUSIONS. Critical care management provides dismal short-term survival benefits in patients with intractable cancer and disease-related respiratory failure from airway's obstruction or compression. Patients with good performance status and non-tumoral pulmonary involvement have substantial survival, regardless the type of cancer and the need for in-ICU anticancer therapy. The impact of type of cancer and treatment complications will be further tested on long-term outcomes.

GRANT ACKNOWLEDGMENT. CNPq, FAPERJ and INCA.

0408

LUNG CANCER PATIENTS WITH ORGAN FAILURES: DETERMINANT OF ICU ADMISSION OR PALLIATIVE CARE, A HOSPITAL-WIDE PROSPECTIVE STUDY

A.-C. Toffart[1,2], M. Lugosi[2,3], S. Linda[1], O. Pop[1], A. Vesin[2], C. Schwebel[3,4], D. Moro-Sibilot[1,2], J.-F. Timsit[2,3]

[1]A Michallon University Hospital, Thoracic Oncology Unit, Grenoble, France, [2]Université Grenoble 1 U 823-Institut A Bonniot-Université J Fourier, Grenoble, France, [3]A Michallon University Hospital, Medical Intensive Care Unit, Grenoble, France, [4]Université J Fourier Grenoble 1, Laboratoires des Pharmaceutiques Biocliniques U 1039, Grenoble, France

INTRODUCTION. Determinant of intensity of care of lung cancer patients with organ dysfunctions (OD) depends on medical history, oncologist and intensivist advice and wishes of the patients and his/her family. Unfortunately, in most studies, only patients proposed to ICUs are followed for outcome.

OBJECTIVES. We aimed to describe the process of care of hospitalized lung cancer patients with OD dividing patients into intensive, maximum medical (without ICU admission) or palliative care.

METHODS. A prospective study conducted at the Grenoble Teaching Hospital in France between December 2010 and November 2012. All the lung cancer patients with at least one OD have been consecutively included. Informations regarding the medical status and triage decisions were collected prospectively. Risk factors of intensivist call and/or ICU admission were studied using logistic regression models. Outcome was evaluated on March 1st 2013. Prognostic factors were assessed using a log-rank test and a Cox's model.

RESULTS. One hundred and forty patients developed OD in the onco-pulmonology unit (n = 87 (62 %)), at the emergency room (n = 37 (26 %)) or in other hospital wards (n = 16 (11 %)). A quarter (n = 33) of patients presented this OD at night or during the weekend. Patients were proposed for ICU admission in 49 (35 %) cases and discussed with the oncologist in 121 (86 %). Lung cancer patients were more frequently offered for ICU admission by emergency physicians than by onco-pulmonologists ($p = 2.10^{-3}$). Factors independently associated with proposal of ICU admission were Performance status ≤2 (OR, 10.70; 95 % CI, 3.98 to 28.69), absence of progression of the malignancy (OR, 6.58; 95 % CI, 2.10 to 20.62) and severity of acute disease (logistic organ dysfunction ≥2) (OR, 8.31; 95 % CI, 3.01 to 22.96). Among patients offered to intensive care unit admission, 36 (73 %) were admitted to the ICU.

Median survival of the cohort was 5 days [IQR:3–8, minimum:0, maximum:750]. Patients admitted in ICU had a better prognosis ($p = 0.03$). Predictors of outcome were good chronic health status ($p < 10^{-4}$), metastatic disease ($p = 0.03$) and absence of progression of malignancy ($p = 0.02$). Interestingly, in multivariate analysis, ICU admission was not associated with outcome.

CONCLUSIONS. Lung cancer patients with organ dysfunction were proposed for ICU admission in only 35 % of cases in our teaching hospital. Therefore, triage decision was very frequently perfomed by non intensivist physician without intensivist advice. When taking in account severity of acute illness and performance status, ICU admission was no longer associated with a better prognosis.

GRANT ACKNOWLEDGMENT. This project has received funding from Cancéropole Lyon Auvergne Rhône-Alpes (CLARA).

0409

SURVIVAL OF HEMATOLOGICAL PATIENTS AFTER DISCHARGE FROM THE INTENSIVE CARE UNIT

T. Bernal[1], E.V. Pardavila[1], J. Bonastre[2], I. Jarque[2], M. Borges[3], J. Bargay[3], J.I. Ayestarán[4], J. Insausti[5], P. Marcos[6], V. González-Sanz[7], G.M. Albaiceta[1]

[1]Hospital Universitario Central de Asturias, Oviedo, Spain, [2]Hospital Universitario La Fe, Valencia, Spain, [3]Hospital Son Llatzer, Palma de Mallorca, Spain, [4]Hospital Universitario son Espases, Palma de Mallorca, Spain, [5]Hospital de Pamplona, Pamplona, Spain, [6]Hospital Germans Trias i Pujol, Badalona, Spain, [7]Hospital Universitario Miguel Servet, Zaragoza, Spain

INTRODUCTION. Survival of hematological patients admitted to the ICU has improved, but information regarding prognostic factors related to long term survival after ICU stay is scarce.

OBJECTIVES. To identify factors related to long-term outcome in hematological patients after ICU discharge.

METHODS. Prospective, observational study involving 161 hematological patients admitted to the ICU of which 63 were discharge alive and submitted to long-term follow up. Data on performance status, received treatments and outcome of the underlying disease were collected. After univariate comparisons, significant variables were analyzed using multivariate techniques (Cox regression and multinomial analysis).

RESULTS. Mortality after ICU discharge was 61 %. Median follow up was 18 (1–54) months. Median survival was 18 (1–54) months. In the multivariate analysis, a diagnosis of lymphoma (Odds ratio 0.27 [0.09–0.85]), an ECOG > 2 at ICU discharge (Odds ratio 9.36 [3.80–23.06]) and discontinuation of the planned treatment for the hematological disease (Odds ratio 11.72 [3.14–43.77]) were independently related to mortality. A history of hypertension, high APACHE-II score, prolonged mechanical ventilation and ECOG > 2 at ICU discharge decreased the probability of receiving the planned therapy for the hematological malignancy.

CONCLUSIONS. Both ICU care and post-ICU management determine the long-term outcome of hematological patients who are discharged alive from the ICU.

0410

OUTCOME IN CRITICAL ILL PATIENTS WITH NEWLY DIAGNOSED HEMATOLOGICAL MALIGNANCIES WHO RECEIVED CHEMOTHERAPY IN THE INTENSIVE CARE UNIT

F. Arméstar[1], S. Vives[2], M. Eduard[1], C. Ferra[2], P. Marcos[1], Y. León[1], A. Salcedo[1], E. Benveniste[1], M. Morgades[2], M. Batlle[2], J.M. Sancho[2], B. Xicoy[2], J. Klamburg[1], J.M. Ribera[2]

[1]Hospital Universitari Germans Trias i Pujol, Badalona, Spain, [2]ICO-Hospital Universitari Germans Trias i Pujol, Badalona, Spain

INTRODUCTION. The decision to start chemotherapy in critically ill cancer patients is extremely complex in the intensive care unit.

OBJECTIVES. To assess the outcome in critically ill patients with hematological malignancies who receive intravenous chemotherapy in an intensive care unit (ICU) for a life-threatening malignancy-related complication.

METHODS. Retrospective observational study of prospectively collected data in only one center. Between January 2000 and December 2012, 232 patients with hematological malignancies were admitted to the ICU. Eighteen (8 %) required intravenous chemotherapy during the admission (mean age 53 [23–75] years, 12 were man [67 %]). Eleven were acute myeloid leukemia, 5 lymphoproliferative disorders and 2 acute lymphoblastic leukemia. All of them newly diagnosed.

RESULTS. Thirteen (72 %) patients were admitted to the ICU with respiratory failure, 4 (22 %) with septic shock and 1 (6 %) with coma caused by cerebral hemorrhage. Eight (44 %) patients received chemotherapy because of hyperleucocytosis, 3 (17 %) tumor lysis syndrome, 3 (17 %) severe disseminated intravascular coagulation, 3 (17 %) pulmonary infiltration, and 1 (5 %) mediastinal bulky tumor. The median APACHE at the ICU admission was 23 [14–40]. During ICU stay, 13 patients required vasopressors and 4 patients required renal replacement therapy. Seventeen (94 %) patients required mechanical ventilation, the remaining patient required noninvasive mechanical ventilation. Fifteen patients presented hepatic failure (bilirubin >2 mg/dl and/or transaminases >100 U/L). Thirteen (72 %) patients presented a documented infection [7 because a Gram-negative (GN), 2 Gram-positive (GP), 3 GN and GP, one fungal infection]. Seven (39 %) patients died in ICU: death occurred due to cerebral hemorrhage (2 patients), respiratory failure (2 patients) and septic shock (3 patients). Eleven (66 %) patients were discharged from ICU but 2 patients died in Hematologist Department because of septic shock and early relapse, respectively. So in-hospital mortality was 50 %. Six (33 %) patients are alive in complete remission with a median follow up of 42.13 months (range 1.80–140.93).

CONCLUSIONS. Chemotherapy in the ICU for critically ill patients with newly diagnosis of hematology malignancy can be considered even when infection or organ failure is present.
REFERENCE(S) 1. Song JU. Suh GY, Chung MP, et al. Risk factors to predict outcome in critically ill cancer patients receiving chemotherapy in intensive care unit. Support Care Cancer. 2011;19:491–95. 2. Benoit DD, Depuydt PO, Vandewoude KH, et al. Outcome in severely ill patients with hematological malignancies who received intravenous chemotherapy in the intensive care unit. Intensive Care Med. 2006;32:93–9.
GRANT ACKNOWLEDGMENT. Supported in part by FISS PI070444, RD06/0020/1056 of the RTICC and PEF 2011 of the FJC grants.

0411
SEVERE PNEUMONIA IN CANCER PATIENTS: CLINICAL OUTCOMES AND A COMPARISON BETWEEN HEALTHCARE-ASSOCIATED PNEUMONIA AND COMMUNITY-ACQUIRED PNEUMONIA

L. Rabello[1], M. Soares[1,2,3], L. Azevedo[4], J.R. Lapa e Silva[1], I.A. Souza[4], J. Salluh[1,2,3]

[1]Postgraduate Program of Internal Medicine - Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil, [2]D'Or Institute for Research and Education, Rio de Janeiro, Brazil, [3]Postgraduate Program of Oncology - Instituto Nacional de Cancer, Rio de Janeiro, Brazil, [4]ICU, Hospital Sirio-Libanes, São Paulo, Brazil
INTRODUCTION. Severe pneumonia is a major source of mortality for cancer patients. Despite the knowledge on prognostic few studies thoroughly addressed the impact of CAP and HCAP classification or specific cancer-related factors in this population.
OBJECTIVES. The aims of this study were to describe the characteristics and outcomes of cancer patients with severe pneumonia classified according to the ATS CAP/HCAP definitions.
METHODS. A prospective cohort study performed from 2002 to 2011 at Instituto Nacional de Cancer and Hospital Sirio-Libanes, Brazil. Consecutive adult patients with cancer and presenting with pneumonia were enrolled. Demographic, clinical data were collected during the first day of ICU including CURB-65, SAPS II, SOFA score, comorbidities, Performance Status, and cancer-related data.RESULTS A total of 268 patients were admitted in the ICU with pneumonia and were divided into CAP (n = 109/ 40.7 %) and HCAP (n = 159/59.3 %). There were 189 (70.5 %) patients with solid tumors and 81 (30.2 %) patients with hematological malignancies. 167 (62.3 %) patients had septic shock, 205 patients (76.5 %) were mechanically ventilated (MV) and 68 (25 %) patients received renal replacement therapy (RRT). ICU, hospital, 6 month mortality rates were 45.5, 67.9, 75 % respectively. When we compared CAP and HCAP, we observed that low-grade hematologic malignancy [CAP 10 (9.2 %) vs HCAP 31 (19.5 %) p 0.02], neutropenia at admission [5 (4.6 %) vs 27 (16.9 %) p 0.0019], steroids use before hospital admission [18 (16.5 %) vs 69 (43.4 %) p 0.0001] and noninvasive ventilation (NIV) [21 (19.26 %) vs 49 (30.81 %) p 0.04] were more frequent in HCAP. There were no significant differences between the two groups regarding age [CAP 68 (58–75.5) vs HCAP 64 (54–73) p 0.09], Charlson comorbidity index [3 (2–4) vs 3 (2–6) p 0.10], SOFA score D1 [7 (5–11) vs 7 (4–10) p 0.42] and hospital mortality [72 (66 %) vs 110 (69.2 %) p 0.59]. In univariate analysis, poor performance status (2–4) [Survivors 31 (36 %) vs Nonsurvivors 92 (50.5 %) p 0.03], septic shock at ICU admission [29 (33.7 %) vs 138 (75.8 %) p 0.0001], higher CURB-65 [31 (36 %) vs 92 (50.5 %) p 0.03], high levels of severity illness scores [SOFA in the first ICU day—6 (3–7.25) vs 8 (5–11) $p < 0.0001$ and SAPS II—40.5 (33–50.25) vs 52 (42–65) $p < 0.0001$], MV use [40 (46.5 %) vs 165 (90.6 %) p 0.0001], NIV failure [51 (59.3 %) vs 167 (91.76 %) p 0.0001] and RRT [4 (4.6 %) vs 64 (35.2 %) p 0.0001] were more frequent in non-survivors. Microbiological data was comparable between CAP and HCAP.
CONCLUSIONS. Severe pneumonia in cancer patients is associated with an exceedingly high mortality. The classification based on ATS CAP/HCAP definitions does not help physicians to guide antimicrobial therapy or predict hospital mortality. Cancer patients are a distinct group of patients with pneumonia with specific characteristics, predictors of outcome and mortality that may not be comparable to other groups of HCAP patients.

0412
PROGNOSTIC FACTORS IN HEMATOLOGICAL PATIENTS ADMITTED TO THE INTENSIVE CARE UNIT: LONG-TERM SINGLE CENTER EXPERIENCE

M. Rinaudo[1], C. Fernández de Larrea[2], P. Castro[1], M. Suárez-Lledó[2], S. Fernández[1], J.M. Pericas[1], D. Monzon[1], M. Rovira[2], J. Esteve[2], J.M. Nicolás[1]

[1]Hospital Clínic, Medical Intensive Care Unit, Barcelona, Spain, [2]Hospital Clínic, Department of Hematology, Barcelona, Spain
INTRODUCTION. The prognosis of hematological patients admitted to the intensive care unit (ICU) has improved in recent years. However, there is still some controversial data regarding prognostic factors of such patients.
OBJECTIVES. The aim of this study was describe survival outcomes of patients with haematological diseases requiring ICU admission in the last decade.
METHODS. A cohort of patients with hematologic diseases consecutively admitted to a medical ICU in the period 2000–2008 was retrospectively reviewed to identify clinically useful prognostic factors. Medical reports were reviewed, registering main demographical, clinical and laboratory variables.
RESULTS. We included 231 patients (128 M/103F, median age 52 years, range 17 to 83). Ninety-three percent of the patients had haematological malignancies, 40 % had undergone stem-cell transplantation (SCT), mainly allogeneic (75 %), and at least one half of the patients were receiving first-line treatment for their disease at the time of ICU admission. Haematological features associated with a worse overall survival were being admitted from the haematological unit, relapsed disease and allogeneic SCT, whether neutropenia or thrombocytopenia at ICU admission were associated to worse survival in ICU. In contrast, intensity of previous chemotherapy, autologous SCT or having acute leukemia had not impact in survival. ICU factors associated with shorter ICU survival were APACHE II and SOFA scores, previous use of antibiotics, antifungals or a previous microbiological isolation, mechanical ventilation and renal replacement therapy. Multivariate analysis showed mechanical ventilation, allogeneic SCT and relapsed disease as factors associated with both ICU and overall survival, whereas admission year (better in the recent years) was associated only with overall survival.
CONCLUSIONS. The prognosis of critically ill haematological patients is associated to previous allogeneic SCT, relapsed disease and mechanical ventilation. Autologous SCT or acute leukemia presented similar mortality than other hematologic diseases or less intensive therapies.

0413
OUTCOME OF PATIENTS WITH SOLID TUMOURS ADMITTED TO INTENSIVE CARE WITH A MEDICAL DIAGNOSIS

K.A. Puxty[1], D. Morrison[2], J. Kinsella[1], T. Quasim[1]

[1]University of Glasgow, Department of Anaesthesia, Glasgow, UK, [2]University of Glasgow, Public Health, Glasgow, UK
INTRODUCTION. In the past, admission of cancer patients to the intensive care unit (ICU) was considered controversial due to the high mortality rates in this group of patients. More recently this effect appears to be diminishing possibly due to improvements in patient selection and supportive care [1, 2]. However, studies of patients with solid tumours include a large proportion of surgical patients in whom ICU outcomes are favourable.[2].
OBJECTIVES. We planned to describe the demographic and survival outcomes of cancer patients with solid tumours admitted to ICU with a medical diagnosis.
METHODS. Following ethical approval we linked data from the clinical databases of four local ICUs between 1/1/2000 to 31/12/2009, to the West of Scotland Cancer Registry to produce a dataset of patients who have had cancer and an admission to ICU. The dataset was restricted to only include those admitted to ICU with a medical diagnosis and a solid tumour diagnosed within the 5 years prior to or during the ICU admission. We created a second dataset of patients who have been admitted to ICU with a medical diagnosis but have never had cancer.
RESULTS. There were 1,717 patients (10.9 %) that were identified as having a solid tumour of which 345 patients (20.1 %) had a medical cause for admission. When compared with the non-cancer population, patients with cancer were older, mean age 63.1 years (SD 14.0) vs 52.3 years (SD 17.3) $p < 0.0001$, with a higher APACHE II score, 23.4 (SD 7.7) vs 20.9 (SD 8.8) $p < 0.0001$. ICU mortality was higher in the cancer group (45.8 vs 30.6 % $p < 0.0001$) as was hospital mortality (57.7 vs 38.2 % $p < 0.0001$). This higher ICU mortality appears to be maintained with varying APACHE II score (Figure 1). ICU mortality increased with the number of organs being supported and remained higher in the cancer group. (Table 1).

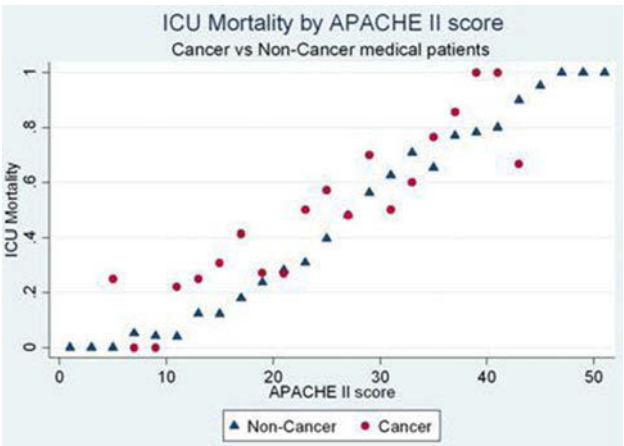


Figure 1

	CANCER PATIENTS IN ICU		NON CANCER PATIENTS IN ICU		*P VALUE
Organ support (Mechanical ventilation or vasoactive drugs or RRT)	Number of patients (%) n=342	ICU Mortality*	Number of patients (%) n=5116	ICU Mortality*	
No organ support	32 (9.4%)	12.5%	624 (12.2%)	5.3%	0.09
Single organ support	140 (40.9%)	30.7%	2163 (42.3%)	15.3%	*<0.001*
Two organ support	137 (40.1%)	63.5%	1764 (34.5%)	52.6%	*0.02*
Three organ support	33 (9.6%)	72.7%	565 (11.0%)	52.2%	*0.02*

Table 1

CONCLUSIONS. This data suggests that the prognosis of medical cancer patients admitted to ICU is not equivalent to those without cancer. These differences in mortality require further exploration.
REFERENCE (S) 1. Taccone FS, Artigas AA, Sprung CL, et al. Characteristics and outcomes of cancer patients in European ICUs. Crit Care. 2009;13:R15. 2. Soares M, Caruso P,

Silva E, et al. Characteristics and outcomes of patients with cancer requiring admission to intensive care units: a prospective multicenter study. Crit Care Med. 2010;38:9–15.

Limitation of therapy: 0414–0427

0414

EVALUATION OF PERCEPTIONS AND KNOWLEDGE ABOUT BRAIN DEATH AND ORGAN DONATION

T. Pham[1], I. Coquet[1], C. Quesnel[2], J.-P. Fulgencio[2], M. Chastrusse[3], M. Fischler[3], E. Ferrand[1]

[1]Hôpital Foch, Equipe Mobile de Soins Palliatifs (EMASP), Suresnes, France, [2]Centre Hospitalier Universitaire Tenon, Réanimation, Paris, France, [3]Hôpital Foch, Anesthésie, Suresnes, France

INTRODUCTION. Every year, more than 200 patients in France die waiting for transplantation. In order to reduce organ shortage, potential organ donors should be identified by physicians in charge.

OBJECTIVES. Evaluate the knowledge of the French legal frame by physicians and their practice concerning organ donation of brain dead patients they might be in charge of.

METHODS. We sent 3200 QS to 800 units of anesthesia, general or specialized ICU (cardiology, neurology, pulmonology and nephrology) and Emergency department. Comparisons of proportions were made using Chi square tests; P values of 0.05 or less were considered statistically significant.

RESULTS. We sent 3200 QS to 800 units of anesthesia, general or specialized ICU (cardiology, neurology, pneumology and nephrology), Emergency department; 890 senior physicians answered (27.9 %) including 41 % intensivists (I) and 59 % non-intensivists (NI).

Most of surveyees would donate their organs (89 %) or would agree to donate their relatives organs (78 %); they also strongly agree with this public health mission (96 %); 84 % already had to deal with a brain dead patient (98 % of the intensivists and 74 % of the non-intensivists, $P < 0.001$); 11 % doubt that patients fulfilling brain death criteria are really dead (5 % of the intensivists and 14 % of the non-intensivists, $P < 0.001$). Physicians knowledge and practice are summarized in table 1 & 2.

Agree not to treat this complication

	Total (n = 890)	I (n = 361)	NI (n = 529)	P
Septicemia	22 %	29 %	18 %	<0.001
Pneumonia	17 %	23 %	14 %	<0.001
Severe desaturation	18 %	22 %	15 %	0.006
Arterial Hypotension	18 %	20 %	17 %	0.22
Cardiac Arrest	41 %	45 %	35 %	<0.001
At least 1 complication	48 %	56 %	43 %	<0.001
All these complications	10 %	16 %	6 %	<0.001

CONCLUSIONS. Our study confirms that there is a lack of knowledge of the brain death identification by concerned physicians. It reveals insufficient treatments for brain dead patients in order to optimize the number of organ donors. These results should urge the French Biomedical Agency to extend the training policy for the organ donation issues among the entire medical community.

REFERENCE(S) 1. Décret no. 96–1041 relatif au constat de la mort préalable au prélèvement d'organe, de tissus et de cellules à des fins thérapeutiques ou scientifiques, du 2 Décembre 1996, J.O du 4 Décembre 1996.

0415

ICU-ADMISSION REFUSAL: A FREQUENT TYPE OF LIMITING LIFE-SUSTAINING THERAPY IN PATIENTS WITH CO-MORBIDITY AND POOR OUTCOME

E. García[1], R. Suarez[2], M.E. Fuentes[3], M.A. Sánchez-González[4], J.M. Campos[2], M. Sánchez[5], P. Albert[6]

[1]Hospital Universitario del Sureste, Intensive Care Unit, Arganda del Rey, Spain, [2]Hospital Clínico San Carlos, Intensive Care Unit, Madrid, Spain, [3]Hospital Clínico San Carlos, Investigation Unit, Madrid, Spain, [4]Universidad Complutense de Madrid, Facultad de Medicina, Madrid, Spain, [5]Hospital Clínico San Carlos, Madrid, Spain, [6]Hospital Universitario del Sureste, Arganda del Rey, Spain

INTRODUCTION. Limiting life-sustaining therapy (LLST) is a common practice in Intensive Care Units (ICU). Rejecting ICU-admission is common, but frequency and rationale aren't well known.

OBJECTIVES.

1. To describe clinical characteristics of patients refused to ICU.
2. To know the frequency, decision-making and factors related to these decisions.

To assess patient's outcome and prognosis.

METHODS. Prospective observational study including consecutive patients referred to Intensive Care Service (ICS) during a year. We excluded scheduled surgery and sudden cardiac arrest.

SETTING. University tertiary care hospital. We recorded age, gender, diagnose categories on triage, underlying chronic disease, dependence for daily living activities, hospital length of stay, mortality rate, arguments, agreement and care recommendations. We collected data from ICS enquiry forms, medical history and discharge/exitus reports. Qualitative variables are expressed as percentage and quantitative ones as mean (± SD) if normal distribution or median (interquartile range) when skewed. We considered significant values $p < 0.05$.

RESULTS. 1. Characteristics: We examined 803 patients. 454 (56.54 %) were admitted to ICU, 228 (28.39 %) were considered too well to benefit and 121 (15.68 %) were denied to ICU. 69 (57 %) patients refused were male, mean age 74 ± 12.24 years, median de 77 (69–83) years. 108 (89.26 %) suffer from underlying diseases (most frequently respiratory, cardiac and malignancy) and 46 (38 %) were dependent for daily living activities. Hospital length of stay was 13 (4–30) days. Diagnose categories were: pulmonary disease (without infectious exacerbation) 37 (30.58 %), sepsis 33 (27.27 %), cardiac disease 32 (26.45 %) and neurological disease 16 (13.22 %).

2. Consensus and decision-making: 7 competent patients were involved in forgoing ICU admission; 42 (58.33 %) relatives and 23 (31.94 %) attending physicians (when family missed) agreed. Rationales considered (usually more than one) were underlying disease 109, bad prognosis 91, poor quality of life 66, age 64 and futility 29. Elderly was never the only one reason. ICS written recommendations were: "non invasive therapy" 118, "improve pharmacological treatment" 30, "assure comfort" 15, "limitation of therapeutic effort" 5, "do-not resuscitate order" 5 and "palliative care" 1.

3. Outcome: Hospital mortality rate was 63.44 %. 23 patients were discharge from hospital to home, 9 required medical and nursing assistance at home (including home ventilators), 5 were discharge to long-term hospital or chronic-patients institutions and 3 patients needed home help for basic self-care and instrumental daily living activities. 18 (40.9 %) survival patients needed a new hospital admission, 9 of them (50 %) in the first month after discharge.

CONCLUSIONS. ICU-admission refusal is common and related to age, underlying end-stage diseases and dependency. It involves high mortality and poor outcome.

0416

PREDICTED FACTORS FOR ICU-ADMISSION REFUSAL IN AN UNIVERSITY TERTIARY CARE HOSPITAL

E. García[1], R. Suarez[2], M.E. Fuentes[3], M.A. Sánchez-González[4], J.M. Campos[5], M. Sánchez[5], P. Albert[1]

[1]Hospital Universitario del Sureste, Intensive Care Unit, Arganda del Rey, Spain, [2]Hospital Clínico San Carlos, Madrid, Spain, [3]Hospital Clínico San Carlos, Investigation Unit, Madrid, Spain, [4]Universidad Complutense de Madrid, Facultad de Medicina, Madrid, Spain, [5]Hospital Clínico San Carlos, Intensive Care Unit, Madrid, Spain

OBJECTIVES. The aim of this study is to analyze ICU-admission refusal as a type of limiting life-sustaining therapies (LLST) and to identify predictive factors associated.

METHODS. Prospective observational study including consecutive patients with decision of LLST by Intensive Care Service during a year. We excluded brain death and sudden cardiac arrest.

SETTING. University tertiary care hospital (1,193 beds, 46 ICU-beds). We analyzed influence of age, gender, diagnostic categories on triage, underlying chronic disease (defined by Knauss)[1] and dependence for daily living activities on LLST decisions, searching univariate associations. We developed a multivariate predictive model for ICU-admission refusal by logistic regression.

RESULTS. We included 281 patients, 161 admitted in the ICU and 120 rejected. Baseline characteristics are shown in Table 1. Univariate analysis identified as independent factors related to ICU-admission refusal: dependence ($p < 0.001$), underlying chronic disease ($p < 0.001$), respiratory diagnose group (without infectious exacerbation) ($p < 0.001$) and age (p 0.011), latest one with a lineal trend. Patients with cardiovascular disorders (p 0.017) and septic disease (p 0.011) were more likely to be admitted in ICU.

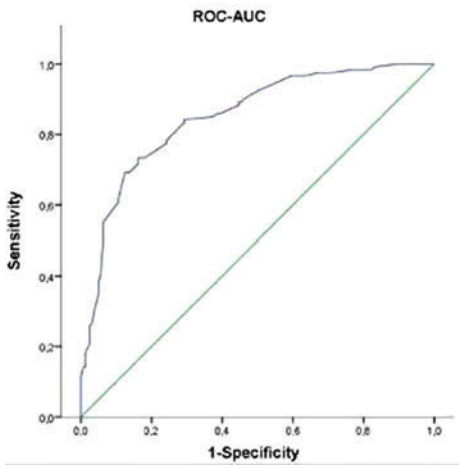
Baseline characteristics of studied population

Variables	ICU admitted (n 161)	ICU refused (n 120)
Male*	103 (53.9 %)	69 (57 %)
Age** (years)	70.95 ± 12.242	74 ± 12.245
Underlying disease*	97 (50.8 %)	108 (89.26 %)
Dependence*	12 (6.3 %)	46 (38 %)
Respiratory diagnose*	12 (7.5 %)	36 (30 %)
Cardiovascular diagnose*	65 (40.37 %)	32 (26.6 %)
Neurological diagnose*	68 (42.24 %)	33 (27.5 %)

Multivariate logistic regression analysis identified as independent factors related to ICU-admission refusal: dependence (OR 8.032, IC $_{95\ \%}$ 3.504–18.410; $p < 0.001$), underlying chronic disease (OR 8.914, IC $_{95\ \%}$ 4.061–19.570; $p < 0.001$), age 76–81 years (OR 2.497, IC $_{95\ \%}$1.031–6.051; p 0.043), age ≥82 years.

(OR 4.132, IC $_{95\ \%}$ 1.643–10.393; p 0.003), respiratory diagnose group (OR 7.254, IC $_{95\ \%}$ 2.961–17.770;

$p < 0.001$) and neurological diagnose group (OR 6.165, IC $_{95\ \%}$ 1.994–19.064; p 0.002). The model predictive yield was: sensitivity 73.3 % and specificity 82 %, with an area under receiver operating characteristics curve (ROC AUC) of 0.851 (0.806–0.896); $p < 0.001$ (Figure 1).



ROC-AUC: individual probability of ICU refusal

CONCLUSIONS. Refusal of ICU admission in our population was correlated with underlying disease, dependence, age 76–81, age ≥82, respiratory and neurological diagnose groups.

REFERENCE(S) Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification system. Crit Care Med. 1985;13(10):818–29.

0417

HOSPITAL AND 1-YEAR MORTALITY RATES FOR PATIENTS WITH LIMITATION OF LIFE-SUSTAINING TREATMENT, CONSIDERING ICU-ADMISSION

E. García[1], R. Suarez[2], M.E. Fuentes[3], M.A. Sánchez-González[4], J.M. Campos[2], M. Sánchez[2], P. Albert[1]

[1]Hospital Universitario del Sureste, Intensive Care Unit, Arganda del Rey, Spain, [2]Hospital Clínico San Carlos, Intensive Care Unit, Madrid, Spain, [3]Hospital Clínico San Carlos, Investigation Unit, Madrid, Spain, [4]Universidad Complutense de Madrid, Facultad de Medicina, Madrid, Spain

OBJECTIVES.
1. To describe hospital and 1-year mortality rates for patients with decisions of limiting life-sustaining therapy (LLST) considering ICU admission or not.
2. To estimate 1-year survival functions for these groups.

METHODS. Prospective observational study including consecutive patients with decision of LLST by Intensive Care Service during a year. We excluded brain death and sudden cardiac arrest.

SETTING. University tertiary care hospital (1,193 beds, 46 ICU beds). We recorded age, gender, diagnose categories on triage, underlying chronic disease, dependence for daily living activities, hospital length of stay, ICU admission, hospital mortality rate and 1-year mortality rate. Univariate study was performed using Student's T test for quantitative variables with normal distribution or non-parametric test U-MannWhitney when not, and χ^2 or exact Fisher's test for qualitative ones. A logistic regression was used to examine association between mortality and studied factors. Survival patients discharged from hospital were followed up during a year since LLST decision for estimating surviving functions by Kaplan–Meier's method.

RESULTS. We included 281 patients (baselines characteristics are shown in Table 1).

Studied population's baseline characteristics

Variable	Dead (n 224)	Alive (n 57)
Male*	129 (57.59 %)	27 (47.37 %)
Age** (years)	72.11 ± 11.73	73.53 ± 12.75
ICU admission*	161 (57.29 %)	120 (42.71 %)
Underlying disease*	148 (66.1 %)	45 (78.95 %)
Dependence*	38 (16.96 %)	19 (33.33 %)
Septic diagnose*	86 (38.39 %)	15 (26.31 %)
Cardiovascular diagnose *	76 (33.93 %)	21 (36.84 %)
Hospital length of stay	14.5 (4–34.75)	17 (11–37)

224 patients (79.7 %) died in hospital and 1-year mortality rate increased till 84 % (236/281). When compared considering ICU admission, hospital mortality was 91.3 % for admitted and 63.77 % for rejected patients and 1-year mortality: 94.4 and 70 % respectively. Univariate analysis identified as independent factors associated with *hospital mortality:* ICU-admission ($p < 0.001$) and daily living activities dependence (p 0.006) and with *1-year mortality:* ICU-admission ($p < 0.001$) and daily living activities dependence (p 0.018). Multivariate logistic regression analysis identified "ICU-admission" as significant independent factor related to both *hospital mortality* (OR 6.36; IC $_{95\ \%}$ (2.793–14.485). $p < 0.001$) and *1-year mortality* (OR 6.36; IC $_{95\ \%}$ (2.793–14.485). $p < 0.001$. Kaplan–Meier's survival functions were estimated for all patients with LLST decision and considering ICU-admission. (Graphic functions will be shown).

CONCLUSIONS. Patients with decisions of LLST had high hospital and 1-year mortality rates. Independent factors related to mortality were dependence and ICU admission. An accurate identification of patients who might benefit from ICU admission would avoid unnecesary suffering, would improve care and would carry a significant outcome impact.

0418

DO NOT ATTEMPT RESUSCITATION DECISIONS IN THE PREHOSPITAL SETTING

K. Fortounis[1], B. Fyntanidou[1], E. Amaniti[1], V. Ourailoglou[1], M. Aggou[1], D. Chlorou[1], V. Grosomanidis[1]

[1]National Emergency Medical System, Thessaloniki, Greece

INTRODUCTION. Prehospital Emergency Care Providers are commonly confronted with ethical conflicts such as do not attempt resuscitation decisions (DNAR), duration and termination of cardiopulmonary resuscitation (CPR). Although there are published guidelines concerning the ethical issues of resuscitation, physicians' attitude towards resuscitation varies[1,2].

OBJECTIVES. The purpose of this study was to report ethical dilemmas faced in Thessaloniki by the National Emergency Medical System (EMS-EKAB) of Greece, which is a two-tiered EMS system.

METHODS. 1,754 patients (1,349♂/405♀) with a mean age of 60.6 ± 14.5 who suffered prehospital cardiac arrest (CA) and were treated by Thessaloniki EMS personnel during the period from 01.01.2000 to 31.03.2005 were included in this study. All data were recorded in accordance to the Utstein style principles. Data were initially collected in a paper-based system and then transferred in an electronic base.

RESULTS. In 1,557 (88.6 %) cases CA was of cardiac origin. 1,240 (70.7 %) cases of CAs occurred at home, 64 (3.6 %) at work, 321 (18.3 %) in a public place and 129 (7.4 %) elsewhere. Resuscitation was attempted in 1,489 (84.9 %) cases of CA, whereas in 265 (15.1 %) a DNAR decision was made. Return of spontaneous circulation (ROSC) was achieved in 602 (40.4 %) patients, in 710 (47.7 %) CPR was discontinued and 177 (11.9 %) patients were transferred to the emergency department under ongoing CPR. Mean duration of CPR in the prehospital setting was 42.2 ± 15 min. Reasons for DNAR were prolonged CA at the time of EMS arrival without implementation of bystander CPR, obvious evidence of irreversible death (Post mortem lividity/Rigor mortis), or end stage malignant and other severe chronic diseases. Discontinuation of CPR was decided in cases of prolonged unsuccessful CPR. Transportation of patients under ongoing CPR was reserved for patients with a new episode of CA after initial in-field ROSC or in cases where physicians hesitated to cease resuscitation efforts. ROSC was not achieved in any of these patients. Thorough information was provided to the relatives of the patients for whom DNAR was decided. Negative reactions or any hostile behavior and conflicts were not elicited in any case.

CONCLUSIONS. According to our study, it seems that, despite some practical difficulties, DNAR decisions can and also should be established even in the prehospital setting. Moreover, transportation of CA patients under ongoing CPR seems to be futile and should therefore be reconsidered.

REFERENCE(S) 1. Lippert F, Raffay V, Georgiou M, Bossaert L. European Resuscitation Council Guidelines for Resuscitation 2010 Section 10. The ethics of resuscitation and end-of-life decisions. Resuscitation. 2010;81:1445–51. 2. Baskett P, Lim A. The varying ethical attitudes towards resuscitation in Europe. Resuscitation. 2004;62:267–273.

0419

TEACHING MEDICAL STUDENTS TO COMMUNICATE WITH RELATIVES ABOUT DEATH AND DYING IN THE ICU: DEVELOPMENT OF A PEER-TUTORED COMMUNICATION WORKSHOP

L. Dorner[1], H. Skupin[2], S. Philipp[3], D. Schwarzkopf[1], C.S. Hartog[1,2]

[1]Jena University Hospital, Center for Sepsis Control and Care, Jena, Germany, [2]Jena University Hospital, Department of Anesthesiology and Intensive Care, Jena, Germany, [3]Jena University Hospital, Institute for Psychosocial Medicine and Psychotherapy, Jena, Germany

INTRODUCTION. Relatives of patients dying in the ICU experience psychologic strain; effective end-of-life (EOL) communication may help to reduce their psychological burden [1,2]. However, EOL communication skills are not commonly taught.

OBJECTIVES. To develop and evaluate a communication workshop teaching EOL communication with relatives of patients dying in the ICU.

METHODS. Experienced intensivists developed content and structure of a voluntary workshop and trained two 5th–6th year student tutors. Nine core elements of EOL communication were developed, including 4 information elements (create common information base, share medical information effectively, explain death and dying in the ICU, make clear arrangements) and 5 items for emotional support [1, 2] (Value family statements, Acknowledge emotions, Listen to the family, Understand the patient as a person and Elicit questions). Based on a fictive patient, a handout was prepared with ready-to-use sentences for each communication element. The workshop included a theoretical and a practical part based on effective teaching modules [3]. Tutors used pictures to convey the relatives' shock and emotions, explained deficits of complex language and explained the core elements of EOL communication using the written handout. Students then entered into pair-wise role play with alternating roles of physician and relative. Afterwards, tutors gave structured feedback. Students rated their self-efficacy before and after the workshop on a 5-point scale (1-very poor; 5-very well), which addressed the 9 core elements and 2 additional items (tolerating strong emotions, satisfaction with own communication). In addition, students rated peer teaching, content and organization of the workshop on a 6-point scale of 1 (very poor) to 6 (excellent).

RESULTS. Forty students (54 % female) took part, 10 from 1st-year (24 %), 8 from 2nd- and 3rd year, respectively (20 % each) and 11 (26 %) from 4th-year. Students rated their self-efficacy significantly higher after the training than before in almost all items. Largest improvements were found for "create a common information base" and "talk about death and dying" (median [IQR] 3 [3, 4] vs. 5 [4, 5] and 3 [2, 4] vs. 4.5 [4, 5], both $p < 0.001$). Teaching and organization received overall very good to excellent ratings. Verbal comments highlighted the need for and efficacy of this workshop.

CONCLUSIONS. A 90-min workshop using role-play and peer-assisted learning was effective to increase medical students' self-rated end-of-life communication skills. To increase student participation, end-of-life communication skills teaching should be embedded as compulsory module into a structured communication curriculum.

REFERENCE(S) 1. Curtis et al. Chest. 2008;134:835–43. 2. Lautrette et al. N Engl J Med. 2007;356:469–78. 3. Maguire et al. BMJ. 2002;325:697–700.

GRANT ACKNOWLEDGMENT. Funded by the German Ministry of Education and Research, grant no. 01 E0 1002.

0420

EXPERIENCE OF RESIDENTS AND FELLOWS WITH ICU END-OF-LIFE CARE: A NATIONWIDE SURVEY

M. Darmon[1], G. Ducos[2], I. Coquet[2], M. Resche-Rigon[3], M. Paries[2], H. Ksibi[2], M. Chaize[2], B. Schlemmer[2], E. Azoulay[2], Famirea Study Group

[1]Saint-Etienne University Hospital, Medical-Surgical ICU, Saint-Etienne, France, [2]Saint-Louis University Hospital, Medical ICU, Paris, France, [3]Saint-Louis University Hospital, Department of Biostatistics, Paris, France

INTRODUCTION. Intensivists seek to provide the appropriate level of care, based on patient's (-relative's) values and on accurate prognostic estimation. Withdrawing and withholding life sustaining therapies, integrating palliative care, and avoiding non-beneficial ICU admissions are now part of intensive care. Studies have reported on the difficulties that ICU physicians have to cope with during end-of-life (EoL) care. However, little is known on knowledge, skills and needs of junior intensivists as regard to these issues.

OBJECTIVES. To report on junior intensivist experience with end-of-life care, and to assess the impact of formal academic training on Junior's needs.

METHODS. Telephones survey before (2007—period 1) and 5 year after (2012—period 2) the implementation of a formal academic training on EoL. Collected items included.
1/self-assessed knowledge,
2/competence,
3/overall satisfaction with dying and death, as well as
4/global quality of the dying process.
A composite score has been built to depict optimal end-of-life care as indicated by the four domains.
Results are reported as medians (interquartile range, IQR) or numbers (%). Logistic regression was used to identify determinants of the perception of good end-of-life care, based on the composite score.

RESULTS. 429 junior intensivists were surveyed, 299 during period 1 (109 ICUs) and 130 during period 2 (49 ICUS). Most of the responders were residents (74.7 %), aged of 28 years (27–30). Respondents were of male gender more frequently during period 1 (64.5 vs. 50 % in period 2, $p = 0.002$).
Respondents reported more frequently having received a dedicated formation regarding EoL decision or triage during period 2 (38.5 vs. 17.3 % during period 1, $p < 0.0001$).
During period 2 respondents reported being less uncomfortable or having uncertainty regarding the EOL or triage process (17.7 vs. 38.9 % in period 1 [$P < 0.0001$] and 48.5 vs.69.4 % in period 1 [$P < 0.0001$] respectively). Self-assessed knowledge and skills with end-of-life care (likert scale from 0 to 10), were respectively lower and higher during period 2 [5 (4–6) vs. 6 (5–6), $P = 0.006$ and 6 (5–7) vs. 5 (5–6), $P = 0.05$].
Factors independently associated with good perception of the dying process (logistic regression) were age (OR 1.19 per year; 95 % CI 1.09–1.25) and male gender (OR 1.61; 95 % CI 1.05–2.47). Conversely, previous conflict with family members (OR 0.58; 95 % CI 0.0.37–0.87) and absence of formal training (OR 0.29; 95 % CI 0.17–0.50) were associated with a poor perception of this process.
CONCLUSIONS. This study adds information as regard to junior's experience with ICU EoLcare. Implementation of formal academic training and courses dedicated to EoL care is associated with a better perception of the dying process, may decrease uncertainty and increase junior's comfort. Studies assessing proactive training program are needed as well as qualitative data to understand which aspects of end-of-life care deserve specific skills.

0421
KNOWLEDGE AND PERCEPTIONS ABOUT THE COLLEGIAL PROCESS IN DECISIONS TO WITHHOLD/WITHDRAW LIFE SUSTAINING TREATMENTS AMONG FRENCH PHYSICIANS

T. Pham[1], I. Coquet[1], C. Quesnel[2], J.-P. Fulgencio[2], M. Chastrusse[3], M. Fischler[3], E. Ferrand[1]

[1]Hôpital Foch, Equipe Mobile de Soins Palliatifs (EMASP), Suresnes, France, [2]Centre Hospitalier Universitaire Tenon, Réanimation, Paris, France, [3]Hôpital Foch, Anesthésie, Suresnes, France
INTRODUCTION. Decisions to withdraw or withhold life sustaining treatments avoid therapeutic obstinacy. In France since 2005 a specific Law (the Leonetti Act) regulates these decisions when the patient is unable to express himself and the healthcare team must follow a collegial process with an interdisciplinary approach.
OBJECTIVES. The aim of this study was to evaluate what is the current knowledge of the collegial process in decision making among concerned physicians 7 years after the Leonetti Act.
METHODS. Multicenter observational study based on an anonymous questionnaire (QS) proposed to senior hospital physicians who might treat patients concerned by withdrawing or withholding decisions. The QS dealt with their knowledge, feelings and practice concerning withdrawing and withholding process. Comparisons of proportions were made using Chi square test, P values of 0.05 or less were considered statistically significant.
RESULTS. We sent 3,200 QS to 800 units of anaesthesia, general or specialized ICU (cardiology, neurology, pneumology and nephrology) and Emergency department; 890 senior physicians responded (27.9 %) including 41 % intensivists (I) and 59 % non intensivists (NI).
The collegial process criteria were declared to be known by 45 %, but only 25 % knew how to describe it; 28 % thought decision making could lead to conflict. Knowledge, actual practice and perceptions of the process are summarized in Table 1.

Table 1 Knowledge and respect of the collegial process

	Total (n = 890) (%)	I (n = 361) (%)	NI (n = 529) (%)	P
Declared to know the process	45	70	28	<0.001
Actual knowledge	25	27	6	<0.001
Consults the nurse	56	66	50	<0.001
Consults the relatives	47	67	34	<0.001
Know the surrogate part	57	69	49	<0.001
Advice of an external consultant	42	56	32	<0.001
Process traceability	65	83	54	<0.001
Strict observance of the process	28	35	24	0.001
Observance of the process except the advice of an external consultant	68	78	59	<0.001

CONCLUSIONS. Our study confirms that there is a lack of knowledge of the legal requirement of withdrawal/withholding decisions by concerned physicians. The impact of this ignorance appears to be subdued in practice, especially in ICU, except when an external consultant is involved, which seems to be a specific issue. A lot has to be done in order to ensure that laws are implemented.
REFERENCE(S). Journal Officiel 23 Avril 2005, 'Loi no 2005-370 du 22 avril 2005 relative aux droits des malades et à la fin de vie'.

0422
THE EXPERT-ICU STUDY: A FRENCH MULTICENTER STUDY OF ICU PHYSICIAN-BASED DETERMINANTS OF LIFE-SUSTAINING THERAPY DURING NIGHT AND WEEK-END SHIFTS

M. Ben-Rehouma[1], J.-F. Timsit[2,3,4], S. Ruckly[4], M. Darmon[3,5], C. Clec'h[3,6], C. Adrie[7], A. Tabah[1], E. Azoulay[3,8], M. Garrouste-Orgeas[1,3], Outcomerea Research Group

[1]Saint Joseph Hospital Network, Medical-Surgical ICU, Paris, France, [2]Albert Michallon University Hospital, Medical ICU, Grenoble, France, [3]Joseph Fourier University, Albert Bonniot Institute, La Tronche, France, [4]Outcomerea, Department of Statistics, La Tronche, France, [5]Saint-Etienne University Hospital, Medical ICU, Saint-Priest en Jarez, France, [6]Avicenne University Hospital, Medical ICU, Bobigny, France, [7]Cochin University Hospital, Department of Physiology, Paris, France, [8]Saint Louis University Hospital, Medical ICU, Paris, France
INTRODUCTION. Few studies of physician-related factors, experience, specialty, religion, ethnicity, and nationality exploring intensity of care were available.
OBJECTIVES. To describe patient's characteristics admitted during the night and week-end shift, to assess the physician-based determinants life sustaining treatments of patients admitted while adjusting on center effects.
METHODS. An observational study (2001–2009) was performed in six ICUs. The patient's characteristics were extracted from the prospective database Rhea (Outcomerea group). In September 2012, physicians answered a questionnaire on line exploring the following: age, gender, religion and religiosity, ICU experience, specialty, belonging to the staff or not. We used hierarchical mixed models to adjust on center and physician random effects.
RESULTS. Of the 9,627 ICU stays 2,181 (22 %) were deleted (lack of admission hour). Of the 166 physicians who participated in duties, 156 (93 %) physicians were contacted. The response rate was 119/156 (76 %). The ICU physicians were men (70 %), 41 ± 7.8 years old, catholic (51.3 %), with a background of 50 duties and over in 40 % of them before the first duty in the study center. Patients admitted during duties vs those outside the duty respectively had significantly less hematologic diseases and metastatic cancer (229/4,398; 5.2 % vs 261/4,230; 6.2 %) and (247/4,398; 5.6 % vs 269/4,230; 6.4 %; $p = 0.05$) or respiratory chronic diseases ($p < 0.001$). They were less mechanically ventilated (1,852/4,398; 42.3 % vs 1,952/4,230; 46.1 %, $p = 0.0004$), had less central catheter (1,859/4,398; 42.3 % vs 1,083/4,230; 48.1 %; $p < 0.0001$) or arterial catheters (1,313/4,398; 29.9 % vs 1,430/4,230; 33.8 %, $p < 0.0001$). ICU and hospital mortality were not different. When adjusted on center and physician random effects, SAPS II score was higher for ICU patients accepted by women [median (25–75 %)] [42 (29–58) vs 40 (28–54); $p = 0.004$] and physician without religion [42 (29–56) vs 39 (28–54); $p = 0.02$]. Similarly, during the first 48 h, physicians aged <35 years used more vasopressors (OR 1.15, 95 % CI 1.08–1.22, $p < 0.0001$), start renal replacement therapy (OR 1.04, 95 % CI 1.07–1.19, $p = 0.04$). Physicians with emergency care as primary specialty used invasive mechanical ventilation more frequently (OR 1.14, 95 %CI 1.04–1.24, $p = 0.004$). Physicians' religiosity was associated with more non-invasive mechanical ventilation (NIV) (OR 1.05, 95 % CI 1.01–1.09, $p = 0.008$) whereas, experience (>20 years of duty) was associated with less NIV (OR 0.91, 95 % CI 0.85–0.98, $p = 0.008$). At day 3–4, the only physicians' characteristic associated with withholding or withdrawing treatment was the admission by a physician who did not belong to the staff.
CONCLUSIONS. Patients admitted during the duty period had less comorbidities and received less intensity of treatment. Physicians-based determinants influencing life-sustaining treatments were age, religion, specialty, experience and not belonging to the ICU center team.

0423
TIMING, CONTENT AND IMPACT OF END OF LIFE DISCUSSIONS WITH PATIENTS AND FAMILIES IN ICU: PERSPECTIVES FROM ISRAEL AND THE UK

R. Endacott[1,2], F. de Keyser Ganz[3], J. Benbenishty[4], M. Ben Nunn[5], H. Ryan[6], W. Chamberlain[7], C. Boulanger[8], C. Boyer[1]

[1]Plymouth University, School of Nursing & Midwifery, Plymouth, United Kingdom, [2]Monash University, School of Nursing & Midwifery, Melbourne, Australia, [3]Hadassah Hebrew University, School of Nursing & Midwifery, Jerusalem, Israel, [4]Hadassah Hebrew University Medical Center, ICU, Jerusalem, Israel, [5]Kaplan Medical Centre, ICU, Rehovot, Israel, [6]Yeovil District Hospital NHS Foundation Trust, ICU, Yeovil, United Kingdom, [7]Taunton & Somerset NHS Foundation Trust, ICU, Taunton, United Kingdom, [8]Royal Devon & Exeter Hospital NHS Foundation Trust, ICU, Exeter, United Kingdom
INTRODUCTION. Preferences and processes for ICU end of life care vary across countries [1] and public and clinician expectations of outcome do not always match [2]. Identifying opportunities and appropriate content for end of life discussions with ICU patients and families is an area where learning across country boundaries can be fruitful.
OBJECTIVES. 1. To identify factors perceived by ICU nurses to contribute to the quality of dying in Israel and the UK. 2. To compare the emotional content of discussions between ICU nurses about end of life care in Israel and the UK.
METHODS. Focus group and individual interviews were conducted with nurses (n = 55) in four ICUs in Israel and three ICUs in the UK. Data were analysed using qualitative thematic analysis and quantitative Linguistic Inquiry and Word Count (LIWC) software to examine the amount and content of emotional talk.
RESULTS. The dominant factors identified by participants across units and countries were the timing and content of end of life communication. Participants also identified similar critical junctures, such as the first visit of the family to ICU, where the quality of communication influenced the quality of end of life care. The individual responses to approaching death by clinicians and families could be accommodated when communication was effective. The amount of emotional talk used by participants when recounting end of life narratives varied by Unit and by country.
CONCLUSIONS. Findings suggest that individual ICU culture may influence communication processes when talking about end of life care with patients and families. The critical junctures identified by participants may provide a useful framework for guiding end of life discussions in ICU.
REFERENCE(S). 1. Sprung CL, Woodcock T, Sjokvist P, Ricou B, Bulow HH, Lippert D, et al. Reason, considerations, difficulties and documentation of end-of-life decisions in European intensive care units: the ETHICUS study. Intensive Care Med. 2008;34:271–277. 2. Endacott R, Boyer C. Preparing for the unavoidable: public and clinician expectations of death. Nurs Crit Care. 2013; in press.
GRANT ACKNOWLEDGMENT. Isaiah Berlin Academic Study Group.

0424
DISCUSSION AND DOCUMENTATION OF DO NOT ATTEMPT RESUSCITATION (DNAR) DECISIONS IN A DGH

M. Toynbee[1,2], O. Nicholas[1], D. Dutta[3]

[1]Princess Alexandra Hospital NHS Trust, Harlow, United Kingdom, [2]Homerton University Hospital NHS Foundation Trust, London, United Kingdom, [3]Princess Alexandra Hospital NHS Trust, Intensive Care Unit, Harlow, United Kingdom
INTRODUCTION. Decisions relating to resuscitation are emotive, topical and imperative to patient-centred care. There is increasing consensus on the importance of early discussion and decision-making, with clear unambiguous documentation of this process and outcome for all acute admissions [1]. The recent National Confidential Enquiry into Patient Outcome and Death (NCEPOD) publication 'CAP: Time to Intervene' [2] highlights the inadequacy nationally of consideration and documentation.

OBJECTIVES. Our hospital, Princess Alexandra[3], adopted the new East of England NHS DNR documentation pro-forma in early 2012. The NCEPOD report concluded that 85 % of inpatient CPR attempts were futile and that the majority of these failed attempts were clinically predictable, highlighting the inadequacies of decision-making and documentation. We aimed to look at the completion rates of this new document on our medical wards to compare this with regional and national rates and improve this as necessary.
METHODS. We undertook a complete survey of all medical inpatients notes on four wards (n = 96) on a single day; recording the completion rates, completeness of documentation and record of outcome of DNAR decisions. Having analysed our results we communicated our findings and suggestions for improvement to the trust: This included a trust-wide meeting and dissemination of the new targets electronically. Given that this area of hospital practice is most important in acute medical admissions, we focused on staff in this area by additionally following-up on understanding and suitability of the new pro-forma with care-providers on a one-to-one basis. We then repeated the survey 3 months later.
RESULTS. Our initial rates of documentation were in line with national averages (25 % compared to 22 % nationally) but below local trust policy and national guidelines (both 100 %). By re-audit we had almost doubled this to 48 %. A similar improvement was seen in rates of consultant involvement in decision-making. We also saw greatly improved rates of discussion with both patients and their families, an issue that is becoming increasingly important.
CONCLUSIONS. Locally and nationally DNAR decisions are inadequately discussed and documented. This results in significant distress for patients, their families and healthcare providers. Whilst the ethical and financial implications of predictably futile CPR attempts are important to raise throughout a hospital trust, we have shown that significant improvements can be made by focusing discussions and setting targets.
REFERENCE(S). 1. Decisions relating to cardiopulmonary resuscitation-joint statement from BMA, Resuscitation Council (UK) and Royal College of Nursing-Oct 2007. 2. Time to Intervene? NCEPOD report 2012. 3. Resuscitation Policy, PAH NHS Trust, January 2012.

0425
A REVIEW OF THE METHODS OF WITHDRAWAL OF LIFE SUSTAINING CARE IN INTENSIVE CARE

L.G. Young[1], J. Cuthill[1]

[1]Glasgow Royal Infirmary, Intensive Care Unit, Glasgow, United Kingdom
INTRODUCTION. No specific UK guidelines currently exist as to how life-sustaining interventions, in particular ventilation, should be withdrawn in the ICU. Some clinicians prefer immediate terminal extubation, whilst others prefer rapid terminal weaning of ventilation.
OBJECTIVES. The aim of this audit was to examine the specific unit practice with regard to withdrawal of life sustaining care in intensive care patients over a 1 year period.
METHODS. All patients who died in our intensive care unit in the year 2012 plus those discharged for 'palliative care' were found by searching the Wardwatcher database. Medical and nursing notes of these patients were retrospectively reviewed via the CareVue electronic patient record system.
RESULTS. Glasgow Royal Infirmary is a 20-bedded unit consisting of 12 level 3 and 8 level 2 beds. It provides tertiary services for burns and pancreatitis. In 2012 our unit admitted 947 patients of which 135 (14.3 %) died. Life sustaining care was actively withdrawn in eighty-four level 3 patients. Eighty of these died within the unit, three further patients were discharged to the ward for ongoing palliative care and one was discharged home for palliation. Of the 80 patients who died in the unit following withdrawal, the median age was 67 years (range 17–84). The median time from admission to the decision to withdraw was 5 days (range 1–124). 26 % patients were extubated, 29 % were converted to a swedish nose and 2 % to a T-piece, and 17 % had rapid terminal weaning of ventilation without extubation (remaining 26 % unclear). Fifty-six patients were prescribed vasopressor agents at the time of decision to withdraw which were discontinued in 38 patients (68 %), continued in 2 patients, and the management was unclear in the remaining 16. Median time from withdrawal of therapy to death was 39 min (range 10 min–18 h 54 min) in the extubated patients versus 42 min (range 6 min–11 h 30 min) ($p = 0.14$) in all other patients.
CONCLUSIONS. Significant variation in practice exists within our unit, with the mode of withdrawal being decided by the consultant in charge on a specific day.
Our unit adopted a critical care end of life pathway in February 2013. This includes reminders to ensure that there is a 'Do Not Attempt Resuscitation' form completed, family members have been made aware and that all inappropriate tests and monitoring have been discontinued. It also covers spiritual care and consideration of organ donation. We plan to repeat this audit in 6 months to assess the impact this pathway has had on our practice.
REFERENCE(S). 1. Campbell ML. How to withdraw mechanical ventilation. AACN Adv Crit Care. 2007;18(4):397–403. 2. Truog et al. Recommendations for end-of-life care in the intensive care unit: a consensus statement by the American College of Critical Care Medicine. Crit Care Med. 2008;36(3):953–63.

0426
LIVE SUPPORT THERAPY LIMITATION PRACTICES IN A SPANISH POLIVALENT ICU

M. Llauradó[1,2], A. Sandiumenge[1,2,3], P. López[4], J. Twose[4], E. Cos[3], V. Blázquez[3], M. Bodí[1,2,3]

[1]Institut d'Investigació Sanitària Pere Virgili, Intensive Care Unit-University Hospital Joan XXIII, Tarragona, Spain, [2]Universitat Rovira i Virgili, Tarragona, Spain, [3]University Hospital Joan XXIII, Intensive Care Unit, Tarragona, Spain, [4]Catalan Transplant Organization, Barcelona, Spain
INTRODUCTION. Many patients admitted in the ICU are under some kind of live support therapy limitation (LSTL). These practices vary depending on the geographical region as well as its cultural patterns. However, LSTL practices have changed in the last years.
OBJECTIVES. To describe LSTL practices in a polivalent ICU and to compare characteristics of dead patients according to the application or not of LTSL.
METHODS. Prospective, observational, 9-month study of all patients who died and/or underwent LSTL in a 30-bed adult polivalent ICU.
First LTSL action (F-LSTL) and the last or definitive action (D-LSTL) were registered. The D-LSTL was defined as the LSTL action that preceded patient's death in ICU.
Patient's characteristics and F-LSTL and/or D-LSTL actions were described.
A total of 604 patients were admitted in the ICU, with a mortality rate of 20.4 % (n = 122).
RESULTS. In the study period, 123 (20.5 %) underwent LSTL, of whom 39 patients (31.7 %) survived the ICU and 31 (25.2 %) of them were alive at hospital discharge. Patients undergoing LSTL were 59.0 % male; 68.8 ± 14.0 years old; APACHEII 20.5 ± 6.8; 72.1 % medical, 21.3 % surgical, 5.7 % trauma, and 23.8 % neurocritical. No differences were found in demographic characteristics of patients who died after LTSV with respect to those dying without LTSV.
Main reasons for F-LSTL and D-LSTL were comorbidity (44.0 and 58.0 % respectively) and therapy futility (42.9 and 40.5 % respectively).
First and definitive LSTL actions were taken 8 days and 4.5 h ± 11 days and 22 h, 8 days and 10 h ± 10 days and 18 h after admission respectively. LSTL decisions agreement among medical staff and with family was reached in 100 and 76 % respectively. 73.1 % of the LSTL actions were recorded in the medical history.
Witholding measures (81.3 %) was the most frequent measure taken in the F-LTSL (36.5 % mechanical ventilation, 28.6 % do not ressucitate) followed by 14.5 % conditioned intensive therapy and 2.2 % withdrawing measures, whereas withdrawing was the most common action in D-LSTL (82.4 %) followed by withdolding (17.6 %). When measures were withdrawn, 22 actions involved vasoactive support and/or 24 mechanical ventilation. Of those patients who died, time to death when measures were withhold was 2 days and 4 h ± 2 days and 6.5 h and when measures were withdrawn was 6 h and 9 min ± 8 h and 30 min ($p < 0.05$).
CONCLUSIONS. Despite LTSL is a frequent practice in the ICU, one out of four patients undergoing this action survive hospital stay. Time to death is shorter in patients who measures are withdrawn than in those who undergo withholding.

0427
AUDIT OF CARE WITHDRAWALS IN OUR INTENSIVE CARE UNIT

D. Dutta[1], D. Ragavan[1,2], E. Sweeney[3], H. Tufton[4]

[1]The Princess Alexandra Hospital NHS Trust, Anaesthesia & Critical Care, Harlow, United Kingdom, [2]Barnet Hospital NHS Trust, London, United Kingdom, [3]Princess Alexandra Hospital NHS Trust, Harlow, United Kingdom, [4]The Princess Alexandra Hospital NHS Trust, Harlow, United Kingdom
INTRODUCTION. Withdrawal of active care is regularly practiced in critical care units. However, the spirits of BMA guidance [1] encompass Human Rights Act offering dignity and transparent decision. The Intensive Care Society, UK laid down principles [2] towards every withdrawal decisions. General Medical Council, UK gives a very broad based guidance to the process by offering examples of decision making models [3]. There is, however, no available guidance on assessment of therapeutic futility given the diversity of cases. The purpose of this prospective study was to identify current patterns in withdrawal of care.
OBJECTIVES. To assess the various factors surrounding withdrawal of care from patients admitted to a single ITU/HDU unit in the UK.
METHODS. Prospective single centre study lasting 7.5 months with a 34 % inclusion rate of all candidates. Dates & Times recorded for each patient: on admission to ITU; on withdrawal of care; at patient death. Data recorded on: admitting reason, co-morbidities, members of staff involved in decision, reasons for decision; organ donation decisions.
RESULTS. 27/74 potential patients admitted to audit. Average age at admission 72.74 years (range 44–91 years; SD 11.71), Average time to withdrawal of care 4.25 days (0-21 days; SD 4.95), Average time from withdrawal to death 318 min (0–1,870 min; SD 395 min). Consultants were involved in all withdrawal decisions, without any disagreement from staff or patients. 26 patients (96.2 %) had care withdrawn on clinical grounds of futility. In 6 (22.2 %) of the 27 cases relatives expressed the wishes of the patients to discontinue life support measures. Quality of life was taken into consideration in 4 (14.8 %) patients. No advance decisions/directives were identified in any of the patients. 4 (14.8 %) patients were considered for organ donation while referral to organ donation team was made in three (11.1 %) cases.
CONCLUSIONS. There was a wide variety in the demographics of patients & their co-morbidities. In most cases withdrawal led to a quick death indirectly indicating appropriateness. We observed a low incidence of consideration for organ donation. This could be because the patients were very sick to begin with and were in advanced stages of organ failure evidenced by the timing of the death. It is evident that clinical judgement of therapeutic futility plays a major role in decision making. It is also evident that despite increase public awareness, advance decisions of treatment refusals are not so common. We have revised our 'Liverpool Care Pathway' for critical care unit to ensure organ donations are considered in all cases of treatment withdrawals.
REFERENCE(S). 1. BMA Booklet (2nd Edition) on withholding and withdrawing life prolonging treatment. October 2000. 2. Guidelines for limitation of treatment. ICS, UK 2003. 3. Good practice in decision making, GMC 2010.

Bloodstream infections: 0428–0441

0428
IMPACT OF QUALITY IMPROVEMENT STRATEGIES FOR THE PREVENTION OF CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS: A SYSTEMATIC REVIEW AND META-ANALYSIS

K. Blot[1], J. Bergs[2], S. Blot[1], J. Hellings[2], D. Vandijck[1,2,3]

[1]Ghent University, Faculty of Medicine & Health Sciences, Ghent, Belgium, [2]Hasselt University, Health Economics & Patient Safety, Diepenbeek, Belgium, [3]Ghent University Hospital, General Internal Medicine & Infectious Diseases, Ghent, Belgium
INTRODUCTION. Nosocomial central line-associated bloodstream infections (CLABSI) are an important economic burden and cause of impaired patient outcomes. Quality improvement strategies may increase adherence to infection prevention processes, which lowers the CLABSI rate.
OBJECTIVES. To assess the impact of quality improvement interventions on the rates of CLABSI in adult ICUs.
METHODS. The MEDLINE database was systematically searched for relevant articles from January 1995 to June 2012. Studies were assessed by their methodological quality using the Downs and Black tool. A meta-analysis was performed (random effects model with DerSimonian-Laird estimator), and mixed-effects modelling was used to compare quality improvement intervention studies that did or did not use a bundle or checklist strategy.
RESULTS. The systematic review identified 46 before-after, 11 interrupted time series, and 3 controlled before-after studies of quality improvement strategies. A meta-analysis of 41 trials involving 560 adult, 11 neonatal, and 9 paediatric ICUs showed a decrease in CLABSI rates [odds ratio (OR) 0.39; 95 % confidence interval (CI) 0.33–0.46; $P < 0.001$; Fig. 1). A large amount of statistical heterogeneity was found between studies ($I^2 = 85.4$ %, $\tau^2 = 0.1617$, $P < 0.001$).
Subgroup analyses demonstrated CLABSI rate reductions for trials without a bundle or checklist (22 trials; OR 0.45, 95 % CI 0.36–0.55) and those with a bundle and/or checklist

intervention (19 trials; OR 0.34, 95 % CI 0.27–0.41) showed an even stronger effect ($P = 0.03$, Fig. 1).
CONCLUSIONS. Implementation of quality improvement strategies contributes to a decrease in CLABSI rate. Strategies including a bundle or checklist appeared to have larger risk reductions.

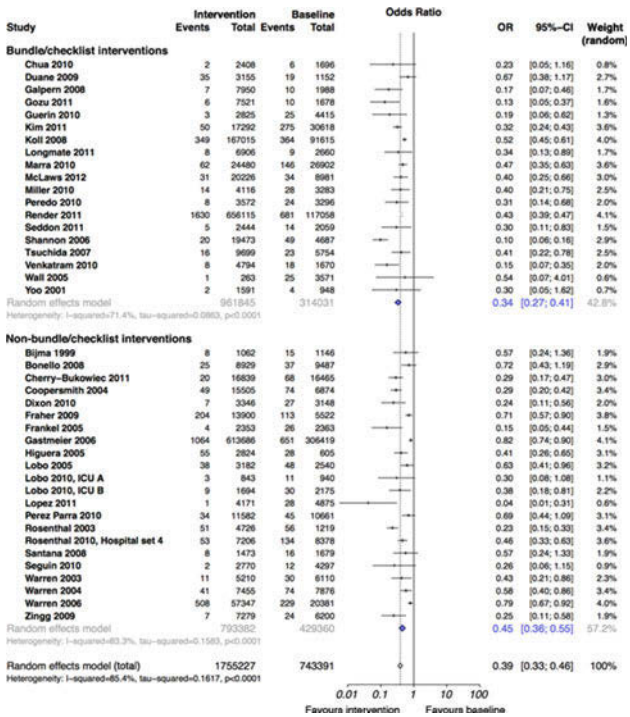


Fig. 1 Subgroup analysis of QI interventions

0429

HAVE THE CRB RATES BEING MAINTAINED IN SPAIN AFTER THE BACTEREMIA ZERO PROJECT?

M. Palomar[1], F. Alvarez Lerma[2], P. Olaechea[3], Y. Agra[4], M.J. Lopez Pueyo[5]

[1]H U Arnau de Vilanova, Lleida, Spain, [2]H Mar, Barcelona, Spain, [3]H Galdakao, Galdakao, Spain, [4]Spanish Ministery of Health, Madrid, Spain, [5]H CrucesYague, Burgos, Spain

INTRODUCTION. A preventive program, bacteraemia zero (BZ), implemented in Spain in 2009 during 18 months, achieved a 40 % reduction over the 2008 basal rates of catheter related bacteraemia (CRB).
OBJECTIVES. To asses the evolution of CRB rates and the number of ICUs participating in BZ.
METHODS. Prospective surveillance of CRB, including bacteraemia of unknown origin + bacteraemia secondary to catheter (CB) and bacteremia secondary to other foci (BSOF) in 2011 and 2012, comparing with 2008 baseline and BZ period (January 2009–June 2010). Data collection was performed through the Web, following the definitions and methodology ENVIN-HELICS. The CRB was expressed as incidence density, episodes per 1,000 CVC days, and the BSOF, episodes × 1,000 days of stay.
RESULTS. Up to 219 UCIs provided data from January 2009, registering a total of 1,394.608 days of CVC during 1,674.421 days of stay. A total of 3,604 episodes of CRB of which 1,900 were CB, and 2,824 BSOF were reported.

Period	2008	BZ(2009-10)	2011	2012
ICUs N	121	192	208	219
Pts-days	106.427	666919	527414	480088
CVC-days	89151	614070	410729	369809
CRB_N	436	1709	1071	824
CRB ID o/oo	4.89	2.78	2.61	2.23
CB_N	244	957	528	415
CB ID o/oo	2.73	1.56	1.29	1.12
BSOF_N	160	1330	863	631
BSOF ID o/oo	1.50	1.70	1.64	1.31

Table 1

CONCLUSIONS. After completing the project, coinciding with the beginning of NZ, the number of participants ICU in BZ increased. With a large sample, CRB and CB rates have been maintained, even improved. Initial increase of BSOF rate, return close to basal rate.
GRANT ACKNOWLEDGMENT. Spanish Ministery of Health.

0430

POSITIVE PRESSURE NEEDLELESS CONNECTORS (PPNCS) DID NOT INCREASE RATES OF CATHETER HUB COLONIZATION RESPECT THE USE OF NEUTRAL PRESSURE NEEDLELESS CONNECTORS (NNCS) IN A PROSPECTIVE RANDOMIZED TRIAL

J.C. Yébenes[1], M. Delgado[2], J.A. Capdevila[2], G. Sauca[3], A. Gabillo[2], E. Guell[1], J. Mendez[1], N. Arroyo[2], CRITICC Catheter-Related Infection Team In Critical Care

[1]Hospital de Mataró, Intensive Care Department, Mataró, Spain, [2]Hospital de Mataró, Internal Medicine Department, Mataró, Spain, [3]Hospital de Mataró, Microbiology Department, Mataró, Spain

INTRODUCTION. Needleless connectors (NCs) allow administrating medication avoiding the use of needles. It's safe for healthcare workers but some outbreaks of catheter-related bloodstream infections (CRBSI) have been reported after the substitution of neutral pressure connectors (NP-NCs) for positive pressure connectors (PP-NCs). It suggests an increased risk of endoluminal colonization associated with the use of PPNCs.
OBJECTIVES. The aim of this study was to compare the rates of colonization of central venous and arterial catheter hubs fitted with two types of NCs (NP-NCs vs PP-NCs) in critically ill patients.
METHODS. We designed a prospective randomized study to compare rates of catheter hub colonization. The study included all central venous and arterial catheters maintained for 3 or more days in patients admitted to a polyvalent intensive care unit. Patients were randomized to receive one of two types of NCs, a NP-NCs (Microclave, ICU Medical, San Diego, CA, USA) or PP-NCs (SmartsitePlus, Carefusion, San Diego, CA, USA). The main outcome measure was the percentage of positive endoluminal swab cultures (>15 cfu) obtained of the catheter hub at day 3 and 7 of catheter use. All NCs were replaced every 7 days of use. Rates of hub colonization during all the catheter insertion every day 3 and 7 of NCs use were also obtained, as the rate of CRBSI in both groups. Swabs were obtained under strictly sterile conditions up to the time of catheter withdrawal. Nurses were specifically trained in the NCs handling.
RESULTS. We obtained 326 cultures from 146 catheters (81 central venous catheters and 65 arterial catheters) in 70 patients, with a total cumulative risk of 1,250 catheter-days. The colonization rates at day 3 of insertion were 5/71 (7 %) for the NDDNFC and 6/64 (9 %) for the PPDNFC. On day 7 of insertion the rates had increased to 7/47 (14 %) and 5/35 (14 %) respectively, with no statistically significant differences between groups. Global swab cultures were positive in NP-NCs in 29/198 (14.6 %) respect 17/128 (13.3 %) in PP-NCs during the catheter use. We did not observe any case of CRBSI.
CONCLUSIONS. We did not observe differences in terms of hub colonization using the positive or neutral pressure NCs at day 3 or 7 of use, neither during the all insertion period. In our experience, the use of PP-NCs did not resulted in significantly more frequent colonization of central venous or arterial catheter hubs respect NP-NCs.

0431

IMPACT OF AN EDUCATIONAL PROGRAM ON DECREASING CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTION IN A MEDICAL INTENSIVE CARE UNIT IN SPAIN

J.P. Valencia Quintero[1], M.D.M. Jiménez Quintana[1], F. Manzano Manzano[1], M. Colomo Gonzáles[1], V. Sánchez Saez[1]

[1]Hospital Virgen de las Nieves, ICU, Granada, Spain

INTRODUCTION. In the intensive care unit, decreasing the rate of catheter-associated bloodstream infections has become in a high priority since 2009 for all members of the intensive care unit team.
OBJECTIVES. Our goal was to determine how an intervention schedule, would decrease the line-associated bloodstream infection (CLABSI) in a intensive care unit (ICU). A secondary objective was to identify risk factors for CLABSI.
METHODS. A retrospective, interventional study used an interrupted time-series design, was conducted during two time periods for all patients admitted to our ICU (04/01/05–30/06/09 and from 04/01/10 to 31/12/12) in the "Hospital Virgen de las nieves" in Spain. Data collection was conducted during three consecutive months by year using study formats of ENVIN-HELICS. An educational intervention developed by a multidisciplinary team since September 2009 was used like a collaborative process, was Implemented and included: proper hand hygiene, use of chlorhexidine, measures of total barrier inserting central venous catheter (CVC), preferential use of the subclavian vein and removing unnecessary CVC catheters. The primary outcome measure was overall CLABSI rates (infections per 1,000 days of catheter) in the pre-intervention (first period) and full intervention (second period). Variables collected included demographics, diagnosis, APACHE II score, percentage of mechanical ventilation, in-hospital mortality, and duration in days of CVC. Statistical analysis of multivariate logistic regression was made.
RESULT: 622 and 108 patients were studied in each period. No significant differences in demographic variables between the two periods. APACHE II score were 16.89 ± 7.7 and 19.3 ± 9.2 points ($p < 0.001$) respectively.
VM in first period was 18.2 vs. 27.9 % ($p < 0.001$), In-hospital mortality was 19.1 vs 14.4 % ($p = 0.15$).
The annual average rate of CLABSIs show a decreased in the ICU from 3.98/1,000 days of CVC in the first period to 2.18/1,000 days of CVC in the second period ($p = 0.045$). the CVC was used in 89.2 % in the first period and 83.9 % in the second ($p = 0.01$). Duration of CVC was 8.73 ± 10 days in the first period and 10 ± 16 days in the second ($p = 0.09$).
The multivariate analysis shows that the second period have less likely of CLABSI comparated with the first one (OR 0.09, 95 % CI 0.09–0.91, $p = 0.041$), and more likely when was highest the duration of CVC (OR 1.08, 95 % CI 1.04–1.11, $p < 0.001$).
CONCLUSIONS. We conclude that implementation of these intervention has shown a positive impact in the reduction measured in the number of CLABSI, despite the increase in days of CVC. This project will continue into the future.

0432

DEVICE RELATED NOSOCOMIAL INFECTION SURVEILLANCE AND CONTROL IN ICU

D. Pastor Marcos[1], D. Fontaneda López[1], S. Gutiérrez Martín[1], P. Jiménez García[1], D. Carriedo Ule[1], F.J. Díaz Domínguez[1]

[1]Complejo Asistencial Universitario de León, Intensive Care Unit, León, Spain

INTRODUCTION. Device-related nosocomial infection (DNI) control and surveillance should form a part of regular clinical practice protocols in the intensive care units.
OBJECTIVES. Assessment of the incidence (no of infections/1,000 days with the device) of DNI and its relationship with control measures taken during a 12-year period (2001–2012) in the medical-surgical-trauma ICU of a Uniivertsitary Hospital of León Spain. The DNI

monitored were: ventilator-associated pneumonia (VAP), catheter-associated urinary tract infection and central line-associated bloodstream infection (CLABSI).
METHODS. Observational prospective cohort study with data collection through ENVIN-HELICS registry [1]. All patients hospitalized ≥48 h were included. DNI reduction measures were implemented over three consecutive periods of time:
Period 1 (Jan/01–Dec/05). Initiation of DNI Surveillance (minimum 3 months/year); selective digestive decontamination (SDD), topic and systemic, in high risk groups [coma patients, polytraumatized patients on mechanical ventilation (MV) ≥48 h]; ICU personnel training in DNI prevention; location change of the unit in 2004 and maintaining the personnel/patient ratio.
Period 2 (Jan/06–Dec/08). Year-long DNI surveillance; SDD extended to all patients on MV ≥48 h; avoidance of supine position at 0° in patients on MV; contact isolation for those patients with multi-drug resistant pathogens and a specific protocol for handwashing with alcohol based solutions.
Period 3 (Jan/09–Dec/12). Additional measures of proved efficacy in the prevention of CLABSI and VAP were implemented; BacteriemiaZero and NeumoniaZero (programs of the Working group of Infectious Disease of the Spanish Society of Intensive Care [1]).
RESULTS. 3,124 patients were included, with a total of 32,412 days of ICU stay. No differences in age, length of stay or mortality. Statistical significance in APACHE II score between period 2 and 3 (Table 1).

Table 1 φ p < 0.001

	Period 1	Period 2	Period 3
Patients	395	974	1,755
Age	56.0 ± 20.18	57.57 ± 19.38	57.88 ± 18.47
Apache II score	15.21 ± 7.26	14.53 ± 6.99φ	15.75 ± 7.86φ
ICU stay	9.68 ± 9.19	10.18 ± 10.75	9.63 ± 11.34
Mortality %	16.71	13.15	13.13

There was a statistically significant reduction of the incidence density of all infection types in all periods (Table 2).

Table 2 Ratio: days device used/total days of ICU

	Period 1	Period 2	Period 3
MV ratio	0.77	0.69	0.64
VAP	21.89	4.05	3.91
(RI, 95 % CI)		0.18 (0.12 ± 0.28) p < 0.001	0.17 (0.12 ± 0.26) p < 0.001
CAUTI ratio	1	0.98	0.97
CAUTI	9.91	5.01	3.30
(RI, 95 % CI)		0.50 (0.33 ± 0.76) p < 0.001	0.50 (0.33 ± 0.76) p < 0.001
CVC ratio	0.68	0.99	0.99
CLABS	9.01	6.24	1.99
(RI, 95 % CI)		0.12 (0.44 ± 0.32) p < 0.0036	0.21 (0.09 ± 0.45) p < 0.0036

CONCLUSIONS. A decrease of DNI in the ICU was observed, probably as a consequence of the infection control measures taken in the different periods and their overall effectiveness.
Nonetheless, no significant changes were observed in the reduction of either the average length of ICU stay or mortality. However, a non significant reduction of mortality was observed between the period 1 and 2.
REFERENCE(S). http://hws.vhebron.net/envin-helics/.

0433
AN ANALYSIS OF THE INCREMENTAL DAILY RISK OF CATHETER-RELATED BLOOD STREAM INFECTION IN A PARENTERAL NUTRITION POPULATION

I. Conrick-Martin[1], M.E. McGovern[2], K.S. Boner[1], J. Bourke[1], E. Fitzgerald[1], R. Hone[3], M. Lynch[3], D. Phelan[1], C.M. Walshe[4]

[1]Mater Misericordiae University Hospital, Critical Care Medicine, Dublin, Ireland, [2]Harvard School of Public Health, Global Health and Population, Boston, United States, [3]Mater Misericordiae University Hospital, Clinical Microbiology, Dublin, Ireland, [4]Beaumont Hospital, Anaesthesia & Intensive Care Medicine, Dublin, Ireland
INTRODUCTION. Catheter-related blood stream infection (CRBSI) remains a significant complication of central venous catheters (CVCs), with an attributable morbidity, mortality and cost[1]. An improved understanding of the patient factors that were associated with CRBSI such as duration of parenteral nutrition (PN) CVC should facilitate the reduction of these complications.
OBJECTIVES. Our objective was therefore to establish if the contribution of the number of PN CVC days to the risk of developing CRBSI was quantifiable in an adult PN population.
METHODS. Study was carried out in a 525-bed tertiary-referral teaching hospital over a 14-year study period (1997–2010) looking at 1,961 patients in whom 3,213 CVCs were utilised over 19,511 CVC days. All in-patients referred for PN administration via standard CVCs were included. Prospectively collected data were recorded in a specific PN record. The CVC-related infection audit group meet quarterly to review all sepsis episodes, assigning a diagnostic category.PN CVC days were examined using a logistic regression model to take account of the dichotomous nature of the outcome.
RESULTS. There were 256 CRBSI episodes in 216 patients. Median (IQR) patient age was 62 (23), and 58 % were male. Each extra CVC PN day was associated with an increased risk of developing CRBSI of 4.3 % The risk of CRBSI rose linearly from CVC insertion time to day 30 PN (see Fig. 1) indicating that the risk increase per day remains constant (4.3 %) throughout the period of PN cannulation.
CONCLUSIONS. This large study is the first, to our knowledge, to demonstrate a quantifiable daily risk (4.3 %) associated with CVC-administered PNThe linear association between CRBSI and CVC PN days is consistent with current recommendations against elective scheduled CVC change [2] and quantifies the risk underlying the recommendation that PN CVCs should be removed once no longer required.

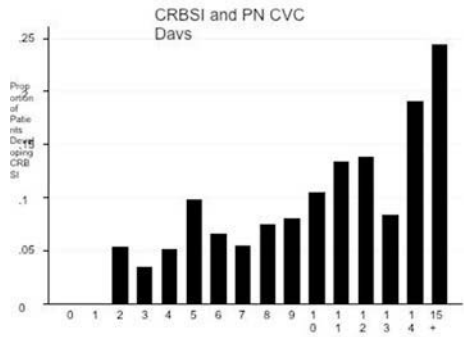


Fig. 1 Relationship between CRBSI and number of PN CVC Days. *CRBSI* catheter-related bloodstream infection, *CVC* central venous catheter, *PN* parenteral nutrition

REFERENCE(S). 1. Blot SI, Depuydt P, Annemans L, Benoit D, Hoste E, De Waele JJ, Decruyenaere J, Vogelaers D, Colardyn F, Vandewoude KH. Clinical and economic outcomes in critically ill patients with nosocomial catheter-related bloodstream infection. Clin Infect Dis. 2005;41:1591–1598. 2. O'Grady NP, Alexander M, Dellinger EP, et al. Guidelines for the prevention of intravascular catheter related infections. Infect Control Hosp Epidemiol. 2002;23:759–769.

0434
PREVALENCE OF BACTEREMIA IN THE INTENSIVE CARE UNIT: A DANISH CROSS-SECTIONAL STUDY

M.S. Nielsson[1,2], C.F. Christiansen[1], S. Ellermann-Eriksen[3], H.C. Schønheyder[4], B.S. Rasmussen[2], E. Tønnesen[5], M. Nørgaard[1]

[1]Aarhus University Hospital, Department of Clinical Epidemiology, Aarhus, Denmark, [2]Aalborg University Hospital, Department of Anesthesiology and Intensive Care Medicine, Aalborg, Denmark, [3]Aarhus University Hospital, Department of Clinical Microbiology, Aarhus, Denmark, [4]Aalborg University Hospital, Department of Clinical Microbiology, Aalborg, Denmark, [5]Aarhus University Hospital, Department of Anesthesiology and Intensive Care Medicine, Aarhus, Denmark
INTRODUCTION. Infection is a frequent cause of admission to the intensive care unit (ICU) [1] and bacteremia is associated with increased morbidity and mortality [2]. Limited data exist on how prevalence of bacteremia differs by age among ICU patients.
OBJECTIVES. To determine the prevalence of bacteremia at ICU admission among ICU patients in relation to age.
METHODS. We used population-based medical and administrative registries to identify a cohort of 19,213 patients admitted to 1 of 6 ICUs in the North Denmark Region during 2005–2012. We obtained information on bacteremia within 7 days of ICU admission as well as information on pre-existing morbidity according to Charlsons comorbidity index and surgery performed within 7 days of ICU admission. We estimated bacteremia prevalence at ICU admission (defined as bacteremia within 7 days of ICU admission), and compared prevalence between age groups (15–49, 50–64, 65–79, ≥80 years of age) by prevalence odds ratios (PORs) computed by logistic regression, stratified by type of admission (medical, acute/elective surgical), adjusting for sex and pre-existing morbidity.
RESULTS. Of the 19,213 patients, only 650 (3.4 %) of the patients had bacteremia at ICU admission. Table 1 presents bacteremia prevalence and PORs by age group and type of admission. In medical patients younger than 50 years the prevalence of bacteremia at time of admission was 2.2 % while the prevalences in all age groups above 50 years were 6–7 %. Prevalence was lower among acute/elective surgical patients and was below 1 % for elective surgical patients regardless of age.
CONCLUSIONS. Bacteremia prevalence at ICU admission was increased in patients ≥50 years compared with patients aged 15–49 years. There was, however, no further increase in PORs with advancing age above 50 years.

Table 1 Bacteremia prevalence and POR 2005–2012

Admission type	15–49 years	50–64 years	65–79 years	≥80 years
Medical patients, n (%)	2,059 (38.4)	1,412 (28.6)	1,720 (26.5)	737 (30.5)
Bacteremia at admission, n (%)	46 (2.2)	91 (6.4)	115 (6.7)	52 (7.0)
Prevalence odds ratios (95 % CI)	1 (ref)	2.5 (1.8–3.9)	2.5 (1.7–3.6)	2.6 (1.7–4.0)
Acute surgical patients, n (%)	2,529 (47.2)	1,944 (39.4)	2,403 (37.0)	1,240 (51.3)
Bacteremia at admission, n (%)	44 (1.7)	86 (4.4)	128 (5.2)	55 (4.4)
Prevalence odds ratios (95 % CI)	1 (ref)	2.3 (1.6–3.4)	2.6 (1.8–3.8)	2.2 (1.4–3.3)
Elective surgical patients, n (%)	775 (14.5)	1,581 (32.0)	2,374 (36.5)	439 (18.2)
Bacteremia at admission, n (%)	3 (0.4)	8 (0.5)	19 (0.8)	19 (0.8)
Prevalence odds ratios (95 % CI)	1 (ref)	1.2 (0.3–4.8)	1.9 (0.5–6.7)	1.6 (0.3–8.3)

REFERENCE(S). 1. Vincent J-L, Rello J, Marshall J, Silva E, Anzueto A, Martin CD, et al. EPIC II Group of Investigators. International study of the prevalence and outcomes of infection in intensive care units. JAMA. 2009;302(21):2323-9. doi:10.1001/jama.2009.1754. 2. Laupland KB, Gregson DB, Zygun DA, Doig CJ, Mortis G, Church DL. Severe bloodstream infections: a population-based assessment. Crit Care Med. 2004;32:992-7.
GRANT ACKNOWLEDGMENT. This research was made possible through financial support from the Clinical Epidemiology Research Foundation, Denmark, and from the Heinrich Kopps Foundation, Denmark. The funding institutions had no influence on the study.

0435
ETIOLOGY & RESISTANCE PATTERN OF HOSPITAL ACQUIRED BLOOD STREAM INFECTIONS

R. Agrawal[1], A. Varma[1], S. Gupta[1]

[1]Fortis Escorts Heart Institute, Critical Care Medicine, New Delhi, India
INTRODUCTION. The data in Indian ICU's regarding HABSI is scarce and few reports suggest it to be higher than western data.

OBJECTIVES. To determine the incidence,etiology and resistance pattern of HABSI in Indian context.
METHODS. It was a single center study in 35 bed ICU over 1 year period. HABSI was defined according to current CDC guidelines [1]. HCAP, CAUTI and skin related infections causing BSI were defined according to recent guidelines and analysed.
RESULTS. Out of 332 positive samples 90 samples (n = 45) were HABSI. The microbiological analysis showed 60 % were *Gram negative,* 27 % were *Gram positive* bacteria and 6 % were *candida.* CRBSI was the most common etiology of blood stream infections.HCAP and CAUTI caused 9.5 % of infections respectively.

Table 1 Etiology of HABSI

Source	Total (%)
CRBSI	69
HCAP	9.5
CAUTI	9.5
Skin	7
Devices	5

The resistance pattern analysis showed 69 % isolates were ESBL. Of ESBL isolates 25 % were XDR (sensitive only to colistin methionate).

Table 2 Resistance pattern in ESBL isolates

ESBL types	n (%)
MDR	17 (65
XDR(carbapenem resistant)	7 (25)
PDR(pan Drug resistant)	3 (10)

HABSI hospital Acquired blood stream infection, *CRBSI* catheter related blood stream infection, *HCAP* healthcare associated pneumonia, *XDR* extreme drug resistant, *ESBL* extended spectrum beta lactamases

CONCLUSIONS. In our study the incidence of HABSI was 27 %, CRBSI was found to be the most common etiology.Gram negative infections were most common unlike western data where Gram positive are more prevalent [2]. About two-third of Gram negatives were ESBL isolates.Our study highlights need for stringent guidelines for CRBSI prevention and optimal antimicrobial usage to minimize resistance.
REFERENCE(S). 1. Richard P, et al. Crit care Med. 1999;27:887–892. 2. Wisplinghoff Clin Infect Dis. 2004;39:309–317. 3. Garrouste M, et al. Clin Infect Dis. 2006;42: 1118–1126. 4. Valles J, et al. J Infect. 2008;56:27–34.

0436
INVESTIGATION OF PROCALCITONIN, WBC, CRP AND SOFA SCORE KINETICS DURING THE FIRST DAYS OF CATHETER-RELATED BLOODSTREAM INFECTIONS: RELATIONSHIP WITH THE CONTROL OF THERAPY

V. Theodorou[1], V.E. Papaioannou[1], G.A. Tripsianis[2], E.K. Christophoridis[1], G.A. Kouliatsis[1], I.A. Pneumatikos[1]

[1]University Hospital of Alexandroupolis, Department of Intensive Care Unit, Alexandroupolis, Greece, [2]University Hospital of Alexandroupolis, Department of Medical Statistics, Alexandroupolis, Greece
INTRODUCTION. Using diagnostic biomarkers to assist early clinical decisions during the management of bacteremia could be helpful.
OBJECTIVES. The potential role of PCT, WBC, CRP, SOFA score, and their kinetics as a way to early monitor the efficacy of therapy of intravascular catheter-related bloodstream infections (CRBSI) in intensive care unit (ICU) was assessed in the present study.
METHODS. Twenty-six patients presented with CRBSI during their ICU stay were included in the study. They were divided in two groups according to clinical and microbiological control of bactereamia, 72 h upon onset of therapy (controlled, n = 16 vs non-controlled, n = 10). Serum PCT, WBC and CRP levels and SOFA scores, along with their variations over time, were measured during the first 5 days of therapy and compared between and within patients. A logistic regression was also performed for assessing prognostic accuracy of measured variables upon infection control.
RESULTS. A significant reduction of PCT concentration on D1 (day 1 of treatment) compared to D0 (onset of clinically suspicious infection) was observed in both groups of patients. However, both its serum levels and SOFA scores tended to further decrease significantly in patients with controlled CRBSI, but remained stable in the non-controlled group. In addition, on D3 PCT was found significantly reduced in the controlled compared with the non-controlled group [0.55 (0.50–3.10) vs 2.60 (0.75–5.12), respectively; p = 0.047], whereas SOFA was found significantly decreased on D2 in the same group of patients (5.37 vs 7.70, p = 0.033). Neither WBC threshold values nor their kinetics were found to differ between and within patients, whereas non-controlled group exhibited significantly higher CRP levels on D5 (p = 0.0046). SOFA score higher than 5.5 during D2 and PCT values higher than 1.5 ng/ml on D3 were found to predict therapy control (OR 10.11, 95 % CI 1.60–64.00, p = 0.009).
CONCLUSIONS. We suggest that daily measurements of PCT serum levels and SOFA scores can be of significant value for monitoring and predicting therapeutic efficiency during CRBSI.
REFERENCE(S). Charles PE, Tinel C, Barbar S, Aho S, Prin S, Doise JM, Olsson NO, Blettery B, Quenot JP. Procalcitonin kinetics within the first days of sepsis: relationship with the appropriateness of antibiotic therapy and the outcome. Crit Care. 2009;13:R38.

0437
INCIDENCE AND RISK FACTORS FOR CENTRAL VASCULAR CATHETER-RELATED BACTEREMIA IN A MEDICAL INTENSIVE CARE UNIT

Z. Hajjej[1], E. Abbessi[1], M. Nasri[1], W. Sallemi[1], H. Gharsallah[1], M. Ferjani[1]

[1]Military Hospital of Tunis, Intensive Care Unit, Tunis, Tunisia
INTRODUCTION. Central venous catheters (CVCs) are commonly used in the ICU. Up to 80 % of ICU patients may require central venous catheterization [1]. Catheter-related infections (CRI) and especially catheter-related bacteremia (CRB) are the most common complications associated with CVCs, responsible for additional morbidity and mortality, a longer length of stay and increased hospital costs [2].
OBJECTIVES. The aims of our study were to determine the incidence, microbiological profile and risk factors for CRI in a Tunisia medical intensive care unit.
METHODS. Over eight months (1 January 2012–30 August 2012) a prospective, observational study was performed. Patients who required central venous catheter (CVC) placement for duration greater than 48 h were included in the study. The definitions of catheter colonization (CC) and CRB published by IDSA were used [3]. Patients with CRB were designated as group A, patients with CC were designated as group B. Continuous variables are expressed as mean ± standard deviation, while categorical variables are expressed with absolute and relative frequencies.
RESULTS. During the study period, a total of 260 patients, with a total of 482 CVCs were enrolled. The ratio of exposure to CVC was 77 % and the mean duration of catheterization was 33 days. CVC insertion sites included the subclavian (58 %), the internal jugular (33 %) or the femoral vein (9 %).Overall, 25 (5.1 %) patients were classified as having CRB (group A), 90 (18.6 %) patients as having CC (group B). CRB incidence was 5 per 1,000 catheter days, whereas CC incidence was 19 per 1,000 catheter days. Risk factors independently for CC were prolonged duration of catheterization, use of parenteral nutrition and changing the CVC dressing at intervals of 48 h or more. The predominant microorganisms isolated from CRB episodes were Gram-negative bacilli (*Pseudomonas aeruginosa* and *Klebsiella pneumonia*).
CONCLUSIONS. The incidence of CC and CRB was high. Use of CVC for the shortest time possible, good hand hygiene and change of CVC dressing at intervals of less than 48 h are infection prevention practices that need to be followed.
REFERENCE(S). 1. Vincent JL, et al. JAMA. 1995;274:639–44. 2. Renaud B, et al. Am J Respir Crit Care Med. 2001;163:1584–90. 3. Mermel LA, et al. IDSA. 2009.

0438
POSTOPERATIVE BACTEREMIAS IN HEART TRANSPLANTATION

P. Fernandez Ugidos[1], R. Gomez Lopez[1], P. Vidal Cortes[1], M.J. Paniagua Martin[2], E. Barge Caballero[2], J. Muñiz[3], M.T. Bouza Vieiro[4], A.V. Aller Fernandez[4], V. Rodriguez Lopez[4], A.I. Suarez Freire[4], S. Fojon Polanco[4], M.G. Crespo Leiro[2]

[1]Complexo Hospitalario Universitario Ourense, ICU, Ourense, Spain, [2]Complexo Hospitalario Universitario A Coruña, Cardiologia, A Coruña, Spain, [3]Complexo Hospitalario Universitario A Coruña, UDC, A Coruña, Spain, [4]Complexo Hospitalario Universitario A Coruña, ICU, A Coruña, Spain
INTRODUCTION. Infection is a major complication after heart transplantation (HT). Among nosocomial infections, bloodstream infections are of particular importance, especially those related to catheters, because of its high morbi-mortality and its potentially prevention.
OBJECTIVES. To determine the incidence and clinical and microbiological characteristics of patients that suffer a bacteremia during the immediate postoperative period, before hospital discharge.
METHODS. Historical prospective cohort study of all patients undergoing HT in a single center of Northern Spain during 18 years. Define nosocomial infections, sepsis and multiple organ dysfunction according to CDC criteria, SSC and SOFA score, respectively. In this group of patients were selected for analysis those with diagnostic of bacteremia.
RESULTS. In 594 HT, we found 97 infection episodes in 75 patients. 31 % were bacteremia (the second infection cause, only behind pneumonia). 76.5 % was associated with catheters (BAC) and 23.5 % primary. 80.6 % of patients are male, with a mean age 51.54 years 29 %. 41.9 % of patients required hospitalization before HT (mean stay in ICU 4.03 days) and 29 % of cases were transplanted in emergencies 0.35 % required pretransplant circulatory assistance. 25.8 % required mechanical ventilation (MV) pretransplant. 29 % cases had, already in preoperative period, central venous catheter (CVC). Respect postoperative time: Patients with bacteremia required MV during a mean of 24 days. All of them carried at least one CVC (mean of 2.96, median 2), for an average of 42.44 days. Perioperative shock was suffered by 61.3 % (mainly, for primary graft failure). Acute renal failure (ARF) appeared in 58.1 %, needing extra-renal techniques (TDER) 41.9 % of patients. 19.4 % of cases suffered a rejection episode. Fever appeared in 80.6 % and leukocytosis in 93.1 %. The most common causative agent was Stafilococcus negative coagulase (31.91 %), followed by enterococci (14.89 %) and *E. coli* (12.6 %) 0.423 % were treated with broad espectrum antibioterapy. 69.23 % of cases were localized infections, 5.13 % severe sepsis and 25.64 % of patients suffered septic shock. Multiorgan failure appears in 16.3 % of cases (mean SOFA 14.9 points, range 8–19). The mean stay at ICU was 39.41 days. The hospital mortality rate was 16.1 %.
CONCLUSIONS. In our series, the incidence of bloodstream infection after HT was 5.23 %. These patients had long ICU stay, long MV time and their mortality was 16.1 %. A quarter of patients suffer septic shock with high incidencia of ARF. The first causal agent was negative coagulase stafilococci.

0439
HYPOTHERMIA AND INFECTION PREVENTION SURVEY

I. Voigt[1], C.K. Naber[1]

[1]Elisabeth-Krankenhaus Essen, Heart and Vascular Center, Essen, Germany
INTRODUCTION. The ILCOR-Guidelines [1] recommend mild therapeutic hypothermia (MTH) in unconscious adult patients after return of spontaneous circulation from out-of-hospital cardiac arrest. Even though mortality rates decrease and patients present better neurologic outcomes, postresuscitation care is becoming more important in this group of patients. Besides rhythm disturbance, bleeding and cardiodepression another challenge are infections. The incidence of pneumonia was reported up to 40 % in post-cardiac arrest patients treated with MTH.
OBJECTIVES. The objective of this survey was to evaluate infection prevention strategies used during MTH.
METHODS. During April and May 2012 we sent an e-mail invitation to 105 corresponding authors of articles concerning mild therapeutic hypothermia. Responses submitted between 5 April and 30 June 2012 were collected into a central database and analysed.
RESULTS. 68 (65 %) physicians submitted valuable data. Average rate of hypothermia patients was 32.7/year. MTH standard operation procedures are available in 58 (83 %) units. Our results implicate inflammatory biomarkers like CRP, WBC, Procalcitonin or IL-6 to be less useful in the participating intensivist's opinion. In contrast pulmonary infiltrates on chest x-ray, positive microbiological cultures or clinical signs are thought to have bigger influence on antibiotic treatment initiation. Among the responding physicians most used

strategy to avoid infection is to keep the patient in a semi-recumbent position (approx. 30°–40°), followed by oral hygiene with chlorhexidine and early enteral nutrition. On the other hand selective digestive tract decontamination or continuous subglottic secret removal are less likely used. 22 (31 %) ICUs start prophylactic antibiotic treatment right after the induction of MTH. Half of the participating units named cephalosporins (51 %) or Penicillin-Combinations (51 %) as first-line therapy compared with carbapenemes (20 %) or glycopeptides (17 %).
CONCLUSION. In this study we could confirm the big variety in infection prevention strategies during MTH. Although pneumonia rate is reported up to 40 % there is uncertainty about whether biomarkers are able to confirm infection during MTH. Infection prevention strategies are used with best acceptance of 30–45° semi-recumbent positioning, cuff pressure monitoring and oral hygiene with chlorhexidine. Larger trials need to show the effectiveness of above mentioned strategies.
REFERENCE(S). 1. Morrison LJ, et al. Part 8: advanced life support: 2010 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. Circulation 2010;122(16 Suppl 2):S345–421.

0440
WHOLE BLOOD MICRORNA PROFILING REVEALS POTENTIAL BIOMARKERS OF SEPSIS

K.F. van der Sluijs[1], A.M. Tuip-de Boer[1], F.M. de Beer[1], L.D. Bos[2], M. Straat[2], L. Wieske[2], L.A. van Vught[2], M.A. Huson[3], J. Horn[2], M.J. Schultz[2], C.W. Wieland[1]

[1]Academic Medical Center, Laboratory of Experimental Intensive Care and Anesthesiology, Amsterdam, Netherlands, [2]Academic Medical Center, Department of Intensive Care Medicine, Amsterdam, Netherlands, [3]Academic Medical Center, Center of Experimental Molecular Medicine, Amsterdam, Netherlands
INTRODUCTION. Reliable biomarkers to separate sepsis from systemic inflammatory response syndrome (SIRS) are lacking [1, 2]. MicroRNAs are single-stranded oligonucleotides involved in posttranscriptional regulation. MicroRNAs are known for their stability in biological fluids making them excellent candidates for diagnostic biomarkers [3].
OBJECTIVES. To determine whether (1) the microRNA profile in whole blood differs between sepsis and SIRS patients, and (2) specific microRNAs can serve as biomarkers for sepsis.
METHODS. Whole blood (PAXgene) was collected from ten sepsis patients (culture-confirmed secondary peritonitis) and ten SIRS patients (trauma patients without evidence of infection that met at least two SIRS criteria) on the day of ICU admission. Sepsis and SIRS were defined according to Bone et al. After total RNA isolation, microRNA profiling was performed by microRNome PCR array (Qiagen). Receiver operating characteristic (ROC)-curves were made for all miRNAs differentially expressed in SIRS and sepsis patients ($p < 0.01$; student's t test).
RESULTS. Of the 1,066 miRNA targets analyzed, 20 microRNAs were significantly upregulated in patients with sepsis (all $p < 0.01$). Area under the ROC-curve for MiR-188-5p, miR-548v and miR-340 were 0.98 ($p < 0.001$), 1.00 ($p < 0.001$) and 0.93 ($p < 0.01$) respectively.
CONCLUSION. At ICU admission, whole blood miRNA profiles differ between patients with sepsis and SIRS and MiR-188-5p, miR-548v and miR-340 are probably useful biomarkers. External validation of these results is required to confirm the diagnostic value of the specific microRNAs.
REFERENCES. 1. Uzzan BM, Cohen RM, Nicolas PP, Cucherat MM, Perret GY. Procalcitonin as a diagnostic test for sepsis in critically ill adults and after surgery or trauma: a systematic review and meta-analysis. Crit Care Med 2006;34:1996. 2. Gibot SM, Kolopp-Sarda MN, Bene MC, Cravoisy A, Levy B, Faure GC, Bollaert PE. Plasma level of a triggering receptor expressed on myeloid cells-1: its diagnostic accuracy in patients with suspected sepsis. Ann Intern Med 2004;141:9. 3. Schmidt WM, Spiel AO, Jilma B, Wolzt M, Muller M. In vivo profile of the human leukocyte microRNA response to endotoxemia. Biochem Biophys Res Commun 2009;380:437.
GRANT ACKNOWLEDGMENT. Financial support by NWO-Horizon (40-41009-98-9004).

0441
AMALGAMATION OF PROCALCITONIN (PCT), C-REACTIVE PROTEIEN (CRP), AND SEQUENTIAL ORGAN FAILURE SCORING SYSTEM (SOFA) IN PREDICTING SEPSIS SURVIVAL

M.A. Hegazy[1], A.S. Omar[2], N. Samir[3], S. Weber[4], W. Radwan[3]

[1]Shaikh Khalifa Medical City, Critical Care, Abu Dahbi, United Arab Emirates, [2]Beni Suef University, Critical Care, Beni Suef, Egypt, [3]Cairo University, Critical Care, Cairo, Egypt, [4]Shaikh Khalifa Medical City, Microbiology, Abu Dahbi, United Arab Emirates
INTRODUCTION. Hassling clinical features had been found in sepsis and non-infectious systemic inflammatory response syndrome, with neither sensitive nor specific physiologic parameters and time exhausting microbiological data, which may be also inconclusive.
OBJECTIVES. To compare the clinical informative value of procalcitonin (PCT) and C-reactive protein (CRP) plasma concentration in the early detection of sepsis and to relate to other scoring systems.
METHODS. One thirty-eight patients were enrolled in our study with mean age of 55.6 ± 19 years with 77 males and 61 females, all were subjected to PCT, CRP, and sequential organ failure assessment (SOFA) score daily for 7 days (day 1 starting symptoms). Blood samples were collected before starting antibiotics. The acute physiology and chronic health evaluation (APACHE) II score was used to determine the initial severity of illness. All patients were followed up for 28 days to be assigned to three groups: group I, SOFA 2–7; group II, SOFA 8–10; and group III, SOFA ≥11.
RESULTS. Underlying clinical diagnosis reveled pneumonia in 72 patients, urinary tract infections in 8, blood stream infection in 4 while other infections in 23, while infection could not be traced in 25 patients. The mean PCT was 3 ng/ml (95 % CI 1–4), 12 ng/ml (95 % CI 9.1–14) and 19 ng/ml (95 % CI 16.3–22.3) in group I, II and III respectively with statistical significance difference in the mean PCT level between the 3 groups ($P < 0.0001$). On the other hand CRP mean level did not significantly differentiate between the groups (147.1 mg/l in group II which even higher than the level group III is 138.4 mg/l. We found statistically significant positive correlation between PCT and APACHE II score by using Spearman correlation test that could not be achieved between CRP and APACHE II.
CONCLUSIONS. Given PCT its patronage display over a wide spectrum of insults it seems to do better than CRP in predicting the SOFA groups.
REFERENCE(S).
GRANT ACKNOWLEDGMENT. To all members of the critical care departments, Cairo, Beni Suef Universities, Egypt and Shikh Khalifa medical city. UAE.

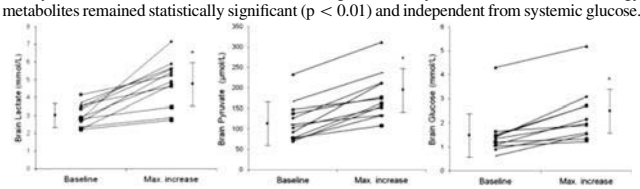
Tuesday 08 October 2013

Oral Sessions
Abstract Award Session: 0442–0445

0442
BENEFICIAL EFFECTS OF EXOGENOUS LACTATE ADMINISTRATION IN HUMANS WITH TRAUMATIC BRAIN INJURY

P. Bouzat[1], N. Sala[1], T. Suys[1], J. Bloch[2], R. Meuli[3], P.J. Magistretti[4], M. Oddo[1]

[1]Lausanne University Hospital, Department of Intensive Care Unit, Lausanne, Switzerland, [2]Lausanne University Hospital, Department of Neurosurgery, Lausanne, Switzerland, [3]Lausanne University Hospital, Department of Radiology, Lausanne, Switzerland, [4]Lausanne University, Brain Mind Institute, Laboratory of Neuroenergetics and Cellular Dynamics, Lausanne, Switzerland
INTRODUCTION. Experimental evidence suggests that exogenous lactate can support brain energy metabolism after injury and may be neuroprotective. No studies have examined whether lactate is beneficial in humans with traumatic brain injury (TBI).
OBJECTIVES. To examine the effect of sodium lactate infusion on cerebral energy metabolism after TBI.
METHODS. Twelve consecutive TBI patients (mean age 39 years, mean GCS 5) were enrolled in a prospective phase II interventional study to receive a continuous infusion of sodium lactate (40 μmol/kg/min for 60 min, followed by 30 μmol/kg/min for the next 2 h), administered within 48 h from TBI. Patients were monitored with cerebral microdialysis, brain tissue PO_2 and intracranial pressure, placed in the brain parenchyma (white matter, right frontal lobe in all patients). Brain interstitial tissue concentrations of lactate, pyruvate, glucose and glutamate were measured hourly.
RESULTS. Exogenous lactate administration was associated with a significant and clinically relevant increase of brain lactate (baseline 3 ± 0.6 vs 4.9 ± 1.3 mmol/L maximum increase), pyruvate (118 ± 48 vs 180 ± 55 μmol/L) and glucose (1.5 ± 0.9 vs 2.3 ± 1.1 mmol/L) (Fig. 1, all $p < 0.01$, paired T test). Lactate therapy also resulted in a reduction of brain glutamate (16 ± 14 vs 10 ± 9 mmol/L) and intracranial pressure (10 ± 6 vs 6 ± 4 mmHg, $p < 0.05$), while brain tissue PO_2 remained stable (25 ± 10 mmHg vs 23 ± 7 mmHg). Blood lactate increased from 1.8 ± 1.2 to a maximum of 5.5 ± 1.8 mmol/L. After adjusting for subject variability over time with mixed-effects multilevel regression analysis, increase of all brain energy metabolites remained statistically significant ($p < 0.01$) and independent from systemic glucose.



Brain tissue concentrations of metabolites

CONCLUSIONS. This is the first clinical study demonstrating lactate uptake and utilization by the injured human brain, with sparing of cerebral glucose. Increase of pyruvate and glucose in brain interstitial tissue during exogenous lactate administration further suggests beneficial effects of lactate therapy after TBI.
GRANT ACKNOWLEDGMENT. Supported by the Swiss National Science Foundation and the European Critical Care Network (ECCRN) of the ESICM.

0443
PREOPERATIVE SERUM SODIUM AND POSTOPERATIVE MORTALITY: A EUSOS SUBSTUDY

M. Cecconi[1], H. Hochrieser[2], B. Metnitz[3], R. Moreno[4], R. Pearse[5], P. Metnitz[6], A. Rhodes[1], on behalf of the EuSOS Investigators

[1]Intensive Care Medicine, St George's Healthcare NHS Trust and St George' University of London, London, United Kingdom, [2]Center for Medical Statistics, Informatics and Intelligent Systems of the Medical University of Vienna, Vienna, Austria, [3]Austrian Center for Documentation and Quality Management in Intensive Care Medicine, Vienna, Austria, [4]UCINC, Hospital de São José, Centro Hospitalar de Lisboa Central, EPE, Lisbon, Portugal, [5]Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, United Kingdom, [6]Department of Anesthesia, General Intensive Care and Pain Management of the Medical University of Vienna, Vienna, Austria
INTRODUCTION. Derangements in serum sodium levels during the perioperative period are common. It is unclear whether how levels relate to post operative outcomes.
OBJECTIVES. To describe the relationship between preoperative sodium values and mortality using data from the European Surgical Outcomes Study.
METHODS. Patients of this 7-day cohort study were enrolled in April 2011. Consecutive patients aged 16 years and older undergoing inpatient non-cardiac surgery in 498 hospitals across 28 European nations were included and followed up for a maximum of 60 days. The primary endpoint was in-hospital mortality. Secondary outcome measures were admission to intensive care, use of mechanical ventilation, and initiation of inotropes or vasopressors within 24 h after surgery. Sodium levels were split into none categories (see Table) from severe hyponatremia to severe hypernatremia. The "normal sodium range" was divided into: normal (138–142 mmol/L), borderline hyponatremia (136–137 mmol/L.) and borderline hypernatremia (143–144 mmol/L). A X^2 test was used to compare categorical variables, with a p value <0.05 considered as significant.
RESULTS. We enrolled 46,539 patients in the study. Due to missing values, 10.723 patients were excluded from analysis leaving 35,816 patients for analysis. There were significant differences ($p < 0.0001$) in mortality across all intervals of preoperative sodium levels.

Table 3 Sodium intervals and mortality

Sodium interval	n	% Total population	Mortality %
Severe hyponatremia (<125 mmol/L)	108	0.3	10
Moderate hyponatremia (126–130 mmol/L)	41	1.4	8.3
Mild hyponatremia (131–135 mmol/L)	3,338	9.3	5.8
Borderline hyponatremia (136–137 mmol/L)	4,598	12.8	3.5
Normal range (138–142 mmol/L)	21,943	61.3	2.6
Borderline hypernatremia (143–144 mmol/L)	3,805	10.6	2.8
Mild hypernatremia (145–149 mmol/L)	1,422	4.0	4.5
Moderate hypernatremia (150–154 mmol/L)	69	0.2	26.1
Severe hypernatremia (more than 155 mmol/L)	39	0.1	12.8

CONCLUSIONS. Even mild degrees of dysnatremia are associated with higher mortality in surgical patients.

REFERENCE(S). 1. Pearse RM et al. Lancet. 2012;380:1059–65. 2. Leung AA et al. Arch Intern Med. 2012;10:1–8.

GRANT ACKNOWLEDGMENT. European Society of Intensive Care Medicine and European Society of Anaesthesiology.

0444

BRAIN WHITE MATTER DAMAGE PREDICTS POOR SHORT-TERM OUTCOME AFTER OUT-OF-HOSPITAL CARDIAC ARREST

O. Arola[1], S. Virtanen[2], R. Laitio[1], R. Parkkola[2], M. Hynninen[3], R.O. Roine[4], M. Tiainen[5], H. Silvennoinen[6], J. Saunavaara[2], J. Martola[6], L. Valanne[6], J. Airaksinen[7], A. Saraste[7], V.-P. Harjola[8], J. Wennervirta[3], M. Bäcklund[3], E. Ylikoski[1], O. Inkinen[1], J. Grönlund[1], P. Silvasti[3], E. Nukarinen[3], M. Varpula[9], J. Niiranen[9], M. Pietilä[7], K. Korpi[9], K. Olkkola[1], H. Scheinin[10], T. Laitio[1], for the Xe-HYPOTHECA Study Group (Clinicaltrials. Gov NCT00879892)

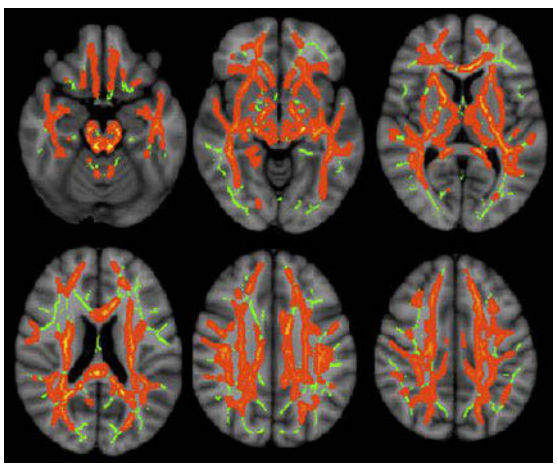
[1]Turku University Hospital, Department of Anesthesiology and Intensive Care, Turku, Finland, [2]Turku University Hospital, Medical Imaging Centre of Southwest Finland, Turku, Finland, [3]Helsinki University Central Hospital, Department of Anaesthesiology and Intensive Care, Helsinki, Finland, [4]Turku University Hospital, Department of Neurology, Turku, Finland, [5]Helsinki University Hospital, Department of Neurology, Helsinki, Finland, [6]Helsinki University Hospital, Helsinki Medical Imaging Center, Helsinki, Finland, [7]Turku University Hospital, Heart Centre, Turku, Finland, [8]Helsinki University Central Hospital, Division of Emergency Care, Helsinki, Finland, [9]Helsinki University Central Hospital, Heart and Lung Center, Helsinki, Finland, [10]Turku University, Turku, Finland

INTRODUCTION. Early prognostication in comatose survivors of out-of-hospital cardiac arrest (OHCA) is a clinical imperative. Fractional anisotropy (FA), an index measured by magnetic resonance diffusion tensor imaging (DTI), has been shown to be exceedingly sensitive to microstructural damage in brain white matter tracts [1].

OBJECTIVES. We hypothesized that white matter damage is more extensive in the early phase in OHCA patients who will not survive to hospital discharge.

METHODS. Mild therapeutic hypothermia was implemented for 24 h after OHCA in 56 patients. All patients underwent a brain MRI (3T) within 16 h after completion of rewarming, i.e. within 48 h after OHCA. The DTI data were processed using the observer independent tract-based spatial statistics tool of the FSL software package. Aligned and skeletonised FA maps, each containing 117,498 voxels (voxel size $1 \times 1 \times 1$ mm^3), were created and mean FA values of these maps were measured to determine a global FA value for each subject. Analysis of covariance (ANCOVA), with age as a covariate, was used to analyze differences between the two groups of hospital survivors ($N = 38$) and non-survivors ($N = 18$). Voxelwise analysis was also performed. Clinicians were blinded to DTI results during hospital stay to prevent "self-fulfilling prophecies".

RESULTS. Global FA values were significantly lower in non-survivors compared to survivors (mean ± SEM; 0.416 ± 0.0066 vs. 0.439 ± 0.0044, $p = 0.0087$), after controlling for age. Voxelwise analysis showed that lower FA values for the non-survivors were seen diffusely in white matter with no clear predilection for specific areas of brain. The figure represents FA skeleton of the white matter tract of 56 patients. Red indicates significantly lower FA values in non-survivors compared to survivors with a threshold significance level of $p = 0.05$, corrected for multiple comparisons across space. Of the analyzed brain tissue, 43 % exhibited significantly lower FA values in the non-survivor group.



FA skeleton of white matter tract of 56 patients

Area under receiver operating characteristic curve to predict in-hospital death was 0.737 for the global FA.

Table 4 Clinical characteristics

	Survivors (N = 38)	Non-survivors (N = 18)	p value
Age, years, median (IQR)	60 (47–65)	65 (57–72)	<0.05
Male, n (%)	23 (61)	15 (83)	NS
ROSC, minutes, median (IQR)	20.0 (16.0–25.0)	27.0 (23.8–28.5)	<0.001
ST-elevation myocardial infarction, n (%)	14 (37)	8 (44)	NS
ΔTroponin-T, difference between values at 72 h after OHCA and at ICU admission, median (IQR)	−0.8 (−0.01–0.9)	0.4 (0.07–2.1)	NS
ΔNSE, difference between values at 72 h after OHCA and at ICU admission, median (IQR)	−6.9 (−12.8–1.5)	13.4 (3.4–70.0)	<0.0001
Status epilepticus, n (%)	2 (5)	15 (83)	<0.0001

CONCLUSIONS. Degree of white matter damage derived from MRI affords additional value on early prognostication within the first 48 h after OHCA for short-term poor outcome.

REFERENCE(S). 1. Kinnunen KM, Greenwood R, Powell JH, et al. White matter damage and cognitive impairment after traumatic brain injury. Brain 2011;134:449–463.

GRANT ACKNOWLEDGMENT. This study was funded by Academy of Finland and by the Clinical Research funding (EVO) of Turku University Hospital.

0445

COMPARISON OF TWO LEVELS OF MEAN ARTERIAL PRESSURE ON SURVIVAL IN PATIENTS WITH SEPTIC SHOCK : SEPSISPAM TRIAL

P. Asfar[1], F. Meziani[2], J.F. Hamel[3], F. Grelon[4], B. Megarbane[5], N. Anguel[6], J.P. Mira[7], P.F. Dequin[8], S. Gergaud[9], N. Weiss[10], F. Legay[11], Y. Le Tulzo[12], M. Conrad[13], R. Robert[14], F. Gonzalez[15], L. Nicolet[16], F. Tamion[17], J.M. Tonnelier[18], J.L. Teboul[19], P. Radermacher[20]

[1]Centre Hospitalo-Universitaire, Réanimation Médicale, Angers, France, [2]Centre Hospitalo-Universitaire de Strasbourg, Nouvel Hôpital Civil, Réanimation Médicale, Strasbourg, France, [3]Centre Hospitalo-Universitaire d'Angers, Biostatistiques, Angers, France, [4]Centre Hospitalier du Mans, Réanimation Polyvalente, Le Mans, France, [5]Hôpital Lariboisière, Réanimation Médicale et Toxicologique, Paris, France, [6]Centre Hospitalo-Universitaire Kremlin Bicêtre, Réanimation Médicale, Le Kremlin Bicêtre, France, [7]Hôpital Cochin, Réanimation Médicale, Paris, France, [8]Centre Hospitalier Régional Universitaire de Tours, Réanimation Médicale, Tours, France, [9]Centre Hospitalo-Universitaire d'Angers, Réanimation Chirurgicale, Angers, France, [10]Hôpital Européen Georges Pompidou, Réanimation Médicale, Paris, France, [11]Centre Hospitalier Yves Le Foll, Réanimation Polyvalente, St Brieuc, France, [12]Centre Hospitalier Régional Universitaire, Hôpital de Pontchaillou, Réanimation Médicale, Rennes, France, [13]Centre Hospitalo-Universitaire de Nancy, Réanimation Médicale, Nancy, France, [14]Centre Hospitalier Régional Universitaire de Poitiers, Réanimation Médicale, Poitiers, France, [15]Hôpital Avicenne, Réanimation Médico-Chirurgicale, Bobigny, France, [16]Centre Hospitalo-Universitaire, Hôtel Dieu, Réanimation Médicale, Nantes, France, [17]Centre Hospitalo-Universitaire de Rouen, Réanimation Médicale, Rouen, France, [18]Centre Hospitalier Régional Universitaire de Brest, Hôpital La Cavale Blanche, Réanimation Médicale, Brest, France, [19]Centre Hospitalo-Universitaire du Kremlin Bicêtre, Réanimation Médicale, Le Kremlin Bicêtre, France, [20]Universitätsklinikum, Klinik für Anästhesiologie, Sektion Anästhesiologische Pathophysiologie und Verfahrensentwicklung, Ulm, Germany

INTRODUCTION. The Sepsis Survival Campaign guidelines recommend initial resuscitation with vasoactive drugs targeting a mean arterial pressure MAP ≥ 65 mmHg (grade 1C, strong recommendation with low level of evidence). Large prospective randomized controlled trials focusing on resuscitation of patients with septic shock showed that MAP was 75–95 mmHg at 24 h after inclusion. Randomized trials investigating MAP increments (65 vs. 75 vs. 85 mmHg) after initial hemodynamic stabilization only recruited a small number of patients (n = 10–28), and failed to demonstrate a clinical benefit of specific blood pressure level.

OBJECTIVES AND METHODS. Therefore, we conducted a multicenter, randomized, stratified, open label trial in patients with septic shock receiving usual care (including catecholamines), to test the hypothesis whether a target MAP of 80–85 mmHg ("High MAP" group) maintained during the first 5 days would decrease 28-day mortality, as when compared with 65–70 mmHg ("Low MAP" group). Patients were stratified at the time of randomization according to the presence of history of chronic arterial hypertension.

RESULTS. 776 patients underwent randomization (n = 388 each), and were included in the analysis. Neither 28-day mortality rate (34.0 and 36.5 %, respectively; P = 0.47) nor 90-day mortality (42.3 and 43.7 %, respectively; P = 0.69) showed any significant difference, no matter the stratification according to the presence of history of arterial hypertension. However, in patients with a history of arterial hypertension, both the difference between the maximum renal SOFA score and the renal SOFA score at inclusion, as well as the requirement for renal replacement therapy were significantly lower in the "High MAP" group. The overall rate of serious adverse events and the number of adverse cardiac events did not significantly differ either between the two groups. However, the incidence of de novo atrial fibrillation was significantly higher in the "High MAP" group. This difference was due to the markedly higher incidence in patients without history of arterial hypertension. Overall frequency of ischemic adverse events was also comparable in the two

groups, but patients without a history of hypertension experienced more bleeding complications in the "Low MAP" group.
CONCLUSIONS. Targeting MAP to 80–85 mmHg did not reduce 28- or 90-day mortality rate. In the subgroup of patients with chronic hypertension, targeting MAP to 80–85 mmHg reduced the requirement for renal replacement therapy, whereas in patients without chronic hypertension, targeting MAP to 65–70 mmHg increased gastrointestinal bleedings and targeting MAP to 80–85 mmHg increased atrial fibrillation rate.
GRANT ACKNOWLEDGMENT. Programme Hospitalier de Recherche Clinique 2009; French Ministery of Health.

Mechanical ventilation settings: from optimal to individualized?: 0446–0450

0446

PROPORTIONAL ASSIST VENTILATION (PAV+) VS. ASSIST CONTROL VENTILATION IN ACUTE PHASE OF CRITICAL ILLENESS PATIENTS: MULTICENTER RANDOMIZED TRIAL

M. Delgado[1], C. Subira[2], A. Diaz-Prieto[3], C. Hermosa[4], J. Riera[5], R. Fernandez[2]

[1]Inselspital, Universitätsspital Bern, Universitätsklinik für Intensivmedizin, Bern, Switzerland, [2]Hospital Sant Joan de Deu, Althaia Xarxa Assistencial, Intensive Care Unit, Manresa, Spain, [3]Hospital de Bellvitge, Intensive Care Unit, Barcelona, Spain, [4]Hospital del Henares, Intensive Care Unit, Coslada, Spain, [5]Hospital Vall d'Hebrón, Intensive Care Unit, Barcelona, Spain
INTRODUCTION. Proportional Assist Ventilation (PAV+) applies an inspiratory pressure, depending on the patient's inspiratory effort, allowing a cycle to cycle variability and, therefore, better patient–ventilator interaction. Several trials have compared PAV+ with pressure support ventilation as weaning mode but, until now, it has not been assessed its utility in acute phase of illness.
OBJECTIVES. We aim to analyze PAV+ vs. assist control ventilation (ACV) in the initial phases of mechanical ventilation (MV) regarding days of MV and outcomes.
METHODS. Multicenter, prospective, simple blind and randomized trial comparing high assistance PAV+ (gain 80 %) vs. ACV. Baseline variables as comorbidities and SAPS3 score were recorded. Inclusion criteria: MV >24 h, Compliance >30 ml/cmH_2O, Resistance >8cm $H_2$0/l/s, work of breathing (WOB) <1.5 J/l and sedation Ramsay scale 3–4. Variables: MV length, gas exchange, respiratory mechanics, length of stay (LOS) in ICU/hospital and mortality (ICU, hospital and 60 days). Statistical analysis: *U* Mann–Whitney and Fisher exact test, logistical regression for variables related to PAV+ failure.
RESULTS. 102 patients were enrolled, 52 allocated to PAV+ and 50 to ACV. No differences were found in demographic data, except of age (62 vs. 67 years, p = 0.04) and SAPS 3 (56 vs. 61, p = 0.04). We could not identify differences in any of the objectives between PAV+ and ACV. MV length: MV_{total} 3 vs. 3, p = 0.7; MV_{acute} 3 vs. 2, p = 0.1; $MV_{weaning}$ 0 vs. 0, p = 0.8; LOS ICU: 9 vs. 8 days, p = 0.27; LOS hospital: 19 vs. 17 days, p = 0.8; gas exchange was similar between groups and survival was also similar: ICU: 84 vs. 86 %, p = 0.5; Hospital: 71 vs. 78 %, p = 0.4, at 60 days: 71 vs. 74 %, p = 0.6. The trial showed a high incidence of failure by PAV+ application (42 %), attributed to excessive sedation (32 %), high WOB (24 %) and high respiratory rate (19 %).
CONCLUSIONS. PAV+ could be an alternative to ACV in acute phase but did not ameliorate any of the objectives. The high incidence of PAV+ failure interferes with the routinely application in ICU.

0447

EFFECTS OF INDIVIDUALIZED PEEP-ADJUSTMENT IN OBESE PATIENTS UNDERGOING BARIATRIC SURGERY

P. Simon[1], C. Nestler[1], S. Hammermüller[1], M. Thiele[1], L.M. Camilo[2], A. Beda[3], A. Dietrich[4,5], A.W. Reske[1,5], U.X. Kaisers[1,5], H. Wrigge[1,5]

[1]University Hospital of Leipzig, Department of Anaesthesiology and Intensive Care Medicine, Leipzig, Germany, [2]Federal University of Rio de Janeiro, Institute of Biophysics Carlos Chagas Filho, Rio de Janeiro, Brazil, [3]Federal University of Minas Gerais, Belo Horizonte, Department of Electronic Engineering, Belo Horizonte, Brazil, [4]University Hospital Leipzig, Department of Surgery, Leipzig, Germany, [5]University of Leipzig, Integrated Research and Treatment Center (IFB) Adiposity Diseases, Leipzig, Germany
INTRODUCTION. In obese patients, postoperative pulmonary complications may be increased after mechanical ventilation during general anaesthesia [1]. Physiological considerations suggest that PEEP-levels around 5 cmH_2O fail to avoid lung collapse during anaesthesia ventilation. Lung recruitment followed by ventilation with individualized PEEP can reduce atelectasis formation [2]. Electrical impedance tomography (EIT) allows visualizing regional ventilation at the bedside non-invasively. Experimental EIT data demonstrated that delayed inflation of lung regions during a low-flow maneuver correlates with cyclic lung collapse. Minimizing this inhomogeneity in inflation assessed as regional ventilation delay (RVD) by EIT can be used to individualize PEEP titrated to avoid alveolar collapse [3].
OBJECTIVES. We hypothesized that EIT-based individual PEEP-titration improves respiratory system function in obese patients during general anaesthesia.
METHODS. With institutional ethical committee approval and written informed consent, patients scheduled for bariatric surgery were randomized to ventilation with either conventional or individualized PEEP ($PEEP_{EIT}$). After induction of anaesthesia, volume-controlled ventilation (VT = 8 ml/kg PBW, I:E ratio 1:2, respiratory rate of 12/min) was started. Control patients were ventilated with conventional PEEP of 5 cmH_2O ($PEEP_5$). Patients ventilated with $PEEP_{EIT}$ received a recruitment (plateau pressure 50 cmH_2O; PEEP of 30 cmH_2O; 10 breaths) followed by decremental PEEP-titration (steps of 2 cmH_2O) starting at PEEP of 26 cmH_2O. On every PEEP-step a low-flow lung inflation was performed to assess lung inhomogeneity by RVD. $PEEP_{EIT}$ was chosen when the RVD was lowest. During anesthesia ventilation we measured PaO_2/FIO_2, driving pressure (plateau pressure—PEEP), and compliance as well as MAP were assessed after intubation, before PEEP titration, twice during surgery and before extubation. After confirming normal distribution, data were compared using repeated measures ANOVA or Mann–Whitney *U* test due to non-normal distribution. P values ≤0.05 were considered statistically significant.
RESULTS. 28 patients ($PEEP_5$ n = 15, $PEEP_{EIT}$ n = 13) with BMI 51 ± 8 kg/m^2 completed the study. $PEEP_{EIT}$ was significantly higher [median 18 cmH_2O (range 10–26)] than the $PEEP_5$ (p < 0.001; Fig. 1). With $PEEP_{EIT}$, patients had better oxygenation, less inhomogeneous lung inflation as assessed by EIT, and better compliance.

		before PEEP titration	3h after intubation	4h after intubation	before extubation	p-value
PEEP *cmH2O; median [range]*	$PEEP_5$	5	5	5	5	<0.001
	$PEEP_{EIT}$	5	18 [10:26]	18 [10:26]	18 [10:26]	
mean arterial pressure *mmHg; mean ± SD*	$PEEP_5$	67.7 ± 9.2	75.6 ± 7.2	77.6 ± 6.0	80.8 ± 18.8	§ <0.05; $/& n.s.
	$PEEP_{EIT}$	77.1 ± 19.4	73.4 ± 9.1	70.8 ± 5.8	85.0 ± 16.3	
PaO_2/F_iO_2 *mmHg; mean ± SD*	$PEEP_5$	286.8 ± 151.1	383.6 ± 95.7	433.5 ± 90.8	365.1 ± 144.1	§/$/& <0.001
	$PEEP_{EIT}$	242.8 ± 122.5	504.2 ± 70.4	513.2 ± 41.4	515.3 ± 88.3	
dynamic compliance *mL/cmH2O; mean ± SD*	$PEEP_5$	42.3 ± 10.6	31.9 ± 7.8	29.0 ± 4.1	40.8 ± 10.5	§/$/& <0.001
	$PEEP_{EIT}$	41.9 ± 11.0	61.3 ± 19.3	58.3 ± 14.6	82.7 ± 23.8	
RVD *mean ± SD*	$PEEP_5$	16.6 ± 5.5	18.2 ± 4.4	19.7 ± 2.2	14.2 ± 3.1	§/$/& <0.05
	$PEEP_{EIT}$	14.9 ± 2.5	13.7 ± 3.7	12.7 ± 2.9	10.0 ± 2.2	
driving pressure *cmH2O; mean ± SD*	$PEEP_5$	12.6 ± 2.6	16.8 ± 2.2	17.2 ± 1.3	14.1 ± 2.7	§/$/& <0.001
	$PEEP_{EIT}$	13.1 ± 4.7	9.5 ± 1.5	9.7 ± 1.6	7.0 ± 1.5	

RVD – regional ventilation delay index ([3] and see text); ANOVA: time (§), group ($), time*group (&)

Figure 1

CONCLUSION. In obese patients undergoing bariatric surgery, inhomogeneity of lung inflation can be reduced by lung recruitment and PEEP-titration guided by EIT. This requires higher PEEP values than commonly recommended. Our data suggest that individualized ventilation results in improved lung function.
REFERENCES. 1. Pelosi P et al. J Appl Physiol 1997. 2. Rothen HU et al. Lancet 1995. 3. Muders T et al. Crit Care Med 2012.
GRANT ACKNOWLEDGEMENT. Integrated Research and Treatment Center Adiposity Diseases, Leipzig, Germany. Draeger Medical, Luebeck, Germany.

0448

COMPARISON OF SLEEP QUALITY IN MECHANICALLY-VENTILATED ICU PATIENTS: PSV VS. NAVA

S. Italiano[1], F. Roche-Campo[1], S. Gimenez[2], S. Clos[2], H. Aguirre-Bermeo[1], J. Grandjean[1], T. Maraffi[1], F.J. Parrilla[1], J. Mancebo[1]

[1]Hospital de la Santa Creu i Sant Pau, Intensive Care Unit, Barcelona, Spain, [2]Hospital de la Santa Creu i Sant Pau, Centre d'Investigació de Medicaments, Institut de Recerca de l'HSCSP, Departament de Farmacologia i Terapèutica. Institut d'Investigacions Biomèdicas, IIB Sant Pau. Centro de Investigación Biomédica de Salud Mental, Barcelona, Spain
INTRODUCTION. Sleep quantity and quality are severely altered in ICU patients under mechanical ventilation. Ventilatory mode and setting likely play a role in sleep disruption. The neurally adjusted ventilatory assist (NAVA) mode provides good patient-ventilator synchronization and could improve sleep quality.
OBJECTIVES. The aim of this study was to evaluate the direct impact of two different ventilatory modes on sleep quantity and quality.
METHODS. Prospective, comparative study in 8 conscious and non-sedated patients in an adult ICU located at a university hospital. Patients were weaning from mechanical ventilation and ventilated with pressure support ventilation (PSV) clinically adjusted to get a respiratory rate >20 and <30 bpm. Patients were randomized to receive PSV or NAVA first in two 5-h crossover periods (10 h total) from 10 p.m. to 8 a.m. Polysomnography was performed continuously through the entire 10-h study period. The NAVA was adjusted to obtain a peak pressure similar to that obtained in PSV. Continuous variables were compared with the Wilcoxon test, with the results expressed in median and interquartile ranges.
RESULTS. The main sleep abnormalities were low sleep efficiency (total sleep time/total study period), N3 and rapid eye movement (REM) sleep time. No differences in sleep quantity and quality were found between the PSV and NAVA modes (Table 1). No central apneas were observed in either ventilator mode. The median pressure support was 9 cm $H_2$0 (8–12) and the median NAVA gain was 0.80 cmH_2O/μV (0.6–1.1). The tidal volume was significantly lower and the respiratory rate significantly higher during NAVA ventilation vs. PSV [355 (320–515) mL vs. 425 (380–550) p = 0.03 and 29 (19–37) bpm vs. 26 (18–32) p = 0.02, respectively).

Table 1 Sleep characteristics during the 600 min study period (n = 8)

	PSV	NAVA	p
Total sleep time (min)	80 (39–121)	62 (25–148)	0.89
Sleep efficiency (%)	27 (14–39)	21 (8–50)	0.78
Stage N1 (min)	21 (18–41)	23 (17–35)	0.94
Stage N2 (min)	46 (20–71)	26 (5–86)	0.89
Stage N3 (min)	1 (0–12)	0 (0–22)	0.89
REM (min)	0 (0–0)	0 (0–9)	0.18
Fragmentation index	11 (5–12)	13 (6–18)	0.21

Abbreviations: fragmentation index (arousals and awakenings per hour)

CONCLUSIONS. In non-sedated, mechanically-ventilated patients in the ICU, sleep quantity and quality during weaning were highly abnormal, with short N3 and REM sleep stages. The ventilatory modes, adjusted as described, were similar in terms of sleep quantity and quality.
GRANT ACKNOWLEDGMENT. Maquet Sweden provided all the NAVA catheters for this study free of charge.

0449
EARLY USE OF HIGH-FREQUENCY PERCUSSIVE VENTILATION IN ADULT ARDS. A SINGLE CENTRE EXPERIENCE

H. Spapen[1], M. Borremans[1], V. Van Gorp[1], J. Troubleyn[1], J. De Regt[1], R. Jacobs[1], M. Diltoer[1], E. De Waele[1], P.M. Honoré[1]

[1]University Hospital, Vrije Universiteit Brussels, Intensive Care, Brussels, Belgium
INTRODUCTION. Few studies, mainly in surgical and trauma (i.e. non-septic) patients with refractory hypoxaemia during conventional ventilation, have investigated the efficacy of high-frequency percussive ventilation (HFPV) in adult patients with ARDS.
OBJECTIVE. To evaluate the effects of early use of HFPV on respiratory variables and outcome in pneumonia-induced septic versus non-septic ARDS.
Methods. Retrospective analysis of prospectively gathered data in 60 consecutive patients initiated on HFPV within 12 h of fulfilling the Berlin criteria for moderate or severe ARDS. Ventilation and oxygenation were governed according to a predefined protocol to keep pH > 7.35, SpO_2 > 95 %, and P_aCO_2 between 35 and 45 mmHg. Other treatment modalities influencing ventilation and/or oxygenation were not allowed except in patients not responding to HFPV after 24 h, excluding them from final analysis. HFPV was continued until patients could be switched to conventional ventilation. Baseline variables between pneumonia-associated and non-septic ARDS patients were compared with Fisher′s exact test and Mann–Whitney *U* test as applicable. Evolution of pH, P_aCO_2 and P_aO_2/F_iO_2 during HFPV were assessed by one-way analysis of variance. A Kaplan–Meier curve was used to describe survival.
RESULTS. 42 patients (20 pulmonary sepsis-induced ARDS and 22 non-septic ARDS cases) were evaluable. Baseline demographic characteristics, severity of illness, lung injury score, pH, and respiratory variables were comparable between pneumonia- and non-sepsis-related ARDS. Within the first 24 h, HFPV restored normal pH and P_aCO_2 and considerably improved oxygenation. This improvement was sustained throughout the whole duration of HFPV treatment. Oxygenation improved more in non-septic than in pneumonia-related ARDS. Patients with pneumonia-induced ARDS also remained longer HFPV-dependent (7.0 vs. 4.9 days; $p < 0.05$). Overall mortality at 30 days and in-hospital mortality were respectively 33 and 42 %. Moderate and severe ARDS patients had a similar 30-day mortality rate (33 vs. 41 %; p = NS). However, 30-day mortality was significantly higher in pneumonia-related as compared with non-septic ARDS (50 vs. 18 %; $p = 0.01$). HFPV was haemodynamically well-tolerated. Barotrauma was not observed.
CONCLUSION. HFPV caused rapid and sustained improvement of oxygenation and ventilation in patients with moderate to severe ARDS. Less improved oxygenation, longer ventilator dependency, and worse survival were observed in pneumonia-related ARDS.

0450
AUTOMATED VERSUS NON-AUTOMATED WEANING FOR REDUCING THE DURATION OF MECHANICAL VENTILATION FOR CRITICALLY ILL ADULTS AND CHILDREN

L. Rose[1], M. Schultz[2], C. Cardwell[3], P. Jouvet[4], D. Mcauley[3], B. Blackwood[3]

[1]University of Toronto, Toronto, Canada, [2]Academic Medical Center, University of Amsterdam, Amsterdam, Netherlands, [3]Queens University Belfast, Belfast, United Kingdom, [4]Sainte-Justine Hospital, Montreal, Canada
INTRODUCTION. Automated closed loop systems may improve adaptation of mechanical support to patient's ventilatory needs and facilitate systematic and early recognition of their ability to breathe spontaneously and for discontinuation of ventilation.
OBJECTIVES. Our objective was to compare the duration of weaning from mechanical ventilation for critically ill ventilated adults and children managed with automated closed loop systems versus non-automated strategies reported in randomized controlled trials (RCTs). Secondary objectives were to determine differences in duration of ventilation, intensive care unit (ICU) and hospital length of stay (LOS), mortality, and adverse events.
METHODS. We performed a systematic review and meta-analysis. We searched, from database inception to August 2012, Cochrane Central Register of Controlled Trials; MEDLINE; EMBASE; CINAHL; LILACS; DARE, HTA Database; Web of Science Proceedings; trial registration websites, and reference lists of relevant articles. We included RCTs comparing automated closed loop ventilator applications to non-automated weaning strategies including non-protocolized usual care and protocolized weaning in patients over 4 weeks of age receiving invasive mechanical ventilation. Two authors independently extracted study data and assessed risk of bias. We combined data into forest plots using random effects modelling. Subgroup and sensitivity analyses were conducted according to a priori criteria.
RESULTS. Pooled data from 15 eligible trials (14 adult, 1 paediatric) totalling 1,173 participants indicated automated closed loop systems reduced the geometric mean duration of weaning by 32 % (95 % CI 19–46 %, $P = 0.002$), however heterogeneity was substantial (I2 89 %, $P < 0.00001$). Reduced weaning duration was found with mixed or medical ICU populations (43, 95 % CI 8–65 %, $P = 0.02$) and Smartcare/PS^{TM} (31, 95 % CI 7–49 %, $P = 0.02$). Automated closed loop systems reduced the duration of ventilation (17, 95 % CI 8–26 %) and ICU LOS (11, 95 % CI 0–21 %). There was no difference in mortality rates or hospital LOS. Overall the quality of evidence was high with most trials rated as low risk of bias.
CONCLUSIONS. Automated closed loop systems may result in reduced duration of weaning, ventilation, and ICU stay. Reductions are more likely in mixed or medical ICU populations and in Smartcare/PS^{TM}. Adaptive Support Ventilation and other automated systems did not influence these outcomes. Due to substantial heterogeneity in trials there is a need for an adequately powered high quality multi-centre RCT in an adults that excludes 'simple to wean' patients. There is a pressing need for further technological development and research in the paediatric population.
GRANT ACKNOWLEDGMENT. Canadian Institutes of Health Research.

Cardiac Issues in ICU: 0451–0455

0451
GLOBAL ECHOCARDIOGRAPHIC EVALUATION OF RIGHT VENTRICULAR DYSFUNCTION AFTER CARDIAC SURGERY

O. Abou Arab[1], P.G. Guinot[2], D. Longrois[3], H. Dupont[2]

[1]CHU Amiens, Anesthesiology, Amiens, France, [2]CHU Amiens, Amiens, France, [3]Bichat University Hospital, Paris, France
INTRODUCTION. Right ventricular dysfunction (RVD) is a well-known complication after cardiac surgery that is associated with increased morbidity and mortality. Due to the absence of a reliable and accurate right ventricular echocardiographic criteria, no consensual definition of RVD is established.
OBJECTIVES. The aim of this study was to evaluate the ability of a global transthoracic echocardiographic evaluation of right heart to identify a group of patients with RVD and correlate the presence of these criteria to clinical outcome.
METHODS. After IRB approval, 71 patients following cardiac surgery were prospectively included. A same ICU physician performed a transthoracic cardiac echography the day before the surgery and immediately at the admission in ICU. Left and right ventricular function were assessed: left ventricular ejection fraction (LVEF), right ventricular ejection fraction (RVEF), tricuspid annular plane systolic excursion (TAPSE), systolic tricuspid annular motion at the lateral wall Sr(t), visual dilatation of the right heart. Values of RV echographic variables were divided into quartiles and the bottom quartile used to represent significant (RVD). RVD was defined by two positive measures significant RVD among different RV measures. Data are expressed as median (25–75th), numbers (%). Wilcoxon, Mann Whitney and Fisher tests were used.
RESULTS. Median age was 66 years (60–76), logistic EuroSCORE was 4.6 (2.2–8.4). All RV echocardiographic parameters decreased after surgery ($p < 0.05$): RVEF [50 % (40–55) vs 40 % (35–50)], TAPSE [2.2 (1.9–2.5) cm vs 1.3 (0.93–1.5)], Sr(t) [1.5 cm^{-1} (1.2–1.8) vs 0.8 (0.63–0.9)]. RV parameters were moderately internally correlated: Sr(t) and TAPSE ($r = 0.38$, $p = 0.001$), Sr(t) and RVEF ($r = 0.42$, $p = 0.001$), TAPSE and RVEF ($r = 0.46$, $p = 0.001$). RVD defined by composite criteria was present in 20 (28 %) patients of the overall population. Patients with RVD had a significant worse post operative course, with a longer ICU stay [4 (3–6) vs 2 (2–3) days, $p = 0.02$], a longer intubation time [8 (5–12) vs 6 (3–8) h, $p = 0.04$], higher frequency of acute kidney injury (65 vs 12 %, $p = 0.001$), more use of norepinephrine (67 vs 34 %, $p = 0.008$).
CONCLUSIONS. RVD defined by a composite criterion based on a global echocardiographic evaluation could identify a group of patients with worse outcome after cardiac surgery. This approach has to be confirmed in larger cohorts.

0452
COMPUTER GUIDED LOW-NORMAL VERSUS HIGH-NORMAL POTASSIUM CONTROL AND ITS EFFECT ON ATRIAL FIBRILLATION IN 1225 THORACIC ICU PATIENTS—THE GRIP-COMPASS TRIAL

M. Hoekstra[1], L. Hessels[2], L. Yeh[1], A. Oude Lansink[2], M. Vogelzang[2], I.C. van der Horst[2], J. van der Maaten[1], F. Ismael[2], M. Struys[1], F. Zijlstra[3], M.W. Nijsten[2]

[1]University Medical Center Groningen, University of Groningen, Anesthesiology, Groningen, Netherlands, [2]University Medical Center Groningen, University of Groningen, Critical Care, Groningen, Netherlands, [3]Erasmus MC University Medical Centre Rotterdam, Cardiology, Rotterdam, Netherlands
INTRODUCTION. Atrial fibrillation is common in critically ill patients admitted to the intensive care unit (ICU). Both hypokalemia and hyperkalemia are associated with the occurrence of atrial fibrillation. It is unknown if strategies to regulate potassium can prevent atrial fibrillation. In contrast to glucose control, no trials have been performed to examine to potassium control and the optimal target.
OBJECTIVES. To investigate the effect of two different potassium targets (within normal range) on atrial fibrillation in a cohort of ICU patients after open-heart surgery.
METHODS. We assigned consecutive patients admitted to the thoracic ICU to undergo a potassium suppletion strategy aiming at a low normal potassium (4.0 mmol/L, LNP group) or high-normal potassium (4.5 mmol/L, HNP group). Potassium regulation of both trial arms was performed by the validated GRIP-II computer-assisted decision support system. Primary outcome was the occurrence of atrial fibrillation or atrial flutter (AFF) in the first postoperative week in patients who underwent coronary artery bypass grafting and/or valvular surgery.
RESULTS. A total of 1,225 patients were included of which 945 underwent heart surgery (462 patients in the LNP group and 483 patients in the HNP group). The mean daily administered dose of potassium was 31 ± 24 mmol (LNP) versus 51 ± 28 mmol (HNP) ($P < 0.001$), which resulted in a mean ICU potassium of respectively 4.2 ± 0.5 mmol/L and 4.4 ± 0.6 mmol/L ($P < 0.001$). The incidence of AFF after open heart surgery did not differ between the two groups (38 % LNP group and 40 % HNP group). There were also no differences in the incidence of myocardial infarction, stroke, kidney failure and mortality (ICU, hospital and 1-year).
CONCLUSIONS. In this first prospective trial that examined potassium regulation, two different computer-assisted potassium regulation strategies did not result in a difference in the incidence of atrial fibrillation after open-heart surgery. Thus potassium control between 4.0 and 4.5 mmol/L appears suitable target range.

0453
OFF-PUMP CABG SURGERY REDUCES SYSTEMIC INFLAMMATION COMPARED TO ON-PUMP CABG BUT DOES NOT CHANGE ENDOTHELIAL RESPONSES: A RANDOMIZED CLINICAL STUDY

R.M. Jongman[1,2], J.G. Zijlstra[3], M.A. Mariani[4], J. Moser[2,3], M.M.R.F. Struys[1], J.J.M. Ligtenberg[5], A.R. Absalom[1], G. Molema[2], T.W.L. Scheeren[1], M. van Meurs[2,3], Endothelial Dysfunction

[1]University Medical Center Groningen, University of Groningen, Department of Anaesthesiology, Groningen, Netherlands, [2]University Medical Center Groningen, University of Groningen, Department of Pathology and Medical Biology, Medical Biology Section, Groningen, Netherlands, [3]University Medical Center Groningen, University of Groningen, Department of Critical Care, Groningen, Netherlands, [4]University Medical Center Groningen, University of Groningen, Department of Cardiothoracic Surgery, Groningen, Netherlands, [5]University Medical Center Groningen, University of Groningen, Department of Emergency Medicine, Groningen, Netherlands
INTRODUCTION. Coronary artery bypass graft (CABG) surgery can be followed by organ failure, due to a systemic inflammatory reaction. To reduce this systemic inflammation, CABG can be performed on the beating heart (off-pump CABG), thereby avoiding cardiopulmonary bypass and cross-clamping of the aorta. There is increasing evidence that

the endothelium plays an important role in the pathophysiology of organ failure post CABG. When the endothelium becomes activated, it starts to express adhesion molecules and secretes pro inflammatory cytokines [1]. The Angiopoietin (Ang)/Tie2 receptor system and the VEGF/VEGF receptor system are involved in endothelial activation in organ failure [2]. Endothelial activation can be studied by measuring systemic levels of soluble adhesion molecules, and angiogenic and vascular leakage related factors in the plasma [3].
OBJECTIVES. To study the effects of off-pump versus on-pump CABG surgery on systemic inflammation and endothelial activation.
METHODS. In this prospective, randomized, observational study, 60 patients who were scheduled for elective CABG surgery were randomized to have surgery for on-pump or off-pump CABG. One patient was excluded from the study because off-pump CABG was performed, whereas the patient was randomized for on-pump CABG. Blood was collected at four time points: at start of the procedure, at the end, 6, and 24 h postoperatively. Levels of inflammatory cytokines [IL-6, TNF-α, IL-10, and myeloperoxidase (MPO)], soluble adhesion molecules (E-selectin, VCAM-1, and ICAM-1), and angiogenic factors and their receptors (Ang-1, Ang-2, sTie2, VEGF, sFlt-1, and KDR) were measured in the plasma.
RESULTS. There was no difference in pre-operative characteristics between the patient groups. The inflammatory cytokines TNFα, IL-10 and MPO, but not IL-6, were more increased after the procedure in the on-pump group compared with the off-pump CABG group. The soluble endothelial adhesion molecules E-selectin, VCAM-1, and ICAM-1 showed a similar release pattern in the plasma during and after CABG in on-pump and off-pump and were not elevated. Ang-2 was only increased 24 h after surgery, and was not different between on-pump and off-pump group. Higher levels of sFlt-1 were found at the end of the procedure in off-pump CABG compared to on-pump CABG.
CONCLUSIONS. Our study showed that avoiding cardiopulmonary bypass and aortic cross-clamping in CABG surgery reduces the systemic inflammatory response. On-pump CABG does not lead to a higher release of soluble endothelial adhesion molecules in the system compared to off-pump CABG. The systemic levels of angiogenic and vascular leakage related molecules of the endothelial Ang/Tie2 and the VEGF/VEGF receptor system were more deranged from start values in on-pump than in off-pump CABG.
REFERENCE(S). 1. Aird WC. Crit Care Med 2003;31(4 Suppl):S221–30. 2. van Meurs M et al. Crit Care 2009;13(2):207. 3. de Pablo R et al. Eur J Intern Med 2013;24(2):132–138.

0454
STUDY OF FOCUSSED ASSESSMENT OF TRANSTHORACIC ECHOCARDIOGRAPHY(FATE) PROTOCOL IN ADULT POST CARDIOTHORACIC SURGERY PATIENTS

S.N. Veerappa[1], R. Gupta[1], Adult Post Operative Cardiothoracic Surgery Patients

[1]Narayana Hrudayalaya, Critical Care Medicine, Bangalore, Karnataka, India
INTRODUCTION. • Echo in the ICU has commonly been used as a diagnostic tool-worthwhile using it for monitoring and hemodynamic assessment.
• FATE is a quick, goal oriented cardiac and pleura imaging protocol designed for use in ICU
• Involves basic echo in four standard transthoracic acoustic windows

OBJECTIVES. To evaluate the utility of focused assessment of transthoracic echo (FATE) protocol in decision making in adult post cardiothoracic surgery patients in intensive therapy unit.
METHODS. • Inclusion criteria: adult patients undergoing cardiac surgeries with indications for echo in the post op period like-pre-load assessment, increased need for inotropes, drop in hematocrit, respiratory insufficiency, hemodynamic instability in the immediate post op period were included in the study.
• Exclusion criteria: pre-operative patients requiring stay in AITU were excluded, pediatric patients and patients <18 years of age undergoing surgery for congenital heart diseases were excluded.
• 366 patients among the 1,024 adult patients undergoing cardiothoracic surgery including valve repairs and replacements, bypass grafting and aortic aneurysm repairs were studied over a period of 4 months.
• FATE protocol was followed when there was clinical indication for echocardiography in the immediate postoperative (<12 h).
• 4 views-apical, parasternal, sub-xiphoid, and pleural views, were examined by a senior consultant intensivist using a standard GE VIVID 3 ECHO machine using the 3 Hz probe
• Assessment of usefulness of FATE was made in 4 categories-
1. Poor window/no information 2. Support of existing information 3. Added new information 4. Added decisive information • Tabulated results where subjected to paired and unpaired 't' tests for parametric and non-parametric data as applicable and CHI square test applied for usefulness of FATE. Test results were significant when p value was <0.05
RESULTS. • A total of 366 patients were studied, of whom 290 (79.23 %) were males and 76 (20.76 %) were females.
• A total of 283 (77.32 %) patients were on ventilator at the time of examination. Mean age 52.91 ± 26.12 years. Mean BMI 24.53 ± 8.12
• Decisive information was obtained using FATE in 246 (67.21 %).
• New information was obtained in 32 (8.74 %).
• 86 (23.49 %) FATE supported already existing information.
• 2 (0.66 %) patients had very poor ECHO window.
• Of the 246 (67.21 %) patients that FATE helped obtaining decisive information. In 234 (95.12 %) patients, medical management was directly influenced by FATE findings, 50 (20.32 %) patients were extubated aiding in early transfer out of the ITU.
• In 80 (32.52 %) patients, FATE aided in decision making, in terms of requirement of surgical intervention-inter costal drain (ICD) insertion in 47 (19.10 %) and re-exploration in 33 (13.41 %).
CONCLUSIONS. Decisive information obtained using FATE in 246 (67.21 %) was found to be statistically significant with a p value <0.0001.
REFERENCE(S). http://www.fate.org

0455
INFLUENCE OF GOAL-DIRECTED HEMODYNAMIC OPTIMIZATION ON CLINICAL PARAMETERS OF PATIENTS UNDERGOING TRANSCATHETER AORTIC VALVE IMPLANTATION (TAVI) - A RETROSPECTIVE ANALYSIS

V. Mezger[1], M. Habicher[1], F. Balzer[1], G. Fucini[1], K. Stangl[2], M. Sander[1]

[1]Charité—University Medicine Berlin, Anesthesiology and Intensive Care Medicine, Berlin, Germany, [2]Charité—University Medicine Berlin, Department of Cardiology and Angiology, Berlin, Germany

INTRODUCTION. TAVI has become a potential option for patients with aortic valve stenosis. As this patient population according to age and cardiovascular condition is considered as "high risk" the intraoperative anesthetic management and especially hemodynamic stability maintaining preload and avoiding tachycardia is essential (1).
OBJECTIVES. The aim of this study was to investigate the influence of a standardized goal-directed hemodynamic optimization during TAVI on clinical parameters.
METHODS. 40 Patients receiving TAVI whether through transfemoral or transapical approach received a standardized volume management intraoperatively according to Pearse et al. (group 1). Therefore, 250 ml of Hydroxyethyl starch (HES) were infused after induction controlling the effect via SV-monitoring. Responders (dSV > 10 %) received additional volume boluses until dSV was <10 %. After valve implantation infusion of 250 ml HES was performed again. Responders (dSV > 10 %) received additional volume boluses until dSV was <10 % [2]. Data of another 40 patients who underwent TAVI with fluid management according to the attending anesthesiologist (group 2) was analyzed retrospectively and compared to data above.
RESULTS. During this study data of 80 patients was analyzed. One patient was excluded because of missing data. There was no difference between the two groups according sex and age. Group 1 obtained significantly more HES 6 % (726 ± 261l vs. 295 ± 319 ml; $p < 0,01$), group 2 significantly more cristalloids compared to group 1 (731 ± 300l vs. 363 ± 271 ml; $p < 0,01$) with no variation in cumulative administration of volume intraoperatively. In addition there was no difference in number of intraoperative transfusions or dose of noradrenaline. Beyond significant decrease in length of anesthesia but not significant reduction of surgery time were observed in group 1 (126.7 ± 46.3 vs. 163.3 ± 75.3 min; $p = 0,002$ and 81 ± 40.2 vs. 98.3 + 68.1 min; $p = 0,057$). Interestingly, a significant decrease in number of days staying at ICU (4.55 ± 4.89 vs. 6.62 + 6; $p < 0,05$) contemporaneous not changing length of hospital stay could be found in the group that underwent a goal-directed hemodynamic optimization.
CONCLUSIONS. Goal-directed volume management after transcatheter aortic valve implantation led to reduced use of cristalloids and increased use of colloids during the procedure and resulted in a shorter ICU stay. Further investigations regarding postoperative complications will help to elucidate the reduced length of ICU treatment in the group with goal-directed hemodynamic management.
REFERENCE(S). 1. Habicher M, Perrino A Jr, Sander M et al. Contemporary fluid management in cardiac anesthesia. J Cardiothorac Vasc Anesth 2011;25:1141–53. 2. Pearse R, Dawson D, Bennett ED et al.: Early goal-directed therapy after major surgery reduces complications and duration of hospital stay. A randomised, controlled trial. Crit Care 2010;9:R687–93.
GRANT ACKNOWLEDGMENT. Institutionally.

Prognostic biomarkers in sepsis: 0456–0460

0456
PROCALCITONIN, C-REACTIVE PROTEIN AND LACTATE AS PROGNOSTIC MARKERS OF MORTALITY IN PATIENTS WITH COMPLICATED INTRA-ABDOMINAL INFECTION ADMITTED TO THE ICU

A. Suarez de la Rica[1], E. Maseda[1], V. Anillo[1], C. Hernandez Gancedo[1], A. Lopez-Tofiño[1], F. Gilsanz[1]

[1]Hospital Universitario La Paz, Anaesthesiology and Surgical Critical Care, Madrid, Spain
INTRODUCTION. Biomarkers are increasingly used to facilitate early diagnosis and management of sepsis, and they can also help the clinician in prognostication.
OBJECTIVES. The aim of the study was to compare the prognostic utility of procalcitonin (PCT), C-reactive protein (CRP) and lactate with each other and with clinical severity scores.
METHODS. Patients with complicated intra-abdominal infection admitted to ICU after source control surgery between January 2010 and January 2013 were studied. PCT, CRP and lactate were measured at admission and daily on the first 3 days. Initial severity was assessed by simplified acute physiology score II (SAPS II) and sequential organ failure assessment (SOFA) score. Severity was reassessed after 3 days by SOFA score. ICU mortality and 28-day mortality were evaluated.
RESULTS. A total of 91 patients were included. 10 patients (10.9 %) died in the ICU, and 14 (15.3 %) in the first 28 days after ICU admission. On day 28, SAPS II, SOFA score at admission and on day 3 were different between non survivors and survivors (59 vs. 37, 9 vs. 4 and 8 vs 4; $p < 0.001$). CRP on day 1, on day 2 and CRP peak values were also higher in non-survivors (247 vs. 112 mg/l, $p = 0.001$; 266 vs. 101, $p < 0.001$; 302 vs. 213, $p = 0.006$). Lactate on day 1 was higher in non-survivors (2.1 vs. 0.9 mmol/l; $p = 0.002$). PCT peak values tended to be higher in non-survivors, without reaching significance (77 vs. 18 ng/ml; $p = 0.053$). SOFA score on day 3 was the best predictor of 28-day mortality (AUC 0.85), followed by CRP on day 2 (AUC 0.82), lactate on day 1 (AUC 0.81), CRP on day 1 (AUC 0.79) and SAPS II (AUC 0.79). At logistic regression analysis SOFA score on day 3 and CRP on day 2 were the only independent predictors of 28-day mortality (OR 1.5, CI 95 % 1.09–2.07, $p = 0.013$; OR 1.01, CI 95 % 1.002–1.023). ICU non-survivors had higher CRP on day 1 and 2 (263 vs. 118 mg/l, $p = 0.004$; 232 vs. 114, $p = 0.013$), higher lactate at admission and on day 1 and 2 (3.3 vs. 2 mmol/l, $p = 0.021$; 2.5 vs. 0.9, $p = 0.001$; 1.4 vs. 0.3, $p = 0.043$) and higher peak PCT values (64 vs. 22.6 ng/ml, $p = 0.015$).
CONCLUSIONS. CRP is a good prognostic biomarker, better than PCT and lactate in postsurgical patients with complicated intra-abdominal infection, mainly on day 2 after ICU admission. Prognostic value of SOFA score on day 3 is superior to that of SAPS II, SOFA score at admission, PCT, CRP and lactate.
REFERENCE(S). 1. Krüger S, Ewig S, Giersdorf S et al. Cardiovascular and inflammatory biomarkers to predict short and long term survival in community-acquired pneumonia. Am J Respir Crit Care Med 2010;182:1426–1434. 2. Menedez R, Martinez R, Reyes S et al. Biomarkers improve mortality prediction by prognostic scales in community-acquired pneumonia. Thorax 2009;64:587–591.

0457
CLEARANCE LACTATE LEVELS IN EARLY GOAL DIRECTED THERAPY IN SEVERE SEPSIS AND SEPTIC SHOCK PATIENTS

P. García Olivares[1], I.A. De Sousa[1], L. Tang[1], M. Díaz[1], E. Keough[1], M. Dalorzo[1], M.A. Estévez[1], C. Caciano[1], C. Ramírez[1], C. Bocanegra[1]

[1]H.G.U. Gregorio Marañón, Intensive Care Unit, Madrid, Spain
INTRODUCTION. Lactate clearance in the first 6 h is associated with outcome in septic patients and it has been proposed to guide treatment.

OBJECTIVES. The aim of this study was to assess if lactate clearance could be a good indicator of an adequate resuscitation in initial management of septic patients and its impact in mortality.
METHODS. Prospective, observational study of septic patients cohort admitted in ICU during a 20 months period in the years 2011 and 2012. All patients were managed according to SSC recommendations. We collected epidemiological data, sepsis-related data and lactate levels at ICU admission and at the end of initial resuscitation (6 h). We calculated lactate-clearance [LC = (L1 h−L6 h/L1 h) × 100 %] and created two patients groups depending on lactate-clearance percentage (according to the point of greater discrimination respect to mortality by means of AUROCC): lactate-clearance (LC) > 0 < 30 %.
Continuous data were expressed as mean ± SD and categorical data as percentages. Continuous variables were compared using Student *t* test and categorical variables using Chi-squared test. Association between lactate-clearance and mortality was estimated by Kaplan–Meier method and differences in mortality rates were tested using multivariate Cox proportional hazards analysis, after adjustment for possible confounding factors.
RESULTS. 133 patients were included. 66 % were male. Average age was 60 ± 15 years. Charlson index 2 (1–4). Severity scores: APACHE II 24 ± 7, number of organ failure 2 (1–3). SSC bundle implemented (% patients): lactate measured 90 %, blood cultures before antibiotics 77 %, early antibiotics administered 74 %, fluids administration 77 %, achieve CVP > 8 mmHg and $ScvO_2$ > 70 % in 35 and 25 %, respectively.
Two groups of patients defined (LC > 30 %, n = 58 and LC < 30 %, n = 61; 14 patients were excluded for not lactate measured) had similar characteristics. (Table 1).

Table 1

	Lactate clearance <30 %	Lactate clearance >30 %	Significance
Age	61 ± 12	56 ± 17	0.17
Charlosn index	2.5 ± 2.2	2.6 ± 2.5	0.89
APACHE II	25.8 ± 6.8	24.5 ± 8.2	0.45
Number organ failure	2.9 ± 1.6	2.5 ± 1.5	0.22
Lactate levels	3.9 ± 3.1	4.1 ± 1.9	0.79
Number SSC bundles implemented	4 ± 1	4 ± 1	0.13
Septic shock (%)	82 %	67 %	0.14
Infectious focus pneumonia (%)	59 %	46 %	0.27
Mechanical ventilation	73 %	60 %	0.10

Surviving patients had a greater lactate clearance (24.7 ± 33.6 % vs 5.4 ± 61.2 %; p = 0.01). At the end of initial resuscitation, fluids-bundle implemented and fluid volume administered was higher in LC > 30 % group (94 vs 65 %, p = 0.00 and 2,950 ± 1,150 vs 1,930 ± 1,130 ml, p = 0.00, respectively). In LC > 30 % group 24.1 % (14/58) did not survive to ICU discharge, whereas in LC < 30 % group 39.3 % (24/61) died during ICU stay (p = 0.04) (Fig. 1).

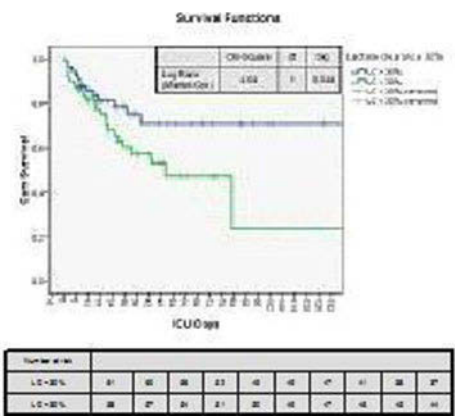


Figure 1

In multivariate Cox proportional hazards analysis adjusted for age, Charlson index, severity scores (APACHE II, number of organ failure), presence of septic shock, initial lactate levels, number of SSC bundles implemented included early and adequate antibiotic therapy and sepsis primary focus, lactate-clearance ≥30 % group had a significant reduction in the risk of death: hazard ratio 0.30; 95 % CI 0.10–0.88.
CONCLUSIONS. In our septic patients cohort a better fluids resuscitation was associated with a greater lactate clearance. Patients with a lactate clearance greater than 30 % at the end of initial resuscitation, had a lower risk of death.

0458

RAPID LACTATE CLEARANCE AND SEPSIS BUNDLE COMPLIANCE IN SEVERE SEPSIS PATIENTS ADMITTED TO 5 AUSTRALIAN ICU SITES; A PROSPECTIVE OBSERVATIONAL STUDY

D. Chamberlain[1], E. Willis[1], A. Bersten[2]

[1]Flinders University, Health Sciences, Adelaide, Australia, [2]Flinders University, Critical Care Medicine, Adelaide, Australia

INTRODUCTION. Recent clinical studies have confirmed the strong prognostic value of delayed lactate clearance in severe sepsis and septic shock [1, 2]. The 2012 sepsis guidelines suggest to normalize lactate in patients with elevated lactate levels [3].
OBJECTIVES. The goal was to determine potential patient characteristics, hemodynamic and perfusion-related parameters and therapeutic interventions associated with 6-h lactate clearance (LC) in a cohort of severe sepsis patients. In addition compliance with the sepsis bundles both 2008 and 2012 was examined.
METHODS. Continuous hemodynamic variables, fluid and vasopressor administration, were obtained in conjunction with a prospective, observational study of 1 year duration examining sepsis bundle compliance in severe sepsis enrolled on ICU admission. LC was defined as the percent change in lactate levels after 6 hours from the first baseline measurement either in the emergency department (ED) or hospital floor.
RESULTS. Of 1,022 patients enrolled, 347 with shock, age 57.0 ± 20.4 years, 583 originated from ED (23 % in-hospital mortality (IHM))and 439 hospital floor(37 % IHM), overall IHM of 29.1 %.
First serum lactate (mean 4.32 ± 3 mmol; shock 7.6 ± 3.2), vs ICU 6 h (mean 2.12 ± 3; shock 6.1 ± 3.5) and 72 h (mean 2.10 ± 2; shock 3.8 ± 3.5). LC > 50 %was a negative predictor of mortality (adjusted OR 0.379, 95 % CI 0.265–0.543, p < 0.01). LC > 50 % was associated with initial fluid bolus >20 ml/kg [χ^2 349.586, Cramer V(CV) = 0.514, p < 0.01], the use of vasopressors within the first hour (χ^2 433.41, CV = 0.572, p < 0.01) and a MAP target of ≥75 mmHg (χ^2 282.34, CV = 0.462, p < 0.01) but not a MAP target of ≥65 mmHg (χ^2 54.038, CV = −0.202 p < 0.01).

Table 1 Lactate clearance and associated variables

Variables	Quartile 1 (N = 255)	Quartile 2 (N = 255)	Quartile 3 (N = 255)	Quartile 4 (N = 255)	p value
Age (years)	55 ± 21	57 ± 20	62 ± 18	59 ± 20	<0.01
Lactate(mmols/L)	5.7 ± 3	5.4 ± 3.5	4.8 ± 3.1	4.2 ± 3.6	0.36
Shock (n)	104	121	93	29	<0.01
Apache II 24 h	21 ± 8.2	21 ± 8.2	18 ± 7	16 ± 8.6	<0.01
SOFA score 24 h	9.1 ± 4.2	8.7 ± 4	6.1 ± 3.9	5 ± 3.7	<0.01
Died in hospital n (%)	159 (60)	102 (39)	6 (2)	29 (11)	<0.01

Table 2 Hemodynamic and resuscitation variables

Variables	Quartile 1 (N = 255)	Quartile 2 (N = 255)	Quartile 1 (N = 255)	Quartile 1 (N = 255)	p value
Temperature (°C)	37.6 ± 2.0	37.3 ± 2.1	36.9 ± 2.5	36.5 ± 2.4	0.45
Heart rate (beats per min)	117 ± 12	117 ± 13	111 ± 18	110 ± 20	0.09
Systolic blood pressure (mmHg)	98 ± 21	105 ± 31	123 ± 23	118 ± 19	0.06
Mean arterial pressure (mmHg)	71 ± 16	76 ± 16	85 ± 17	82 ± 18	<0.01
ScVO2 (%) measured (n)	62 ± 7.5 (31)	60 ± 5.9 (36)	65 ± 3.5 (73)	67 ± 5 (58)	<0.01
Vasopressors (n)	101	111	142	134	0.10
Appropriate antibiotics <3 h (n)	84	89	102	98	0.66
Full sepsis bundle compliance 6 h 2008 (%)	12	16	28	23	<0.01
Compliance 3 & 6 h 2012 (%)	47 & 32	46 & 29	42 & 33	40 & 34	0.11 & 0.22

CONCLUSIONS. Routine care was more compliant with the 2012 resuscitation bundles. Lactate clearance was the strongest (negative) predictor of mortality. All resuscitation elements were associated positively with LC except for MAP ≥ 65 mmHg.
REFERENCE(S). 1. Arnold, Ryan C, et al. Multicenter study of early lactate clearance as a determinant of survival in patients with presumed sepsis. Shock (2009);32.1:35–39. 2. Nguyen H, Bryant, et al. Early lactate clearance is associated with improved outcome in severe sepsis and septic shock*. Crit Care Med 2004; 32.8:1637–1642. 3. Dellinger R, Phillip, et al. Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock 2012. Intensive Care Med 2013;39.2:165–228.
GRANT ACKNOWLEDGMENT. Flinders Foundation Research Grant.

0459

SERUM PROCALCITONIN LEVELS IN SEVERE SEPSIS AND SEPTIC SHOCK

P. García Olivares[1], M. Díaz[1], I.A. De Sousa[1], L. Tang[1], M.A. Estévez[1], C. Ramírez[1], C. Caciano[1], C. Bocanegra[1], E. Keough[1], M. Dalorzo[1]

[1]H.G.U. Gregorio Marañón, Intensive Care Unit, Madrid, Spain

INTRODUCTION. The use of serum procalcitonin to differentiate the pathogen involved in an infection and as a prognostic marker in septic patient remains controversial.
OBJECTIVES. The purpose of this study was to analyze the clinical applications of serum procalcitonin (PCT) levels in patients with severe sepsis and septic shock.
METHODS. We studied prospectively all patients admitted in ICU with severe sepsis and septic shock between March 2011 and November 2012. All patients were managed according to SSC bundles. We collected epidemiological data, sepsis-related data, serum PCT levels in the first 4 days of admission and outcome. Serum PCT levels were analyzed as continuous variable, as categorical variable depending on point of greater discrimination to differentiate Gram-negative infection (AUROCC) and as PCT levels clearance between first and third day to differentiate prognosis of patients [(PCT 1° day–PCT 3° day/PCT 1° day) × 100].
Continuous data were expressed as mean ± SD and categorical data as percentages. Continuous variables were compared using Student *t* test and categorical variables using Chi-squared test. Multivariable logistic regression was used to estimate the association of serum PCT levels with Gram-negative infection and prognosis.
RESULTS. 201 patients were included in the study. 66 % were males. Mean age was 60 ± 15 years and index Charlson 2 (1–4). 70 % of patients had septic shock. Infection focus: respiratory 50 %, intra-abdominal 21 % and urinary 16 %. Microbiological isolates: 66 patients had Gram-negative bacteria, 50 Gram-positive bacteria and 75 had not isolation. Severity scores: APACHE II 24 ± 7 and SOFA 9 ± 4. Lactate levels 3.8 ± 2.4 mmol/l and serum PCT levels 10.6 ng/ml (2.2–38.9). 61 % of patients required mechanical ventilation (9 days; IR 4–21) and 74 % required amines (2 days; IR 1–4). ICU stay was 8 days (4–20) with 25.4 % of mortality and hospitality stay was 25 days (12–45) with 29.9 % of mortality. Serum PCT levels were higher in patients with Gram-negative infection (37.7 ± 51.1 vs 22.1 ± 33.1; p = 0.03), above all those with bacteremia (45.9 ± 55.1 vs 20.8 ± 32.4; p = 0.00) (Fig. 1).

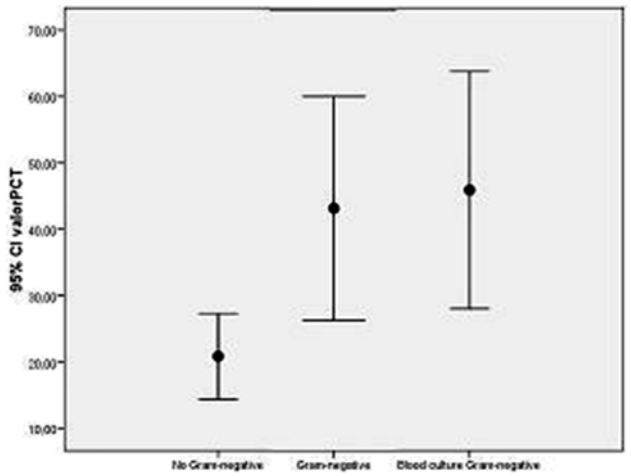


Figure 1

Serum PCT value which better discriminated the patients with Gram-negative infection was 25 ng/ml (53 vs 30 %, p = 0.01). In multivariate analysis including age, comorbidity, nosocomial sepsis, septic shock, infection focus and number of organs failure, serum PCT levels related to Gram negative infection (Table 1).

Table 1

	Odds ratio	CI 95 %
Serum PCT levels >25 ng/ml	5.04	1.72–14.67
Age >70 years	3.77	1.39–10.20
Nosocomial infection	3.17	1.14–8.79
Urinary focus	10.03	1.75–57.43
Number organ failure	1.64	1.15–2.35

Patients with serum PCT clearance <50 % on the third day of sepsis had higher risk of death (RR 3.53; CI 95 % 1.04–11.96). In multivariate analysis including age, comorbidity, septic shock, infection focus, severity scores and SSC bundles implemented, serum PCT clearance on the third day was an independent factor of mortality (Table 2).

Table 2

	Odds ratio	CI 95 %
Serum PCT clearance <50 % (3°day)	6.29	1.05–37.81
APACHE II	1.23	1.03–1.47
Number organ failure	2.14	1.02–4.52

CONCLUSIONS. In our study serum PCT level was able to discriminate Gram-negative infection, and early clearance of its level was associated with a lower risk of death in patients with severe sepsis and septic shock.

0460

HIGH LEVELS OF FERRITIN, A POOR PROGNOSTIC FACTOR IN PATIENTS WITH SEVERE SEPSIS

F. Valenzuela Sanchez[1], M. Recuerda Nuñez[1], J.F. Rodríguez Gutierrez[2], R. Bohollo de Austria[1], B. Valenzuela Méndez[3], V. Moreno Calvo[2], L. Calbo Caballos[4], J. Sánchez Ruiz[1], M. Jaen Franco[1], S. Garzón López[2], J. Arias Garrido[1]

[1]Associate University Hospital SAS of Jerez, Critical Care Medicine Unit, Jerez de la Frontera, Spain, [2]Associate University Hospital SAS of Jerez, UGC Hematology, Jerez de la Frontera, Spain, [3]Universidad de Sevilla, Sevilla, Spain, [4]Associate University Hospital SAS of Jerez, UGC Clinical Analysis Laboratory, Jerez de la Frontera, Spain

INTRODUCTION. Although iron is essential for important biological processes, excessive iron can cause tissue damage and even increase susceptibility to infections.

OBJECTIVES. To determine importance of the elements involved in iron metabolism through its relationship with immune parameters, transfusions received during the evolution of septic patients admitted to the ICU and mortality.

METHODS. Prospective observational study. We recruited patients admitted to the ICU with a diagnosis of severe sepsis during a period of 6 months. Epidemiological data, serum iron (Fe), saturation index (SI), ferritin and transferrin, numbers of leukocytes, neutrophils, lymphocytes and monocytes, as well as lymphocyte subpopulations, HLA-DR and CD14+ expression, and levels of IgA, IgG and IgM at admission and at 48 h.

RESULTS. After the implementation of the protocol, we included 55 patients, mean age 61 ± 17 years, mortality was 29 %. Apache II was 26 ± 7, the average stay in the ICU of 12.2 ± 11 days. The sepsis origin was abdominal in the 40 % of the patients, followed by lung (38.2 %). 16 patients had a history of immunosuppression (lymphoma, leukemia, chemotherapy, steroids, HIV). The mortality in this subgroup was 43.7 %, higher than in the group without prior immunosuppression in which was 22 %. 14 patients had less than 500 cells and their mortality was 43 %, significantly higher than the remaining 38 patients was 23 %. Fe levels were 29.3 ± 38 mcg/dl at admission, 43.8 ± 43 mcg/dl at 48 h. In non survivors a non significant increase was found at admission (37.3 ± 41/26.3 ± 37 mcg/dl, p = ns) however, it increases significantly at 48 h (84.3 ± 59/33.13 ± 31 mcg/dl; p = 0.008). Similar results were found in the comparison of IS. Ferritin levels were 992 ± 1,390 ng/ml at admission and rose to 2,934 ng/ml, mainly due to the non-survivors: from 2,153 ± 2,250 ng/ml at admission rose significantly to 8,854 ± 8,500 ng/ml (p = 0.02) at 48 h, significantly higher levels than that found in the survivors (Table 1). Transferrin levels were similar in all groups and evolutionarily: 141.3 ± 55–131.23 ± 40 mg/dl at 48 h in the total group. No differences were found in the groups with a history of severe immunosuppression or lymphopenia. It was significantly associated with the number of plasma transfusions.
(R2 0.452, p = 0.001) and no relationship was found with transfusions of red cells or platelets. Any significant relationship with immune parameters was found.

Table 1

	Fe at admission	Fe 48 h	Ferritin at admission	Ferritin 48 h	p
Sepsis group	29.35 ± 38	43.78 ± 43	992 ± 1,390	2,934 ± 7,028	p = 0.05
Survivors	26.3 ± 37	32.5 ± 30	598 ± 537	1,687 ± 6,155	n/s
Non survivors	37.3 ± 45	84.3 ± 58	2,153 ± 2,250	8,854 ± 8,500	p = 0.020
p	ns	p = 0.008	p = 0.0138	p = 0.0138	

CONCLUSIONS. Ferritin levels increase substantially and progressively in septic patients with poor prognosis, accompanied by increased levels of serum Fe. Ferritin levels are related to plasma transfusions received within the first 48 h. No relationship was found with the studied immunity parameters.

Haemodynamic assessment: what's new at the bedside?: 0461–0465

0461

EVALUATION OF VENTRICULO-ARTERIAL COUPLING USING TRANS-ESOPHAGEAL AORTIC DOPPLER AND ARTERIAL TONOMETRY

O. Passouant[1,2], A. Legall[1], E. Gayat[1,2], F. Vallée[1], K. Madadaki[1], A. Mebazaa[1,2]

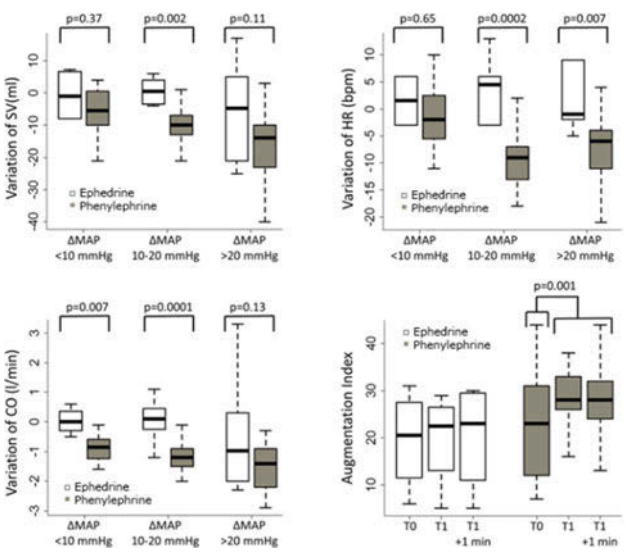
[1]Hôpital Lariboisière, Département d'Anesthésie-Réanimation, Paris, France, [2]Université Paris VII, Inserm U 942, Paris, France

INTRODUCTION. Vasopressors are frequently used in anesthesia to correct arterial hypotension. The increase of blood pressure causes an increase of left ventricular (LV) afterload and can lead to a decrease of stroke volume (SV).

OBJECTIVES. The goal of this study was to investigate the differential effect of different vasopressors on ventricular-arterial coupling, based on the simultaneous measurement of blood pressure, stroke volume and central blood pressure.

METHODS. The study was approved by the Institutional Review Board of the Société de Réanimation de Langue Française (CE SRLF 11-356). Patients scheduled for neurosurgical procedure under general anesthesia were included after informed consent. Standard monitoring included simultaneous and continuous measurement of blood pressure by arterial catheter and SV by esophageal Doppler (CombiQ®, Deltex Medical), disposed after induction of anesthesia. In addition, an arterial tonometer (SphygmoCor®, ATCOR Medical) was used to estimate noninvasively aortic blood pressure. According to local standard of care, when hypotensive episodes occurred, patients received 9 mg of ephedrine (EPH) or 50 mg of phenylephrine (PHE), according to physician's choice. Before each injection of vasopressor (T0), at the peak effect (T1) and 1 min after (T1 + 1 min), the following parameters were collected: SV, heart rate (hr), cardiac output (co), mean arterial pressure (map), augmentation index (Aix) (Aix reflect the arterial compliance, estimated from the central pressure wave). The primary endpoint was the variation between T0 and T1 of SV, DC and Aix obtained at three levels of MAP increase (<10, 10–20, >20 mmHg).

RESULTS. 127 bolus of vasopressors were administered (22 EPH, 105 PHE) in 34 patients (median age 47 ± 13 years). MAP, SV, DC and Aix were similar before injection of vasoconstrictors in three groups. The figure below describes the variations of hemodynamic parameters for the different levels of MAP augmentation. Differential effects of two vasopressors for the same level of MAP increase have been observed. Thus, the decrease of SV is significantly higher in the EPH group compared to the PHE group for increasing MAP > 10 mmHg. The decline of SV and HR led to a significant CO decrease in the PHE group. There is a significant increase of Aix in PHE group compared to the EPH group, associated with a SV decline significantly higher in the PHE group.



Hemodynamic changes using vasopressors

CONCLUSIONS. This study confirms that phenylephrine led to a larger decline of stroke volume and cardiac output than ephedrine, for similar levels of blood pressure increase. This

difference is explained by a decrease of heart rate, but also by a larger increase of left ventricular afterload when using phenylephrine compared to ephedrine.

0462

STATIC ASSESSMENT OF ARTERIAL LOAD DOES NOT PREDICT ARTERIAL PRESSURE RESPONSE TO FLUID ADMINISTRATION IN CRITICALLY ILL PATIENTS

M.I. Monge Garcia[1,2], M. Gracia Romero[1], A. Gil Cano[1], A. Rhodes[2], R.M. Grounds[2], C. Maurizio[2]

[1]Hospital SAS de Jerez, Servicio de Cuidados Intensivos y Urgencias, Jerez de la Frontera, Spain, [2]St. George's Healthcare NHS Trust and St George's University of London, Department of Intensive Care Medicine, London, United Kingdom

INTRODUCTION. Hemodynamic resuscitation should be aimed to guarantee an adequate oxygen delivery and sufficient perfusion pressure to the tissues. Since the arterial pressure response to volume expansion (VE) depends not only on cardiac output increase but also on arterial load, knowing if a patient is preload-dependent only provides a partial solution in defining the appropriate therapy. In this regard, the static evaluation of arterial load by assessing the pressure–volume relationship could help to determine if a patient's blood pressure will improve with an increase in cardiac output (CO) following VE.

OBJECTIVES. To determine whether the assessment of static parameters of arterial load allows predicting the arterial pressure response after fluid administration in critically ill patients.

METHODS. Patients monitored with an esophageal Doppler (CardioQ-Combi^{TM}, Deltex Medical, Chichester, UK) and equipped with an indwelling arterial catheter in whom the decision to give fluids was taken according to the presence of hypoperfusion. We evaluated baseline values and changes after VE of different aspects of the arterial load: steady component by the systemic vascular resistance [SVR = mean arterial pressure (MAP)/CO]; pulsatile component by the net arterial compliance (C = stroke volume/arterial pulse pressure); and the effective arterial elastance (Ea = 90 % of systolic arterial pressure/stroke volume), as an integrative parameter that incorporates both steady and pulsatile components of arterial load. Patients were classified as fluid-responders (CO increase after VE $\geq$ 15 %) and pressure responders (MAP increase after VE $\geq$ 15 %).

RESULTS. 94 patients were prospectively included, 55 of them were fluid-responders (59 %). In the whole population, only 38 patients were pressure responders (40 %), 27 of them in the fluid-responders group (49 %). In this subgroup, no differences in arterial load before VE between pressure responders and non-responders were observed. In fluid-responder patients in whom arterial pressure did not increase $\geq$15 % after VE, fluid administration induced a significant decrease in arterial load (Ea: from 1.97 $\pm$ 0.83 to 1.75 $\pm$ 0.71 mmHg/mL; SVR: from 1,259 $\pm$ 590 to 1,128 $\pm$ 526 dyn s cm^{-5}; C: from 1.24 $\pm$ 0.69 to 1.35 $\pm$ 0.71 mL/mmHg; P < 0.0001, respectively), whereas no significant changes were observed in patients that exhibited an increase $\geq$15 % in CO and MAP. There was no relationship between preinfusion arterial tone parameters and VE-induced changes in MAP, systolic or diastolic arterial pressure. None of studied arterial load parameters predicted the MAP response to fluid administration.

CONCLUSION. The arterial pressure response to fluid administration cannot be predicted using static arterial load parameters. Changes in arterial load determined the arterial pressure response in fluid-responder patients.

0463

THE MEAN SYSTEMIC FILLING PRESSURE ANALOGUE PREDICTS RESPONSE TO FLUID CHALLENGE IN POSTOPERATED PATIENTS OF CARDIOTHORACIC SURGERY

E. Monares[1], M.R. Pinsky[2], C. Meneses[1], A. Torres[3], A. Palacios[1], J.S. Sánchez[1], J. Franco[4]

[1]ABC Medical Center, Critical Care, Mexico, Mexico, [2]University of Pittsburgh, Department of Critical Care Medicine, Pittsburgh, United States, [3]ABC Medical Center, Orthopaedics, Mexico, Mexico, [4]ABC Medical Center, Critical Care, Chief Department, Mexico, Mexico

INTRODUCTION. The mean systemic filling pressure (Pmsf), is the best quantitative method to assess effective circulating blood volume. Recently, continuous estimates of Pmsf using an analogue analysis (Pmsa) have shown that this parameter can be continuously be monitored at the bedside.

OBJECTIVES. To evaluate the usefulness of Pmsa to predict response to fluid challenge in postoperated patients of cardiothoracic surgery (PCS).

METHODS. The study was conducted in an intensive care unit (ICU) of a tertiary care hospital. PCS, admitted to ICU from January 2010 to January 2013 were included. The study was approved by the IRB of the institution. Cardiac output (CO), central venous pressure (CVP), mean arterial pressure (MAP), pulmonary arterial occlusion pressure (PAOP), right ventricular end-diastolic volume (RVEDVI), DO2, VO2, were measured before and after a fluid challenge. The amount of administered volume corresponded to the minimum required to raise the CVP 2 mmHg. Pmsa was estimated from CO, MAP and CVP, assuming fixed venous-arterial resistance and compliance values. Volume responders were defined as those with $\geq$20 % CO increase or a 20 % increase in VO_2. Comparison of quantitative variables between groups was performed with Mann–Whitney and Student *t* tests for independent samples, according to the distribution of each variable. A two-tailed p value <0.05 was considered significant. Threshold Pmsa to predict fluid response were obtained to maximize the ROC for both outcomes.

Baseline characteristics of the population N=28

Age (years)	60	DS ± 9.5
Euro Score (points)	10	DS ± 5
MAP (mmHg)	77.5	DS ± 10
CVP (mmHg)	14.5	DS ± 5
CO (L/min)	4.3	2.2 – 6.0
POAP (mmHg)	17	10 - 27
IVDFVD (ml)	107	DS ± 31
Mspa (mmHg)	20.5	DS ± 4.5
Volume infused (ml)	245	150 – 500
DO_2 (ml/min/$_2$)	572	DS ± 120
VO_2 (ml/min/m$_2$)	148	DS ± 48

Baseline characteristics

RESULTS. In 28 fluid challenges (M/F 17/11), 15 (46.5 %) were Responders (R). The only statistically significant difference between responders and non-responders was pre-challenge Pmsa and DO2.

Difference between responders and non-responders

	Responders n=15	Non responders n=13	p
Age (years)	65 + 12	65 + 8	0.81
Euro Score(points)	9.5 + 4	12 + 5	0.15
MAP (mmHg)	80 + 9.5	73 + 10	0.37
CVP (mmHg)	14.5 + 4.5	11.5 + 5	0.15
CO (L/min)	4.5 (3.0 - 6.0)	4.5 (2.5 - 5.5)	0.80
Pmsa (mmHg)	22.5 (17.0-25.0)	16.5(10.5-22.0)	0.007
Volume infused (ml)	250 (150 400)	250 (150 500)	0.6
DO_2 (ml/min/$_2$)	6171133	5341125	0.002
VO_2 (ml/min/m$_2$)	167137	146145	0.052

Difference between responders and non-responders

Analysis of ROC for baseline values as predictors of an increase in cardiac output by ≥20% after fluid load

	AUC	CI 95%	p	Sen%	Sp%	Cut-off	LR+	LR-
Mspa	0.846	0.696-0.996	0.002	80	80	20mmHg	4	0.25

Analysis of ROC for baseline values as predictors of an increase in VO_2 by ≥20% after fluid loading

	AUC	IC 95%	p	Sen%	Sp%	Cut-off	LR+	LR-
Mspa	0.832	0.673-0.990	0.003	85	70	19mmHg	2.83	0.21

ROC analysis

CONCLUSIONS. Pmsa, a bedside measure, is useful for prediction of response to volume challenge.

0464

EFFECT OF NEUROMUSCULAR BLOCKERS ON CARDIAC FUNCTION OF PATIENTS WITH ABDOMINAL COMPARTMENT SYNDROME

Y. Mahjoub[1], Z. Smaïli[1], N. Ammenouche[1], M. Levrard[1], S. Malaquin[1], A. Duwat[1], N. Airapetian[1], E. Lorne[1], F. Tinturier[1], H. Dupont[1]

[1]CHU Amiens, Unité de Réanimation Polyvalente, Amiens, France

INTRODUCTION. The first line therapy for patients suffering from abdominal compartment syndrome (ACS) is to decrease intra-abdominal pressure.

OBJECTIVES. The aim of this study was to determine the effects of neuromuscular blockers, given to decrease intra-abdominal pressure, on cardiac function and hemodynamics in ICU patients with ACS.

METHODS. A prospective non-interventional study was carried out. From 2010 to 2012, all patients treated in ICU with neuromuscular blockers for ACS were prospectively included after local ethics committee approval. Respiratory, hemodynamic and Doppler echocardiographic parameters were recorded before and after the infusion of 0.15 mg/kg of cisatracurium. Data were presented as median (IQR). A Wilcoxon rank sum test was performed to compare data before and after neuromuscular blockers infusion.

RESULTS. Fourteen patients were included: 8 (57 %) males and 6 females with a median age of 53 years (20–77). SAPS II was 60 $\pm$ 10. Baseline intra abdominal pressure was 29 $\pm$ 9 cmH_2O and decreased by 41 % after neuromuscular blockers (to 17 $\pm$ 4 cmH_2O, p = 0.001). Plateau pressure decreased from 25 $\pm$ 5 to 22 $\pm$ 4 cmH_2O (p = 0,03). The right ventricle (RV) was dilated at baseline with a ratio of RV end diastolic area to left ventricular (LV) end diastolic area above 0.6. Neuromuscular blockers significantly decreased this ratio. The peak systolic velocity of tricuspid annulus (St), an index of RV systolic function assessed by Doppler tissue imaging, was significantly increased after cisatracurium infusion. No changes in left ventricular function were noticed (Table 1).

CONCLUSIONS. This study shows that for patient with ACS, neuromuscular blocker infusion allows a significant reduction of intra-abdominal pressure and plateau pressure as well as an improvement of right ventricular function.

Table 1

	Before cisatracurium	After cisatracurium	p
Mean arterial pressure (mmHg)	66 $\pm$ 20	78 $\pm$ 19	0.24
Stroke volume (ml)	70.4 $\pm$ 22.3	75.6 $\pm$ 24.7	0.09
Cardiac output (l/min)	7.1 $\pm$ 2.5	7.84 $\pm$ 3.1	0.08
LV ejection fraction (%)	60.0 $\pm$ 8.0	63.0 $\pm$ 8.0	0.24
LV Tei index	0.6 $\pm$ 0.3	0.5 $\pm$ 0.2	0.38
Surface area ratio (RV/LV)	0.7 $\pm$ 0.2	0.6 $\pm$ 0.2	0.03
St wave peak velocity (m/s)	0.1 $\pm$ 0.07	0.2 $\pm$ 0.1	0.01

0465

EVALUATION OF THE NEW HEMODYNAMIC PARAMETER "AFTERLOAD-RELATED CARDIAC PERFORMANCE" (ACP) IN A LARGE COHORT OF SEPTIC PATIENTS

O. Bayer[1], D. Schwarzkopf[2], Y. Sakr[1], C. Hartog[1,2], H. Ebelt[3], K. Reinhart[1,2], K. Werdan[3]

[1]Jena University Hospital, Department of Anesthesiology and Intensive Care Medicine, Jena, Germany, [2]Jena University Hospital, Center for Sepsis Control & Care, Jena, Germany, [3]University Hospital Halle (Saale), Department of Medicine III, Halle, Germany

INTRODUCTION. Severe sepsis may cause an impairment of cardiac function [1]. To determine the extend of septic cardiomyopathy the parameter "afterload-related cardiac performance" (ACP) was developed, which describes the relationship between the measured cardiac output (CO) and the CO, which a healthy heart is expected to be able to generate at a given SVR. CO predicted as normal is calculated as the 80 % upper prediction limit of the regression $CO = \alpha * SVR^{\beta} + \varepsilon$. The ACP is described as $CO_{measured}/CO_{predicted\ as\ normal} \times 100$ [2].

OBJECTIVES. Validation of the ACP as a prognostic parameter in larger cohort of septic patients and evaluation of differences in prognostic power between patients with cardiac surgery and patients with non-cardiac surgeries.

METHODS. Retrospective study of N = 408 patients with severe sepsis and established hemodynamic monitoring on a surgical ICU. ACP was tested against other hemodynamic parameters [CO, cardiac index (CI), cardiac power output (CPO), cardiac power index (CPI)] by correlation with indicators of disease severity (SOFA, SAPS 2, APACHE II, procalcitonin), mean differences between survivors and non-survivors, prediction of hospital survival in multiple logistic regression controlling for other risk indicators, ROC analysis. Differences in predictive power between surgical subgroups were testet by ROC analysis. Optimal cut-off points were defined at the maximal sum of sensitivity and specificity, utility of different cut-off points on ACP for surgical subgroups were evaluated by survival analysis.

RESULTS. Among other hemodynamic parameters (CO, CI, CPO, CPI) ACP was the only one that showed consistent correlations with all severity parameters, ranging from −0.09 to −0.17 (all $p < 0.001$). It also showed the highest mean difference between survivors and non-survivors (Cohen's $d = -0.33$). ACP stayed a significant predictor for mortality controlling for other risk factors. ROC analyses of CPI, CPO and ACP revealed small but significant AUC's for all three parameters (AUC ≥ 0.56), with no significant differences between the curves ($p \geq 0.654$). For ACP the AUCs did not differ significantly between surgical subgroups ($p = 0.206$). In patients with heart surgery the optimal cut-off on ACP was lower than for the overall group and resulted in better prediction of survival time (HR = 0.14 for subgroup specific cut-off, HR = 0.46 for general cut-off).
CONCLUSIONS. Our analyses mostly show that ACP is superior to other hemodynamic parameters in predicting disease severity and death. Its predictive power was not significantly higher for septic patients with heart surgeries but a lower cut-off value is needed to optimally discriminate between survivors and non-survivors in this subgroup.
REFERENCE(S). 1. Parrillo JE. The cardiovascular pathophysiology of sepsis. Annu Rev Med 1989;40:469–85. 2. Werdan K et al. Septic cardiomyopathy: hemodynamic quantification, occurrence, and prognostic implications. Clin Res Cardiol 2011;100:661–668.

Different measures of daily intensive care practice: does it matter?: 0466–0470

0466

HYDROXYETHYL STARCH (HES) FLUID RESUSCITATION IN CRITICAL CARE: HAS OUR PRACTICE CHANGED?

M. Russell[1], C. Snelson[1]
[1]Queen Elizabeth Hospital, Critical Care, Birmingham, United Kingdom
INTRODUCTION. Improving outcomes in Critical Care is often challenging, with research showing a gap between evidence and practice [1]. Over recent years, more evidence has emerged about the use of HES, culminating in the publication of two RCTs and updated surviving sepsis guidelines [2–4]. We wanted to assess how our practice has changed since the emergence of this evidence, and which interventions had impacted on HES prescription.
OBJECTIVES. The primary objective was to assess if there had been a change in HES prescription. The secondary objective was to assess which methods led to an alteration in its prescription.
METHODS. Admissions to three areas of Critical Care including mixed general surgery/medicine, trauma, burns and neurosurgery were included from five separate months chosen because of being before or after conferences, publications or local meetings (Table 1).

Table 1 Significant events for HES prescription

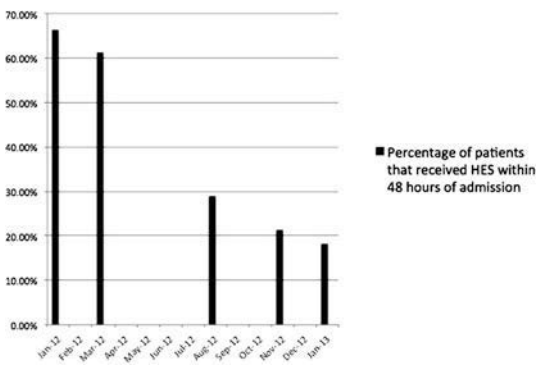
January 2012	Baseline month following the ESICM recommendations against usage of HES fluid in severe sepsis/acute kidney injury
March 2012	Brussels 32nd International Symposium on Intensive Care and Emergency medicine conference
August 2012	Post publication of 6S trial [2]
November 2012	Post publication by the CHEST investigators [3]. Presentation of 6S trial in our departmental journal club (November 12th)
January 2013	Post departmental presentation (December 5th) on the use of HES fluids within critical care—presentation by CHEST [3] author John Myburgh.

Retrospectively we analysed if patients had received HES within 48 h of admission to critical care.
RESULTS. 5 months of admissions were studied over a 13-month period, with a total of 1,224 patients (Table 2).

Table 2 HES within 48 h of admission

Month	Total admissions	Number of patients that received HES	Number of patients that did not receive HES	p value compared to January 2012	p value compared to previous month
January 2012	223	148 (66.3 %)	75 (33.7 %)		
March 2012	237	145 (61.2 %)	92 (38.8 %)	0.248	0.248
August 2012	272	78 (28.9 %)	194 (71.1 %)	<0.001	<0.001
November 2012	291	62 (21.3 %)	229 (78.7 %)	<0.001	0.043
January 2012	201	31 (18.2 %)	170 (81.8 %)	<0.001	0.101
Totals	1,224	464	760		

The highest percentage of HES used was 66.3 % (January 2012) and this figure decreased sequentially until a low of 18.2 % in January 2013 (Bar Chart 1).



Bar Chart 1: HES within 48 h of admission

There was a statistically significant decrease ($p < 0.001$) in the use of HES by August 2012 when compared to January 2012 (Table 2). This statistical significance was confirmed in both November 2012 ($p < 0.001$) and January 2013 ($p < 0.001$).
DISCUSSION. In this retrospective study there was a statistically significant decrease in the number of patients receiving HES within 6 months of the 6S trial [2] publication and attendance at a conference by departmental consultants. Further reductions followed the publication by the CHEST investigators [3] and presentation of 6S [2] in our journal club. Despite many interventions 18.2 % of patients were still receiving HES in January 2013 and potentially receiving a fluid that confers an increased risk of requiring renal replacement therapy [2, 3]. Further decreases are unlikely to happen without removal from hospital formularies or restriction on prescription. Further local and national consensus on the prescription of intravenous fluids within critical care will be important to stop the reactive changes that occur as new evidence is published. Greater planning and organisation will ensure that patients receive the most appropriate fluid resuscitation.
REFERENCES. 1. Grol G, Grimshaw J. From best evidence to best practice: effective implementation of change in patient care. Lancet 2003;362:1225–30. 2. Perner A et al. HES 130/0.42 versus Ringer's acetate in Severe Sepsis. 2012;367(2):124–134. 3. Myburgh A et al. HES or saline for fluid resuscitation in intensive care. NEJM. 2012;367(20):1901–1911. 4. Dellinger RP et al. Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock: 2012. Crit Care Med 2013;41:580–637.

0467

A COMPARATIVE ANALYSIS OF ACOUSTIC CONDITIONS IN AN OLD AND A NEW ICU ROOM

K.S. Simons[1], M. Park[2], W. de Bruijn[2], M. van den Boogaard[3], A. Kohlrausch[2], P. de Jager[1]
[1]Jeroen Bosch Ziekenhuis, Intensive Care, 's-Hertogenbosch, Netherlands,
[2]Philips Research, Smart Sensing and Analysis Group, Eindhoven, Netherlands,
[3]Radboud University Nijmegen Medical Centre, Intensive Care Research, Nijmegen, Netherlands
INTRODUCTION. Noise has several negative effects on health in people and may cause sleep disturbances and delirium in ICU patients. Studies have shown that average sound pressure levels (SPL) in the ICU are well above the maximum recommended value of 35 dBA. Sources of noise include pumps, monitors and devices, but also potentially modifiable factors such as staff speech or activities. While most research so far has focussed on overall sound levels and subjective evaluations of disturbing factors, few studies have systematically investigated the sources of noise. In addition, little is known about the contribution of background building noise and the noise from corridors and other rooms to the total amount of noise.
OBJECTIVES. To determine: (1) different aspects of ICU acoustic conditions from recordings made in two ICU rooms. (2) The contribution of background building noise and the noise from corridors and other rooms to the total amount of noise. (3) To perform a source-specific analysis of the noise.
METHODS. A 3-day calibrated audio recording was made in the old ICU of the Jeroen Bosch Hospital, from which various acoustic parameters were obtained, including the proportion of restorative periods (time intervals of at least 5 min in which the SPL does not exceed 50 dBA. In addition, a selected 24-h recording was manually annotated for 6 categories and 28 subcategories of sound events which enabled a source-specific analysis (Table 1). From the new ICU, another audio recording was performed for 24 days. In addition, other types of acoustic parameters were measured in empty rooms of the old and the new ICU, during the relocation of the hospital.
RESULTS. Time-averaged SPL(L_{Aeq}) in both ICU rooms were in the range of 55–60 dBA depending during daytime. At night, only 54–57 % of the time was considered to be restorative. Source-specific analysis revealed that the acoustic energy of the noise in the old ICU room was attributed to speech and other activities by staff (57 %), alarms (30 %) and the operational noise of medical devices (13 %) (Fig. 1). Measurements in the empty ICUs showed a better isolation between the nursing station and the patient room in the new building (reduction >10 dB) but the average noise level did not differ between the two ICUs, suggesting that the dominant noise sources may exist mainly within the patient room.

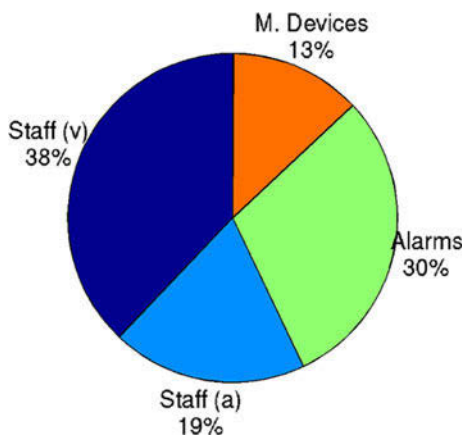


Fig. 1 Contribution of the noise sources in the

Table 1 Categories of ICU sound events

Number	Category of sound events	Abbreviation (see Fig. 1)	Number of subcategories	Remarks
1	Patient (verbal/ non-verbal)	Patient (v)	2	Non verbal sound non-verbal sound includes laughing, coughing, breathing
2	Staff (verbal/ non verbal)	Staff (v)	4	See above
3	Alarms	Alarms	2	Remote/nearby alarms
4	Medical devices	M. Devices	4	Device operational noise
5	Staff (activities)	Staff (a)	15	Noise generated by staff activities e.g. footsteps, object dropping etc
6	Unidentified	Unidentified	1	

CONCLUSION. Various acoustic parameters measured in the old and the new ICUs were comparable to those reported in other studies. Potentially modifiable noise such as speech and other staff activities accounted for 57 % of the total acoustic energy. In contrast to common belief, noise from outside the patient room (e.g. from the nursing station) did not play a major role in noise pollution in the patient rooms.

0468

NATIONAL SURVEY ON INTENSIVE CARE UNITS INTUBATION MANAGEMENT

A. Duwat[1], A. Turbelin[1], V. Hubert[1], S. Petiot[1], R. Deransy[1], N. Airapetian[1], N. Ammenouche[1], M. Levrard[1], Y. Mahjoub[1], F. Tinturier[1], H. Dupont[1]

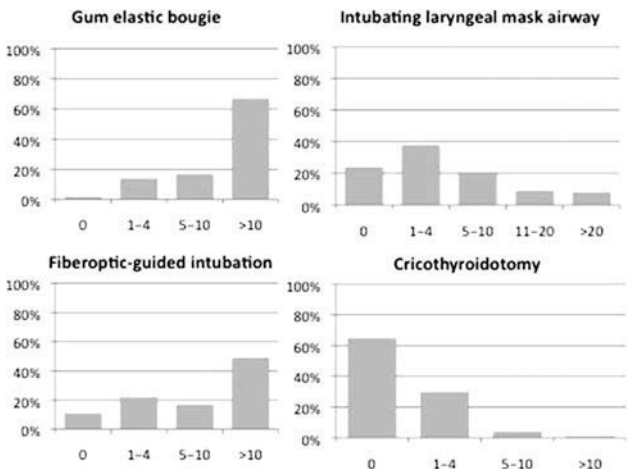
[1]CHU Amiens, Amiens, France

INTRODUCTION. Difficult intubation rate is higher in the intensive care units than in the operating room [1, 2]. Alternative devices are available for airway management essentially in the operating room.

OBJECTIVES. We conducted a national survey of knowledge and practical experience of intensivists for difficult intubation, as well as their training and equipment available within units.

METHODS. An anonymous questionnaire with 40 questions was emailed to physicians working in intensive care units in France (January 2013).

RESULTS. 509 intensivists responded to the survey, 349 (69 %) anesthesiologists and 115 (23 %) medical intensivists. 73 % of intensivists followed a specific algorithm when unanticipated difficult intubation and 63 % in case of difficult oxygenation. 97 % of physicians reported having a portable storage unit for difficult intubation: the gum elastic bougie is available in 96 %, intubating laryngeal mask airway in 82 % and cricothyroidotomy in 75 %. 141 intensivists (28 %) have a videolaryngoscope. On difficult intubation experience, 413 intensivists (83 %) reported having use intubating laryngeal mask airway <10, 253 (50 %) less than 10 fiberoptic-guided intubation and 326 (65 %) have never practice cricothyroidotomy. 29 % used a standard oxygen mask as pre-oxygenation technique and 30 % did not use rapid sequence induction. 212 intensivists (42 %) feel that their training on difficult intubation is inappropriate and 432 (87 %) would participate in high fidelity simulation mannequin scenarios.



Number of procedures performed

CONCLUSIONS. Our survey has highlighted a major expectation of French intensivists regarding the place of difficult intubation in initial or continuous training. Alternative techniques do not seem to be mastered by all practitioners given the insufficient number of procedures performed. Equipment for management of a difficult airway (portable storage unit) are available but too often incomplete. Procedures for rapid sequence induction and pre-oxygenation are not performed correctly by 30 % of practitioners. Guidelines of the French consensus conference on difficult intubation propose measures to optimize the realization of intubation. In view of the many recent scientific studies, validated protocols [3] can now be offered to intensivists to secure this high-risk procedure. The place of high-fidelity simulation should become increasingly important in education and training, especially for algorithm and complex procedural skills acquisition.

REFERENCE(S). 1. Br J Anaesth 2011;106:632–642. 2. Br J Anaesth 2012;108:792–799. 3. Intensive Care Med 2010;36:248–255.

0469

ARE THERE MISSED OPPORTUNITIES FOR PREVENTATIVE RENAL CARE IN CRITICALLY ILL PATIENTS REQUIRING ACUTE RENAL REPLACEMENT THERAPY?

M. Varrier[1], N. Culshaw[1], M. Ostermann[1], A. Jones[1]

[1]Guy's and St Thomas' NHS Foundation Trust, London, United Kingdom

INTRODUCTION. There is increasing data showing that acute kidney injury (AKI) is associated with chronic kidney disease (CKD) and increased risk of developing end-stage renal failure (ESRF) [1]. Furthermore, the risk of needing renal replacement therapy (RRT) during critical illness is higher in patients with pre-existing CKD. Therefore, the occurrence of severe AKI may be an important opportunity to identify patients with a high risk of ESRF or CKD related morbidity who would benefit from nephrology follow-up. There is no UK data describing longer term renal outcomes, communication from hospital to primary care or Nephrology follow up of this potentially vulnerable group.

OBJECTIVES. To describe patient and renal outcomes of patients with AKI in ICU who had RRT and left hospital alive; to describe quality of information transfer regarding AKI to the primary care physician; to explore how many patients were subsequently reviewed by nephrologists.

METHODS. We searched the electronic medical records of all patients admitted to the ICU of a large tertiary referral centre between April 2010–March 2011, identifying those who received RRT for AKI and survived their stay in ICU. Patients with existing ESRF were excluded. Electronic hospital discharge summaries were used to assess communication with primary care physicians. Data on estimated glomerular filtration rate (eGFR) at hospital discharge and 1 year post discharge were collected via our electronic patient record system, or directly from the patient's primary care physician as appropriate.

RESULTS. Of 147 patients who received RRT for AKI and survived to ICU discharge, 124 survived to hospital discharge. In this cohort, information about RRT on ICU was included in the hospital discharge letter of only 62 patients (50 %).

Table 1 Renal outcome by CKD stage at hospital discharge

eGFR at hospital discharge (ml/min)	Number (%)	Mean baseline eGFR pre-hospital admission (ml/min)	Mean eGFR at hospital discharge (ml/min)	Mean eGFR of survivors at 1 year post ICU (ml/min)
<15	7 (5.6)	60.0	6.3	41.5
15–29	15 (12.1)	35.1	24.1	33.3
30–44	31 (25)	61.2	37.6	44.0
45–59	24 (19.4)	55.7	50.9	47.7
≥60	47 (37.9)	79.2	82.2	76.2

Table 2 Patient outcome/nephrology follow-up

eGFR at hospital discharge (ml/min)	Number (%)	Follow up advised in discharge summary (%)	No of patients with known outcome at 1 year (%)	1-year mortality (% of known outcome)	Under follow up by nephrology (%)
<15	7 (5.6)	7 (100)	6 (85.7)	2 (33.3)	7 (100)
15-29	15 (12.1)	6 (40)	10 (66.7)	3 (30)	6 (40)
30-44	31 (25)	5 (16.1)	17 (54.8)	3 (17.6)	4 (12.9)
45-59	24 (19.4)	2 (8.3)	17 (70.8)	3 (17.6)	2 (8.3)
≥60	47 (37.9)	2 (4.3)	28 (59.6)	8 (28.6)	2 (4.3)
Total	124		78 (62.9)	19 (24.4)	21 (16.9)

CONCLUSIONS. 1. In ICU patients who received RRT for AKI, CKD with an eGFR < 60 ml/min at discharge from hospital is common, and persistent at 1 year, reflecting both pre-existing CKD and newly acquired renal impairment. 2. Whereas in patients with more severe renal impairment at hospital discharge communication and subsequent follow-up was good, in those with less severe impairment appropriate information transfer and thus nephrology follow-up was far less common. 3. With the appropriate expertise this latter group may have modifiable disease. As such, these should be considered missed opportunities for preventative medical care, improved patient quality of life and reduced healthcare resource consumption, and greater awareness amongst ICU clinicians is essential.

REFERENCES. Coca SG et al. Chronic kidney disease after acute kidney injury: a systematic review and meta-analysis. Kidney Int 2012;81(5):442–8.

0470

IMPLEMENTATION OF AN INDEPENDENT INTENSIVE CARE TEAM FOR CRITICAL ILL PATIENTS IN EMERGENCY DEPARTMENT (ED) AND ITS IMPACT ON ED LENGTH OF STAY AND MORTALITY

H.M. Kim[1], K.S. Kim[1], W.Y. Kwon[1], G.J. Suh[1], Y.S. Jung[1], S.E. Lee[1], Y.C. Kye[1]

[1]Seoul National University Hospital, Department of Emergency Medicine, Seoul, Republic of Korea

INTRODUCTION. Emergency department (ED) overcrowding is a worldwide problem which adversely affecting patient outcome. Critical ill patients are most vulnerable to this kind of risk, while utilizing significant resources by themselves.

OBJECTIVES. The objective of this study was to examine the impact of implementing an independent intensive care team for critical ill patients in ED and its impact on ED length of stay and mortality.

METHODS. This was a before-after study performed in a single academic, urban, adult ED. All patients between January 2010 and December 2010 were triaged by emergency severity index (ESI). All patients were treated by emergency physicians on duty, except ESI level 1 patients from June 2010 to December 2010 (after group). The independent intensive

care team was activated by a triage nurse during regular hours only and the intensive care team composed of an intensivist faculty and a resident from emergency ICU responded to provide the initial management and disposition. If the patients were admitted to emergency ICU, then the intensive care team continued subsequent care. Primary outcomes were ED length of stay and hospital mortality in ESI level 1 patients.
RESULTS. Among 38,605 patients enrolled, 683 patients were triaged as ESI level 1 (Table 1).

Table 1 Basic characteristics of all adult patients who visited ED during study period

	Total n = 38,605	Before n = 15,437	After n = 23,168	P value
Age per year	54.6 (54.4–54.7)	54.6 (54.4–54.7)	54.4 (54.2–54.7)	0.094
Male sex	19,246 (49.9)	7,712 (50.0)	11,534 (49.8)	0.738
ESI 1	683 (1.8)	301 (2.0)	382 (1.7)	
ESI 2	6,432 (16.7)	2,179 (14.1)	4,253 (18.4)	
ESI 3	26,863 (69.6)	11,548 (74.8)	15,315 (66.1)	<0.001
ESI 4	15,315 (66.1)	1,227 (8.0)	2,835 (12.2)	
ESI 5	2,835 (12.2)	2,835 (12.2)	383 (1.7)	

Data were presented as mean ± 95 % confidence intervals for continuous variables or as numbers with percentage as appropriate ESI, emergency severity index

After the implementation of an independent intensive care team, ED length of stay of ESI level 1 patients has significantly decreased (Table 2).

Table 2 Comparison of ED length of stay according to ESI levels

	Total n = 38,605	Before n = 15,437	After n = 23,168	p value
All patients n = 38,605	684.0 (674.7–693.4)	692.2 (677.2–707.2)	678.6 (666.7–690.5)	0.162
ESI 1 (n = 683)	685.8 (605.2–766.4)	821.0 (689.7–952.3)	579.3 (479.4–679.2)	0.004
ESI 2 (n = 6,432)	1033.9 (1006.4–1061.3)	1001.9 (955.6–1048.1)	1050.3 (1016.2–1084.3)	0.102
ESI 3 (n = 26,863)	688.6 (677.6–699.5)	696.6 (679.5–713.7)	682.5 (668.3–696.7)	0.213
ESI 4 (n = 4,062)	183.3 (175.1–191.5)	161.0 (147.1–172.9)	192.9 (182.4–203.5)	<0.001
ESI 5 (n = 565)	84.1 (70.4–97.9)	73.8 (49.0–98.5)	89.1 (72.4–105.7)	0.313

Data were presented as mean ± 95 % confidence intervals for continuous variables

Decrease in ED length of stay in ESI level 1 patients was significant in patients admitted to ICU (Table 3).

Table 3 Comparison of ED length of stay according to ED disposition in ESI level 1 patients

Disposition	Before (n = 301)	After (n = 382)	p value
Admitted (n = 509)	n = 215,949.8 (782.2–1117.5)	n = 294,542.9 (431.7–654.1)	<0.001
To ICU (n = 367)	n = 139,286.2 (200.1–372.2)	n = 228,183.6 (137.5–229.6)	0.039
To ward (n = 142)	n = 762,163.7 (1870.6–2456.7)	n = 661,784.1 (1456.2–2112.1)	0.087
Transferred (n = 54)	n = 22,754.0 (162.7–1345.3)	n = 32,586.2 (244.0–928.4)	0.591
Discharged (n = 72)	n = 43,520.0 (341.7–698.4)	n = 291,298.6 (776.0–1821.1)	0.007
Dead at ED (n = 48)	n = 21,188.3 (59.7–317.0)	n = 27,195.0 (137.9–252.1)	0.922

Data were presented as case numbers with ED length of stay (mean ± 95 % confidence intervals)

However, ED mortality [before, 21/301 (7.0 %) vs after, 27/382 (7.1 %)] and hospital mortality after admission [before, 54/215 (29.9 %) vs after 88/294 (27.9 %)] were not different between two groups.
CONCLUSIONS. Implementation of an independent intensive care team in single adult ED was effective in reducing ED length of stay in ESI level 1 patients. However, mortality of ESI level 1 patients was not improved by this implementation.

Intestinal failure challenges: 0471–0475

0471

INFLUENCE OF INTRAABDOMINAL HYPERTENSION ON CELULAR APOPTOSIS AND NECROSIS IN PORCINE MODELS

G. Magdaleno[1], L. Torres[1], T. Mondragon[1], A. Buensuseso[1], S. Leco[1], D. Hernandez[1], M. Moreno[1], M. Poblano[1], F. Tendillo[2]

[1]Hospital Juarez de Mexico, Intensive Care Unit, Mexico, Mexico, [2]Hospital Universitario Puerta de Hierro Majadahonda, Intensive Care Unit, Madrid, Spain

INTRODUCTION. Apoptosis and cell necrosis has been described in various human and animal models of ischemia–reperfusion related injury that affects many organs mainly heart, liver and kidney.
OBJECTIVES. This study was undertaken to examine the apoptosis and necrosis of renal and liver cells before, and after the increase of intraabdominal pressure and its relationship to appearance of ischemia/reperfusion related injury.
METHODS. We examined three anesthetized and intubated 30 kg porcine models, and studied it over a period of 6 h. After preparation and establishing a steady state, the intra-abdominal pressure was increased with a intraperitoneal catheter that was placed in the peritoneal cavity at level of the umbilicus; and then a saline 0.9 % solution was infused to increase intra-abdominal pressure. The IAP was increased up to 20 mmHg. The hemodinamyc parameters were monitored with a Swan Ganz Catheter and (VIGILANCE®) monitoring system and blood gases. Moreover renal an liver biopsies were performed by exploratory laparotomy after the increase of IAP to 20 mmHg and 6 h after sustained elevated IAP, samples were transported in 0.9 % saline solution and analyzed by annexin V assay flow cytometry to assess apoptosis and 7-aminoactinomycin D fluorescent test cell necrosis.
RESULTS. Cardiac output and volumetric preload index did not significantly decrease, while the APP decreased from 70 to 40 mmHg in 6 h. PO_2, serum lactate and PCO2 remained unchanged. Apoptosis and necrosis were more prominent to the renal cells compared with the other organ cells studied induced by intraabdominal pressure.

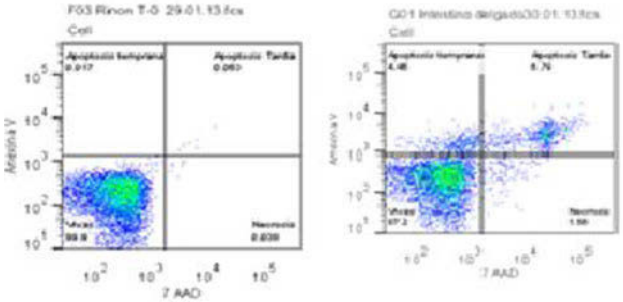


Grafico 1

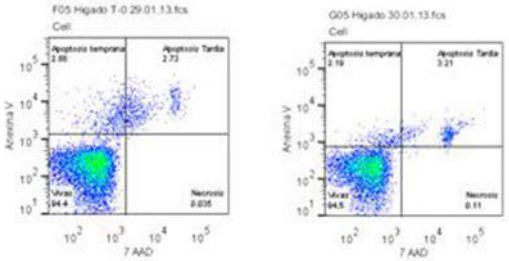


Grafico 2

CELLS	KIDNEY		LIVER	
	INITIAL	AT 6 hrs	INITIAL	AT 6 hrs
LIVE	99.9%	87.2%	94.5%	94.4%
NECROSIS	0.038%	1.56%	0.11%	0.035%
EARLY APOPTOSIS	0.017%	4.46%	2.19%	2.88%
LATE APOPTOSIS	0.63%	6.79%	3.21%	2.73%

Table 1

CONCLUSIONS. Ischemic damage and apoptosis were induced by intraabdominal pressure. Apoptosis and necrosis were more prominent to the renal cells compared with the other organ cells studied. Medical management to prevent organ system dysfunction should be initiated as soon as possible, with a goal of maintaining an adequate APP.
REFERENCE(S). Gagangeet S, Pavan M, Isha G, Aditi Ranade, Anip Bl, Pathophysiology and management of acutekidney injury in the setting of abdominal compartment syndrome. Am J Ther 2012.

0472

PLASMATIC CITRULLINE LEVELS IN GASTROINTESTINAL FAILURE AND MULTIPLE ORGAN FAILURE

G. Chiarini[1], D. Ferrari[1], P. Galli[2], M. Marini[2], R. Marino[1], N. Latronico[1]

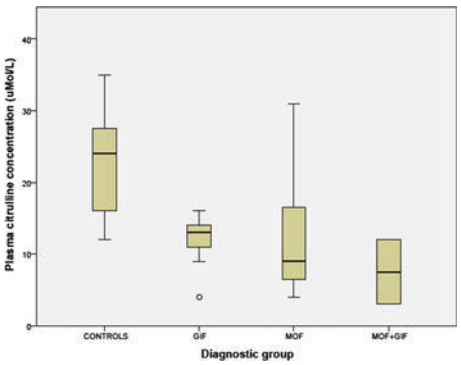
[1]Università degli Studi di Brescia, Anesthesia and Critical Care Medicine, Brescia, Italy, [2]Università degli Studi di Brescia, Clinical Chemistry Laboratory, Brescia, Italy

INTRODUCTION. Gastrointestinal symptoms are common during the first week of intensive care unit (ICU) stay and are associated with poor outcome. Gastrointestinal failure (GIF) is defined as the presence of three or more gastrointestinal symptoms and is independently associated with an increased risk of ICU mortality. Citrulline is an amino acid mainly synthesized from glutamine in the mitochondria of small bowel enterocytes, and is a marker of enterocyte dysfunction. Gut failure is a critical event in the inflammatory process leading to multiple organ dysfunction and failure (MOF).
OBJECTIVES. We evaluated if patients with GIF or MOF had lower plasmatic levels of citrulline than controls. We also measured intra-abdominal (IAP) pressure in all patients enrolled.
METHODS. We included all patients with GIF or MOF admitted to the ICU from January to April 2013. ICU patients with no GIF or MOF served as control. Patients were followed daily for the development of infection, sepsis and MOF throughout the ICU stay. We evaluated the plasmatic levels of arginine, glutamine and citrulline, and measured IAP within 72 h from inclusion into the study. We expressed continuous variables as means (SD) or as medians [interquartile range (IQR)] and discrete variables as counts (percentage). Differences in the study population were analyzed by means of a Student *t* test using SPSS statistical package; $p < 0.05$ was considered as significant.
RESULTS. We included 19 patients (10 with GIF, 7 with MOF, 2 with GIF and MOF) and 23 controls. The groups were similar for age, sex and disease severity. Patients with GIF or MOF had lower plasmatic levels of citrulline [11.8 (SD 6.3) vs. 22.4 (SD 6.9) μmol/L; $p = 0.0000$], glutamine [393.7 (SD 73.8) vs. 486.3 (SD 142.7] μmol/L; p = 0.014] and arginine [60.7 (SD 28.6) vs. 81.8 (SD 35.8) μmol/L; $p = 0.04$] than controls. IAP was higher in patients with GIF or MOF compared to controls [14.6 (SD 4.0) vs 9.8 (SD 2.9) cmH_2O, $p = 0.0009$]. Citrulline plasmatic levels were lower in 10 patients with GIF [12.0 (SD 3.4) vs 22.4 (SD 6.9); $p = 0.00009$], in 7 patients with MOF [12.9 (SD9.4) vs. 22.4 (SD 6.9); $p = 0.04$], and in 2 patients with GIF and MOF [7.5 (SD 6.4) vs 22.4 (SD 6.9); $p = 0.007$] compared to control.
CONCLUSIONS. Plasmatic citrulline is low in patients with clinical symptoms of GIF suggesting that citrulline can be a marker of small bowel dysfunction in critically ill

patients. Plasmatic citrulline is also low in patients with MOF with no clinical evidence of GIF, suggesting that subclinical form of small bowel dysfunction can exist.

REFERENCES. 1. Reintam Blaser A Gastrointestinal symptoms during the first week of intensive care are associated with poor outcome: a prospective multicentre study. Intensive Care Med 2013;39:899–909. 2. Piton G Acute intestinal failure in critically ill patients: is plasma citrulline the right marker? Intensive Care Med 2011;37:911–917.

GRANT ACKNOWLEDGMENT. We used internal funds of the University of Brescia.



Box plot of plasmatic levels of citrulline

0473

HOW TO DEFINE THE FEEDING INTOLERANCE: RETROSPECTIVE OBSERVATIONAL STUDY IN 1712 INTENSIVE CARE PATIENTS

A. Reintam Blaser[1], L. Starkopf[1], J. Starkopf[1]

[1]University of Tartu, Tartu, Estonia

INTRODUCTION. Feeding intolerance (FI) in intensive care patients is not uniformly defined, but is most often described as high gastric residual volumes (GRV).

OBJECTIVES. We aimed to identify the best FI definition through analyzing its impact on mortality.

METHODS. All adult patients from 2004 to 2011 receiving enteral nutrition (EN) during their ICU stay were analysed. Amount of EN, absent bowel sounds (BS), vomiting/regurgitation, diarrhoea, bowel distension, and GRVs were documented daily. The sum of 5 and of 4 gastrointestinal (GI) symptoms (absent BS excluded for the latter) was calculated daily. GRV $\geq$ 500 ml/day was considered as high for these calculations. Different FI definitions were composed with GRV solely or its combinations with other GI symptoms, or of failure to reach EN targets. The predictive power of FI on mortality was tested by adding the presence of FI (different definitions were tested one-by-one) into the multiple regression analysis together with admission day variables (n = 33).

RESULTS. 1,712 patients were studied, 221 (12.9 %) of them died in ICU, but 494 (28.6 %) died within 90 days of ICU admission. 8 out of 12 FI definitions assessed were associated with ICU- and 90 days mortality (Table 1). SOFA sub-scores of admission day, except of respiratory, together with age were independent predictors of 90 days mortality, whereas hematologic SOFA and age were not predictive for ICU mortality. The combined models (independent admission variables + the best FI definition) are presented in Table 2. FI defined as presence of 2 out of 5 GI symptoms was most strongly related to increased ICU-mortality, whereas EN < 20 % of caloric target was the strongest predictor for 90 days mortality (respective Kaplan–Meier survival curve is presented on Fig. 1).

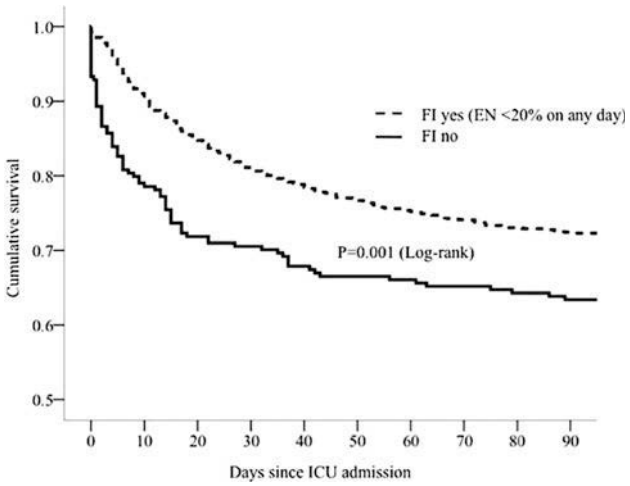
CONCLUSIONS. FI is associated with impaired ICU outcome, and the impact depends on the definition used. The best definition of FI for prediction of ICU-mortality is based on complex assessment of GI symptoms. The best definition of FI for prediction of 90 days mortality is based on enteral underfeeding itself.

Presence of FI and mortality

Variable	Definition of FI	Patients with FI, n (%)	ICU mortality FI no, %	ICU mortality FI yes, %	p value	90 days mortality FI no, %	90 days mortality FI yes, %	p value
FI 1A	GRV $\geq$ 500 ml/24 h	371 (21.7)	10.1	22.9	<0.001	26.6	36.9	<0.001
FI 1B	GRV $\geq$ 250 ml/24 h	690 (40.3)	9.1	18.6	<0.001	25.2	34.2	<0.001
FI 2A	EN calories <20 % on any day	928 (54.2)	6.9	18.0	<0.001	19.1	37.1	<0.001
FI 3A	EN calories <50 % on day 3	644 (61.8)	7.3	14.1	0.001	23.9	32.6	0.003
FI 4A	$\geq$1 out of 4 GI symptoms	848 (49.5)	8.2	17.7	<0.001	22.8	35.0	<0.001
FI 4B	$\geq$2 out of 4 GI symptoms	391 (22.8)	10.1	22.3	<0.001	26.3	37.3	<0.001
FI 5A	$\geq$1 out of 5 GI symptoms	873 (60.0)	7.9	17.8	<0.001	22.9	34.6	<0.001
FI 5B	$\geq$2 out of 5 GI symptoms	418 (24.4)	9.4	23.9	<0.001	25.7	38.5	<0.001

Regression models

	ICU mortality	ICU mortality	90 days mortality	90 days mortality
Variable	Odds ratio	95 % CI	Odds ratio	95 % CI
SOFA cardiovascular	1.67	1.38–2.05	–	
SOFA hepatic	1.46	1.22–1.74	1.25	1.07–1.47
SOFA neurological	1.47	1.30–1.66	1.63	1.46–1.81
SOFA renal	1.27	1.11–1.456	1.29	1.16–1.43
SOFA hematological	–		1.27	1.10–1.47
Age	–		1.04	1.03–1.05
FI 2A	–		2.08	1.50–2.90
FI 5B	2.60	1.75–3.87	–	



Kaplan–Meier survival curves

GRANT ACKNOWLEDGMENT. The study was supported by target financing from the Ministry of Education and Science of Estonia (SF0180004s12).

0474

INTRAABDOMINAL PRESSURE VALUE AS A MARKER OF ENTERAL NUTRITION TOLERANCE IN CRITICALLY ILL PATIENTS. THE PIANE STUDY. PRELIMINARY RESULTS

J.C. Montejo[1], L. Bordejè[2], E. Calvo[3], A. García de Lorenzo[4], C. González Iglesias[5], C. Ortiz Leyba[6], A. Robles[7], C. Sánchez Alvarez[8], J.C. Yébenes[9], Piane Study Group, Semicyuc

[1]Hospital Universitario 12 de Octubre, Intensive Care Medicine, Madrid, Spain, [2]H. U. Germans Trias i Pujol, Intensive Care Medicine, Badalona, Spain, [3]H. del Henares, Intensive Care Medicine, Coslada, Spain, [4]H. U. La Paz, Intensive Care Medicine, Madrid, Spain, [5]H. de Barbastro, Intensive Care Medicine, Barbastro, Spain, [6]H. U. Virgen del Rocío, Sevilla, Spain, [7]H. U. Vall d'Hebron, Intensive Care Medicine, Barcelona, Spain, [8]H. U. Reina Sofía, Intensive Care Medicine, Murcia, Spain, [9]H. de Mataró, Mataró, Spain

INTRODUCTION. Enteral nutrition (EN) is associated with a high incidence of gastrointestinal complications (GIC) in critically ill patients. Nevertheless, it is extremely difficult to anticipate the presence of GIC complications. We tested the hypothesis that intraabdominal pressure value (IAP) would be a marker of EN intolerance in critically ill patients.

OBJECTIVES. To analyze if high levels of IAP are associated with higher frequency of GIC. To investigate if there is an IAP value that predicts EN intolerance.

METHODS. An observational, non-interventional, prospective and multicenter study was planned in adult ICU patients in Spain. Patients were included if more than 5 days of EN were anticipated. EN application and CGI management were done according to a previous established protocol. IAP was determined by urinary catheter with Abdo-Pressure® system. Variables related with EN and GIC were followed each day. IAP variables (max, med and before GIC) were also followed each day. For statistical analysis we compared the group of patients without GIC (Group A) with the group with GIC (Group B). Statistics was performed by an independent agency. ROC curve, Pearson correlation coefficient, Student t test or ANOVA were used. Sample size was estimated in 220 cases.

RESULTS. A total of 28 ICU participated in the study and included 247 patients in a 4 months study period. A number of 2.494 EN days were followed. Group A included 119 patients. EN intolerance (Group B) was present in 128 patients (51.8 %). There were no differences between groups in age (Global 62.0 $\pm$ 14.7 years; x $\pm$ SD), sex distribution (Global 63.6 % male), admission diagnosis (Global 80 % medical causes), APACHE II at admission (A 22.1 $\pm$ 8.6; B 20.8 $\pm$ 6.8) (x $\pm$ SD), SOFA at admission (A 7.6 $\pm$ 3; B 7.5 $\pm$ 3.5) (x $\pm$ SD) o time to start EN (A 30.2 $\pm$ 23.0; B 30.9 $\pm$ 24.1 h) (x $\pm$ SD). EN days, mechanical ventilations days and ICU length of stay were higher for patients in group B: EN: (8.1 $\pm$ 8.4 vs 18.1 $\pm$ 13.7; p < 0,001), mechanical ventilation days: (8.0 $\pm$ 7.7 vs 19.3 $\pm$ 14.9;p < 0,001), days in ICU: (12.3 $\pm$ 11.4 vs 24.8 $\pm$ 17.5; p < 0,001) (x $\pm$ SD). Daily mean IAP was similar in both groups (A 14.8 $\pm$ 3.7; B 14.8 $\pm$ 4.1 mmHg) (x $\pm$ SD). Daily maximum IAP was higher in Group A (A 16.8 $\pm$ 4.0; B 19.4 $\pm$ 4.8) (x $\pm$ SD) (p < 0,001). In the ROC curve a value of 14 mmHg was obtained for IAP as a predictor of EN intolerance, but with a low sensitivity (58.6 %) and specificity (48.7 %).

CONCLUSIONS. Patients with EN intolerance spent more days in ICU and have a longer EN and mechanical ventilation courses. EN intolerance is associated with a higher IAP value. These preliminary data does not permit to determine an IAP value useful for EN intolerance prediction. An APACHE II or SOFA value in the first 24 h does not anticipate EN intolerance.

GRANT ACKNOWLEDGMENT. A restricted grant from ConvaTec was received for this study.

0475

SYMPTOMS OF GASTROINTESTINAL DYSFUNCTION IN INTENSIVE CARE PATIENTS: FREQUENCY, RISK FACTORS AND ASSOCIATED OUTCOMES. A STUDY OF THE CALNUCI WORKING GROUP

C.I. Loudet[1], L.I. Tumino[1], M.C. Marchena[1], R. Gimbernat[2], M.L. Cabana[3], G. Capurro[4], P. Astegiano[5], M.A. Velásquez[6], M. Casanova[7], M.C. Roth[8], G. Roda[9], P. Okurzati[10], Y. Balmaceda[2], J. Rodríguez Bugueiro[7], CALNUCI Group

[1]Hospital General San Martín de La Plata, La Plata, Argentina, [2]Centro de Cuidados Intensivos, San Juan, Argentina, [3]Hospital Pablo Soria, Jujuy, Argentina, [4]Hospital General Dr. Oscar Allende, Mar del Plata, Argentina, [5]Hospital José María Cullen, Santa Fe, Argentina, [6]Sanatorio Nuestra Señora del Rosario, Jujuy, Argentina, [7]Hospital El Cruce, Florencio Varela, Argentina, [8]Hospital San Juan de Dios, La Plata, Argentina, [9]Hospital Municipal Eva Perón, Merlo, Argentina, [10]Casa Hospital San Juan de Dios, Ramos Mejía, Argentina

INTRODUCTION. Gastrointestinal (GI) symptoms are frequent in the ICU, probably reflecting acute GI dysfunction and could be related to worsening outcomes.

OBJECTIVES. To determine the incidence of and risk factors for GI symptoms and their association with feeding intolerance and clinical outcomes.

METHODS. Cohort study of consecutive patients requiring enteral nutrition (EN) ≥5 days performed in 10 ICUs in Argentina. GI symptoms were defined according to the ESICM Working Group on Abdominal Problems*. EN Efficacy(ENEf) = % administered/prescribed EN volume. EN major cessation = period cessation >12 h/day or ENEf ≤50 %.Data are presented according to their nature. Comparisons were performed with *t* test, Wilcoxon rank sum or X^2 tests as appropriate. Independent predictors for most frequent GI symptoms were identified with logistic regression analysis. $P < 0.05$ was considered significant. STATA 11.1 software was used.

RESULTS. Of 334 patients: age 45 ± 18, APACHE II 18 ± 7, SOFA 5(3–8), MV 12(8–17) days, ICU LOS 16(11–23), admission diagnosis: medical 50 % emergency and elective surgery 45 and 5 %; 62 % had shock; mortality 39 %. Patients had 4,508 EN days, ENEf 79 ± 16, early EN 72 %, EN major cessation 79 %. Constipation occurred in 76 %, Gastroparesis (GP) 34 %, vomiting 16 %, diarrhea 7 %, GI bleeding 3 %. Tables 1 and 2 show comparisons between patients with/without GP and with/without constipation (only with statistical significance). Independent predictors: of GP were age OR 0.97 (95 % CI 0.96–0.99), constipation OR 2.94 (95 % CI 1.46–5.92], vomiting: OR 2.95 (95 % CI 1.30–6.69) and opioid days OR 1.03 (95 % CI 1.00–1.07); of constipation were shock OR 1.73 (95 % CI 1.10–3.21), GP OR 2.76 (95 % CI 1.25–6.06), opioid days OR 1.09 (95 %CI 1.03–1.16) and use of fentanyl OR 3.14 (95 %CI 1.63–6.05).

Both GP and constipation statistically increased MV days, ICU and hospital LOS, EN major cessation and reduced ENEf ($p < 0.01$); only GP increased VAP ($p < 0.01$).

CONCLUSIONS.
- Nutritional variables were acceptable in this cohort, except for high incidence of EN major cessation.
- Most frequent GI symptoms coexist and interact as well as share similar determinants, probably reflecting GI dysfunction.
- GI symptoms have clear effects on other clinical outcomes, especially related to duration of MV, hospital and ICU LOS.

REFERENCE. 1. Reintam Blaser A, Malbrain ML, Starkopf J, et al. Gastrointestinal function in intensive care patients: terminology, definitions and management. Recommendations of the ESICM Working Group on Abdominal Problems. Intensive Care Med 2012;38:384–394.

GRANT ACKNOWLEDGMENT. Sociedad Argentina de Terapia Intensiva.

Gastroparesis. risk factors

	GP yes (34 %)	GP no (66 %)	P value
Age, mean ± SD	39 ± 17	47 ± 17	<0.01
Shock, n (%)	33 (30)	89 (42)	<0.05
Trauma, n (%)	32 (29)	35 (16)	<0.01
Constipation, n (%)	97 (89)	148 (69)	<0.01
Opioid days median (p 25–75)	9 (5-14)	6 (3-11)	<0.01
Vomiting, n (%)	25 (23)	25 (12)	<0.01

Constipation. risk factors

	Constipation yes (76 %)	Constipation no (24 %)	P value
Age, mean ± SD	44 ± 18	49 ± 18	<0.05
Shock, n (%)	165 (67)	37 (48)	<0.01
Gastroparesis, n (%)	97 (40)	12 (16)	<0.01
Opioid days, median (p 25–75)	7 (5–13)	5 (3–8)	<0.01
Fentanyl, n (%) (vs morphine)	181 (80)	35 (57)	<0.01

Post-operative complications: management and impact on outcome: 0476–0480

0476

THE RELATIONSHIP BETWEEN THE ASA SCORE AND OUTCOME FROM SURGERY. RESULTS FROM THE EUSOS STUDY

A.C. Diogo[1,2], F. Iannuccelli[1], A. Rhodes[1], R. Pearse[3], R. Moreno[2]

[1]St George's Healthcare NHS Trust, London, United Kingdom, [2]UCINC, Hospital de São José, Centro Hospitalar de Lisboa Central, EPE, Lisboa, Portugal, [3]The London School of Medicine and Dentistry, Queen Mary University of London, London, United Kingdom

BACKGROUND. The European Surgical Outcomes Study (EuSOS) [1] described the mortality following in-patient surgery. Several factors were identified that were able to predict poor outcomes in a multivariate analysis. These included age, procedure urgency, severity and type and the American Association of Anaesthesia (ASA) score. This study describes in more detail the relationship between the ASA score and postoperative mortality.

METHODS. Patients of this 7-day cohort study were enrolled in April 2011. Consecutive patients aged 16 years and older undergoing inpatient non-cardiac surgery with a recorded ASA score in 498 hospitals across 28 European nations were included and followed up for a maximum of 60 days. The primary endpoint was in-hospital mortality. Decision tree analysis using CHAID (SPSS) systems were used to delineate nodes associated with mortality.

RESULTS. 46,539 patients were enrolled into the study. Due to missing values, 873 patients were excluded, leaving 45.666 for analysis. Increasing ASA scores were associated with increased admission rates to intensive care (ICU) and also increased mortality rates. Despite a progressive relationship with mortality, discrimination was poor, with an aROC curve of 0.658 (95 % CI 0.642–0.6775). By using regression trees (CHAID), we identified four discrete ASA nodes associated with mortality, with ASA 1 and ASA 2 being compressed into the same node.

Results

ASA Score	N (%)	Median age (IQR)	Admitted to ITU (%)	Mortality (%)
1	11,431 (25.0)	39 (28–51)	1.6	1.9
2	21,193 (46.4)	60 (47–70)	5.1	1.9
3	11,411 (25.0)	71 (61–78)	14.0	4.0
4	1,543 (3.4)	74 (62–81)	36.8	17.3
5	88 (0.2)	71 (57–80)	72.7	52.3

CONCLUSIONS. The ASA score is able to determine higher risk groups of surgical patients, but clinicians cannot discriminate between grades 1 and 2. Overall, the discriminatory power of the model was less than acceptable for widespread use.

REFERENCE. 1. Pearse RM, et al. Mortality after surgery in Europe: a 7 day cohort study. Lancet 2012;380(9847):1059–1065.

0477

START TIMES OF EMERGENCY SURGERY AND IN-HOSPITAL MORTALITY: A COHORT STUDY ON THE EUSOS DATABASE COMPARING MORTALITY AFTER DAY SHIFT, EVENING SHIFT AND NIGHT SHIFT PROCEDURES

R.M. Pearse[1], B. van Zaane[2], R.P. Moreno[3], W.F. Buhre[4], W.A. van Klei[2], A. Rhodes[5], for the European Surgical Outcomes Study (EuSOS) Group for the Trials Groups of the European Society of Intensive Care Medicine and the European Society of Anaesthesiology

[1]Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, United Kingdom, [2]University Medical Center Utrecht, Utrecht, Netherlands, [3]UCINC, Hospital de São José, Centro Hospitalar de Lisboa Central, EPE, Lisbon, Portugal, [4]Maastricht University Medical Center, Maastricht, Netherlands, [5]St George's Healthcare NHS Trust and St George's University of London, London, United Kingdom

INTRODUCTION. Evidence suggests that sleep deprivation associated with night-time working may adversely affect physical and mental performance. As a result, surgical procedures performed at night may be associated with increased mortality risk.

OBJECTIVES. The aim of this study was to evaluate any association between night-time surgery and hospital mortality.

METHODS. This is a sub-study on the European Surgical Outcomes Study (EuSOS) database in all patients older than 16 years who underwent emergency or urgent surgery. Patients were stratified by the time of surgery. The primary outcome was in-hospital mortality after emergency and urgent surgery. Secondary outcomes were length of hospital stay and critical care admission during hospital stay. Logistic multi-level regression analysis was used to determine whether or not hospital mortality was different depending on the time of day the procedure occurred, as depicted by the hour of day anaesthesia commenced, and to adjust for identified confounding factors effecting outcome.

RESULTS. 11,290 patients undergoing non-elective surgery were included in the analysis with 636 in-hospital deaths (5.6 %). Crude mortality odds ratios increased sequentially from daytime [426 deaths (5.3 %) to evening 155 deaths (6.0 %), OR 1.14 (95 % confidence interval 0.94–1.38)] to night-time [60 deaths (8.3 %) OR 1.62 (1.22–2.14)]. The highest mortality was found in patients who underwent urgent or emergency surgery between 4:00 and 6:59, with a peak incidence of 19.1 %, and an OR of 6.37 (95 % CI 2.72–14.95) between 4:00 and 4:59. However, after adjustment for confounding factors, surgery during the evening [OR 1.09 (0.91–1.31)] and night [OR 1.20 (0.9–1.6)] was not associated with an increased risk of post-operative death.

CONCLUSIONS. Whilst non-elective surgery during the evening and night is associated with increased mortality, these differences appear to be explained by known patient and surgery related risk factors rather than the time at which the procedure was performed.

GRANT ACKNOWLEDGMENT. This study was funded by the European Society of Intensive Care Medicine and the European Society of Anaesthesiology.

0478

LOW CENTRAL VENOUS OXYGEN SATURATION AT EXTUBATION AFTER CARDIOVASCULAR SURGERY IS THE INDEPENDENT PREDICTOR FOR READMISSION AND IN-HOSPITAL DEATH

Y. Sotomi[1], K. Iwakura[1], K. Abe[1], J. Yoshida[1], T. Masai[1], K. Fujii[1]

[1]Sakurabashi-Watanabe Hospital, Cardiovascular Center, Osaka, Japan

INTRODUCTION. Despite recent widespread application of central venous oxygen saturation (ScvO2), little is known about the relationship between this value and outcome.

OBJECTIVES. To evaluate the relationship between the ScvO2 value and outcome in comparison with mixed venous oxygen saturation (SvO2).

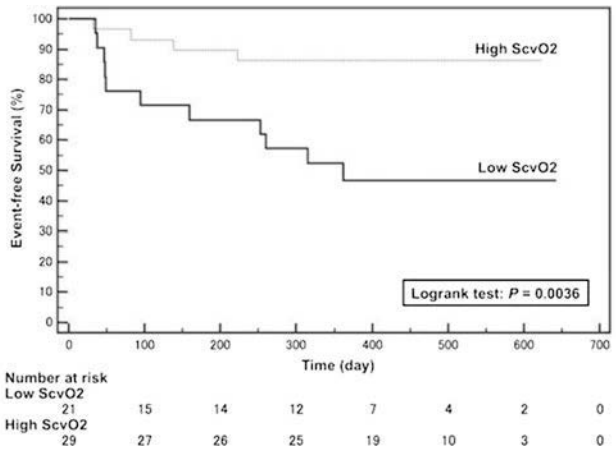
METHODS. The study design was a prospective cohort study. ScvO2, SvO2, and other biochemical and demographic data were prospectively measured in the perioperative period of cardiovascular surgery. The primary composite outcome was readmission and in-hospital death. Average SvO2 and ScvO2 during operation, minimum SvO2 and ScvO2 during operation, average SvO2 and ScvO2 in ICU, and SvO2 and ScvO2 at extubation in ICU were evaluated as predictors in addition to other demographic data. Independent predictors of composite outcome were identified with the use of Cox proportional hazards model.

RESULTS. Perioperative data from consecutive 50 patients (68 ± 11 years, 31 males) who underwent cardiovascular surgery was analyzed. In-hospital death and readmission was observed in 15 patients. Univariate analysis revealed that predictors of composite outcome were history of chronic kidney disease [hazard ratio (HR) 3.71, 95 % confidential interval

(CI) 1.27–10.84, $P = 0.017$], left ventricular ejection fraction <40 % (HR 3.27, 95 % CI 1.04–10.27, P = 0.044), ScvO2 < 64.4 % at extubation in ICU (HR 4.69, 95 % CI 1.50–14.68, P = 0.0083), and length of ICU stay (HR 1.06, 95 % CI 1.01–1.11, P = 0.012). Multivariate analysis revealed that chronic kidney disease (HR 3.68, 95 % CI 1.25–10.83, P = 0.0186) and ScvO2 < 64.4 % at extubation (HR 4.65, 95 % CI 1.48–14.63, P = 0.0088) were independent predictors for composite outcome. Kaplan–Meier analysis revealed that higher rate of readmission and in-hospital death (53.4 % within 1 year after operation) in patients with low ScvO2 at extubation (n = 21) than in the patients with high ScvO2 at extubation (13.8 %, n = 29) (Logrank test, $P = 0.0036$).

CONCLUSIONS. In the perioperative period of cardiovascular surgery, CKD and ScvO2 < 64.4 % at extubation were identified as independent predictors for in-hospital death and readmission. Compared with SvO2, low ScvO2 at extubation more closely related with readmission and in-hospital death.

REFERENCE. 1. Changes in central venous saturation after major surgery, and association with outcome. Crit Care 2005;9:694–9.



The impact of ScvO2 on composite outcome

0479

PERI-OPERATIVE POINT-OF-CARE PLATELET FUNCTION ASSESSMENT PREDICTS BLEEDING RISK AND NEED FOR TRANFUSION IN ISOLATED CABG: PACS STUDY

J. Thekkudan[1], F. Mohammed[1], R. Sahajanandan[1], M.B. Gravenor[2], S.L. Hinder[2], A. Meraglia[1], S. Lakshmanan[1], H. Luckraz[1]

[1]Heart & Lung Centre, Cardiothoracic Unit, Wolverhampton, United Kingdom, [2]School of Medical Sciences, Statistics, Swansea, United Kingdom

INTRODUCTION. More patients are currently referred for coronary artery bypass grafting (CABG) whilst still on anti-platelet therapy. This leads to increased post-op bleeding, need for transfusion (blood and blood products) and its incumbent post-op morbidities and even mortality.

OBJECTIVES. To assess the predictive value of the point-of-care testing for platelet function using the multiplate device.

METHODS. Patients undergoing isolated CABG were prospectively included (n = 84). Half of the patients were on anti-platelet therapy till surgery (Group A) while the other half stopped anti-platelet treatment at least 5 days pre-op. Platelet function was assessed using whole blood, immediately pre-op and post-op using the multiplate device and overall coagulation was assessed with the TEG. Primary end-point was excessive bleeding (>2.5 ml/kg/min) within the first 3 h post-op. Secondary end-points included need for blood and platelet transfusions.

RESULTS. There were no significant differences between the two groups in terms of age and gender. There were more diabetics and patients requiring urgent surgery in Group A. There were no significant differences in post-op complications except for more excessive bleeding (59 vs 33 %, p = 0.02), higher re-exploration rates (14 vs 0 %, p < 0.01) and higher rate of blood (41 vs 14 %, p < 0.01) and platelet (14 vs 2 %, p = 0.05) transfusions in Group A.

On multivariate analysis, pre-op platelet function testing (area under curve <31) was the most significant predictor of excessive bleeding (OR 2.3, p = 0.08), need for blood transfusion (OR 5.5, p < 0.01) and platelet transfusion (OR 15.1, p < 0.01). Sensitivity for predicting need for platelet transfusion was 0.86, and negative predictive value was 0.98 with the pre-op Aspi test. Sensitivity of predicting post-op need for transfusion (0.86) and excessive blood blood loss (0.81) was best with the post-op Aspi test (multiplate).

TEG results did not correlate well with any of these outcome measures.

CONCLUSIONS. Pre-operative platelet testing with the multiplate was the strongest predictor for bleeding and need for blood and platelet transfusions in patients on anti-platelet therapy till time of surgery.

REFERENCE(S). Ranucci M et al. Multiple electrode whole blood aggregometry and bleeding in cardiac surgery patients receiving thienopyridines. Ann Thorac Surg 2011;91:123–30.

GRANT ACKNOWLEDGMENT. Charitable Hospital Fund.

0480

THE VALUE OF SERUM PROCALCITONIN LEVEL FOR DIFFERENTIATION OF INFECTIOUS FROM NONINFECTIOUS SYSTEMIC INFLAMMATORY RESPONSE SYNDROME AFTER CARDIAC SURGERY

C. Mitaka[1], Z. Dong[2], G. Haraguchi[1]

[1]Tokyo Medical and Dental University Graduate School, Critical Care Medicine, Tokyo, Japan, [2]Beijing Tongren Hospital, Critical Care Medicine, Beijing, China

INTRODUCTION. Cardiac surgery can cause a systemic inflammatory response syndrome (SIRS), which is making difficult the interpretation of inflammatory markers. It is not always possible to distinguish SIRS with infection from SIRS without infection in patients after cardiac surgery. Therefore, the diagnosis of post-operative infection after cardiac surgery is difficult to assess. Procalcitonin (PCT) is a marker of inflammation and is used for identification of bacterial infection.

OBJECTIVES. The objective of this study was to evaluate the diagnostic value of serum PCT level for infection and compare it with those of C-reactive protein (CRP) and white blood cell count (WBC) in patients after cardiac surgery.

METHODS. We retrospectively analyzed episode of SIRS in 65 patients who underwent cardiac surgery. Patients were divided into two groups: infected and non-infected, according to their clinical signs, radiographic findings, microbiological findings and laboratory tests. Serum levels of PCT and CRP, WBC, microbiological cultures, duration of mechanical ventilation, length of stay in the ICU and hospital, 28-day mortality and hospital mortality in the two groups were compared. The optimal cut-off values of PCT, CRP and WBC for the diagnosis of infection were evaluated.

RESULTS. Infection was diagnosed in 22 of 65 patients and involved the bloodstream in 12 cases, respiratory tract in 10 cases, urinary tract in 4 cases, and two-site infection in 4 cases. There were no significant differences in 28-day mortality between the two groups, but hospital mortality was significantly higher in the infected group. Duration of mechanical ventilation and length of stay in ICU and hospital were significantly longer in the infected group. The median maximum values of PCT, CRP and WBC in the infected group (3.47 ng/ml, 15.35 mg/dl and $17.45 \times 10^3/\mu l$, respectively) were significantly ($p < 0.001$) higher than those in the non-infected group (0.11 ng/ml, 9.9 mg/dl, $6.75 \times 10^3/\mu l$, respectively). According to the receiver operating characteristic curve, the optimal cut-off values for the diagnosis of infection were PCT ≥ 1.24 ng/ml, CRP ≥ 12.9 mg/dl, and WBC ≥ $19.4 \times 10^3/\mu l$. The sensitivities of the diagnosis of infection were 77.3 % for PCT, 77.3 % for CRP and 50 % for WBC; specificities were 97.7 % for PCT, 81.4 % for CRP and 97.7 % for WBC. The area under the receiver operating characteristic curves were 0.933 for PCT (95 % CI 0.871–0.995), 0.868 for CRP (95 % CI 0.784–0.953) and 0.775 for WBC (95 % CI 0.650–0.901).

CONCLUSIONS. PCT was a valuable marker compared to CRP and WBC in early diagnosis of bacterial infection after cardiac surgery. PCT ≥ 1.24 ng/ml was the optimal cut-off value for diagnosis of infection, and the cut-off value for diagnose infection after cardiac surgery should be different from the normal cut-off value.

REFERENCE(S). Wacker C, et al. Lancet 2013. doi:10.1016/S1473-3099(12)70323-7.

Advances in nursing and physiotherapy: 0481–0485

0481

STRUCTURED REHABILITATION WITHIN CRITICAL CARE, A SERVICE IMPROVEMENT PROJECT

D.J. Mcwilliams[1], J. Weblin[1], G. Atkins[1], C. Snelson[2]

[1]Queen Elizabeth Hospital, Therapy Services, Birmingham, United Kingdom, [2]Queen Elizabeth Hospital, Critical Care, Birmingham, United Kingdom

INTRODUCTION. The negative effects of prolonged stays in intensive care and longer periods of mechanical ventilation are associated with significant physical dysfunction. Despite an increasing evidence base for early rehabilitation strategies, uptake and delivery of such interventions in the UK has been variable. In part, this is due to a lack of randomised controlled trials within UK based populations, where already established daily physiotherapy makes the generation of control groups difficult. At University Hospitals Birmingham Foundation trust physiotherapy staffing within critical care was reduced following a service evaluation in 2010, with a staffing ratio of 1 physiotherapist to 10 patients.

OBJECTIVES. This trial aims to assess the impact of an increased level of physiotherapy in ICU, with a focus on early and structured rehabilitation programmes.

METHODS. Baseline data was collected retrospectively for the period from 1st April 2011 to31st March 2012, then prospectively for the period from 1st April 2012 to 31st March 2013, for all patients admitted to a large UK based ICU and ventilated for ≥5 days. Following the appointment of a new clinical specialist physiotherapist and additional funding for a band 6 rehabilitation physiotherapist a new supportive rehabilitation team was introduced to critical care on 1st April 2012. A key worker system was introduced for patients ventilated >5 days, with weekly goal setting at specific therapy rehabilitation meetings. An MDT involving physiotherapists, nurses, dieticians and an ICU consultant was also introduced for patients ventilated >14 days to allow collaborative plans for weaning and rehabilitation. Primary outcome was mean physical function, assessed via the Manchester mobility score (MMS) at ICU discharge. Secondary measures of mean ICU and hospital LOS, ventilator days and mortality were also included in the analysis. Data was analysed using the students *t* test.

RESULTS.

Patient demographics

	n	Age	APACHE II	APACHE mortality
2011/12	290	55	16.3	29.2
2012/13	231	53.1	18.6	34.3

Results

	Mean MMS	ICU LOS	Ventilator days	Total LOS	Mortality
2011/12	3.3	21.3	14.5	44.3	114 (39 %)
2012/13	4.4	16.6	10.3	36.4	64 (27 %)
		p < 0.001	p < 0.01	p < 0.001	

The introduction of the ICU rehabilitation team was associated with a significant incease in mobility score at ICU discharge. This was associated with a significant reduction in ICU LOS (16.6 vs 21.3 days, p < 0.001), ventilator days (p < 0.01), and total hospital LOS (36.4 vs 44.3 days, p < 0.001). This occurred despite an increased illness severity for patients in 2012/13 compared to the previous year.

CONCLUSIONS. Increased physiotherapy staffing in the form of specialist critical care rehabilitation teams are effective in improving the level of mobility within critical care.

This increased function was also assciated with a reduced LOS and shorter weaning times.
REFERENCE(S). 1. Needham DM, et al. Early physical medicine and rehabilitation for patients with acute respiratory failure: a quality improvement project. Arch Phys Med Rehab 2010;91:536–542. 2. Morris PE, et al. Early intensive care unit mobility therapy in the treatment of acute respiratory failure.CCM 2008;36:2238–2243.

0482
IS ROUTINE REPLACEMENT OF PERIPHERAL INTRAVENOUS CATHETERS NECESSARY IN PEDIATRIC PATIENTS?

G. Hong[1], E. Ha[2]

[1]Asan Medical Center, Pediatric Nursing Department, Seoul, Korea, Republic of, [2]Asan Medical Center, Pediatrics, Seoul, Republic of Korea

INTRODUCTION. Among hospital patients, intravenous therapy is the most common invasive procedure. The procedure is not without risks, between 2.3 and 67 % of patients develop thrombophlebitis, and the more serious complication infection of the bloodstream, occurs in about 0.1 % of cases. Current guidelines recommend that peripheral intravenous (IV) catheters should be replaced every 72–96 h to prevent the potential of developing phlebitis in adults, and leave peripheral IV catheters in pediatric patient until IV therapy is completed, unless complications occur. But it is not able to present evidence to support this recommendation, because there is little research about peripheral IV catheter duration of pediatric patients.
OBJECTIVES. We aim to evaluate the risk to pediatric patients of having peripheral IV catheter left in place for as long as they are clinically indicated and compare routine replacement of peripheral IV catheters with replacement only when clinically indicated. So we tried to present evidence to support recommendation of clinically indicated replacement in pediatric patients.
METHODS. A nonequivalent control group non-synchronized design study was conducted in pediatric patients who required peripheral IV catheterization for treatment admitted to Children's Hospital between June 2012 and August 2012. Were divided into two groups of 4-week intervals, during first 4 weeks routine replacement every 72 h was achieved(control group) and during the next 4 weeks catheter replacement was conducted only when clinically indicated(intervention group). We compared the difference of peripheral IV catheter duration, incidence of phlebitis or infiltration between the two groups.
RESULTS. A total of 1,172 cases were investigated (control group 492 cases, intervention group 680 cases). There was no significant difference between two groups in underlying disease, age and gender. Overall mean retention time of peripheral IV catheter was 45.05, 36.75 h in control group and 54.05 h in intervention group. It showed significantly longer retention time in intervention group, and 24.0 % of intervention group was able to maintain peripheral IV catheter for more than 72 h without any other complications. Incidence of phlebitis or infiltration was 36.8 % in the control group compared 38 % in the intervention group: the difference was not significant ($p = 0.225$). It showed a higher incidence of phlebitis or infiltration in pediatric patients of less than 3 months (49.7 %).
CONCLUSIONS. Replacing peripheral IV catheters when clinically indicated has no effect on the incidence of failure, based on a composite measure of phlebitis of infiltration in pediatric patients as in adults. So we think that our results could be good evidence of current guideline for care of pediatric peripheral IV catheter. And we suggest that larger trials are needed to test this finding using phlebitis alone as a more clinically meaningful outcome.

0483
A COMPARISON OF THE EFFECTS OF MANUAL AND VENTILATOR HYPERINFLATION ON MUCUS CLEARANCE RATE, GAS EXCHANGES AND HEMODYNAMICS IN A MODEL OF SEVERE *P. AERUGINOSA* PNEUMONIA

J.D. Martí[1], G. Li Bassi[2], T. Comaru[2], M. Rigol[2], G. Ntoumenopoulos[3,4], S. Terraneo[2], E. Aguilera[2], M. Rinaudo[2], F. De Rosa[2], R.C. Peralta[2], N. Luque[2], A. Torres[2]

[1]Hospital Clinic, Pulmonary and Critical Care Medicine, Barcelona, Spain, [2]Hospital Clinic and IDIBAPS, Barcelona, Spain, [3]School of Physiotherapy, Australian Catholic University, Sydney, Australia, [4]Physiotherapy Department, Guy's and St Thomas' NHS Foundation Trust, London, United Kingdom

INTRODUCTION. Lung hyperinflation is a technique applied to revert pulmonary atelectasis and clear retained secretions in tracheally intubated patients. Hyperinflation may be delivered by a resuscitator bag (MHI) or a ventilator (VHI). To date, there are limited comparative studies, limited by the use of surrogate endpoints to estimate the effects of these interventions on mucus clearance.
OBJECTIVES. We compared, in an animal model of severe *P. aeruginosa* pneumonia, the effects of MHI vs. VHI on mucus clearance rate, gas exchange and hemodynamics.
METHODS. Five pigs (31.6 ± 1.82 kg) were anesthetized, intubated and on mechanical ventilation (MV). Pigs were placed in prone horizontal position. Severe *P.aeruginosa* pneumonia was developed as previously reported [1]. After 30 h of MV, animals were randomly allocated to receive either MHI or VHI; at 54 h of MV they received the other treatment. A two-handed technique MHI was carried out for 2 min via a self-inflating bag (Mark IV, Ambu®, Denmark) with 15 L/min flow of O_2. 2-min VHI was delivered with a SERVO-I ventilator (Maquet, NJ, USA), in volume control, square-wave inspiratory flow, inspiratory–expiratory ratio of 1.5:1. During both techniques, an inspiratory pressure of 40 cmH_2O was achieved, F_IO_2 was 1, respiratory rate 6/min, 4-s inspiratory and expiratory phases, 2-s inspiratory pause and PEEP as prior to the intervention. Heart rate (HR) and mean arterial pressure (MAP) were monitored during the interventions. Mucus clearance rate (MCR) was assessed through fluoroscopic tracking of tantalum disks (ESPI Metals, Ashland, OR, USA) insufflated into the trachea [2]. Gas exchange and hemodynamic parameters were assessed before and after the interventions and the differential change of the two paired values computed. Lastly, tracheal secretions were suctioned and mucus wet-weight recorded.
RESULTS. Both interventions were completed in all animals. Following insufflation, the majority of the disks (70.6 %) were placed mainly on the most dependent part of the trachea. Median (IQR) MCR during MHI and VHI was 1.71 (1.35) and 2.20 (1.61) mm/min, respectively (N:10, $p = 1.00$). Mucus wet-weight was 650 (987) mg after MHI, and 357 (412) mg after VHI ($p = 0.87$). HR and MAP did not change significantly during both interventions. Additionally, after the interventions no differences in gas exchange and hemodynamic parameters were found between techniques (Table 1).

Table 1: Differences in Gas Exchange and Hemodynamic Parameters between Time of Assessments [After Intervention-Baseline] per Hyperinflation Technique

	Manual Hyperinflation	Ventilator Hyperinflation	p value*
P_aO_2/F_IO_2 (mm Hg)	11.25 [31.00]	- 7.75 [39.07]	0.62
P_aCO_2 (mm Hg)	0.20 [2.10]	- 1.60 [5.60]	1
Heart rate (beats/min)	- 7.00 [10.00]	7.00 [13.00]	0.25
Mean Arterial Pressure (mm Hg)	1.00 [17.00]	10.00 [8.00]	0.25
Mean Pulmonary Arterial Pressure (mm Hg)	0.00 [2.00]	0.00 [4.00]	0.75
Cardiac Output (L/min)	- 0.17 [0.54]	0.05 [0.90]	0.81
Stroke Volume (mL/beat)	4.41 [3.23]	- 7.66 [8.93]	0.18
Systemic Vascular Resistance (dyne·s/cm^5)	455.94 [869.95]	598.45 [621.29]	1
Pulmonary Vascular Resistance (dyne·s/cm^5)	- 57.28 [49.69]	19.96 [60.88]	0.62
Pulmonary Shunt (%)	-0.39 [2.22]	0.20 [6.36]	0.62
Oxygen Delivery (mL/min)	-19.38 [55.76]	5.15 [82.46]	0.81
Oxygen extraction ratio (%)	-2.95 [6.95]	-0.92 [14.34]	0.81

Data are reported as Median [Interquartile Range, IQR]
* Wilcoxon signed rank test

Table 1 Differences in gas exchange and hemodynamic parameters between time of assessments [after intervention-baseline] per hyperinflation technique

CONCLUSIONS. In a model of severe pneumonia, MCR, sputum production, gas exchange and hemodynamics are affected similarly by MHI and VHI. Further clinical research is needed to identify specific indications for the use of either technique.
REFERENCE(S). 1. Luna CM et al. Chest 132:523–31. 2. Li Bassi G et al. Crit Care Med 40:895–902.

0484
IMPACT OF QUALITY IMPROVEMENT STRATEGIES FOR THE PREVENTION OF CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS ON CLINICAL AND ECONOMIC OUTCOMES: A SYSTEMATIC REVIEW AND META-ANALYSIS

K. Blot[1], J. Bergs[2], S. Blot[1], J. Hellings[2], D. Vandijck[1,2,3]

[1]Ghent University, Faculty of Medicine & Health Sciences, Ghent, Belgium, [2]Hasselt University, Health Economics & Patient Safety, Diepenbeek, Belgium, [3]Ghent University Hospital, General Internal Medicine & Infectious Diseases, Ghent, Belgium

INTRODUCTION. Nosocomial central line-associated bloodstream infections (CLABSI) are an important burden of patient and economic outcomes.
OBJECTIVES. To assess the impact of CLABSI quality improvement strategies on mortality, length of stay, and hospital costs.
METHODS. The MEDLINE database was systematically searched for relevant articles from January 1995 to June 2012. Studies were assessed by their methodological quality using the Downs and Black tool. A meta-analysis was performed (random effects model with DerSimonian-Laird estimator) to determine the impact on mortality and length of stay (LOS) following interventions aimed at reducing CLABSI rates. Reported data on costs were also inventoried appropriately.
RESULTS. The systematic review identified 46 before-after, 11 interrupted time series, and 3 controlled before-after studies of quality improvement strategies.
Seven trials reporting mortality showed significant CLABSI rate reductions [odds ratio (OR) 0.49; 95 % confidence interval (CI) 0.33–0.74; $P < 0.001$), yet the mortality did not change significantly (OR 0.87; 95 % CI 0.73–1.04; $P = 0.12$; Fig. 1). Five trials reporting LOS likewise decreased their CLABSI rate (OR 0.34; 95 % CI 0.21–0.55; $P < 0.001$), but no change in LOS (standardised mean difference 0.01; 95 % CI −0.10 to 0.12; $P = 0.81$; Fig. 2) was observed. There were moderate levels of statistical heterogeneity found between the mortality ($I^2 = 42.9$ %, $\tau^2 = 0.0239$, $P < 0.1049$) and LOS studies ($I^2 = 50.5$ %, $\tau^2 = 0.0076$, $P < 0.0887$).
Economic data were reported by 17 studies. Estimated annual hospital savings following implementation of quality improvement initiatives varied between $39,616 and 3,994,932. These costs were calculated by multiplying the number of prevented CLABSI or LOS by their estimated costs, which respectively ranged between $3,700–82,000 and $1,397–7,249.
CONCLUSIONS. These findings suggest that the implementation of well-focussed quality improvement strategies result in decreased CLABSI rates and subsequent hospital savings.

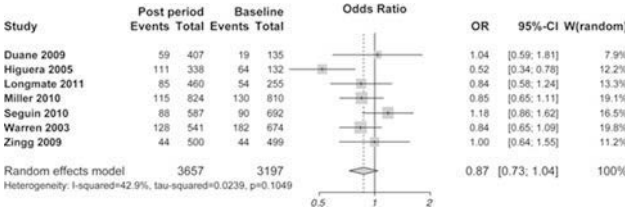


Fig. 1 Mortality

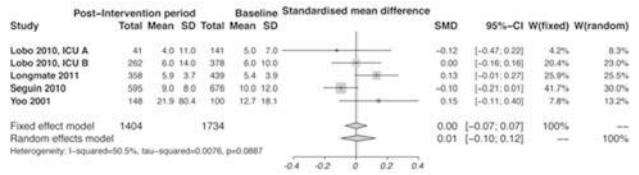


Fig. 2 Length of stay

0485

'PREDICT, ASSESS, TREAT': DEVELOPING CLINICAL SKILLS IN RECOGNISING AND RESPONDING TO CLINICAL DETERIORATION: OUTCOMES OF A SCENARIO BASED CLINICAL SKILLS PROGRAMME FOR CLINICAL STAFF IN A TERTIARY REFERRAL ACUTE HOSPITAL SETTING

C. Carbery[1]

[1]St Vincent's Hospital Melbourne, Intensive Care Unit, Melbourne, Australia

INTRODUCTION. Ensuring that patients who deteriorate in hospital receive appropriate and timely care is a key safety and quality challenge. Early recognition of clinical deterioration, followed by prompt and effective action, can prevent critical illness at an early stage. This prevents unnecessary cardiac arrest and improves the quality of care for those patients who may subsequently require admission to a critical care area. In September 2012, the National Safety and Quality Health Service Standards were endorsed to provide a nationally consistent and uniform set of measures of safety and quality, with the criteria to ensure a patient's deterioration is recognised promptly and appropriate action is taken.

OBJECTIVES. The Critical Care Liaison team embraced the NSQHS recommendations by developing the "Predict, Assess, Treat" clinical skills programme, utilising the common 'ABCDE' approach and interactive clinical scenarios, based on MET calls. The aim is to improve systems and practices for anticipating, recognising and responding to clinical deterioration. Clinical deterioration can happen at any point in a patient's illness or care process. Our programme is aimed at encouraging nurses at the bedside to proactively review their patients every day. This hands-on approach enhances the nurse's ability to recognise the patient at risk of deteriorating and implement simple, prompt actions in response.

METHODS. Needs assessment survey was conducted to determine education and clinical skills gap between current and best practice. The format of programme is based on recognised principles of clinical teaching and uses a structured system of patient assessment and management to assist staff in patient care even when faced with unfamiliar clinical situations. Nursing, medical and allied health staff were invited to attend a study day following a structured format of lectures, skills stations and deteriorating patient simulation scenarios. Evaluation survey was conducted post education programme to appraise effectiveness.

RESULTS. Over 350 staff have participated in the programme with a demonstrated improvement in recognition of patients deteriorating and improved response to alerting parent team and Liaison team for review of patient. Survey of staff has shown an increase in confidence to assess and predict clinical deterioration.

Clinical skills education is associated with an increase in Liaison referrals, MET calls and a decrease in cardiac arrests.

CONCLUSIONS. The 'Predict, Assess, Treat' clinical skills programme with interactive clinical scenarios is an excellent strategy for updating and promoting skills in early recognition and response to clinical deterioration, with resultant improvement in safety and quality of patient care.

REFERENCE(S). Australian Commission on Safety and Quality in Healthcare. National Safety and Quality Health Service Standards, Sydney: ACSQHS, September 2011–12.

Tuesday 08 October 2013

Poster Sessions
Stroke in intensive care: 0486–0499

0486

A SURVEY ON PHARMACOLOGICAL THROMBOPROPHYLAXIS IN PATIENTS WITH ANEURISMAL SAH (ASAH) IN NEUROCRITICAL CARE UNITS IN THE UK

A. Sethi[1], S. Wijayatilake[1], G. De la Cerda[1]

[1]Barking, Havering and Redbridge University Hospitals, Intensive Care Medicine, London, United Kingdom

INTRODUCTION. The incidence of DVT in SAH ranges from 1.5 to 18 %. The conventional methods for DVT prophylaxis in SAH patients include the use of mechanical and pharmacological methods. The timing, dose and pharmacological agent used is controversial. As per the recommendations of Neurocritical care society, unfractionated heparin for prophylaxis could be started 24 h after surgical clipping or endovascular coiling (moderate quality evidence—strong recommendation)[1].

OBJECTIVES. The objective of this survey was to provide an overview of the current practice in the timing of administration of pharmacological thromboprophylaxis in patients with aSAH.

METHODS. Twenty five major neurointensive care centers were identified, and telephonic survey was conducted by the investigators. Senior members of intensive care were questioned and data was collected using a single page questionnaire containing four questions.

RESULTS. None of the NICUs had a protocol regarding initiation of pharmacological thromboprophylaxis in patients with aSAH.

In regards to timing of administration, 20 % of the units started prophylaxis within 48 h of aneurysm obliteration, 36 % of units started thromboprophylaxis at the end of the first week, 12 % of the units started thromboprophylaxis between the first and the second week and 24 % of NICUs were unclear as when to start the thromboprophylaxis. The remaining 8 % of NICUs never started thromboprophylaxis until the patients were discharged from the intensive care unit (Fig. 1).

In regards to decision making, in 70 % of units the decision of when to start thromboprophylaxis was made by the neurosurgeons, in 20 % by the neurointensivist and in 10 % was a joint decision.

92 % of the NICUs stated that there was not a systematic and consistent approach regarding pharmacologic thromboprophylaxis in patients with aSAH in their units.

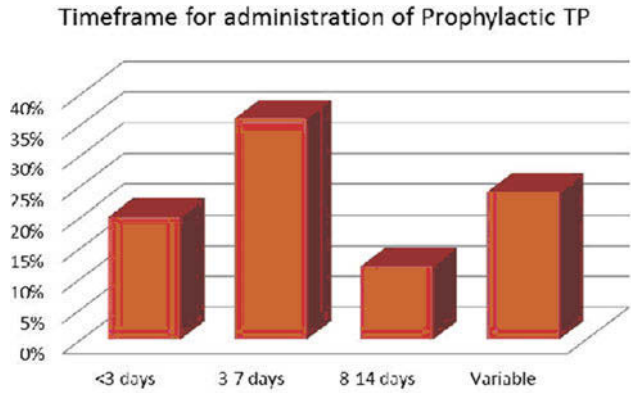


Fig. 1 Timeframe for administration of prophyla

CONCLUSIONS. (1) There is a wide variability in medical practice in the UK with regards to the administration of pharmacological thromboprophylaxis in patients with aSAH. (2) Despite strong recommendations from international guidelines to start low molecular weight heparin or unfractionated heparin within 24 h of obliteration of aneurysm, majority of NICUs failed to start the thromboprophylaxis within the recommended time frame.

REFERENCE(S). 1. Michael N. Diringer, Thomas P, Bleck J. Claude Hemphill III, et al. Critical care management of patients following aneurysmal subarachnoid hemorrhage: recommendations from the neurocritical care society's multidisciplinary consensus conference. Neurocrit Care 2011;15:211–240.

0487

NON-INVASIVE MEASUREMENT OF HEMODYNAMIC VARIATIONS (BY NEXFIN®) INDUCED BY VASOPRESSOR ADMINISTRATION IN NEUROSURGICAL PATIENTS

S. Demiri[1], M. Coroir[1], O. Passouant[1], F. Vallée[1], F. Bart[1], E. Gayat[1], M. Bucciero[1], K. Madadaki[1], A. Mebazaa[1]

[1]CHU Hopital Lariboisiere, Département d'Anesthésie-Réanimation, Paris, France

INTRODUCTION. Hemodynamic monitoring is crucial in neurosurgery to ensure an adequate and stable cerebral perfusion by maintaining a sufficient blood pressure and cardiac output (CO) during general anesthesia.

OBJECTIVES. The objective of this study was to compare an invasive method of arterial catheter and Oesophageal Doppler (OD) with a non-invasive technique (Nexfin®, Bmeye) during hemodynamic variations of arterial pressure (AP) and stroke volume (SV) induced by vasopressor administration.

METHODS. The study was approved by the Institutional Review Board of the Société de Réanimation de Langue Française (No 11-356). This prospective and observational study included neurosurgical patients after informed consent from December 2012 to March 2013. Patients needing hemodynamic monitoring by an arterial catheter and OD (CombiQ®, Deltex Medical) were included. In addition to the usual monitoring, Nexfin® device was installed for these patients. Nexfin® helps to obtain a noninvasively arterial pressure pulse wave, after extrapolation of digital pressure variations and to estimate the SV by an algorithm analyzing the pulse contour.

Intra operative hypotension was treated by vasopressor administration. The following parameters were collected before (T0) and at the maximum effect (T1) after vasopressor administration: systolic arterial pressure (SAP) and diastolic (DAP), heart rate (HR), SV and CO. The concordance of variations (ΔT0–T1) for AP and SV between invasive and non-invasive techniques was assed by Bland and Altman method for repeated measure.

RESULTS. Nineteen patients undergoing endocranial neurosurgery were included: mean age 50 ± 16 years, ASA I–II in 88 % of the population. 150 hypotensive episodes were corrected by vasopressor administration. Before administration, the SAP and DAP were respectively 97 ± 8 et 54 ± 8 mmHg, the HR 74 ± 15 bpm/min, the SV and the CO by OD were respectively 68 ± 19 and 4.9 ± 1.5 l/min. The concordance parameters are displayed in the Table below.

Table of concordance

	Biais	Inferior limit of agreement	Superior limit of agreement
ΔSAP (mmHg)	−8.8	−32.1	14.4
ΔDAP (mmHg)	−5.7	−17.0	5.5
ΔSV (ml)	−3.4	−27.5	20.7
ΔCO (L/min)	−0.23	−2.2	1.7

CONCLUSIONS. Non-invasive hemodynamic device Nexfin® estimates with acceptable bias the hemodynamic variations induced by vasopressor in neurosurgery. Nevertheless, limits of agreement are still too wide to recommend such device for daily practice and further study with a larger population is needed to ensure the proper usefulness of this kind of monitoring.

0488
ACUTE KIDNEY INJURY AFTER SUBARACHNOID HEMORRHAGE

I. Belloni[1], O. Tujjar[1], S. Scolletta[1], J.-L. Vincent[1], F.S. Taccone[1]

[1]Hopital Erasme, Bruxelles, Belgium

INTRODUCTION. Acute kidney injury (AKI) is common in critically ill patients and may contribute to poor outcome. Few data are available on the incidence and the impact of AKI in patients suffering from subarachnoid hemorrhage (SAH) [1].

OBJECTIVES. The aim of this study was to evaluate the occurrence and time course of AKI in a single-center cohort of SAH patients.

METHODS. We reviewed all patients who stayed in our Department of Intensive Care for >48 h for SAH over a five-year period (2007–2011). Exclusion criteria were time from SAH symptoms to ICU admission >96 h. Demographics, WFNS score, comorbidities, development of infection, use of vasopressors, mechanical ventilation, renal replacement therapy (RRT) and of potential nephrotoxic agents were recorded. AKI was defined as a daily urine output (UO) <0.5 ml/kg/h and/or an increase in serum creatinine (sCr) of ≥0.3 mg/dL from baseline levels. Neurological status was assessed at day 28 using the Glasgow outcome scale (GOS; from 1, death; 5, good recovery).

RESULTS. Of a total of 256 patients admitted for SAH over the study period, 202 patients met the inclusion/exclusion criteria (median age 56 years; 78 male gender). A total of 25 (12 %) patients developed AKI during the ICU stay, with a median time to AKI of 8 (4–10) days since admission. Patients with AKI had higher WFNS score on admission [3 (1–5) vs. 1 (1–4), $p = 0.007$], were more likely to be diabetic (5/25 vs. 12/177, $p = 0.04$) and developed more clinical vasospasm (13/25 vs. 36/177, $p = 0.002$) than those without AKI. Also, they more frequently developed infections (17/25 vs. 62/177, $p = 0.002$), were more commonly treated with vasopressors (19/25 vs. 73/177, $p = 0.001$), mannitol (9/16 vs. 29/177, $p = 0.02$) and mechanical ventilation (20/25 vs. 87/177, $p = 0.005$). These patients had a higher ICU mortality (11/25 vs. 39/177, $p = 0.03$) and lower GOS at 28-days [2 (1–4) vs. 4 (2–5), $p = 0.004$).

CONCLUSIONS. AKI occurred in more than 10 % of patients after SAH. These patients showed a higher severity of neurological impairment on admission and needed a more aggressive ICU therapy; they had higher mortality and poorer brain recovery.

REFERENCE(S). Zacharia BE et al. Stroke 2009;40:2375–2381.

0489
MORBID-MORTALITY IN ICU PATIENTS WITH SUBARACHNOID HAEMORRHAGE SECONDARY TO ANEURYSM RUPTURE WITH ENDOVASCULAR VS. ANEURYSM SURGICAL CLIPPING

J. Cabrera-Arrocha[1], D. Linares-Buitrago[1], J.L. Ramirez-Cardozo[1], P. Saavedra[2], S. Ruiz-Santana[1]

[1]Hospital Universitario de Gran Canaria Dr. Negrín, Intensive Care Unit, Las Palmas de Gran Canaria, Spain, [2]Universidad de Las Palmas de Gran Canaria, Mathematics Department, Las Palmas de Gran Canaria, Spain

INTRODUCTION. In the last years the endovascular treatment has shifted to surgical treatment in cerebral aneurysm rupture reducing morbidity and hospital stay.

OBJECTIVES. Analyzed morbidity and hospital stay of patients admitted to our ICU for subarachnoid haemorrhage (HSA) secondary to ruptured aneurysm treated with endovascular vs surgical treatment.

METHODS. Longitudinal, prospective study in a neurocritical ICU for adult patients performed from January 2007 up to December 2012. Patients were divided according to whether endovascular treatment was performed or required clipping of aneurysm. Demographic data, severity scores, Glasgow on admission and at ICU and hospital discharges, Fisher scale grade, intraparenquimal hematoma presence, endovascular and/or surgical treatment, intracranial hypertension presence, external ventricular drain requirement, rebleeding, vasospasm, ICU readmission, ICU and hospital length of stay, and hospital mortality were collected. Categorical variables are expressed as frequencies and percentages, and continuous variables as mean and SD when data followed a normal distribution, or as medians and interquartile (25–75th percentile) range when distribution departed from normality. The percentages were compared using the Chi square test, the means by the *t* test, and the medians by the Wilcoxon's test. Those variables that showed statistical significance with the surgical treatment in the univariate analysis were introduced in a multivariate logistic regression analysis. A retrospective variable selection based on the Akaike information criterion was performed. The resulting model was summarized as p values and 95 % CI. Statistical significance was set at $p < 0, 05$. The data were analyzed using PASW statistical software (version 18.0, SPSS, Chicago IL, USa).

RESULTS. A total of 68 out of 206 studied patients required aneurysm surgical clipping. The variables that showed statistical significance in the univariate analysis were, intraparenquimal hematoma presence, intracranial hypertension presence, external ventricular drain requirement, vasospasm and hospital stay. However, GCS at hospital discharge less 14 and patient death did not show statistical significance. Variables independently associated to clipping surgery treatment were external ventricular drain requirement (OR 2.25; 95 % CI 1.13–4.45; $p < 0.019$) and vasospasm (OR 2.28; 95 % CI 1.13–4.59; $p = 0.021$.

CONCLUSIONS. The external ventricular drain requirement and vasospasm were independently associated to aneurysm surgical clipping. There were not statistical significance between endovascular and clipping treatment groups concerning mortality or GCS <14 at hospital discharge.

0490
ENDOVASCULAR VERSUS SURGICAL TREATMENT IN SPONTANEOUS SUBARACHNOID HEMORRHAGE (SAH): ANALYSIS OF A 17-YEAR PERIOD

F.I. Pino Sánchez[1], F. Guerrero López[1], S. Nogueras Guijarro[1], M. Monsalve Álvarez de Cienfuegos[1], M. Colomo González[1], E. García Bautista[2], J. de la Cruz Sabido[3]

[1]H.U. Virgen de las Nieves, Intensive Care Unit, Granada, Spain, [2]H.U. Virgen de las Nieves, Interventional Neuroradiology, Granada, Spain, [3]H.U. Virgen de las Nieves, Neurosurgery, Granada, Spain.

INTRODUCTION. The current SAH multidisciplinary approach, with the addition of new endovascular techniques has produced changes in the management of these patients.

METHODS. We performed a retrospective analysis of patients admitted to a neuro intensive care unit (ICU) with spontaneous SAH diagnosis for a period of 17 years, collecting demographic variables, general and specific gravity scores, presence of aneurysms responsible, treatment used, length of stays, clinical outcome (GOS), complications and mortality. It has also been made a comparative study of the key variables in accordance with the treatment used in cases where there was an aneurysm and it was treated. The statistical analysis consists of a basic descriptive statistics with absolute and relative frequency for categorical variables, mean and standard deviation for normally distributed continuous variables, and median and interquartile range otherwise; for comparisons were used Chi square, student t and Mann–whitney *U* tests as appropriate. Statistical significance was $p < 0.05$.

RESULTS. We included 925 cases, 58.6 % female, age 55.7 ± 14.7 years. In the overall sample aneurysm was not detected in 211 cases and aneurysm was found responsible in 77.1 % (714 cases), 638 of the anterior circulation (89 %) and 76 (10.6 %) of the posterior circulation. Of these 714 patients with aneurysms, 80 % were treated acutely: by endovascular approach in 380 cases, 66.2 %, and surgery in 194 cases, 33.8 %. In 15 cases surgical and endovascular treatment were used in the same patient during the acute phase. 324 patients were not treated by any of the previous methods because they have not aneurysm demonstrated or by poor clinical status or postponed treatment.There is a clear trend of increased endovascular treatment over surgery throughout the study years: 1996–2000 (45.1 vs 54.9 %) 2003–2007 (38.2 vs 61.8 %) and 2008–2013 (23.7 vs 76.3 %), resulting statistically significant ($p = 0.001$). When we compare patients with aneurysms who were treated acutely, as endovascular treatment or surgery, we found no differences by gender, severity by APACHE and GCS, mortality, GOS, rebleeding, cerebral infarction, or extra-neurological complications such as pneumonia and urinary tract infection. There are differences in age, ICU and hospital stay, delay from SAH and from admission to treatment, and neurological complications such as hydrocephalus and vasospasm.Table 1.

Comparison of surgical vs endovascular treatment

	Surgery	Endovascular	p
Age	51.6 ± 12.6	55.3 ± 15.3	0.002
APACHE III	28 (18, 47)	30 (17, 52)	0.34
GCS	14 (9, 15)	14 (10, 15)	0.9
Time admission-treatment	4 (2, 10)	1 (1, 2)	0.001
Hospital mortality	9.3 %	12.4 %	0.3
GOS I-III	30.9 %	33.1 %	0.6
Vasospasm	23.7 %	33.9 %	0.01
Rebleeding	9.3 %	8.2 %	0.65
Stroke	24.7 %	18.4 %	0.07

CONCLUSION. In our sample, changes in the management of SAH, primarily aimed at early diagnosis and treatment, have resulted in that endovascular treatment has taken a leading role, with no negative consequences, and even some positive as decreasing of length of stays.

0491
RELATION BETWEEN CARDIAC OUTPUT AND CEREBRAL BLOOD FLOW VELOCITIES DURING FLUID LOADING IN PATIENTS WITH OR WITHOUT ACUTE SYSTEMIC INFLAMMATION

M. Le Dorze[1], C. Rabuel[1], D. Payen[1]

[1]Hôpital Lariboisière, Département d'anesthésie réanimation SMUR, Paris, France

INTRODUCTION. If physiologically cerebral blood flow (CBF) is maintained during changes in mean arterial pressure (autoregulated concept), the relation between CBF and cardiac output (CO) is unclear, especially in ICU context. This relation might be changed by the presence of an acute systemic inflammation and/or brain lesion.

OBJECTIVES. To assess changes in middle cerebral artery velocity (MCAv) when CO increases during fluid loading (FL). Hypothesis: MCAv changes during CO increase could be different when acute systemic inflammation is present or not: study on phasic velocities (systolic/diastolic).

METHODS. Prospective observational monocentric study: Control group, $n = 7$, patients without comorbidity measured, just after general anesthesia for non major orthopedic surgery; Sepsis group, n-12. Measurements before and after fluid loading 250 ml of crystalloids in 3 mn. CO and stroke volume (SV) (oesophageal Doppler, CardioQ®, Deltex, UK), systolic (SVel) and end-diastolic (EDVel) flow velocities (MCAv) (Transcranial Doppler, Athys®, Lyon, France), systolic, diastolic and mean arterial blood pressure (SABP, DABP, MABP) and heart rate (HR). Values are expressed as median (25–75 percentiles), statistical analysis using non parametric tests.

RESULTS.

Control group age 34 (27–34) years; changes in CO (10 %) with no change in of MCAvS. *Sepsis group* age 53 (41–58) years, 7 septic shock, 5 severe sepsis; change in CO (20 %) was associated with increased EDVel with no change in SVel. EDVel increased in fluid responders ($n = 8$; $p = 0.01$) and remained unchanged in non responders ($n = 4$; $p = 1.00$).

CO changes did not differ between the two groups ($p = 0.71$). Table: effect of FL.

Effect of fluid loading

	Control (n = 7) before/after FL	p	Sepsis (n = 12) before FC/after FL	p
CO (l min^{-1})	6.7 (5.0–7.0)/ 7.4 (5.5–8.9)	0.03*	5.8 (4.7–8.2)/ 7.0 (5.0–8.6)	0.04*
HR (bpm)	78 (69–83)/ 70 (56–80)	0.05*	86 (78–99)/ 87 (80–97)	0.86
MABP (mmHg)	80 (60–96)/ 69 (63–91)	0.20	71 (68–75)/ 80 (71–89)	0.01*
SVel (cm s^{-1})	66 (56–70)/ 63 (60–75)	0.07	101 (71–107)/ 99 (78–118)	0.36
EDVel (cm s^{-1})	32 (27–35)/ 29 (24–34)	0.86	32 (26–37)/ 36 (32–45)	0.02*

CONCLUSIONS. CO increase during FL did not change the MCAv in control group, brain circulation remains independent from systemic circulation. When systemic inflammation is present, an increase in CO is associated with EDVel increase only, an effect related to higher vasodilatation. This study does not inform on pre-existing dilatation or an induced dilation

by CO increase. These results suggest that acute inflammation puts brain circulation in systemic hemodynamic dependence.
REFERENCE(S). 1. J Appl Physiol 2010;109:1424–1431. 2. Neurocrit Care 2010;12: 35–42. 3. Am J Physiol Regul Integr Comp Physiol 2012;303:1127–1135.
GRANT ACKNOWLEDGMENT. This work was supported in part by University Paris 7 Plan Quadrienal grant.

0492
ADRENOMEDULLIN, A NEW PROGNOSTIC MARKER IN THE NEUROCRITICAL PATIENT. A PRELIMINARY STUDY

M.P. Gracia[1], A. Ois[2], C. Soriano[2], J. Roquer[2], Y. Diaz[2], A. Zapatero[2], I. Dot[2], F. Alvarez-Lerma[2]

[1]Hospital Mar, Critical Care, Barcelona, Spain, [2]Hospital del Mar, Barcelona, Spain
Adrenomedullin (ADM) is a 52 amino acid vasoactive peptide expressed by endothelial cells which increases in cellular stress conditions. It has been shown its usefulness in patients with cardiovascular disease and sepsis.
OBJECTIVE. To assess the usefulness of plasma MRproADM levels for predicting the risk of death in patients with severe neurocritical disorders.
METHODS. Prospective and observational study in patients with severe neurocritical diseases admitted to the ICU and/or stroke units between 2010 and 2012. On admission to the hospital, plasma stable fragments of pro-ADM (MRproADM) were measured by an automated immunoflurescence test (Thermo Scientific BRAHMS MR-proADM KRYPTOR Immunoassay, Germany). Samples were centrifuged and supernatants frozen at −70 °C until analysis. Univariate and multivariate analyses adjusted by risk factors were performed. Statistical significance was set at $P < 0.05$.
RESULTS. The study population included 104 patients, 57 with subarachnoid haemorrhage (54.8 %), 40 with stroke (38.5 %), and 7 with head injury (6.7 %), with a mean (SD) age of 62 (15.7) years, and a 90-day mortality rate of 30.8 % (n = 32). The median (25–75th percentile) MRproADM level was 0.70 (0.55–1.86) nmol/L. Levels of MRproADM were significantly associated with 90-day mortality rate in the univariate analysis 0.67 (0.49–0.78) nmol/L vs. 0.87 (0.67–1.35) nmol/L ($P < 0.001$). The percentage of mortality for each quartile was 11.5, 25.9, 25, and 65.2 %, respectively ($P < 0.001$). In the multivariate analysis adjusted by age, sex, and cardiovascular risk factors, plasma levels of MRproADM were significantly associated with mortality (odds ratio 2.72, 95 % confidence interval 1.60–4.73, $P < 0.001$).
CONCLUSION. Plasma levels of MRproADM may be a useful predictor of the risk of death in patients with severe cerebral diseases.

0493
OUTCOME OF PATIENTS WITH ACUTE STROKE REQUIRING MECHANICAL VENTILATION

P. Bouvet[1], B. Pons[2], S. Guyomarc'h[1], P. Gery[1], D. Page[1], M. Coudrot[3], E. Diconne[1], F. Zeni[1], M. Darmon[1]

[1]Saint-Etienne University Hospital, Medical-Surgical ICU, Saint-Etienne, France, [2]Pointe-à-Pitre University Hospital, Medical Surgical ICU, Pointe-à-Pitre, France, [3]Saint-Etienne University Hospital, Saint-Etienne, France
INTRODUCTION. Prognosis of patients with acute stroke and requiring mechanical ventilation remains controversial [1, 2].
OBJECTIVES. The main objective of this study was to assess ICU outcome of these patients. Secondary objectives were to assess temporal trend in survival and the prognostic factors.
METHODS. Monocenter retrospective cohort study conducted in our ICU between January 1994 and December 2008. Every adult patient requiring ICU admission and mechanical ventilation at the early phase (<7 days) of strokes were included in this study.
Results are reported as median (IQR) or n (%). Factors associated with ICU mortality were assessed using a backward conditional logistic regression model.
RESULTS. 274 patients were included in this study, including 61 patients (22.3 %) with ischemic stroke, 57 patients (20.8 %) intracerebral hemorrhage and 156 patients (56.9 %) subarachnoid hemorrhage (SAH). Median age was 55 years (45–66) and 157 patients were of male gender (57.4 %). Severity at ICU admission was assessed by SAPSII score was of 45 (36–55). Coma was the main reason for mechanical ventilation (n = 195; 71.4 %). Vasopressors were required in 143 (52.2 %) and renal replacement therapy in 6 (2.2 %).
Twelve patients had ischemic stroke of embolic origin and 107 patients (68.6 %) with SAH had a Fischer score IV. Of patients with ischemic stroke, fibrinolysis was performed in seven. Endovascular treatment of SAH was performed in 74 patients. Decompressive craniectomy was performed in three patients.
ICU mortality was 48.2 % (n = 132). ICU mortality according to the type of stroke was of 49.2, 61.4 and 42.9 % in ischemic stroke, hemorrhagic stroke and SAH respectively (P = 0.06).
Factors independently associated with ICU mortality are reported in Table 1.

Factors independently associated with ICU death

	OR (95 % CI)
Sepsis at admission	0.34 (0.15–0.77)
IGSII (/point)	1.09 (1.06–1.11)
ARDS	6.01 (1.50–24.1)
Cerebral edema	2.91 (1.52–5.58)
Anisocoria at admission	6.73 (2.05–22.08)

When forced in the final model, neither mechanism of stroke nor admission period (<1999, 1999–2004, >2004) were associated with outcome. These variables did not change the final model.
Hospital and 1 year mortality and functional prognosis are currently being evaluated.
CONCLUSIONS. Survival of critically-ill patients requiring mechanical ventilation at the early phase of stroke remains meaningful. Aetiology or admission period had no influence of outcome after adjustment for confounders.
REFERENCE(S). 1. Navarrete-Navarro P et al. Intensive Care Med 2003. 2. Berrouschot J et al. Crit Care Med 2000.

0494
ANALYSIS OF HOSPITAL MORTALITY OF PATIENTS ADMITTED TO THE INTENSIVE CARE UNIT (ICU) FOR SPONTANEOUS INTRACEREBRAL HEMORRHAGE

F. Guerrero-López[1], F.I. Pino-Sánchez[2], M. Colomo González[2], R. Lara Rosales[2], P. Navarrete-Navarro[2], E.A. Fernández-Mondéjar[2]

[1]H.U. Virgen de las Nieves, Critical Care, Granada, Spain, [2]H.U. Virgen de las Nieves, Granada, Spain.
INTRODUCTION. Intracerebral hemorrhage (ICH) is associated with the highest mortality of all strokes. Knowing mortality predictors can help clinicians in decision making.
OBJECTIVES. To analyze hospital mortality of patients admitted to the neuro intensive care unit (NICU) for nontraumatic ICH confirmed by brain imaging (CT or MRI) and predictors of hospital mortality.
METHODS. Single-center cohort study of ICH patients admitted consecutively to the 12-bed NICU of a tertiary hospital in the period from 1996 to 2012. Variables were collected on sex, age, history of hypertension, previous antithrombotic treatment, Glasgow Coma Score (GCS), blood glucose, blood pressure, APACHE III score on admission, location of hematoma, need for mechanical ventilation, surgery for hematoma evacuation, other medical and surgical treatments, year of admission (for periods 1996–2000, 2001–2004, 2005–2008, 2009–2012), length of stay in ICU and hospital, and hospital mortality. Results are expressed as mean ± standard deviation, median and interquartyle range and absolute and relative frequencies. Comparisons between variables were made using Student t, Mann–Whitney *U* and Pearson χ^2 tests. The relationship between the independent variables and in-hospital mortality was assessed by multivariate logistic regression analysis. $p < 0.05$ was considered to indicate statistical significance.
RESULTS. Between 1996 and 2012 we admitted to ICU 1,006 patients with ICH; the hospital mortality was 52.1 % (95 % CI 49–55.2 %) and the ICU mortality was 46.4 % (95 % CI 43.3–49.5 %). Patients who died were older (62.5 ± 13.8 vs 53.9 ± 16.5 years), had higher APACHE III score (86.9 ± 23.9 vs 49.1 ± 25.1), glycemia (198 ± 84 vs 162 ± 61), systolic blood pressure (188 ± 44 vs 178 ± 39), and lower scores of GCS [4 (3.5) vs 9 (7.13)] ($p < 0.001$ for all the comparisons); more often had a history hypertension (57.4 vs 50.2 %, p = 0.02), prior antithrombotic therapy (22.7 vs 15.1 %, p = 0.002), they needed more often mechanical ventilation (MV) (92.7 vs 62 %, $p < 0.001$), and less frequently subjected to surgical hematoma evacuation (14.3 vs 31.3 %, $p < 0.001$). Survivors had longer ICU and hospital stay [6 (3.14) vs 2 (1.6) days and 31 (14.63) vs 2 (1.8) days, respectively, $p < 0.001$]. Patients admitted in the last 4 years had a lower mortality (43.7 %) that in previous periods (50, 59.9 and 55.8 % respectively), p = 0.002. There was no difference in mortality by sex or location of the hematoma. Table shows the results of the logistic regression analysis.

Logistic regression for hospital mortality

Variable	p	Odds ratio	95 % CI OR
Age (years)	<0.01	1.02	1.01–1.03
APACHE III	<0.001	1.04	1.03–1.05
GCS 3–5	<0.001	1	
GCS 6–8		0.5	0.31–0.8
GCS 9–12		0.44	0.25–0.78
GCS 13–15		0.27	0.12–0.58
MV	<0.001	2.56	1.44–4.52
Surgery	<0.001	0.35	0.23–0.53
Period (2009–2012)	<0.05	0.56	0.34–0.83

CONCLUSIONS. The hospital mortality of patients with intracerebral hemorrhage who required ICU admission remains high, depending on the of admissions and discharges policies. This mortality increases with increasing age and baseline severity (GCS, APACHE). The need for mechanical ventilation increases the risk of death and surgery (hematoma evacuation) reduces it. Mortality has decreased in recent years, probably in relation to the best general care.

0495
PRE-OPERATIVE MALNUTRITION IN PATIENTS OPERATED ELECTIVELY FOR RESECTION OF BRAIN TUMORS IS ASSOCIATED TO A HIGHER MORBIDITY IN NEUROINTENSIVE CARE UNIT (NICU) AND TO A LONGER STAY IN HOSPITAL AND IN NICU

E.M. Olivares-Durán[1], B.B. Lozano-Moreno[2], P. Vargas-Rocha[3]

[1]El Bajío Regional High Specialty Hospital (HRAEB), NICU & Adult ICU, León, Mexico, [2]University of the Valley of Atemajac, León, Mexico, [3]University of Guanajuato, Department of Nursing and Obstetrics, Campus León, León, Mexico
INTRODUCTION. Patients that will be operated for resection of brain tumors have high risk of malnutrition, but there is not enough information about potential impact of preoperative malnutrition in the postoperative course of this group of patients in NICU.
OBJECTIVES. To compare, in a series of patients admitted consecutively to the NICU for elective resection of brain tumors, the rate of postoperative complications, the time of mechanical ventilation, and the length of stay in hospital and in NICU, observed in the group of malnourished patients versus those observed in the group without malnutrition.
METHODS. Prospectively, during a 15-month period, patients that were admitted to the HRAEB for elective resection of brain tumors were nutritionally evaluated by means of the subjective global assessment of nutritional status (SGA-NS) scale. All the patients were admitted to NICU during their postoperative period, where postoperative complications, time of mechanical ventilation, length of stay (LOS) in NICU and total LOS in hospital were registered. In this research, the differences between the group of malnourished patients versus the group of patients without malnutrition are reported. Either Student's *t* test or Chi square test was used, as it corresponded. Values of p lower than 0.05 were considered significant.
RESULTS. 52 patients were included in this report (2 more patients were operated for resection of brain tumor, but they were excluded since SGA-NS was not totally completed). From the 52 patients, 31 (59.6 %) were qualified by SGA-NS as status A (well nourished), and 21 as malnourished (40.3 %): 18 patients (34.6 %) in status B (moderately malnourished malnutrition) and 3 more (5.7 %) in the status C (severely malnourished).
On Table 1, five significant differences are shown, which document higher rates of diverse postoperative complications (including higher incidence of infectious complications and/or

extended mechanical ventilation), as well as longer LOS in hospital and in NICU, in the group of patients with malnutrition with regard to the group without malnutrition. Relative risk (RR) for complications potentially associated to malnutrition (infectious complications and/or extended mechanical ventilation) was 7.93. The rate of hospital mortality in the group without malnutrition was of 0 versus 9.5 % (2/21) in the group of malnourished patients (non-significant p values).
CONCLUSIONS. In this series of patients undergone to elective resection of brain tumors, the prevalence of preoperative malnutrition was 40.3 %. In the NICU, the group of undernourished patients showed times of mechanical ventilation, LOS in the NICU and in the hospital, as well as rates of morbidity significantly higher than those observed in the group of patients without malnutrition.
REFERENCE(S). Detsky A, McLaughlin J, Baker J, et al. What is subjective global assessment of nutritional status. JPEN J Parenter Enteral Nutr 1987;11:8–13.

Significant differences between the groups

Variable	Group with malnutrition	Group without malnutrition	p
Number of patients with all kind of complications	17 (81.0 %)	6 (19.3 %)	<0.001
Number of patients with complications potentially associated to malnutrition	16 (76.2 %)	3 (9.6 %)	<0.001
Number of patients with mechanical ventilation >72 h	10 (47.6 %)	1 (3.2 %)	<0.001
LOS-NICU (average ± standard deviation)	5.1 ± 3.7	1.54 ± 1.06	<0.005
Total LOS-hospital (average ± standard deviation)	12.4 ± 7.4	7.8 ± 6.5	<0.01

0496
ELEVATED INTRACRANIAL PRESSURE IN SUBARACHNOID HEMORRHAGE. RISK FACTORS AND MANAGEMENT

A. Vázquez González[1], M. Mourelo Fariña[1], B. Besteiro Grandío[2], I. Astola Hidalgo[1], Y. López Curbeira[3], V. Aller Fernández[1], R. Galeiras Vázquez[1], D. Freire Moar[1]

[1]CHUAC, ICU, A Coruña, Spain, [2]Saint James's University Hospital, ICU, Leeds, United Kingdom, [3]CHUF, Ferrol, Spain
INTRODUCTION. Subarachnoid hemorrhage (SAH) is associated to significant morbidity and mortality in young people. The first secondary brain injury mechanisms contribute to the poor outcome. Elevation of intracranial pressure (ICP) is one of the most important factors.
OBJECTIVES. To analyze the characteristics and management of patients with SAH admitted to the ICU.
METHODS. We collected patients admitted to the ICU (2004–2009) with diagnosis of SAH. We described age, sex, treatment of ICP, ICU stay, hospital stay and mortality. Univariate analysis was performed with t-test and Chi square test, considering significant $p < 0.05$.
RESULTS. We entered 287 patients diagnosed of SAH, 51 of them suffered ICP. The age was 58-year-old (SD 13.71). 68.6 % of these patients were women. 78 % of these patients died.The severity scales were: Fisher 3.57 (SD 0.83), APACHE II 18.35 (SD 4.84), SAPS II 42.92 (SD 12.92), SOFA 6.55 (SD 3.03), Glasgow (GCS) 10.2 (SD 4.31), GCS to 24 h 6.67 (SD 4.55), GCS at discharge 1.82 (DE) and Glasgow outcome scale (GOS) 3 months 1.69 (SD 1.17) at 3 months RANKIN 5.35 (SD 1.31). Exitus were associated to APACHE II (P 0.04) and SOFA (P0.02).The most frequent antecedent was hypertension 52.9 %, followed by 33.3 % toxic habits, dyslipidemia 17.6, 13.7 % diabetes mellitus, heart disease and oral anticoagulants with 9.8 % each. Only antededent of ischemic heart disease and use of oral anticoagulants were more common in men (25 %) versus women (2.9 %), with statistical significance. Isquemic heart disease and hypertension were both associated to age, with an average age of patients with heart disease about 69-year-old and patients without heart disease about 59-year-old ($p = 0.04$), and the average age of hypertensives patients was 61.4-year-old while patients without hypertension was 52.6-year-old, with statistical significance($p = 0.02$).The most frequent aneurysm territories were middle cerebral artery in 31.4 % of cases, followed by 11.8 % in anterior cerebral artery and 7.8 % in anterior communicating artery.ICU stay was not correlated to age or GCS, APACHE, SAPSII or SOFA.In the treatment of ICP, sedation was the first option in 74.5 % relaxation was used as 2nd option in 52.9 %, the hypertonic saline and mannitol were used as 3rd option in 23.5 and 37.3 % each. External ventricular derivation and hyperventilation were used as 4th option in 11.8 and 3.9 % of cases. Decompressive surgery and barbiturates were both used as 5th option in 5.9 %. No correlation was found between exitus and treatments.
CONCLUSIONS. SAH associated to ICP, affects young patients,predominantly women without a significant difference and it has high death rate.The most affected area by the aneurysm is the middle cerebral artery. Only hypertension and ischemic heart disease are more associated to males and age with significant differences. There are not significant differences about ICU stay or treatments used, although these outcomes could be because of the number of patients included.

0497
EVALUATION OF NEUROMONITORING PARAMETERS DURING VENTILATION, CONTROLLED VOLUME AND PRESSURE, IN PATIENTS WITH HEMORRHAGIC STROKE

A. Gritsan[1], N. Dovbysh[2], A. Gazenkampf[1], G. Gritsan[3]

[1]Krasnoyarsk State Medical University, Krasnoyarsk Regional Hospital, Anaesthesiology and Intensive Care, Krasnoyarsk, Russian Federation, [2]Krasnoyarsk Regional Hospital, Anaesthesiology and Intensive Care, Krasnoyarsk, Russian Federation, [3]Krasnoyarsk State Medical University, Anaesthesiology and Intensive Care, Krasnoyarsk, Russian Federation
OBJECTIVE. To study the parameters of neuromonitoring during artificial ventilation (AV), controlled by volume (VC) and pressure (PC) in patients with hemorrhagic stroke.
MATERIALS AND METHODS. A prospective study on the comparative performance evaluation of neuromonitoring during mechanical ventilation, 75 patients with hemorrhagic stroke, which were divided into 2 groups: Group 1, 39; Group 2, 36 patients which held MV by VC and PC mode respectively. In 71.8 % (28) of cases in the first group and in 61.1 % (22) in the second group, patients underwent surgery. All patients received standardized therapy based on Guidelines for the Management of Spontaneous Intracerebral Hemorrhage in Adults. Neuromonitoring was carried out in the following amounts: control ICP and CPP (20 patients) apparatus Spiegelberg brain-pressure monitor in the "on-line" mode, the definition of linear flow velocity in the middle cerebral artery (Vmca) on both sides (48 patients), the definition SrO2 (26 people) unit Somanetics invosoximeter cerebral/somatic/continuously and level SvjO2 (45). To measure SvjO2 chosen dominant jugular Vienna, determined during the ultrasound. The study was conducted at the following stages: Stage 1—1 day the patient is in the hospital, or the beginning of mechanical ventilation, Stage 2—3 day, 3 phase—day 5, Stage 4—7 days and 5 stage—the 10th day of respiratory support.
RESULTS. SrO2 value on the affected side on the 2nd phase of the study in the first group was 5.9 % lower ($p < 0,05$), than in group 2, and the most significant differences were found in the 4th stage of the study, when the difference between treatment groups on average reached 14.7 % (64.0 and 75.0 % respectively). In this case, on the intact side by 2–4 stages of the study the differences in SrO2 ranged from 11.4 to 12.8 %. At the same time, the group 2 value SvjO2 already on one phase of the study the average was higher by 8.2 % ($p < 0,05$), than in those of the first group, and the maximum statistically significant difference was detected at 4 and 5 stages study (10.1 and 8.2 %, respectively).
ICP level in the second group at all-time points, except for the 3 days of mechanical ventilation (stage 2), higher than in group 1, with the greatest difference (23.6 %) on the 4th stage of the study (23.8 ± 1.1 and 18.2 ± 0.8 mmHg, respectively).
CPP at all stages, the last one (step 5), in the group with ventilation in VC mode, the average was higher than in the group with ventilation mode PC. The maximum statistically significant difference was determined at the second stage and was 16.9 % (91.1 ± 2.6 and 77.9 ± 2.2 mmHg, respectively).
CONCLUSIONS. (1) In patients with hemorrhagic stroke, during mechanical ventilation to control the volume (VC), in comparison with the control pressure mechanical ventilation (PC), supported by better performance SrO2 and SvjO2. (2) Mode of respiratory support (VC and PC) has no significant effect on the level of ICP.

0498
HUNT AND HESS SCALE AS A PREDICTOR OF OUTCOME IN SUBARACHNOID HAEMORRHAGE

P. Ferreira[1], A. Marques[2], S. Beirão[2], P. Coutinho[2]

[1]Centro Hospitalar e Universitário de Coimbra, Anaesthesiology—HG, Coimbra, Portugal, [2]Centro Hospitalar e Universitário de Coimbra, Intensive Care—HG, Coimbra, Portugal
INTRODUCTION. The severity of clinical presentation is the strongest prognostic indicator in spontaneous subarachnoid haemorrhage (SAH). Many complications can occur during SAH management (rebleeding, vasospasm) and are major predictors of poor outcome. Despite difficulties in accurately predict the prognosis of SAH patients, Hunt and Hess is one of the most widely used scales to assess clinical severity at hospital admission.
OBJECTIVES. To evaluate Hunt and Hess scale as a predictor of outcome in patients admitted to our ICU with SAH.
METHODS. All 54 SAH patients admitted to our 9-bed mixed intensive care unit (ICU) in a 5-year period (January 2008–January 2012) were retrospectively evaluated. Demographic data, severity scores, Hunt and Hess and Glasgow coma scales, length of stay, duration of mechanical ventilation support, complications, mortality and patients status 6 months after hospital discharge were collected.
RESULTS. The average age was 51.7 ± 13.1 years; 35 (64.8 %) patients were female. Severity scores on admission: APACHE II 19.4 ± 8.8, SAPS II 40.3 ± 17.2, SOFA 9.9 ± 11.7, Glasgow coma scale 6.9 ± 3.1 (3–14) and Hunt–Hess scale 4.2 ± 0.7 (3–5). Average ICU length of stay (LOS) was 9.1 ± 5.7 (1–28) days and hospital LOS 30.3 ± 36.1 (2–190) days. Most patients (51 = 94.4 %) needed mechanical ventilation, with an average duration of 6.5 ± 4.7 days. At least one aneurysm was identified in 49 (90.7 %) patients, an arteriovenous malformation in 2 (3.2 %) and absence of vascular lesions in 3 (5.6 %). Intra-cranial complications included: brain edema 34 (63 %), hydrocephalus 26 (48.1 %), cerebral ischemia 22 (40.7 %), vasospasm 20 (37 %) and re-bleeding 11 (20.4 %). ICU mortality was 31.5 %, hospital mortality 38.9 % and 6 months after discharge mortality 59.3 %. Analysing global mortality, most deaths (90.6 %) occurred in patients with Hunt–Hess 4 and 5.The 22 survivors were observed approximately 6 months after hospital discharge: 13 individuals presented with neurological deficits (Hunt–Hess grade 3 n = 2; grade 4 n = 6; grade 5 n = 5) and 9 without deficits (Hunt–Hess grade 3 n = 4; grade 4 n = 4; grade 5 n = 1).
CONCLUSIONS. The majority of patients in our study were poor-grade SAH (Hunt and Hess 4 and 5) and this group was clearly associated with high mortality rate and permanent neurological deficits in survivors. Nevertheless, 16 patients (29.6 %) initially classified as poor-grade SAH actually survived, and 5 (9.2 %) of them without neurological deficits. Aggressive treatment even in poor-grade SAH patients can result in more favourable long-term outcomes than predicted by Hunt and Hess scale.
REFERENCE(S). 1. Stroke. 2012;43:1711–1737. 2. Curr Opin Crit Care 2011;17:85–93.

0499
INCIDENCE AND PROGNOSTIC SIGNIFICANCE OF HYPERGLYCEMIA IN ACUTE PERIOD OF ANTERIOR PART CIRCLE OF WILLIS CEREBRAL ANEURYSM RUPTURE

J.V. Titova[1], E.A. Karapetyan[1], A.A. Solodov[1], S.S. Petrikov[1], V.V. Krylov[1]

[1]Medical Emergency Scientific Research Institute n.a.N.V. Sklifosovsky, Moscow, Russian Federation
INTRODUCTION. Hyperglycemia (HG) is a risk factor of poor-grade outcome in patients (pts) with subarachnoid hemorrhage (SAH) due to cerebral aneurysm rupture. But the incidence of HG in pts with SAH is not defined.
OBJECTIVES. To determine the incidence and prognostic significance of HG in acute period of anterior part circle of Willis cerebral aneurysm rupture.
METHODS. Medical reports retrospective analysis of 165 pts (age 48.9 ± 11; male/female—75/90) with SAH due to anterior circle of Willis aneurysm rupture was presented. Diabetes mellitus was exclusion criteria. Hunt and Hess (H–H) scale severity grading was: II-in 26.1 % pts, III-in 59.4 % pts, IV-in 12.1 % pts and V-in 2.4 % pts. Fisher SAH computed tomography (CT) grading scale was: 1-in 10.9 % pts, 2-in 1.2 % pts, 3-in 21.2 % pts, 4-in 66.7 % pts. The localization of aneurysm ruptured was: middle cerebral artery (MCA)-in 24.2 % pts, anterior cerebral artery-anterior communicating artery (ACA-ACoA)-

in 52.7 % pts and internal carotid artery (ICA)-in 23.1 % pts. Aneurysm surgical clipping or endovascular coiling was performed in all pts in acute period of SAH. Cerebral vasospasm was revealed in 64 pts (38.7 %) in early postoperative period by transcranial dopplerography (cerebral blood flow velocity in involved MCA 120 cm/s and higher and Lindegaard index 3 and more). All pts (n = 165) were divided in 4 groups (GR) on the base of severity and CT scale grading: GR 1-H–H II, Fisher 3–4 (n = 43), GR 2-H–H III–IV, Fisher 1–2 (n = 19), GR 3-H–H III–IV, Fisher 3–4 (n = 99), GR 4-H–H V, Fisher 1–4 (n = 4). Blood glucose concentration (BGC) was determined and compared in GR 1–4 during 24 h after surgery. HG was defined as the increase of BGC up to 6.1 mmol/l and more. ABL 800 analyzer was used for BGC measurement 1–4 times per 24 h (334 samples totally). We analyzed maximal during 24 h BGC in SAH pts.
RESULTS. HG (6.1–10 mmol/l) was revealed in 51 % pts, severe HG more than 10 mmol/l-in 37 % pts, normoglycemia-just in 12 % pts. Comparison of HG incidence in pts with different aneurysm localization, grade of H–H severity and Fisher scale is presented in Table 1.

Table 1 Hyperglycemia incidence

	Normoglycemia (<6.1 mmol/l), %	HG (6.1 mmol/l and more), %	HG (6.1–10 mmol/l), %	HG (>10 mmol/l), %
MCA	12.2	87.8	48.8	39
ACA-ACoA	9.1	90.9	50	40.9
ICA	18.4	81.6	55.3	26.3
GR 1 (H–H II, Fisher 3–4), n = 43	13.9	86.1	60.5	25.6
GR 2 (H–H III–IV, Fisher 1–2), n = 19	10.5	89.5	47.4	42.1
GR 3 (H–H III–IV, Fisher 3–4), n = 99	12.1	87.9	48.5	39.4
GR 4 (H–H V, Fisher 1–4), n = 4	0	100	25	75

Clinical outcome at BGC different levels in acute period of anterior part circle of Willis cerebral aneurysm rupture is presented in Table 2.

Table 2 Clinical outcome

	Normoglycemia (<6.1 mmol/l)	HG (6.1–10 mmol/l)	HG (>10 mmol/l)
Mortality rate, %	15	20.2	31.1
High grade outcome (Glasgow outcome scale 4–5), %	80	73.9	65.6

CONCLUSIONS. Hyperglycemia incidence in pts with anterior part circle of Willis cerebral aneurysm rupture in first day after surgery is 88 %. Incidence and level of hyperglycemia does not depend on aneurysm localization and increases at grade of severity H–H III and higher and Fisher CT scale 3–4. Hyperglycemia in the first day after neurosurgical procedure is accompanied by increase of mortality rate and decrease of high-grade outcome.

New trends in non-invasive ventilation: 0500–0513

0500

PERCEPTIONS AND AFFECTS OF NON INVASIVE VENTILATION IN INTENSIVE CARE PHYSICIANS, NURSES, PATIENTS AND THEIR RELATIVES: A MULTICENTER PROSPECTIVE STUDY (THE PARVENIR STUDY)

M. Schmidt[1], S. Perbet[2], N. Mongardon[3], K. Razazi[4], M. Dres[5], E. Guerot[6], N. Terzi[7], P. Andrivet[8], M. Alves[9], V. Peigne[10], R. Sonneville[11], B. Sztrymf[12], F. Colet[13], C. Cracco[14], X. Fabre[15], V. Labbe[16], D. Reuter[17], C. Rafat[18], M. Conseil[19], C. Minet[20], E. Azoulay[17], T. Similowski[21], A. Demoule[1], PARVENIR Study Group

[1]Groupe Hospitalier Pitié-Salpêtrière, Pneumolgie et Réanimation Médicale, Paris, France, [2]Hotel Dieu, Clermont-Ferrand, France, [3]Hopital Cochin, Paris, France, [4]Hopital Henri Mondor, Creteil, France, [5]Hopital de Bicetre, Le Kremlin Bicetre, France, [6]Hopital Europeen Georges Pompidou, Paris, France, [7]Centre Hospitalier Universitaire, Caen, France, [8]Hopital de Bligny, Briis sous Forges, France, [9]Hopital Saint-Antoine, Paris, France, [10]Hopital Percy, Clamart, France, [11]Hôpital Bichat Claude Bernard, Paris, France, [12]Hopital Antoine Beclere, Clamart, France, [13]Centre Hospitalier, Saint-Malo, France, [14]Centre Hospitalier, Angouleme, France, [15]Centre Hospitalier, Roanne, France, [16]Hopital Tenon, Paris, France, [17]Hopital Saint-Louis, Paris, France, [18]Hopital Louis Mourier, Colombes, France, [19]Hopital Saint-Eloi, Montpellier, France, [20]Centre Hospitalier Universitaire, Grenoble, France, [21]Groupe Hospitalier Pitié-Salpêtrière, Paris, France

INTRODUCTION. Non invasive ventilation (NIV) has become a cornerstone therapy of acute respiratory failure and is thus increasingly used in the intensive care unit (ICU). To date, few data are available on how caregivers, patients and their relative perceive NIV.
OBJECTIVES. We therefore designed a study with three distinct objectives: (1) to compare the perception of NIV use between physicians and nurses, (2) to compare the perception of NIV use among patients and their relatives, (3) to put in perspective these two sets of data.
METHODS. Prospective multicenter survey in 33 ICU in France and Belgium. Physicians and nurses answered to a 50 items questionnaire describing their feeling and perception of NIV. During the same period, patients who received NIV during their ICU stay without being intubated (NIV success) and their relatives answered on discharge a 30-items questionnaire describing their feeling regarding NIV. Patients who did not understand French and who had delirium (CAM-ICU) were not included in the study.
In questionnaires, each item was quantified from 1 (⟨not agree at all⟩) to 10 (⟨totally agree⟩).
RESULTS. 751 nurses [29 (25–35)-year-old], 312 physicians [32 (28–40)-year-old], 396 patients [age 69 (60–80)-year-old, SAPS II 36 (28–42), 57 % male] et 145 relatives [age 59 (47–69)-year-old, 38 % male] were included. Compared with physicians, nurses perceived NIV as more binding and stressful ($p < 0.0001$) and more time consuming [score 6 (4–7)]. For a large majority of patients and their relatives, NIV was felt as an effective treatment [respectively 8 (6–10) and 9 (8–10), respectively], which they did not regret to have been treated with [score 1(1–3)]. However, both patients and relatives described NIV as an aggressive [4 (1–7)] and stressful treatment [4 (1–7)], whose principles had been little explained [5 (1–10)].
CONCLUSIONS. Although both nurses, physicians perceived NIV as an efficient therapy, nurses who are closer to the patients than physicians during NIV sessions have a more negative perception of the tolerance and burden of care of NIV. In addition, patients who succeeded NIV and their relatives considered NIV as an effective treatment for the price of discomfort and significant trauma and complained of a lack of information on NIV. The impact of this negative perception and lack of information on care-giving and long-term psychological consequences remains to be determined.

0501

EFFECTS OF SUPER-HIGH FLOW NASAL OXYGEN THERAPY ON AIRWAY PRESSURE AND RESPIRATORY MECHANICS

R. Parke[1], A. Bloch[1], S. Mc Guinness[1]

[1]Auckland District Health Board, Cardiothoracic & Vascular Intensive Care Unit, Auckland, New Zealand

INTRODUCTION. Previous research has demonstrated a positive linear correlation between the flow delivered and the airway pressure generated by nasal high flow therapy.[1] Current practise is to use flows over a range of 30–50 lpm resulting in low levels of positive airway pressure and possible clinical benefits [2, 3]. Since it is technically possible to apply higher flows we aimed to investigate the effects of up to 100 lpm in healthy volunteers. Electrical impedance tomography (EIT) is an evolving technology based on a non-invasive, radiation-free and real-time approach to gain information on global and regional lung ventilation.[4]
OBJECTIVES. To describe the relationship between flow and airway pressure in a group of healthy subjects and to demonstrate the resulting changes in lung physiology using EIT.
METHODS. Following ethical approval, 15 healthy volunteers were consented and enrolled into this study. A 10 Fr catheter was inserted into the nasopharynx via the nose and placement of the catheter was confirmed using end tidal CO_2 monitoring. EIT monitoring was undertaken using the PulmoVista 500 (Draeger, Germany).
Optiflow (Fisher and Paykel Healthcare, NZ) was used to deliver humidified air intranasally and measurements were performed with gas flow rates from 30 to 100 lpm in 10 lpm increments. Subjects breathed with their mouths closed and pressure was recorded over 1 min at each flow rate and the average nasopharyngeal pressure calculated. Cumulative changes in end expiratory lung impedance were also recorded.
RESULTS. Demographics: n = 15. Median age = 29 years (22–44); mean height = 171.8 cm (SD 7.5); mean weight = 69.7 kg (SD 10.3); 47 % male.
There was a linear increase in airway pressure and in end expiratory lung impedance (ΔEELI) with increased gas flow (Table 1).

Table 1

Gas Flow Rate (lpm)	Baseline	30	40	50	60	70	80	90	100
Airway pressure (cmH_2O)—mean	0.5	2.7	3.8	4.9	6.1	7.7	9.0	10.0	11.9
SD	0.3	0.7	0.8	1.1	1.3	1.5	1.9	2.1	2.7
Respiratory rate (bpm)—mean	14	9	8	7	8	7	8	7	8
SD	4.1	3.0	3.3	3.0	3.7	3.8	4.2	3.5	5.0
ΔEELI	0.0	0.49	0.47	0.66	0.93	1.02	1.24	1.33	1.58

CONCLUSIONS. When using nasal high flow therapy with greater gas flows than are used in clinical practice, we demonstrated that positive airway pressures are generated and this is accompanied by a decrease in respiratory rate. EIT demonstrates an increase in expiratory lung volumes with higher gas flows. Further studies in patient populations are required to evaluate any clinical benefits of these observed effects.
REFERENCES. 1. Parke R, Eccleston ML, McGuinness SP. The effects of flow on airway pressure during nasal high-flow oxygen therapy. Resp Care 2011;56:1151–52. 2. Parke R, McGuinness S, Eccleston M. Nasal high-flow therapy delivers low level positive airway pressure. BJA 2009;103:886–903. 3. Parke R, McGuinness SP, Eccleston ML. A preliminary randomized controlled trial to assess effectiveness of nasal high-flow oxygen in intensive care patients. Resp Care 2011;56:265–704. 4. Corley A, et al. Oxygen delivery through high-flow nasal cannulae increase end-expiratory lung volume and reduce respiratory rate in post-cardiac surgical patients. BJA 2011;107:998–1004.
GRANT ACKNOWLEDGMENT. Research in CVICU is supported by an unrestricted grant from F&P Healthcare (NZ).

0502

RESPIRATORY MECHANICS AND MUSCLE EFFORT OF BREATHING DURING NONINVASIVE CPAP: COMPARISON AMONG DIFFERENT DEVICES WITH FACE MASK. CLINICAL STUDY

J.M. Serrano Simon[1], A. Rodriguez Perea[1], R. Diaz Pernalete[1], R. Leon Lopez[1], F. Ruiz Ferron[2]

[1]Hospital Universitario Reina Sofia, Intensive Care Unit, Cordoba, Spain, [2]Hospital Universitario Medico-Quirurgico Jaen, Intensive Care Unit, Jaen, Spain

INTRODUCTION. CPAP is a useful technique widely used in acute respiratory failure. Noninvasive CPAP (NIV-CPAP) reduces respiratory muscle effort and improve gas exchange. New devices for its application have been recently implemented. The impact of these new NIV-CPAP on respiratory mechanic and respiratory muscle of patients with acute respiratory failure has not been quantified.
OBJECTIVES. To evaluate the performance of a new air-entrainment mask with a preset mechanical CPAP valve (ventumask®, Starmed, high flow-HF) versus Boussignac® valve

(Vygon), in terms of respiratoy muscle and mechanics, breathing pattern and quality cpap level.

METHODS. Six patients admitted to ICU with acute respiratory failure postoperative after thoracic surgery and one patient with pneumoniae requiring NIV were studied, in CPAP level 5, 7.5, 10 cmH_2O. Each patient his own control. All patients are ventilated with both system during 60 min. Measurements: Signal flow, airway pressure and pleural pressure (Ppl) by pulmonary monitor Bicore® CP-100, and processed using Anadat® software. We evaluate respiratory mechanics (multiple linear regression from transpulmonary pressure calculated); inspiratory muscle effort (pressure–time product by integrated difference among Ppl and estimated recoil pressure of the chest wall calculated from dynamic elastance of the chest wall; during inspiratory effort); and expiratory effort (Integration Paw expiratory rise, end-expiratory pressure above); breathing pattern; sense of comfort and clinics tolerance. Statistical analysis: the results are shown as mean ± SD. Comparative statistics relied on the nonparametric Wilcoxon test.

RESULTS. Patients: 6 males and 1 female, mean age of 62 ± 8 and APACHE II 18. In time of the study: pH 7.35, PaCO2 46 ± 15 mmHg, PaO_2 64 ± 14 mmHg and FiO_2 40 ± 10 %.

Table 1: parameters of respiratory mechanics, muscle effort and breathing pattern: Ti/Ttot: inspiratory time fraction. RR: breaths/minute. PTPinsp: pressure–time product of inspiratory effort. PTI_Paw (integrated time expiratory Paw). *p < 0.05, **p < 0.0001.

Table 1 Respiratory mechanics. Respiratory muscle

	CPAP 5 cmH_2O Boussignac	CPAP 5 cmH_2O VentumaskHF	CPAP 7.5 cmH_2O Boussignac	CPAP 7.5 cmH_2O VentumaskHF	CPAP 10 cmH_2O Boussignac	CPAP 10 cmH_2O VentumaskHF
Delta pleural pressure (cmH_2O)	11.20	9.78 ± 0.63	12.78 ± 0.34**	5.69 ± 0.31	12.32 ± 0.49**	4.93 ± 0.47
Delta Paw (cmH_2O)	2.25	4.60 ± 0.26*	2.57 ± 0.12	4.97 ± 0.13**	2.41 ± 0.11	4.45 ± 0.12**
Elastance (cmH_2O/L)	24.12 ± 0.36	45.17 ± 4.0**	26.42 ± 0.18	22.92 ± 2.25	26.62 ± 0.55	30.59 ± 0.93*
Resistance (cmH_2O/L/sg)	5.85 ± 1.47	5.83 ± 3.9	3.85 ± 0.45	8.01 ± 1.46**	4.5 ± 0.46	6.45 ± 1.26*
RR(B/min)	16	21.6*	16.2	19.8	13.2	20.4*
Tidal volume (L)	0.385 ± 0.01*	0.242 ± 0.05	0.424*	0.364 ± 0.03	0.399 ± 0.01	0.332
TI/Ttot (%)	35.96	36.42	34,5	30	31	33
PTPinsp (cmH_2O*sg/min)	169.76*	141.43	199.26	182.22	180.65**	64.26
PTI_Paw (cmH_2O*sg/min)	178.67	293.13**	283.176	335.67**	333.88	489.72**

Figure 1. Patient No 2. Graphic recording representative during CPAP 7.5. Pressures, flow, volume-time tracing. Note peep level increased above of preset level, higher dynamic hyperpressurization and flow noises with ventumask® high flow.

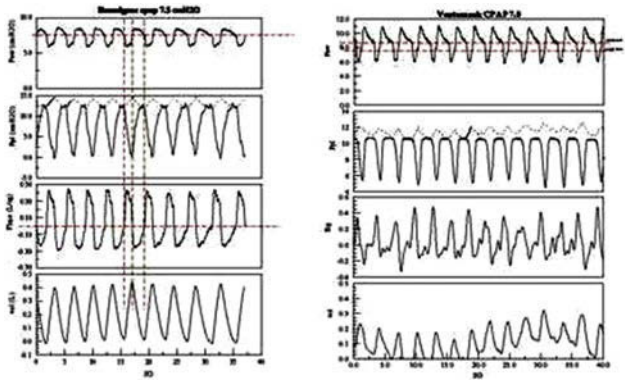


Fig. 1 CPAP 7.5

CONCLUSIONS. Our results indicate that pressurization and clinical tolerance is appropriate in both systems. The best performance of breathing pattern and respiratory mechanics in lower levels of CPAP with Boussignac® valve could be explained by being an open system. The inspiratory effort is reduced using ventumask® high flow, but increases expiratory effort possibly due to the impedance of peep valve, which can raise the preset level flow dependent.

0503

NEURALLY ADJUSTED VENTILATORY ASSIST VERSUS PRESSURE SUPPORT WITH OPTIMAL SETTINGS FOR NON INVASIVE VENTILATION

B. Repusseau[1], F. Vargas[1,2], C. Laluque[1], H.N. Bui[1], A. Boyer[1], B. Clouzeau[1], O. Pillet[1], T. Saghi[1], D. Gruson[1], G. Hilbert[1,2]

[1]Université Victor Segalen, Service de Réanimation Médicale, CHU Pellegrin, Bordeaux, France, [2]Centre de Recherche Cardio Thoracique INSERM U 1045, Bordeaux, France

INTRODUCTION. Several arguments favor the best possible synchronization during Noninvasive Pressure Support Ventilation (NI-PSV) [1]. Noninvasive neurally adjusted ventilatory assisst (NI-NAVA) could be a solution to support the work of breathing and to improve patient-ventilator synchrony [2].

OBJECTIVES. To compare inspiratory effort, patient ventilator synchrony, gas exchange and comfort during NI-NAVA or NI-PSV with optimal settings, in patient at risk of respiratory distress requiring early noninvasive ventilation after extubation.

METHODS. Prospective, physiologic, crossover study. 1 h after extubation, two 20-min periods were performed in a random order by NI-PSV and NI-NAVA. Baseline measurements were performed during spontaneous breathing (SB initial). Recordings were then obtained during the two NIV periods and final measurements were performed during SB (SB final). NI-PSV optimal setting: NIV mode, short pressurization time (0.1–0.2 s), level of pressure support until the expired tidal volume (TV) was 6–7 mL/kg of body weight, PEEP set at 4–5 cmH_2O, Cycling off set at 40–50 %. NI-NAVA setting: PEEP similar to NI-PSV, NAVA level to until TV was 6–7 mL/kg. Same face mask, same FiO_2.

RESULTS. Data are reported as the median and interquartile range. p is the p values for the Friedman non-parametric test. Pairwise comparisons were obtained by Wilcoxon's signed ranks test. *NI-NAVA versus SB initial p < 0,05, **NI-NAVA versus NI-PSV p < 0,05.

Table 1

	SB initial	NI-NAVA	NI-PSV	SB final	p
Pdi (cmH_2O)	10.1 (6.1–1.,3)	8.1 (3.7–9.1)*	7.2 (4.3–10.5)	11.3 (7.1–14.6)	0.002
PTPdi/min (cmH_2O s/min)	168 (92–273)	116 (55–159)*	119 (77–159)	164 (130–290)	0.001
Inspiratory trigger delay (s)	NA	0.04 (0.03–0.06)	0.21 (0.15–0.25) **	NA	0.01
Expiratory trigger delay (s)	NA	0.27 (0.2–0.37)	0.17 (0.16–0.21)	NA	NS
Time of synchrony (% TiP)	NA	98.5 (97.1–99.8)	76.6 (73.1–83.8)**	NA	0.01
Asynchrony index (%)	NA	1.8 (1.6–3.4)	5.8 (3.2–15.2)	NA	NS
Asynchrony index >10 %	NA	0	3	NA	
Comfort score	NA	4 (3–5)	4 (3–5)	NA	NS
PaO_2/FiO_2 ratio	300 (252–372)	320 (277–433)*	344 (301–422)	290 (238–368)	0.005

CONCLUSIONS. Compared with SB, NI-NAVA decreases inspiratory effort and improves gas exchange, as well as NI-PSV. However, despite optimized settings of NI-PSV, NI-NAVA improves time of synchrony without significant difference on Asynchrony index.

REFERENCE(S). 1. Vignaux L, Vargas F, Roeseler J, et al. Patient-ventilator asynchrony during non-invasive ventilation for acute respiratory failure: a multicenter study. Intensive Care Med 2009;35(5):840–6. 2. Piquilloud L, Tassaux D, Bialais E, et al. Neurally adjusted ventilatory assist (NAVA) improves patient-ventilator interaction during non-invasive ventilation delivered by face mask. Intensive Care Med 2012;38(10):1624–31.

0504

A NEW SETTING TO IMPROVE NON INVASIVE NEURALLY ADJUSTED VENTILATORY ASSIST BY HELMET

G. Cammarota[1], F. Longhini[1], C. Olivieri[2], L. Sasu[2], R. Vaschetto[2], D. Colombo[2], A. Messina[2], V. Repetto[2], F. Della Corte[2], P. Navalesi[2]

[1]Università del Piemonte Orientale, Anestesia e Rianimazione, Novara, Italy, [2]Università del Piemonte Orientale, Novara, Italy

INTRODUCTION. Noninvasive neurally adjusted ventilatory assist delivered via helmet (nNAVAh) has been shown, compared to pressure support ventilation by helmet (nPSVh), to improve patient-ventilator interaction and synchrony in patients with acute respiratory failure (ARF) [1]. Arterial blood gases (ABGs) and the electrical activity of the diaphragm (EAdi) were similar between the two modes [1]. We propose a novel setting of nNAVAh, where the NAVA level (NH) is increased up to 15 cmH_2O/mV and the maximum inspiratory airway pressure (Paw) is limited not to exceed 25 cmH_2O ($nNAVA_{15}h$) to achieve further physiologic improvements.

OBJECTIVES. To observe and compare nNAVAh, nPSVh and $nNAVA_{15}h$ with respect to ABGs, patient's discomfort, assessed using a Visual Analogue Scale (VAS_d), EAdi, inspiratory trigger delay ($delayTR_{insp}$), and rates of machine pressurization.

METHODS. All patients underwent 3 randomized 30-min trials in nPSVh [inspiratory support above positive end-expiratory pressure (PEEP) ≥10 cmH_2O, fastest rate of pressurization), nNAVAh (NH to achieve a comparable peak EAdi ($EAdi_{peak}$) as during nPSVh, and $nNAVA_{15}h$ (NH at 15 cmH_2O/mV and the maximum inspiratory Paw to be equal to the total inspiratory Paw applied during the corresponding nPSVh trial). PEEP (≥10 cmH_2O) was the same between trials. EAdi and Paw tracings were recorded. The last minute of each trial was analyzed. $DelayTR_{insp}$, Paw-time Products the initial 200 ms from the onset of ventilator pressurization (PTP_{200}), and the initial 300 and 500 ms from the onset of the EAdi swing ($PTP_{300EAdi}$ and $PTP_{500\ EAdi}$, respectively), and the triggering area ($PTP_{trigger}$) were computed. ABGs and VAS_d were assessed at the end of each trial.

RESULTS. 15 patients with ARF were enrolled and completed the study protocol. The inspiratory assistance was similar between modes. ABGs were not different between trials, while VAS_d was lower with nNAVAh ($p < 0.05$) than with nPSVh, and significantly lower with $nNAVA_{15}h$ compared to both nNAVAh and nPSVh. $EAdi_{peak}$ was no different between nNAVAh and nPSVh; $nNAVA_{15}h$, produced a decrease in EAdi, as opposed to both nPSVh and nNAVAh ($p < 0.05$). $DelayTR_{insp}$ and $PTP_{trigger}$ were both lower in nNAVAh ($p < 0.05$) and $nNAVA_{15}h$ ($p < 0.05$) than in nPSVh. $nNAVA_{15}h$ significantly improved PTP_{200}, $PTP_{300EAdi}$ and $PTP_{500\ EAdi}$, compared to both nPSVh and nNAVAh.

CONCLUSIONS. Our study confirms that compared to nPSVh, nNAVAh improves patient-ventilator interaction, with no significant differences in EAdi and ABGs. Compared to both nPSVh and nNAVAh, $nNAVA_{15}h$ determines a significant reduction in EAdi and VAS_d and an improvement of the indexes of machine pressurization, without affecting ABGs.

REFERENCE(S). 1. Cammarota G et al. Noninvasive ventilation through a helmet in postextubation hypoxemic patients: physiologic comparison between neurally adjusted ventilatory assist and pressure support ventilation. ICM 2011;37(12):1943–1950.

0505
RISK FACTORS FOR NON INVASIVE VENTILATION REQUIREMENT IN POSTOPERATIVE CARDIAC SURGICAL PATIENTS

F. Ampatzidou[1], M. Sileli[1], T. Kontakiotis[2], M. Agrafiotis[1], O. Ananiadou[3], K. Diplaris[3], G. Drosos[3]

[1]/G. Papanikolaou' General Hospital, ICU Department, Exohi Thessaloniki, Greece, [2]/Aristotelian' University of Thessaloniki, Respiratory Medicine Department, Exohi Thessaloniki, Greece, [3]/G. Papanikolaou' General Hospital, Cardiothoracic Surgery Department, Exohi Thessaloniki, Greece

INTRODUCTION. Postoperative respiratory failure is a common complication in cardiac surgical patients. Reintubation increases morbidity and mortality rates and could be avoided by implementation of non invasive ventilation (NIV).

OBJECTIVES. Aim of our retrospective study is to identify risk factors associated with the postoperative use of NIV.

METHODS. Our electronic database was searched to identify patients that required NIV for post extubation respiratory failure. A number of perioperative variables as well patients' clinical and demographic characteristics were evaluated in order to determine potentially significant associations with the postoperative use of NIV.

RESULTS. From January 2010 to March 2013, 1,265 patients (age 64.9 ± years, 279 females), underwent cardiac surgical procedures in our institution. NIV was employed for the treatment of post extubation respiratory failure in 133 patients (10.5 %) (age 66.5 ± 10.0 years, 89 females). We observed a significant correlation of NIV usage with the following variables: history of COPD, BMI > 40, Euroscore value, cardiopulmonary bypass time and the duration of invasive mechanical ventilation (Table). Reintubation rate in the entire cohort was low (0.02 %) indicating effective application of NIV.

Statistical analysis

Risk factors for NIV	NIV patients n = 133	No NIV patients n = 1,132	p value
COPD	31 (23.3 %)	136 (12 %)	$p < 0.001$
BMI > 40	7 (5.26 %)	24 (2.1 %)	$p = 0.026$
EuroScore	9.6	6.8	$p = 0.011$
CBP time(min)	106	94.7	$p = 0.005$
Invasive mechanical ventilation duration (h)	38.2	18.5	$p < 0.001$

CONCLUSIONS. Postoperative respiratory failure is common in cardiac surgery patients and can be associated with various risk factors. Identification of these factors, may lead to an early and proper application of NIV resulting in better postoperative outcomes.

REFERENCE(S). 1. De Santo LS. J Thorac Cardiovasc Surg 2009. 2. Guarracino F. Minerva Anestesiol 2011.

0506
PREDICTORS OF SUCCESS FOR EARLY TRANSITION FROM INVASIVE TO NON INVASIVE MECHANICAL VENTILATION IN WEANING COPD PATIENTS AFTER ACUTE RESPIRATORY FAILURE; A PROSPECTIVE COHORT TRIAL

S. Salim[1], T. Fahmy[1], A. Yehia[1], N. Abed[1], S. Mokhtar[1]

[1]Cairo University, Critical Care Department, Cairo, Egypt

INTRODUCTION. Several studies [1] have reported the clinical benefits of NIV as a weaning method after failure of conventional weaning techniques. They demonstrated the success of NIV in weaning after a short period of invasive mechanical ventilation and failure of a spontaneous breathing trial (SBT); however, the predictors of success of this transition have not been well studied.

OBJECTIVES. To find physiologic criteria that predict the success of early transition to NIV in COPD patients who failed SBT after (48–72) h of intubation.

METHODS. The study included 30 intubated COPD patients who were tolerating inspiratory support <25 mmHg 48–72 h after intubation in whom SBT failed. After reconnected to mechanical ventilation for (1–2) h patients were then extubation and were put on NIV via oronasal masks, and later weaned from NIV. Arterial blood gases, respiratory mechanics and spontaneous breathing parameters were assessed on admission, before T-piece trial and prior to extubation and disconnection from NIV.

RESULTS. Out of 30 included patients, 21 were successful and later weaned from NIV, while 9 failed and were reintubated; 5 of them died through the course of invasive ventilation, while 4 were successfully weaned conventionally. On admission the successful group had a significant lower Auto PEEP (3.91 ± 0.10 vs 5.44 ± 0.53) ($p < 0.001$), RSBI (175.19 ± 20.74 vs 202.22 ± 21.48) ($p < 0.05$), higher static compliance (23.21 ± 4.50 vs 19.89 ± 2.76) ($p < 0.05$) and NIP (11.86 ± 2.08 vs 7.22 ± 1.79) ($p < 0.001$). RSBI and NIP were the most important independent predictors on admission of success of early switch to NIV, with cut-off value of184 (sens.67; sp 81 % $p < 0.05$) and 9 (sens 90; sp 100 % $p < 0.001$) respectively. Just prior to SBT, the successful group had a significant lower Auto PEEP (2.91 + 0.77 vs 4.56 + 0.73) ($p < 0.001$), RSBI (119.33 ± 8.29 vs 139.67 ± 14.55) ($p < 0.001$), airway resistance (9.69 ± 1.66 vs 12.11 ± 1.62, $p = 0.001$) ($p < 0.001$) PO.1 ($p < 0.001$) (7.21 ± 0.83 vs 9.01 ± 1.16) and PO.1/NIP (0.31 ± 0.04 vs 0.60 ± 0.10) ($p < 0.001$), higher static compliance (44.24 ± 8.88 vs 27.89 ± 6.15) ($P < 0.001$), dynamic compliance (29.00 ± 6.48 vs 18.44 ± 3.43) ($p < 0.001$), NIP (23.57 ± 2.14 vs15.11 ± 1.45) ($p < 0.001$), PO_2 and P/F ratio (207.38 ± 10.97 vs 194.56 ± 10.45) ($p < 0.05$). The decreased airway resistance and increase NIP were the independent predictors of success just prior to SBT with cut-off value of 11 (sens 86 sp 67 % $p < 0.05$) and 19 (sens 100, sp 100 % $p < 0.001$) respectively.

CONCLUSIONS. Lung mechanics rather than ABG seem to predict the readiness for early transition to NIV throughout the whole ventilator course. RSBI, NIP and Airway resistance are the most important predictors of success for early transition to NIV.

REFERENCE(S). 1. Burns KE, Adhikari NK, Keenan SP, Meade M. Use of noninvasive ventilation to wean critically ill adults off invasive ventilation: meta analysis and systematic review. BMJ 2009;338:b1574.

0507
A COMPARISON OF THE NOISE INTENSITY FROM VARIOUS RESPIRATORS INSIDE A HELMET-TYPE INTERFACE DURING NON-INVASIVE POSITIVE PRESSURE VENTILATION

N. Momose[1], Y. Onodera[1], J. Yoshioka[2], T. Kano[1], S. Matsushita[1], M. Nakane[1], K. Kawamae[1]

[1]Yamagata University Faculty of Medicine, Department of Anesthesiology & Intensive Care Medicine, Yamagata, Japan, [2]Yamagata University Hospital, Department of Clinical Engineering, Yamagata, Japan

INTRODUCTION. The helmet-type interface (Caster R™, Starmed Inc. Italy) has been widely used for patients who require non-invasive positive pressure ventilation (NPPV) to treat abnormal respiratory conditions. Because the patient's head is completely covered by the helmet, noise generated by the inspiratory flow from the ventilator may prove annoying.

OBJECTIVES. To evaluate the intensity of the noise level inside the helmet during NPPV, and to compare the difference in noise intensity between several different respirators.

METHODS. A mannequin head, equipped with the helmet-type interface, was connected to a LUNGOO™ spontaneous-breath simulator (Air Water Safety Service, Inc., Kobe, Japan) and a normal breathing pattern was initiated. Five respirator models (PB840, Covidien, USA; Servo-i, Maquet, Solna, Sweden; e360, Newport Medical, Mansfield, MA, USA; Hamilton-C2, Hamilton Medical AG, Bonaduz, Switzerland; V60, Phillips Respironics, Andover, MA, USA) were connected to the helmet-type interface and examined with various pressure-support settings: 0, 5, 10, and 15 cmH_2O, with 5 cmH_2O of constant positive end-expiratory pressure. Noise intensity was measured both inside, at the mannequin's ears, and outside the interface, using lavalier microphones (ECM-88B, Sony Corp., Tokyo, Japan) and a sound-level meter (NA-27A, Rion Co. Ltd., Tokyo, Japan), respectively. All measurements were performed in a quiet room. Sound data were recorded on a computer and later analyzed with SoundEngine software (Soundengine.jp, Tokyo, Japan).

RESULTS. The tables below show the measured noise intensity levels. The PB840 produced the highest level of noise: 21–33 db at the inspiration site and 18–28 db at the expiration site, increasing in proportion to the peak inspiratory pressure-support flow.

Noise intensity of inside the helmet

	PB840	V60	Servo i	C2	e360
Measurement site of the helmet	Left/right (dB)	Left/right (dB)	Left/right (dB)	Left/right (db)	Left/right (dB)
Pressure support (cmH_2O) 0	21/18	Not detectable (N.D)/N.D	5.6/5.7	N.D/N.D	N.D/N.D
5	22/18	8.5/8.3	8.8/8.2	N.D/N.D	N.D/N.D
10	30/25	18/17	13/11	14/12	7.2/5.6
15	33/28	22/18	20/17	16/14	14/12

Noise intensity of outside the helmet

Pressure support (cmH_2O)	PB840 (dB)	V60 (dB)	Servo i (dB)	C2 (dB)	e360 (dB)
0	61.9	49.9	55	51.5	53.1
5	63.9	50.8	54	52.2	53.7
10	64.8	53.8	56.9	52.1	55.2
15	66.6	54.5	58.1	54.2	58.7

CONCLUSIONS. Our results suggest that the PB840 is the noisiest respirator, of those tested in this study, for patients on NPPV using a helmet-type interface. However, noise intensity inside the helmet, compared with outside the helmet, was quite a bit lower than we initially expected.

0508
NON INVASIVE VENTILATION TO TREAT ACUTE RESPIRATORY FAILURE IN ICU: PREDICTIVE FACTORS OF FAILURE, PRACTICE AND IMPACT ON MORTALITY

A. Jamoussi[1], K. Belkhouja[1], K. Ben Romdhane[1], J. Ben Khelil[1], M. Besbes[1]

[1]Hospital A. Mami, Tunis, Tunisia

INTRODUCTION. Non invasive ventilation (NIV) represents an important tool of management of acute respiratory failure (ARF) in intensive care. Its effectiveness is widely proved in acute on chronic respiratory failure (AOCRF) [1] and in cardiogenic pulmonary edema (CPE) [2, 3] but remains uncertain for other ARF causes like acute asthma attack or ARDS.Analyze the risk of failure of NIV is important in deciding which patients should benefit by this ventilator technique.

OBJECTIVES. The primary endpoint of this study is to identify predictive NIV failure's factors. Secondary, our objectives were to describe the NIV practice in our respiratory ICU during 3 years (2007–2009) and to assess the impact of NIV failure on mortality in ARF from different aetiologies.

METHODS. We conducted a retrospective observational cohort study using prospectively collected data over a 3-year period (from 1st January 2007 to 31 December 2009), including hospitalized patients in ICU, that underwent NIV for at least 1 h. We identified three groups:Group I: patients admitted for cardiogenic pulmonary edema (CPE) or acute on chronic respiratory failure (AOCRF). Group II: patients admitted for de novo ARF (no underlying pulmonary disease). Group III: asthmatic patients admitted for acute asthma attackFinally, an other group called 'weaning' was considered: among patients intubated after NIV failure, those who had NIV during the 48 h after extubation, either to treat or to prevent extubation failure.In all patients, we recorded demographic, clinical, arterial blood gases and outcome data.

RESULTS. During the study period, we have admitted 1,636 patients. Among them, 608 (38.7 %) were treated with NIV for ARF due to different causes. The demographic and clinical characteristics are shown in Table 1.

After exclusion of patients having NIV with a 'do not intubate' order, we studied the rate and the independent risks of NIV failure. The results are shown in the Table 2.

When NIV failed, mortality rate was significantly higher than NIV success patients. This result was available in all groups.
In the 'weaning group' composed of 94 patients, 65 (69.1 %) were successfully discharged.

Patient characteristics according to different group

	Group I (n = 507)	Group II (n = 53)	Group III (n = 48)	All groups (n = 608)
Age	62.2 ± 14.1	52 ± 16.5	38.8 ± 12.3	59.4 ± 15.7
Sex-ratio	2.3	1.4	1.2	2.1
SAPS II	34.2 ± 15.1	45 (19–112)	22.5 (9–61)	34.9 ± 16.6
APACHE II	17.8 ± 7.8	23.1 ± 11	12 (4–35)	18 ± 8.3
GCS ≤ 8	45 (8.8 %)	5 (9.4 %)	6 (12.5 %)	56 (9.2 %)
EPR ≥ 3	116 (22.8 %)	13 (24.5 %)	11 (23 %)	140 (23 %)
pH (H0)	7.26 ± 0.09	7.38 ± 0.10	7.24 (6.93–7.44)	7.26 ± 0.10
PaCO2 (H0)	81.5 ± 27.4	38.4 ± 14.7	54.4 (27.9–151)	76.2 ± 29.4
PaO_2/FiO_2 (H0)	184 ± 90	72 (41–307)	210 (82–422)	178.8 ± 91

Rates and independent predictive risks of NIV fail

	All groups	Group I	Group II	Group III
n	608	507	53	48
NIV failure (%)	37.9	35.8	82	12.5
Inepandant risk factors of NIV failure	SAPS II ≥33—PaO_2/FiO_2 à H4 <150—de novo ARF group	APACHE II ≥17—pH (H4) < 7.25	EPR score ≥3	None

CONCLUSIONS. The rate of NIV failure varies according to ARF aetiology. The lower NIV failure rate was in the asthma group. A higher mortality in case of NIV failure witnesses the gravity of patient non-responders to NIV.Nevertheless, if imminent intubation is not considered, NIV should always be tried at first, under close observation.
REFERENCE(S). 1. Brochard L et coll. N Engl J Med 1995;333:817–8222. 2. Masip J and coll. LANCET 2000;356:2126–21323. 3. Girou E et coll. JAMA 2003;290:2985–2991.

0509

NONINVASIVE VENTILATION IN THE VULNERABLE ELDERLY: EXPERIENCE OF AN EMERGENCY DEPARTMENT

E. L'Her[1,2], M. Ollivier-Coutant[1]

[1]CHU de Brest/Université de Bretagne Occidentale, Urgences Adultes, Brest, France, [2]Université de Bretagne Occidentale, CHRU de Brest, LATIM INSERM UMR 1101, Brest, France

INTRODUCTION. Due to an aging population, the number of elderly patients admitted to the emergency department for an acute respiratory failure is increasing. The question of noninvasive ventilation (NIV) in this population has fewly been questionned.
OBJECTIVES. To evaluate the practice of NIV in vulnerable elderlies and to assess its impact on mortality.
METHODS. A 4 years retrospective cohort study (10/2007–10/2011); all datafiles from patients aged 75 years or more and admitted to the emergency department for dyspnea were monitored. NIV practice was evaluated according to a previously published algorithm [1].
RESULTS. During the study period, 4,242 patients over 75 years were studied (84.1 years; >38 % over 85 years), of which 424 were considered as presenting an acute respiratory failure and to have at least one comorbidity. 217 patients were treated by NIV and 207 without NIV (30 % COPD exacerbations and 70 % cardiogenic pulmonary edema; NIV initiation in less than 52 min following ED admission). 33 % of the overall patients were considered as dependant and more than 19 % as presenting altered cognitive status. NIV vs nonNIV patients differed from pH (7.25 ± 0.009 vs 7.31 ± 0.09; $p < 0.05$), pCO_2 (71 ± 25 vs 62 ± 18 mmHg; $p < 0.05$), neurological status (14 vs 15; $p < 0.05$) and age (83 ± 5 vs 85 ± 5; $p < 0.001$), NIV being used in the acutely sicker, but younger and less dependent patients (comorbidities 2.2 vs. 2.5; $p < 0.03$). Early NIV efficiency in terms of dyspnea relief and arterial blood gases improvement was similar to what observed in younger patients. Only 9 % NIV were continued after transfer to an ICU. Early mortality (48 h) was higher for patients treated with NIV if more than 2 comorbidities were observed (26 vs. 8 %; $p = 0.015$), but 1-month mortality was similar in both groups (>28 %).
CONCLUSIONS. NIV is frequently performed in vulnerable elderlies, but its use in patients with more than two comorbidities may be questioned whereas early mortality is higher in this specific sub-group of patients. A prospective evaluation of NIV practice in vulnerable elderlies may take into account clinical and biological efficiency, overall prognosis and survival rate, but should also focus on comfort improvement and include a rapid reassessment of NIV indications and goals.
REFERENCE(S). 1. L'Her E, Elliot, Nava, Schönhofer ed. Non invasive ventilation in the elderly. Non invasive ventilation and weaning. Principles and practice. Hodder-Arnold 2010;438–445.

0510

NONINVASIVE VENTILATION (NIV) IN THE ADULT CRITICAL CARE UNIT (ACCU): PATTERNS OF USE, OUTCOMES, AND PREDICTORS OF FAILURE

C.J. Wright[1], J. Hornsby[2], D.A. Barr[3], S.R. Moonesinghe[2]

[1]Glasgow Royal Infirmary, Acute Medicine, Glasgow, United Kingdom, [2]University College Hospital London NHS Trust, Critical Care, London, United Kingdom, [3]Brownlee Institute, Infectious Diseases, Glasgow, United Kingdom

INTRODUCTION. The efficacy of NIV in type 2 respiratory failure secondary to exacerbations of COPD is well described [1], and it may also be of benefit in cardiogenic pulmonary oedema [2], however, its role in the management of acute respiratory failure outwith these indications is less clear.
OBJECTIVES. To report on use of NIV in the 35 bed ACCU at University College London Hospital (UCLH), UK with regard to patterns of use, outcomes, and predictors of failure.
METHODS. Retrospective service evaluation of NIV use in UCLH ACCU. Electronic records were reviewed for patients admitted from 01/11/10 to 02/12/11 and in whom NIV (BiLevel, CPAP, or both) was recorded on ≥6 occasions on the electronic chart. We excluded patients in whom NIV was ceiling of therapy and those using domiciliary NIV settings. The following data were collected: baseline demographics, primary respiratory diagnosis, co-morbidities, therapy received in ACCU, respiratory physiological variables, length of stay/unit outcome. Descriptive statistics of the cohort and variables associated on univariate and multivariate analysis with requirement for intubation were generated.
RESULTS. 129 patients met inclusion criteria. Pneumonia was the most common primary clinical indication for NIV (40.3 %). ARDS/ALI was the clinical indication group with the highest proportion of patients requiring intubation (71 %). Within the overall cohort 48.1 % of patients required intubation. Of those who required intubation 48.3 % died. All patients who avoided intubation survived. Length of stay was significantly longer in those who required intubation (median days 6 vs 16, $p = < 0.001$). Multivariable analysis of clinically relevant/plausible significant baseline physiology and markers of other non-respiratory organ failure revealed that the following variables were predictors of requirement for intubation: albumin at baseline (OR 0.92, $p = 0.04$), PaO_2/FiO_2 ratio at baseline (OR 0.92, $p = 0.02$) respiratory rate at baseline (OR 1.08, $p = 0.02$), and use of vasopressors and/or inotropes at any point during NIV (OR 4.34, $p = 0.03$).
CONCLUSIONS. Use of NIV in critically ill patients can be a high risk strategy, especially when used outwith conventional indications. Despite our small sample size, we found four routinely measured markers of organ dysfunction which are independent predictors of the requirement for intubation. Despite uncertainty over the generalizability of our results, in particular, the strong independent relationship between the requirement for cardiovascular support, and the failure of NIV therapy to prevent intubation, merits further evaluation in a larger cohort.
REFERENCE(S). 1. Brochard L et al. Noninvasive ventilation for acute exacerbations of chronic obstructive pulmonary disease. NEJM 1995;333(13):817–822. 2. Gray A et al., Noninvasive ventilation in acute cardiogenic pulmonary edema. NEJM 2008;359:142–151.

0511

THE ROLE OF NASAL CANNULA HIGH FLOW CONDITIONED OXYGEN THERAPY ON NON-INVASIVE MECHANICAL VENTILATION PERFORMANCE IN ACUTE RESPIRATORY FAILURE: A PRELIMINARY COHORT STUDY

G. Hernandez[1], C. Vaquero[1], P. Gonzalez[1], S. Garcia[1], A. Villasclaras[1], C. Pardo[1], E. De la Fuente[1], R. Cuena[2], R. Fernandez[3]

[1]Hospital Universitario Infanta Sofia, Intensive Care, Madrid, Spain, [2]Medical Council, Research Unit, Toledo, Spain, [3]Hospital Sant Joan de Deu-Fundacio Althaia, Intensive Care, Manresa, Spain

OBJECTIVES. To determine the role of active humidification and nasal cannula high flow conditioned oxygen therapy (HFO) associated to non-invasive mechanical ventilation (NIMV) on performance of NIMV and outcome of acute respiratory failure (ARF) critically ill patients.
METHODS. General ICU of a university hospital. Patients admitted to the ICU with acute respiratory failure initially selected to NIMV. Criteria indicating NIMV were $pH < 7.32$ in hypercapnic patients and $pO_2/FiO_2 \leq 120$ with $FiO_2 \geq 50$ % in hypoxemic patients. Prospectively recorded patients with active humidification during NIMV and HFO applied during disconnections from NIMV and a historical cohort without active humidification and conventional oxygen therapy during disconnections from NIMV matched for type and severity of respiratory failure, and admission diagnosis. The primary endpoint was the number of hours per day the NIMV was applied during the first 3 days of therapy. The secondary end-point was intubation rate. Statistical analyses included logistic multivariate model.
RESULTS. Each cohort included 49 patients. NIMV was applied for a longer period during the first day in cases (23.6 ± 0.1 vs. 22.1 ± 1, $p < 0.01$), but shorter period in successive days (day 2 18.3 ± 1.3 vs. 19.7 ± 1.6, $p < 0.01$; day 3 12.7 ± 2.6 vs. 18.7 ± 1.5, $p < 0.01$). Variables independently related to time of application differed in every day: day 1 (HFO, OR 1.4, 95 % CI 1.1/11.8, $p < 0.01$; hypoxemic ARF, OR 0.9, 95 % CI 0.4/0.9, $p < 0.01$; APACHE II, OR −1.6, 95 %CI −0.13/−2.2, $p = 0.03$), day 2 (HFO, OR −1.4, 95 % CI -0.4/−11, $p < 0.01$; ARF, OR −2.9, 95 % CI −0.8/−20.9, $p < 0.01$), and day 3 (HFO, OR −5.9, 95 % CI −0.9/−13.9, $p < 0.01$; age, OR 1.5, 95 % CI 1.1/2.2, $p = 0.02$). Intubation rate showed a trend toward a reduce rate in cases (12.2 % vs. 20.4 %, $p = 0.27$), however, the multivariate analysis for intubation, selected only APACHE II (OR 1.1, 95 % CI 1/1.2, $p = 0.04$) and hypoxemic ARF (OR 15.1, 95 % CI 1.4/159.5, $p = 0.02$).
CONCLUSIONS. The use of HFO supporting NIMV in ARF patients, improves the NIMV performance.

0512

COMFORT DURING HIGH-FLOW OXYGEN THERAPY THROUGH NASAL CANNULA IN CRITICALLY ILL PATIENTS: EFFECT OF GAS TEMPERATURE AND FLOW

D.L. Grieco[1], F. Toni[1], M.T. Santantonio[1], L. Spaziani[1], D. Natalini[1], F.A. Idone[1], L. Montini[1], M. Antonelli[1], S.M. Maggiore[1]

[1]Catholic University of the Sacred Heart, Policlinico A. Gemelli, Department of Anesthesiology and Intensive Care, Rome, Italy

INTRODUCTION. High-flow oxygen therapy through nasal cannula (Optiflow®, Fishel & Paykel Healthcare) is increasingly used in adult critically ill patients. In these patients, Optiflow has been reported to be more comfortable than Venturi mask[1]. The manufacturer recommends setting a high temperature (37 °C) on the heated humidifier (HH) to deliver the maximum level of humidity with the inspired gas. The relative contribution of gas humidity and gas flow on patient's comfort is however unknown.
OBJECTIVES. The aim of the present randomized, cross-over trial was to assess the effect of different gas temperatures and flows on patient's comfort during Optiflow.
METHODS. The study was performed in adult, collaborative ICU patients with a $PaO_2/FiO_2 < 300$ mmHg while undergoing oxygen therapy with Venturi Mask. In all patients, four optiflow settings were randomly applied: (1) low HH temperature (31 °C) with low gas flow (25 L/min) (LTLF), (2) low HH temperature with high gas flow (50 L/min) (LTHF), (3) high HH temperature (37 °C) with low gas flow (HTLF), and (4) high HH temperature with high gas flow (HTHF). Each step lasted 1 h. FiO_2 was initially set to achieve a target SpO_2 of 92–98 % (88–95 % in hypercapnic patients, i.e., those with a PaCO2 > 45 mmHg) and was kept unchanged throughout the study. At the end of each step, patient's discomfort related to dryness symptoms was assessed by asking patients to rate it on a visual analog

scale, from 0 (no discomfort) to 10 (maximum discomfort). Respiratory rate and arterial blood gases were also recorded.
RESULTS. Thirty-six patients (SAPSII 41 ± 14, 42 % female, 19 % hypercapnic patients, 56 % post-extubation) were enrolled. At inclusion, PaO_2/FiO_2 was 198 ± 56 mmHg, $PaCO_2$ was 37 ± 9 mmHg, and respiratory rate was 25 ± 5/min. Total discomfort was similar in all steps ($p = 0.24$); however, discomfort related to nose dryness was lower with the low gas flow than with the higher gas flow ($p = 0.01$) independently from the HH temperature. Two patients self-removed the device with the higher gas flow at both HH temperatures, while they well tolerated the device with the low-flow settings ($p = 0.18$). Independently from the gas temperature, PaO_2/FiO_2 was greater with the higher gas flow than with low flow ($p < 0.001$), while respiratory rate ($p = 0.12$) and PaCO2 ($p = 0.82$) were similar in all steps. There was a weak, although significant, inverse correlation between the baseline PaCO2 and the average discomfort with the Optiflow (rho = −0.37; $p = 0.03$).
CONCLUSIONS. Our data suggest that patient's comfort during optiflow does not change with low and high gas temperatures and humidity levels. A higher gas flow is associated with a better oxygenation and a greater discomfort related to nose dryness than a low flow.
REFERENCE(S). 1. Idone FA et al. Nasal high-flow oxygen therapy vs standard oxygen therapy via Venturi maskafter extubation: preliminary results of a randomized, controlled trial. Intensive Care Med 2010;36:S112.

0513
COMPARISON OF TRIGGER DELAY, PRESSURIZATION CAPACITY AND PATIENT-VENTILATOR SYNCHRONY DURING NON-INVASIVE VENTILATION DELIVERED BY OLD AND NEW GENERATION TURBINE BASED ICU AND HOME VENTILATORS

L. Piquilloud[1], G. Paratte[1], J. Verhoeven[2], D. Thevoz[1,3], B. Belmondo[1,3], P. Jolliet[1], J.-P. Revelly[1]

[1]University Hospital of Lausanne (CHUV), Adult Intensive Care and Burn Unit, Lausanne, Switzerland, [2]Physiotherapy School, Liège, Belgium, [3]University Hospital of Lausanne (CHUV), Cardio-Respiratory Physiotherapy Unit, Lausanne, Switzerland
INTRODUCTION. Both ICU and home turbine-based ventilators can be used to deliver NIV to patients with acute respiratory failure (ARF). However, little is known about the relative clinical performances and patient-ventilator interactions of ICU versus home ventilators.
OBJECTIVES. To compare trigger delay (Td), pressurization capacity and patient-ventilator synchrony observed with four old and new generation home and ICU turbine-based ventilators in patients with ARF.
METHODS. Four 20-min NIV sessions (using initial clinician's settings of inspiratory and expiratory pressure for all ventilators) were delivered in random order with the following devices: VPAP3®, Resmed (old home ventilator), Stellar150®, Resmed (new home ventilator), BiPAP vision®, Philips (old ICU ventilator) and V60®, Philips (new ICU ventilator). Pressure–time and flow-time tracings were recorded by a flow sensor placed within the ventilator circuit. Surface electromyogram of the diaphragm (sEMG) was also recorded. Td, pressure–time product during the triggering phase (PTPtrigger) and pressure–time product at 500 ms (PTP500) were computed from the recorded curves. Mean respiratory rate and the number of ineffective efforts during each NIV session were also computed from the curves. Patient comfort was evaluated twice during each NIV session using a visual analog scale graduated from 0 to 10. Comparisons between ventilators were performed by ANOVA for repeated measurements (post hoc test: Newman–Keuls). P value <0.05 considered as significant.
RESULTS. (mean ± SD): 20 patients were included, 7 known for chronic pulmonary disease (5 COPD, 1 restrictive syndrome and 1 mixed obstructive and restrictive syndrome). Age 66 ± 13 years, BMI 25 ± 7 kg/m^2. At inclusion, respiratory rate was 24 ± 5 cycles/min, $PaCO_2$ 39 ± 8 mmHg, PaO_2 77 ± 22 mmHg (with O_2 supplementation between 2 and 10 l/min).

Clinical performances of NIV ventilators

Ventilator	Td (ms)	PTP trigger (s × cmH_2O)	PTP500 (s × cmH_2O)	Ineffective efforts by minute
VPAP3®	148 ± 40 (b, c, d)	0.73 ± 0.26 (d)	2.9 ± 1.0 (b, c, d)	0.2 ± 0.3 (c, d)
Stellar150®	129 ± 28 (a, d)	0.72 ± 0.20 (d)	3.7 ± 1.1 (a, c, d)	0.3 ± 0.4
BiPAP-vision®	113 ± 13 (a, d)	0.66 ± 0.20 (d)	4.1 ± 1.3 (a, b)	0.6 ± 0.5 (a)
V60®	99 ± 14 (a, b, c)	0.58 ± 0.14 (a, b, c)	4.0 ± 1.0 (a, b)	0.6 ± 0.4 (a)

[a]Different from VPAP3

[b]Different from Stellar

[c]Different from BiPAP-vision

[d]Different from V60

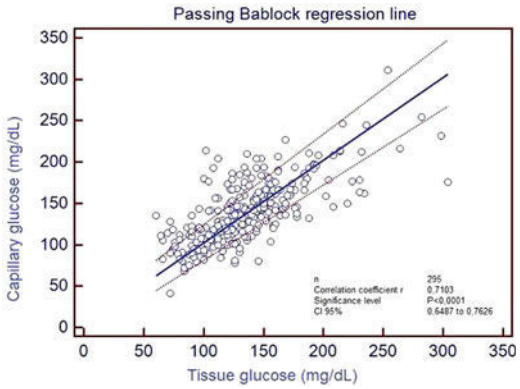
Mean respiratory rate and comfort were not different between the four ventilators tested.
CONCLUSIONS. In ICU patients suffering from acute respiratory failure, NIV delivered with turbine-based ICU-ventilators afforded better pressurization and a shorter response time in comparison to home-ventilators. However, respiratory comfort was similar for all ventilators. As previously published few ineffective efforts occurred during NIV delivered by turbine-based ventilators. Interestingly, the number of ineffective efforts was lower when turbine-based ventilators were used.

Glucose monitoring & control: 0514–0527

0514
CONTINUOUS GLUCOSE TISSUE MONITORING IN CRITICALLY ILL PATIENTS WITH DISTRIBUTIVE SHOCK. CORRELATION WITH INTERMITENT CAPILLARY BLOOD GLUCOSE CONTROL

D. Ballesteros Ortega[1], O. Martínez González[1], R. Blancas Gómez-Casero[1], C. Martín[1], M.B. López Matamala[1], B. Estébanez[1], M. Chana[1]

[1]Hospital Universitario del Tajo, Intensive Care, Aranjuez, Spain
INTRODUCTION. Hyperglycemia is frequent in critically ill patients, appearing in 90 % of them. Recent reports have shown that uncontrolled glycemia produces an adverse effect on mortality.
Subcutaneus continuous glucose monitoring system (CGMS) are used in diabetics outpatients, allowing real-time continuous monitoring. These devices have not been incorporated into the intensive care unit. There are limited studies on its use in the unestable patient, although most show a good correlation between the values obtained with the CGMS and intermittent glycemia obtained by blood glucose measurements.



Passing bablock regresion line

OBJECTIVES. Assess the reliability and accuracy of a continuous subcutaneous glucose monitoring system (CGMS) in comparison with capillary glucose (CG), in patients with distributive shock.
METHODS. A prospective, validation study in a medical-surgical intensive care unit (ICU) at a university hospital was carried out. Admitted patients with a diagnosis of distributive shock and needing insulin infusion for controlling glycemia were included. A CGMS was inserted at the abdominal wall. CG was monitored for adjusting insulin perfusion following the ICU protocol. Pairs of CGMS and CG were assessed for correlation, comparing the values obtained during the first 72 h after the placement of the CGMS.
RESULTS. Twenty-three patients were included in the study. In five patients, CGMS failed to detect tissue glucose. A glucose value <60 mg/dl was observed in 3.6 % of CGMS and in 0.29 % CG values. Two hundred and ninety-five pairs of measurements were included in the statistical analysis for correlation assessment. The intraclass correlation coefficient was 0.706 (substantial agreement). The Pearson correlation coefficient was 0.71 ($p < 0.0001$, 95 % CI 0.65–0.76). The mean of differences of both measurement methods was 3.98 mg/dl (95 % CI 0.66–7.31). The Passing-Bablok plot showed a positive linear correlation among both methods of glucose monitoring.
CONCLUSIONS. CGMS is a reliable and accurate method for monitoring glucose control in critically ill patients with distributive shock. CGMS can detect more episodes of wide glycemic excursions outside the normal range than intermittent CG monitoring does. Variables that may impair glucose metabolism and peripheral soft tissues perfusion could impair CGMS measurements.
REFERENCES. 1. Preiser JC et al. A prospective randomised multi-centre controlled trial on tight glucose control by intensive insulin therapy in adult intensive care units: the Glucontrol study. Intensive Care Med 2009. 2. NICE-SUGAR Study Investigators. Intensive versus conventional glucose control in critically ill patients. N Engl J Med 2009. 3. Goldberg PA et al. Experience with the continuous glucose monitoring system in a medical intensive care unit. Diabetes Technol Ther 2004. 4. Lorencio C et al. Real-time continuous glucose monitoring in an intensive care unit: better accuracy in patients with septic shock. Diabetes Technol Ther 2012.

0515
CONTINUOUS SUBCUTANEOUS GLUCOSE MONITORING AT THE INTENSIVE CARE UNIT: NURSING WORKLOAD REDUCTION AND COST-BENEFIT ANALYSIS

M.K. Sechterberger[1,2], J.H. de Vries[2], R.J. Bosman[1], P.H.J. van der Voort[1]

[1]Onze Lieve Vrouwe Gasthuis, Intensive Care, Amsterdam, Netherlands, [2]Academic Medical Center, University of Amsterdam, Internal Medicine, Amsterdam, Netherlands
INTRODUCTION. Continuous glucose monitoring (CGM) in ICUs has the potential to improve glycaemic control and thereby enhance patient safety and outcomes. Furthermore, CGM may reduce nursing workload related to glucose control.
OBJECTIVES. The primary objective of this study was to assess the influence of real-time CGM on nursing workload for glucose control, compared to intermittent point-of-care glucose measurements (POCM) in patients admitted to the ICU and treated with insulin. We also estimated the net financial benefit or cost of using CGM systems in a critical care setting.
METHODS. We used data of a recent randomized controlled trial at the ICU of a teaching hospital in the Netherlands comparing subcutaneous glucose monitoring with real-time CGM (FreeStyle Navigator®) versus conventional POCM (arterial blood sampling by use of the Accu-Chek® glucometer). The main outcome of this substudy was nursing workload defined as the time burden for glucose control per patient per day (24 h). A time-motion analysis was used to estimate the nursing workload. We additionally performed a cost-benefit analysis in which we assessed the average difference in costs using either real-time GCM or conventional POCM. Cost parameters were nursing personnel costs, costs of the devices and materials used for blood glucose monitoring and laboratory costs. Subsequently, the incremental cost-effectiveness ratio (difference in costs divided by the percentage difference in nursing workload) was calculated.
RESULTS. We analyzed data of 78 patients with CGM versus 77 patients with POCM. The average total time burden for glucose control in the CGM group was 49 (44–58) min per 24 h, whereas in the POCM group the total time burden was 70 (64–81) min ($p < 0.001$). The mean reduction in total nursing workload for glucose control was 30 % or 21 min per patient per 24 h. Mean total costs per patient per day were slightly less in patients randomized to CGM (EUR 64) compared to patients randomized to POCM (EUR 89, difference EUR 25; 95 % CI −43 to 29). The incremental cost-effectiveness ratio was—EUR 83, indicating the superiority of real-time CGM over conventional glucose control.

CONCLUSIONS. This study shows that in ICU patients the use of continuous subcutaneous glucose monitoring significantly reduces the nursing workload for glucose control and costs were reduced compared to conventional glucose monitoring with intermittent point of care measurements.

0516

THE ABILITY OF VARIOUS GLUCOSE VARIABILITY METRICS FOR MORTALITY PREDICTION IN CRITICALLY ILL PATIENTS: A COMPARATIVE STUDY

S. Kokkoris[1,2], E. Kyriakides[1,3], I. Constantinou[4], L. Loizou[4], N. Stylianides[3,5], M. Dikaiakos[4], S. Nanas[6], T.C. Kyprianou[1,2,3]

[1]Nicosia General Hospital, Dept of Intensive Care Medicine, Nicosia, Cyprus, [2]St Georges University of London Medical School at University of Nicosia, Nicosia, Cyprus, [3]Intensive Care Forum NGO, R&D Division, Nicosia, Cyprus, [4]University of Cyprus, Dept of Computer Science, Nicosia, Cyprus, [5]University of Cyprus, Dept of Electrical Engineering, Nicosia, Cyprus, [6]Evangelismos General Hospital, First Critical Care Dept, Athens, Greece

INTRODUCTION. Glucose variability (GV)/hyperglycaemia have been associated with excess mortality by increasing oxidative stress, neuronal/mitochondrial damage, and coagulation activity. Experimental models showed that rapid and frequent fluctuations of blood glucose levels (BGL) are even more detrimental than sustained hyperglycaemia.

OBJECTIVES. To compare the ability of the various methods of GV measurement for mortality prediction in a general adult ICU population.

METHODS. This was a retrospective, single-center study including all consecutive patients admitted to a general adult ICU. Patient data were retrieved from their EMR, from Nov 2011 to Dec 2012. Exclusion criteria: Length of stay in the ICU less than 48 h (511 patients), death occurring in less than 48 h (79 patients). BGL measurements were retrieved and GV was estimated using 13 methods. Statistical analysis: Mann-Witney *U* test, Chi square test, logistic regressions, ROC analysis. Comparisons between ROCs were performed by the DeLong test.

RESULTS. Initially, 914 patients were screened. Of them, 324 patients were eventually included in the analysis. The mean ± SD values for age, SAPS II and SOFA were 60 ± 17 years, 46 ± 19 and 8 ± 4, respectively. 66 % were males, 17 % were diabetics, while the ICU and hospital mortality were 25 and 29 %, correspondingly. The mean (±SD) number of glucose measurements per patient per day was 12 ± 13. All methods of GV measurement, except of mean absolute glucose change per patient per hour (MAG), were significantly different between survivors and non-survivors in the univariate analyses. The ROC analyses revealed that the mean daily delta BGL (mean of daily difference between minimum and maximum BGL) was the best predictor of death compared to the others, with an AUC of 0.74, which was not significantly different from that of SAPS II score (0.77). A reference clinical model for mortality prediction was constructed by including a priori selected parameters (age, gender, SAPS II, DM) in a multivariate logistic regression model (model's AUC = 0.788). The predicted probabilities of this model were used for subsequent ROC analyses. Each method of GV measurement was added to the model and comparison between the AUC of each new model and that of the reference model was made. The model including mean daily delta BGL was the only which had significantly higher predictive ability compared to the reference model (AUC = 0.82, p = 0.02).

CONCLUSIONS. The majority of GV metrics showed fair performance for mortality prediction, with the exception of the mean daily delta BGL, which had significantly higher performance compared to most of the others, being comparable to that of SAPS II as well.

REFERENCES. Eslami S et al. Intensive Care Med (2011);37:583–593.

GRANT ACKNOWLEDGEMENT. EU INTERREG cross-border co-operation program 2007–2013: C (2008) 1131/28-03-2008 Call ID: K1, Protocol ID: 9115, Contract No: K1_3_02.

0517

ECONOMIC EVALUATION OF A STRICT GLUCOSE CONTROL-GUIDELINE IN CRITICALLY ILL PATIENTS, FOCUSING ON COSTS OF POINT-OF-CARE TESTING OF GLUCOSE

R.T.M. van Hooijdonk[1], L.M.G. Steuten[2,3], H. Monteban[4], M.R. Mulder[5], F. van Braam Houckgeest[6], J.P. Sluijs[7], A. Abu-Hanna[8], P.E. Spronk[1,9], M.J. Schultz[1]

[1]Acadamic Medical Center, University of Amsterdam, Department of Intensive Care, Amsterdam, Netherlands, [2]PANAXEA bv, Enschede, Netherlands, [3]University of Twente, Department of Health Technology and Services Research, Enschede, Netherlands, [4]Monteban Value Services, Amerongen, Netherlands, [5]Roche Diagnostics International Ltd, Rotkreuz, Switzerland, [6]Tergooi Hospitals, Hilversum, Netherlands, [7]Medical Center Haaglanden, The Hague, Netherlands, [8]Academic Medical Center, University of Amsterdam, Department of Medical Informatics, Amsterdam, Netherlands, [9]Gelre Hospitals, Department of Intensive Care, Apeldoorn, Netherlands

INTRODUCTION. Point-of-care testing of blood glucose (BG-POCT) is mandatory for safe insulin infusion in critically ill patients. Costs associated with BG-POCT are seen as substantial, especially when more frequent BG-monitoring is needed, as with strict glucose control. Costs of POCT, however, should not be considered in isolation, but as part of the (financial) benefits of strict glucose control, as well as other costs associated with use of the insulin infusion guideline.

OBJECTIVES. We hypothesize cost of BG-POCT to increase total costs of hospital care after implementation of an insulin titration guideline mandating more frequent BG-monitoring.

METHODS. This is a secondary analysis of a project of implementation of strict glycemic control in three mixed medical-surgical Dutch ICUs [1]. A health-economic model including health states 'target glucose', 'hypoglycemia', 'hyperglycemia', and hospital death was developed to compare expected costs, the number of patients in target and the number of life years saved, between loose and strict glucose control.

RESULTS. The median number of BG-measurements per patient per day increased from 4.2 in the group of patients 12 months before implementation (N = 1,321), to 8.7 in the group of patient 24 months after implementation (N = 2,175), of strict glycemic control. Total costs for BG-POCT increased with 72 % per patient per day. Yet, when taking all main hospital costs and effect measures into account, strict glucose control with BG-POCT is expected to reduce hospital costs with €134 during the total inpatient stay, as patients spend less time in either hypo/hyperglycemic events and have shorter stays in the ICU (−0.5 day) and hospital (−1.1 day). This translates into expected cost savings of €13 per additional patient in target glucose and with €10 per additional life year saved, compared to the loose glucose monitoring protocol. As long as costs of BG-POCT do not exceed €19 per patient per day then, ceteris paribus, the strict protocol as applied in this study remains cost neutral.

CONCLUSIONS. This health-economic model shows that the additional costs of BG-POCT with strict glucose control are fully offset against the savings generated by reduced hypo/hyperglycemic events and length of ICU/hospital stay. Indeed, the strict glucose control protocol can improve quality of care in a budget-neutral way, even when BG-POCT costs would be slightly higher.

REFERENCE(S). 1. Schultz MJ, et al. Minerva Anestesiol 2012;78(9):982.

GRANT ACKNOWLEDGMENT. The implementation project was supported by a grant from the Netherlands Organization for Health Research and Development. The health economic model development was supported by a grant from Roche Diagnostics International Ltd.

0518

CAUSES AND CONSEQUENCES OF EXTREME HYPOGLYCEMIA

L. Woittiez[1,2,3], J. van Pelt[4], K. Hoogenberg[2], M.W. Nijsten[3]

[1]Zaans Medisch Centrum, Department of Internal Medicine, Zaandam, Netherlands, [2]Martini Hospital, Department of Internal Medicine, Groningen, Netherlands, [3]University Medical Center Groningen, University of Groningen, Department of Critical Care, Groningen, Netherlands, [4]University Medical Center Groningen, University of Groningen, Department of Laboratory Medicine, Groningen, Netherlands

INTRODUCTION. Several conditions can lead to very low blood glucose levels. The causes and consequences of extreme hypoglycemia in otherwise unselected patients have not been studied in larger patient groups.

OBJECTIVES. Determine the major causes, relevant aggravating factors, and short-term and long-term consequences in adult patients of extreme hypoglycemia (EH), defined as glucose levels <20 mg/dL (i.e. ≤1.0 mmol/L). We also assessed the impact of the GRIP computerized glucose control system[1] that was implemented in 2005 in our intensive care unit (ICU).

METHODS. The study was performed in our 1,000-plus bed and 45 ICU bed tertiary hospital over a 12-year period. All blood glucoses in all patients recorded in the hospital information system were screened for results of <20 mg/dl. All these cases of EH were carefully assessed for either pre-analytical or analytical measurement errors. Patient characteristics, relevant department and phase of the hospital stay and potentially contributing causes were recorded. Short and long-term mortality were also determined.

RESULTS. Of all measurements recorded in the hospital information system, 670 measurements were <20 mg/dL, with 42 classified as errors. 514 patients were identified as having had true EH. After exclusion of 309 neonatal and 37 pediatric cases, 168 adult patients were further studied. Three categories of EH were identified: EH resulting from insulin or oral antidiabetics (including endocrinologic testing) (60 %), EH secondary to liver failure (35 %) and a small group of miscellaneous causes (5 %). An important fraction of EH's occurred in the intensive care unit (43 %). Medication that could have contributed to EH, either during endocrinologic testing or for the treatment of diabetes, was used in 107 patients (63 %). Metformin was used by 9 patients, but in none of them it was the presumed key cause for EH.

1-Year mortality was 2 % after EH due to endocrinological testing, 44 % in outpatients after diabetic treatment and 97 % after liver failure (P < 0.001). Before GRIP was introduced 6 cases of EH during insulin treatment occurred in the ICU. After GRIP no cases of insulin-induced EH were observed. Likewise the incidence of liver-failure associated EH decreased, presumably through the more timely initiation of glucose administration.

CONCLUSIONS. Survival after extreme hypoglycemia depends very strongly on the cause. The prognosis varies from good after endocrinological testing, to moderate after accidental self-overdosing of insulin to extremely poor after liver failure. We believe active prevention of hypoglycemia during impending liver failure deserves further study.

REFERENCE. 1. Vogelzang M, et al. Design and implementation of GRIP: a computerized glucose control system at a surgical intensive care unit. BMC Med Inform Decis Mak 2005;5:38.

0519

THE PREVALENCE OF UNRECOGNISED DIABETES AND CRITICAL-ILLNESS INDUCED HYPERGLYCAEMIA IN CRITICALLY ILL PATIENTS: A PROSPECTIVE OBSERVATIONAL STUDY

M.P. Plummer[1], A.V. Zaknic[1], B.A. Reddi[1,2], J. Raj[2], K. Sundararajan[1,2], M.J. Chapman[1], M. Horowitz[1], A.M. Deane[1]

[1]University of Adelaide, School of Medicine, Adelaide, Australia, [2]Royal Adelaide Hospital, Intensive Care Unit, Adelaide, Australia

INTRODUCTION. Unrecognised diabetes mellitus occurs, not infrequently, in both 'healthy' people living in the community and hospitalised patients. The prevalence of known diabetes in patients admitted to intensive care units (ICU) is estimated to be 15–20 %. ICU patients also commonly develop critical-illness induced hyperglycaemia (CIIH), or disordered glucose metabolism that normalises once the acute illness resolves. Recent observational data indicate that hyperglycaemia does not represent the same insult in all critically ill patients i.e. hyperglycaemia may be less deleterious in patients with pre-existing diabetes. Accordingly, the potential impact of acute glycaemia is dependent on a patient's chronic glucose control. There is, however, little information about the comparative prevalence of: (1) CIIH; (2) recognised diabetes; (3) unrecognised diabetes; and (4) 'normal' glucose tolerance, in the critically ill.

OBJECTIVES. To determine the prevalence of CIIH and both recognised and unrecognised diabetes in patients admitted to a tertiary level ICU.

METHODS. This prospective observational study compared 867 consecutive patients aged ≥18 years, admitted over a 9 month period, in whom glycated haemoglobin (HbA_{1c}) and blood glucose concentrations were measured during the first 2 days of their ICU admission. Patients were stratified into four groups; 'known diabetes', 'unrecognised diabetes', CIIH and 'normal' glucose tolerance. Known diabetes included patients with a documented history of either type-1 or type-2 diabetes. Unrecognised diabetes was defined as patients without a history of diabetes in whom $HbA_{1c} \geq 6.5$ %. The local medical officer of all patients in this category was contacted to ensure that a diagnosis of diabetes had not been made in the past. CIIH was defined (as per WHO guidelines) as patients in whom $HbA_{1c} < 6.5$ %, who had a fasting blood glucose ≥7.0 mmol/L and/or a random blood glucose ≥11.1 mmol/L. Patients with 'normal' glucose tolerance were defined according to

HbA_{1c} < 6.5 %, fasting blood glucose <7.0 mmol/L and no blood glucose ≥11.1 mmol/L. Data are median (range).
RESULTS. CIIH occurred in 45.4 % (394/867) of patients, known diabetes 21.2 % (of which 94.5 % were type-2), unrecognized diabetes 4.8 % and normal glucose tolerance in 28.6 %. In patients with known diabetes, HbA_{1c} was 6.7 % (4.3, 16.3) and in unrecognised diabetes 6.8 % (6.5, 12.3).
CONCLUSIONS. Impaired glucose tolerance occurs in the majority of critically ill patients and is most frequently attributable to critical illness induced hyperglycaemia (CIIH). While patients with known diabetes are frequently admitted to ICU, many of these patients have good glycaemic control prior to their admission.
GRANT ACKNOWLEDGMENT. Support for this trial was provided by a Diabetes Australia Research Trust Project Grant (CIA-Y13GDEAA).

0520
GLYCAEMIC CONTROL IN AUSTRALIA AND NEW ZEALAND BEFORE AND AFTER THE NICE-SUGAR TRIAL: A TRANSLATIONAL STUDY

K.-M. Kaukonen[1], M. Bailey[1], D. Pilcher[1,2,3], N. Orford[4], S. Finfer[5], R. Bellomo[1], The Australian and New Zealand Intensive Care Society (ANZICS) Centre for Outcomes & Resource Evaluation (CORE)

[1]Monash University, ANZIC-RC, Department of Epidemiology and Preventive Medicine, Melbourne, Australia, [2]ANZICS-CORE, Melbourne, Australia, [3]The Alfred Hospital, Department of Intensive Care, Melbourne, Australia, [4]Geelong Hospital, Intensive Care Unit, Geelong, Australia, [5]George Institute for International Health, Sydney, Australia
INTRODUCTION. The uptake of Intensive Insulin Therapy (IIT) [1, 2] before the NICE-SUGAR [3] trial in Australia and New Zealand (ANZ) and on the bi-national response to the trial is unknown. Yet such data would provide important information on the evolution of ANZ practice in this field.
OBJECTIVES. We aimed to study ANZ glycaemic control before and after the publication of the results of the NICE-SUGAR trial.
METHODS. All patients during a 2 years period before and after the publication of NICE-SUGAR study in ANZ were eligible. We used the mean 1st day glucose (Glu_1) (a validated surrogate of ICU glucose control) to define practice. The implementation of an IIT protocol was presumed if Glu_1 measurements was <6.44 mmol/L for a given ICU. Hypoglycaemia was categorised as moderate (glucose ≤2.2 mmol/L) or severe (glucose ≤3.9 mmol/L).
RESULTS. We studied 49 ICUs and 176,505 patients. No ICU practiced IIT before or after NICE-SUGAR. Overall, Glu_1 increased from 7.96 (2.95) to 8.03 (2.92) mmol/L ($p < 0.0001$) after NICE-SUGAR. Similar increases was noted in all patient subgroups studied (surgical, medical, insulin dependent diabetes mellitus, ICU stay >48/<48 h). The rate of severe and moderate hypoglycaemia before and after NICE-SUGAR study were 0.59 % vs. 0.55 % ($p = 0.33$) and 6.62 % vs. 5.68 % ($p < 0.0001$), respectively. Both crude and adjusted mortalities declined over the study period.
CONCLUSIONS. IIT had not been adopted in ANZ before the NICE-SUGAR study and glycaemic control corresponded to that delivered in the control arm of NICE-SUGAR trial. There were only minor changes in practice after the trial toward looser glycaemic control. The rate of moderate hypoglycaemias decreased along with such changes.
REFERENCE(S). 1. Van den Berghe G et al. Intensive insulin therapy in critically ill patients. NEJM 2001;345(19):1359–1367. 2. Van den Berghe G et al. Intensive insulin therapy in the medical ICU. NEJM 2006;354(5):449–461. 3. Finfer S et al. Intensive versus conventional glucose control in critically ill patients. NEJM 2009;360(13):1283–1297.
GRANT ACKNOWLEDGMENT. The study did not have external funding.

0521
CONTINUOUS ARTERIAL GLUCOSE MONITORING BY QUENCHED CHEMICAL FLUORESCENCE IN ICU PATIENTS AFTER CARDIAC SURGERY

S. Bird[1], L. Macken[1], O. Flower[1], F. Bass[1], N. Hammond[1], E. Yarad[1], S. Webb[1], N. Kennedy[1], A. Baker[1], C. Chau[2], M. Librande[2], P. Strasma[2], S. Finfer[1]

[1]Royal North Shore Hospital, Intensive Care, Sydney, Australia, [2]GluMetrics Inc, Irvine, United States
INTRODUCTION. Continuous glucose monitoring (CGM) has the potential to improve patient safety and outcomes in Intensive Care Units (ICUs). The GluCath Intravascular CGM System uses a novel quenched chemical fluorescence sensing mechanism to measure glucose concentration (BG) in arterial blood.
OBJECTIVES. We evaluated the performance of sensors deployed for up to 48 h via indwelling arterial catheters in 20 subjects following cardiac surgery. We analyzed qualitative (ease-of-use, workflow fit) and quantitative (accuracy vs. reference analyzer) data.
METHODS. Heparin bonded sensors were deployed via a standard 20 G radial artery catheter inserted for routine care. Sensors were inserted shortly after ICU admission; in vivo calibration was performed at 1 and 2 h and each morning. Glucose values were recorded every 10 s by the System. Reference samples were drawn hourly from the same arterial catheter and analyzed using a Radiometer ABL 800 Flex Blood Gas Analyzer (BGA). To avoid artifact during the blood draw and subsequent flush, reference samples were paired with sensor readings recorded 1 min prior to the blood draw. Diagnostic ultrasounds were performed pre and post sensor insertion, then daily to monitor arterial vessel patency, sensor placement and to document arterial catheter or sensor associated thrombus. Sensor accuracy is reported as mean bias, mean absolute difference (MAD), mean absolute relative difference (MARD), % of samples meeting ISO15197 (within ±20 % of reference measurements if BG ≥ 4.2 mmol/L) and % of samples within 12.5 % of the reference sample. Data are also presented as a modified Bland–Altman plot.
RESULTS. Arterial sensors were successfully deployed in all twenty patients and did not interfere with clinical care, blood pressure monitoring or blood sampling. Three arterial catheters failed unrelated to the presence of the sensor, resulting in early sensor removal. Ultrasound showed thrombus formation in two subjects, one involving the arterial catheter alone, one involving the arterial catheter and sensor. BG from 759 reference samples ranged from 4.8 to 13.5 mmol/L. Thirty-three paired BG readings were excluded, two due to out-of-range sensor readings associated with subject movement, three due to pre-analytic dilution error in the reference sample and 28 due to sensor failure in one subject (after 17 h indwelling). Arterial sensor accuracy compared to the BGA was a mean bias of −0.03 mmol/L, MAD of 0.53 mmol/L, MARD of 6.4 %. 86.3 % of paired sensor readings were within 12.5 % of the reference measurement; 97.0 % of arterial sensor measurements met ISO15197 criteria (Table 1; Fig. 1).
CONCLUSIONS. The GluCath System successfully measured glucose concentration continuously in ICU patients after cardiac surgery without compromising arterial line function or patient care.

Table 1

Number of participants	Paired points	Mean bias (mmol/L)	Aggregate MAD (mmol/L)	Aggregate MARD	Samples within 12.5 % of reference	Samples meeting ISO 15197 criteria
20	759	−0.03	0.53	6.4 %	86.3 %	97.0 %

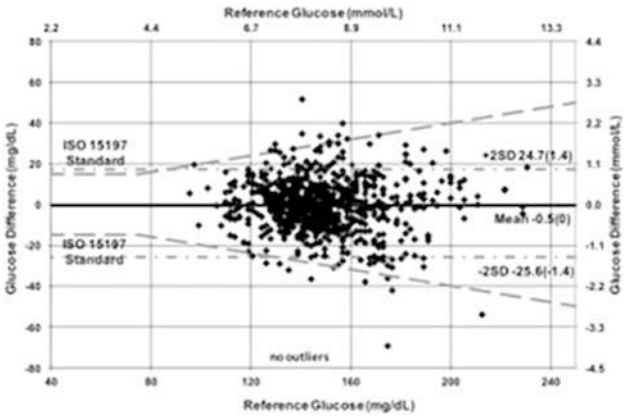


Figure 1

0522
THE SAFETY AND EFFICACY OF A SUBCUTANEOUS CONTINUOUS GLUCOSE MONITORING COMPARED TO POINT OF CARE MEASUREMENT IN CRITICALLY ILL PATIENTS: A RCT

D.T. Boom[1], S. Rijkenberg[1], S. Kreder[1], M.K. Sechterberger[1], R.J. Bosman[1], P.H.J. van der Voort[1]

[1]Onze Lieve Vrouwe Gasthuis, Intensive Care, Amsterdam, Netherlands
INTRODUCTION. Hyperglycaemia, hypoglycaemia and glucose variability are associated with adverse outcome of critically ill patients. Using a continuous glucose monitoring (CGM) system these disturbances in glucose regulation might be reduced. The reliability and accuracy of CGM using subcutaneous measurements has been studied in critically ill patients before.
OBJECTIVES. The present study aims to determine whether the clinical use of subcutaneous CGM is safe, effective and feasible in critically ill patients.
METHODS. In an open labeled randomized controlled trial patients were assigned to glucose regulation using a subcutaneous CGM system (FreeStyle Navigator®) or frequent point of care measurements (POCM) using Accu-Chek® (Roche) for 5 days or until ICU discharge. Blinded arterial blood glucose measurements were performed on standard times in both groups. Patients with POCM also had subcutaneous CGM but these data were blinded. Data from CGM or POCM were entered in the same computerized glucose regulation protocol which prescribed the insulin dose and the time of next data entering.
RESULTS. 178 Patients were included. Median APACHE IV was 0.32 (IQR 0.55) and 92 % were mechanically ventilated. 13 % were complicated cardiac surgery patients, the others medical patients. From 15 patients CGM data were lost for technical reasons, therefore 163 were analysed. Study duration was median 70 h (IQR 99) in the CGM patients and 60 h (IQR 89) in POCM patients ($p = 0.91$). We analyzed 2,844 glucose measurements, of which 1,358 were paired CGM-POCM. The time in target range (5–9 mmol/l) was median 57.5 h (IQR 74.4) in CGM patients and median 34.9 h (IQR 62.7) in POCM group ($p = 0.043$). The incidence of severe hypoglycemia (below 2.2 mmol/l) or severe hyperglycaemia (above 25 mmol/l) was similar in both groups ($p = 0.54$ resp $p = 0.09$) as well as the glucose variability in terms of mean absolute glucose change per hour (MAG). The total number of blood samples per patient was 25 for CGMS and 41 for POCM ($p = 0.001$). Hospital and ICU length of stay and mortality did not show any significant differences.
CONCLUSIONS. Glucose monitoring using a subcutaneous device was safe in terms of hypoglycaemia incidence and resulted in significantly more time in target range than the use of a point of care blood measurement. In addition, the number of blood samples was reduced.

0523
IS AVERAGE GLUCOSE LEVELS ASSOCIATED WITH HOSPITAL MORTALITY IN LOW-RISK ICU PATIENTS?

B. Yegneswaran[1], R.S. Parker[2], G. Clermont[2]

[1]UPMC, Erie, United States, [2]University of Pittsburgh, Pittsburgh, United States
OBJECTIVE. To determine how the association of average glucose and hospital mortality among critically ill patients depends of severity of illness.
METHOD. We conducted a chart review of MIMICII and HIDENIC databases, prospective cohorts of over 32,000 and 46,000 patients of a wide case-mix admitted to the ICUs of Beth Israel Deaconess Medical Center and the University of Pittsburgh Medical Center between 2001 and 2008. All admissions of patients ≥18 years without the diagnosis of DKA and non-ketotic hyperosmolar state were included. Diabetics were identified from ICD-9 discharge codes. Severity of illness was defined using a propensity score for death

(pDead) computed as the predicted hospital death from either SAPSI (MIMICII) or APACHEIII(HIDENIC) scores on the day of ICU admission. Average glucose (AVG) was computed as the area under the glucose curve throughout ICU admission. Hypoglycemia was defined as AVG ≤60 mg/dl. A patient was defined as low-risk if her pDEAD was less than the median. Patients were binned according to their AVG in bins of 10 mg/dl and crude mortality rates computed within bins and statistically significant mortality between adjacent bins was ascertained, following Bonferroni correction. Patients are low-risk and high-risk were analyzed separately. A multivariate model including AVG was also constructed.
RESULTS. MIMICII database 21,209 admissions met inclusion criteria. Mean age: 62.5 ± 16.4 years; female: 9,070 (42.8 %); diabetes 5,496 (25.9 %); mean admission SAP1 score: 13.8 ± 5.2; mean LOS: 9 days (IQR-6, 15); hospital mortality: 10.3 %. HIDENIC database 38,872 admissions met inclusion criteria. Mean age: 59.4 ± 17.3 years; female 16,675 (42.9 %); diabetes 11,326 (29.1 %); mean admission APACHEIII score: 80.2 ± 14; mean LOS: 11 days (IQR-7, 22); Hospital mortality: 14.3 %.In both low-risk and high-risk groups, there was a bathtub-like association between hospital mortality and AVG, with nadir mortality being flat between 80 and 130 mg/dl. Low & increased average glucose are associated with mortality. Mean pDead was 0.06 and the percentage of death was 6.6 % among low risk ICU patients, compared to 0.20 and 19.4 % in high-risk patients. Vasopressor, infection status, ventilator use, age of patients, glucose variability, average and maximum glucose levels where all significantly associated with mortality while diabetes had a protective effect in multivariate analysis.
CONCLUSION. In a large observational cohort, there is a strong relationship between average blood glucose and mortality in low-risk ICU patients, after adjustment for severity and process of care.
GRANT SUPPORT. Supported by National Institutes of Health (R21-DK-92813).

0524
EXPANDING ANALYTICS TO ASSESS GLYCEMIC CONTROL IN CRITICAL CARE

M.R. Rigby[1], T. Leong[2], C. Rider[1], T. Szakmany[3,4]

[1]Indiana University School of Medicine, Department of Pediatrics, Indianapolis, United States, [2]Emory University School of Medicine, Rollins School of Public Health, Atlanta, United States, [3]Royal Glamorgan Hospital, Anaesthesia, Critical Care and Theatres, Llantrisant, United Kingdom, [4]Cardiff University, Department of Anaesthesia, Intensive Care and Pain Medicine, Cardiff, United Kingdom

INTRODUCTION. Over the past decade glycemic control has become accepted care in critically ill patients. Although original studies suggested that targeting blood glucose (BG) in the 4.4–6.1 mmol/L range were optimal, subsequent studies and recommendations have suggested a more liberal upper limit, i.e. 8.3–10 mmol/L [1]. These recommendations are based on clinical studies that have assessed glycemic management based on averaging BG readings with little appreciation for the frequency of reading or ICU course.
OBJECTIVES. In order to better understand how outcome may correlate with BG readings over the course of an ICU stay, we developed an approach to assess and compare BG readings, time and area in and out of recommended ranges in ICU patients.
METHODS. We assessed BG readings, demographics and outcome of mechanically ventilated patients who were admitted to the Royal Glamorgan Hospital ICU, had a length of stay greater than 1 day and at least 5 blood glucose readings in 2011–2012. Timed BG readings were entered into proprietary software in which output includes average BG, BG standard deviation, and allows assessment of the number and percent of readings in defined BG ranges. In addition to number of readings, output includes time and area (time×BG level) in and out of preselected range of 4.4–8.3 mmol/L [1].
RESULTS. Out of the 203 eligible patients 185 were analysed. In 18 patients full outcome date was not available. Of the 185 patients 157 (77.3 %) survived. While gender did not differ between survivors (S) and non survivors (N/S) ($p > 0.05$), age (59 vs 67 years) was significantly different between groups ($p = 0.0039$). Although the average LOS for S was longer than for N/S (9.8 vs 8.3 days) ($p = 0.0002$), there were only 36 % more BG checks in the S vs N/S groups (49 vs 36). The average and standard deviation of all BG measurement for the S and N/S groups were 7.7 ± 1.6 and 8.3 ± 2 mmol/L ($p > 0.05$). When analyzing the BG results with our new method, the S and N/S were in range on average 85 and 72 % of the area, respectively ($p = 0.0134$). The average % area above the preselected range (8.3 mmol/L) in N/S was 25.7 % in contrast to 15.2 % for the S ($p = 0.0375$).
There was not a statistical difference between mortality groups and average % area under 4.4 mmol/L 0.13 S vs 2 % N/S, $p = 0.1228$).
CONCLUSIONS. One of the limitations of previous studies in ICU glycemic control may be the approaches used to quantify glycemic control, which may be influenced by the number and timing of BG levels. Our approach to assess use time and area weighted assessments and may assist in determining optimal therapeutic ranges and help in real-time assessments. The average % area within the normal range appears to be a more sensitive parameter to objectively measure the quality of glucose control on the ICU.
REFERENCE(S). Crit Care Med 2013;41:580–637.

0525
INCIDENCE, CAUSES AND CONSEQUENCES OF EARLY HYPOGLYCEMIA IN SEVERE TRAUMA PATIENTS

M. Wouters[1,2], R.A. Posma[1], L. van der Weerd[1], T.S. van Putten[1], K.W. Wendt[2], M.W. Nijsten[1]

[1]University Medical Center Groningen, University of Groningen, Department of Critical Care, Groningen, Netherlands, [2]University Medical Center Groningen, University of Groningen, Department of Surgery, Groningen, Netherlands

INTRODUCTION. Multiple trauma patients have increased energy needs caused by the injury and the subsequent systemic responses. Even in normally nourished persons glycogen stores may become inadequate after prolonged stress. Whether early hypoglycemia due to exhaustion might occur in trauma patients not been studied before.
OBJECTIVES. To determine the incidence and risk factors of hypoglycemia in multiple trauma patients and relate this to potential contributing factors and subsequent outcomes.
METHODS. A retrospective database review was conducted on all adult trauma patients (age ≥16 years) seen at our emergency department (ED) and subsequently admitted to the intensive care unit (ICU) between 1992 and 2011. The lowest glucose in the first 48 h after the time of the accident was determined for all patients. Age, diabetes status, alcohol use, interval between accident and treatment at the emergency department, injury severity score (ISS), transfusion requirements and core temperature at the ED and ICU were recorded. Outcome measures including hospital mortality were also recorded, to determine the relation between glucose and mortality. We subsequently selected patients with an episode of hypoglycemia defined as any glucose ≤4.5 mmol/L in the first 48 h after the accident. These cases were then matched on age, sex and year of admission with an equal number of controls. Cases and controls were studied in detail. We also recorded if any calorie-containing infusions or feeding were administered.
RESULTS. A total of 2,326 adult patients with mean ± SD lowest glucose of 6.0 ± 2.0 mmol/L and a hospital mortality of 22 % were studied. Multivariable logistic regression analysis showed that glucose, age, ISS and transfusion requirements were all significantly related to hospital mortality. Moreover glucose also displayed a significant U-shaped relation with outcome ($P < 0.001$), thus underscoring that low early glucose levels are associated with mortality. 247 patients had a lowest glucose of ≤4.5 mmol/L and were matched with another 247 control patients. Diabetes status was univariately associated with low glucose levels ($P = 0.02$) and alcohol use showed a trend towards low glucose levels ($P = 0.05$). The interval between accident and ED-admission was not related with hypoglycemia, but core temperature measured at the ED and later at the ICU was significantly lower in hypoglycemic cases versus controls: 35.8 ± 1.7 versus 36.3 ± 0.9 °C ($P = 0.002$). Upon multivariable analysis, a lower core temperature remained associated with hypoglycemia ($P = 0.015$).
CONCLUSIONS. Early hypoglycemia can occur in severe trauma patients and is associated with increased mortality. The association of a low body temperature with hypoglycemia suggests insufficient metabolism as a common mechanism. Whether early administration of larger amounts glucose to selected trauma patients might provide benefit, deserves further study.

0526
PROSPECTIVE STUDY EXPLORING PREDICTIVE VALUE IN BLOOD GLUCOSE CONCENTRATION AND BLOOD GLUCOSE VARIABILITY TO PROGNOSIS IN PATIENTS WITH SEVERE ABDOMINAL INFECTIONS

L. Xiaoyue[1], C. Li-Hua[1]

[1]Dongguan People's Hospital, Department of Critical Care Medicine, Dongguan, China

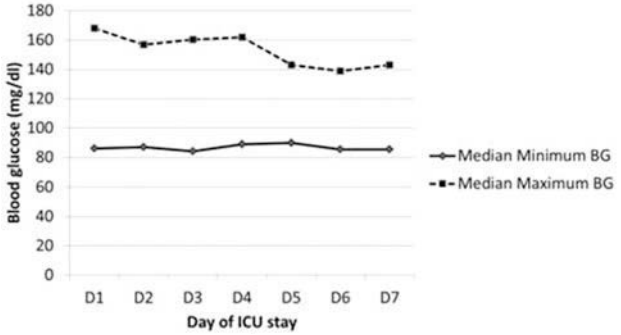
OBJECTIVES. To investigate the predictive value in blood glucose concentration and blood glucose variability to prognosis in patients with severe abdominal infections.
METHODS. A prospective study was conducted. Blood glucose monitoring and prognosis observation were performed for the adult nondiabetic patients with severe abdominal infections admitted in ICU from July 2012 to Feb 2013. Blood monitoring terminal was 24 h after admitted in ICU. Prognosis observation terminal was 7 days after admitted in ICU. The blood glucose concentration admitted in ICU, the maximum and minimum values of blood glucose were recorded. Acute physiology and chronic health evaluationII(APACHEII) scores, sequential organ failure assessment (SOFA), differential value of blood glucose(GLU_{dif}), average value of blood glucose (GLU_{ave}) and standard deviation (GLU_{sd}), coefficient of blood glucose (GLU_{cv}), mean absolute blood glucose fluctuation amplitude (MAGE) were calculated. Patients were divided into good prognosis group and bad prognosis group.
RESULTS. Forty-two patients were divided into good prognosis group ($n = 24$) and bad prognosis group ($n = 18$). There were no significantly differences in age, sex, primary disease, blood glucose concentration on admission, acute physiology and chronic health evaluation and sequential organ failure assessment between two groups ($P > 0.05$). GLU_{max}, GLU_{dif}, MAGE in good prognosis group were significantly lower than those in bad prognosis group ($P < 0.05$). Area under ROC of MAGE, GLU_{max} and GLU_{dif} were 0.806, 0.787 and 0.769. With a cut-off value of 15.4 mmol L^{-1}, GLU_{max} had a sensitivity of 77.8 % and a specificity of 83.3 %.
CONCLUSIONS. High blood glucose concentration and high blood glucose variability are important factors to bad prognosis in patients with severe abdominal infections. GLU_{max} during 24 h admission to ICU is a good index to predict prognosis for patients with severe abdominal infections. The cut-off value of GLU_{max} was 15.4 mmol L^{-1}.
REFERENCE(S). 1. Van den Berghe G, Wouters P, Weekers F, et al. Intensive insulin therapy in the critically ill patients. N Engl J Med 2001;345(19):1359–1367. 2. The NICE-SUGAR study investigators: Intensive versus conventional glucose control in critically ill patients. N Engl J Med 2009;360:1283–1297. 3. Levy MM, Fink MP, Marshall JC, et al. 2001 SCCM/ESICM/ACCP/ATS/SIS international sepsis definitions conference. Crit Care Med 2003;31(4):1250–1256. 4. Phillip Dellinger R., Mitchell M. Levy, Andrew Rhodes, et al. Surviving Sepsis campaign: international guidelines for management of severe sepsis and septic shock: 2012. Crit Care Med 2013;41(2):580–637. 5. Jacka MJ, Torok-Both CJ, Bagshaw SM. Blood glocose control among critically ill patients with brain injury. Can J Neurol Sci 2009;36(4):436–442.

0527
GLUCOSE DISORDERS IN CRITICALLY ILL CHILDREN IN A TERTIARY CARE INDIAN ICU

K. Naranje[1], B. Poddar[1], R. Lal[2], A. Baronia[1]

[1]Sanjay Gandhi Postgraduate Institute of Medical Sciences, Critical Care Medicine, Lucknow, India, [2]Sanjay Gandhi Postgraduate Institute of Medical Sciences, Pediatric Surgery, Lucknow, India

INTRODUCTION. Glucose disorders in the form of hyperglycemia, hypoglycemia and variability of blood glucose (BG) levels have been associated with adverse outcomes in critically ill children. Few studies are reported from developing countries.
OBJECTIVES. To study the incidence of hyperglycemia (BG ≥ 126 mg/dl), hypoglycemia (BG ≤ 60 mg/dl) and glucose variability in critically ill children in the first week of ICU stay and their association with mortality, length of ICU stay and organ dysfunction.
METHODS. Retrospective study of children (≤18 years) admitted to a combined adult and pediatric ICU of a tertiary care teaching hospital in India over a period of 9 years (March 2003–April 2012). Data was retrieved from the patient records and included demographic and clinical profile, severity of illness, indications for ICU admission and outcome. Maximum and minimum BG levels, insulin and steroid usage, and ICU interventions for first 7 days of ICU stay were noted. BG variability was defined as occurrence of hypoglycemia and hyperglycemia on the same day. Data was analysed using SPSS statistics version 17.0.
RESULTS. 391 children were admitted during this period; data is presented for 102 patients. The median age was 6 years (range 10 days to 18 years); 72 (70.5 %) were males.The median PRISM III score on day 1 was 9 (IQR 5–13.5). The median length of ICU stay was 4 days (IQR 2–6 days) and 33 (32.3 %) patients died during the ICU stay; majority 31 (93.9 %) were with medical conditions. Figure 1 shows median maximun and minimum BG levels in the first 7 days.



Median values of maximum and minimum BG

90 (88.2 %) out of 102 patients had hyperglycemia on at least one occasion in the first 7 days; 60 (58 %) had BG ≥ 180 mg/dl. Hyperglycemia was observed in 54 (88.8 %) of 61 medical patients and 36 of 41 (87.6 %) surgical patients. 36 (35.3 %) required insulin therapy. Hypoglycemia was seen in 42 (41.2 %); 7 (6.9 %) had BG ≤ 40 mg/dl. Variability of BG was seen in 33 (32.4 %) patients and was influenced by use of insulin (adjusted OR 3.5; 95 %CI 1.20–10.28 p = 0.02), suggesting iatrogenic effect. Steroid was used in 21.6 % and was unrelated to hyperglycemia. Z score <−2 was seen in 29 (28.4 %) and was a significant negative predictor of hyperglycemia (adjusted OR 0.23; 95 % CI 0.06–0.9 p = 0.04). Among steroid and vasoactive agents, number of days of vasoactive agent usage predicted BG ≥ 180 (adjusted OR 2.5; 95 % CI 1.17–5.15 p = 0.02). BG variability and hypoglycemia were seen significantly more often in non-survivors (19/33, 57.6 % and 4/33, 12.1 %) than in survivors (14/69, 20.3 % and 4/69, 5.8 %) respectively (p < 0.01). On logistic regression analysis, none of the abnormalities in glucose homeostasis predicted mortality or secondary outcomes.

CONCLUSIONS. Hyperglycemia was found in 88.2 % children admitted in our ICU and was unrelated to mortality. BG variability and hypoglycemia occurred more frequently in non-survivors than in survivors. Children with weight for age Z score <−2 were less likely to have hyperglycemia.

Heart failure: diagnosis & management: 0528–0541

0528
HEART ATTACK AND YOUNG PATIENTS

J. Muñoz-Bono[1], G. Jiménez-Pérez[1], J.M. Mora-Ordóñez[1], J.A. Arboleda Sánchez[1], M.D. Fernández-Zamora[1], G. Quesada-García[1]

[1]Carlos Haya Regional Hospital, Intensive Care Unit, Málaga, Spain

INTRODUCTION. Advanced age is a risk factor for acute myocardial infarction (AMI), but in young adults the AMI may have different characteristics from those of the older population.

OBJECTIVES. Aim of this study was to evaluate the clinical features and complications of the patients with acute coronary syndrome admitted in the Intensive Care Units.

METHODS. Multicenter observational and descriptive analysis of all patients under 45 years admitted for acute coronary syndrome (ACS) in 12 hospitals of Andalusia region from January 2008 to December 2012, included in the database ARIAM for acute coronary syndrome.

RESULTS. We collected 11,575 patients during the period of study of which 1,428 (12.3 %) were <45 years. The 67.3 % were admitted with the diagnosis of STEMI and 32.7 % with NSTEMI. 13 % were women. Only 5.7 % had no cardiovascular risk factor and 62.2 % had at least two cardiovascular risk factors associated. Stresses that 72.5 % of patients were smokers, 36.6 % were dyslipidemic and 27.4 % hypertension. The 24 % of patients had any complication during their hospital stay, being ventricular arrhythmias (VF/VT) the most common (6.1 %), followed by cardiogenic shock (2.2 %). Mechanical complications were infrequent being acute MI (0.8 %) the most commont. The 1.8 % had postinfarction angina during the evolution.The average stay of patients in the intensive care unit and hospital was 2.26 and 5.71 days respectively. Hospital mortality was 1.6 %.

CONCLUSIONS. The percentage of young patients with a novo coronary disease is not negligible and their morbidity is comparable to that of other patients, despite the protective effect would be expected from a younger age.

REFERENCE(S). Awad HH, McManus DD, Anderson FA Jr, Gore JM, Goldberg RJ. Young patients hospitalizad with an acute coronary syndrome. Coron Artery Dis 2013;24(1):54–60.

GRANT ACKNOWLEDGMENT. Ariam Researchers.

0529
ICU MORTALITY IN VERY ELDERLY PATIENTS ADMITTED FOR CARDIAC DISEASE

D. Gamero-Donis[1], J.A. Silva-Obregón[1], J.E. Romo-Gonzales[1], C. Marian-Crespo[1], J.M. Borrallo-Pérez[1], C. Martín-Dal Gesso[1]

[1]Hospital Universitario de Guadalajara, Intensive Care Unit, Guadalajara, Spain

INTRODUCTION. Nowadays patients over 80-year-old with ischemic myocardiopathy or bradiarrythmia are routinely admitted to intensive care unit (ICU).

OBJECTIVES. Our objective is to evaluate the mortality in this group of patients.

METHODS. Retrospective, descriptive analysis of all the cardiac patients older than 80 years admitted to ICU between January 2003 and May 2011. We divided the patients into two groups: ischemic (IM) and pacemaker (PM). ICU, in-hospital (HOS) and 12-month mortality was analyzed as well as mortality stratified by gender or reason for admission. We also evaluated the impact on mortality of endotracheal intubation (EI), considering as intubated all patients who died intubated or required more than 24 h of mechanical ventilation.

RESULTS. 673 very-elderly patients were evaluated in the study period, 25 patients were lost due to transfer to another hospital then 648 patients were analyzed. Of these 55.5 % (360) were cardiac patients. Mean age: 84.3 ± 3.3 years [p25 (81.7), p75 (86.2), 57.7 % (208)] were male. 71 0.7 (258) were admitted for IM and 28.3 % for PM.

A 8 % (29) needed EI: (1) IM 86 % (25) & PM 14 % (4); (2) 58.6 % (17) were male. There were no significant differences. Overall mortality: ICU 32 [8.9 % (CI 95 %; 5.8–11.9)], HOS 52 [14.4 % (CI 95 %; 10.6–18.2)], 12 M 77 [21.4 % (CI 95 %; 17.0–25.7)].

Mortality by gender: no significant differences. Male–female; ICU (9.6–7.9 %), HOS (15.4–13.2 %), 12 M (23.6–18.4 %). Mortality by groups: ICU: IM 11.6 % (30), PM 2 % (2); [RR 5.9; CI 95 %, 1.4–24.3, p = 0.04]. HOS: IM 17.8 % (46), PM 5.9 % (6); [RR 3.0; CI 95 %, 1.3–6.8, p = 0.04]. 12 M: IM 24.0 % (62), PM 14.7 % (15); (p = NS). Mortality in EI vs non-EI: greater in EI, with no differences by gender or group. ICU (62.1 vs 4.2 %); (RR 14.6; CI 95 %, 8.1–26.3, p < 0.001). HOS (65.5 vs 10 %); (RR 6.5; CI 95 %, 4.3–9.9, p < 0.001). 12 M (72.4 vs 16.9 %); (RR 4.3; CI 95 %, 3.1–5.9, p < 0.001).

CONCLUSIONS. In our study the main patient was a male with IM. We did not find significant differences in overall or gender mortality. Compared with PM, IM had an increased significant mortality in the ICU and in-hospital, although at 12 M mortality there were no differences. In terms of EI there were no significant differences by gender or reason of admission, but it is a determinant risk marker of mortality in patients due to an observed increase in mortality up to 72.4 % at 12 months.

0530
DIAGNOSTIC AND PROGNOSTIC PERFORMANCE OF CARDIAC TROPONIN-I IN A COHORT OF ADULT NON-TRAUMATIC EMERGENCY DEPARTMENT PATIENTS ACROSS TAIWAN

C.-Y. Chen[1], L.-M. Chen[1], K.-F. Chen[1], Y.-L. Chan[1]

[1]Chang Gung Memorial Hospital, Linkou, Emergency Medicine, Taoyuan, Taiwan, Republic of China

INTRODUCTION. Cardiac troponin-I (cTn-I) has been widely utilized as the biomarker of myocardial injury, especially acute myocardial infarction (AMI). However, many other clinical conditions, namely sepsis, chronic kidney disease and cerebrovascular accidents can also cause elevations of blood cTn-I level. Moreover, higher blood cTn-I levels in these conditions may also predict an unfavourable outcome.

OBJECTIVES. To investigate the diagnostic and prognostic values of cTn-I in a large cohort of the emergency department (ED) patients.

METHODS. Chang Gung Memorial Hospital (CGMH) has five branches (Keelung, Taipei, Linkou, Chiayi and Kaohsiung) across the island of Taiwan. Amongst the adult non-traumatic patients who visited the ED of CGMH between 2009 and 2011, those with a blood cTn-I level of >0.4 ng/ml and were subsequently admitted to the intensive care unit and the floor were identified, and their medical records were reviewed. Presence of AMI was identified from the discharging diagnostic codes. Data were shown as mean ± standard error of the mean.

RESULTS. Of the 4,675 patients with elevated blood cTn-I levels, only 2,854 (61.0 %) had the discharging diagnosis of AMI. AMI patients had higher blood cTn-I levels (9.7 ± 0.5 vs. 4.5 ± 0.3 ng/ml, p < 0.05), but their in-hospital mortality rate was lower (9.0 vs. 17.3 %; $p < 0.01$) compared with non-AMI patients. Setting the cut-off blood cTn-I level at 1.36 ng/ml yields highest combination of sensitivity (59 %) and specificity (60 %) in this patient cohort. After adjusting age and presence of shock, altered consciousness and AMI, blood cTn-I level has been found an independent predictor of death (p < 0.01).

cTn-I levels in co-morbidities

	Non-myocardial infarction		Myocardial infarction	
	n (%)	cTn-I (ng/ml)	n (%)	cTn-I (ng/ml)
Chronic kidney disease	121 (52.4)**	2.9 ± 1.0	110 (47.6)	4.4 ± 0.9
Sepsis	862 (56.5)**	4.0 ± 0.4	663 (43.5)	11.9 ± 1.7*
Liver cirrhosis	117 (74.5)**	3.9 ± 0.9	40 (25.5)	4.4 ± 1.0
Cerebrovascular accidents	113 (62.1)	5.2 ± 1.1	69 (37.9)	9.8 ± 2.3*
Fever	335 (66.3)*	4.9 ± 0.7	170 (33.7)	9.1 ± 1.4**

*p < 0.05; **p < 0.01

CONCLUSIONS. An elevated blood level of cTn-I does not always lead to the diagnosis of AMI. However, those who had higher blood cTn-I levels not attributable to AMI had higher mortality. Several kinds of co-morbidities can cause high blood cTn-I levels. However, regardless of the presence of AMI, blood cTn-I level is an independent predictor of death.

0531
HIGH SENSITIVITY TROPONIN ASSAY IN THE INTENSIVE CARE UNIT

M. Abubaker[1], H. Cooney[1], J. Brohan[1], G. Fitzpatrick[1]

[1]Tallaght Hospital, Anaesthesia/Intensive Care, Dublin 24, Ireland

INTRODUCTION. The cardiac isoform Troponin T (cTnT), only expressed in cardiac muscle, egresses rapidly from the myocyte following myocardial damage. cTnT and its detection in the blood using immunoassays is central to the diagnosis of myocardial infarction. Elevated cTnT can also occur in pulmonary embolism, heart failure, renal failure and sepsis and is usually associated with a worse prognosis [1] One study in septic patients found that mortality in patients with elevated cTnT was 83 % compared with 38 % in patients with no troponin elevation [2]. The new high sensitivity troponin assay (hs-cTnT) is a modification of the fourth generation troponin assay with improved analytical sensitivity and is thus able to detect more subtle elevations. The hs-cTnT assay was introduced to our hospital in June 2012.

OBJECTIVES. This observational study aimed to compare the prevalence of an elevated cTnT in our ICU patients in the 6 weeks after the introduction of hs cTnT with the prevalence of elevated cTnT in the 6 weeks before (using the older 4th generation assay).

METHODS. A retrospective review of all patients admitted to ICU in the 6 weeks before and after the introduction of the hs-cTnT assay was carried out. Clinical and biochemical data including daily troponin was obtained from the ICU clinical information system (Phillips Medical, Amsterdam). Statistical analysis was carried out using Social Science Statistics. Differences in categorical variables were tested for significance using Chi Square test. Continuous variables were tested using Mann–Whitney *U* test.

RESULTS. Seventy-six patients were admitted to ICU over the 12 weeks period. 51 % (n = 39) admitted in the first 6 weeks had daily cTnT measured using the 4th generation cTnT assay. Forty-nine percent (n = 37) admitted in the second 6 weeks and had troponin measured using the hs cTnT assay. There were no significant differences between the groups

with respect to renal replacement therapy, inotropic/vasopressor suport or incidence of arrythmias. 8 (20 %) of the patients admitted in the first 6 weeks had an elevated cTnT, 33 (89 %) of those admitted in the second 6 weeks had an elevated cTnT ($p < 0.0001$). Two of these 33 patients had a confirmed NSTEMI.
CONCLUSIONS. The highly significant difference in the cTnT between the two groups of patients tested with different assays and the high prevalence of troponin elevation detected with the new assay raises a number of clinically relevant questions: (1) Is this evidence of some degree of myocardial injury occurring in the vast majority of critically ill patients? (2) What are the prognostic implications of this injury.
REFERENCE(S). 1. Korff et al. Differential diagnosis of elevated troponins. Heart 2006;92:987993. 2. Spies et al. Serum cardiac troponin T as a prognostic marker in early sepsis. Chest 1998;113:1055–63.

0532
DIFFERENTIAL PROGNOSTIC VALUE OF ADMISSION PLASMA GLUCOSE ON 30-DAY MORTALITY IN CARDIOGENIC SHOCK WITH AND WITHOUT DIABETES MELLITUS

J.H. Yang[1], J.H. Lee[1], C.R. Chung[1], C.-M. Park[1], K. Jeon[1], G.Y. Suh[1]

[1]Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea, Republic of
INTRODUCTION. Admission glucose level is a predictor of mortality in patients with ST elevation myocardial infarction (STEMI). However, limited data are available on cardiogenic shock.
OBJECTIVES. We evaluated the additive predictive value of glucose level at admission to the Thrombolysis In Myocardial Infarction (TIMI) and Global Registry of Acute Coronary Events (GRACE) risk scores according to the presence or absence of diabetes mellitus.
METHODS. Using a prospective, multi-center registry in Korea between November 2005 and September 2010, 816 STEMI patients with cardiogenic shock were analyzed. Patients were categorized according to glucose levels at admission: <7.8, 7.8–10.9, 11.0–16.5 and ≥16.6 mmol/L. Primary outcome was 30-day mortality. The added values of glucose to the thrombolysis in myocardial infarction (TIMI) and Global Registry of Acute Coronary Events (GRACE) scores were assessed by receiver operating characteristic curves and integrated discrimination improvement analyses.
RESULTS. Thirty-day mortality was sequentially higher in patients with higher admission glucose (20.4, 23.3, 39.8, and 43.1 % $p < 0.001$). Among non-diabetic patients, 30-day mortality was predicted by TIMI scores with a *c*-statistic of 0.615 [95 % confidence interval (CI), 0.561–0.662) and GRACE scores with a *c*-statistic of 0.652 (95 % CI, 0.604–0.695). Incorporation of admission glucose increased the *c*-statistic for TIMI score to 0.685 (95 % CI, 0.639–0.720, $p < 0.001$) and GRACE score to 0.708 (95 % CI 0.664–0.742, $p < 0.001$). Additional predictive values for glucose were not observed for diabetes. Integrated discrimination improvements (TIMI vs. additional glucose and GRACE vs. additional glucose) were 0.041 ($p < 0.001$) and 0.039 ($p < 0.001$) in non-diabetic patients.
CONCLUSIONS. Admission glucose level was a prognostic factor of 30-day mortality and had an additional predictive value in establishing risk scores only in nondiabetics patients with cardiogenic shock.
REFERENCE(S). 1. Iwakura K, Ito H, Ikushima M, Kawano S, Okamura A, Asano K, Kuroda T, Tanaka K, Masuyama T, Hori M, Fujii K. Association between hyperglycemia and the no-reflow phenomenon in patients with acute myocardial infarction. J Am Coll Cardiol 2003;41:1–7. 2. Hoebers LP, Damman P, Claessen BE, Vis MM, Baan J, Jr., van Straalen JP, Fischer J, Koch KT, Tijssen JG, de Winter RJ, Piek JJ, Henriques JP: Predictive value of plasma glucose level on admission for short and long term mortality in patients with ST-elevation myocardial infarction treated with primary percutaneous coronary intervention. Am J Cardiol 2012;109:53–59. 3. Timmer JR, van der Horst IC, Ottervanger JP, Henriques JP, Hoorntje JC, de Boer MJ, Suryapranata H, Zijlstra F: Prognostic value of admission glucose in non-diabetic patients with myocardial infarction. Am Heart J 2004;148:399–404.

0533
HEMODYNAMIC EFFECTS IN THE ATRIAL CONTRACTION MODEL ON THE TOTAL ARTIFICIAL HEART USING CENTRIFUGAL BLOOD PUMPS WITH ADULT GOATS

T. Shiga[1,2], H. Miura[2], Y. Shiraishi[2], M. Yamauchi[1], T. Yambe[2]

[1]Tohoku University Graduate School of Medicine, Anesthesiology and Perioperative Medicine, Sendai, Japan, [2]Institute of Development, Aging and Cancer, Tohoku University, Medical Engineering and Cardiology, Sendai, Japan
INTRODUCTION. To replace total artificial heart (TAH) with cutting dysfunctional heart is one of the therapies for end-stage heart failure patients. But pulsatile TAH available in the market has some problem in the point of thrombosis and durability because their purpose is for short term use only to bridge-to-transplantation. Though continuous-flow-type ventricular assist device (VAD) has well for long use for destination therapy. Then Frazier et al. reported continuous-flow TAH using axial-type VADs with calf [1]. However, hemodynamic effects of atrial contraction with centrifugal-type TAH are unknown.
OBJECTIVES. In this study, we examined hemodynamic effects in the atrial contraction model on the TAH using commercially available centrifugal-type VADs with adult goats.
METHODS. We performed experiments with adult goats. The heart was exposed by the left thoracotomy under general anesthesia. The two centrifugal-type VADs were installed for the systemic and pulmonary circulation. We made end-to side anastomosis by the ePTFE vascular grafts to the descending aorta or the pulmonary artery, and connected to atriums via the atrial appendage for the inflow of each pump. Then we clumped both ventricles. Hemodynamics of TAH model using centrifugal-type VADs (EVAHEART™) in the market with clumped ventricles was examined. We measured the following: ECG, aortic presser, left and right atrial pressure, pulmonary artery pressure as well as the pump flow, rotational numbers and voltage of pumps with atrial contraction.
RESULTS. We showed hemodynamic parameters with adult goats and atrial contraction wave in the ECG in synchronization with the atrial contraction. Average right pump rotation number was 1,450 rpm, right flow rate was 2.5 L/min, right atrial pressure was 14/9 mmHg, pulmonary artery pressure was 25/14 mmHg, left pump rotation number was 2,400 rpm, left flow rate was 2.2 L/min, left atrial pressure was 30/22 mmHg and artery pressure was 84/80 mmHg. Atrial presser made by atrial contraction, P wave in the ECG, caused aortic and pulmonary arterial pressure to increase through the pumps. By increasing the blood flow with the atrial contraction, voltage and rotation number of pumps were decreased under constant control of the rotational speed. The driving power consumption of the pump was changed by changes of flow rate from atrial contraction.
CONCLUSIONS. The atrial contraction might contribute to the increase of pulsatility during the centrifugal type TAH application. There might be a possibility that regulate autonomic nervous response with the control of cardiac output from pumps driving power consumption.
REFERENCE(S). 1. Frazier OH, Cohn WE, Tuzun E, et al. Continuous-flow total artificial heart supports long-term survival of a calf. Tex Heart Inst J 2009;36:568–74.

0534
USEFULNESS OF THE CARDIAC MAGNETIC RESONANCE IN PATIENTS WITH CHEST PAIN, ELEVATION OF MYOCARDIAL BIOMARKERS AND ECG REPOLARIZATION ABNORMALITIES

A. Corrales Cruz[1], A.R. Murillo Martin[1], O.A. Hernandez Parada[1], M.R. Solano Vera[1], E. Gonzalez[1], M.L. Cardo[2], M.A. Godoy[3], J.M. Añon Elizalde[1]

[1]Hospital Virgen de la Luz, Intensive Care, Cuenca, Spain, [2]Hospital Virgen de la Luz, Cardiology, Cuenca, Spain, [3]Hospital Virgen de la Luz, Radiology, Cuenca, Spain
INTRODUCTION. The presence of chest pain with myocardial biomarkers elevation and electrocardiographic abnormalities suggest an acute coronary syndrome (ACS), but there are others entities whose clinical presentation is similar: acute myocarditis, tako-tsubo syndrome.
OBJECTIVES. Establish the role of cardiac magnetic resonance (CMR) in the differential diagnosis of diseases that present as an ACS.
METHODS. From October 2010 to January 2013, ten patients with suspected ACS and an electrocardiogram (ECG) non diagnostic of ACS were collected. T2-weighted sequences and late enhancement IR sequences CMR were performed.
RESULTS. Age 39 ± 8 years. Men 100 % (n = 10). Ultrasensitive troponin 687 ± 344 ng/L. CK 567 ± 303 U/L. ECG alterations: positive peaked T waves 40 % (n = 4), elevated ST-segment (J point) 60 % (n = 6). Echocardiogram: ejection fraction (EF) normal 50 % (n = 5), EF decreased 50 % (n = 5). Wall motion of the heart abnormality 70 % (n = 7). Further EF standardization 100 % (n = 5). Final diagnosis by CMR: myocarditis in 90 % (n = 9) (intramural late enhancement of patched and diffuse distribution). Coronary angiography: only performed in two patients with normal coronary arteries.

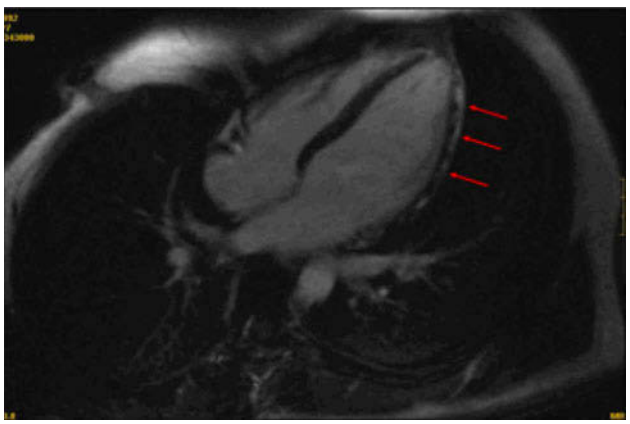


Image 1

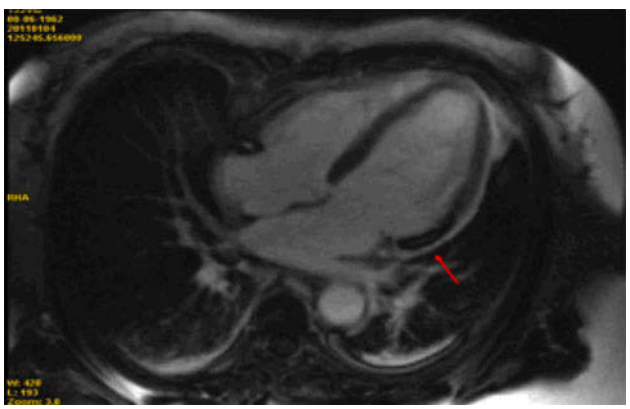


Image 2

CONCLUSIONS. There are heart diseases of non-ischemic etiology that can be processed as an ACS, the pattern of enhancement IR sequences in the CMR can help in the differential diagnosis of these entities whose treatment and prognosis are different.

0535
PREDICTORS OF DEVELOPING MAJOR SHORT-TERM CARDIOVASCULAR EVENTS IN PATIENTS EVALUATED BY A CHEST PAIN UNIT

M.A. Ramirez-Marrero[1], M. Cano-Garcia[1], I. Vegas-Vegas[1], M.A. Roldan-Jimenez[1], D. Gaitan-Roman[1], J.A. de la Chica-Sanchez[1], M. de Mora-Martin[1]

[1]Hospital Carlos Haya, Cardiology, Malaga, Spain

INTRODUCTION AND OBJECTIVES. The purpose of a chest pain unit (CPU) is the risk stratification of patients, coming to the Emergency with a chest pain episode with ischemic profile, without any other severity criteria. The purpose of our study is to identify risk predictors of developing major cardiovascular events (MACEs) in patients discharged by the CPU.

MATERIALS AND METHODS. A prospective analysis of all patients consecutively evaluated by our CPU from June 2009 to April 2012 was performed. Clinical and epidemiological variables were collected, establishing prognostic analysis, including cardiovascular death, non-fatal myocardial infarction and hospitalization for heart failure. A follow-up with a mean of 8 months in all cases was completed.

RESULTS. 1,006 patients were included, mean age 59.4 ± 13.2 years, 41.3 % male. After completing the follow-up, 32 (3.2 %) patients developed MACEs; 28 non-fatal AMI, three heart failure and one patient died from cardiovascular causes. These patients showed an older age compared to the rest (66.6 ± 11.4 vs. 59.5 ± 13.3, p = 0.003), higher prevalence of hypertension (4.9 vs. 3.1 %, p = 0.03), DM (8.7 vs. 2.4, p = 0.0001), previous history of ischemic heart disease (8.5 vs. 2.4 %, p = 0.0001), greater comorbidity (Charlson index 1.32 ± 1.16 vs. 0.93 ± 1.30, p = 0.07) and higher percentage of morphological and/or functional ischemia induction tests with pathological outcome (70 vs. 30 %, p = 0.0001). After adjustment, the presence of DM, history of ischemic heart disease and pathological ischemia induction test results were associated with increased risk of development of MACEs (OR 2.32, 95 % CI 1.47–4.58, OR 3.79, CI 95 % and OR 7.32, 1.15–12.5, 95 % CI 2.11–15.4, respectively).

CONCLUSIONS. Patients discharged by a CPU and who developed MACEs after a short-term follow-up show a more adverse cardiovascular risk profile. The presence of DM, the previous history of ischemic heart disease and an abnormal test of ischemia induction were associated with a worse prognosis.

0536

EARLY EVOLUTION OF MULTIORGAN DYSFUNCTION AFTER STARTING INTRAAORTIC COUNTERPULSATION

R. Gómez López[1], P. Fernandez Ugidos[1], P. Vidal Cortes[1], M. Lorenzo Lage[2], E. Rodriguez Garcia[1]

[1]Complexo Hospitalario Universitario Ourense, Intensive Care, Ourense, Spain, [2]Complexo Hospitalario Universitario Ourense, Cardiologia Intervencionista, Ourense, Spain

INTRODUCTION. Intraaortic counterpulsation (IC) has been tipically limited to hospitals with cardiac surgery. The availability of a cardiac catheterization laboratory in our second level institution and the need to transport critically ill cardiac patients to the reference for early surgical management becomes in a counterpulsation program in our institution.

OBJECTIVES. To describe the characteristics and the evolution of the multiorgan dysfunction syndrome (MODS) in patients on IC in order to know its potential benefits in our conditions.

METHODS. Observational study that includes all patients on IC from January 2010 to December 2012. APACHE II and SOFA scores were used to grade the MODS. SOFA global score and SOFA score by system (SOFAs) were considered. The variation (Δ) at 6 and 24 h were calculated. Because of the small sample size the statistical analysis was limited to descriptive parameters. Qualitative variables are described with number of cases (n) and percentages and quantitative variables with the average and standard deviation, including the range in variables with wide dispersion.

RESULTS. From 14 analyzed patients [73.5 % males, age 65.9 ± 11.5 years (43–83)], 12 (85.7 %) were on IC because of refractory ischemic cardiogenic shock. Each of the other patients (n = 1, 7.15 %) were on IC because of refractory pulmonary oedema and refractory angina respectively. At the beginning of IC, medium arterial pressure (MAP) was maintained [68.3 ± 13.3 mmHg (45, 93)] by epinephrine [12 patients, 1.8 ± 2.4 μg/kg/min (0–8.5)] and dobutamine [5 patients, 5.3 ± 2.7 μg/kg/min (3.3, 10)]. Patients were tachycardic [heart rate (HR) 100.1 ± 39.1 beats per minute (bpm) (48, 220)] and hypoperfused [lactate (lact) levels 4.3 ± 3 mmol/L (1.8–10.6)]. The APACHE II at 24 h was 23.8 ± 14.3 (3–46) points (pts) and the SOFA at the beginning of IC was 11.1 ± 5.1 pts (2–18). Cardiovascular dysfunction (SOFAs 3.5 ± 1.4 pts) was more severe than respiratory (SOFAs 3.1 ± 1.2 pts), renal (SOFAs 1.9 ± 1.6 pts), neurologic (SOFAs 1.5 ± 1.7 pts), hematologic (SOFAs 0.7 ± 0.9 pts) and liver (SOFAs 0.3 ± 0.7 pts) dysfunctions. Variable response depending on the system was observed at 6 h (ΔMAP 16.1 ± 36.1 mmHg, ΔHR −0,15 ± 16 lpm, ΔLact −0,28 ± 2,6 mmol/L, cardiovascular ΔSOFA 0 pts, $\Delta PaO_2/FiO_2$ 50.9 ± 90 pts, respiratory ΔSOFA −0.35 ± 0.74 pts, ΔCreatinine 0.13 ± 0.34 mg/dL, renal ΔSOFA 0.06 ± 0.25 pts, liver ΔSOFA 0.06 ± 0.25 pts and global ΔSOFA −0.14 ± 1.02 pts) and at 24 h (ΔMAP 12.6 ± 42.7 mmHg, ΔHR −14.5 ± 44.2 lpm, ΔLact −0.35 ± 2.5 mmol/L, cardiovascular ΔSOFA −0.26 ± 0.59 pts; $\Delta PaO_2/FiO_2$ 65.4 ± 98.1 pts, respiratory ΔSOFA −0.57 ± 0.9pts; ΔCreatinine 0.17 ± 0.1 mg/dL, renal ΔSOFA 0.13 ± 1.35 pts; hematologic ΔSOFA 0.33 ± 1.17 pts, liver ΔSOFA 0.66 ± 1.39 pts, global ΔSOFA 0.2 ± 3.7 pts).

CONCLUSIONS. In our series cardiovascular and respiratory dysfunctions are the most frequent ones in patients on IC. We observed an earlier and more intense improvement in respiratory function comparing with the effect of IC on other systems.

0537

CIRCADIAN VARIATION IN BLOOD PRESSURE AND HEART RATE IN NON-HYPERTENSIVE CHRONIC HEART FAILURE

A.M. Gonzalez-Gonzalez[1], M.A. Ramirez-Marrero[1], A.M. Garcia-Bellon[1], M.D. Martinez[2], P. Aranda-Lara[2], M. de Mora-Martin[1]

[1]Hospital Carlos Haya, Cardiology, Malaga, Spain, [2]Hospital Carlos Haya, Nephrology, Malaga, Spain

INTRODUCTION AND OBJECTIVES. Ambulatory blood pressure monitoring (ABPM) is routinely used in hypertension patients. However, its importance in chronic heart failure (CHF) patients has been scarcely mentioned. Our aim was to evaluate 24-h blood pressure patterns in non-hypertensive patients with the diagnosis of chronic heart failure.

DESIGN AND METHODS. We studied 80 patients with a clinical diagnosis of non-hypertensive CHF. They were followed-up by the Heart Failure Unit. We performed a 24-h ambulatory blood pressure monitoring as well as an echocardiogram and analytical test in order to look for differences in 24-h BP patterns.

RESULTS. 80 patients. Mean age: 62.7 ± 12. Males 72.5 %. Mean BMI 29.6 ± 5 kg/m^2. Mean time of follow-up of CHF 69 ± 66 months. Associated risk factors: dyslipidemia 25 %, diabetes 20 %, obesity 45 %, active smoking 30 %, ex-smoking 27.5 %. Therapeutic regimen applied: RAS blockers 85 %; betablockers 92.5 %; loop diuretic 75 %; spironolactone 35 %; statins 55 %; antiplatelet/anticoagulant drugs 75 %, nitrates 20 %, digoxin 30 %. The 24-h ABPM measurements were the following: mean 24 h systolic BP 107.7 ± 13.8 mmHg, mean daytime systolic BP 109.6 ± 14.2, mean nightime systolic BP 104.5 ± 14.5, mean 24 h diastolic BP 64.4 ± 7.8, mean daytime diastolic BP 66.4 ± 8.8 and mean nightime diastolic BP 60.4 ± 7.6. The majority of CHF patients (77.5 %) have an abnormal pattern of ABPM; non-dipper pattern in 46 (57.5 %) patients, and riser patter in 16 (20 %).

CONCLUSIONS. Non-hypertensive heart failure patients had, in majority, an abnormal circadian rhythm of blood pressure. It is well known the prognosis values of these alterations. This highlights the high cardiovascular risk and the neurohumoral alterations of these patients with chronic heart failure, whether they are hypertensive or not.

0538

SHOULD WE USE INTRAAORTIC BALLOON COUNTERPULSATION (IABP) IN CARDIOGENIC SHOCK?

J.J. Blanco[1], F. Jiménez[2], R. Manzanedo[1], G. Pérez-Acosta[1], E. Zborovszky[1], J. Ocampo[1], E. Gross[2], V. Nieto[2], M. Sánchez Palacios[1]

[1]Hospital Universitario Insular de Gran Canaria, Intensive Care Unit, Las Palmas de Gran Canaria, Spain, [2]Hospital Universitario Insular de Gran Canaria, Cardiology, Las Palmas de Gran Canaria, Spain

INTRODUCTION. Cardiogenic shock is the leading cause of in-hospital mortality after acute myocardial infarction (AMI). In current international guidelines intraaortic balloon counterpulsation (IABP) is considered to treatment for cardiogenic shock complicating AMI [1]. Recent studies question their role in the treatment of cardiogenic shock[2].

OBJECTIVES. Analyze the influence of intra-aortic balloon pump (IABP) on mortality in patients with cardiogenic shock following acute myocardial infarction (AMI).

METHODS. Retrospective analysis was performed over a period of 10 years, on patients admitted to the hospital in cardiogenic shock with AMI. All patients were treated with coronary reperfusion, vasopressor support and to receive the best available medical therapy in this time. Two groups for the analysis were made: patients with IABP (n = 128) and without IABP (n = 48). We analyzed epidemiological data, coronary disease and mortality related to treatment with intraaortic balloon counterpulsation (IABP) for cardiogenic shock complicating AMI. Statistical analysis was performed by Chi square test and Student test.

RESULTS. We studied 176 patients with an average age of 63.82 ± 10.95 years (67 % male). All patients had cardiovascular risk factors and 41.5 % had previous ischemic cardiomyopathy (ICM). The APACHE II at admission was 20 ± 98.67. As reperfusion therapy: 71 % were treated with primary angioplasty and 29 % of them received thrombolysis and rescue angioplasty. 72.2 % of patients had multivessel disease. TIMI III flow result was obtained of the infarct related artery in 94.3 % of the cases. The clinical and epidemiological results are presented in Tables 1 and 2.

Baseline characteristics of patients and Myocardial infarction

	IABP (128)	DM (48)
Age (yr)	66,66 ± 10,76	66,92 ± 10,99
Male sex	87 (68%)	31 (64,6%)
Cardiovas. risk factors		
Current smoking	66 (51,6%)	23 (47,9%)
Hypertension	65 (50,8%)	33 (68,8%)
Diabetes	59 (46,1%)	26 (54,2%)
Hypercholest.	46 (35,9%)	27 (56,3%)
Prior ischem. heart dis.	52 (40,6%)	21 (43,8%)
Non–STEMI	21 (16,4%)	6 (12,5%)
STEMI	107 (83,6%)	42 (87,5%)
AMI anterior	66 (51,6%)	23 (47,9%)
Echocardiography		
FEVI	34,4 ± 10,2	37,2 ± 10,8
FEVI < 35	53 (49,5%)	16 (34,8%)

Table 1

Coronary reperfusion and Clinical outcome

	IABP (128)	No IABP (48)
Fibrinolysis	28 (29,7%)	13 (27,1%)
Primary PCI	90 (70,3%)	35 (72,9%)
Multivessel disease*	95 (74,2%)	32 (66,7%)
Nº diseased vessels*	2,30 ± 0,94	1,94 ± 0,86
TIMI III flow	119 (93%)	47 (87,9%)
Hospital stay	11,54 ± 17,06	17,08 ± 16,93
ICU stay	6,72 ± 12,7	10,46 ± 13,08
APACHE II	20,45 ± 8,13	19,42 ± 9,62
Sepsis in Hosp.	20 (15,6%)	9 (14,2%)
Mortality	76 (59,4%)	23 (47,9%)

* Nº diseased vessels
IABP vs No IABP: OR 2.56; IC 95% (1.38 – 7.66)

Table 2

CONCLUSIONS. In our study, the mortality was not improved in patients treated with IABP. Patients treated with IABP had more coronary disease.
REFERENCE(S). 1. O'Gara PT, Kushner FG, Ascheim DD, et al. ACCF/AHA guideline for the management of ST-elevation myocardial infarction: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2013;61(4):e78–140. 2. Thiele H, Zeymer U, Neumann FJ et al. IABP-SHOCK II Trial Investigators. Intraaortic balloon support for myocardial infarction with cardiogenic shock. N Engl J Med 2012;367:1287–96.

0539
MINIMALLY INVASIVE MECHANICAL CIRCULATORY SUPPORT IN THE MANAGEMENT OF CARDIOGENIC SHOCK AND REFRACTORY CARDIAC ARREST

P. Ostadal[1], A. Kruger[1], D. Vondrakova[1], P. Kmonicek[1], M. Mates[1], M. Skabradova[1], S. Horáková[1], K. Kopriva[1], D. Doubek[1], P. Jehlicka[1], P. Neuzil[1]

[1]Cardiovascular Center, Na Homolce Hospital, Prague, Czech Republic
INTRODUCTION. Mini-invasive circulatory support systems have been recently introduced in the management of critical conditions caused by severe cardiac failure.
OBJECTIVES. We analyzed a group of patients treated in our center by mini-invasive circulatory support for severe heart failure, cardiogenic shock or refractory cardiac arrest.
METHODS. Ninety primarily non-surgical patients [mean age 61 (30–84) years, 81 % were males), treated by Impella 2.5 (N = 2), PulseCath (N = 14), TandemHeart (N = 16), and veno-arterial extracorporeal membrane oxygenation (ECMO; N = 58) were included in the analysis.
RESULTS. Median duration of circulatory support was 2 days, maximum 60 days. The all-cause 30-day mortality in our group was 34 %; in the subgroup of cardiogenic shock patients the 30-day mortality was 48 %. In patients with refractory cardiac arrest, where ECMO was introduced during resuscitation, three individuals from nine treated survived. We found significant survival differences between subgroup with urgent circulatory support introduction and patients with semi-urgent or planned support (30-day mortality 48 vs. 11 %, $P < 0.001$). We did not find differences between survivors and non survivors in the major characteristics including age or left-ventricle ejection fraction. ECMO was the most efficient system with respect to the aortic blood flow; on the other hand, in comparison to other systems ECMO decreased pulmonary artery flow and increased risk of pulmonary oedema development. We found important role of cerebral/somatic oximetry in the monitoring of patients with mini-invasive circulatory support.
CONCLUSIONS. Mini-invasive circulatory support systems and particularly ECMO are promising tools in the management of severely compromised patients with progressing cardiogenic shock or refractory cardiac arrest. Frequently, the circulatory support therapy in these high-risk patients represents the last chance to survive.

0540
BLOOD VOLUME INDEX DERIVED FROM PERCUTANEOUS INDOCYANINE GREEN MEASUREMENT AND ITS ASSOCIATION TO STROKE VOLUME AND CARDIAC INDEX: A PROSPECTIVE STUDY

W. Huber[1], T. Langer[1], B. Ertekin[1], S. Mair[1], B. Saugel[1], T. Lahmer[1], M. Messer[1], R.M. Schmid[1]

[1]Technical University of Munich, Klinikum rechts der Isar, Munich, Germany
INTRODUCTION. Optimization of intravascular volume is a cornerstone of intensive care. In addition to filling pressures and ultrasound-based techniques, several parameters derived from indicator dilution and pulse contour analysis have been suggested for assessment of preload and volume responsiveness. Among these parameters, measurement of circulating blood volume index (BVI) is an obvious approach. BVI can be assessed by several techniques also including percutaneous pulse densitometry after injection of indocyanine green (ICG). Nevertheless, there is little data comparing BVI and other parameters of preload to cardiac index (CI) and stroke volume index (SVI).
OBJECTIVES. To analyze the association of BVI to SVI and CI.
METHODS. Therefore, we compared BVI measured by ICG-pulse densitometry (LiMON; Pulsion Medical Systems, Germany; 0.5 mg/kg ICG i.v.), global end-diastolic index (GEDVI), CVP, stroke volume variation (SVV) to CI and SVI in 47 patients with PiCCO-monitoring (Pulsion Medical Systems; Germany). Statistics: Spearman correlation, Wilcoxon-test (unpaired), ROC-analysis regarding "SVI $\leq$ 40 ml/m^2" (primary endpoint) and multiple regression analysis regarding CI and SVI. IBM SPSS 20.
RESULTS. n = 47; 12 female (25.5 %), 35 male (74.5 %). APACHE-II 18 ± 6, SOFA 10 ± 4; vasopressors 28/47 (60 %); mechanical ventilation 29/47 (68 %). Distribution of BVI-measurements (normal range 2,600–3,200 ml/m^2) demonstrated that 36/47 (77 %) were below the normal range. By contrast, only 10/47 (21 %) of GEDVI-measurements were below the normal range (680–800 ml/m^2). Patients with BVI < 2,600 ml/^{2} had significantly lower SVI ($p = 0.003$), CI ($p = 0.003$) and higher stroke volume variation (SVV; $p = 0.010$) compared to patients with BVI $\geq$ 2,600 ml/m^2. BVI significantly correlated to CI ($r = 0.619$; $p < 0.001$) and SVI ($r = 0.551$; $p < 0.001$). By contrast, neither GEDVI ($r = 0.051$; $p = 0.733$; $r = 0.214$; $p = 0.153$) nor CVP ($r = 0.123$: $p = 0.412$; $r = 0.031$; $p = 0.836$) correlated to CI or SVI. GEDVI/BVI-ratio was significantly associated to CI ($r = -0.413$; $p = 0.004$), but not to SVI ($r = -0.256$; $p = 0.086$). BVI provided the largest ROC-AUC (AUC 0.835; 95 % CI 0.717–0.939) regarding "SVI $\leq$ 40 ml/m^2". Among the other preload-parameters only GEDVI/BVI-ratio was significantly predictive (AUC 0.724; $p = 0.022$), whereas neither CVP (AUC = 0.618; $p = 0.206$) nor GEDVI (AUC = 0.563; $r = 0.504$) were predictive. BVI $\leq$ 2,151 ml/m^2 had a sensitivity of 79 % and a specificity of 75 % regarding SVI $\leq$ 40 ml/m^2.
In multiple regression analysis regarding CI including CVP, GEDVI and BVI, only BVI was independently ($p < 0.001$) associated to CI ($r = 0.566$). Similarly, BVI was independently associated to SVI ($p = 0.005$; $r = 0.403$), whereas neither CVP nor GEDVI were independently associated to SVI.
CONCLUSIONS. BVI is independently associated to SVI and CI. Patients with decreased BVI have significantly lower SVI and CI as well as increased SVV, which emphasizes the value of BVI as a preload marker.

0541
CHANGES OF INTRATHORACIC BLOOD VOLUMES DURING INFUSION THERAPY: COMPARISON OF ULTRASOUND DILUTION (UD) WITH THRANSPULMONARY THERMODILUTION (TTD)

G. Galstyan[1], M. Bichinin[1], V. Gorodetskiy[1]

[1]Scientific Center for Hematology, ICU, Moscow, Russian Federation
INTRODUCTION. Global end diastolic volume (GEDV) and inrathoracic blood volume (ITBV) measured by transpulmonary thermodilution (PICCO, Pulsion, Munich Germany) are largely overestimated when compared with physiological values and analogous parameters measured by ultrasound dilution (COstatus, Transonic Systems, Ithaca, USA)—total end diastolic volume (TEDV) and central blood volume (CBV)[1].
OBJECTIVES. To investigate the changes of intrathoracic blood volumes measured by TTD vs. UD during infusion therapy.
METHODS. Eight adult ICU patients with septic shock were studied with TTD and UD before and after volume load with 6 % HES 130/04 (Voluven, Volulyte, Fresenius Kabi) 500 and 1,000 ml. Changes in cardiac output (CO), GEDV vs TEDV, and ITBV vs CBV were measured,
RESULTS. Total 22 comparisons were analyzed. Table 1.

Changes of CO and volume parameters

Parameters	Cardiac output change (%)	Intrathoracic volume change (%)	End diastolic volume change (%)
TTD, mean ± SD; (range)	5.42 ± 13 (−11 to 42)	3.48 ± 8.5 (−13 to 22)	3.49 ± 8.5 (−13 to 22)
UD, mean ± SD; (range)	4.87 ± 18 (−20 to 40)	2.00 ± 12 (−21 to 29)	6.89 ± 11 (−13 to 25)
Correlation	0.65	0.18	0.2

Relatively strong correlation was found only between changes in CO. There were no correlations between changes of GEDV vs. TEDV and ITBV vs. CBV. Within the methods, correlation between changes of GEDV vs. ITBV for TTD is close to one, as they are mathematically coupled. Correlation between CBV vs. TEDV for UD method was 0.5.
CONCLUSIONS. Both TTD and UD were reasonably close to reflect changes in CO during infusion therapy. Changes in the intrathoracic blood volumes measured by TTD do not agree with the analogous parameters of UD. More patients and further research is needed to understand the main sources of such discrepancy and its clinical implications.
REFERENCE(S). 1. Galstyan G. et al. Intensive Care Med 2010;36:2140–2144.

Post-operative intensive care: 0542–0555

0542
EARLY AND LATE COURSE AFTER LIVER TRANSPLANTATION: STUDY OF FACTORS PREDICTING GRAFT SURVIVAL

R. Gutierrez Rodriguez[1], M.D. Arias Verdu[1], M.J. Furones Lorente[1]

[1]Carlos Haya Regional University Hospital, Critical Care Unit, Malaga, Spain
OBJECTIVES. To determine preoperative markers of poor graft evolution after liver transplantation.
METHODS. A retrospective observational study of patients admitted to the ICU between December 2009 and December 2012 after receiving a liver transplant, 135 patients, and later follow-up of graft function at 3 months. Variables: Age, sex, mean stay, prolonged stay, mortality, graft survival of at least 3 months, graft failure, retransplant, infection, initial postoperative haemorrhage, postoperative renal function, percentages of patients with MELD >15, APACHE II >13, operative time, warm ischaemia time, cold ischaemia time, intraoperative ascites, multitransfusion, obesity, pretransplant concentrations of plasma sodium <140 mEq/L, albumin <2.5 mg, fibrinogen <100, prior kidney failure, presurgical lactate >2, blood glucose >150 mg/dL, percentages of patients with initial dysfunction 6 h post-transplant, and slow graft function persisting after third postoperative day. Statistical study: mean, mode, comparison of means: qualitative variables compared by Chi square and quantitative variables by Student *t* test. Multivariate regression analysis to assess multiple variables.
RESULTS. No significant differences were found between groups concerning mortality according to the MELD and APACHE. There were differences relating to multitransfusion, in both those who received intra-operative transfusion of >3 packed red cells (70 vs. 30 %) and those who received >900 cc of plasma (80 vs. 20 %); $P < 0.05$ for both. The multivariate analysis showed that only massive plasma transfusion was an independent risk factor for death (OR 3; $P = 0.002$; 95 % CI 1.45–4.2). Concerning the markers associated with initial graft dysfunction (first 6 h), we found significant differences ($P < 0.05$) in the following groups: intra-operative plasma transfusion (40 %), pretransplant lactate >2 (70 %), prior kidney failure (80 %), and pretransplant fibrinogen <100 mg (95 %). The multivariate analysis showed that both intra-operative plasma transfusion (OR 2.3; $P = 0.02$; 95 % CI 1.9–3.32) and pretransplant lactate >2 (OR 2.9; $P < 0.001$; 95 % CI 1.6–4.5) were independent factors for initial dysfunction.
Concerning graft dysfunction beyond the third day, significant differences were found: serum sodium levels <140 (36 vs. 10 %), intra-operative multitransfusion with >3 packed red cells (20 vs. 1 %), and massive intra-operative ascites (50 vs. 16 %). The multivariate analysis showed that only transfusion with red cells was independently associated with slow graft recovery (OR 1.8; $P = 0.01$; 95 % CI 1.3–33).
None of the study variables was significantly associated with graft failure at the third month.
CONCLUSIONS. Multitransfusion is associated with greater postoperative morbidity and mortality in liver transplant patients. Neither the MELD nor the APACHE II on admission were associated with a poor evolution, and should not therefore be a contraindication for transplant.

0543
PROTECTIVE EFFECT OF STATINS IN ACUTE KIDNEY INJURY AFTER CARDIAC SURGERY. A PROPENSITY SCORE ANALYSIS OF ARIAM DATABASE

E. Curiel Balsera[1], M.D. Arias Verdú[1], J.M. Mora Ordoñez[1], E. Sanchez Cantalejo[2], R. Hinojosa Perez[3], M.D. Fernandez Zamora[1], E. Alvarez Marquez[4], R. Rivera Fernandez[1], ARIAM Adult Cardiac Surgery

[1]Carlos Haya Regional University Hospital, Intensive Care Unit, Málaga, Spain, [2]Escuela Andaluza de Salud Publica, Granada, Spain, [3]Virgen del Rocio Hospital, Intensive Care Unit, Seville, Spain, [4]Virgen Macarena Hospital, Intensive Care Unit, Seville, Spain

INTRODUCTION. In previous studies it seems that statins could be a protective factor of developing acute kidney injury (AKI) in cardiac surgery.

OBJECTIVES. We tried to confirm this protective effect with a high quality analysis.

METHODS. Prospective, observational and multicentre study of patients admitted in ICU after major cardiac surgery in 13 hospitals of Spain.

AKI was defined as double levels of creatinine if it was normal previously, or above 3.5 mg/dl if it was between 1.2 and 2.2 or need for renal replacement therapy (RRT).

We used Chi square test and student-t test for univariate analysis and binary logistic regression for multivariate analysis, with p value <0.05.

A propensity score-matched analysis was performed to compare AKI in patients treated or not with statins previous major cardiac surgery.

RESULTS. We included 7,276 patients and AKI was developed in 9.6 % of global population. 8.5 % of 3,749 patients treated with statins developed AKI and 10.7 % of 3,527 non treated (p = 0.002; OR 0.78, 95 % CI 0.67–0.91). After adjusted with logistic regression by EuroSCORE, bypass time and previous renal failure, statins continue being protective OR 0.82, 95 % CI (0.7–0.96).

In the propensity score-matched patient population realized in 3,056 (1,528 with statins and 1,528 without), AKI was 10.8 % in patient without statins and 9.9 % in patients with statins, OR 0.91 (0-72–1.11). After adjustment by EuroSCORE, bypass time and previous renal failure, OR was very similar 0.93 (0.73–1.18).

CONCLUSIONS. Although multivariate analysis suggests a protective effect for statins in terms of AKI after cardiac surgery, when we adjusted with a propensity score analysis, protective effect is rejected.

REFERENCE(S). Prowle JR, Calzavacca P, Licari E, Ligabo EV, Echeverri JE, Haase M, Haase-Fielitz A, Bagshaw SM, Devarajan P, Bellomo R. Pilot double-blind, randomized controlled trial of short-term atorvastatin for prevention of acute kidney injury after cardiac surgery. Nephrology (Carlton) 2012;17(3):215–24.

GRANT ACKNOWLEDGMENT. Josele Benitez-Parejo (ARIAM Secretary).

0544

EFFECT OF BODY MASS INDEX IN OUTCOME OF PATIENTS UNDERGOING CARDIAC SURGERY

J.C. Lopez Delgado[1], H. Torrado[1], F. Esteve[1], M.L. Carrio[1], D. Rodriguez-Castro[1], E. Farrero[1], R. Manez[1], J.L. Ventura-Farré[1], C. Javierre[2]

[1]Hospital Universitari de Bellvitge, Intensive Care, L' Hospitalet de Llobregat, Spain, [2]Universitat de Barcelona, Physiological Sciences Department, L'Hospitalet de Llobregat, Spain

INTRODUCTION. Obesity is not considered a risk factor for higher mortality after cardiac surgery. Some reports have documented a better outcome in patients with higher body mass index(BMI) compared with those with normal BMI despite higher comorbidities in obese patients.

OBJECTIVES. The aim of this study is to quantify the effect of BMI on clinical outcomes after cardiac surgery.

METHODS. 2844 consecutive patients requiring all types of cardiac surgery between January 2004 and February 2008 were prospectively studied at our institution. The patients were divided based on BMI ranges: normal (BMI $\geq$ 18.5–24.9 kg m^{-2}; n = 644; 22.6 %), overweight (BMI $\geq$ 25–29.9 kg m^{-2}; n = 1,320; 46.4 %) and obese (BMI $\geq$ 30 kg m^{-2}; n = 856; 30.2 %). Preoperative, operative and postoperative data including main outcomes were recorded together with cardiac surgery scores(Parsonnet,EuroSCORE) and ICU scores(APACHE,SAPS). ANOVA and Bonferroni post hoc analysis were used to compare differences between BMI groups. Multivariable analyses compared the risk of outcomes between different BMI groups after adjusting for case-mix. A complete follow-up was performed in 2,592 patients until January 2013.

RESULTS. In higher BMI groups there were higher cardiovascular risk factors rates, such as hypertension [odds ratio (OR) 3.51; 95 % confidence interval (CI) 2.58–4.78 for obese. OR 1.87 (95 % CI 1.46–2.40) for overweight; $P = < 0.001$], diabetes (OR 2.05; 95 % CI 1.16–3.63 for obese; $P = 0.013$. OR 1.53; 95 % CI 1.20–1.96 for overweight; *$P = 0.001$*) and including hypertrophic cardiomyopathy(OR 2.29; 95 % CI 1.66–3.16 for obese. OR 1.69; 95 % CI 1.29–2.21 for overweight; $P = < 0.001$) compared with normal BMI patients. Respiratory-related morbidities were shown with higher BMI patients, such as a worst oxygenation reflected by lower PaO_2/FiO_2 12hs after admission in higher BMI groups (OR 0.95; 95 % CI 0.92–0.99 for obese; $P = < 0.001$. OR 0.90; 95 % CI 0.85–0.95 for overweight; *$P = < 0.001$*) and longer ventilation times in obese (OR 0.97; 95 % CI 0.94–0.98; $P = 0.007$), and higher risk for septicaemia in obese compared with normal (OR 1.30; 95 % CI 1.06–1.60; $P = 0.012$) and overweight (OR 1.15; 95 % CI 1.03–1.28; $P = 0.007$) BMI groups.

In-hospital mortality was 5.6 % (n = 160) and long-term mortality was about was 11.95 % (n = 310) during the follow-up (6.2 ± 4.1 years). No mortality and survival differences were shown between BMI groups.

CONCLUSIONS. Despite higher respiratory-related morbidities with higher BMI and higher septicaemia with obese during ICU stay, there is not any BMI related influence over in-hospital mortality and long-term survival after cardiac surgery.

REFERENCE(S). 1. Stamou SC, Nussbaum M, Stiegel RM, et al. Effect of body mass index on outcomes after cardiac surgery: is there an obesity paradox? Ann Thorac Surg 2001;91:42–7. 2. Sakr Y, Madl C, Filipescu D, et al. Obesity is associated with increased morbidity but not mortality in critically ill patients.Intensive Care Med 2008;34:1999–2009.

0545

PREOPERATIVE HEMOGLOBIN-A1C AS A PREDICTOR FOR INFECTION POST CORONARY BYPASS SURGERY

A.Z. Hafez[1], W. Abukhudair[1], K. Othman[1], M.F. Rajab[1], M.M.H. Al-Najjar[1]

[1]King Fahd Armed Forces Hospital, Jeddah, Adult Cardiac Surgery Department, Jeddah, Saudi Arabia

INTRODUCTION. Diabetes is a widely recognized risk factor for coronary artery disease and is associated with increased early and late mortality after myocardial revascularization in patients with multivessel disease(1). HbA1c refers to glucose bound hemoglobin A molecule. The hemoglobin A1c (HbA1c) test can provide an assessment of average blood glucose control during the 60–90 days (2–3 months) prior to the test [8–13]. Recent evidence suggests that hyperglycemia plays a significant role in the development of postoperative infections [2–5].

OBJECTIVES. To determine the prevalence of elevated Hemoglobin A1c levels, a marker of glycemic control in patients presenting for coronary artery bypass surgery, whether poorly controlled diabetes (high HbA1C) is a risk factor for infections and, if so, Is good preoperative glycemic control HbA1c levels <7 % is associated with decreased postoperative infections and Whether any protocol might improve outcome in diabetic patients.

METHODS. Retrospective observational study using KFAFH-JEDDAH data base. From January 2006 to December 2008, including 712 patients underwent coronary artery bypass surgery (CABG) + valve surgery. Among them, 478 patients (76.13 %) were diabetic and 234 (32.86 %) were nondiabetic, with primary outcomes were infectious complications, including pneumonia, wound infection, urinary tract infection, or sepsis.

RESULTS. The multivariable model includes age, sex, operation length and HbA1c levels were significantly associated with postoperative infections. An HbA1c level of more than 7 % was significantly associated with increased infectious complications with an adjusted odds ratio of 5 (95 % confidence interval, 2.7–9.3) and a P value of £0.001.

CONCLUSIONS. Good preoperative glycemic control (HbA1c levels <7 %) is associated with a decrease in infectious complications post CABG.

REFERENCE(S). 1. United Kingdom Prospective study, Lancet 1998;352:837–53. 2. Rochman, H. Hemoglobin A1c and Diabetes Mellitus. Ann Clin Lab Sci 1980;10:111–115. 3. Nathan, et al. The effects of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. New England J Med 1993;329:977–986. 4. Golden SH, Peart-Vigilance C, Kao WH, Brancati FL. Perioperative glycemic control and the risk of infectious complications in a cohort of adults with diabetes. Diabetes Care 1999;22:1408–1414. 5. Latham R, Lancaster AD, Covington JF, Pirolo JS, Thomas CS. The association of diabetes and glucose control with surgical-site infections among cardiothoracic surgery patients. Infect Control Hosp Epidemiol. 2001;22:607–612.

0546

SYSTEMIC INFLAMMATORY RESPONSE TO ANESTHESIA: A COMPARISON OF FOUR DIFFERENT TECHNIQUES

C. Chelazzi[1], R. Ricci[1], E. Pettini[1], G. Villa[1], A.R. De Gaudio[1]

[1]University of Florence, Department of Critical Care, Section of Anesthesiology and Intensive Care, Florence, Italy

INTRODUCTION. Surgical injury induces systemic endocrine, metabolic and immune-inflammatory responses, activated by primary immune system and afferent neural stimuli from the surgical area. An increase of counter-insulin hormones, cytokines and catecholamines characterizes the post-operative hyper-metabolic phase [1]. Anesthesia can influence these responses [2].

OBJECTIVES. The aim of this study was to evaluate the post-operative systemic inflammatory response to four different anesthetic techniques: "blended" anesthesia (regional neural blockade plus general anesthesia, B), balanced anesthesia (Ba), TIVA (totally intra-venous anesthesia) and inhalational anesthesia (I).

METHODS. A preliminary retrospective study was conducted. We collected data from patients who underwent elective laparoscopic left hemicolectomy performed for colorectal cancer between January and December 2012. Patients who underwent emergency surgery, "open" surgery and surgery performed for inflammatory bowel diseases were excluded. Patients were divided in four groups depending on the anesthetic technique used for the surgery. Serum levels of glucose, leukocyte count and temperature were collected at different times to evaluate the systemic inflammatory response: before induction (T0), at the end of the surgery (T1, only for blood glucose levels), at 24 (T24) and 48 (T48) h from induction. Glucose variability, determined as the ratio of standard deviation to mean glucose levels at T0, T1, T24 and T48, was used to evaluate the degree of insulin resistance in each patient. Data were subjected to analysis of variance (differences were considered significant when P values were <0.05).

RESULTS. Thirty-two patients were eligible for the study: seven were included in the "B" group, nine in the "Ba" group, eight in the "TIVA" group and eight in the "I" group. Median blood glucose values (mg/dl) were statistically significant at T1 (I 122.5; Ba 100; TIVA 97.5; B 94.5; p < 0,05), T24 (I 135; Ba 114; TIVA 117.5; B 97.5; p < 0,05) and T48 (I 145; Ba 117.5; TIVA 123; B 105; p < 0,05). Median temperature values (°C) were statistically significant at T48 (I 37.3; Ba 37; TIVA 36.9; B 36.85; p < 0,05). Median leukocyte count values (n × 10^6/l) were statistically significant at T24 (I 1,250; Ba 9,000; TIVA 8,550; B 7,300; p < 0,05) and T48 (I 12,750; Ba 10,500; TIVA 9,250; B 7,600; p < 0,05). The difference among mean glucose variability values (mean %) was statistically significant (I 18.6; Ba 8.9; TIVA 11.8; B 5.1; p < 0.05).

CONCLUSIONS. Our preliminary data show that "blended" anesthesia seems to be able to modulate the systemic inflammatory response. A statistically significant difference appears also between anesthetic techniques using opioids, balanced and TIVA, and the inhalational anesthesia.

REFERENCE(S). 1. Desborough: Br J Anaesth 2000;85:109–17. 2. Kehlet et al. Lancet 2003;362:1921–28.

0547

EFFECTS OF SYSTEMATIC LUNG RECRUITMENT IN POST-OPERATIVE STANDARD CARDIAC SURGERY : A PILOT STUDY

G. Abehsira[1], F. Bagate[1], A. Brusset[1], P. Estagnasié[1], P. Squara[1]

[1]Clinique Ambroise Paré, ICU, Neuilly-sur-Seine, France

INTRODUCTION. Cardiac surgery with extracorporeal circulation is associated with inflammation, leucocytes and platelets activation, leading to lung capillary leak and micro embolizations. This may prolong the duration of mechanical ventilation and increase the incidence of pulmonary complications.

OBJECTIVES. To evaluate the impact of systematic lung recruitment on postoperative gas exchange and morbidity after standard on-pump cardiac surgery.

METHODS. Prospective, randomized, single centre pilot study, including 100 consecutive patients admitted in ICU after cardiac surgery. Pre- and post-operative shocks and emergencies were excluded. Patients were included in the immediate postoperative period, still anesthetized, when hemodynamically stable and eligible for extubation. They were randomized for high PEEP application (35 cmH_2O during 45 s) or not (control group). Then, a physician blinded of the randomization applied standard protocols and collected the hemodynamic and ventilation variables at hours 1, 6, 12 and 24.

RESULTS. Of the 100 patients included into the study, 49 were recruited and 51 were not. The two groups were not different in terms of age, gender, BMI, LVEF, type of surgery, postoperative lung compliance, blood pressure, blood gas and lactate. However, in the

recruitment group, the preoperative VEMS smaller (2.2 vs. 2.6 L p = 0.006), the duration of extra corporeal circulation was longer (76 vs. 65 min., p = 0.02) and the proportion of patients receiving small amounts of inotropes higher (12 vs. 3, p = 0.005). The lung recruitment was followed by a significant increase in compliance (70 vs. 53 ml/mmHg, p = 0.006), and better PaO_2, SaO_2, and PaO_2/FIO_2 (384 vs. 309 mmHg, p = 0.002) after 1 h. In contrast, we observed no significant changes in PaO_2, SaO_2, PaO_2/FiO_2, blood pressure and lactate after 6, 12 and 24 h. The duration of mechanical ventilation was comparable (invasive + noninvasive: 6.05 vs. 5.25 h, p = 0.24), as well as the number of respiratory tract complications (13 vs. 15, p = 0.74), the length of stay in ICU and the total length of stay (75 vs. 63 h, p = 0.34 and 10.7 vs. 9.8, p = 0.24, respectively).
CONCLUSIONS. In this prospective, randomized, blind, pilot study, systematic lung recruitment in the postoperative period of standard cardiac surgery was followed by a transient improvement in gas exchange but no clear change in morbidity or length of stay. This pilot study was limited by the small number of patient that led to include patients with relatively less severe states in the control group.

0548
MORTALITY AFTER ON-PUMP CARDIAC SURGERY

G. Prada[1], A. Baluja[1], P. Vazquez[1], M. Dominguez[1], S. Varela[1], S. Selas[1], P. Otero[1], L. Dos-Santos[1], J. Álvarez[1]

[1]Complexo Hospitalario Universitario Santiago de Compostela, Servicio de Anestesioloxía, Reanimación e Tratamento da Dor, Santiago de Compostela, Spain
INTRODUCTION. In the last years advances in cardiac surgery have been striking and mortality rates have been reduced to relatively low ranks although age, severity of heart disease, and associated comorbidity have considerably increased[1,f].
Mitochondria have a central role in energy, heat and free radical O-production, factors that may influence the prognosis of patients undergoing surgery [2].
We hypothesize infection and other factors contribute to cardiac surgery mortality.
OBJECTIVES. (1) Detect factors contributing to mortality after cardiac surgery. (2) Descriptive analysis of mortality in patients undergoing on-pump cardiac surgery.
METHODS. A cohort of 227 patients admitted to our polyvalent critical care unit after on-pump cardiac surgery was prospectively recruited between 2005 and 2010, infected patients on admission and oncologic patients were excluded.
mtDNA analysis was carried out on a PCR for most common haplotypes in our population: Haplogroup H and Haplogroup UK.
The follow up of patients varied from 3.8 to 9.3 years (interquartile range).
RESULTS. General survival after cardiac surgery in our cohort was: 92.5 % at 28 days, 87.2 % at 90 days, 85.02 % at 180 days, 83.26 % at 2 years and 73.57 % at 5 years.
Survival was significantly reduced by sepsis after cardiac surgery: the median survival days was significantly higher for non-septic patients (1,400 vs. 2,424 days, p = 3.069e−15), finally, the median survival days after hospital discharge was significantly lower for septic patients (1,346 vs. 2,412 days, p = 2.659e−11). Patients without sepsis lived 1.79 times longer than others (p = 2.659e−11). No difference in mortality was observed on age, type of surgery, sex or mtDNA (sex log-rank 0.5488; Haplogroup H log-rank 0.6857; Haplogroup UK log-rank 0.2205). In patients already with sepsis after cardiac surgery, the independent factors of mortality, in a Cox analysis were: APACHE II score at sepsis onset (Hazard ratio -HR- 1.09), soft-tissue infections (HR 5.87), diabetes (HR 2.66), and multi-organ dysfunction syndrome (MODS, HR 2.65).
CONCLUSIONS. • Sepsis after on-pump cardiac surgery strikingly increases mortality.
• Mortality related factors for septic patients after on-pump surgery were Diabetes, soft-tissue infection, multi-organ failure and high APACHE score on admission; age, mtDNA Haplogroups, sex, type of surgery and other pathologies were not.
• The main limitation on this clinical trial was low statistical power (n = 227). Extensive studies are needed.
REFERENCE(S). 1. Winters BD,et al. Long-term mortality and quality of life in sepsis: a systematic review. Crit Care Med 2010;38(5):1276–83. 2. Neil Howell, et al. Mitochondrial DNA and survival after sepsis: a prospective study. Lancet 2005;366(9503):2118–2121.
GRANT ACKNOWLEDGMENT. Work of Baluja was supported by a "Del Rio-Hortega" contract CM10/00112 from the Instituto de Salud Carlos III, Spanish Ministry of Economy and Competitivity.

0549
THE IMPACT OF TIME OF OPERATION AND AVAILABILITY OF CONSULTANT CARE ON THE MANAGEMENT AND OUTCOME OF PATIENTS UNDERGOING EMERGENCY LAPAROTOMIES

K. Irwin[1], E. Fontaine[1], A. Burt[1], A.M. Pickford[2], J.J. Paddle[1]

[1]Royal Cornwall Hospital, Intensive Care Unit, Truro, United Kingdom, [2]Royal Cornwall Hospital, Anaesthetics, Truro, United Kingdom
INTRODUCTION. Emergency laparotomies are high-risk surgical procedures with a 30 day mortality of 14.9 % in the UK [1]. Across Europe, wide variation exists in mortality rates for high-risk patients with considerable variation in availability of critical care resources [2]. The Royal College of Surgeons recommends that scoring systems are used to identify high-risk patients and that they receive consultant delivered care in appropriate high-dependency areas [3]. Availability of consultant care varies widely and may be associated with differences in management and outcome for these patients.
OBJECTIVES. To assess whether differences in availability of consultant care between daytime and out-of-hours operating affects patient care and outcome in high-risk laparotomies.
METHODS. We collected data from notes review of patients who underwent emergency laparotomies at the Royal Cornwall Hospital, a large UK general hospital, during one summer and one winter month in 2012. We used the P-POSSUM [4] score to calculate risk and prospectively defined high-risk patients as those who had a mortality risk ≥5 %. We defined in-hours operations as those started between 08:00 and 20:00 Monday to Friday, when the emergency theatres are staffed by consultants. At other times the consultant service is on-call only. We calculated statistical significance using Fisher's exact test.
RESULTS. We collected data on 49 patients undergoing 53 operations (4 patients had 2 operations). Median age was 65 (SD 21.4), 51 % were male. 34 of 53 (64.2 %) operations were identified as high-risk (defined by P-POSSUM risk of death ≥5 %). 4 of the 49 (8.2 %) patients died by day 30, all were high-risk. 23 patients underwent laparotomies out-of-hours and 30 in-hours. More high-risk patients (n = 18, 78 %) underwent laparotomies out-of-hours compared to in-hours (n = 15, 50 %; p = 0.048). 12 (52 %) operations were carried out with both consultant surgeon and anaesthetic presence out-of-hours, compared to 26 (87 %) operations in-hours (p = 0.012). For high-risk patients undergoing procedures out-of-hours, only 9 (50 %) had combined consultant presence, compared to 13 (87 %) during normal working hours (p = 0.034). Only 18 (45 %) high-risk patients in this study were transferred to ICU/HDU for post-operative care.
CONCLUSIONS. In our centre high-risk patients are more likely to have emergency laparotomies out-of-hours compared to in-hours. Despite this they were less likely to receive consultant care, and the majority do not receive post-operative critical care.
REFERENCE(S). 1. Saunders DI, Murray D, et al. Br J Anaesth. 2012;109:368–375. 2. Pearse RM, Moreno RP, et al. Lancet 2012;380:1059–1065. 3. The Royal College of Surgeons/DoH. 2011. http://rcseng.ac.uk/publications/docs/higher-risk-surgical-patient. Accessed 11/04/13. 4. Prytherch DR, Whitley MS et al. Br J Surg 1998;85:1217–20.

0550
EFFECTS OF PREOPERATIVE RESPIRATORY MUSCLE TRAINING ON EARLY AND LATE POSTOPERATIVE OUTCOME OF PATIENTS UNDERGOING ESOPHAGEAL SURGERY

F.M.R. Da Cunha[1], G. Ruas[1], J.M.V. Fanan[1], E. Crema[1], M.S. Volpe[1]

[1]Federal University of Triangulo Mineiro, Uberaba, Brazil
INTRODUCTION. Respiratory muscle training (RMT) is considered a successful intervention that optimizes patient outcome after major thoracic surgery. Patients undergoing esophagectomy present the highest rate of postoperative pulmonary complications among all types of upper abdominal surgery. The increased rate of complications augments morbidity and prolongs hospital stay.
OBJECTIVES. To investigate the effects of preoperative RMT on early (2° PO) and late (30° PO) postoperative outcome of patients undergoing esophageal surgery.
METHODS. Participated in the study patients with megaesophagus or esophageal cancer, in the preoperative of esophagectomy or Heller myotomy. Patients were randomly assigned, 2–3 weeks before surgery, into two groups: RMT and control. Both groups received usual care characterized by being instructed to perform breathing exercises associated to upper and lower limbs exercises. Only the RMT group received preoperatively inspiratory and expiratory muscle training. Each training consisted of 3 series of 12 repetitions performed using IMT and PEP threshold devices, at a resistance equal to 60 % of their maximal inspiratory and expiratory pressures (MIP and MEP), respectively. They trained daily, five times a week, for at least 2 weeks before surgery. The resistance was increased incrementally, based on the rate of perceived exertion. MIP and MEP were obtained at baseline, 1–2 days prior the surgery day (denominated −1) and on the 2° and 30° postoperative (PO) day. Spirometry was obtained on −1 and on the 2° and 30° PO. The 6-min walk test (6MWT) was performed on baseline, −1 and 30° PO. Postoperative hospital length was recorded. Data are expressed as mean ± DP. Statistical analysis was performed using unpaired *t* test or Mann–Whitney and a two-way analysis for repeated measures as appropriate.
RESULTS. Fifteen patients were included in the study, seven were allocated to RMT group and nine to control group. Both groups had similar age, body mass index and gender. Table 1 shows the results of respiratory muscle tests, lung functional test and 6MWT of both groups at the study moments. MIP and MEP increased in the preoperative in the RMT (although only MIP increment was significant), but not in the control group. In the post-operative period MIP and MEP had a similar behavior in both groups. Lung function was decreased in the 2° PO and returned to baseline values in the 30° PO in both groups. RMT did not affect the distance walked during the 6MWT in the pre and postoperative periods. Hospital length was lower in RMT group compared to control group, but it was not statistically significant (9 ± 9 vs 7 ± 7 days, p = 0,665) (Table 1).

	Groups	Baseline	-1	2°PO	30°PO
Respiratory muscle tests					
MIP (cmH_2O)	Control	79 ± 38	74 ± 36	34 ± 21	83 ± 29
	RMT	83 ± 32	106 ± 21*	42 ± 18	87 ± 17
MEP (cmH_2O)	Control	93 ± 10	89 ± 22	61 ± 29	95 ± 21
	RMT	103 ± 26	119 ± 13	62 ± 41	110 ± 15
Lung function test (% predicted)					
FVC	Control	98,0 ± 17,2	-	65,5 ± 26,9	95,5 ± 15,6
	RMT	94,1 ± 18,1	-	54,4 ± 10,7	92,3 ± 11,4
FEV_1	Control	92,1 ± 19,8	-	61,0 ± 23,2	87,4 ± 19,3
	RMT	81,6 ± 27,8	-	50,6 ± 11,7	88,8 ± 10,3
FEV_1/FVC	Control	76,4 ± 8,2	-	76,6 ± 6,1	74,1 ± 8,0
	RMT	69,0 ± 14,0	-	75,7 ± 9,1	78,8 ± 10,9
Functional capacity test					
6MWT (m)	Control	508 ± 89	483 ± 65	-	517 ± 77
	RMT	498 ± 69	504 ± 90	-	474 ± 57

RMT=Respiratory muscle training; MIP=Maximal inspiratory pressure; MEP=Maximal expiratory pressure; FVC=Forced vital capacity; FEV_1= forced expiratory volume in the first second of expiration; 6MWT=Six-minute walk test; -1 is preoperative.
*P=0,015 vs baseline.

Table 1

CONCLUSIONS. These preliminary results of a current study suggest that RMT was successful at increasing MIP in the preoperative, but it did not influence patient outcome undergoing esophageal surgery.
GRANT ACKNOWLEDGMENT. Coordenação de Aperfeiçoamento de Pessoal de Nível Superior—CAPES, Brazil.

0551
PREDICTORS OF POSTOPERATIVE RESPIRATORY FAILURE IN PATIENTS ADMITTED TO A SURGICAL INTENSIVE CARE UNIT IMMEDIATELY AFTER FEMUR FRACTURE REPAIRS

S.J. Lee[1], G.Y. Chang[1], S.W. Kim[1], Y.J. Ryu[1], J.H. Lee[1], J.H. Chang[1]

[1]Ewha Medical Center and Ewha Medical Research Institute, Ewha Womans University School of Medicine, Internal Medicine, Seoul, Korea, Republic of

INTRODUCTION. Femur fracture and following surgical repair demands patient to keep prolonged bed rest with supine position. It might cause various pulmonary complications including respiratory failure. However, there are few reports about predictors for postoperative pulmonary complications including respiratory failure in femur fracture patients.
OBJECTIVES. The aim of this study was to describe the clinical features and outcomes and assess the predictive factors for postoperative respiratory failure requiring mechanical ventilation in patients admitted to the intensive care unit (ICU) immediately after femur fracture repairs.
METHODS. Following a retrospective review of clinical data and radiographic findings, total 94 patients admitted to the ICU immediately after femur fracture repairs were enrolled in this study from August, 2008 to December, 2011.
RESULTS. The median age of the patients was 82 year (41-100) and 75.5 % (n = 71) was female. 31 (33.0 %) patients had underwent postoperative pulmonary complication. Pneumonia developed in 17 patients (18.1 %), atelectasis in 5 (5.3 %), pulmonary edema in 10 (10.6 %), pleural effusion in 15 (16.0 %), and pulmonary embolism in 3 (3.2 %) patients. In-hospital mortality developed in 6 patients (6.4 %). Ten patients (10.6 %) developed acute respiratory failure requiring mechanical ventilation. The factors associated with postoperative respiratory failure by univariate analysis ($p < 0.2$) were one preoperative factor (right ventricular systolic pressure (RVSP) (39 vs. 48 mmHg, $p = 0.084$) and four operative factors (requirement of transfusions (0 vs. 16.0 %, $p = 0.014$), prolonged operation time over 2 h (7.7 vs. 25.0 %, $p = 0.041$), loss of blood above 500 mL (6.2 vs 20.0 %, $p = 0.044$), and volume overload (total input–output) in operation room (1,014 vs. 1,386 mL, $p = 0.060$). After adjusting for age and gender, these five factors were introduced into the multivariate analysis model, which revealed that RVSP [odds ratio (OR) = 1.079, $p = 0.043$] and volume overload in operation room (OR = 1.002, $p = 0.036$) were the independent predictive factor for postoperative respiratory failure.
CONCLUSIONS. Pulmonary hypertension diagnosed by RVSP and a large volume overload above output during operation were predictors for postoperative respiratory failure requiring mechanical ventilation in patients after femur fracture repairs.
REFERENCE(S). 1. Batsis JA, Huddleston JM, Melton LJ, 3rd et al. Body mass index (BMI) and risk of noncardiac postoperative medical complications in elderly hip fracture patients: a population-based study. J Hosp Med 2009;4:E1–9. 2. Harvin JA, Harvin WH, Camp E et al. Early femur fracture fixation is associated with a reduction in pulmonary complications and hospital charges: a decade of experience with 1,376 diaphyseal femur fractures. J Trauma Acute Care Surg 2012;73:1442–8; discussion 8–9.

0552
RATE AND CAUSES OF POSTOPERATIVE DEATH AFTER POST-ANAESTHESIA CARE UNIT/HIGH DEPENDENCY UNIT STAY

N. Wickboldt[1], C. de Lorenzi[1], M. Borgeaud[1], C. Delhumeau[1], G. Haller[1], B. Walder[1]

[1]University Hospitals of Geneva, Department Anaesthesiology, Intensive Care and Clinical Pharmacology, Geneva, Switzerland
INTRODUCTION. Care of patients with critical illness after surgery is performed often outside of ICU; such a clinical pathway with a stay in a post-anaesthesia care unit (PACU), sometimes combined with a high dependency unit (PACU-HDU), may be associated with considerable mortality. Rates and causes of postoperative death outside ICU were rarely investigated.
MAIN OBJECTIVE. To estimate the in-hospital death rate post-PACU-HDU stay and to identify risks associated with this mortality.
SECONDARY OBJECTIVES. To determine causes of postoperative mortality and time between PACU and HDU discharge and death.
DESIGN. Single centre, retrospective. Data from hospital computerized patient data systems were searched.
SETTING. Tertiary care centre with a centralised PACU-HDU (with guidelines, rounds, discharge criteria, committed medical and nursing heads and the possibility to stay some days).
PATIENTS. Post-interventional adults except after cardiac surgery, craniotomies, gynaecologic interventions, interventions on multiple trauma, with a stay in the PACU-HDU during the period of July 2008–June 2011.
STATISTICAL ANALYSES. Descriptive statistics were conducted [frequency, percent, or median, interquartile range (IQR)]. Univariate and multivariate logistic regression [odds ratio (OR) with 95 % confidence interval (95 % CI)] with an alpha threshold of 5 % were used to identify risk factors of postoperative mortality.
RESULTS. In-hospital, postoperative mortality after PACU-HDU was 0.8 % (214/27,404 patients). Risk factors for mortality were age [OR 1.04 (95 % CI 1.03–10.5); survivors: median 59 years (IQR 42; 72), non-survivors: median 78 years (IQR 69; 86)], dichotomised ASA PS (ASA PS 1–2 vs. ASA PS 3–5) [OR 7.63 (95 % CI 4.94–11.81); survivors with ASA PS 3–5: 26.1 %, non-survivors with ASA PS 3–5: 86.4 %], non-elective surgery (vs. elective surgery) [OR 2.71 (95 % CI 2.03–3.61); survivors with non-elective surgery: 36.6 %; non-survivors with non-elective surgery: 63.6 %], and duration of PACU-HDU stay [OR 1.00 (95 % CI 1.00–1.00); survivors: median 152 min (IQR 99; 269); non-survivors: median 392 min (IQR 165; 1,080)]. The severity of intervention and anaesthesia time were not independent risk factors of mortality.
Hundred twenty-seven non-survivors (59.3 %) had oncologic pathologies. The causes of death were respiratory [68 (31.8 %)], cardiac [55 (25.7 %)], infectious [52 (24.3 %)], oncologic [36 (16.8 %)], cerebral [16 (7.5 %)], renal [13 (6.1 %)], haemorrhagic [13 (6.1 %)], intestinal [4 (1.9 %)], not established [10 (4.7 %)]. The median survival time after discharge from PACU to HDU was 6 days (IQR 3; 10).
CONCLUSIONS. The postoperative pathway via a PACU-HDU is safe. Risk factors of postoperative death were age, higher ASA PS, non-elective intervention, and prolonged PACU-HDU stay. Major causes of death after PACU-HDU stay are respiratory, cardiac and infectious; death was several days after PACU-HDU discharge.

0553
DECISION FORK RESPIRATORY TACTICS IN PATIENTS WITH ALI/ARDS IN CARDIOVASCULAR AND THORACIC SURGERY

R.A. Ibadov[1], A.S. Arifjanov[1], Z.N. Mansurov[1], N.A. Strijkov[1]

[1]Republican Specialized Center of Surgery named after acad. V. Vakhidov, Tashkent, Uzbekistan
OBJECTIVES. Comparison of the effectiveness of the modes of respiratory support, different by pressure and volume (PCV, VCV) to select the optimal variants for mechanical ventilation in patients with of acute respiratory distress syndrome ALI/ARDS.
METHODS. The patients included in the study were those after cardiopulmonary bypass surgery, coronary artery bypass grafting, and heart valve replacement surgeries, complicated by ARDS, in ICU RSCS after acad. Vakhidov within 2010–2012. The diagnosis of ALI/ARDS based on a standard (X-ray study, indicators of oxygen status pO_2 (A–a) 192 ± 5, pO_2 (a/A) 39 ± 3, Fshunt-19 ± 2, $PaO_2/FiO_2 < 300$).
In a comparative aspect, to divide two group patients: Group A, n = 28. Used mode of mechanical ventilation was with controlled pressure (PCV), an inverse relationship I:E − 1.5:1, Pinsp-20–26 cm of water, $FiO_2 < 60$ % "Optimal" PEEP, the rate of Vinsp—40–60 l/min, auto PEEP comprising no more than 50 % of total PEEP. Group B, n = 26. Used mode of ventilation comprised ventilation with small Vt and low Pplat (<35 smH_2O), with controlled volume (VCV), Ppeak <35–40 cm of water, VT 6–8 ml/kg, Fi $O_2 < 60$ %, PEEP 8–10 mmHg, the rate of Vinsp—40–60 l/min. The efficiency measure criterions: PaO_2 and SaO_2, PaO_2/FiO_2, Fshunt, pO_2 (A–a), pO_2 (a/A), Cst., degree of lung injury by J. Murray.
RESULTS. Improvement of PaO_2/FiO_2 in group A than in group B (outcome—108.7 ± 22.4/112.4 ± 20.2, 5-day-184.8 ± 22.4/140.4 ± 24.2. A/B, respectively). There was a difference in values of pO_2 (A–a) 170 ± 18/165 ± 20 on the 2nd day, 100 ± 20.4/140 ± 22.6 on the 5th day, 58 ± 24.4/100 ± 22.2 respectively. In the first group transition of ALI into ARDS was observed in two cases, in the second group—in four cases. Compared to group B, reduction of duration of mechanical ventilation was observed in patients of group A (16 ± 4.6/12 ± 2.6 days, respectively).
CONCLUSIONS. Management of patients with ALI/ARDS in the modes by pressure, with restricted peak inspiratory pressure and tidal volume with prolonged inspiratory time, prove to be more effective for the correction of hypoxemia, for reducing the negative effects of mechanical ventilation on pulmonary parenchyma, for reducing duration of mechanical ventilation and more favorable in terms of lethality when compared with conventional methods of mechanical ventilation.

0554
THE CHOICE SET RESPIRATORY TACTICS OF PATIENTS WITH HYPERVOLEMIA LESSER CIRCULATION IN THE EARLY POSTOPERATIVE PERIOD AFTER REGULATED SUBCLAVIAN-PULMONARY ANASTOMOSIS

R.A. Ibadov[1], H.K. Abrolov[1], D.I. Zhulamanova[1], N.A. Strijkov[1]

[1]Republican Specialized Center of Surgery named after acad. V. Vakhidov, Tashkent, Uzbekistan
OBJECTIVES. Optimization of respiratory tactics during intensive management of early postoperative period after regulated subclavian-pulmonary anastomosis in patients with Fallot's tetralogy and lesser circulation.
METHODS. 81 patients with Fallot's tetralogy and lesser circulation after elective surgery regulated subclavian-pulmonary anastomosis for the last 2 years, in the ICU RSCS after V. Vakhidov. Proximal end of tourniquet regulators was used in case of 39 patients and Fogarty catheter for volume dosing of shunt was used in case of 42 patients. Clinical examination: EchoCG (with detection of velocity of blood flowing through the subclavian-pulmonary regulated anastomosis), ECG, chest X-rays (with special emphasis on assessing the degree of blood filling in the pulmonary circulation); cardiac monitoring: heart rate, blood pressure, central venous pressure, gas exchange parameters and deep oxygen status (pH, SpO_2, pO_2, pCO_2, lactate); monitoring of hemoglobin, hematocrit levels and data of blood coagulation.
RESULTS. From overall patients 14 patients had hyperfunction of anastomosis: the picture of pulmonary preedema was noted in 6 cases, and 9 patients had "managed" hypervolemia of the pulmonary circulation that manifested as: hemodynamic instability (MABP 75–80 mmHg, HR −120 to 140 bpm, CVP 100–140 mmH_2O), increase of SpO_2 to 90.1 ± 1.2 together with poor values of deep oxygen status (A–a 205.1 ± 5.3 mmHg, a/A 47.3 % ± 1.4). Restriction of anastomosis functioning allowed to achieve stabilization of hemodynamic (blood pressure 90–100 mmHg), deep oxygen status (A–a and −230 mmHg, a/A-30 %, SpO_2-80 % at FiO_2-40 %), which were accompanied by disappearance of rales, improvement of echocardiographic data in dynamics with reduced duration of mechanical ventilation and time of staying in the ICU. Approximate initial date MLV: Vt = 7–9 ml/kg, f = 15–17, I:E = 1:2, PEEP = 5 smH_2O, FiO_2 = 40–50 %, trigger = 3–3.5 L/min or 2.5–3 smH_2O. On reaching satisfactory performance of gases of blood, stable haemodynamics, good functioning SPA and good X-ray picture patients expose to extubation.
CONCLUSIONS. The proposed tactics of intensive care in the early postoperative period after controlled subclavian-pulmonary anastomosis in patients with Fallot's tetralogy allows monitoring and active controlling of the volume of shunted through the anastomosis blood, thus helping to avoid development of hyperfunctioning of anastomosis and pulmonary edema.

0555
FACTORS PREDICTING HAEMORRHAGE DURING THE IMMEDIATE POSTOPERATIVE PERIOD AFTER LIVER TRANSPLANTATION

R. Gutierrez Rodriguez[1], M.V. Garcia Martinez[1], M.D. Arias Verdu[2]

[1]Carlos Haya Regional University Hospital, Critical Care Unit, Malaga, Spain, [2]Carlos Haya Regional Hospital, Critical Care Unit, Malaga, Spain
OBJECTIVES. To determine risk factors reliably associated with the need for multitransfusion and haemorrhage during the immediate postoperative period.
METHODS. A retrospective observational analytical study of male and female patients admitted after liver transplantation, in our intensive care unit, during the last 3 years. Exclusion factors: none.
Variables: Age, sex, stay, mortality, intra-operative and immediate post-operative haemorrhage, important intra-operative ascites, MELD, Child Pugh, APACHE II, transplant indication, percentage of patients with pretransplant haemoglobin values <10, international normalized ratio (INR) > 1.6, prothrombin time >40 %, platelets <70.000 IU/L, Factor V < 60 %, fibrinogen <100 mg.
Statistical study: mean, mode, comparison of means: qualitative variables compared by Chi square and quantitative variables by Student *t* test. Multivariate regression analysis to assess multiple variables.
RESULTS. The study comprised 135 patients, 121 men and 14 women; mean age 59 years. The mean MELD was 15, the mean Child Pugh 7, mean APACHE II 18. Most had alcoholic cirrhosis (51 %), 37 % hepatocarcinoma, and 46 % were HCV positive recipients. No significant differences were found between groups concerning the INR, Factor V, or fibrinogen.
There were differences relating to those with platelets < 70,000, with a greater risk of immediate haemorrhage (50 vs. 13 %; P = 0.001), multitransfusion (>3 packed red cells) during the first 24 postoperative hours (56 vs. 20 %; p < 0.05), and early kidney failure (43

vs. 13 %; P < 0.05). Haemoglobin values <10 g/L were associated with greater transfusion (46 %), haemorrhage (38 %), pulmonary complications (pneumonia, distress or pleural effusion) (46 %), and prolonged ICU stay (>5 days) (42 %), all with P < 0.05.
The multivariate analysis showed that only pretransplant haemoglobin <10 g/L was independently associated with the risk for multitransfusion (OR 2.6; p = 0.001; 95 % CI 1.35–4). There were no significant differences between groups concerning death.
CONCLUSIONS. A higher number of patients is probably needed to find a marker of coagulopathy better associated with mortality. Nevertheless, give these results we should re-evaluate the procedure in those patients with pretransplant haemoglobin values <10 g/L.

Stratification of ARDS severity: still a challenge: 0556–0569

0556
LOW DOSE CT SCAN FOR QUANTITATIVE ANALYSIS IN PATIENTS WITH ARDS

D. Chiumello[1], S. Coppola[1], S. Froio[1], I. Cigada[2], F. Menga[2], M. Brioni[2], A. Colombo[2], C. Sparacino[2], T. Langer[2], M. Savioli[1], A. Lissoni[1], M. Lazzerini[3], L. Gattinoni[1,2]

[1]Fondazione IRCCS Ca' Granda—Ospedale Maggiore Policlinico, Dipartimento di Anestesia, Rianimazione (Intensiva e Subintensiva) e Terapia del Dolore, Milano, Italy, [2]Università degli Studi di Milano, Dipartimento di Fisiopatologia Medico-Chirurgica e dei Trapianti, Milano, Italy, [3]Fondazione IRCCS Ca' Granda—Ospedale Maggiore Policlinico, Unità Operativa di Radiologia, Milano, Italy

INTRODUCTION. In ARDS patients a correct ventilatory strategy should be based on the study of lung residual aeration and recruitability. Quantitative analysis of lung CT scan at different airway pressures is considered the reference method to study lung parenchyma in these patients [1]. However, this technique is not usually utilized to monitor the evolution of the disease, due to the risk of cumulative radiation exposure. The use of low dose lung CT scan could reduce radiation exposure, but it has not been validated for quantitative analysis in ARDS patients.
OBJECTIVES. To assess the accuracy of quantitative analysis performed on low dose lung CT scan, compared to standard lung CT scan.
METHODS. Eleven sedated and paralyzed ARDS patients who were scheduled for chest CT scan for clinical purpose, underwent two consecutive chest CT scans during the same inspiratory or expiratory hold, at different values of airway pressure. The first one was a standard CT scan (120 kV, 110 mAs, pitch 1.2, collimation 0.6), while the second one was performed using a low radiation dose (120 kV, 30 mAs). All CT scans were performed using Care Dose Technology. CT images, in which lung parenchyma was manually delineated, excluding mediastinal structures and pleural effusion, were analyzed by a dedicated software to quantify tissue weight of the lung compartments according to thresholds usually adopted in literature [2].
RESULTS. A total of 19 couples of chest CT scans were performed. Total lung tissue weight was 1,541 ± 497 and 1,528 ± 473 g (P = 0.396) computed with quantitative analysis performed on standard and low dose CT scan, respectively. Linear regression showed a very good correlation between lung tissue weight computed analyzing standard and low dose CT scan ($R^2 = 0.99$, P < 0.001) (Fig. 1, upper panel), and Bland–Altman analysis showed a bias and limits of agreement of 12.4 and -109.6–134.5 g (Fig. 1, lower panel). Also, a very good correlation was found between standard and low dose CT scans in computing tissue weight of hyperinflated, normal, poorly inflated and not inflated lung regions (Table 1).

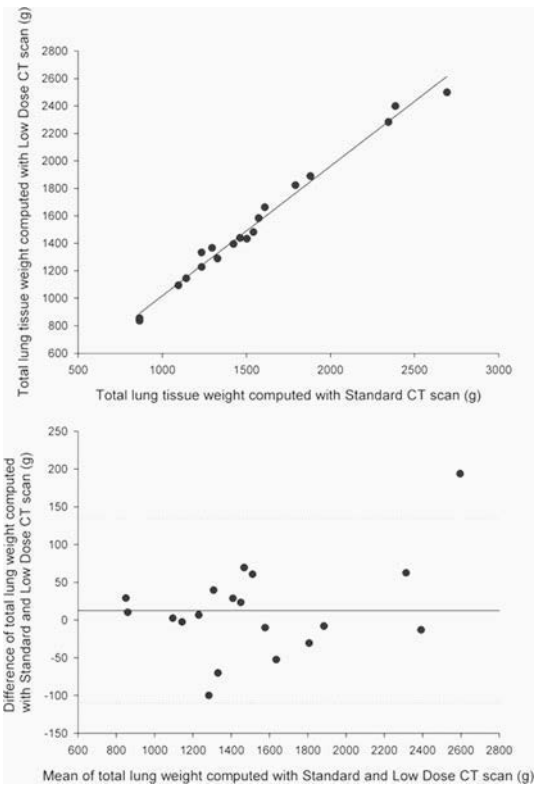


Figure 1

Table 1

Lung tissue compartments (% of total lung tissue weight)	Standard CT	Low dose CT	Regression R2	Regression P	Bland–Altman BIAS	Bland–Altman LoA
Hyper-inflated tissue %	0.8 ± 1.4	1.0 ± 1.6	0.978	<0.001	−0.16	−0.75; 0.43
Normal tissue %	38.7 ± 22.0	37.8 ± 22.2	0.994	<0.001	0.86	−2.56; 4.28
Poorly inflated tissue %	27.7 ± 11.1	28.4 ± 10.9	0.965	<0.001	−0.72	−4.78; 3.34
Not inflated tissue %	32.8 ± 20.4	32.8 ± 19.3	0.982	<0.001	0.02	−5.67; 5.70

CONCLUSIONS. Low dose lung CT scan can be used for quantitative analysis in ARDS patients, allowing to monitor the evolution of the disease with reduced radiation exposure.
REFERENCE(S). 1. Gattinoni L et al. N Engl J Med. 2006:354(17):1775–86. 2. Gattinoni L et al. Am J Respir Crit Care Med. 2001;164(9):1701–11.

0557
THE BIOLOGICAL EFFECTS OF PEEP IN THE PRESENCE OF INTRA-ABDOMINAL HYPERTENSION DEPEND ON THE ETIOLOGY OF ACUTE RESPIRATORY DISTRESS SYNDROME

C.L. Santos[1,2], L. Moraes[1], R.S. Santos[1], C.S. Samary[1], J.D. Silva[1], M.M. Morales[3], V.L. Capelozzi[4], C.S.N.B. Garcia[1], P.L. Silva[1], A. Schanaider[2], P. Pelosi[5], P.R.M. Rocco[1]

[1]Federal University of Rio de Janeiro, Carlos Chagas Filho Biophysics Institute, Laboratory of Pulmonary Investigation, Rio de Janeiro, Brazil, [2]Federal University of Rio de Janeiro, Faculty of Medicine, Department of Surgery, Rio de Janeiro, Brazil, [3]Federal University of Rio de Janeiro, Carlos Chagas Filho Biophysics Institute, Laboratory of Cellular and Molecular Physiology, Rio de Janeiro, Brazil, [4]University of São Paulo, School of Medicine, Department of Pathology, São Paulo, Brazil, [5]University of Genoa, Department of Surgical Sciences and Integrated Diagnostics, Genoa, Italy

INTRODUCTION. Low tidal volume (V_T) combined with positive end-expiratory pressure (PEEP) is frequently used to ventilate acute respiratory distress syndrome (ARDS) patients. However, depending on both the etiology of ARDS and presence of intra-abdominal hypertension (IAH), transpulmonary pressure changes and thus the level of PEEP setting [1, 2].
OBJECTIVES. This study aimed to compare the effects of different PEEP in pulmonary (p) and extrapulmonary (exp) ARDS associated or not with IAH.
METHODS. Wistar rats were randomly allocated to receive *Escherichia coli* lipopolysaccharide intratracheally (200 μg, ARDSp) or intraperitoneally (1,000 μg, ARDSexp). After 24 h, they were randomized into subgroups without or with IAH (15 mmHg) and ventilated with V_T = 6 ml/kg and PEEP (P) = 5, 7 or 10 cmH_2O during 1 h.
RESULTS. In both ARDS etiology associated or not with IAH, P7 and P10 improved oxygenation compared to P5. In the presence of IAH, we found in ARDSp, Est,L was higher in P7 and P10 than P5, but only P10 resulted in hyperinflation and diaphragmatic damage. In ARDSexp, P7 reduced Est,L and alveolar collapse, but worsened type II epithelial cell damage and increased interleukin (IL)-6, type III procollagen (PCIII), and surfactant protein (SP)-B expressions. P10 led to alveolar hyperinflation, worsened alveolar-capillary membrane, and epithelial and endothelial cell damage, as well as increased IL-6, PCIII, SP-B, and vascular cell adhesion molecule (VCAM)-1 expressions.
CONCLUSIONS. In the presence of IAH, PEEP should be set according to the etiology of ARDS. In ARDSp, P7 and P10 impaired lung mechanics, morphology and worsened markers of epithelial and endothelial cell damage. In ARDSexp, P7 improved lung mechanics and reduced atelectasis. However, both P7 and P10 increased inflammatory and fibrogenic mediators and type II epithelial cell injury.
REFERENCE(S). 1. Pelosi P, Luecke T, Rocco PR. Curr Opin Crit Care. 2011;17(1):72–9. 2. Santos CL et al. Intensive Care Med. 2012;38(3):499–508.
GRANT ACKNOWLEDGMENT. PRONEX-FAPERJ, FAPERJ, CNPq, CAPES.

0558
IS THE DYNAMIC COMPLIANCE BASED PEEP TITRATION A VALID METHOD TO ASSESS A SAFE AND PHYSIOLOGICAL VENTILATORY STRATEGY IN ARDS PATIENTS?

D. D'Antini[1], P. Raimondo[1], L. Mirabella[1], M. Rauseo[1], D. La Bella[1], C. D'Onofrio[1], M. Dambrosio[1], G. Cinnella[1]

[1]University of Foggia, Anesthesiology and Intensive Care, Foggia, Italy

INTRODUCTION. Patients with ARDS always have atelectasic lung regions and non-homogeneous distribution of damage over the lungs. Alveolar recruitment strategy (ARS) are ventilatory strategies that aim to restore the aeration. They consist of a brief and controlled increment in airway pressure to open up collapsed areas of the lungs and sufficient positive end-expiratory pressure (PEEP) to keep them open afterward.
OBJECTIVES. Our work compared the physiological effect of dynamic compliance based Positive End Expiration Pressure (PEEP) titration on the end-inspiratory transpulmonary pressure (P_L) to keep the lung open after the recruitment manoeuvre.
METHODS. A prospective study was conducted in 8 consecutive patients with mild ARDS undergoing mechanical ventilation. Esophageal pressure was used for partitioning respiratory mechanics between lung and chest wall and for measuring lung transpulmonary pressure. Respiratory mechanics, gas exchange, hemodynamic were measured before (T-Pre) and after (T-Post) the RM. An ARS was performed in patients showing a P_L < 24 cmH_2o on T-Pre. The ARS was performed in pressure control ventilation with a driving pressure (Plateau–PEEP) of 20 cmH_2O. PEEP was increased in steps of 5 cmH_2O, until a plateau pressure of 40 and a PEEP of 20 cmH_2O were reached. After ten breaths a PEEP titration trial was started by reducing PEEP in steps of 2 cmH_2O until the closing pressure, defined as sudden fall in static compliance (Crs), was evidenced. Following a second recruiting step, ventilation was reassumed with tidal volume (Vt) of 8 ml/kg of ideal body weight and a PEEP set at the value of closing pressure plus 2 cmH_2O (open lung PEEP, OL-PEEP).

RESULTS. In three patients the values of end-inspiratory transpulmonary pressure (P_L) was close to the upper physiological limit of 25 cmH_2O (23.1 ± 2.6) and no ARS was performed; in five patients P_L values were 13.1 ± 3.7, external PEEP 8.5 ± 3.1, and an ARS was performed; on T-Post P_L was 15.2 ± 3.1 at T-Post (NS vs T-Pre) and OL-PEEP was 10.2 ± 3.9 (NS vs T-Pre). Recruiting manoeuvres increased P/F in this group from 221 ± 18 at T0 to 253 ± 11 at T-Post ($p < 0.01$).
CONCLUSIONS. Our preliminary data show that: (a) in ARDS patients with $P_L < 24$ cmH_2O the setting of PEEP by means of decremental trial (closing pressure plus 2 cmH_2O) allows to reach values of P_L below the upper physiological limit, keeping it in a safe range; (b) PEEP titration according to the clinical assessment of dynamic compliance was found as a safe method in our ARDS patients, even if our data show that PEEP levels could have been higher to reach P_L closer to the upper physiological limit of 25 cmH_2O, if appropriate.
REFERENCE(S). 1. Grasso S, et al. ECMO criteria for influenza A (H1N1)-associated ARDS: role of transpulmonary pressure. Intensive Care Med 2012;38(3):395–403. 2. Cinnella G, et al. Physiological effects of a lung-recruiting strategy applied during one-lung ventilation. Acta Anaest Scand. 2008;52(6):766–75.

0559
THE BENEFICIAL EFFECTS OF PEEP TITRATION IS INDEPENDENT OF RECRUITMENT MANEUVER STRATEGY IN EXPERIMENTAL ACUTE RESPIRATORY DISTRESS SYNDROME

L. Moraes[1], R.S. Santos[1], C. Samary[1], C.L. Santos[1], M. Ramos[1], C. Baez-Garcia[1], P.L. Silva[1], P. Pelosi[2], P.R.M. Rocco[1]

[1]Federal University of Rio de Janeiro/Carlos Chagas Filho Biophysics Institute, Rio de Janeiro, Brazil, [2]Department of Surgical Sciences and Integrated Diagnostics, University of Genoa, Genoa, Italy
INTRODUCTION: Recent studies have shown that the pattern of airway pressure increase (fast vs. slow) during a recruitment maneuver (RM) application may yield different biological effects in acute respiratory distress syndrome (ARDS). However, these studies compared different RMs using a fixed PEEP which may hinder RM beneficial effects. Since PEEP titration may prolong these beneficial effects, we hypothesized that depending on the type of RM the PEEP setting may differ.
OBJECTIVES. This study aimed to compare different RMs associated with a decremental PEEP trial adjusted according to the lowest respiratory system elastance (ERS) in an experimental sepsis-induced ARDS.
METHODS. Eighteen Wistar rats were submitted to cecal ligation and puncture surgery. After 48 h, animals were anesthetized and mechanically ventilated (MV) (VT = 6 ml/kg, RR = 80 bpm, PEEP = 0 cmH_2O, and $FiO_2 = 0.4$). Baseline functional data were collected, and animals were randomly assigned to two different RMs (n = 6, each), targeted to maximal inspiratory pressure of 30 cmH_2O, as follows: (1) sustained continuous positive airway pressure for 30 s (CPAP) and (2) RM with stepwise airway pressure increase (5 cmH_2O/step, 8.5 s at each step) within 51 s (STEP). The third group was non-recruited (NR), but submitted to PEEP titration similar to the previous two groups. PEEP titration was performed by a decremental method, consisting of reducing PEEP 2 cmH_2O every 2 min, starting at PEEP = 11 cmH_2O. PEEP level was adjusted to the lowest ERS. PEEP of 11 cmH_2O was chosen based on pilot studies showing higher ERS above this level. After RM application, all animals were ventilated with VT = 6 ml/kg and $FiO_2 = 0.4$ for 1 h. Functional data were gathered at baseline and end of the experiments when lungs were removed for histology.
RESULTS. Functional data were similar among the groups at baseline. Although CPAP and STEP maneuvers presented similar pressure–time product, STEP presented lower mean airway pressure compared to CPAP ($p < 0.05$). All animals.
showed a decrement in Est,L (40–50 % after RM), which was sustained for 1-h ($p < 0.05$). PEEP median level was 5 cmH_2O in all groups but presented higher variation in NR (26 %). Alveolar collapse was also higher in NR group.
CONCLUSION. In the present ARDS model, oxygenation and lung mechanics improved despite RM strategy. PEEP titration decreased and stabilized Est,L during 1 h MV. Titrated PEEP level was similar in all groups, although its variability was higher in NR, suggesting the need for RM to open the different lung units reducing alveolar heterogeneities.
REFERENCE(S). 1. Impact of pressure profile and duration of recruitment maneuvers on morphofunctional and biochemical variables in experimental lung injury. Crit Care Med 2011;39(5). 2. Use of dynamic compliance for open lung positive end-expiratory pressure titration in an experimental study. Crit Care Med 2007;35(1).
GRANT ACKNOWLEDGMENT. PRONEX-FAPERJ,FAPERJ, CNPq,CAPES,INCT-INOFAR.

0560
DEAD SPACE QUANTIFICATION RELATED TO MORTALITY USING HARRIS BENEDICT FORMULA VERSUS FAISY EQUATION FOR CALCULATION OF VCO_2 IN PATIENTS WITH ARDS

C. Rodriguez[1], M.A. Romero[1], M.E. Camarillo[1], E. Monares[1], G. Camarena[2], J.M. Ramirez[3], J. Franco[4]

[1]ABC Medical Center, Critical Care, Mexico, Mexico, [2]Santa Fe ABC Medical Center, Critical Care, Sub Chief Department, Mexico, Mexico, [3]Santa Fe ABC Medical Center, Critical Care Department, Mexico, Mexico, [4]ABC Medical Center, Critical Care, Chief Department, Mexico, Mexico
INTRODUCTION. Dead space (Vd/Vt) is defined as the remainder of the tidal volume that is not involved in gas exchange. In patients with ADRS an increase vd/vt is related to higher mortality. It is usually calculated using alveolar gas equation from Siddiki, which uses VCO_2 obtained by Harris Benedict equation (HBE). However this equation has been developed for healthy subjects and its accuracy is limited in critically ill patients using invasive mechanical ventilation. Faisy's equation (FE) is another equation for calculating VCO_2 in critically ill patients under mechanical ventilation and is currently validated.
OBJECTIVES. Compare usefulness between both Harris Benedict and Faisy equations using VCO_2 to calculate dead space in patients with ARDS and to determine predictive mortality rate.
METHODS. Retrospective, observational study. We included patients diagnosed with ARDS according to Berlin Consensus criteria, from September 2010 to November 2012, under invasive mechanical ventilation. Parameters recorded were: age, gender, SOFA, Charlson index, tidal volume, minute volume, PEEP, PaO_2/FiO_2 100 %, temperature (at first and third day). We calculated Vd/Vt using FE and HBE. Normally-distributed variables were compared with an Independent T-Test; non-parametric variables with a Mann–Whitnety's *U*. Threshold VD/VT values to predict mortality were obtained to maximize the ROC.
RESULTS. 52 patients were included, 32 female (61.5 %) and 20 male (38.4 %), mean age 60.5 ± 16, admission SOFA 11(10–12), ARDS Score 2(0–6), Charlson index 1(0–6), PaO_2/FiO_2 100 of 190 ± 89. Subjects were divided by survivors and non survivors: 12 patients died (23.07 %) and 40 survivor patients (76 %). In the group of survivors we observed they were younger, had lower SOFA, ARDS and Charlson Index, than non-surviving population. In the survivors the Vd/Vt using VCO_2 by HBE was 0.39 ± 0.08 and by FE was 0.54 ± 0.10. In non-survivors the Vd/Vt by FE was 0.65 ± 11 and by HBE was 0.56 ± 0.18. We observed that the mortality prediction with FE had 90 % sensitivity and 70 % specificity (AUC) = 0.829 (P = 0.001); and the mortality prediction with HBE had 75 % sensitivity and 65 % specificity, AUC = 0.704 (p = 0.03).

The mortality prediction according to equation of Vd/Vt using Harris Benedict

AUC	CI 95%	p	Sen%	Sp%	Cut-off	LR+	LR-
0.704	0.486-0.922	0.03	75	65	0.43	2.14	0.38

The mortality prediction according to equation of Vd/Vt using Faisy

AUC	CI 95%	p	Sen%	Sp%	Cut-off	LR+	LR-
0.829	0.672-0.986	0.001	90	70	0.58	3	0.14

ROC analysis

CONCLUSIONS. Dead space calculated by VCO_2 obtained for Faisy's equation in patients with ARDS under mechanical ventilation proved better than dead space calculated using Harris Benedict to predict mortality in ARDS patients.

0561
ASSESSMENT OF EXTRAVASCULAR LUNG WATER IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME BY THE BERLIN DEFINITION: A VALIDATION STUDY

M. Mizunuma[1], H. Ishikura[1], Y. Kawano[1], R. Ichiki[1], K. Hoshino[1], H. Ohya[1], A. Murai[1], T. Umemura[1]

[1]Fukuoka University Hospital, Emergency and Critical Care Medicine, Fukuoka, Japan
INTRODUCTION. The Berlin Definition is a new classification of acute respiratory distress syndrome (ARDS) [1]. In this new definition, the severity of the ARDS is divided into three categories (mild, moderate, severe) based on the level of pulmonary oxygenation, as indicated by the PaO_2/FiO_2 ratio. Recently, it has been reported that the pulmonary oxygenation is closely related to the extravascular lung water and the pulmonary vascular permeability in patients with ARDS [2].
PURPOSE. The aims of this study were to validate the relationships between the severity of ARDS based on the Berlin definition and the extravascular lung water index (EVLWI) and the pulmonary vascular permeability index (PVPI).
METHODS. A single center, retrospective, observational study was carried out from January 2009 to February 2013. We enrolled the patients with a PaO_2/FiO_2 <300 who were receiving mechanical ventilation, and whose EVLWI and PVPI could be assessed by the transpulmonary thermodilution method for four consecutive days. Based on the Berlin definition, we classified the patients into three (mild, moderate and severe) groups.
RESULTS. A total of 98 patients were enrolled in this study. The median age was 70.0 years and 44 %(43/98) of the patients were female. The median APACHE II score and SOFA score on admission were 8 and 23, respectively. The causes of ARDS were pneumonia (n = 41), aspiration (n = 14), non-pulmonary sepsis (n = 22), pancreatitis (n = 1) and non-cardiogenic shock (n = 20). The rate of ARDS induced direct lung injury was 58 % (57/98). There ware no significant differences between the three groups in terms of the SOFA score on admission, but the APACHE II score was significantly higher in the severe group (27.48 ± 6.89) compared with the mild group (20.61 ± 7.78, p = 0.004) and the moderate group (21.82 ± 7.14, p = 0.010). The values of the PVPI were significantly higher in the severe group (3.73 ± 1.78) than in the mild group (2.33 ± 1.05, p = 0.002) and moderate group (2.63 ± 1.28, p = 0.008). The EVLWI values were also significantly higher in the severe group (17.63 ± 5.56) than in the mild group (12.80 ± 5.41, p = 0.030), but there was no significant difference between the severe group and moderate group (14.99 ± 7.14, p = 0.270). There was a significant negative correlation between the EVLWI and PaO_2/FIO_2 ratio (r = −0.300, $p < 0.001$), and also between the PVPI and PaO_2/FIO_2 ratio (r = −0.285, $p < 0.001$).
CONCLUSIONS. In this validation study, the severity of ARDS based on the Berlin Definition correlated with the EVLWI and PVPI. From these results, we believe that the classification based on the Berlin definition strongly reflects the pathological conditions of the lungs in ARDS patients.
REFERENCE(S). 1. JAMA. 2012;307(23):2526–33. 2. Minerva Anestesiol. 2013;79(3): 274–84.

0562
DIFFERENCES IN THE PREVALENCE OF ARDS BASED ON THE AMERICAN-EUROPEAN CONSENSUS CONFERENCE VERSUS THE BERLIN DEFINITIONS: RESULTS FROM THE PREVALENCE OF ARDS IN THE ICU STUDY (PARIS STUDY): A ONE-DAY PREVALENCE MULTICENTER OBSERVATIONAL STUDY

B. Furtado-Lima[1], A. Pontes-Arruda[1], L.G. de Castro[1], J.H. Militão[1], V.D.A. do Ceará[1], H. Monte-Coelho Neto[1], A.P. Lima[1], A.P. Magalhães-Júnior[1], D. Guimarães[1], H.P. Moreira[1], F.E. Mendonça-Neto[1], M.F. Colares[2], M. Martins[2], I.S. Bonfim[3]

[1]Christus University Center, School of Medicine, Fortaleza, Brazil, [2]Hospital Fernandes Távora, Fortaleza, Brazil, [3]Hospital Regional do Cariri, Juazeiro do Norte, Brazil
INTRODUCTION. Acute Respiratory Distress Syndrome (ARDS) is considered a severe form of respiratory failure characterized by a noncardiogenic pulmonary edema and refractory hypoxemia with massive pulmonary and systemic release of pro-inflammatory mediators. The incidence of this life-threatening pulmonary disease is currently estimated in the United States as 56–82 cases per 100,000 persons/year [1,2]. This incidence was based in a past consensus definition [3]. There is few data available comparing the incidence using the previously definitions with the recently published new definitions for ARDS [4].

OBJECTIVES. To conduct a multicenter one-day prevalence study in Brazilian ICU's to evaluate the incidence of ARDS in accordance with physicians personal diagnosis versus ARDS as defined by the American-European Consensus Conference and by the new Berlin definitions.
METHODS. After institutional review board approval was obtained data from all ICU patients in 30 ICU's in 15 hospitals were collected during a single day in April 2012. Interviews were conducted with the attending physicians in order to capture physicians personal opinion about the incidence of ARDS at the study day. All other parameters were collected in loco using patients' original medical records. Data was then evaluated to determine if the patient has ARDS in accordance with the American–European Consensus and also in accordance with the new Berlin definitions. Categorical variables were compared between the two groups using the χ^2 test or Fisher's exact test as appropriate. Quantitative normally distributed variables between the groups were compared using an unpaired two-sample *t* test.
RESULTS. Data from 207 patients were collected. Incidence of ARDS was significantly different depending on the method used. The incidence was 6.2 % (n = 13) in accordance with physician's personal opinion, but after audit it was considered much higher: 9.7 % (n = 20) in accordance with the American-Consensus and 24 % (n = 51) using the new Berlin definitions ($p < 0.05$), representing an incidence of 140 per 1,000 hospital days (American-European Consensus) versus 246/1,000 hospital days (Berlin) ($p < 0.0001$).
CONCLUSIONS. Incidence of ARDS in Brazilian ICU's is extremely high. The study identified huge differences also in terms of the incidence as evaluated using the previous versus the new definitions for ARDS. Educational strategies are of pivotal importance in order to allow appropriate diagnosis and treatment of patients suffering from ARDS.
REFERENCE(S). 1. Rubenfeld et al. N Engl J Med. 2005;353:1685–1693. 2. Mutlu GM, Budinger GR. N Engl J Med. 2006;354:416–417. 3. Bernard GR et al. Am J Respir Crit Care Med. 1994;149:818–24. 4. The ARDS Definition Task Force. Acute respiratory distress syndrome The Berlin definition. JAMA. 2012;307(23). doi:10.1001/jama.2012.5669.

0563

COMPLIANCE WITH THE USE OF PROTECTIVE VENTILATION IN THE TREATMENT OF PATIENTS SUFFERING FROM ARDS: RESULTS FROM THE PREVALENCE OF ARDS IN THE ICU STUDY (PARIS STUDY): A ONE-DAY PREVALENCE MULTICENTER OBSERVATIONAL STUDY

L.G. de Castro[1], A. Pontes-Arruda[1], J.H. Militão[1], V.D.A. do Ceará[1], H. Monte-Coelho Neto[1], A.P. Lima[1], A.P. Magalhães-Júnior[1], D. Guimarães[1], H.P. Moreira[1], F.E. Mendonça-Neto[1], B. Furtado-Lima[1], M.F. Colares[2], M. Martins[2], I.S. Bonfim[3]

[1]Christus University Center, School of Medicine, Fortaleza, Brazil, [2]Hospital Fernandes Távora, Fortaleza, Brazil, [3]Hospital Regional do Cariri, Juazeiro do Norte, Brazil
INTRODUCTION. Lung protective ventilation is the provision of mechanical ventilation with static inspiratory pressures (plateau pressure) of less than 30 cm of water and tidal volumes normalised to predicted body weight. This type of ventilatory support has been described as one of the few strategies that has consistently been shown to reduce mortality in patients with acute respiratory distress syndrome (ARDS).
OBJECTIVES. To conduct a multicenter one-day prevalence study in Brazilian ICU's to evaluate the use of protective ventilation in patients suffering from ARDS in accordance with the new Berlin definitions [1].
METHODS. After institutional review board approval was obtained data from all ICU patients in 30 ICU's in 15 Brazilian hospitals were collected during a single day in April 2012. All relevant parameters were collected *in loco* using patients' original medical records or directly by checking the patient's mechanical ventilator. Data was then evaluated to determine if the patient has ARDS in accordance with the Berlin definitions. Predicted body weigh was also calculated in loco using a standard and validated equation. Categorical variables were compared between the two groups using the χ^2 test or Fisher's exact test as appropriate. Quantitative normally distributed variables between the groups were compared using an unpaired two-sample *t* test. For quantitative non-normally distributed data, the nonparametric Wilcoxon rank-sum test was used. Normality was assessed by using the Shapiro–Wilk test.
RESULTS. Data from 207 patients were collected. Incidence of ARDS was 24 % (n = 51) using the new Berlin definitions, representing an incidence of 246/1,000 ICU days. Only 7,8 % (n = 4) of the patients positively diagnosed with ARDS were in use of a protective ventilation strategy, all of them with non-severe ARDS. None of the patients diagnosed in loco with either moderately or severe ARDS were in use of protective ventilation.
CONCLUSIONS. After an extensive and in loco audit procedure the use of protective ventilation was considered extremely low in patients suffering from ARDS in Brazilian hospitals. There is plenty of space to implement educational strategies in order to increase awareness about the importance of protective ventilation in the treatment of patients suffering from ARDS.
REFERENCE(S). 1. The ARDS Definition Task Force. Acute respiratory distress syndrome. The Berlin definition. JAMA. 2012;307(23). doi:10.1001/jama.2012.5669.

0564

PROGNOSTIC VALUE OF INITIAL INMUNOCOMPETENCE STATE IN PATIENS WITH ARDS

N.F. Villanueva Gómez[1], L. Nogales Martín[1], D. Andaluz Ojeda[1], L. Rico López[2], R. Cicuéndez Ávila[1], R. Almansa Mora[2], J. Bermejo Martín[2], F. Gandía Martínez[1]

[1]Hospital Clínico Universitario de Valladolid, Intensive Care Unit, Valladolid, Spain, [2]Hospital Clínico Universitario de Valladolid, Microbiology Department Research Unit, Valladolid, Spain
INTRODUCTION. The immunocompetence status of the host and its possible role on the evolution and survival are poorly understood aspects in patients with ARDS, being sepsis the main cause of this entity.
OBJECTIVES. Analyze the predictive value of immunoglobulin levels and different lymphocyte subpopulations in relation to survival in a number of patients with ARDS.
METHODS. Prospective observational study of consecutive patients with ARDS under invasive mechanical ventilation. ARDS variables at baseline: demographics, ApacheII, SOFA, LIS, static compliance, PaO_2/FiO_2, biological markers, immunoglobulins and blood levels of CD3, CD4, CD8 and NK cells (Natural Killer: CD16 + CD56) at day 1. Statistical analysis: Mann–Whitney *U* test. Area under ROC curve. Logistic regression model: forward stepwise for lymphocyte subpopulations with $p < 0.1$ (CD4 and NK cells) adjusted for age and APACHE II. Statistical significance: $p < 0.05$.
RESULTS. Patients 32. Age 60.9 ± 14.1. Male 60 %. Apache II 20.5 ± 7.1. SOFA 8.7 ± 3.4. LIS 2.5 ± 0.5. PaO_2/FiO_2 147.2 ± 44.1. ARDS of pulmonary origin 81 %. Septic ARDS 69 %. ICU stay 23 ± 16.8 days. Hospital stay 43.9 ± 31 days. Mortality 28 days 43 %. ICU mortality 50 %. Hospital mortality 65 %.

Results 1

	Survivors (n = 16)	Nonsurvivors (n = 16)	p value
Age	54.4 ± 14.8	67.3 ± 10.2	0.010
APACHE II	17.5 ± 5.8	23.1 ± 7.2	0.031
PaO_2/FiO_2	159.4 ± 50.2	135.1 ± 34.5	0.323
Compliance (ml/cmH_2O)	28.9 ± 7.8	24.9 ± 8.1	0.160
SOFA	8.3 ± 2.6	9.2 ± 4	0.539
LIS	2.2 ± 0.5	2.7 ± 0.3	0.012
Procalcitonine (ngr/ml)	0.74 ± 0.78	10.6 ± 18.1	0.005
IgG (mg/dl)	576.4 ± 232.3	769.8 ± 698.9	0.767
IgM (md/dl)	70.7 ± 67.7	115.9 ± 118.3	0.291

Results 2

	Survivors (n = 16)	Nonsurvivors (n = 16)	p value
Lymphocites (cells/mm^3)	1.248 ± 719	1.005 ± 536	0.436
CD3 + T (cells/mm^3)	920.5 ± 568.1	650.4 ± 305.1	0.345
% CD3	77.1 ± 8	66.8 ± 18.5	0.412
CD4 + T (cells/mm^3)	499.7 ± 362.8	276 ± 193.1	0.081
% CD4	52.3 ± 9.9	40 ± 17	0.052
CD8 + T (cells/mm^3)	189.3 ± 131.9	189.4 ± 144.3	0.902
% CD8	20.8 ± 11.4	27.9 ± 17.1	0.267
NK (cells/mm^3)	85.4 ± 71.7	125.3 ± 118.6	0.389
% NK	6.4 ± 2.2	11.2 ± 6.3	0.023

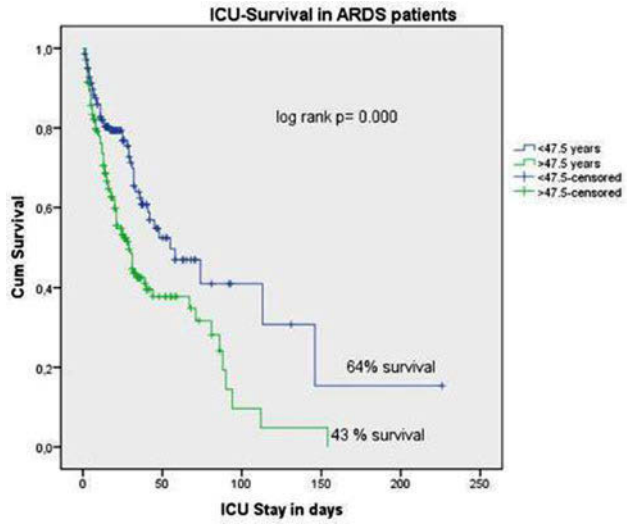
Area under ROC curve for CD4 + T %: 0.703, P = 0.056, 95 % CI (0.511–0.898). Area under ROC curve for NK cells %: 0.742, P = 0.023, 95 % CI (0.555–0.929). Logistic regression model: Lymphocytes total CD4: OR 1.004, P = 0.048, 95 % CI (1.000–1.009). CD4 %: OR 1.125, P = 0.039, 95 % CI (1.006–1.254). CD4 > 34 % and survival prediction: sensitivity 93 %, specificity 67 %.
CONCLUSIONS. Significant differences in levels of specific host immune cell populations in relation to survival were observed in our series of patients with ARDS. While innate immunity was preserved from a quantitative point of view, some elements involved in the adaptive immune response, mainly CD4 Th cells, had abnormally low counts in the non-survivors sub-group. Low levels of these cells considered as an independent variable were associated with higher risk of mortality. Further studies including functional analysis of CD 4 cells are needed to confirm their exact role in the pathogenesis of this disease.
REFERENCES. 1. Quilez ME, Fuster G, Villar J, Flores C, Martı′-Sistac O, Blanch L, Lopez-Aguilar J. Injurious mechanical ventilation affects neuronal activation in ventilated rats. Crit Care. 2011;15:R124. 2. Stuber F, Wrigge H, Schroeder S, et al. Kinetic and reversibility of mechanical ventilation-associated pulmonary and systemic inflammatory response in patients with acute lung injury. Intensive Care Med 2002;28:834–841.

0565

HIGHER AGE IN ARDS PREDICTS MORTALITY IN SEVERE ARDS AND OLDER AGE STARTS IN THE FOURTH DECADE

M. Schmidt[1], F. Balzer[1], C. Pille[1], J. Ziegler[1], L. Toepfer[1], D. Schwaiberger[1], C. Spies[1], S. Weber-Carstens[1], M. Deja[1]

[1]Charité—Universitätsmedizin Berlin, Anaesthesiology and Surgical Intensive Care CCM/CVK, Berlin, Germany
INTRODUCTION. Elderly patients have become an increasingly prevalent proportion of the intensive care unit population. Age was described as risk factor for ICU mortality in ARDS patients [1].
OBJECTIVES. To analyse the influence of age in a cohort of severe ARDS patients.
METHODS.
DESIGN. Retrospective analysis.
SETTING. 24-bed university hospital ICU, nationwide ARDS referral centre in Germany.
We used ROC curve to identify a cut off level of age for survival. Overall survival was estimated by the Kaplan–Meier method. We then investigated the influence of age on survival and diverse other well known and assumed parameter associated with survival [e.g. aetiology, organ failure, SOFA, APACHE II, SAPS II, acidosis (pH), application of extracorporeal lung support (ECMO/ECLA), oxygenation index (OI), hypercapnia (paCO2), and Charlson Comorbidity score(CCS)] using univariate analysis. Univariate significant and clinical important parameters were analysed using Cox regression to identify independent factors for survival. Correlations were tested using the Pearson correlation coefficient.
RESULTS. We identified 315 adult ARDS patients (male 66 %; median age 51 years, range 18–80 years; 58 % pneumonia; 57.8 % ECMO and/or ECLA) from January 2007 to December 2011. Overall mortality was 46 % (ECMO patients 59 %). Regarding mortality the cut off for age was 47.5 years for all patients (AUC 0.623; $p < 0.001$) and 46. 5 years for ECMO patients (AUC 0.623; $p < 0.001$). Years of age >47.5 predicted mortality with a sensitivity of 56 % and a specifity of 63 %.



KAPLAN–Meier Survival curve

Patients >65 years (range 65–80 years) had a survival rate of 37 %. In univariate analysis, age, acute liver and renal failure, acidosis, delirium, ECMO/ECLA, SOFA, SAPS and APACHE were significant associated with survival, CCS, gender, intracerebral bleeding, and aetiology of ARDS were not. In the multivariate COX regression analysis age per decade (HR 1,314; 95 % CI 1.166–1.480); OI (HR 1.015; 95 % CI 1.004–1.026), acute liver failure (HR 0.343; 95 % CI 0.208–0.566), delirium (HR 2.4; 95 % CI 1.343–4.288) and acidosis (HR 0.111; 95 % CI 0.031–0.395) were found to be independent predictors for survival. ECLA/ECMO, SOFA, SAPS II and APACHE II had no significant independent influence on survival in multivariate Cox regression.

Neither delirium nor comorbidities were correlated with higher age ($p = 0.420$; $p = 0.120$, respectively). Acute liver failure and use of ECMO were more frequent in younger age but without statistical significance ($p = 0.157$; $p = 0.192$).

CONCLUSIONS. Our study shows that higher age is associated with higher mortality in ARDS patients but the cut off age is much earlier than 65 years. The risk of dying increases with 31 % per decade. Furthermore, acute liver failure and brain failure (delirium) had high impact in mortality.

REFERENCE(S). Rubenfeld G, et al. Incidence and outcomes of acute lung injury. N Engl J Med. 2005;353:1685–1693.

0566

IS THERE ANYTHING NEW WE CAN DO TO PREVENT ACUTE RESPIRATORY DISTESS SYNDROME (ARDS) AFTER PNEUMONECTOMY?: A SINGLE CENTER EXPERIENCE

L. Fernández-López[1], F. Hidalgo Martinez[2], G. Echarri González[2], M. Aseginolaza Pagola[2], M. Sanz Ganuza[2]

[1]Clinica Universidad de Navarra, Anaesthesia and Critical Care Unit, Pamplona, Spain, [2]Universidad de Navarra, Anaesthesia and Critical Care Unit, Pamplona, Spain

INTRODUCTION. Although new challenges have been achieved on pneumonectomy, this procedure is still related to an important prevalence of complications with an important global morbidity and a considerable mortality rate.

The impact of intraoperative and anaesthetics factors in those variables remain still unclear.

OBJECTIVES. Our objective was to stablish the possible predisposing factors for complications, specially ARDS, after pneumonectomy.

METHODS. We conducted a retrospective analysis of 35 pneumonectomies performed in a University Hospital from July 2000 to June 2012. We analyzed preoperative tasks (antropomorphic data, drug abuse, previous treatments and diagnosis, respiratory function test (RFTs), intraoperative aspects (surgical side, surgery time, fluidotherapy, bleeding and immediate extubation versus delayed extubation) and postsurgical events: such as bleeding, respiratory and renal complications, days of stay in ICU.

Stadistical analysis was performed using STATA program version 11.1 (Stat Corp., College Station, TX, USA). Fisher exact test and Mann–Whitney *U* test were conducted to test for differences between patients with and without ARDS.

RESULTS. A total of 35 pneumonectomies were performed. ARDS was diagnosed in 4 patients (11.4 %) The global mortality was 8.5 % (3 of 35). Respiratory infection in the last month, right-sided pneumonectomy, alcohol consumption, blood product transfusion in both operating room (OR) and ICU, colloid infusion during surgery, duration of anaesthetic procedure, length of hospital stay, the place where extubation was conducted and acute kidney injury (AKI), were associated with a higher risk of respiratory complications. Nevertheless, the univariable analysis performed, showed that infection in the last month ($p = 0.01$), duration of anaesthetic procedure ($p = 0.05$), AKI ($p = 0.01$), and platelets and fresh frozen plasma transfusion in OR ($p = 0.006$), were significantly associated with ARDS.

CONCLUSIONS. Although this study is limited by its retrospective nature and the small number of patients included, we detected several risk factors which were related to respiratory complications.

Detecting preoperative and intraoperative risk factors remains a challenging task since morbidity and mortality and clearly related; thus, preventing those factors should be a target to aim in order to decrease possible complications.

REFERENCE(S). 1. Licker M et al. Eur Respir J 2011;37:1189–98. 2. Blank RS et al. Ann Thorac Surg 2011;92:1188–94. 3. Shapiro M et al. Ann Thorac Surg 2010;90: 927–35.

0567

EFFECT OF ALVEOLAR RECRUITMENT MANEUVERS ON MORTALITY OF PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME: SYSTEMATIC REVIEW AND META-ANALYSIS

E.A. Suzumura[1,2], A.M. Buehler[1], M.F. Figueiró[1], L.N. Laranjeira[1], K. Normilio-Silva[1,2], D.G. Bugano[1], O. Berwanger[1], A.B. Cavalcanti[1,2]

[1]Hospital do Coração, Research Institute, São Paulo, Brazil, [2]Universidade de São Paulo, Departamento de Medicina Preventiva, São Paulo, Brazil

INTRODUCTION. Despite protective mechanical ventilation, acute respiratory distress syndrome (ARDS) is associated with high mortality. Alveolar recruitment maneuvers (ARM) may reduce ventilator-induced lung injury and improve oxygenation in patients with ARDS, but the effect on mortality remains unknown.

OBJECTIVE. To evaluate the effect of ARM on mortality of ARDS patients.

METHODS. We conducted a systematic review of randomized controlled trials (RCTs) evaluating the effect of any ARM compared to a control group with no ARM, and reporting mortality on adults with ARDS. PEEP levels of experimental and control arms might have been either high versus low or similar. We searched MEDLINE, EMBASE, LILACS, CINAHL, CENTRAL, Scopus and Web of Science (inception to December 2012). We hand searched the bibliographies of the retrieved articles and we attempted to identify unpublished trials by contacting experts. No language restrictions were used. Six reviewers formed three pairs that double-checked all citations, selected articles for inclusion, and abstracted clinical and methodological data from included studies. Disagreements were resolved by a third reviewer. We pooled data using random-effects model. Trial sequential analysis (TSA) was used to determine the alpha spending boundary and the optimal information size (OIS) taking into account the risk of random error due to repetitive testing, which is analogous to sequential monitoring boundaries in a single trial. OIS was calculated considering 90 % of power, type I error of 1 %, relative risk reduction (RRR) of 20 % and a mortality rate of 36 % in the control group.

RESULTS. From 7,681 citations, 2,844 were duplicates. Seven RCTs (total of 1,500 patients; 572 events) met the selection criteria and were included in the meta-analysis. Pooled risk ratio of ARM versus no ARM was 0.86 (95 % confidence interval 0.76–0.98; $I^2 = 0$ %). Effect was similar in trials with ARM and high PEEP vs no ARM and low PEEP, or studies with ARM vs no ARM but the same PEEP levels (Fig. 1). The observed number of events is lower than the OIS and the cumulative meta-analysis does not cross upper monitoring boundary, suggesting that there is still substantial chance of a false-positive result (Fig. 2).

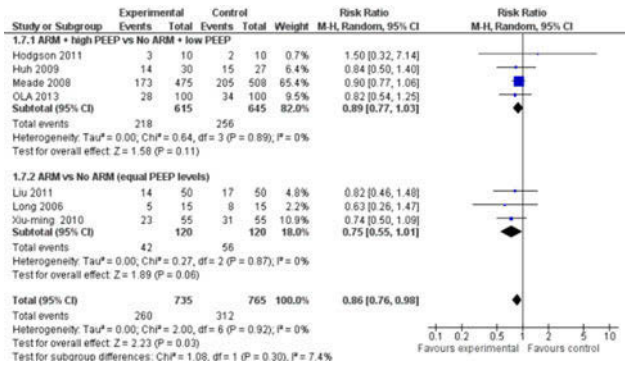


Fig. 1 Forest plot

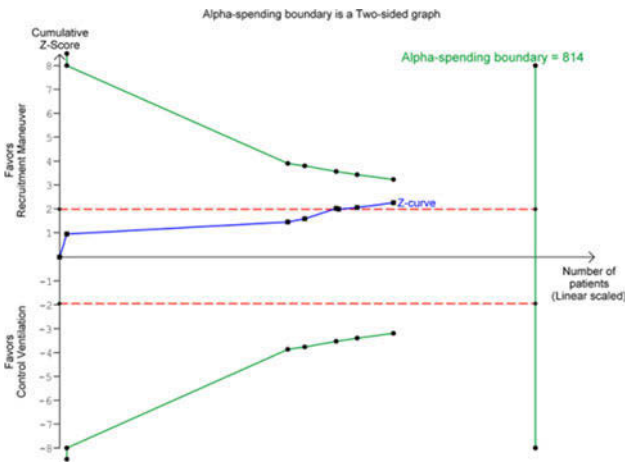


Fig. 2 Trial sequential analysis

CONCLUSION. The evidence that ARM reduces mortality is encouraging but too unreliable to allow definitive conclusions to be drawn.

GRANT ACKNOWLEDGMENT. Brazilian Ministry of Health.

0568

HIGH FREQUENCY OSCILLATORY VENTILATION IN SEVERE ACUTE RESPIRATORY DISTRESS SYNDROME: A TWO YEAR RETROSPECTIVE ANALYSIS

R. Spiritoso[1], N. Barmania[1], M. Hamilton[1], D. Kennedy[1]

[1]Royal London Hospital, London, United Kingdom

INTRODUCTION. High Frequency Oscillatory Ventilation (HFOV) is a rescue ventilation strategy used in severe acute respiratory distress syndrome (ARDS). Two large, recent, randomised controlled trials failed to show a benefit for HFOV. In OSCAR [1], there was no difference between control and HFOV, while in OSCILLATE [2], there was reduced mortality in the control group. Concerns persist regarding both the safety and efficacy of HFOV [1–3].

OBJECTIVES. We describe our early experience with HFOV over 2 years following its introduction in 2009. We hoped to critically appraise our current practice in the use of HFOV, analysing selection criteria, timing of commencement and duration of HFOV, FiO_2 response and incidence of multi organ failure (MOF) associated with HFOV.

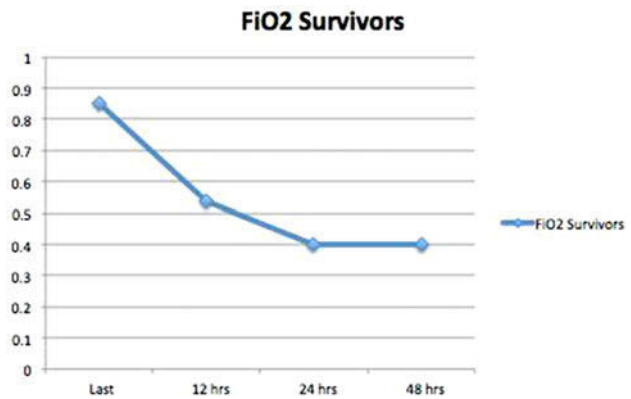
METHODS. Retrospective analysis of audit data and observation charts in adult patients receiving HFOV for ARDS. Data collected: admission diagnosis, presence of multi organ failure (MOF), last documented FiO_2 and duration of CMV (Continuous mandatory ventilation)before starting HFOV; FiO_2 at 12, 24, 48 h after starting HFOV; mortality.

RESULTS. Between January 2010 and December 2011, 126 patients received High-frequency oscillatory ventilation on the Intensive Care Unit at the Royal London Hospital. Of these, 15 patients were excluded due to missing or incomplete data.

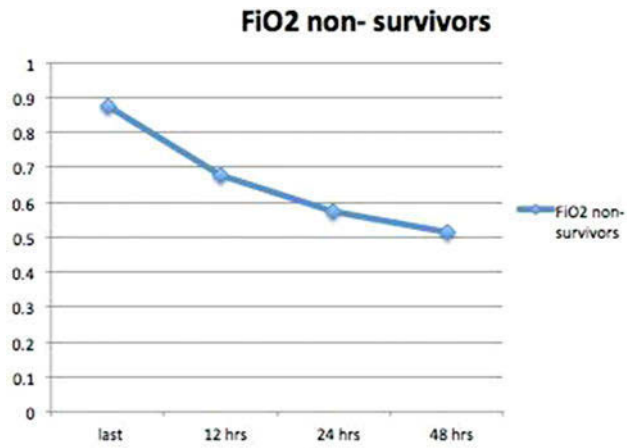
Results

	Survivors	Non survivors
FiO_2 prior to HFOV	46 (90.1 %)	58 (96 %)
CMV ≤24 h	24 (47 %)	33 (55 %)
CMV ≥48 h	27 (52 %)	27 (45 %)
HFOV for ≤ 48 h	12 (23.5 %)	32 (53.3 %)
HFOV ≥48 h	39 (76.4 %)	28 (46.6 %)
MOF	19 (37.3 %)** among the survivors, in 4 patients (7.8 %) MOF status was not reported	48 (81 %)
Outcome	51 (46 %)	60 (54 %)

Of the 111 patients analyzed, the majority were male (65.7 %), >50-year-old (57.6 %), admitted from general medicine (48.6 %) or general surgery (33 %). FiO_2 when starting HFOV was >0.8 (96.3 %), indicating a high degree of severity of ARDS in these patients.



Survivors



Non-survivors

CONCLUSIONS. HFOV was effective in reducing FiO_2 in both survivors and non-survivors with ARDS. There was no difference in mortality in patients where HFOV was started earlier compared with those in whom it was started later. Neither longer nor shorter duration of oscillation was associated with a better outcome. Both groups had a high incidence of MOF when HFOV was commenced. This might explain the difficulty in demonstrating any benefit from HFOV.

REFERENCE(S). 1. Duncan Young, D.M., Sallie Lamb, D.Philet al. High-frequency oscillation for acute respiratory distress syndrome. N Engl J Med 2013;368:806–813. 2. Niall D. Ferguson, M.D., Deborah J. Cook, M.D. et al. High-frequency oscillation in early acute respiratory distress syndrome. N Engl J Med 2013. 3. Sameer Jog, Divyesh Patel, Tejal Dravid. Early application of high frequency oscillatory ventilation in 'H1N1 influenza' related ARDS is associated with better outcome: a retrospective study. Intensive Care Med. 2013.

GRANT ACKNOWLEDGMENT. ICNARC Audit Nurse team.

0569

BRONCHIOLITIS AND PNEUMONIA IN PEDIATRIC ACUTE RESPIRATORY DISTRESS SYNDROME, INCIDENCE, CHARACTERISTICS AND OUTCOMES: A PRELIMINARY REPORT

O. Fariñas Román[1], O. Pérez Quevedo[1], G. Pérez Acosta[1], C. Alonso-Graña[1], E. Consuegra Llapur[1], C. Rodríguez Guedes[1], A. Morón Saen[1], J.M. López Álvarez[1], A. Jiménez Bravo[1]

[1]Hospital Materno Infantil de Canarias, ICU Pediatric, Las Palmas de Gran Canaria, Spain

INTRODUCTION. Some children's with Bronchiolitis or pneumonia develop respiratory distress, diffuse lung infiltrates and respiratory failure. Acute respiratory distress syndrome (ARDS) is a devastating disorder of overwhelming pulmonary inflammation and hypoxemia, resulting in high morbidity and mortality. It is recognized as the most severe form of acute lung injury.

OBJECTIVES. To prospectively assess the incidence, complications and outcomes of Bronchiolitis and pneumonia producing ARDS in mechanical ventilated infants.

METHODS. Longitudinal, prospective, observational study in a pediatric intensive care unit. Performed from January 2007 up to December 2012. Patients were studied according to their diagnosis (Bronchiolitis or pneumonia). We collected demographic data, gas exchange, prone ventilation, nitric oxide, PEEP level, neuromuscular blockade and complications (barotraumas, bronchial fistulas, DIC, severe sepsis and septic shock) in mechanical ventilated children's admitted in our ICU.

Categorical variables are expressed as frequencies and percentages, and continuous variables as mean and SD when data followed a normal distribution, or as medians and interquartile (25–75th percentile) range when distribution departed from normality. The percentages were compared using the Chi square test, the means by the t- test and the medians by the Wilcoxon's test.

Statistical significance was set at $p < 0, 05$. The data were analyzed using PASW statistical software (version 18.0, SPSS, Chicago, IL, USA).

RESULTS. Twenty-six patients were studied and the number of those with pneumonia were significantly higher ($n = 20$) than Bronchiolitis ($n = 6$) ($p = 0.02$). The mean age (months) and weight (kg) were 52.8 and 19.38, respectively. We found significant differences in respiratory rate ($p = 0.01$) and PEEP (0.01) in Pneumonia, compared to Bronchiolitis. However, there were not significant differences in number of patients treated in prone position, inhaled nitric oxide and neuromuscular blockade in both groups.

CONCLUSIONS. • When compared pneumonia and Bronchiolitis, the first one is significantly more frequent as cause of ARDS in mechanically ventilated children's.

• These required higher levels of PEEP and respiratory rate in pneumonia compared to Bronchiolitis.

• The remaining therapeutic maneuvers did not show significantly differences and did not improve the outcome between both studied groups.

Ventilation in the critically ill: from physiology to technology: 0570–0582

0570

INFLUENCE OF CHEST WALL IN MECHANICAL AND HEMODYNAMIC PROPERTIES IN WISTAR RATS DURING MECHANICAL VENTILATION

B. Curty Bergamini[1], N. Silva Carvalho[1], W. Araujo Zin[2], A. Giannella-Neto[1], A. Roncally Carvalho[2]

[1]Federal University of Rio de Janeiro/Institute Alberto Luiz Coimbra of Post-Graduation and Research in Engineering (COPPE), Rio de Janeiro, Brazil, [2]Federal University of Rio de Janeiro/Carlos Chagas Filho Institute of Biophysics, Rio de Janeiro, Brazil

INTRODUCTION. Small animals usually exhibit an exacerbated hemodynamic compromise in response to positive end-expiratory pressure (PEEP). We hypothesize that, in rats, chest wall may restricts lung expansion exacerbating hemodynamic instability when positive pressure is applied.

OBJECTIVES. To evaluate the influence of chest wall on the estimation of cyclical recruitment/overdistension and cardiopulmonary interactions in response to high tidal volume (V_T) and PEEP.

METHODS. 24 male Wistar rats 330 (30 g) were anaesthetized, paralyzed and mechanically ventilated (Baseline settings $V_T = 6$ ml/kg, ZEEP, RR = 90 bpm, I:E ratio = 1:2 in room air). The animals were then divided into three groups: (1) open chest group (OC; intact chest wall followed by opening anterior chest wall, $n = 8$); (2) restricted chest group (RC; intact chest wall followed by chest wall restriction with a pressure cuff around the chest pressurized with 11–12 cmH_2O, $n = 8$) and (3) restrict group (R; restricted chest wall, followed by opening anterior chest wall, $n = 8$). In all groups, a set of five PV curves was obtained at each experimental condition. After that and with the same baseline settings, PEEP was sequentially set at 0 (30 s), 3 (30 s) 7 (30 s) and 8 cmH_2O (30 s) and thereafter decreased from 8 to 4 and 0 cmH_2O 10 min per step. Respiratory system mechanical properties were calculated in a breath-by-breath basis with the least squares method applying the volume-dependent single compartment model. The fraction of the volume-dependent elastance ($\%E_2$) was then calculated in order to evaluate the presence of cyclical recruitment/derecruitment ($\%E_2 < 0$) as well as overdistension ($\%E_2 > 10$ %). Differences between groups (factor 1) and each level of PEEP (factor 2) were assessed by a two-way ANOVA test ($P < 0.05$). Multiple comparisons were adjusted by the Bonferroni–Holm method.

RESULTS. Tidal recruitment occurred in the RC group at a PEEP of 8 and 4 cmH_2O and at ZEEP in the OC and R group. Overdistension was observed in OC and R groups on PEEP of 8 cmH_2O (Table 1). In OC_Opened and R_Opened the PV curve presented a double hump plus a low mathematical inflection point (MIP). After the occurrence of the second MIP, inflation continued linearly with increasing Paw, and no fall in compliance ensued. OC_Closed, RC group and R_Restricted presented PV curves with a sigmoidal profile. During PV curve inspiration was observed a significant hypotension with subsequent recovery at the end of expiration in all groups. During decrescent PEEP titration, the mean AP increases independently on group.The opening and restriction of the chest wall reduced the mean AP values compared to baseline levels in closed condition.

Group	8 cmH2O	4 cmH2O	0 cmH2O
OC_Closed	29,03 (8,01)*	-6,99 (3,67)*+	-19,44 (2,37) *#
OC_Opened	37,45 (6,09)	0,20 (4,04)*	-20,25 (2,31) *#
RC_Closed	-11,09 (16,24)	-1,47 (16,05)*	14,01 (22,42) *#
RC_Restricted	-10,93 (22,98)	-3,10 (28,85)*	2,60 (30,97) *#
R_Restricted	30,53 (9,90)*	11,67 (5,06)*	-5,80 (4,88) *#
R_Opened	48,42 (9,89)	17,13 (6,81)	-7,43 (8,86)*#

Data are presented as median and range values. * significantly different from PEEP of 8 cmH2O. $p < 0.02$. # significantly different from PEEP of 4 cmH2O. $p < 0.02$. + differences among groups at a given PEEP. $p < 0.003$

%E2 during PEEP titration

CONCLUSIONS. Chest wall mechanical properties do not influence the detection of PEEP-induced tidal recruitment/overdistension and may contributes to hemodynamic impairment in response to PEEP and V_T.

GRANT ACKNOWLEDGMENT. CNPq,CAPES,PRONEX/FAPER.

0571

PROPORTIONAL VERSUS PRESSURE SUPPORT VENTILATION DURING LOWER LIMBS EXERCISE IN CRITICALLY ILL VENTILATED PATIENTS

E. Akoumianaki[1], N. Dousse[1], J.C. Lefebvre[1], S. Graf[1], A. Lyazidi[1,2], R.L. Cordioli[1], N. Rey[1], J.C.M. Richard[1,2], L. Brochard[1,2]

[1]University Hospital of Geneva, Intensive Care Unit, Geneva, Switzerland, [2]University of Geneva, Medical School, Geneva, Switzerland

INTRODUCTION. Early exercise of critically ill patients has beneficial effects on muscle strength, mass preservation and on systemic inflammatory suppression. Under mechanical ventilation (MV) the type of mode may affect exercise performance. In pressure support ventilation (PSV), assistance remains fixed for every breath. A mismatch between demand and assist could increase work of breathing and limit exercise. Ventilator modes that provide assistance proportional to patient's instantaneous effort (proportional assist ventilation, PAV+ and neurally adjusted ventilatory assist, NAVA) should efficiently track the dynamic changes of ventilator demand during exercise and more adequately unload respiratory muscles.

METHODS. Critically ill patients requiring MV for more than 48 h and submitted to reentrainment by physical therapists were prospectively enrolled. At day 1 the patients underwent an incremental workload test on a cycloergometer to determine the maximum resistance level capacity. The next day, two 15 min-exercise periods at 60 % of the maximum resistance were performed. During each session patients were ventilated with PSV and a proportional mode in random order. The type of proportional mode (PAV+ or NAVA) was randomly selected. VO_2 was measured through indirect calorimetry. Dyspnea and limb fatigue were evaluated through a modified Borg dyspnea scale score and a Borg limb discomfort scale. The % change in VO_2 (ΔVO_2 %) between baseline and the final 5 min of each exercise session and the work efficiency (ratio of ΔVO_2 per power generated) were computed. The respiratory rate per minute (RR), the distance performed and the difference in dyspnea and limb fatigue were also recorded. A statistical comparison was done by the Wilcoxon signed rank test.

RESULTS. Ten patients were tested, 4 in the group of NAVA-PSV and 6 in the group of PAV±PSV. Median (25–75th percentile) age, APACHE II score, days on ICU and days on MV at the time of the study were 55.5 years (54.3–65), 23 (20.5–27.3), 14.5 days (10.5–28.8) and 14.5 days (10.5–28.8) respectively. ΔVO_2 (%) and work efficiency were significantly higher during PSV in comparison to proportional modes (PROP) (Table).

	PROP	PSV	p
ΔVO2 (%)	16 (3-23)	29 (28-32)	0.01
Work efficiency (mlO_2/min/Watt)	25.4 (1.2 -46.1)	49.2 (36.2-85.2)	0.02
Distance (km)	3.3 (2.3-3.6)	3.3 (2.6 -3.9)	0.09
Dyspnea	1 (-0.8-3.8)	2 (0.5-4)	0.33
Limb fatigue	0.5 (0-1.8)	2 (0.3-2)	0.53
RR (br/min)	27 (20-34)	29 (19-35)	0.11

Table

CONCLUSIONS. Despite the same degree of exercise (same distance), patients ventilated with proportional modes exhibit approximately 50 % less increase in oxygen consumption and a better work efficiency than those ventilated with PSV. The ventilation mode does not affect respiratory rate, dyspnea or limb fatigue. This could allow these patients to perform much more exercise than with traditional modes.

0572

CORRECTION OF EXTRAVASCULAR LUNG WATER IN CARDIAC SURGERY PATIENTS: A PROSPECTIVE, RANDOMIZED, SINGLE-BLINDED STUDY

E. Fominskiy[1], V. Lomivorotov[1], V. Nepomniashchikh[1], S. Efremov[1]

[1]Academician EN Meshalkin Novosibirsk State Budget Research Institute of Circulation Pathology, Novosibirsk, Russian Federation

INTRODUCTION. Edema is a common morbidity following cardiopulmonary bypass (CPB) and can result in injury to many organs, including the lungs. CPB-related pulmonary dysfunction can cause significant problems in cardiac patients. One of the primary strategies for decreasing excessive fluid extravasation involves the use of hypertonic saline. However, the ability of hypertonic saline to reduce interstitial fluid accumulation in the lungs of cardiac surgery patients is yet unknown.

OBJECTIVES. To test the hypothesis that the infusion of 7.2 % NaCl plus 6 % hydroxyethyl starch 200/0.5 (HSH) would decrease extravascular lung water and consequently improve pulmonary function in coronary artery bypass graft (CABG) surgery patients.

METHODS. Single-center prospective randomized single-blinded study. Forty patients scheduled for first-time CABG with CPB were randomly allocated (by means of a computer-generated code) to receive once either HSH (HSH group, $n = 20$) or 0.9 % NaCl (control group, $n = 20$) at a dose of 4 ml/kg for 30 min after anesthesia induction in tertiary cardiothoracic referral center between February and August 2012. The primary outcome measure was extravascular lung water index (EVLWI) obtained using the PiCCO plus system at baseline, 5 min, 2, 4 h after CPB, and on postoperative day 1 (POD1). Data are shown as median [IQR] and Mann–Whitney's test was used in the analysis (MedCalc Statistical Software v12.1.4). Trial registration: NCT01675453.

RESULTS. Forty patients were analyzed. EVLWI in the HSH group as compared with the control group was significantly lower at 2 h after CPB [8 (7–8) vs. 9 (8–10) ml/kg; $p < 0.05$] and remained lower until POD1 [7 (7–8) vs. 9 (8–10) ml/kg; $p < 0.01$]. The index of arterial oxygenation efficiency was significantly higher in the HSH group as compared with the control group at 5 min [298 (226–404) vs. 206 (156–286) mmHg; $p < 0.01$], 2 h [310 (232–362) vs. 235 (163–308) mmHg; $p < 0.05$] and 4 h [383 (303–417) vs. 316 [250-354] mmHg; $p < 0.05$) after CPB. The alveolar-arterial oxygen tension difference was significantly lower in the HSH group as compared with the control group at 5 min [197 (131–231) vs. 244 (213–313) mmHg; $p < 0.01$], 2 h [168 (140–203) vs. 199 (188–294) mmHg; $p < 0.01$] and 4 h [126 (114–169) vs. 191 (135–238) mmHg; $p < 0.05$] after CPB. The oxygen delivery index was much greater in the HSH group at 5 min after CPB [465 (404–574) vs. 353 (319–403) ml/min/m^2; $p < 0.01$), and on POD1 [504 (380–518) vs. 393 (358–447) ml/min/m^2; $p < 0.05$).

CONCLUSIONS. The administration of HSH to CABG surgery patients decreased extravascular lung water content, subsequently reducing oxygenation impairment after CPB. The oxygen delivery was more effective when HSH was used. Further works are necessary to investigate the influence of HSH on extravascular lung water content in compromised cardiac patients.

GRANT ACKNOWLEDGMENT. The study was funded by intramural sources only.

0573

AEROSOL-THERAPY IN THE INTENSIVE CARE UNIT: A TWO WEEKS CROSS SECTIONAL STUDY

S. Ehrmann[1,2,3], F. Roche-Campo[4], L. Contentin[5,6], K. Razazi[7], A. Donzeau[8], D. Thevoz[9], J. Dugernier[10], S. Jochmans[11], A. Edelson[12], M. Papanikolaou[13], H. Leon Yoshido[14], J.-M. Arnal[15], E. Curiel-Balsera[16], M. Besbes[17], R. González[18], I. Daroui[19], G. Apiou-Sbirlea[2,3,20], D. Isabey[2,21,22], L. Brochard[2,23,24], AT@ICU Study Group

[1]CHRU de Tours, Service de Réanimation Polyvalente, Tours, France, [2]Inserm UMR 955, Equipe de Biomécanique Cellulaire et Respiratoire, Créteil, France, [3]Université Paris Est, Faculté de Médecine, Créteil, France, [4]Hospital de Sant Pau, Servei de Medicina Intensiva, Barcelona, Spain, [5]Centre Hospitalier Universitaire Cochin, Assistance Publique Hôpitaux de Paris, Service de Réanimation Médicale, Paris, France, [6]CHRU de Tours, Service de réanimation polyvalente, Tours, France, [7]Groupe Hospitalier Henri Mondor, Assistance Publique des Hôpitaux de Paris, Service de Réanimation Médicale, Paris, France, [8]Centre Hospitalier Universitaire d'Angers, Service de Réanimation Médicale et de Médecine Hyperbare, Angers, France, [9]Centre Hospitalier Universitaire Vaudois, Service de Médecine Intensive Adulte et Centre des Brulés, Lausanne, Switzerland, [10]Cliniques Universitaires Saint Luc, Intensive Care Unit, Brussels, Belgium, [11]Centre Hospitalier Marc Jacquet, Service de Réanimation, Melun, France, [12]Centre Hospitalier du Taaone, Service de Réanimation, Pirae, French Polynesia, [13]Hippocrateion General Hospital of Athens, Intensive Care Unit, Athens, Greece, [14]Hospital Nacional Edgardo Rebagliati Martins ESSALUD, Medicina Intensiva, Unidad de Cuidados Intensivos, Lima, Peru, [15]Hôpital Sainte Musse, Service de Réanimation Polyvalente, Toulon, France, [16]Hospital Regional Universitario Carlos Haya, Unidad de Cuidados Intensivos, Málaga, Spain, [17]Hospital A Mami, Intensive Care Unit, Ariana, Tunisia, [18]Hospital General Universitario Gregorio Maranon, Pediatric Intensive Care, Madrid, Spain, [19]Ospedale 'Sacrocuore—Don Calabria', Dipartimento di Anestesia-Rianimazione, Negrar, Italy, [20]Wellman Center for Photomedicine and Department of Dermatology, Massachusetts General Hospital and Harvard Medical School, Boston, United States, [21]Université Paris Est, Faculté de médecine, Créteil, France, [22]CNRS, ERL 7240, Equipe Biomécanique Cellulaire et Respiratoire, Créteil, France, [23]Hôpitaux Universitaires de Genève, Service des Soins Intensifs, Geneva, Switzerland, [24]Université de Genève, Faculté de Médecine, Geneva, Switzerland

INTRODUCTION. Aerosol-therapy is appealing as it may enable to deliver high drug concentrations at the site of action while limiting systemic side effects. In the intensive care unit, a great number of molecules have been reported to be nebulized. However, technical implementation may be challenging, particularly during mechanical ventilation and only little data is available concerning current practice in the intensive care environment.

OBJECTIVES. To prospectively describe the practice of aerosol-therapy in intensive care and intermediate care unit in terms of frequency, technical implementation and tolerance.

METHODS. Prospective non-interventional cross-section descriptive study. All patients admitted to 83 centers over a 2 weeks observational study period (staggered over March and April 2013) were included. We here present preliminary results for the 55 first participating centers.

RESULTS. 1,857 patients [median SAPSII 34 (21–48) were present in the participating centers over the study period (8,225 patients.days of which 6,951 (84 %) were spent in the ICU)]. 468 (25 %) patients received at least one inhaled medication during the study. Overall 6,361 aerosols were analyzed. 3,117 (49 %), 253 (4 %) and 2,988 (47 %) were

performed during invasive-, non-invasive mechanical ventilation and spontaneous breathing respectively.
2,528 (40 %) nebulization concerned more than one molecule delivered as an association. The most frequently drugs delivered were bronchodilators [n = 7,418 (75 %)], followed by steroids [n = 1,561 (16 %)]. Among other nebulized drugs, anti-infective molecules were delivered 278 times (3 %): colistin (87 %), amphotericine B (11 %), ceftazidime (2 %). The aerosolization devices used were jet-nebulizers [n = 3,646 (58 %)], metered dose inhalers [1,600 (25 %)] ultrasonic nebulizers [774 (12 %)] and vibrating mesh nebulizers [247 (4 %)]. Overall, for aerosol-therapy during mechanical ventilation, the nebulizer was mostly placed immediately distal or immediately proximal of the Y piece (75 % of aerosols), heated humidification pursued (83 %) and ventilator settings not changed (<1 %). Of note, when nebulizing anti-infective drugs, heated humidification was interrupted in 57 % of the cases. No side effects of aerosol-therapy were observed for the large majority of deliveries (98 %). Reported side effects were: tachycardia (33 %), cough (26 %), hypotension (19 %), hypoxemia (14 %), and bronchospasm (4 %).
CONCLUSIONS. Aerosol-therapy is very frequent in intensive and intermediate care units as it concerns about one quarter of patients. Half of the aerosols are delivered to mechanically ventilated patients mostly using jet-nebulizer. Ventiltor settings are almost never changed during aerosolization. Aerosol-therapy of anti-infective drugs is rare and mostly concerns colistin. Overall side effects are infrequent.
GRANT ACKNOWLEDGMENT. Agence Nationale de la Recherche (ANR-2010 BLAN 1119 05).

0574
OPTIMIZATION OF HUMIDIFICATION PERFORMANCES AND MONITORING OF HEATED WIRE HEATED HUMIDIFIERS

F. Lellouche[1], P.-A. Bouchard[1]

[1]Institut Universitaire de Cardiologie et de Pneumologie de Québec, Intensive Care Unit, Québec, Canada
INTRODUCTION. In a previous study, we showed that hygrometric performances of heated wire humidifiers were reduced by high ambient temperatures and high outlet ventilator temperatures [1]. Current methods to reduce this issue are not efficient [1] and no monitoring tool exists to evaluate humidification performances in the daily practice. Recent studies demonstrate that heated humidifiers can lead to under-humidification with increased endotracheal tube resistances [2].
OBJECTIVES. To demonstrate the relation between absolute humidity delivered with heated wire humidifiers and different parameters that could be used as surrogates for humidity. To demonstrate a method to improve humidification performances with these devices.
METHODS. On a bench test, we measured heater plate temperature, inlet chamber temperature and delivered humidity with MR850 system (Fisher & Paykel). The measurements were performed at 4 different ambient temperatures (<21, 22, 25 and 30 °C), 9 inlet chamber temperatures (20, 22, 25, 28, 30, 32, 35 and 40 °C) and 5 min ventilation levels (5, 7.5, 10, 12.5, 15 l/min). For each condition, three hygrometric measurements with the psychrometric method were performed at steady state. We developed a method to decrease the inlet chamber temperature and consequently to improve humidification performances.
RESULTS. For a given ambient temperature, we showed good correlations between absolute humidity delivered and both inlet chamber temperature (R^2 from 0.63 to 0.93) and heater plate temperature (R^2 from 0.76 to 0.96). When all ambient temperatures were mixed, only heater plate temperature remained well correlated with delivered humidity (figure). Minute ventilation modifies this correlation. With ambient temperature of 30 °C, delivered humidity went from 17.5 to 38.2 mgH_2O/L by decreasing inlet chamber temperature from 39.5 to 22.1 °C.

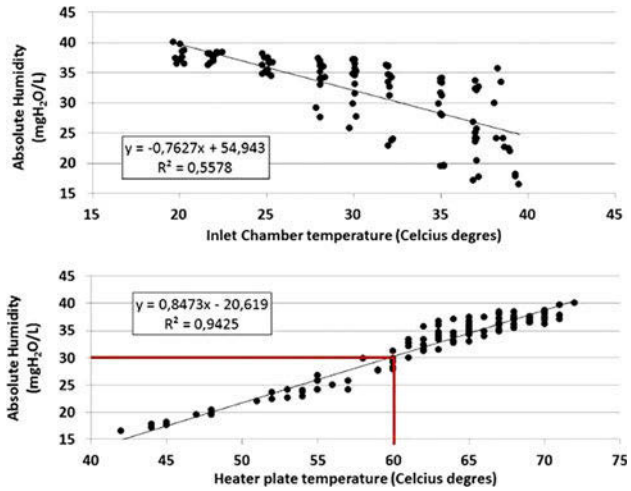


Fig. Pearson correlations between absolute humidity and inlet chamber temperature (*upper panel*) and heater plate temperature (*lower panel*) for a minute ventilation of 10 l/min. Correlation HA-HP and HA-ICT

CONCLUSIONS. In this bench study, we have shown a good correlation between heater plate temperature and humidity delivered with a heated wire humidifier. This relation could be used as a surrogate of humidity to improve the humidification monitoring. We also shown an original method to improve humidification with these devices.
REFERENCE(S). 1. Lellouche F, Taillé S, Maggiore SM, Qader S, L'her E, Deye N, Brochard L. Influence of ambient and ventilator output temperatures on performance of heated-wire humidifiers.Am J Respir Crit Care Med. 2004;170(10):1073–9. Epub 2004 Jul 21. 2. Morán I, Cabello B, Manero E, Mancebo J. Comparison of the effects of two humidifier systems on endotracheal tube resistance. Intensive Care Med. 2011;37(11): 1773–9. Epub 2011 Sep 27.

GRANT ACKNOWLEDGMENT. Fond de recherche en Santé du Québec, Canadian Fundation for Innovation.

0575
CLINICAL EVALUATION OF AN AUTOMATED OPEN LOOP CONTROLLER OF INSPIRED OXYGEN CONCENTRATION FOR MECHANICAL VENTILATION

K. Saihi[1,2], J.C.M. Richard[1], X. Gonin[1], T. Krüger[2], S. Mersmann[2], M. Dojat[3], L. Brochard[1,4]

[1]University Hospital of Geneva, Intensive Care Unit, Geneva, Switzerland, [2]Dräger Medical GmbH, Lübeck, Germany, [3]Grenoble Institute of Neurosciences, INSERM U836 & Joseph Fourier University, Grenoble, France, [4]University of Geneva, Geneva, Switzerland
INTRODUCTION. Hypoxemia is always a concern for clinicians but cumulated evidence also exists suggesting the potential risks associated with high fraction of inspired oxygen (FiO_2) in critically ill patients. In intensive care units, there is a considerable variation in the attitude of intensivists toward oxygen management. Based on these concerns, a system that automatically control FiO_2 based on continuous measurement of SpO_2 has been developed. In the first part of this study we tested two different SpO_2–FiO_2 feedback open loops to determine whether different response slopes were needed depending on the level of hypoxemia to maintain SpO_2 in the same predefined target range. In the second part of the study, we compared the results obtained with the FIO_2 controller to an historical group.
METHODS. The system consists of a pulse oximeter (Massimo) connected to a monitor communicating with a Draeger ventilator Evita XL. Tested as an open loop, the system calculates and proposes subsequent FIO_2 settings to continuously adapt and maintain the measured SpO_2 within a predetermined target range (92–96 %). *First part of the study* 20 critically ill patients under mechanical ventilation were allocated to two FiO_2–SpO_2 feedback loops manually applied during 3 h each in a random order. FiO_2 adjustments were performed by a dedicated research nurse who accepted or refused the suggestions in real time. For each recording, the percentages of time spent in and outside the target SpO_2 (hypoxemia and hyperoxemia) were measured. *Second part* we compared the percentage of time with SpO_2 in the target range obtained with the controller to similar periods of time observed in a control group of 33 ICU patients managed with usual care (FiO_2 changes at the discretion of nursing staff). SpO_2–FiO_2 values of the control group were collected from a patient data management system over three different 6 h-periods (at admission, after 24 h, at day 7).
RESULTS. *First part* The two feedback loops were tested in 20 patients, separated into two groups according to the PaO_2/FiO_2 ratio (155 ± 26 severe vs. 251 ± 56 moderate). The percentage of time spent in the target range was always higher than 95 %, whatever the loop or the group. The loop with the higher slope of response was slightly better for the more hypoxemic patients (P/F < 200) to prevent few transient desaturation episodes. *Second part* The following table illustrates the results in term of percentage of time when SpO_2 was in or outside the target range according to the three different time periods in the control group. All comparisons favor the controller.

Time spent in the range (%)	Study group (n= 20)	Control group (n= 33)		
		First 6 h after admission*	At 24 h**	At Day 7*** (n=27)
Hypoxemia ($SpO2 < 92\%$)	2.3 ± 1.6	8.4 ± 11.8	9.1 ± 21.3	6.6 ± 19.8
Normoxemia (Target range)	90.2 ± 4.9	24.8 ± 27.4	25.6 ± 31.1	27.0 ± 36.3
Hyperoxemia ($SpO2 \geq 97\%$)	7.7 ± 3.7	66.8 ± 33.1	65.3 ± 36.1	66.4 ± 31.9

Comparaison of the two groups

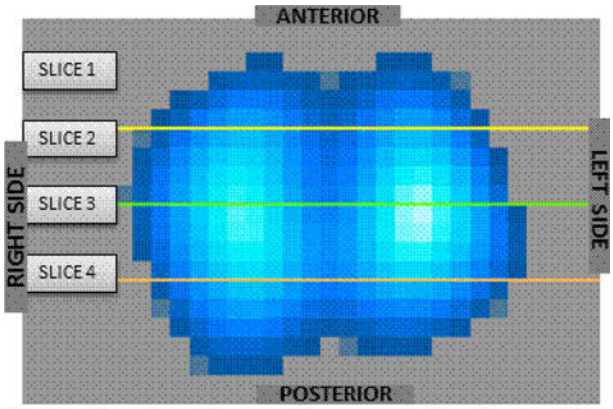
CONCLUSIONS. The specific open loop FiO_2 controller is able to reliably maintain SpO_2 within the predefined target range. Two different loops can be used depending on the P/F ratio to prevent hypoxemia and hyperoxemia. The controller has an excellent performance when compared to the daily care.
GRANT ACKNOWLEDGMENT. This study was supported by a grant from Dräger.

0576
HIGHER PEEP LEVELS (13 VS 8 CM H_2O) AFTER CARDIAC SURGERY CAN PREVENT PROGRESSIVE ATELECTASIS AND IMPAIRED LUNG FUNCTION DURING WEANING

R.R.D.S. Santiago[1], A.C. Leme[2], M.B.V. Freitas[2], P.L. Figueiredo[2], M.L.D.A. Souza[2], S. Gomes[1], A.S. Hirota[1], C.R.R. Carvalho[1], F.R.G. Galas[3], L.A. Hajar[3], K.F. Toldo[2], E. Leite Vieira Costa[1], M.B.P. Amato[1]

[1]Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Heart Institute (InCor), São Paulo, Brazil, [2]Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Depto de Fisioterapia—Heart Institute (InCor), São Paulo, Brazil, [3]Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, ICU Surgery—Heart Institute (InCor), São Paulo, Brazil
INTRODUCTION. Pulmonary dysfunction after cardiac surgery is probably related to two main causes: the surgical procedure itself and the mechanical ventilation of the lung in an inflammatory environment [1]. The inflammatory reaction include decreased lung compliance, pulmonary edema, increased intrapulmonary shunt fraction, and decreased functional residual capacity (FRC) [1]. Lung recruitment maneuver and PEEP were needed to increase and maintain the increased lung volume and PaO_2.
OBJECTIVES. To demonstrate that a higher PEEP (13 cmH_2O) can prevent progressive atelectasis in post cardiac surgery patients when compared with lower PEEP (8 cmH_2O).
METHODS. The purpose of intensive alveolar recruitment protocol after cardiac surgery (NCT 01502332) is to evaluate prospectively the impact of two protective mechanical ventilation strategies. The inclusion criteria is a gas exchange PaO_2/FIO_2 <250 (PEEP of 5 cmH_2O) in post-operative time. An alveolar recruitment pressure of 45 cmH_2O, followed by higher PEEP(13 cmH_2O), will be compared to the standard alveolar recruitment protocol, pressure of 20 cmH_2O, followed by lower PEEP (8 cmH_2O). After an overnight stabilizing period of controlled mechanical ventilation, the patients will follow the routine weaning protocol.

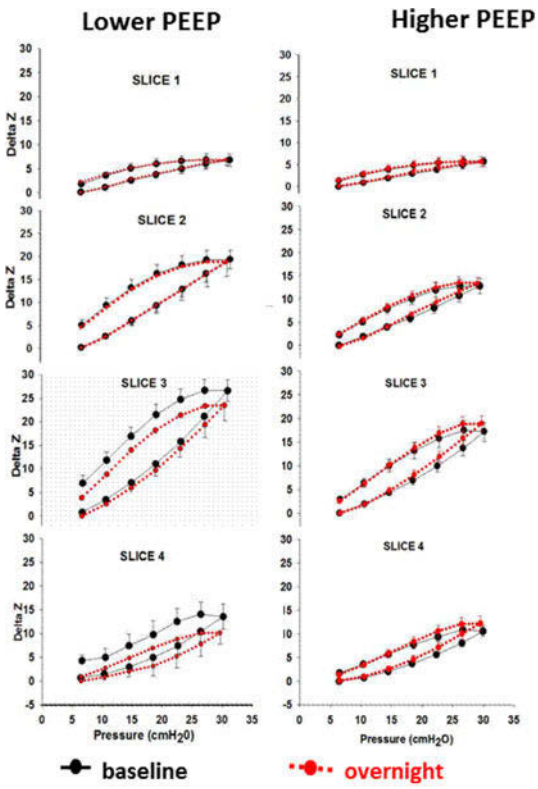
A group of patients (n = 19, 10 with lower PEEP and 9 with higher PEEP) from this study were monitored with the Electrical Impedance Tomography (TIE) during the P–v curve measurements realized two times: at baseline and after an overnight ventilation with the randomized PEEP. We studied regional P–V curves in four horizontal slices of same height, with slice 1 representing the most ventral and slice 4 the most dorsal region we had defined 4 slices [2].



Electrical Impedance Tomography representation of regional P-v curves.

Fig. 1

RESULTS. The use of higher PEEP values prevented the downward displacement of the P–V curve from the first (baseline) to the second (overnight) measurements in slice 4 (p = 0.006). A similar trend was found in slice 3 (Fig. 2).In lower-PEEP group, especially in gravity dependent areas (slices 3 and 4), we observed a progressive atelectasis.



The regional P-v curve in four slices at baseline and after overnight ventilation in both groups (Higher PEEP vs Lower PEEP). Delta Z : impedance variation.

Fig. 2

In a subgroup of patients in whom compliance data were available (6 patients in each group), compliance improved in the higher-PEEP group (p = 0.03). The PaO_2 (mmHg) values were similar (p = 0.3).

CONCLUSIONS. We observed that the use of lower PEEP values (8 cmH_20) was associated with the development of atelectasis overnight, which could be prevented by the use of higher PEEP values (13 cmH_2O). We believe that a PEEP of 8 cmH_20 is insufficient to ventilate immediate post cardiac surgery patients.

REFERENCE(S). 1. Miranda DR et cols. Mechanical ventilation affects pulmonary inflammation in cardiac surgery patients: the role of the open-lung concept. J Cardiothorac Vasc Anesth. 2007;21(2):279–84. 2. Kunst PW et cols. Regional pressure volume curves by electrical impedance tomography in a model of acute lung injury.Crit Care Med. 2000;28(1):178–83.

GRANTS. FAPESP, CAPES, FINEP, LIM09.

0577

ACCURACY OF WORK OF BREATHING DISPLAY DURING PROPORTIONAL ASSIST VENTILATION WITH LOAD ADJUSTABLE GAIN FACTORS

E. Akoumianaki[1], A. Lyazidi[1,2], J. Mancebo[3], R.L. Cordioli[1], N. Rey[1], J.C.M. Richard[1,2], L. Brochard[1,2]

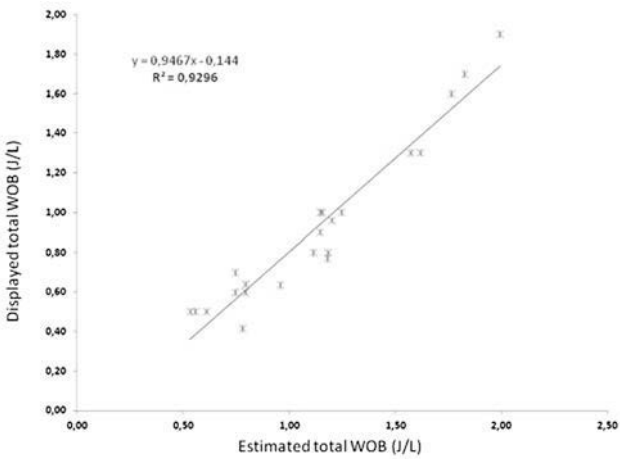
[1]University Hospital of Geneva, Intensive Care Unit, Geneva, Switzerland, [2]University of Geneva, Medical School, Geneva, Switzerland, [3]Hospital Sant Pau, Servei de Medicina Intensiva, Barcelona, Spain

BACKGROUND. One of the main goals of assisted mechanical ventilation is to decrease patient's work of breathing (WOB). Noninvasive estimation of patient's WOB would be extremely useful for evaluating the efficacy of assistance and for adjusting ventilator settings. Proportional assist ventilation with load-adjustable gain factors (PAV+, PB 840, Covidien) is the only ventilator mode that automatically monitors at frequent intervals the patient's respiratory mechanics (compliance, C_{Rrs}, and resistance, R_{Rrs}) and WOB in a totally noninvasive way. The WOB (with its two components: patient's and ventilator WOB) is displayed as a bargraph on the ventilator screen in Joules per liter (J/L) units.

AIM. To test the accuracy and reliability of PB 840-PAV+ ventilator WOB measurement.

MATERIALS AND METHODS. Spontaneous breathing was simulated with an active lung model (Active Servo Lung 5000, ASL 5000; Ingmar Medical, Pittsburg), programmed to provide three mechanical conditions: normal (5 $cmH_2O/L/s$ R_{Rrs}, 60 ml/cmH_2O C_{Rrs}), restrictive (5 $cmH_2O/L/s$ R_{Rrs}, 20 ml/cmH_2O C_{Rrs}) and obstructive (20 $cmH_2O/L/s$ R_{Rrs}, 60 ml/cmH_2O C_{Rrs}). Each condition was tested under two respiratory rates (RR), 20 and 30 breaths/min, and across two levels of muscle pressure (Pmus): 5 and 10 cmH_2O. The simulator was connected to a PB840 ventilator and each of the aforementioned scenarios was examined at two PAV+ gain levels, 30 and 60 %. Finally, we tested PAV+ using a real esophageal pressure signal, derived from our patient's database, to drive the simulator.
From the flow, Pmus and airway pressure curves provided by the simulator, we calculated patient, ventilator and total WOB based on the Campbell diagram. We compared the WOB based on the Campbell diagram to the WOB displayed by the ventilator, as well as C_{Rrs} and real assistance provided.

RESULTS. The displayed and real total WOB were strongly correlated ($r^2 = 0.93$, Fig. 1). The Bland–Altman plot revealed a mean bias of 0.27 J/L, indicating an underestimation of the real WOB, with a limit of agreement of 0.6 to −0.11 J/L. The correlation was weaker for the patient's WOB ($r^2 = 0.63$). Assistance provided by the ventilator was in general lower than the assistance set, and the % error in patient's WOB calculation was largely explained by the % error in true assistance delivered by the ventilator ($r^2 = 0.73$). The median (25–75th percentile) error in CRrs was 3 % (−20, 10 %).



Figure

CONCLUSIONS. Changes in patient's work of breathing during PAV+ can be precisely captured by the ventilator and the bargraph monitoring can reliably alert physicians for changes in inspiratory WOB. However, relying on the absolute values of WOB measured by the ventilator can be misleading. Possible reasons for this include errors in respiratory mechanics calculation and delayed assistance due to the triggering part of the breath.

GRANT ACKNOWLEDGMENT. The study was supported by a grant from Covidien AG.

0578

EFFECTS OF MANUAL HYPERINFLATION ON LUNG AERATION IN DIRECT AND INDIRECT ARDS

S.N.T. Hemmes[1,2], F. Paulus[1], M.J. Schultz[1,3]

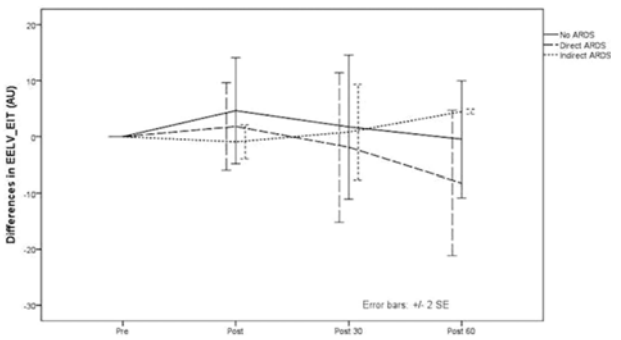
[1]Academic Medical Center, University of Amsterdam, Intensive Care, Amsterdam, Netherlands, [2]Academic Medical Center, University of Amsterdam, Anesthesiology, Amsterdam, Netherlands, [3]Academic Medical Center, University of Amsterdam, Laboratory of Experimental Intensive Care and Anesthesiology (LEICA), Amsterdam, Netherlands

INTRODUCTION. Manual Hyperinflation (MH), a frequently performed maneuver in mechanically ventilated critically ill patients, aims at mobilization of sputum and thereby preventing airway plugging. MH, however, could also induce de-recruitment of lung tissue. We hypothesized MH maneuvers to cause more de-recruitment in patients with direct ARDS compared to patients with indirect ARDS.

OBJECTIVES. The aim of this study was to assess changes in end-expiratory lung volume measured by electrical impedance tomography ($EELV_{EIT}$) in mechanically ventilated critically ill patients after MH maneuvers.

METHODS. Prospective observational study; $EELV_{EIT}$ was measured 3 min before ($t = 0$) and 3 min after ($t = 1$) the MH maneuver. Three-minute measurements were repeated at 30 min ($t = 30$) and 60 min ($t = 60$) after MH. Results are shown in arbitrary units (AU) as measured by EIT.

RESULTS. The study included 7 patients with direct ARDS, three patients with indirect ARDS, and ten patients without ARDS. Changes in $EELV_{EIT}$ are shown in the figure. Although the decline in $EELV_{EIT}$ was larger in patients with direct ARDS than in patients with indirect and patients without ARDS, differences did not reach statistical significance.



Differences (mean) in EELV measured by EIT

CONCLUSIONS. MH may induce de-recruitment of lung tissue in patients with direct ARDS, while no changes were seen in EELV (measured by EIT) in patients with indirect ARDS or non-injured lungs.
GRANT ACKNOWLEDGMENT. The department of SH, FP and MS is kindly provided with a Goettingen Goe-MF II' EIT system by CareFusion, Hoechberg, Germany for investigator-initiated clinical studies.

0579
EVALUATION OF THE SERVO 900C AND HBO SERVO-I VENTILATORS UNDER HYPERBARIC CONDITIONS

N. Rey[1], R. Pignel[2], A. Lyazidi[3], E. Akoumianaki[1], R. Cordioli[1], M. Pellegrini[4], L. Brochard[3], J.C.M. Richard[3]

[1]University Hospital of Geneva, Intensive Care Unit, Geneva, Switzerland, [2]University Hospital of Geneva, Hyperbaric Medical Center, Geneva, Switzerland, [3]University Hospital of Geneva, Intensive Care Unit and University of Geneva, Geneva, Switzerland, [4]University Hospital of Geneva, Hyperbaric Medical Center and Anesthesia Unit, Geneva, Switzerland

INTRODUCTION. Intensive Care ventilators are designed for normobaric ambient pressure, and their behavior can be affected under hyperbaric conditions. Indeed, at high atmospheric pressure, the higher gas density markedly increases resistance to flow, which may internally limit the delivered ventilator flow.The aim of the present bench test study performed under hyperbaric conditions was to evaluate the ability of two ventilators to respect all inspiratory flow and ventilation settings.
METHODS. We compared the Servo 900C®, still widely used in this context, to the hyperbaric oxygen Servo-i® HBO (Maquet, Solna, Sweden) specifically designed for mild hyperbaric environment. Both ventilators were connected to a Michigan test lung (compliance 50 mL/cmH_2O and resistance 5 cmH_2O/L/s) placed into the hyberbaric chamber.Measurements were made at absolute atmospheres (ATA) of 1, 2.8 (limit of the Servo-i® HBO ventilator recommended use: 0.65–3.1 ATA) and 4, in ATPD conditions and converted to BTPS conditions. Flowmeter was calibrated at each ATA level. The Servo-i® HBO and the pneumatic part of Servo 900C® were inside the hyperbaric chamber, while its electronic part was kept outside. Settings were: volume controlled mode with squared flow, respiratory rate of 20 cycles/min, positive end expiratory pressure of 5 cmH_2O. Tidal volume and I/E were set in order to obtain at ATA1 inspiratory flows of 30, 60 and 90 L/min. For ATA 4, we also tested the ventilator at FiO_2 40 %: indeed the actual delivered flow may depend on whether one or two gas sources are used.
RESULTS. For the Servo 900C®, actually delivered flow was correct at ATA1, slightly limited at ATA 2.8 and more frankly at ATA 4. The flow was correct at ATA1 and slightly overestimated at ATA 2.8 with the Servo-i® HBO. Interestingly the higher flow was limited only at 21 (or 100 %) but not anymore when FiO_2 was 40 %. In this case both the air and oxygen valves are activated leading to higher internal impedance of the system and, as a result, higher flow capabilities.

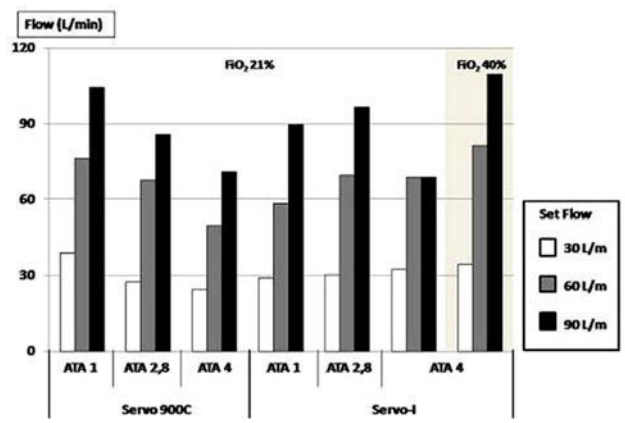


Figure: Measured flow (L/min) during volume controlled mode with Servo 900C® and Servo-i® under each ambient pressure, with different FiO_2 at absolute atmospheres 4 for Servo-i®

CONCLUSIONS. Capacities of ventilators are affected in hyperbaric conditions. The Servo 900C® fails to maintain inspiratory flow and therefore tidal volume from ATA 2.8 to ATA 4. On the contrary, the Servo-i® HBO maintains the flow setting whatever the ATA conditions when FiO_2 is set higher than 21 or below 100 %. In these conditions, there is no benefit for additional use of Helium (data not shown). The better results of the Servo-i® HBO may be explained by more reliable flow sensors and higher performances of the valves in hyperbaric conditions.

0580
FEASIBILITY OF ELECTRIC IMPEDANCE TOMOGRAPHY BASED PEEP-TITRATION IN MORBIDLY OBESE PATIENTS DURING ANESTHESIA

C. Nestler[1], P. Simon[1], S. Hammermüller[1], D. Kamrath[1], L.M. Camilo[2], A. Beda[3], A. Dietrich[4,5], A.W. Reske[1,5], U.X. Kaisers[1,5], H. Wrigge[1,5]

[1]University Hospital Leipzig, Department of Anesthesiology and Intensive Care Medicine, Leipzig, Germany, [2]Federal University of Rio de Janeiro, Institute of Biophysics Carlos Chagas Filho, Rio de Janeiro, Brazil, [3]Federal University of Minas Gerais, Department of Electronic Engineering, Belo Horizonte, Brazil, [4]University Hospital Leipzig, Department of Surgery, Leipzig, Germany, [5]University of Leipzig, Integrated Research and Treatment Center (IFB) Adiposity Diseases, Leipzig, Germany

INTRODUCTION. Morbidly obese patients (MOP) are prone to develop atelectasis in general anesthesia [1]. Alveolar recruitment maneuvers (RM) followed by adequate PEEP may normalize lung function. Electric Impedance Tomography (EIT) measures relative impedance changes during tidal breathing allowing non-invasive visualization of regional ventilation at bedside. Regional Ventilation Delay (RVD) index describes the delay until a lung pixel is ventilated [2]. In experimental studies, RVD index has been shown to correlate with ventilation inhomogeneity and tidal recruitment allowing PEEP titration.
OBJECTIVE. Since the EIT based RVD method has never been used in humans, we investigated the technical feasibility of EIT for PEEP titration ($PEEP_{EIT}$) in MOP during general anesthesia and compared the resulting PEEP levels with a method based on dynamic compliance ($PEEP_C$) [3].
METHODS. After induction of anesthesia, MOP scheduled for bariatric surgery received a RM (50/30 cmH_2O for 10 cycles) followed by a decremental PEEP-trial (range 26–4 cmH_2O, steps of 2 cmH_2O) in constant flow volume controlled ventilation [8 ml/kg predicted body weight (PBW), RR 12 bpm, I/E 1:2). At every PEEP-step, we evaluated RVD index obtained by EIT (PulmoVista™, Draeger, Germany) during a low flow maneuver (LF 12 ml/kg PBW, flow 4 l/min) and pulmonary dynamic compliance during normal breaths.
Individual PEEP for each method was assumed to be that with either, minimal RVD (best ratio between tidal recruitment and overdistention), or maximum compliance, respectively.
RESULTS. In 13 MOP with mean BMI of 49.6 kg/m^2, EIT signals were obtained and RVD determinations always showed a PEEP dependent minimum. Resulting $PEEP_{EIT}$ amounted 18 (10–26) cmH_2O whereas corresponding $PEEP_C$ was 20 (14–26) cmH_2O (Fig. 1).
CONCLUSIONS. Our preliminary clinical data suggest that (1) EIT is technically feasible in MOP despite a lower signal to noise ratio caused by massive adipose tissue isolating the lung, (2) EIT-based RVD index allows PEEP titration in humans with a clearly detectable minimum indicating lowest ventilation inhomogeneity, (3) resulting PEEP levels (median18 cmH_2O) were higher than commonly used in MOP during anesthesia, and (4) we did not observe arterial hypotension. So far, our EIT based PEEP titration has been validated only in experimental studies using computed tomography (CT). Although for obvious reasons we could not validate RVD method using CT in humans, resulting PEEP levels were in the same range as PEEP levels determined by dynamic compliance, suggesting that EIT based RVD is plausible and suitable to noninvasively titrate PEEP in obese patients at bedside.
REFERENCE(S). 1. Rothen HU et al. Br J Anaesth. 1999. 2. Muders T et al. Crit Care Med. 2012. 3. Suarez-Sipmann F et al. Crit Care Med. 2007.
GRANT ACKNOWLEDGMENT. Integrated Research and Treatment Center (IFB) Adiposity Diseases, University of Leipzig, Leipzig, Germany. Draeger Medical, Luebeck, Germany.

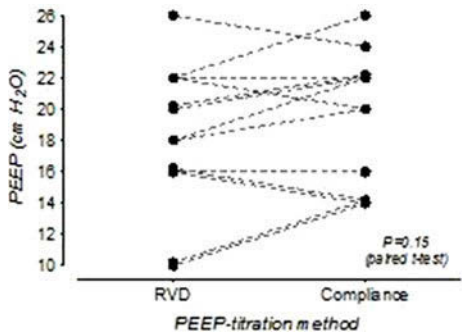


Fig. 1

0581
ANAESTHESIA, MUSCLE PARALYSIS AND MECHANICAL VENTILATION LEAD TO A RAPID IMPAIRMENT OF LUNG GAS EXCHANGE UNRELATED TO ALVEOLAR-CAPILLARY MEMBRANE DISFUNCTION

E. Vassena[1], E. Arisi[1], F. Di Marco[2], D. Bonacina[1], M. Somaini[1], E. Pitino[1], R. Fumagalli[1,3]

[1]University of Milano-Bicocca, Department of Experimental Medicine, Monza, Italy, [2]Università degli Studi di Milano, Clinica Malattie dell'Apparato Respiratorio, Ospedale San Paolo, Milan, Italy, [3]Ospedale Niguarda-Ca' Granda, Dipartimento Emergenza-Urgenza, Milan, Italy

INTRODUCTION. A previous study of Di Marco et al.[1] demonstrated that patients with no evident pulmonary disease, after at least 24 h of mechanical ventilation, are subjected to a significant impairment of pulmonary diffusing capacity for carbon monoxide (DLCO). The

reason of this gas exchange impairment is unknown but there are consistent data suggesting that mechanical ventilation per se could be responsible of this derangement.
OBJECTIVES. The aim of the study was to evaluate the effects of anaesthesia, muscle paralysis and mechanical ventilation on pulmonary capillary blood volume (V_C) and pulmonary membrane diffusing capacity (D_M).
METHODS. We enrolled 27 patients without evidence of pulmonary disease scheduled for elective surgery. DLCO measurements for each patient were acquired through side-stream infra-red gas analyser at the patient's mouth, either during spontaneous breathing pre-surgery and mechanical ventilation (immediately after the intubation). At the same time, lung volumes (end-expiratory lung volume, EELV) were assessed through the method of methane dilution. D_M and V_C were calculated from DLCO using Roughton and Foster's method[2] by using different inspiratory oxygen fractions. The data were compared either through paired T-test if normally distributed or Wilcoxon signed rank test if otherwise.
RESULTS. We observed a significant reduction of DLCO from 16.7 ± 2.7 in spontaneous breathing to 8.4 ± 2.3 mL/min/mmHg during mechanical ventilation ($p < 0.001$). We also found a decrease in EELV from 3.068 ± 0.715 to 1.739 ± 0.466 L ($p < 0.001$). There was a significant reduction of both D_M (from 21.5 ± 4.7 to 12.3 ± 4.2 ml/min/mmHg, $p < 0.001$) and V_C (from 205 ± 66 to 91 ± 58 mL, $p < 0.001$). Normalizing the values of both D_M and V_C to EELV we found that there was no significant change in D_M between spontaneous breathing and mechanical ventilation (7.3 ± 1.9 and 7.1 ± 1.9 ml/min/mmHg/L, $p = 0.736$), while there still was a difference in terms of V_C (69 ± 43 and 51 ± 30 mL/L; $p = 0,028$), although it was less significant compared to the non-normalized data.
CONCLUSIONS. Our results show that anaesthesia and muscle paralysis impair lung's gas exchange through an alteration of both capillary blood volume and pulmonary membrane diffusing capacity. Specifically, D_M reduction seems to be mainly due to the reduction of lung volume (EELV), while other factors could be involved in V_C impairment :atelectasis and positive pressure effects on microcirculation are the proposed explanations.
REFERENCE(S). 1. Di Marco F, Devaquet J, Lyazidi A, Galia F, da Costa NP, Fumagalli R, Brochard L. Positive end-expiratory pressure-induced functional recruitment in patients with acute respiratory distress syndrome. Crit Care Med. 2010;38(1):127–32. 2. J.M.B. Hughes, D.V. Bates Historical review: the carbon monoxide diffusing capacity (Dl_{CO}) and its membrane (Dm) and red cell (Θ Vc) components. Respir Physiol Neurobiol. 2003;138(2–3):115–42.

0582
PULMONARY AND HEMODYNAMIC EFFECTS OF VENTILATORY STRATEGY INDUCED ALVEOLAR HYPERDISTENSION OR CYCLIC RECRUITMENT IN HEALTHY LUNGS UNDER ANESTHESIA

M.B. Ávila[1], L.M. Camilo[1], L.F. Cruz[1], V.G.L. Mancin[1], L.H. Travassos[1], W.A. Zin[1], A.R. Carvalho[1]

[1]Federal University of Rio de Janeiro, Carlos Chagas Filho Biophysics Institute, Rio de Janeiro, Brazil
INTRODUCTION. Mechanical ventilation can induce lung injury and it has been associated with alveolar cyclic recruitment and overdistension. Protective ventilation strategies with low tidal volume (V_t) could be beneficial, however do not prevent lung damage.
OBJECTIVES. Evaluate the pulmonary and hemodynamic consequences of ventilatory strategies with low V_t and predominance of alveolar cyclic recruitment or overdistension based on mathematical estimative of the percentage of volume-dependent elastance (%E2).
METHODS. Eighteen male Wistar rats were sedated, paralyzed and mechanically ventilated in volume control mode with a V_t of 6 mL/kg, ZEEP, and FiO_2 0.5. Recruitment maneuver was performed by gradual elevation of PEEP until 8 cmH_2O, followed by PEEP titrating (8–0 cmH_2O, 1 cmH_2O/30 s by step) and new recruitment maneuver. The animals were then divided into 3 groups according to the strategy used in PEEP titration and were left on mechanical ventilation for 2 h: NEG (ventilated with PEEP where %E2 < 0, n = 6), MID (ventilated with PEEP where %E2 > 0 and <10, n = 6) and MAX (ventilated with PEEP where %E2 > 30, n = 6). Airway pressure, flow, blood pressure (BP) and heart rate were continuously monitored. Arterial blood gases were analyzed after 5 and 120 min of ventilation. After mechanical ventilation, the lungs were removed, and prepared for histological analysis of quantitative alveolar collapse/consolidation and surface/volume ratio (Sv). The ethics committee of IBCCF approved this study with number 012.
RESULTS. After 2 h of ventilation, all groups presented lung function impairment, with increased elastance. However, in the group with high %E2 (MAX), this impairment was less evident (67.9, 45.0 and 16.6 % increase in NEG, MID and MAX groups, respectively). In contrast, this group showed decreased BP (44.8 %) when compared with NEG and MID (NEG 33.3, MID 40.9 %). Histological analysis showed augmented collapse/consolidation in NEG group (60 %) with a lower Sv (7.27 mm^{-1}), in sharp contrast with, MAX and MID groups (32 and 34 % of collapsed; Sv 20.33 and 17.6 mm^{-1}, respectively). The PO_2 showed a tendency to be higher in Max group in the end of the ventilation (117, 152 and 161 mmHg; in NEG, MID and MAX groups, respectively).
CONCLUSIONS. Our results suggest that ventilation with higher %E2 in healthy lungs was less harmful to pulmonary mechanical, preserving lung surface area and improving oxygenation after 2 h of mechanical ventilation at the expense of important deleterious hemodynamic consequences.
GRANT ACKNOWLEDGMENT. CNPq, FAPERJ.

CAP, VAP & nosocomial infections: 0583–0596

0583
SURFACTANT PROTEIN A GENETIC VARIANTS ASSOCIATED WITH SEVERE INFLUENZA VIRUS (H1N1PDM) INFECTION

J. Solé-Violán[1], J.M. Ferrer Agüero[1], E. Herrera-Ramos[2], M. López-Rodríguez[2], J.J. Ruíz-Hernández[3], J.P. Horcajada[4], L. Borderías[5], E. Lerma[4], J. Blanquer[6], M.C. Pérez-González[7], M.I. García-Laorden[8], Y. Florido[9], V. Mas[4], M. Montero[4], L. Sorlí[4], C. Villaplana[10], O. Rajas[11], M. Briones[12], J. Aspa[11], E. López-Granados[13], F. Rodríguez de Castro[14], C. Rodríguez-Gallego[9]

[1]Hospital Universitario de Gran Canaria Dr. Negrín, Intensive Care Medicine, Las Palmas de Gran Canaria, Spain, [2]Hospital Universitario de Gran Canaria Dr. Negrín, Immunology, Las Palmas, Spain, [3]Hospital Universitario de Gran Canaria Dr. Negrín, Internal Medicine, Las Palmas, Spain, [4]Hospital Universitari del Mar, Department of Infectious Diseases, Barcelona, Spain, [5]Hospital San Jorge, Department of Respiratory Diseases, Huesca, Spain, [6]Hospital Clínico y Universitario de Valencia, Intensive Care Unit, Valencia, Spain, [7]Hospital Universitario de Gran Canaria Dr. Negrín, Department of Microbiology, Las Palmas, Spain, [8]Academic Medical Center, Center for Experimental and Molecular Medicine, Amsterdam, Netherlands, [9]Hospital Universitario de Gran Canaria Dr. Negrín, Department of Immunology, Las Palmas de Gran Canaria, Spain, [10]Laboratori de Referència de Catalunya, Barcelona, Spain, [11]Hospital Universitario de la Princesa, Department of Respiratory Diseases, Madrid, Spain, [12]Hospital Clínico y Universitario de Valencia., Department of Respiratory Diseases, Valencia, Spain, [13]Hospital Universitario La Paz, Department of Immunology, Madrid, Spain, [14]Hospital Universitario de Gran Canaria Dr. Negrín, Department of Respiratory Diseases, Las Palmas de Gran Canaria, Spain.
INTRODUCTION. Accumulating evidence suggests that inherited variability in host immune responses influences susceptibility and outcome of IAV (Influenza A virus) infection, but these factors remain largely unknown.
OBJECTIVES. To analyze the role of genetic variants at the genes of MBL (MBL2), SP-A1 (SFTPA1), SP-A2 (SFTPA2) and SP-D (SFTPD) in the defense against IAV infection.
PATIENTS: 93 unrelated white Spanish patients who have suffered H1N1pdm infection between July 2009 and November 2011 were recruited. The general population group consisted of unrelated healthy volunteers analyzed for MBL2 (N = 1,736) and SFTPA1 and SFTPA2 (N = 769) polymorphisms.
METHODS. Influenza A H1N1 virus was detected in nasopharyngeal swabs using the Real-Time PCR. Functional variants at MBL2, SFTPA1, SFTPA2 and SFTPD (rs721917) were analyzed. The Hardy–Weinberg equilibrium was analyzed by Haploview v. 4.2. Haplotypes were estimated in silico by PHASE v. 2.1.1. The comparison of genotypes distribution based on the susceptibility and severity were performed using the Chi-squared test or Fisher's exact test when needed. The relationship between severity in hospitalized patients and genotypes was evaluated by binary logistic regression models. Cox proportional hazard ratios adjusted for the independent variables were also performed.
RESULTS. None of the frequencies of the genetic variants under analysis was found to be significantly different between H1N1pdm infected patients and general population. When severity of infection was evaluated in patients hospitalized for H1N1pdm infection (N = 70), we found that two missense variants at SFTPA2 (rs1965708-C and rs1059046-A) were significantly associated with a higher rate of ICU admission as well as with development of acute respiratory failure (ARF) and acute respiratory distress syndrome (ARDS). In addition, the variant rs1965708-C was also associated with development of PVP and septic shock. Seven different haplotypes for SFTPA1 and eight for SFTPA2 were found in our population. The haplotype $1A^0$ was found to be overrepresented in hospitalized patients who developed ARF or ARDS, whereas the haplotype $1A^1$ was protective against the need of ICU admission and the development of ARF. These associations remained significant in multivariate analysis adjusted for age, gender, risk factors and development of either secondary bacterial pneumonia or bacteremia.
CONCLUSIONS. Our pilot study suggests that variants at SFTPA2 influence the severity of H1N1pdm infection in hospitalized patients. The data from our study could pave the way for a potential treatment with SP-A2 for future IAV pandemics.
GRANT ACKNOWLEDGMENT. FIS PI 02/1620, 04/1190, 06/1031, 10/01718 and 12/01565 with the funding of FEDER-FSE; RedRespira-ISCIII-RTIC-03/11; SEPAR; Universidad de Las Palmas de Gran Canaria and Instituto de Salud Carlos III, FI 11/00593.

0584
EFFICACY OF INHALED COLESTIMETHATE SODIUM IN VENTILATOR-ASSOCIATED TRACHEOBRONCHITIS DUE TO MULTIDRUG-RESISTANT GRAM-NEGATIVE BACTERIA

L.P. Maskin[1], M. Setten[1,2], P.O. Rodriguez[1,3], I. Bonelli[1], S. Attie[1], R. Valentini[1]

[1]Instituto Universitario CEMIC, Intensive Care Unit, Buenos Aires, Argentina, [2]Instituto Universitario CEMIC, Department of Physiotherapy, Buenos Aires, Argentina, [3]Instituto Universitario CEMIC, Department of Medicine, Pulmonary Section, Buenos Aires, Argentina
INTRODUCTION. Ventilator-associated tracheobronchitis (VAT) is thought to be an intermediate process between colonization of the lower respiratory tract and ventilator-associated pneumonia (VAP), occurring in 2.7–10 % of ventilated patients.
OBJECTIVES. To evaluate the efficacy of inhaled colestimethate sodium (CMS) to improve VAT signs. Additionally, to evaluate the safety of inhaled CMS.
METHODS. We consecutively included all critically ill patients who met VAT due to multidrug-resistant Gram-negative bacteria (MDRB) defined as new purulent respiratory secretions in patients under MV (>48 h) with Pseudomonas spp. or Acinetobacter baumanii on culture, and without new infiltrates in the chest X-ray. Inhaled CMS (50 mg bid) was administrated for 7 days. White blood cell count and creatinine were controlled daily. Secretion volume (1-scarce/2-normal/3-abundant) and purulence (1-non-purulent/2-mild purulent/3-frankly purulent) was daily assessed by the same physical therapist. A tracheal aspirate was obtained for culture on the 7 days of treatment. Patients were followed until hospital discharge searching for pulmonary infections. Data are expressed as median (IQR 25–75), or percentage, as needed. Student *t* test and Chi square test were used for comparisons.
RESULTS. From September 2009 to December 2012, 716 patients were screened. Nineteen patients were included (74 % male, 15/19). Median age: 67-year-old (56–76). APACHE II score: 23 (18–28). MV duration before VAT was 40 days (30–46), and 17 patients (89 %) had tracheotomy. Bacteriology: Pseudomonas 84 % (16 patients), and Acinetobacter 16 % (3 cases), most of them only sensitive to CMS and amikacin.At day 7 of CMS treatment, tracheal aspirate culture were negative in 94 % (18/19), secretions volume decreased [3(3–3) vs 1(1–2), $p < 0.001$) and secretion purulence improved [3(2–3) vs 1(1–1), $p < 0.001$). No differences were seen in white blood cells count (9.400/mm^3 (7.450–11.950) vs 8.000 mm^3 (6.200–8.800), p: 0.14], or in serum creatinine [0.55 mg/dl (0.50–1.02) vs 0.64 mg/dl (0.53–0.92), p: 0.63] in the first 7 days of treatment. Only two patients developed renal injury (defined as increased in basal creatinine >50 %—RIFLE criteria); but they recovered at the end of CMS treatment. Two patients developed mild bronchospasm during a single CMS therapy sessions. Only one treatment was stopped in a neurological patient who presented abnormal movements. One patient developed VAP after CMS treatment in the ICU (5 %). Two others had pneumonia during ward stay. Neither of them was caused by multidrug-resistant Gram-negative bacteria.
CONCLUSIONS. Inhaled CMS decreased tracheal secretions volume, purulence and bacterial load in a group of patients with VAT ventilated for a long period of time in the ICU. This improvement in VAT due to MDRB may reduce VAP risk.

0585
CORTICOSTEROIDS IN INFLUENZA A/H1N1

I. Ben Saida[1], A. Khedher[1], J. Ayechi[1], R. Chahed[1], W. Hachfi[2], H. Dammak[3], A. Abdelghani[4], M. Boussarsar[1]

[1]Farhat Hached Hospital, ICU, Sousse, Tunisia, [2]Farhat Hached Hospital, Infectious Diseases, Sousse, Tunisia, [3]Habib Bourguiba Hospital, ICU, Sfax, Tunisia, [4]Farhat Hached Hospital, Pulmonary Diseases, Sousse, Tunisia

INTRODUCTION. Influenza A/H1N1 have been responsible for severe and potentially fatal forms of viral pneumonia. Clinicians have been urged to prescribe corticosteroids as adjunctive treatment for their modulating effect on the inflammatory response. However results were controversial.

OBJECTIVE. To evaluate efficacy and safety of corticosteroids prescribed as adjunctive treatment of A/H1N1viral pneumonia.

METHODS. This is a retrospective study including the whole influenza A/H1N1-PCR-confirmed patients admitted to Farhat Hached Hospital, Sousse (n = 45) and patients admitted to the ICU of Habib Bourguiba Hospital, Sfax (n = 32). Demographic, clinical, treatment and outcome characteristics of the study patients were collected. Univariate and multivariate analyses were performed to identify factors independently associated with mortality. Were also performed, subgroup analyses according to the severity of pneumonia and center effect to identify the impact of corticosteroids. Univariate analysis was performed to identify factors associated with the decision of adding corticosteroids.

RESULTS. Patients were 40.76 ± 16.73 years aged. They were managed 6.03 ± 4.06 days from symptoms onset. 74.1 % presented with pneumonia. 31.2 % required mechanical ventilation. All patients received antiviral therapy at the admission. Corticosteroid therapy was prescribed in 53 % of patients. Death occurred in 23.4 %. Univariate, multivariate and subgroups analyses identified no protective effect of corticosteroids on mortality. High doses of corticosteroids were associated with more mortality. Corticosteroids were rather prescribed in patients with the most severe forms of lung injury.

CONCLUSION. Our study joins other reports in the literature [1–4] to confirm the ineffectiveness and even harmful effect of corticosteroids as adjunctive treatment of influenza A/H1N1 pneumonia. The lack of efficiency is probably the result of a prescription based on a poorly lit empiricism modeled on serious bacterial community-acquired pneumonia.

REFERENCES. 1. Diaz E, et al. H1N1 SEMICYUC-CIBERES-REIPI Working Group (GETGAG). Corticosteroid therapy in patients with primary viral pneumonia due to pandemic (H1N1) 2009 influenza. J Infect 2012;64(3):311–8. 2. Martin-Loeches I, et al. Use of early corticosteroid therapy on ICU admission in patients affected by severe pandemic (H1N1)v influenza A infection. Intensive Care Med. 2011;37(2):272–83. 3. Kim SH, et al. Korean Society of Critical Care Medicine H1N1 Collaborative. Corticosteroid treatment in critically ill patients with pandemic influenza A/H1N1 2009 infection: analytic strategy using propensity scores. Am J Respir Crit Care Med 183(9):1207–14. 4. Brun-Buisson C, et al. REVA-SRLF A/H1N1v 2009 Registry Group. Early corticosteroids in severe influenza A/H1N1 pneumonia and acute respiratory distress syndrome. Am J Respir Crit Care Med. 2011;183(9):1200–6.

0586

THE EFFECT OF COLISTIN AND CARBAPENEM IN THE TREATMENT OF MULTIDRUG-RESISTANT ACINETOBACTER BAUMANNII PNEUMONIA IN THE INTENSIVE CARE UNITS

S.J. Kwon[1], J. Son[2], E. Choi[2], M. Na[2], E.-H. Yu[2], J.H. Kim[2]

[1]Konyang University Hospital, Internal Medicine, Daejeon, Korea, Republic of, [2]Konyang University Hospital, Daejeon, Korea, Republic of

INTRODUCTION. The nosocomial pneumonia due to Acinetobacter baumannii is increased. However, it is difficult to treat due to limited treatment regimens.

OBJECTIVES. To compare several antimicrobials with Colistin for suspected pneumonia in the ICU.

METHODS. The study included 179 mechanically ventilated patients more than 48 h who developed suspected ventilator associated pneumonia (VAP) in 52 beds ICU of teaching hospital in South Korea. We retrospectively analyzed 61 patients with A.baumannii pneumonia.

RESULTS. 50 patients had multidrug-resistant A. baumannii (MDR-AB) pneumonia and 11 patients had carbapenem-susceptible A. baumannii (CSAB) pneumonia. The age, APACHE-2 score and SOFA score at VAP episode and CPIS were 65.8 ± 15.9, 19.2 ± 7.4, 8.0 ± 2.4 and 5.6 ± 1.6. There were no differences in the patient's characteristics between the two groups. Clinical responses were observed in 52 % in MDR-AB pneumonia and 63.6 % in CSAB pneumonia (p = 0.076). The adequacy of antimicrobials in CSAB pneumonia was higher than MDR-AB pneumonia (90.9 vs 40 %, p = 0.003). There was not significant difference of 28-day mortality in CSAB and MDR-AB pneumonia (27.3 vs 44 %, p = 0.5). The 28-day mortality of 24 MDR-AB pneumonia who had clinical failure (75 %) was significantly higher than 26 patients who had clinical response (15.4 %, p = 0.00). The monotherapy and combination regimen including Colistin were more effective in the treatment of MDR-AB pneumonia. Clinical response with Colistin and without Colistin were 53.8 and 29.2 % (p = 0.077) respectively. 35 patients who received either Colistin or Carbapenem had 73.2 % clinical response. The regimens including rifampicin or ampicillin/sulbactam were not effective in MDR-AB pneumonia.

CONCLUSIONS. CSAB pneumonia could easily be treatment comared to MDR-AB, but there was no significant difference of 28-day mortality in two groups. The mortality of patients who had clinical failure was higher and regimen including Colistin was more effective than other antimicrobials. Empirical need regimen including Colistin in the treatment of MDR-AB pneumonia may be considered in the ICU.

REFERENCE(S). 1. Li Jian, et al. Colistin: the re-emerging antibiotic for multidrug-resistant Gram-negative baterial infection. the lancet infection. 2006;6:589–601. 2. Heyland DK et al. Randomized trial of combination versus monotherapy for the empiric treatment of suspected ventilator-associated pneumonia. Crit Care Med 2008;36(3):737–744.

0587

INTRAVENOUS USE OF COLISTIN IN ICU PATIENTS

A. Vakalos[1], M. Gabra[1]

[1]Xanthi General Hospital, ICU, Xanthi, Greece

INTRODUCTION. Intravenous use of colistin is appropriate in order to control severe sepsis from Gram negative pathogens in ICU patients. It remains one of the last resort antibiotic for multidrug-resistant Pseudomonas spp, Acinetobacter spp and Klebsiella spp resisted to carbapenems.

OBJECTIVES. The aim of our study is to record the use of intravenous colistin according to clinical and nursing indexes in our both surgical and medical ICU, during 5 years time period.

METHODS. From 2008 to 2012 admitted to our both medical and surgical ICU 384 patients: mean age 65.1 years, mean length of stay (LOS) 13.8 days, mean APACHE II score on admition 20.9, mean vendilation days (VD) 11.75 days, predicted mortality 37.6 %, actual mortality 31.78 %, standardized mortality ratio (SMR) 0.84. From the pharmacy department we used the records according the annual colistin items consumption and from our database the annual number of patients (Pts), the ICU hospitalization days (H. Days), the number of ventilated patients (Pts V.) and the ventilation Days (V. Days). After that, we calculated the ratio items over each index, per year and overall.

RESULTS.

Results

	2008	2009	2010	2011	2012	Overall
Pts	45	66	64	102	107	384
Items	292	1,378	907	1,472	3,138	7,187
Items/Pts	6.48	20.87	14.17	14.43	29.32	18.76
H. Days	695	757	881	1,434	1,304	5,071
Items/H. Days	0.42	1.82	1.02	1.02	2.40	1.41
Pts V.	41	57	57	88	93	336
Items/Pts V	7.12	24.17	15.91	16.72	33.74	21.38
V. Days	541	605	699	999	1,067	3,911
Items/V. Days	0.58	2.27	1.29	1.47	2.94	1.83

CONCLUSIONS. According to our data, there is an increasing use of intravenous colistin recorded from year 2008 to 2012, especially in the years 3009 and the last year, not only per patient, but per hospitalization days, per patient ventilated and per ventilation days as well. Our data suggest that our infection control policy is depended to last resort antibiotics like colistin, due to high incidence of multidrug-resistant Gram negative pathogens.

0588

INHALED COLISTIN FOR THE TREATMENT OF PATIENTS WITH PNEUMONIA BY MDR PATHOGENS

H.B. Lee[1], S.Y. Park[1]

[1]Chonbuk National University Medical School & Hospital, Internal Medicine, Jeon-ju, Korea, Republic of

INTRODUCTION. Recently ventilator-associated pneumonia (VAP) caused by multi-drug resistant (MDR) gram-negative bacteria has been increasing and resulting in significant morbidity and mortality. Colistin is active against gram-negative bacteria, including the MDR gram-negative bacteria such as *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and so on. However, intravenous administration of colistin was abandoned because of its nephrotoxicity and neurotoxicity, and it was controversial problem whether inhaled colistin is effective or not.

OBJECTIVES. We conducted the present study to assess the effectiveness and safety of aerosolized colistin for the treatment of pneumonia by MDR gram-negative pathogens.

METHODS. From February 2012 to February 2013 in medical ICU of Chonbuk National University Hospital in Korea, we retrospectively reviewed patients, who received inhaled colistin due to VAP by MDR *A. baumannii*, *P. aeruginosa* and *Klebsiella pneumoniae*. The favorable response was defined as clinically and radiologically improved case and/or microbiological results.

RESULTS. In total 19 patients received aerosolized colistin. The mean length of stay in the MICU was 25.8 ± 32.0 days and the mean hospital stay was 61.7 ± 75.4 days. The mean duration of aerosolized colistin therapy was 10.9 ± 16.5 days. Eleven patients showed a favorable response to the therapy (11of 19, 57.9 %). Follow-up cultures were available in 17 patients, and the negative conversion rate of responsible pathogens was 47.1 % (8 of 17). Six patients experienced adverse event related with nephrotoxicity (6 of 19, 26.3 %), and one asthmatic patient was stopped because of nebulize-inducing bronchial spasm (5.3 %).

CONCLUSIONS. Aerosolized colistin appears to be relatively safe and effective option for the treatment of VAP by MDR pathogens. Its role in the treatment of MDR gram-negative pneumonia needs further evaluation.

0589

IMPLEMENTATION AND EVALUATION OF A EPIDEMIOLOGICAL SURVEILLANCE PROTOCOL FOR THE MANAGEMENT AND CONTROL OF NOSOCOMIAL INFECTIONS IN ICU

A. Barrero-Almodovar[1], F. Maroto-Monserrat[1], F. Villarrasa-Clemente[1], S. Gallego-Lara[1], S. Exposito-Garcia[2], J.L. Garcia-Garmendia[1]

[1]Hospital San Juan de Dios del Aljarafe, ICU, Seville, Spain, [2]Hopital San Juan de Dios del Aljarafe, Prevention Medicine Service, Seville, Spain

INTRODUCTION. Nosocomial infection is one of the most prevalent problems in ICUs, having particular importance those caused by multiresistant bacteria (MRB). Tools allowing the anticipation and prevention of MRB transmission, are of special interest for patients' safety.

OBJECTIVES. To examine the effectiveness of a microbiological monitoring and preventive patient isolation protocol in a mixed ICU.

METHODS. Ambispective observational study in a District Hospital. Inclusion of patients with MRB colonization/infection, and indication of contact isolation (CI) in the ICU, before (retrospective period,during 2010), and after the implementation of the Protocol (prospective period, during 2012); and additional inclusion of those patients undergoing preventive contact isolation (PCI) in 2012. Demographic variables, hospital stay, severity indexes (Apache II and SOFA), number and days of CI and PCI, and bacteriology of the microbiological isolates were collected. Descriptive analysis of all collected variables, including, the cumulative incidence of cases of colonization/infection due to MRB.

RESULTS. In 2010, 385 admissions generated 2002 stays. In 2012 we admitted 269 patients, who generated 2055 stays. Microbiological surveillance detected 41 and 34 patients with MRB isolates in 2010, and 2012, respectively. The severity and demographic characteristics were similar. In 2010, 34 MRB isolates were considered infections, and 7 MRB colonizations; the most frequently isolated bacteria was *A. baumannii* (n = 23), followed by *E. coli* (n = 13), and MRSA (n = 5). In 2012 we detected 11 MRB infections and 27 MRB colonizations; the most frequently isolated bacteria was ESBL-*K. pneumoniae* (n = 22), followed by *A. baumannii* (n = 7) and *P. aeruginosa* (n = 6). The number of patients with MRB isolates/100 ICU admissions in 2010 was 10.64, while in 2012 was 12.63. The number of patients with MRB isolates/1,000 ICU stays was reduced from 20.47 in 2010 to 16.54 in 2012.The number of MRB infections/100 ICU admissions was reduced from 8.83 in 2010 to 4.08 in 2012. The number of MRB infections/1,000 ICU stays was reduced from 16.98 in 2010 to 5.35 in 2012. There was an increase in the number of total

isolations days in 2012 (CI + PCI) with respect to 2010, due to an increase of PCI, and with a decrease in the number of CI.
CONCLUSIONS. Microbiological surveillance constitutes a useful tool for the management and control of nosocomial infections in ICU; It does not imply an increase in work, but rather contributes to systematically assess the identification, management and control of the MRB colonized/infected patient.

0590
SELECTIVE DIGESTIVE DECONTAMINATION AT POLYTRAUMA PATIENTS AS A PREVENTIVE TECHNOLOGY OF THE AIRWAYS AND URINARY TRACT INFECTIONS

Y. Nalapko[1]
[1]Lugansk State Medical University, Department of Anesthesiology and Intensive Care, Lugansk, Ukraine
INTRODUCTION. Polytrauma is one of the most severe pathologies in ICUs characterized by high rate of complications, including infection, disability and mortality. Bacterial translocation leads to the progression of systemic inflammatory response syndrome that aggravates the posttraumatic period.
OBJECTIVE. To detect the role of selective digestive decontamination as a preventive measure of nosocomial infections at polytrauma patients.
METHODS. A comparison of the incidence of infections associated with medical care, in 91 patients with severe polytrauma (ISS > 26) was done. Standard care was given to 54 patients. Therapy was aimed to stabilizing of the vital signs of body systems, systemic antibiotic therapy (control group). In 37 patients of the comparative group, intensive therapy was supplemented by enteral tube administration of 250 mg of pefloxacin and 100,000 IU of polymyxin E, four times a day for 5–7 days from the date of admission. The incidence of the nosocomial pneumonia, catheter-related urinary tract infection (UTI) and the terms of their manifestation was analyzed by the Centers for Disease Control criteria (2008) [1].
RESULTS. The emergence of infections was observed in 90.7 % of patients in the control group and 75.7 % of the comparative group. Thus, the introduction of early gut decontamination protocol showed a reduction in the incidence of nosocomial infections by 15.0 %. In the structure of infectious complications in the control group and the comparison group the UTI were dominative and occurred in were, respectively, 83.3 and 62.1 %. In the comparison group they developed on 5–6 days later than in the control group. The incidence of nosocomial pneumonia was 51.9 vs. 43.2 % in control and comparative groups, respectively. The delay of manifestation in the comparison group did not exceed 3 days.
CONCLUSIONS. (1) At polytrauma patients the approach with selective digestive decontamination by pefloxacin and polymyxin E is an effective method of prevention of the healthcare related pneumonia and UTI, but no infection of the blood flow and wound infection. (2) Selective decontamination of the digestive tract at polytrauma can delay the development of infectious complications of respiratory and urinary systems to 4.4 days.
REFERENCE(S). 1. CDC/NHSN surveillance definition of health care-associated infection and criteria for specific types of infections in the acute care setting. Horan TC, Andrus M, Dudeck, MA. Am J Infect Control 2008;36:309–32.

0591
A SERIES OF SEVERE COMMUNITY-ACQUIRED PNEUMONIA IN A POLYVALENT ICU

A. Puerto-Morlan[1,2], M.-V. de la Torre-Prados[1,2], A. Garcia-de la Torre[2,3], J. Perez-Vacas[1,2], N. Zamboschi[1,2], C. Trujillano-Fernandez[1,2], A. Garcia-Alcantara[1,2], F. Cota-Delgado[1,2]
[1]Hospital Universitario Virgen de la Victoria, Intensive Care Unit, Malaga, Spain, [2]IBIMA Institute, Malaga, Spain, [3]Hospital Universitario Puerto Real, Malaga, Spain
INTRODUCTION. Despite advances in management of community-acquired pneumonia (CAP), it remains as the most common cause of severe sepsis. Early recognition of CAP is crucial to avoid delays in management.
OBJECTIVES. Factors related to survival will allow to improve clinical results in severe CAP, specially morbidity and mortality.
METHODS. A retrospective chart review was performed on 175 patients admitted to ICU with severe CAP diagnosis from January 2009 until December 2012. We analyzed demographic, clinical and microbiological data. Descriptive and comparative statistical analysis was performed using the statistical software packages SPSS version 15.0 (SPSS Inc., Chicago, IL, USA).
RESULTS. 69 % of our CAP cases suffer septic shock. The mean age was 57 ± 17 years and 33 % (n = 58) were women. APACHE II in the first 24 h of admission to ICU was 18.74, ICU mortality was 31 % similar to predicted at 32 %. Mean SOFA score was 6.9. Mortality was related with elder patients (56 years ± 18 vs. 61 ± 13 years, p = 0.01), longer delay time in admission to ICU (0.82 vs. 1.41 days, p = 0.01), higher severity by APACHE II (16 vs. 24, p = 0.000) and by SOFA score (5.5 vs. 10, p = 0.000), more organ dysfunction (1.93 vs. 3.04 organs, p = 0.000), larger radiologic pathologic images (30 vs. 60 %, p = 0.03), background of onco-haematological illness (n = 12, 67 vs. 29 %, p = 0.01), higher LDH (378 vs 852 UI/L, p = 0.01) and procalcitonin (13.38 vs 32.3 ng/ml, p = 0.01), showing at admission leucocytosis or leucocytopenia (n = 126, 17 vs. 83 %, p = 0.02) and longer mechanical ventilation time (8 vs. 10 days). No microorganism was identified in 38 % (n = 66) of cases. In 23 % (n = 40) of patients CAP etiology was pneumococcus, with a 25 % (n = 10) of bacteraemia showing a significant increase in mortality (26 vs. 80 %, p = 0.005).
CONCLUSIONS. To improve the clinical results in CAP we must detect patients with more than one dysfunctional organ earlier, admit to ICU and give intensive support. The presence of pneumococcus bacteraemia showed worse outcomes.
REFERENCE(S). 1. Pereira JM et al. Severe sepsis in community-acquired pneumonia. Early recognition and treatment. Eur J Int Med 2012;23:412–419. 2. Chen et al. Cochrane Database Syst Rev 2011;3.

0592
UTILITY OF A MULTIPLE REAL-TIME PCR ASSAY FOR CHOICE OF EMPIRICAL ANTIBIOTICS IN VAP

E. Velasco López[1], M. Rodríguez Gómez[1], F. Martínez Sagasti[1], J. Ramírez Larriviery[1], M.A. González Gallego[1], M. Nieto Cabrera[1], M. Sanchez García[1]
[1]Hospital Clínico San Carlos, Madrid, Spain
OBJECTIVES.
Main To evaluate the accuracy of a commercially available cartridge-based automated polymerase chain reaction (PCR) diagnostic test (Xpert MRSA/SA SSTIt®, Cepheid) and validate its clinical utility in detecting Staphylococcus aureus, both methicillin-susceptible (MSSA) and resistant (MRSA), in respiratory tract samples.
Secondary To study whether a negative test result might have avoided unnecessary empirical antibiotics for coverage of MRSA in patients with suspected VAP.
MATERIALS AND METHODS. Prospective, observational study in consecutive patients admitted from September 2012 to April 2013 with suspected late-onset VAP (>1 week of mechanical ventilation) who were about to receive empiric coverage for MRSA. Patients already on anti-MRSA antibiotic therapy were excluded.
Aliquota of endotracheal aspirate (EA) or bronchoalveolar lavage (BAL) fluid samples obtained for culture at the discretion of the attending physician for the diagnosis of VAP were processed according to the manufacturer's instructions. Time interval from sampling to final report was calculated for both molecular and culture methods. Attending physicians were not informed of the PCR analyses and all details of antibiotic therapy were recorded. Other collected variables were: age, sex, APACHE II score, and ICU-mortality.
Descriptive statistics are expressed as mean ± standard deviation (SD) or percentages.
RESULTS. We studied 7 patients, 6 males, aged 55.8 ± 15, with APACHE II score 20.8 ± 8.3. At the time of diagnosis 4 patients had septic shock and pO_2/FiO_2 152 ± 66 and 5 died in the ICU. Neither PCR analysis nor conventional culture detected MSSA or MRSA in five EA and two BAL samples. The molecular test detected the mec gen in three samples. The corresponding conventional cultures yielded growth of a Gram-negative bacillus in one and of coagulase-negative Staphylococci in two samples. Molecular test and culture results were available in 1 ± 0.3 and 74 ± 26 h, respectively. All sven patients received empiric linezolid therapy for 5 ± 1 days. Supposing that all patients receive a single early dose of empiric anti-MRSA antibiotic, the molecular test could have avoided 90 % of subsequent antibiotic exposure and cost.
CONCLUSIONS. Our preliminary results suggest that negative PCR-based test results for MSSA and MRSA in EA and BAL samples predict negative cultures and, therefore, may avoid unnecessary empirical antibiotic MRSA coverage. This diagnostic test may improve antibiotic treatment by allowing very early de-escalation, thereby reducing the risk of development of bacterial resistance and other adverse events and costs.

0593
THE CHRONICLE OF AN OUTBREAK

J.M. Mora Ordoñez[1], V. Olea Jiménez[1], G. Jiménez Pérez[1], E. Curiel Balsera[1]
[1]Hospital Regional Carlos Haya, Medicina Intensiva, Málaga, Spain
INTRODUCTION. The issue of antimicrobial resistance is not something trivial, we are faced with the rapid emergente and spread of multidrug resistant bacteria. This represents an increase in the costs, and increased morbidity and mortality. Between multi-resistant bacteria are ESBL. Were detected for the first time in Germany in 1983 and in Spain in 1988.The emergence of extended-spectrum beta-lactamases (ESBL) have been greatly disrupted the treatment of these bacterial infections. The ESBL enzymes are able to hydrolyze the broad-spectrum cephalosporins and the monobactams. Along with tigecycline, carbapenems and Colistin are those with the highest activity have against most of ESBL producing strains.
The progressive increase to the majority of the ESBL and carbapenemases, antibiotic group that was in most cases the last line of treatment, is currently being very common in hospitals.
OBJECTIVES. To analyze the outbreak of ESBL Klebsiella Carlos Haya Hospital Complex in 2011 and control measures.
METHODS. A prospective descriptive observational ESBL Klebsiella pneumoniae outbreak carbapenemase. We collected all the outbreak patients, colonized or infected. The first recorded was in May 2012 and we finished the outbreak in October 2012.
RESULTS. 135 patients were collected suspects of which 104 patients were confirmed ESBL *K. pneumoniae* carbapenemase. After send the samples to reference center confirmed Majadahonda *K. pneumoniae* blaOXA 48 in 82 patients. The UCI service was the highest number of affected patients presented, being more than 46 % where first isolation and in 71.3 % of patients in the outbreak had ICU stay.
51 % of the cases was considered colonization. Among the 47.5 % had respiratory infection, 22.5 % bacteriemia and 20 % UTI.
The main reason for admission of patients was 29.2 % Neurosurgical, 10.9 % polytrauma, sepsis 15.8, 24.3 % other postoperatively, other 15.8 %.
Epidemiologically the patients had a mean age of 60.5 ± 16.4 years, 70.7 % were male. Mean hospital stay was 61.46 ± 38 days and the average length of stay up to the first isolation was 23.9 ± 16.3 days.
Mortality was 21 % being attributable to only 2.4 %.
CONCLUSIONS. We report a rare outbreak blaOXA48 K.pneumoniae nationally and first described in intensive care units at the level of Andalusia. The UCI is the first unit of accumulation and distribution of cases. The treatment for this infection outbreaks is difficult and prolonged.
REFERENCE(S). Clinical microbiology and infection CMI 2012;18:413–431.

0594
CYTOKINE EXPRESSION ACCORDING MICROBIOLOGICAL AETIOLOGY IN MECHANICALLY VENTILATED PATIENTS WITH PNEUMONIA

A. Estella[1]
[1]Hospital del SAS de Jerez, Intensive Care Unit, Jerez de la Frontera, Spain
INTRODUCTION. Several studies have examined the role that cytokines play in severe pneumonia. The specific relationship between microbiological aetiology and the inflammatory response has been scarcely studied.
OBJECTIVES. The aim of the present study was to investigate systemic and intrapulmonary cytokine response according culture results.
METHODS. This study was conducted in a 17-bed Intensive Care Unit of a community hospital. Mechanically ventilated patients with microbiologically confirmed pneumonia to which cytokines were measured were retrospectively analysed. Patients with negative cultures, fungal pneumonia or polymicrobial etiology were excluded. Plasma and bronchoalveolar lavage (BAL) Interleukin (IL)-6, IL-8 and TNFα levels were analyzed according microbiological aetiology, we distinguish three groups: gram-negative, gram-positive and viral (Influenza A H1N1v). Statistical analysis: data were analyzed by SPSS 18.

RESULTS. Fourteen patients were included. Three subgroups were defined according to Gram stain and culture results of bronchoscopy bronchoalveolar samples: six patients with gram-negative pneumonia, five patients with gram-positive pneumonia and three patients with primary viral pneumonia due to Influenza A H1N1v. The concentration of the cytokines measured in plasma and the BAL fluid are reported in table and are expressed in pg/ml.

Plasma and BAL cytokine levels

	IL-6	BAL IL-6	IL-8	BAL IL-8	α -TNF	BAL α-TNF
Gram-negative	151.4 ± 177.3	267.6 ± 247.03	214.8 ± 123.7	2,131.6 ± 1035.2	3.6 ± 4.07	39.6 ± 30.7
Gram-positive	186.5 ± 251.4	139.67 ± 103.5	187 ± 120.7	1.665 ± 1612.25	14.65 ± 21.46	549.8 ± 431.7
Viral	85	<14	66.2	<62	<16	<16

CONCLUSIONS. The small sample size and retrospective design may result in limited data for analysis, we conclude:
Cytokine patterns in BAL fluid and plasma of mechanically ventilated patients with severe pneumonia may differ, depending of the type of pathogen.
Bacterial pneumonia induces stronger inflammatory cytokine mediated response than viral pneumonia.
Gram positive bacteria elicit as much α-TNF release as did Gram negative bacteria.
REFERENCE(S). Cytokine expression in severe pneumonia: a bronchoalveolar lavage study.Montón C, Torres A, El-Ebiary M, Filella X, Xaubet A, de la Bellacasa JP. Crit Care Med. 1999;27(9):1745–53.

0595
COMPARATIVE STUDY OF THE COMBINATION OF HIGH DOSES OF AMPICILLINE/SULBACTAME WITH COLISTIN VERSUS MEROPENEM WITH COLISTIN IN VENTILATOR ASSOCIATED PNEUMONIA CAUSED BY ACINETOBACTER BAUMANNII

F. Frantzeskaki[1], E.-S. Karampi[1], P. Papadopoulos[1], E. Paramythiotou[1], M. Theodorakopoulou[1], A. Flevari[1], M. Rizos[1], C. Diakaki[1], A. Armaganidis[1], G. Dimopoulos[1]

[1]Attikon University Hospital, University of Athens Medical School, Intensive Care Unit, Athens, Greece

INTRODUCTION. Ventilator associated pneumonia due to multidrug resistant *Acinetobacter baumannii* carries significant morbidity and mortality in the intensive care unit (ICU) setting. Sulbactam, a β-lactamase inhibitor has shown bactericidal activity against *A. baumannii*. In vitro synergistic activity of the combination of sulbactam with colistin or meropenem and colistin has been demonstrated in several studies.
OBJECTIVES. We prospectively compared the clinical efficacy and safety of the combination of high doses of ampicilline/sulbactam with colistin versus meropenem with colistin in ventilator associated pneumonia caused by multidrug resistant Acinetobacter baumannii.
METHODS. This prospective study was performed at 21-bed polyvalent intensive care unit. All mechanical ventilated patients >72 h who developed VAP and had positive *A. baumannii* tracheal aspirates (>10^6 cfu/ml) were enrolled in the study. The antimicrobial susceptibility of the isolates was determined using the disk-diffusion (Kirby–Bauer) method, the VITEK II system and the E-test method (AB Biodisk, Solna-Sweden). All isolates exhibited resistance to almost all antibiotics routinely tested, excluding colistin. Patients were randomly assigned to receive intravenous ampicillin/sulbactam 6 g (at a rate 2:1) every 6 h iv and colistin 3MIU every 8 h (group A) or meropenem 2gx3 iv and colistin 3MIU every 8 h (group B), all adjusted to creatinine clearance. Follow up cultures and clinical evaluation of all patients was performed 5 days after the initiation of therapy. Clinical success was defined by a lessening of the signs and symptoms of VAP, while microbiologic success was defined as eradication of the pathogen in tracheal aspiration cultures.
RESULTS. Twenty-four patients with VAP (mean age ± SD 62 ± 7), having positive A.baumannii tracheal aspirates >10^6 were enrolled. Among them, 16 patients were included in Group A and 8 in Group B. Clinical and microbiologic success was observed in 13 patients of Group A (81 %) and 6 patients of Group B (75 %) ($p = 0.1$). There was no significant difference in 14 and 30 days mortality between the 2 groups. Adverse reactions occurred in 1 patient (15.3 %) of Group A (rush and eosinophilia), which led to discontinuation of treatment.
CONCLUSIONS. The combination of A/S with colistin or meropenem with colistin might be equally safe and effective treatment options for these difficult to treat infections. However, more data are needed to clarify the possible synergistic activities of these therapeutic combinations against multidrug resistant *A. baumanii* strains.
REFERENCE(S). 1. Kempf M, Djouhri-Bouktab L, Brunel JM, Raoult D, Rolain JM. Synergistic activity of sulbactam combined with colistin against colistin-resistant *Acinetobacter baumannii.* Int J Antimicrob Agents 2012;39(2):180–1.

0596
TUBERCULOSIS IN THE ICU: A TERTIARY HOSPITAL 11 YEARS EXPERIENCE

L. Fernandez[1], J. Lopez[1], M. Irazábal[1], I. Pozuelo[1], P. Millan[1], C. Guallar[1], B. Civantos[1], S. Yus[1]

[1]Hospital Universitario La Paz, Intensive Care Unit, Madrid, Spain

INTRODUCTION. Tuberculosis (Tb) is a curable disease with a myriad of clinical presentations, some of them very severe.
OBJECTIVES. We describe some of the features of patients with tuberculosis (TB) who required admission to our ICU as: incidence, mortality, and delay or not in the onset of specific anti-tuberculous treatment.
METHODS. A retrospective cohort study from January 2000 to October 2011, in a 20-bed intensive care unit (ICU) of a tertiary University Hospital. We included all patients with an active TB, that required admission in our ICU during that period. Data collected included demographics, severity scores on admission (APACHEII, SOFA), risk factors (comorbidities, toxic habits, HIV status, corticosteroids and immunosuppressive treatments), and clinical presentation. Early diagnosis of TB, time to initiation of specific treatment and its relation with ICU mortality were also analysed.
RESULTS. During the reviewed period (11 years), from 8,790 patients, only 23 were admitted due to active tuberculosis, with an incidence of 0.26 %. Of these, 78.28 % were male, with a mean age of 40.8 years. Mean APACHEII and SOFA were 14.21 and 5.80 respectively. The most common clinical presentation was pulmonary disease in 69.56 % (16 patients) followed by 13 patients who met criteria of pneumonia and 3 patients who met criteria of milliary disease. Developed ARDS five patients. The mortality rate of this group was 37.5 % (6 out of 16 patients). Five with ARDS and none with milliary TB. Central nervous system involvement represented 30.43 % (7 patients), 5 had meningoencephalitis and 2 had space occupying lesions (SOL) tuberculomas. Mortality in this last group was 42.85 % (3 out of 7 patients). There were three patients with both pulmonary and neurological involvement. Six were known HIV positive patients.
Mortality was 39.13 % (9 out of 23 patients) and it was statistically ($p < 0.002$) higher than the global ICU mortality: 19.74 % (1,736 patients out of 8,790). Also, was related with severity criteria at admission: APACHEII (21.66 vs 15.04), shock criteria (7 out of 9 patients) and ARDS (5 out of 9 patients). There was delay in initiation of treatment in 39.13 % with five deaths.
CONCLUSIONS. Eventhough TB only represents 0.26 % of all the ICU admissions, appears to be a condition with higher mortality than rest of the ICU admissions.
There was a high rate of treatment delay (39 %), although due to our limited number of patients, we cannot evaluate its effect on mortality.
In the ICU TB is diagnosed and treated late, therefore, it is important to have a high index of suspicion to avoid treatment delays and prevention remains a challenge in this population.

Coagulation and transfusion: 0597–0610

0597
LONG- VERSUS SHORT-AXIS ULTRASOUND GUIDANCE FOR SUBCLAVIAN VEIN CANNULATION

A. Vezzani[1], T. Manca[1], F. Nicolini[1], B. Borrello[1], C. Brusasco[2], F. Corradi[1]

[1]Cardiac Surgery Intensive Care Unit, Parma, Italy, [2]University of Genoa, Genova, Italy

AIM. The aim of this study was to compare the short and long axis approaches to ultrasound guided subclavian vein cannulation with respect to indicators of success.
METHODS. Patients (n = 46) undergoing cardiac surgery and requiring central venous cannulation were randomised to undergo either long- or short-axis ultrasound-guided cannulation of the subclavian vein by a skilled anesthesiologist. First pass success, number of needle passes, procedural taken and complications were documented for each procedure.
RESULTS. The subclavian vein was successfully cannulated in all 46 patients.
The first pass success rate was higher in the short axis group 86 % compared to the long axis group 56 % [24:28 (86 %) versus 10:18 (56 %) $p = 0.043$]. Procedural time was significantly lower in the short axis (1.44 ± 1.11 versus 3.00 ± 2.01 min $p = 0.002$). Fewer needle redirections were required in the short axis group (0.14 ± 0.36 versus 1.11 ± 1.13 $p = 0.008$).
CONCLUSIONS. The short-axis procedure was associated with a higher first pass success rate, shorter procedure time and fewer needle redirections. A short-axis procedure for ultrasound-guided subclavian cannulation offers advantages over long-axis procedure.

0598
TOO HOT TO HANDLE! OUTCOMES OF CRITICALLY ILL PATIENTS WITH TEMPERATURE RELATED ILLNESS DURING A TROPICAL SUMMER IN SOUTHERN INDIA

S. Kalaiselvan Murugesan[1], A.S. Arunkumar[1], M.K. Renuka[2]

[1]Sri Ramachandra University, Critical Care Medicine, Chennai, India, [2]Sri Ramachandra University, Anesthesiology, Chennai, India

INTRODUCTION. India is a tropical country with hot summers. ICU admissions due to heat related illness is common.
OBJECTIVES. We evaluated the clinical features and outcome of patients admitted to our tertiary care multidisciplinary ICU with heat related illness.
METHODS. This is a retrospective observational study.We included all patients admitted during April to July 2012, with fever, neurological symptoms and absence of meningism[1]. We excluded patients with features of infection in CSF analysis and neuroimaging studies showing acute stroke or CNS infection.
Data on demographics, co-morbid illness, APACHE II, SOFA scores,presenting symptoms, vital parameters, lab parameters, concomitant medications, echocardiography and neuroimaging studies were collected. Outcome data included, mortality, ICU length of stay (LOS), ventilator days, discharge SOFA and Glascow Coma Scale (GCS).
Statistical analysis was done using student *t* test, Chi square test and multi-variate analysis.
RESULTS. 26 patients were analysed. 15 were males. The mean age was 53.12 (±18.6) years (mean ± S.D). Mean APACHE II was 19.6 ± 7.7 and SOFA was 7.5 ± 2.6.

Admission vital parameters

Vitals	Mean ± SD
Temperature	102.7 ± 2.7 F
GCS	8.65 ± 4.2
Systolic BP	115.15 ± 23.98 mmHg
Diastolic BP	71.35 ± 14.70 mmHg

Admission lab values

Labs	Mean ± S.D
Serum sodium	124.38 ± 13.33 meq/L
Serum lactate	2.3 ± 2.1 mmol/L
Serum creatinine	1.40 ± 0.67 mg/dl
Serum bilirubin	1.43 ± 1.36 mg/dl
Hematocrit	34.96 ± 7.5 %
CPK	1,856 ± 2,372 IU/L

Frequent co-morbid illness included hypertension (38 %), diabetes mellitus (26 %), neurological diseases (23 %) and coronary artery disease (11.5 %).The common presenting

symptoms were neurological symptoms (100 %), fever (88 %) and gastrointestinal symptoms (30 %). Incidence of organ dysfunction were, neurological impairment (100 %), raised creatinine (57 %), hepatic impairment (34 %) and coagulation abnormalities (26 %). No patient had an acute infection on admission. MRI findings suggestive of heat stroke like diffusion restriction in thalamus, hippocampus, cerebellum and basal ganglia were seen in 6 of 26 patients. All these patients had a poor outcome.

Outcome data Outcome parameters	
Mortality rate (%)	34 % (9/26)
Discharge SOFA (mean ± SD)	2.43 ± 1.5
Discharge GCS (mean ± SD)	13.17 ± 1.8
ICU ALOS (days) (mean ± SD)	12.41 ± 11.53
Ventilator days (mean ± SD)	10.16 ± 12.46

7 of 17 patients discharged had residual neurological impairment (41 %). On univariate analysis, non-survivors had worse SOFA sores (8.89 ± 2.47 vs 6.76 ± 2.48), higher serum lactate (mmol/L) (3.45 ± 2.30 vs 2.03 ± 2.32) and longer ventilator days (19.14 ± 19.6 vs 7.53 ± 11.9), however multivariate analysis did not show any statistically significant difference.

CONCLUSIONS. Heat-related illness had high mortality and significant neurological morbidity [2]. No other significant residual organ dysfunctions were noted.

REFERENCE(S). 1. Bouchama A, Knochel JP. Medical progress: heat stroke. N Engl J Med 2002;346(25):1978–88. 2. Dematte JE, O'Mara K, Buescher J, et al. Near-fatal heat stroke during the 1995 heat wave in Chicago. Ann Intern Med 1998;129:173–81.

0599

INCREASING *S. AUREUS* CHALLENGE REDUCES PLASMA IRON AFTER TRANSFUSION WITH OLDER STORED BLOOD BUT WORSENS MORTALITY AND LUNG INJURY

I. Cortes Puch[1], D. Wang[1], J. Sun[1], S.B. Solomon[1], T. Kanias[2], K. Remy[1], J. Feng[1], M.T. Gladwin[2,3], D.B. Kim-Shapiro[4], H.G. Klein[5], C. Natanson[1]

[1]National Institutes of Health, Critical Care Medicine Department, Clinical Center, Bethesda, United States, [2]University of Pittsburgh, Vascular Medicine Institute, Pittsburgh, United States, [3]University of Pittsburgh School of Medicine, Department of Medicine, Division of Pulmonary, Allergy and Critical Care Medicine, Pittsburgh, United States, [4]Wake Forest University, Department of Physics and the Translational Science Center, Winston-Salem, United States, [5]National Institutes of Health, Department of Transfusion Medicine, Bethesda, United States.

INTRODUCTION. Current evidence suggest that transfusion of RBC stored for longer periods is associated with increased risks [1–3]. In a previous study, we found in an *S. aureus* pneumonia canine model, randomization to exchange transfusions with older (42-day-old) vs. fresh blood (7-day-old) significantly increased mortality and lung injury [3].

OBJECTIVES. To further investigate potential mechanisms by which older blood worsens outcomes and the effect of severity of the pulmonary infection on outcomes from transfusion of older blood.

METHODS. 48 purpose-bred beagles were challenged intrabronchially with increasing doses of *S. aureus* [0 (n = 8), 1.0 (n = 8), 1.25 (n = 24) and ≥1.5 (n = 8) × 10^9 CFU/kg]. Animals were randomized to be exchange-transfused (80 ml/kg) with either 7 or 42-day-old stored blood (4 aliquots of 20 ml/kg q 3 h), starting at 4 h after bacterial challenge. Commercially available canine universal donor leukoreduced blood was used. During the 96 h study, all animals received antibiotics, fluids, vasopressors and mechanical ventilation titrated by algorithms.

RESULTS. Old vs. fresh blood in all animals significantly increased plasma cell-free hemoglobin (CFH) levels during transfusion, independent of bacterial dose and persisting over 4 days (mean 20–150 μM). Fresh blood also increased CFH but this took time to develop (≥10 h) and prominent increases were found only at the highest bacterial dose (mean 75 μM). Without bacterial challenge, non-transferrin bound iron (NTBI) and plasma labile iron (PLI) levels were more elevated with older vs. fresh blood (range 0.2–1.8 μM) during transfusion and remained elevated ≥10 h after transfusion. However, as bacterial dose increased, the iron levels with older blood progressively decreased during and after transfusion ($p \leq 0.01$) associated with progressively worsening shock (significantly more with older vs. fresh blood, $p = 0.03$ at 24 h). At the middle bacterial dose (1.25 × 10^9 CFU/kg) with older blood, significant increases in mortality (100 % vs. 33 %) and lung injury ($p = 0.03$) were associated with the disappearance of plasma iron (NTBI and PLI).

CONCLUSIONS. We found there is in vivo hemolysis of older blood releasing CFH similarly, independent of the presence of bacteria. However, in a bacterial dose dependent fashion, there was with older blood, a decrease in plasma iron, potentially promoting bacterial growth and worsening outcome. To minimize risks from transfusion related to infection, this study suggest fresher blood should be used. If older blood is used, therapies aiming to remove plasma iron should be considered. Lastly, during severe infection, bacteria can promote CFH release over time to use as a potential source of iron worsening the infection. Therefore, iron may be a potential therapeutic target to improve outcome during sepsis.

REFERENCE(S). 1. Hess et al. Transfus Med Rev 2002;16:283–295. 2. Wang et al. Transfusion 2012;52:1184–1195. 3. Solomon et al. Blood 2012;121:1663–1672.

0600

WASHING OLDER UNITS OF BLOOD REDUCES PLASMA IRON DURING TRANSFUSION AND IMPROVES OUTCOMES

I. Cortes Puch[1], D. Wang[1], J. Sun[1], S.B. Solomon[1], T. Kanias[2], K. Remy[1], J. Feng[1], M.A. Popovsky[3], M.T. Gladwin[2,4], D.B. Kim-Shapiro[5], H.G. Klein[6], C. Natanson[1]

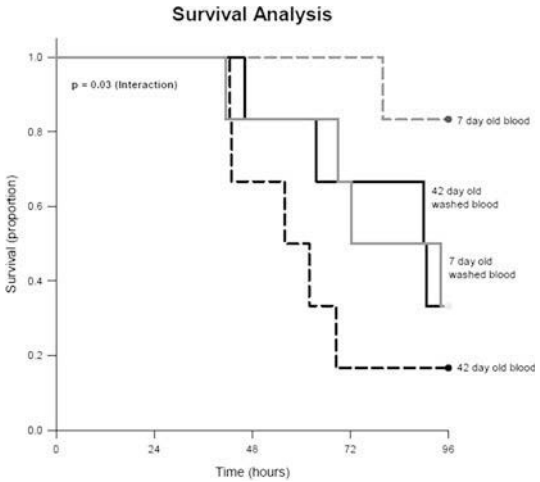
[1]National Institutes of Health, Critical Care Medicine Department, Clinical Center, Bethesda, United States, [2]University of Pittsburgh, Vascular Medicine Institute, Pittsburgh, United States, [3]Haemonetics Corporation, Braintree, United States, [4]University of Pittsburgh School of Medicine, Department of Medicine, Division of Pulmonary, Allergy and Critical Care Medicine, Pittsburgh, United States, [5]Wake Forest University, Department of Physics and the Translational Science Center, Winston-Salem, United States, [6]National Institutes of Health, Department of Transfusion Medicine, Bethesda, United States

INTRODUCTION. Blood for transfusion is stored 35–49 days worldwide. In a recent meta-analysis it was shown that transfusion of older blood is associated with increased morbidity and mortality [1, 2]. These findings are mostly based on observational studies and four randomized controlled trials are ongoing in Canada, United States and Australia to try to confirm or refute these results. In addition, these findings have raised interest in developing strategies to improve blood storage and prevent these risks. Washing blood is a feasible approach that could remove fragile older cells with storage lesions and any abnormal products accumulating in the storage bag.

OBJECTIVES. We previously found exchange-transfusion with older (42-day-old) compared to fresh stored blood (7-day-old), significantly increased mortality and lung injury in canines with *S. aureus* pneumonia [3]. We now examined if washing blood prior to transfusion would reduce this harmful effect of older blood and whether washing fresh blood was safe.

METHODS. We used a 2-by-2 factorial design. The two factors examined were transfusion of (1) old vs. fresh blood (42 vs. 7-day-old) and using (2) washed vs. unwashed blood. 24 purpose-bred beagles, challenged intrabronchially with *S. aureus* (1.5 × 10^9 CFU/kg at 0 h) were randomized to be exchange-transfused with commercially available universal donor canine blood (20 ml/kg) at 4, 7, 10 and 13 h with either 7-day-old washed (n = 6) or unwashed blood (n = 6), or 42-day-old washed (n = 6) or unwashed (n = 6) blood. Blood was washed prior to transfusion using the Haemonetics ACP215 device. Animals over the 96 h study received sedation antibiotics, fluids, vasopressors and mechanical ventilation titrated to physiologic endpoints.

RESULTS. The effect of washing blood on survival was significantly different and opposite depending if the stored blood was old or fresh. Washing improved survival rates with transfusion of older blood and worsened survival rates with washing fresh blood (significant qualitative interaction $p = 0.03$). There were similar interactions examining iron and cell-free hemoglobin (CFH) plasma levels. During transfusion, iron levels decreased more with washing of older vs. fresh blood ($p = 0.008$ for interaction at 13 h). After transfusion, CFH levels increased more with washing fresh compared to older blood ($p = 0.006$ for interaction at 48 h).



Survival

CONCLUSIONS. Washing older blood appears to eliminate plasma iron preventing bacterial growth and improving outcomes. In contrast, washing fresh blood can cause CFH release over time providing iron for bacteria and worsening outcomes. Fresh blood provided the lowest risks related to transfusion during infection resulting in the best potential outcome. Further studies are needed to determine when during storage, washing blood changes from being harmful to beneficial.

REFERENCE(S). 1.Hess et al. Transfus Med Rev 2002;16:283–5. 2. Wang et al. Transfusion 2012;52:1184–95. 3. Solomon et al. Blood 2012;121:1663–72.

0601

THE TRANSFUSION OF OLD NON LEUKOREDUCED RED BLOOD CELLS INCREASES PLASMA FREE HEMOGLOBIN IN SEPTIC PATIENTS

A. Donati[1], E. Damiani[1], R. Domizi[1], C. Scorcella[1], A. Carsetti[1], S. Tondi[1], R. Castagnani[1], S. Pierantozzi[1], S. Calcinaro[1], N. Mininno[1], V. Monaldi[1], P. Pelaia[1], C. Ince[2]

[1]Università Politecnica delle Marche, Anesthesia and Intensive Care Unit, Department of Biosciences and Public Health, Ancona, Italy, [2]Academic Medical Center, Department of Translational Physiology, Amsterdam, Netherlands

INTRODUCTION. Free hemoglobin (Hb) can scavenge nitric oxide, thereby inducing vasoconstriction and damaging the vascular endothelium. High free Hb levels are associated with increased mortality in septic patients [1]. Red blood cell (RBC) storage lesions may increase free Hb content in the supernatant of older blood bags [2].

OBJECTIVES. To assess whether the transfusion of different types of packed RBCs increases plasma free Hb in septic patients and how this may affect the microvascular perfusion and the endothelial glycocalyx.

METHODS. Prospective randomized study on 30 patients with either sepsis, severe sepsis or septic shock, who received fresh (storage <10 days) non-leukoreduced (NLR) RBCs (group 1), fresh leukoreduced (LR)RBCs (group 2) or old (storage >20 days) NLR RBCs (group 3). Plasma free Hb was measured before and 1 h after transfusion. Simultaneously, the tissue Hb index (THI) was assessed on the thenar eminence with near infrared spectroscopy and the sublingual microcirculation was studied using sidestream dark field imaging; the total density of small vessels (TVDs) and the perfused boundary region (PBR, as an index of glycocalyx damage) were calculated with dedicated software. Free Hb levels in the supernatant of packed RBCs were also measured.

RESULTS. Plasma free Hb significantly increased only in patients receiving old NLR RBCs, although no differences were seen for free Hb content in blood bags between the three groups. Changes in plasma free Hb after transfusion were inversely related to changes in THI and TVDs.

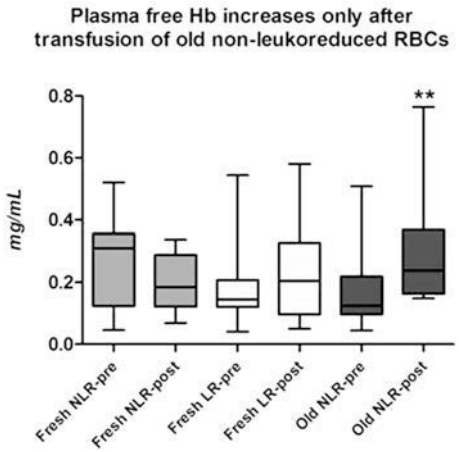


Figure 1

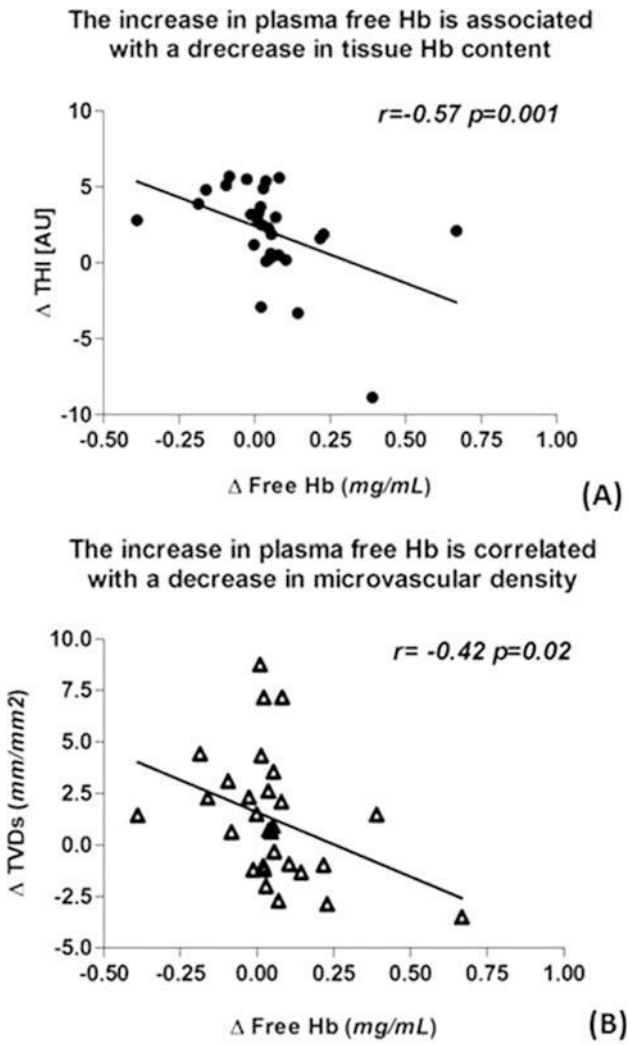


Figure 2

Higher free Hb levels in the blood bag were associated with the increase in PBR after transfusion.

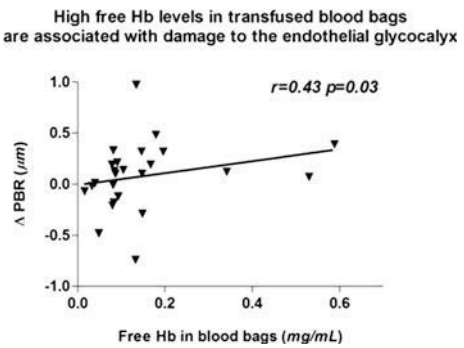


Figure 3

CONCLUSIONS. The transfusion of old NLR RBCs increases plasma free Hb in septic patients, unlike the transfusion of fresh NLR or LR RBCs. Free Hb levels in the supernatant seemed not to increase over time in our sample; however, prolonged storage might have led to RBC plasma membrane alteration, thereby facilitating the release of Hb in the circulation. Higher plasma free Hb levels are associated with decreasing capillary density and microvascular perfusion and may contribute to the endothelial glycocalyx damage during sepsis.
REFERENCE(S). 1. Janz DR et al. Crit Care Med 2013;41(3). 2. Donadee C et al. Circulation 2011;124:465–476.

0602

RISK FACTORS FOR DELAYED TRALI IN THE CRITICALLY ILL: A COHORT STUDY

N. Juffermans[1], J. Binnekade[1], P. Marik[2], M. Koopman[3], W. Breebaart[1], M. Muller[1]

[1]Academic Medical Center, University of Amsterdam, Amsterdam, Netherlands, [2]Eastern Virginia Medical School, Division of Pulmonary and Critical Care Medicine, Virginia, United States, [3]Sanquin Blood Supply, Amsterdam, Netherlands

INTRODUCTION. "Classic" Transfusion Related Acute Lung Injury (TRALI), which by definition can occur up to 6 h following a blood transfusion, is considered a rare phenomenon. However, there is a clear association between transfusion and lung injury in the critically ill, suggesting that TRALI can occur also outside the scope of this (rather arbitrary) time frame. The association between transfusion and lung injury is not well understood.

OBJECTIVES. To determine risk factors for a delayed TRALI reaction (D-TRALI, occurring after 6–72 h following transfusion) and to compare these to classic TRALI.

METHODS. Retrospective cohort study in critically ill patients admitted for >48 h to the ICU of a tertiary referral hospital in the Netherlands. Statistics by logistic regression analysis.

RESULTS. Of 4 855 admitted patients, 2 024 patients had a length of stay >48 h, of whom 1,046 received a transfusion. Of these, 183 patients had D-TRALI. Compared to classic TRALI, risk factors for D-TRALI were volume of transfused red blood cells [OR 1.30 (1.23–1.49), $p < 0.001$) and plasma 1.19 (OR 1.0–1.42), $p = 0.05$]. Transfusion of a product from a female donor increased the risk of classic TRALI [OR 1.86 (1.20–3.08), $p < 0.05$], but was associated with a decreased risk of developing D-TRALI [OR 0.42 (0.24–0.75), $p = 0.003$]. The presence of sepsis and liver failure, which were risk factors for TRALI, reduced risk of D-TRALI. There were no patient-related risk factors for D-TRALI compared to classic TRALI. Compared to transfused controls, risk factors for D-TRALI were non-specific conditions associated with lung injury, including hypo-albuminemia [OR 1.86 (1.01–3.43), $p = 0.05$], acidosis [OR 2.04 (1.24–3.64), $p < 0.005$] and APACHE II score [OR 1.05 (1.01–1.09), $p < 0.009$].

CONCLUSIONS. D-TRALI appears to be a different clinical entity than classic TRALI, with different risk factors. The volume of transfused blood, but not specific clinical disease entities, predispose to D-TRALI. Blood from female donors was a risk factor for TRALI, but not for D-TRALI, suggesting that antibodies do not play a role in D-TRALI.

REFERENCE(S). Marik PE, Corwin HL. Acute lung injury following blood transfusion: expanding the definition. Crit Care Med 2008;36:3080–4.

0603

EFFECT AND DURATION OF PROPHYLACTIC PLATELET TRANSFUSIONS BEFORE INSERTION OF CENTRAL VENOUS CATHETER IN PATIENTS WITH BONE MARROW FAILURE EVALUATED WITH POINT OF CARE METHODS AND FLOW CYTOMETRY

T. Kander[1], U. Schött[1], J. Persson[1], E. Norström[2]

[1]Lund University, Department of Intensive and Perioperative Care, Lund, Sweden, [2]Lund University, Department of Clinical Chemistry, Lund, Sweden

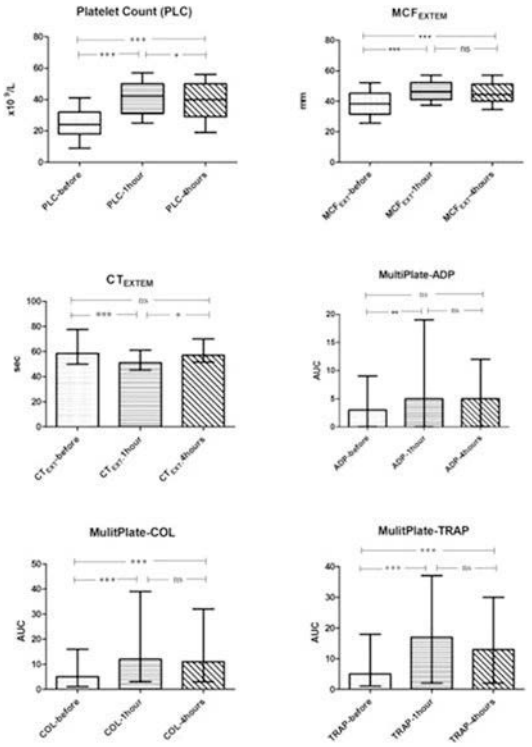
INTRODUCTION. Patients with bone marrow failure and severe thrombocytopenia are routinely given prophylactic platelet transfusions to minimize the risk for bleeding complications before interventions such as insertion of central venous catheters. To set the optimal transfusion trigger we need to better measure and evaluate the effect of a platelet transfusion. We have performed a prospective observational study on patients with bone marrow failure planned for prophylactic platelet transfusion before the insertion of a central venous catheter.

OBJECTIVES. To evaluate the effect and duration of prophylactic platelet transfusions in thrombocytopenic patients with bone marrow failure.

METHOD. 39 consecutive adult patients with bone marrow failure and platelet count (PLC) $< 50 \times 10^9$/L, planed for platelet transfusion before insertion of central venous catheter, were enrolled. Bone marrow failure could be due to chemotherapy, blood malignancy or both. Indication for central venous catheter was chemotherapy in all patients. Blood was drawn from all patients before platelet transfusion, 1 and 4 h after completion of

transfusion. The coagulation enhancement was evaluated with a viscoelastic hemostatic test (ROTEM®), multiplate electrode aggregometry (MultiPlate®) and with flow cytometry using the platelet exposure of P-selectin (CD62P), phosphatidylserine (lactadherin-binding) and activation of GPIIb-IIIa (PAC-1), measured after stimulation with ADP, CRP-XL and TRAP6. Differences between laboratory results before, 1 and 4 h after transfusion were calculated using two tailed, Wilcoxon matched pairs signed test.

RESULTS. 17 women and 22 men were included. Results for central parameters with significances are shown in Fig. 1. Platelet count (PLC) was 24–42–40 $\times$ 10^9/L (before 1–4 h post-transfusion). For significance see the figure below wich presents the most important results. Corrected platelet count increment was 9,198–8,587, 1 respectively 4 h post-transfusion ($p = 0.038$). MCF_{EXT} was 38–46–44 mm (before 1–4 h post-transfusion). CT_{EXT} was 58–53–56 s (before 1–4 h post-transfusion). FIBTEM results were all unchanged after transfusion. All MultiPlate® analyses were significantly increased after 1 h and were not diminished 4 h post- transfusion. Flow cytometry parameters were all unchanged after transfusion.



Most important results. Coagulation analyses before, 1 and 4 h after platelet transfusion. Boxplots with 10–90 percentile whiskers. *Bar graphs* presented as the median with interquartile range. *$p < 0.05$, **$p < 0.001$. ***$p < 0.0001$

CONCLUSION. Prophylactic platelet transfusions to thrombocytopenic patients with bone marrow failure improve coagulability by increasing the number of platelets and not through enhancement of the platelet function. The effect of the platelet transfusion seems to diminish slightly, but persists for 4 h.

GRANT ACKNOWLEDGMENT. No grants were provided for this study.

0604

AGE OF BLOOD AND MORTALITY IN CRITICALLY ILL PATIENTS: THE TRANSFUSE TRIAL

K.-M. Kaukonen[1], D.J. Cooper[1], The TRANSFUSE Investigators

[1]Monash University, ANZIC-RC, Department of Epidemiology and Preventive Medicine, Melbourne, Australia

INTRODUCTION. Red blood cell (RBC) transfusion is a common and potentially life-saving treatment in intensive care units (ICUs) [1]. However, RBC transfusion has also been associated with an increased risk of morbidity and/or mortality in critically ill, surgical and trauma patients [2]. Although this association is multifactorial, attention has focused on the possible harm of transfusing RBC stored for a prolonged time. Observational studies with critically ill patients have showed increased risk of mortality [3, 4]. However, according to the latest review, no definitive argument can be presented [5].

OBJECTIVES. The primary aim of TRANSFUSE is to determine if transfusion of the freshest available RBC in critically ill patients compared to standard care decreases mortality.

METHODS. TRANSFUSE is a multi-centre, randomised, controlled, double blinded, phase III trial. It is conducted by world leaders in collaborative clinical trials. It will be undertaken in 60 sites around Australia, New Zealand and Europe.

5,000 ICU patients requiring blood transfusion will be randomised to either freshest compatible available RBCs or standard practice (oldest compatible available RBCs). Patients will receive the randomised treatment for all transfusion episodes during the hospital stay. The primary outcome measure is 90 days mortality. Additional secondary outcomes include measures of organ dysfunction, sepsis, length of hospital and ICU stays, and quality of life.

RESULTS. The patient recruitment started November 2012. The anticipated completion of the study is by the end of 2015.

CONCLUSIONS. This important, pragmatic and collaborative trial seeks to answer a critical question facing blood scientists, clinicians and policy makers. Regardless of the outcome TRANSFUSE will have important health policy implications in Australia and internationally.

REFERENCE(S). 1. Vincent JL, Baron JF, Reinhart K, et al. Anemia and blood transfusion in critically ill patients. Jama 2002;288:1499–507. 2. Marik PE, Corwin HL. Efficacy of red blood cell transfusion in the critically ill: a systematic review of the literature. Crit Care Med 2008;36:2667–74. 3. Koch CG, Li L, Sessler DI, et al. Duration of red-cell storage and complications after cardiac surgery. N Engl J Med 2008;358:1229–39. 4. Pettila V, Westbrook AJ, Nichol AD, et al. Age of red blood cells and mortality in the critically ill. Crit Care 2011;15:R116. 5. Lelubre C, Vincent JL. Relationship between red cell storage duration and outcomes in adults receiving red cell transfusions: a systematic review. Crit Care 2013;17:R66.

GRANT ACKNOWLEDGMENT. TRANSFUSE study is supported by grants from NHMRC in Australia and HRC in New Zealand.

0605

MASSIVE TRANSFUSION IN RUPTURED ABDOMINAL AORTIC ANEURYSMS (RAAA) IN THE INTENSIVE CARE UNIT (ICU)

M. Gero Escapa[1], M.T. Hernandez Carbonell[2], S. Ossa Echeverri[1], R. Montero Mendizabal[2], M.E. Perea Rodríguez[1], F. Medina Maldonado[2], N. Moradillo Renuncio[2], E. Portugal Rodríguez[1], S. Puerto Corrales[1], M. Goñi Imizcoz[3], D. Armesto Formoso[4]

[1]H. U.de Burgos, Intensive Care Unit, Burgos, Spain, [2]H. U.de Burgos, Vascular Surgery, Burgos, Spain, [3]H. U. de Burgos, Hematology Department, Burgos, Spain, [4]H. U. de Burgos, Investigation Unit, Burgos, Spain.

INTRODUCTION. Ruptured AAA are a common cause of haemorrhagic shock admitted to ICU. Hence the need of massive blood products transfusion (MT) ($\geq$10 red cell concentrates in 24 h) is a part of the therapeutic strategy.

OBJECTIVES. Describe the epidemiological profile of rAAA patients and the main prognostic factores associated with supra (SC) or infra-renal (IC) aortic clamping. Identify risk factors associated with mortality and the impact of a change in transfusion strategy, according to the literature, on mortality.

METHODS. Retrospective descriptive study from January 2003 to December 2012, analyzing 39 patients with rAAA who underwent open surgery and survived at least 24 h. We excluded the ones who underwent endovascular repair (EVAR) due to the low incidence of MT (11.76 %). We collected different variables: age, APACHE II, onset of symptoms, type and time of clamping, surgical time, number of transfused blood products, use of prohemostatic agents, and main complications at 24 h after admission: anemia, thrombopenia, coagulopathy, acute renal failure (ARF), metabolic acidosis, hypoperfusion, ICU and hospital lenght of stay.

RESULTS. A total of 83 patients with rAAA underwent surgery, of which 58 survived over 24 h (69.8 %). 39 patients underwent open surgery, of this 19 (49 %) required MT. We compared MT patients with the non-MT (MT vs non-MT): APACHE II (22 vs 17), average lenght of stay in ICU (15 Vs 10 days) and in hospital (25 vs 14), mortality (53 vs 25 %). No statistical significance was found between suprarenal clamping (23 %) and infrarrenal clamping in: MT requierement (66 vs 44 %), ARF (66 vs 34 %), coagulopathy (78 vs 27 %), hypoperfusion (44 vs 17 %), acidosis (67 vs 25 %) and mortality (78 vs 27 %).Risk factors associated with mortality in open surgery rAAA were: coagulopathy 73 % ($p < 0.002$) (64 % with MT), hypoperfusion 86 % ($p < 0.003$) (100 % with MT) and acidosis 67 % ($p < 0,0001$) (70 % with MT)Transfusional strategy 2003–2012: Group 1 from 2003 to 2008, 44 % MT [16 red blood cells units (RBC), 9 fresh frozen plasma units (FFP) and 2 platelets pool (PP)] mortality of 36 % (67 % MT); Group 2 from 2009 to 2012, 57 % MT (13 RBC, 11 FFP and 4 PP, 50 % use of prohemostatics) mortality of 42.8 % (67 % MT).

CONCLUSIONS. Endovascular repair has a low incidence of MT.MT patients showed a trend toward a longer ICU and hospital stays, higher APACHEII score and mortality. In the patients who undergo open surgery, mortality increases with suprarrenal clamping.Factors associated with mortality among the patients with rAAA were: coagulopathy, acidosis and hypoperfusion. These three factors were found in high rates among death patients with MT.In the last 4 years, more FFP, PP have been administrated and higher use of prohemostatic agents have been observed, without changes in overall mortality in both periods.

REFERENCE(S). 1. Ellard et al. Anaesthesia 2013;68(Suppl. 1):72–83. 2. Johansson et al. Eur J Vasc Endovasc Surg. 2008;36(4):397–400.

0606

BLOOD TRANSFUSION FOLLOWING SEVERE TRAUMA IS ASSOCIATED WITH THE DEVELOPMENT OF AN EARLY ANTI-INFLAMMATORY RESPONSE

H.D.T. Torrance[1,2], K. Brohi[1,2], R.M. Pearse[1,2], P. Fragkou[1,2], C.J. Hinds[1,2], M.J. O'Dwyer[1,2]

[1]Barts Health NHS Trust, Department of Trauma & Critical Care, London, United Kingdom, [2]Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, United Kingdom

INTRODUCTION. Although there has been little definitive supporting evidence to date, blood transfusion is widely thought to induce an anti-inflammatory phenotype.

Our group has previously described the development of an anti-inflammatory response immediately following severe polytrauma [1]. This response was incompletely predicted by the injury severity score (ISS). We hypothesised that blood transfusion has an anti-inflammatory effect in these patients independent of ISS and may be associated with infectious complications.

OBJECTIVES. To identify an association between blood transfusion and early inflammatory changes in severly injured polytrauma patients.

METHODS. 122 ventilated polytrauma patients were recruited. mRNA was extracted from PaxGene tubes collected within 2 h of the initial insult, at 24 and at 72 h. T helper cell subtype specific cytokines and transcription factors mRNA was quantified using real-time PCR. Microbiological data were collected for the duration of the ICU stay. 10 healthy controls served as a comparator.

RESULTS. Early blood transfusion, as defined by transfusion prior to the baseline bloods being drawn, was not associated with ISS or with subsequent mortality. Early transfusion was associated with greater baseline IL-10 levels ($p = 0.001$, Fig. 1). A multiple regression analysis demonstrated that both ISS and early blood transfusion were independent predictors of time 0 IL-10 mRNA levels.

Univariate analysis demonstrated an association between blood transfusion in the first 24 h and higher IL-10 ($p = 0.002$, Fig. 2), lower Foxp3 ($p = 0.03$), lower GATA3 ($p = 0.02$), lower TNFα ($p = 0.04$), lower T-bet ($p = 0.04$) and lower RORγt ($p = 0.03$, Fig. 3).

Those patients receiving transfusions in the first 24 h were more likely to develop late bacteraemia ($p = 0.02$).
CONCLUSIONS. Severe trauma is associated with an inflammatory response that is primarily suppressive in direction. The magnitude of this response is independently associated with blood transfusion and ISS. This may have important clinical consequences such as an increased susceptibility to develop serious hospital acquired infections.

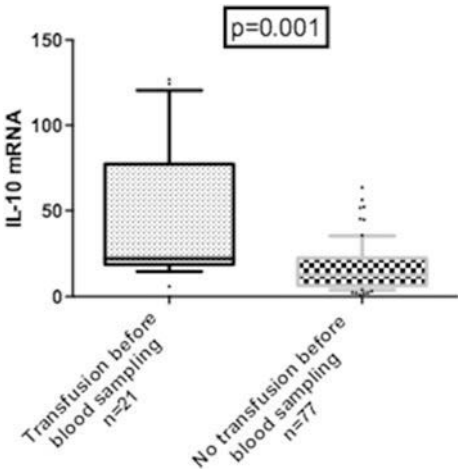


Figure 1

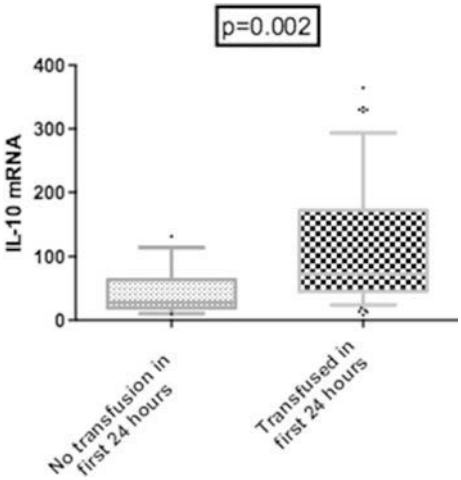


Figure 2

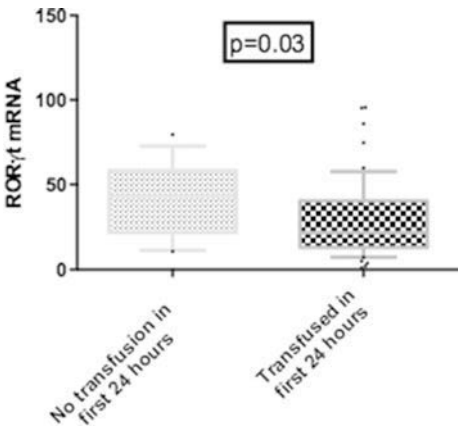


Figure 3

REFERENCE. 1. Torrance HD et al. Cytokine gene expression can predict infectious complications following severe trauma. Crit Care. In press.
GRANT ACKNOWLEDGMENT. Bart's & the London Charity, the Intensive Care Society, & the Isaac Shapera Trust.

0607

INFLUENCE OF FLUID INFUSION RATES FOR PLASMA VOLUME EXPANSION OF LACTATE RINGER AND HYDROXYETHYLSTARCH IN A PIGLET MODEL OF CONTROLLED HEMORRHAGE

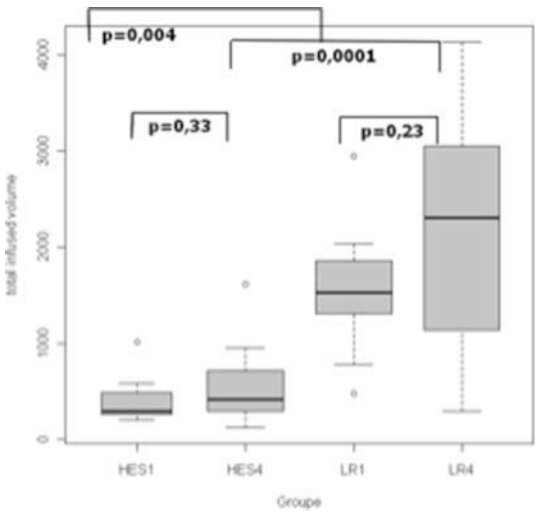
C. Roger[1], B. Louart[1], L. Muller[1], J.Y. Lefrant[1]

[1]CHU Nîmes, Nîmes, France

INTRODUCTION. Fluid resuscitation remains the first therapeutic step for correction of hypovolemia. However, the optimal way to administrate fluids is still debated and the influence of infusion rate for plasma expanding effect of fluid was not studied.
OBJECTIVES. The aim of the present study was to compare plasma volume expansion of lactate Ringer (LR) and hydroxyethylstarch (HES) at two different infusion rates at the early phase of hemorrhagic shock.
METHODS. Fifty-six anesthetized and mechanically ventilated piglets were bled ($\sim$30 ml kg^{-1}) to hold mean arterial blood pressure at 40 mmHg over 30 min and were resuscitated in four groups: LR 1 ml kg^{-1} min^{-1} (LR1 group) (n = 14), HES 1 ml kg^{-1} min^{-1} (HES1 group) (n = 14), LR 4 ml kg^{-1} min^{-1} (LR4 group) (n = 14) or HES 4 ml kg^{-1} min^{-1} (HES4 group) (n = 14) until MAP reached its baseline value $\pm$10 %. MAP was maintained at its baseline value for 1 h. Time and fluid volume necessary to restore the baseline MAP value were measured.
RESULTS. The volume of hemorrhage was similar between groups (p = 0.51). Time needed to restore mean arterial blood pressure (MAP) was: 41 $\pm$ 25 min in LR1 group, 11 $\pm$ 4 in HES1 group, 11 $\pm$ 10 min in LR4 group and 4 $\pm$ 3 min in HES4 group. Fluid volumes of the resuscitation phase were : 1,011 $\pm$ 516 ml in LR1 group, 279 $\pm$ 119 ml in HES1 group, 1,356 $\pm$ 1,319 ml in LR4 group and 439 $\pm$ 397 ml in HES4 group. Biological data are shown in Table 1.

Table 1

	LR1	HES1	LR4	HES4
Hb T0 T4	10.9 $\pm$ 1.5	10.3 $\pm$ 0.8	10.2 $\pm$ 1.5	10.4 $\pm$ 1
	7.6 $\pm$ 1.4	7.2 $\pm$ 1.6	6.4 $\pm$ 1.7	6 $\pm$ 1.5
Creatinine	68 $\pm$ 9	67 $\pm$ 7	76 $\pm$ 15	74 $\pm$ 13
	66 $\pm$ 8	71 $\pm$ 8	73 $\pm$ 13	75 $\pm$ 12
Lactates	2.8 $\pm$ 2.3	3.2 $\pm$ 2.7	3.6 $\pm$ 3	2.6 $\pm$ 1
	3.6 $\pm$ 2.2	3.7 $\pm$ 2.8	5.5 $\pm$ 2.8*	2.6 $\pm$ 1.3
SvO_2	65 $\pm$ 18	69 $\pm$ 15	64 $\pm$ 17	70 $\pm$ 15
	60 $\pm$ 15	63 $\pm$ 16	65 $\pm$ 17	68 $\pm$ 10



Infused fluid volumes

CONCLUSIONS. In this piglet model of controlled hemorrhage, an increased infusion rate (1 vs 4 ml kg^{-1} min^{-1}) does not increase plasma-expanding effect of fluid. Higher fluid infused volumes (not statistically significant) and higher lactates levels in LR4 group could suggest deleterious effects of high infusions rates for crystalloids.

0608

AN EXAMINATION OF THE TRANEXAMIC ACID PROTOCOL USED IN EMERGENCY TRAUMA PATIENTS AT RISK OF HAEMORRHAGE

M.K. Sihera[1], G.N. Barker[1]

[1]Oxford University Hospitals, Adult Intensive Care Unit, Oxford, United Kingdom

INTRODUCTION. Tranexamic acid (TxA) is an anti-fibrinolytic agent used for haemorrhage control in medical and surgical scenarios. Evidence from the CRASH-2 trial [1], has demonstrated that TxA can reduce mortality in trauma patients at risk of haemorrhage without increasing the incidence of adverse thrombotic events. The protocol encourages TxA to be initiated in two doses within 3 h of injury in order for beneficial results to be elicited. Given that hypovolaemic shock secondary to haemorrhage (in trauma patients) accounts for 35 % of pre-hospital deaths and 40 % of deaths within 24 h [2], adherence to this protocol is imperative to patient care.
OBJECTIVES. To determine whether trauma patients admitted to the John Radcliffe Hospital (JRH) received the TxA protocol as recommended by the CRASH-2 trial [1], and assess outcomes on mortality, blood product use and thrombotic complications.

METHODS. Trauma patients admitted to the JRH, between April and December 2012 were audited using data obtained from the 'Trauma Audit Research Network'. This data included the start of pre-hospital administration of TxA from April and the JRH's achievement of 'Major Trauma Centre' status in October. Significant parameters such as vital signs, injury severity scores, administration of TxA, blood product use and thrombotic complications were examined.
RESULTS. Between April and December 2012, there were 559 trauma patients admitted to the JRH. 246 patients were identified as eligible for TxA using the same criteria outlined by the CRASH-2 trial [1]. Of this number, 46 patients received the first dose of TxA (67 % pre-hospital) but only two patients went on to complete the full protocol. Furthermore, 68 patients were transfused with blood products, of which 81 % were eligible for the TxA protocol. With respect to mortality, 28 patients died during this time. 27 of which were eligible for TxA but only one received a single dose. Finally, 13 patients suffered a thrombotic event, 3 of which had received TxA.
CONCLUSIONS. Despite national recommendations for use of this TxA protocol, this audit has shown it has been seldom adhered to at this hospital. Given the positive implications for patient safety and potential for reduction of mortality rates, we suspect that lack of appropriate education and experience with this agent are responsible for its poor implementation in trauma patients despite being the first step in the hospital's major haemorrhage protocol.
REFERENCES. 1. The CRASH-2 Collaborators. Effects of tranexamic acid on death,vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial. Lancet 2010;376:23–32. 2. Kauvar DS, Lefering R, Wade CE (2006) Impact of haemorrhage on trauma outcome: an overview of epidemiology, clinical presentations, and therapeutic considerations. J Trauma 60:S3–11.

0609
EARLY COAGULOPATHY IN TRAUMA PATIENTS

M. Colomo Gonzalez[1], S. Cordovilla Guardia[1], M.S. Monsalve Alvarez de Cienfuegos[1], S. Nogueras Guijarro[1], F. Guerrero Lopez[1], E. Fernandez Mondejar[1]

[1]Hospital Universitario Virgen de las Nieves, Critical Care Unit, Granada, Spain
OBJECTIVES. To know the pattern of coagulation disorders showed by trauma patients in the first 24 h after traumatism and their hemoderivative transfusion needs.
METHODS. We made a retrospective study where all trauma patients admitted in the neuro-trauma intesive care unit (ICU) of our hospital for almost 15 consecutive months (January 2012–15th April 2013) were included. Demographic data, severity scales, ICU mortality and the incidence rate of coagulopathy in the first 24 h after injury, as well as the alteration order of the different coagulation parameters were collected. Exclusion criteria were: Admission delay after trauma >24 h and previous treatment with any kind of oral anticoagulants. It was considered as altered values: Prothrombin activity <70 %, aPTT > 38 s, fibrinogen <180 mg/dl and platelets <100,000/ml. Statistical study: Descriptive of the interest variables and bivariant analisys with χ^2 test, Student's *t* test and Mann–Whitney *U* test. A value of $p < 0,05$ was considered as statistically significant.
RESULTS. During this period 110 trauma patients met the inclusion criteria. 74.5 % were males. The average age was 50.2 ± 20.4 years and the ICU stay median was 3 days (Q1–Q3 1, 10 days). APACHE II at admission and ISS were 17.8 ± 8.2 and 21.42 ± 10.6 respectively. Coagulopathy (defined as the disorder in any of the four studied parameters in any time within the first 24 h) was developed by 52.7 % of patients. Prothrombin activity was the parameter most frequently affected (46.4 %), followed by fibrinogen (24.5 %), platelets (20 %) and aPTT (18.2 %). 24.5 % of the patients showed prothrombin activity disorders in the first coagulation study versus just 10.9 % in fibrinogen. In 10 % of cases the four parameters were found altered, whereas in 8.2 % was 3, in 4.5 % it was 2 and in 24.5 % it was just 1 parameter. 53.4 % of the patients with coagulopathy needed hemoderivatives administration while just 8 out of 52 (15.4 %) showing no alteration in any parameter needed some kind of transfusion ($p < 0.001$). There existed no statistically significative differences between patients developing coagulopathy and those which not neither in age nor ISS, but differences were found in APACHE II (19.8 ± 7.3 vs 15.2 ± 8.7, $p = 0,009$) and APACHE III (68.2 ± 28.8 vs 52..7 ± 34.1, $p = 0.024$). No association was found between coagulopathy and mortality (15.4 vs 19 %, $p = 0.62$).
CONCLUSIONS. Early coagulopathy in trauma patients being admitted in our ICU is a frequent entity. Within the studied parameters, the first and most frequently altered is prothrombin activity followed by fibrinogen. Patients with coagulopathy needed hemoderivatives more frequently.

0610
OPTIMAL STRATEGY OF R.B.C. TRANSFUSION FOR PATIENTS AFTER CARDIAC SURGERY

M. Chkhaidze[1], A. Tsintsadze[2], I. Metreveli[2]

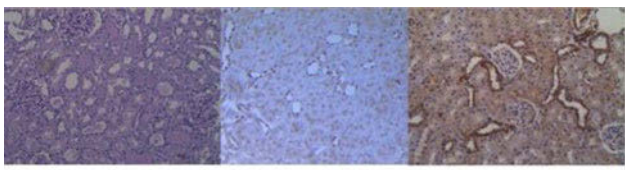
[1]Jo Ann Medical Center, Cardiac Intensive Care, Tbilisi, Georgia, [2]Jo Ann Medical Center, Cardiac and Thoracic Surgery, Tbilisi, Georgia
INTRODUCTION. Despite numerous publications regarding safe thresholds of blood transfusion, there are still no clear evidence of optimal blood transfusion strategy in adult patients undergoing cardiac surgery, and "liberal" blood transfusion guidelines are still actual.
OBJECTIVES. The aim of this RCT study was to compare outcomes of two transfusion strategy, in this group of patients, "restrictive" (R.B.C. transfusion threshold hemoglobin level <8 g/dl) and "liberal" (according to local institutional guideline, Hb < 10 g/dl).
METHODS. From October 2012 till February 2013 we studied 73 patients undergoing elective coronary artery bypass graft surgery, in stable postoperative condition, we randomly divided patients in two groups: "restrictive" group (n = 38) received R.B.C. transfusion in the postoperative period when Hb level was <8 g/dl, and "liberal" group (n = 35) -when Hb level was <10 g/dl. The outcome measures analyzed were: postoperative transfusion rate, duration of mechanical ventilation, length of stay in the ICU, in-hospital morbidity and 30 days mortality rate.
RESULTS. There was no significant difference of demographics and perioperative status between groups. Postoperative transfusion rate was 2.7 ± 0.81 RBC units in "liberal" vs 1.13 ± 0.89 in "restrictive" group. The duration of M.V.—7.8 ± 3.1 h in "liberal" vs 9.2 ± 2.1 h in "restrictive". The length of ICU stay was similar in both groups −3.7 ± 2.4 vs 2.8 ± 1.6 ($p < 0.05$). In-hospital morbidity rate was similar 7.8 vs 8.5 %. 30 day mortality rate was zero in both groups.
CONCLUSIONS. We can conclude that, only difference between these groups is reduction of RBC transfusion by almost 60 %. Thereby, use of "restrictive" RBC transfusion strategy after CABG surgery is safe and cost effective.
REFERENCE(S). 1. Dorée C, Stanworth S, Brunskill SJ, Hopewell S, Hyde CJ, Murphy MF. Where are the systematic reviews in transfusion medicine? A study of the transfusion evidence base. Transfus Med Rev 2010;4(4):286–294. 2. Reeves BC, Murphy GJ. Increased mortality, morbidity, and cost associated with red blood cell transfusion after cardiac surgery. Curr Opin Anaesthesiol 2008;21(5):669–673. 3. Hajjar LA, Vincent JL, Galas FR, et al. Transfusion requirements after cardiac surgery: the TRACS randomized controlled trial. JAMA 2010;304(14):1559–1567.

Evaluation of renal function: 0611–0624

0611
$P2X_7$ RECEPTOR AND HAEMORRHAGE-REPERFUSION: INDUCED ACUTE TUBULAR INJURY

M.L. Sixma[1,2], A. Dyson[1], N. Arulkumaran[1,3], P. Bass[4], R.J. Unwin[4], F.W. Tam[3], M. Singer[1]

[1]University College Hospital London NHS Trust, Bloomsbury Institute of Intensive Care Medicine, London, United Kingdom, [2]University of Groningen, University Medical Center Groningen, Faculty of Medical Sciences, Groningen, Netherlands, [3]Imperial College, Nephrology, London, United Kingdom, [4]Royal Free Hospital, Centre for Nephrology, London, United Kingdom
INTRODUCTION. The $P2X_7$ purinoreceptor ($P2X_7R$) triggers activation of the inflammasome with release of pro-inflammatory cytokines (e.g. IL-1b, IL-18) and the pro-apoptotic caspase-1. Constitutive expression of the $P2X_7R$ in the kidney is minimal. However, in a rat glomerulonephritis model [1], expression, mainly localized to the glomeruli, was upregulated, with selective $P2X_7R$ receptor antagonism being protective.
OBJECTIVES. To determine whether $P2X_7R$ is upregulated in a rat model of severe haemorrhage-reperfusion injury.
METHODS. Anaesthetized male Wistar rats underwent insertion of carotid arterial and jugular venous lines. After 30 min stabilization, 50 % estimated circulating blood volume was removed from the arterial line over 15 min. Animals were monitored for a further 90 min prior to resuscitation. This was immediately followed by administration of shed blood over 15 min then a background infusion of n-saline (10 ml/kg/hr). Animals were culled at 6 h post-reperfusion with kidneys taken for analysis. Paraffin-embedded kidney sections were stained for periodic acid Schiff (PAS) and $P2X_7$ R.
RESULTS. Major histological damage was seen, including loss of brush border from tubular epithelial cells, tubular casts, dilated tubules and tubular cell death (Fig. 1). Immunohistochemistry demonstrated widespread upregulation of renal $P2X_7R$ in tubules of rats that underwent haemorrhage-reperfusion injury but none in naïve rats. $P2X_7R$ expression was localized to areas of tubular damage (Fig. 1). However, the glomeruli were negative for $P2X_7$.



Immunohistochemistry demonstrating ATN and P2X7

CONCLUSIONS. In this rat model of severe haemorrhage-reperfusion injury, there was histological evidence of significant tubular injury. Coexistence of tubular injury and $P2X_7R$ upregulation suggests that $P2X_7R$ is implicated in the pathophysiology of AKI. Further work is required to determine the functional significance of tubular $P2X_7R$, and the potential benefit of $P2X_7$ receptor antagonism in haemorrhage-reperfusion injury-induced AKI.
REFERENCES. 1. Taylor SR et al. $P2X_7$ deficiency attenuates renal injury in experimental glomerulonephritis. J Am Soc Neph 2009;20:1275–81.
GRANT ACKNOWLEDGEMENT: NA is supported by the Wellcome Trust. MLS is supported by the Dutch Kidney Foundation, Kolff Student Grant.

0612
INFLAMMATORY EFFECTS OF REMOTE ISCHAEMIC CONDITIONING IN A PORCINE KIDNEY TRANSPLANTATION MODEL

N. Secher[1], P. Søndergaard[2], K. Ravlo[2], C. Sølling[1], A. Granfeldt[1], A. Barklin[1], L. Wogensen[3], A.K. Keller[4,5], U. Møldrup[4], E.Ø. Østraat[4], T.M. Jørgensen[4], B. Jespersen[2], E. Tønnesen[1]

[1]Aarhus University Hospital, Department of Anaesthesiology, Aarhus C, Denmark, [2]Aarhus University Hospital, Department of Nephrology, Aarhus N, Denmark, [3]Aarhus University Hospital, Research Laboratory for Biochemical Pathology, Aarhus C, Denmark, [4]Aarhus University Hospital, Department of Urology, Aarhus N, Denmark, [5]Aarhus University, Institute of Clinical Medicine, Aarhus C, Denmark
INTRODUCTION. Delayed graft function (DGF) after kidney transplantation is associated with decreased graft survival, increased rejection rate and higher patient mortality. The incidence of DGF is high when kidneys are retrieved from brain dead donors and transplanted to pediatric recipients, but the pathogenesis of DGF and its negative implications on long-term outcome is poorly understood. Remote ischaemic conditioning (rIC) is a treatment where brief episodes of ischaemia in one organ/tissue, induces a systemic protection against subsequent reperfusion injuries in remote organs. This treatment has proven useful in improving GFR after transplantation.

OBJECTIVES. The aim of this study was to investigate the inflammatory response and apoptosis in a large animal kidney transplantation model and determine whether rIC modulates these factors.
METHODS. Kidneys were harvested from eight 60–64 kg brain dead donor pigs and transplanted into two groups of 14–16 kg recipient pigs after 22 h of cold ischaemia. In one recipient group (rIC, n = 8) rIC was performed before the 10-h reperfusion period, while no rIC was performed in the other recipient group (no-rIC, n = 8). Non-transplanted kidneys from eight brain dead pigs served as controls. Renal apoptosis and infiltration of macrophages, T-cells and B-cells was quantified by immunohistochemistry. Concentrations of TNF-α, IL-6, IL-8, and IL-10 in renal tissue were determined by an immunofluorometric assay and in plasma TNF-α, IL-1β, IL-6, IL-8, and IL-10 were measured by a multiplex assay.
RESULTS. Transplantation significantly increased the number of apoptotic cells (control vs. no-rIC, $p = 0.0023$, control vs. rIC, $p = 0.0011$) and macrophages (control vs. no-rIC, $p = 0.0027$, control vs. rIC, $p = 0.0012$) in renal tissue. No difference was found between recipient groups. The number of T-cells and B-cells did not differ between the three groups. TNF-α, IL-6, IL-8, and IL-10 were detected in tissue of renal cortex for all three groups. No differences between the two recipient groups were found for any of the cytokines. Compared to controls higher cortical levels of IL-10 (control vs. no-rIC, $p = 0.0152$, control vs. rIC, $p = 0.0055$) and lower levels of IL-6 (control vs. no-rIC, $p = 0.0321$, control vs. rIC, $p = 0.0109$) were found in transplanted kidneys. A significant rise in plasma IL-1β and IL-6 was observed, but with no difference between recipient groups. Plasma IL-10 was constant during the observation period with no difference between groups. TNF-α and IL-8 in plasma was only detectable in 2 and 1 animal respectively.
CONCLUSIONS. This study is the first to investigate inflammatory response of renal transplantation in a large animal model. In conclusion it shows that renal transplantation causes apoptosis, macrophage infiltration and an anti-inflammatory response in the kidney 10 h after reperfusion. We demonstrated no effect of rIC on apoptosis, leukocyte infiltration or cytokine production.

0613
KINETIC MODELLING OF PLASMA CREATININE CHANGES AFTER AKI: EFFECT OF VOLUME EXPANSION AND CHANGE IN GENERATION RATE

J.R. Prowle[1,2], A. Leitch[1], C.J. Kirwan[1,2], L.G. Forni[3]

[1]The Royal London Hospital, Barts Health NHS Trust, Adult Critical Care Unit, London, United Kingdom, [2]Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, United Kingdom, [3]Western Sussex Hospitals NHS Trust, Department of Critical Care, Worthing, United Kingdom

INTRODUCTION. Diagnosis of acute kidney injury (AKI) remains based on changes in plasma creatinine (pCr), however the rate and magnitude of creatinine increase in AKI can be affected by fall in creatinine generation rate (G) and increase in volume of distribution during critical illness.
OBJECTIVES. To predict effect of volume expansion and changes in G predicted using mathematical models of creatinine kinetics and compare these with those of a popular 'correction formula' [1] that accounts for the effect of volume expansion on pCr during critical illness.
METHODS. We used mathematical models to examine the effect of a net 10L volume expansion in a theoretical 70-year-old male with new onset Acute Kidney Injury (actual GFR fall from 90 to 50 ml/min) on pCr over 4 days. We used two approaches: a single compartment model (10L volume expansion at baseline) and a novel 3-compartment model with variable volume expansion (4 L day 1, 6 L over days 2–4). In both models we compared pCr, with volume expansion, pCr derived with no volume gain, pCr when reductions in G are incorporated and predicted pCr corrected by the published formula for volume expansion.
RESULTS. With no volume expansion both models predicted an 80 % increase in pCr (83.6–150.3 μmol/L). In the single-compartment model with 10 L initial volume expansion, pCr after 96 h was predicted to be 150 μmol/L, whereas in the 3-compartment model with progressive volume expansion it was 146 μmol/L. For both models applying the correction formula for volume increase resulted in a marked over estimation of pCr at even fluid balance by ~25 % (181 vs. 150 & 176 vs. 146 μmol/L). Conversely when we added a 20 % reduction in G to the model with even fluid balance and the same fall in GFR, the day 4 pCr was only 120 μmol/L.

Table: Modelling pCr changes after an acute fall in GFR 90–50 ml/min

Model	Fluid balance	TBW	G (%)	Starting pCr	Day 4 pCr	Correction formula day 4 pCr
1-Compartment fixed-V model	Even	41.2 L	100	83.6	150.3	–
1-Compartment fixed-V model	+10 L at t = 0	51.2 L	100	67.3	150.1	181
1-Compartment fixed-V model	Even	41.2 L	80	83.6	120.3	–
1-Compartment fixed-V model	+10 L at t = 0	51.2 L	80	67.3	120.1	145
3-Compartment variable-V model	Even	41.2 L	100	83.6	150	–
3-Compartment variable-V model	4 L d1 2 L/d d2–4	41.2 to 51.2 L	100	83.6	146	176
3-Compartment variable-V model	Even	41.2 L	80	83.6	120	–
3-Compartment variable-V model	4 L d1 2L/d d2–4	41.2 to 51.2 L	80	83.6	117	141

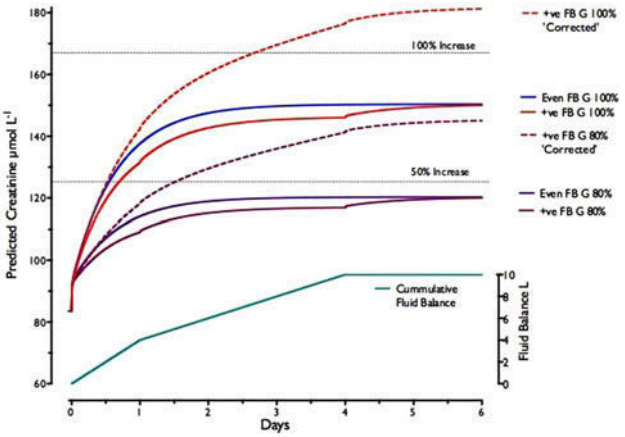


Figure: predicted pCr changes in a 3-compartment variable-volume model with a fall in GFR from 90 to 50 ml/min, with and without the effect of 10L of volume expansion. The effects of a 20 % reduction in G, and results of application of the correction formula for fluid balance are shown

CONCLUSIONS. Using kinetic models based on the physiology of creatinine generation, distribution and excretion, changes in G appear to have a more profound and long-lasting effect than volume expansion on missed-diagnosis of AKI. These predictions are in contrast to those of a commonly used formula that corrects pCr for fluid balance, suggesting that this formula might significantly over-estimate rise in pCr when corrected for fluid administration. We suggest that investigators explore kinetic models that accurately account for both creatinine generation and fluid balance when examining confounding factors for creatinine-based diagnosis of AKI in the critically ill.
REFERENCE(S). 1. Macedo E, et al. Fluid accumulation, recognition and staging of acute kidney injury in critically-ill patients. Crit Care 2010;14:R82.

0614
CAN RENAL RESISTIVE INDEX PREDICT IMPLEMENTATION OF CONTINUOUS RENAL REPLACEMNT IN INTENSIVE CARE UNIT

T. Tsubo[1], E. Hashiba[2], H. Okawa[2], H. Ishihara[2], A. Yamazaki[3], K. Hirota[4]

[1]Hirosaki University Hospital, Intensive Care Unit, Hirosaki, Japan, [2]Hirosaki University Hospital, Intensive Care Medicine, Hirosaki, Japan, [3]Hirosaki University Hospital, ME Center, Hirosaki, Japan, [4]Hirosaki University Hospital, Department of Anesthesiology, Hirosaki, Japan

INTRODUCTION. Continuous renal replacement therapy (CRRT) plays an important role for patients treatment in the intensive care units (ICU). However, prediction for CRRT implementation is sometimes difficult because of lack of adequate kidney injury markers. An increased Doppler renal resistive index (RRI) is known to be a predictor of kidney injury.
OBJECTIVES. This study aims to determine whether RRI would predict the CRRT implementation in the patients in the ICU.
METHODS. Fifty adult patients in the ICU were the subjects in this study: post cardiac surgery (n = 10), post large vessel surgery (n = 8), post abdominal surgery (n = 7) and congestive heart failure (n = 7). The patients were divided into CRRT group (n = 18) and non-CRRT group (n = 32) on ICU day 3. Echography was performed using an ultrasound system (Philips SONOS 7500) equipped with a 5-MHz 64-element probe on ICU day1. The velocity of the interlobar artery of both kidneys were measured and RRI was calculated as (peak systolic velocity—peak diastolic velocity)/peak systolic velocity. Serum creatinie, blood urea nitrogen (BUN) and serum neutrophil gelatinase associated lipocalin (NGAL) concentration were compared between the CRRT group and the non-CRRT group. The relationships between RRI and, serum creatinine, BUN and serum NGAL concentration were compared.
RESULTS. Average patients'age and body weight were 60 ± 6 years and 65 ± 7 kg. Thirty-six patients were male and 14 were female.Average RRI was 9.0 ± 0.7 in the CRRT group and 7.0 ± 0.8 in the non-CRRT group ($p < 0.05$). Average serum creatinine, BUN and serum NGAL concentrations were 1.0 ± 0.8, 20.2 ± 7.4 and 1.8 ± 1.0 ng/ml in the non-CRRT group and 4.2 ± 2.5, 51.2 ± 21.2 and 6.0 ± 3.4 ng/ml in the CRRT group respectively ($p < 0.05$). There was strong relationship between RRI and serum creatinine, BUN and serum NGAL concentrations ($p < 0.01$, 0.05and 0.05) respectively.
CONCLUSIONS. RRI measured on ICU day1 can predict the implementation of CRRT in ICU day 3. RRI is not only dependent on renal vascular resistance but also affected by other confounding factors, including patient characteristics (age, renal disease, arterial disease), central hemodynamics (heart rate, pulse pressure), intra-abdominal pressure, interstitial renal pressure, and renal vascular compliance. Bossard G et al [1] reported that RRI measurement can predict delayed acute kidney injury and anticipate its severity.
RRI has strong relationships with other markers of kidney injury such as serum creatinine, BUN and serum NGAL concentration. Serum NGAL, a marker of renal tubular inflammation rather than glomerular filtration, correlated well with acute changes in serum creatinine [2].
REFERENCE(S). 1. Bossard G, et al. Br J Anaesth 2011;107;891–8. 2. Coca SG, et al. Kidney Int 2008;73:1008–16.

0615
URINARY ALANIL AMINOPEPTIDASE ACTIVITY IS AN EARLY MARKER OF ACUTE KIDNEY INJURY AFTER CARDIAC SURGERY

J.P. Valencia Quintero[1], F. Manzano Manzano[1], M.D.M. Jiménez Quintana[1], M. Redondo Orts[1], A. Quesada[2], L.C. Martínez Peña[1], F. Rodriguez[3], A. Osuna[4], F. Vargas[5], E. Antón-Valades[3], R. Wangensteen[2]

[1]Hospital Virgen de las Nieves, ICU, Granada, Spain, [2]Universidad de Jaén, Área de Ciencias de la Salud, Departamento de Fisiología, Jaen, Spain, [3]Hospital Virgen de las Nieves, Servicio de Análisis Clínicos, Granada, Spain, [4]Hospital Virgen de las Nieves, Servicio de Nefrología, Granada, Spain, [5]Universidad de Granada, Facultad de Medicina, Departamento de Fisiología, Granada, Spain

INTRODUCTION. In a previous study, we have demonstrated that cisplatin injection in rats evokes an early augmentation of alanyl aminopeptidase (AlaAp) activity in urine [1]. In this work, we want to analyze if AlaAp activity is an early marker of acute kidney injury (AKI) development in patients undergoing to cardiac surgery in comparison with proteinuria and microalbuminuria.

METHODS. Sixty-three patients undergone to cardiac surgery without a previous history of renal dysfunction were selected for the study. Blood and urine samples from these patients were taken before surgery, at the income in critical care unit, and at 12, 24 and 48 h after income. 33 patients exhibited an increase of at least 50 % in plasma creatinine levels in the next 48 h after surgery, and were classified as AKI. AlaAp urinary activity was determined by a fluorimetric kinetic method. Proteinuria and microalbuminuria were measured in the clinical laboratory of the hospital with a colorimetric and turbidimetric method, respectively. Results were expressed as the excretion of each marker per mg of urine creatinine. Differences between groups were analyzed with Mann–Whitney (Wilcoxon) test and ROC-AUC analysis.

RESULTS. AlaAp urinary activity was significatively increased 12 h after surgery in the patients that developed AKI in comparison with the patients that did not developed AKI (from 650.9 ± 335.2 to 2,035 ± 705 nmol/min/mg creatinine; $p < 0.001$). We also found a significative increase in AlaAp urinary activity of AKI group 24 h after surgery (from 331.9 ± 151.8 to 1,645 ± 648 nmol/min/mg creatinine; $p < 0.01$). There were no significative differences between both groups in proteinuria or microalbuminuria at 12, 24 or 48 h after surgery. At 12 h, AlaAp showed the largest ROC-AUC of the three markers studied (0.7556 ± 0.062 vs. 0.5166 ± 0.075 for proteinuria and 0.5853 ± 0.0719 for microalbuminuria).

CONCLUSION. AlaAp urinary activity is an early marker of acute kidney injury development after cardiac surgery. Patients that developed AKI showed a significative increase in the urinary excretion of this marker as soon as 12 h after surgery, while proteinuria and microalbuminuria remained unchanged. Also, it was the best discriminator between AKI and no AKI patients at this point. Further studies must be taken to analyze the reliability of this marker in other pathologic states that course with renal dysfunction.

REFERENCE(S). 1. Quesada A, Vargas F, Montoro-Molina S, O′Valle F, Rodríguez-Martínez MD, Osuna A, Prieto I, Ramírez M, Wangensteen R. Urinary aminopeptidase activities as early and predictive biomarkers of renal dysfunction in cisplatin-treated rats. PLoS One 2012;7:e40402.

0616
ASSESSMENT OF KIDNEY MICROCIRCULATION IN MODERATE AND SEVERE ACUTE KIDNEY INJURY BY CONTRAST ENHANCED ULTRASONOGRAPHY

I. Goecze[1], R. Herzog[1], P. Ruemmele[2], E.M. Jung[3], B.M. Graf[4], H.J. Schlitt[5], K. Pfister[5], T. Bein[1]

[1]University Hospital Regensburg, Intensive Care Unit, Regensburg, Germany, [2]University Hospital Regensburg, Department of Pathology, Regensburg, Germany, [3]University Hospital Regensburg, Department of Radiology, Regensburg, Germany, [4]University Hospital Regensburg, Department of Anaesthesiology, Regensburg, Germany, [5]University Hospital Regensburg, Department of Surgery, Regensburg, Germany

INTRODUCTION. Alteration of the kidney microcirculation may be constantly present in patients with moderate and severe acute kidney injury (AKI). Contrast-enhanced ultrasonography (CEUS) represents a new dynamic digital ultrasound-based imaging technique, which allows quantification of the microvascularisation up to the capillary vessels. Although having ideal properties with no nephrotoxicity, no transport requirements and high safety profile, the available data regarding use of CEUS in critically ill are lacking.

OBJECTIVES. Assessment of renal circulation in acute kidney injury with contrast enhanced ultrasonography.

METHODS. Eleven CEUS studies were performed in patients with moderate and severe AKI (KDIGO Grade 2 and 3) in a multidisciplinary intensive care unit. After conventional B-Mode and Doppler sonography, standardised bolus injection of 2.0 ml SonoVue (Bracco, Italy) contrast agent was administered intravenously trough preexisting central venous catheter. CEUS was performed at the bedside for evaluation of microcirculation from the early arterial until late venous phase. For quantification of the perfusion time intensity curves (TIC) and inflow-time color coded maps were created, assessing the peak contrast enhancement (power) and time to peak concentration (TTP) in selected areas of the kidney.

RESULTS. Delayed and diminished microcirculation in the cortex and medulla diffusely or locally (hypoperfused spots) represented the most frequent findings. The kidney biopsy was performed in three patients showing either ischemic changes with tubular necrosis or diffuse swelling with tubuli dilatation, closely correlating with perfusion findings by CEUS. Four patients required renal replacement therapy (RRT) at the time of CEUS. The mean peak contrast enhancement in the kidney cortex was higher in patients with shorter duration of RRT (1.73×10^{-3} vs 0.35×10^{-3} vs 0.09×10^{-3} decibels for 10 vs 23 vs >30 days of RRT). Time to reach the peak concentration was more prolonged in long term RRT (>30 days) as in patients with short duration of RRT (15.5 vs 6.75 s). None of patients developed any adverse reactions associated with the application of contrast agent and imaging technique.

CONCLUSIONS. Contrast enhanced ultrasonography clearly improves visualization of the microcirculation in patients with AKI at the bedside. It provides a good correlation with biopsy findings and is able to discriminate differences in the kidney perfusion in patients on renal replacement therapy.

REFERENCE(S). 1. Clevert DA, D′Anastasi M, Jung EM: Contrast-enhanced ultrasound and microcirculation: efficiency through dynamics–current developments. Clin Hemorheol Microcirc 2013;53:171–86.

0617
IMPACT OF LIVER RESECTION ON PORTAL VENOUS PRESSURE AND RENAL FUNCTION

P. Biesenbach[1], J. Mühlbacher[1], E. Fleischmann[1], T. Grünberger[1], W. Druml[1], F. Luf[1]

[1]Medical University of Vienna, Vienna, Austria

INTRODUCTION. Liver dysfuntction—in correlation to the severity of functional impairment—but also any increase in portal pressure per se ("hepatorenal reflex") can induce alterations in renal function and ultimately result in hepatorenal syndrome (HRS).

OBJECTIVES. To determined the impact of liver resection on portal venous pressure (by measuring the hepatic venous pressure gradient [HVPG]), on concentrations of vasoactive peptides and on renal function.

METHODS. In this prospective investigation twenty patients (mean age 66.3 years) undergoing elective liver resection surgery because of malignant tumor were assessed and grouped according to resection size: (1) hemihepatectomy, n = 13 vs. (2) Segmentectomy, n = 7. HVPG was measured before and after resection by canulation of a hepatic vein under fluoroscopic guidance, liver function was assessed by indocyanine green plasma disappearance rate (ICG-PDR).

RESULTS. HVPG increased in group 1 from 3.7 to 5.4 mmHg ($p < 0.05$) and decreased in group 2 (4.8–4.3 mmHg, p = ns) (Table). Liver function as assessed by ICG-PDR decreased in group 1 by day 1 ($p < 0.05$) and remained stable in group 2. Renin, aldosterone, ADH, adrenaline, noradrenaline and dopamine increased significantly ($p < 0.05$) in group 1 during operation. Group 2 showed a significant rise only in ADH and dopamine. Acute kidney injury occurred in 5 of 13 patients in group 1 and no patient in group 2.

CONCLUSIONS. Liver resection increases the HPVG depending on resection size, presumably by reduction of hepatic vascular reserve. Regulatory mechanisms such as RAAS activation and ADH release activate immediately during operation, suggesting an effect independent of liver function. Acute kidney injury following liver resection in hemodynamically stable patients may be attributed to an increase in portalvenous pressure (hepatorenal syndrome).

0618
ADHERENCE TO A CRITICAL CARE NETWORK BUNDLE OF CARE FOR ACUTE KIDNEY INJURY: AN AUDIT

A. Hall[1], G. Masterson[1,2]

[1]Royal Liverpool University Hospital, Intensive Care Unit, Liverpool, United Kingdom, [2]Cheshire and Mersey Critical Care Network, Liverpool, United Kingdom

INTRODUCTION. Acute kidney injury in intensive care is very common and requires meticulous attention to prevent chronic kidney disease. Our local critical care network (CCN), which produces and monitors quality standards, has a number of published guidelines which are either evidence based or best practice guidelines as published in the literature.

OBJECTIVES. The aims of this study were to review current literature, to improve the renal care bundle and to audit regional ICU adherence to it.

METHODS. Six acute hospitals randomly selected from the CCN were invited to participate and included one teaching hospital and five District General Hospitals. Data on 31 patients in total were collected. Standards audited against are shown in Table 1.

Audited standards.

Expected 100 %.

Standard bloods, renal ultrasound, MAP > 65 mmHg, Anticoagulation protocol used, drug history, renal prescribing guidelines, correct dose renal replacement therapy (RRT).

Expected 0 %:

Furosemide and dopamine as treatments for AKI.

Standards with disputed evidence base.

Urine analysis, *N*-acetyl cysteine given for contrast CT.

RESULTS. All patients had routine renal function and an ABG performed. 65 % had a urine dipstick (6 % were anuric). 38 % had a Renal USS. 84 % of patients had MAP > 65 mmHg maintained with fluids and/or vasopressors, 48 % were given furosemide as treatment for AKI and 3 % received dopamine. Of the 7/31 patients had a contrast CT, only 1 received pre-hydration and no patients received *N*-Acetylcysteine. A RRT dose of 35 ml/kg/h was achieved in >95 % patients. All hospitals had an anticoagulation protocol available which was followed in all but one patient. All patients had a comprehensive drug history taken and all units had prescribing guidelines for patients in renal failure.

CONCLUSIONS. This audit demonstrates that hospitals in our network are compliant with RRT dosing, drug and anticoagulation prescribing. We are poorly compliant with the use of urine dipsticks, furosemide and prevention of contrast nephropathy. Few patients are having renal imaging which is a known standard and needs to be improved to exclude obstructive causes of AKI. These results have been published regionally, presented to the CCN and cascaded to units for service improvement. A follow-on audit looking at poor compliance with renal imaging is underway.

REFERENCE(S). 1. Ho KM, Sheridan DJ. Meta-analysis of frusemide to prevent or treat acute renal failure. BMJ 2006;333:420–3. 2. Marik PE. Low dose dopamine: a systematic review. Intensive Care Med. 2002;28:877–83. 3. Ronco C, Bellomo R, Homel P, et al. Lancet 2000;356:26–30.

GRANT ACKNOWLEDGMENT. We would like to thank the CMCCN staff for help with data collection. There were no financial contributions to this audit.

0619
GENERAL OUTCOMES IN ACUTE DIALYSIS PATIENTS ACCORDING TO TIME OF INITIATION OF NUTRITION

J.E. Echeverri[1,2,3], A. Gonzalez[2], R. Patricia[2], J. Cordoba[2], G. Paola[2], S. Rugeles[4], R.E. Dachiardi[5]

[1]Central Military Hospital, Nephrology, Bogota, Colombia, [2]Hospital Universitario San Ignacio, Nephrology, Bogota, Colombia, [3]Universidad Militar Nueva Granada, Bogota, Colombia, [4]Hospital Universitario San Ignacio, Surgery and Nutritional Support, Bogota, Colombia, [5]Universidad Javeriana, Bogota, Colombia

INTRODUCTION. Acute kidney injury (AKI) is a very frequent complication in patients in the intensive care unit (ICU) with severe illness. The patients with AKI usually have hypercatabolic states, associate with acid base and electrolytic disturbances and changes in gluconeogensis pattern, that can directly impact in the nutritional state. Renal support often impacts the decision of starting nutritional support. There is widespread acceptance by expert panels that early initiation of nutrition can improve the outcomes and complications related to the ICU stay.

OBJECTIVE. To determine the mortality in patients with AKI and RRT according to the time of initiation of nutritional support, that where treated in de UCI of an academic hospital.

STUDY DESIGN. Observational study. This is a retrospective analysis of the critical nephrology program database of our institution. All data were prospectively collected. Inclusion criteria: patients older than 18 years with AKI and hemodialysis requirement during ICU stay. Exclusion criteria: patients with obstructive AKI, acute glomerulonephritis, end stage renal disease, renal transplant, dead in the first day of ICU admission or

with vital prognosis less than 3 months. Groups for analysis according to time of initiation of nutrition: (a) from day 0 to 2 of ICU admission, (b) day 3 and 4, (c) more than 4 days..
RESULTS. 199 patients were included in the analysis. 68 % were male with a mean of 56.5 years. Sepsis was the primary ICU admission diagnosis (48 %). Enteral nutrition was the most common rout of administration, followed by oral and paraenteral rout. In relation to the time of nutritional support initiation, 42 % received it in the first 3 days (Group A), 31 % between the third and fourth days (Group B) and 23 % after the fourth day of ICU admission. 4 % of patients never received nutritional support during ICU stay because of clinical improvement or death in the first 24 h in RRT initiation. There were no differences in the general outcomes of the population such as mortality, dialysis dependency and recovery of renal function, according to the start time of nutrition. (a) mortality 55 %, dialysis dependence 15 %, (b) mortality 52 %, dialysis dependence 11 %, (c) mortality 57 %, dialysis dependence 7 %. Mortality in the group of patients who did not receive nutrition was 63 %, there was no dependence of dialysis and renal function recovery was 37 %.
CONCLUSIONS. We did not find any association between the time of initiation of nutritional support in acute hemodialysis patients and mortality. Although we appreciate that the proportion of patients with renal recovery was higher in the groups with nutritional support start after the 3rd day this difference did not reach statistical significance.

0620

CLINICAL OUTCOMES OF ACUTE KIDNEY INJURY IN ELDERLY PATIENTS ADMITTED TO A RENAL HIGH DEPENDENCY UNIT (HDU)

J. Wang[1], R. Jenkins[1], J. Joslin[1], P. Peto[1], C. Sharpe[1], S. Jayawardene[1], S. Shah[1]

[1]King's College Hospital NHS Foundation Trust, Department of Renal Medicine, London, United Kingdom

INTRODUCTION. The ageing population is susceptible to acute kidney injury (AKI) [1] and its sequelae. Previous studies examining the effect of age on AKI prognosis have mainly been derived from an ITU setting (Level 3 beds) with short follow-up periods leading to conflicting conclusions [2,3,4]. We evaluated the outcomes in a cohort of patients that required haemofiltration and were admitted to a Renal HDU (Level 2 beds) over a 3 years period to assess the influence of age on survival and renal recovery in this clinical setting.
OBJECTIVES. To examine the long term outcomes of AKI in elderly patients admitted to a Renal HDU with regards to survival and renal recovery.
METHODS. This was a retrospective observational study. All patients that were admitted to the Renal HDU from 2009 to 2011 requiring haemofiltration were identified. Patients who were previously dialysis dependent or had a renal transplant were excluded. Patient data was recorded at discharge, 3 and 12 months from time of admission.
RESULTS. Fifty patients were identified. 60 % were over 65 years of age, 60 % were male and 74 % Caucasian. Unadjusted Kaplan–Meier curves demonstrated decreased survival in those over 65 years of age at discharge ($p = 0.03$) but no significant difference at 3 or 12 months was found. Cox regression analysis showed that only inotrope use was associated with survival at discharge ($P < 0.01$). At 3 and 12 months, survival was associated with admission eGFR, inotrope and NIV use (all $P < 0.01$). Factors significantly associated with a lower discharge eGFR (MDRD) include female sex (37 ml/min in males v 22 ml/min in females, $P < 0.01$), baseline eGFR ($P < 0.01$) and younger age (26 ml/min in <65 years v 37 ml/min in >65 years, $P = 0.01$). At 1 year, a lower eGFR was associated with diabetics (31 vs 34 ml/min, $P < 0.01$). The need for continued renal replacement therapy (RRT) at discharge was significantly increased in non-Caucasians ($P < 0.01$) and females ($P = 0.04$) though at 1 year continued RRT was more likely to be required in non-Caucasians alone ($P = 0.02$).
CONCLUSIONS. Advancing age is not an independent factor associated with mortality, renal recovery or RRT dependence following admission to a level 2 bed up to 1 year after discharge. Therefore, we argue that chronological age alone should not be used to restrict access to a level 2 bed when haemofiltration is required.
REFERENCE(S). 1. Uchino et al. Acute renal failure in critically ill patients: a multinational, multicenter study. JAMA. 2005. 2. Xue et al. Incidence and mortality of acute renal failure in medicare beneficiaries, 1992 to 2001. J Am Soc Nephrol. 2006. 3. Schmitt et al. Recovery of kidney function after acute kidney injury in the elderly: a systematic review and meta-analysis. Am J Kidney Dis. 2008. 4. Van den Noortgate et al. Outcome in a post-cardiac surgery population with acute renal failure requiring dialysis: does age make a difference? Nephrol Dial Transplant. 2003.

0621

ESTIMATION OF BASELINE SERUM CREATININE IN SEVERE TRAUMA PATIENTS: A MORE ACCURATE EQUATION VALIDATED IN 652 TRAUMA PATIENTS

M. Saour[1], J. Charbit[1], J. Manzanera[1], A. Damou[1], M. Egan[1], K. Klouche[2], X. Capdevila[1]

[1]Lapeyronie University Hospital, Trauma Intensive Care Unit, DAR A, Montpellier, France, [2]Lapeyronie University Hospital, Intensive Care Medecine, Montpellier, France

INTRODUCTION. The baseline Serum Creatinine (SCr) is required to classify acute kidney injury (AKI) by RIFLE criteria. The four-variable Modification of Diet in Renal Disease (MDRD) equation allows to estimate this SCr when it is unavaible, assuming a normal glomerular filtration rate (GFR) of 75 mL/min/1.73 m^2 (eSCr75).[1, 2]. However, this equation is derived from patients with chronic kidney disease [3], consequently we hypothesize that it may not be appropriate in severe trauma patients due to their epidemiological caracteristics.
OBJECTIVES. The objective was to define the more appropriate GFR to use in MDRD equation to predict accurately SCr in this specific population.
METHODS. Among 855 severe trauma patients admitted in our institution between January 2006 and December 2009, all those older than 16-year-old with a minimal observed SCr (oSCr) below 120 μmol/l were included. The study was divided in two periods: during period 1 (2006–2007), a mean GFR was deduced by MDRD-175 equation and was used in a new equation to estimate SCr for trauma patients ($eSCr_{TRAUMA}$). During period 2 (2008–2009), $eSCr_{75}$ and $eSCr_{TRAUMA}$ were determined for each patient. The agreement between these two estimations and oSCr was evaluated using Bland–Altman approach (mean bias ± consistency interval), precision (root mean square error of differences between oSCr and $eSCr_{75}$ or $eSCr_{TRAUMA}$) and accuracy (percentage of eSCr values that differ of more than 15, 30, or 50 % relative to oSCr).
RESULTS. Total, 652 patients were analyzed, 504 were men (77 %), mean age 37.7 ± 18.7 and mean ISS 21.1 ± 15.7. Main characteristics of populations did not differ in period 1 (n = 314) and period 2 (n = 338). In period 1, mean estimated GFR was of 121 ± 30 ml/min/m^2 and was used to determine $eSCr_{TRAUMA}$. During period 2, the mean estimated GFR was 128 ± 34 ml/min/m^2. In this population, $eSCr_{75}$ equation had a mean bias of 38.6 ± 35.9 μmol/l compared to oSCr. The mean bias of $eSCr_{TRAUMA}$ equation was much lower: 4.1 ± 31.7 μmol/l. In the same way, precision was much higher for $eSCr_{TRAUMA}$ equation than $eSCr_{75}$ equation, 42.6 vs 16.7 μmol/l respectively. $eSCr_{TRAUMA}$ equation had likewise an accuracy significantly higher compared to $eSCr_{75}$ equation (Table).

Accuracy of equations to estimate SCr

	$eSCr_{75}$	$eSCr_{TRAUMA}$	*P* value
15 % Accuracy	8 %	57 %	<0.001
30 % Accuracy	15 %	73 %	<0.001
50 % Accuracy	31 %	88 %	<0.001

CONCLUSIONS. MDRD equation is inaccurate to estimate SCr of severe trauma patients because it assumes a GFR of 75 ml/min/m^2, leading to a systematic overestimation. Thus, AKI incidence will be underestimated. In this specific population we proposed another equation using a mean GFR of 121 ml/min/m^2 to estimate SCr more reliably and precisely and avert misclassification of AKI.
REFERENCE(S). 1. Kidney International Supplements (2012). 2. Crit Care 2004;8:R204–212. 3. Ann Intern Med. 1999;130:461–470.

0622

RENAL REPLACEMENT THERAPY IN PATIENTS WITH ELEVATED PLASMA MYOGLOBIN: A RETROSPECTIVE ANALYSIS OF PATIENTS WITH MYOGLOBIN ≥ 5000 μG/L HOSPITALIZED IN REGIONAL HOSPITAL LIBEREC IN YEARS 2002-2012

I. Zykova[1], B. Paldusova[1], P. Škrabálek[2], D. Morman[1]

[1]Regional Hospital Liberec, Anesthesia and Intensive Care Dept., Liberec, Czech Republic, [2]Regional Hospital Liberec, Clinical Biochemistry Dept., Liberec, Czech Republic

INTRODUCTION. Rhabdomyolysis is a clinical and a laboratory syndrome, caused by an injury to sarcolemma of striated muscle. The content, which consists mainly of myoglobin, is released into extracellular space. Creatinkinase and myoglobin (MGLB) are both measured in elevated concentrations in plasma and used as markers of rhabdomyolysis.
OBJECTIVES. To determine the utilisation of renal replacement therapy (RRT) in patients with elevated plasma myoglobin and the need for chronic dialysis therapy afterwards.
METHODS. Retrospective observational study. All patients hospitalized in Regional hospital Liberec in the study period from January 2002 until December 2012 with myoglobin ≥5,000 μg/l were included. Their charts were reviewed for the use of RRT, 28-day mortality and the need for chronic dialysis therapy in survivors.
RESULTS. During the study period of 11 years 88 patients with peak myoglobin ≥5,000 μg/l were treated in Regional hospital Liberec. The 28-day mortality was 47.7 % (42 patients died). 39 patients (44.3 %) underwent renal replacement therapy (RRT). There were 18 survivors in the group on RRT and only one patient needed long term dialysis therapy. 79 patients were ventilated (89.8 %). There was an increasing trend in mortality and a higher incidence of RRT with an increasing peak myoglobin concentration.

Peak value of myoglobin (MGLB) and use of RRT

Peak value of MGLB	No. of patients on RRT	No. of patients without RRT	No. of patients with limited care
MGLB 5,000–14,999 μg/l	15 (28.8 %)	29 (55.8 %)	8 (15.4 %)
MGLB 15,000–49,999 μg/l	14 (58.3 %)	5 (20.8 %)	5 (20.8 %)
MGLB ≥ 50,000 μg/l	10 (83.3 %)	0 (0 %)	2 (16.7 %)

Peak value of MGLB and 28-day mortality

Peak value of MGLB	Survivors	Non survivors	Unknown
MGLB 5,000–14,999 μg/l	28 (53.8 %)	21 (40.4 %)	3 (5.8 %)
MGLB 15,000–49,999 μg/l	10 (41.7 %)	13 (54.2 %)	1 (4.2 %)
MGLB ≥ 50,000 μg/l	4 (33.3 %)	8 (66.7 %)	0 (0 %)

CONCLUSIONS. The importance of concentration of myoglobin in the diagnostics and therapy of rhabdomyolysis according to literature remains uncertain although it appears to be a better marker of prognosis and need for RRT than creatinkinase.
The long term prognosis of patients with acute renal failure due to rhabdomyolysis appears to be very good with a low incidence of chronic dialysis.
REFERENCE(S). 1. Delaney KA et al.: Use of RIFLE criteria to predict the severity and prognosis of acute kidney injury in emergency department patients with rhabdomyolysis. J Emerg Med 2012;42(5):521–8. 2. Fernandez WG et al. Factors predictive of acute renal failure and need for hemodialysis among ED patients with rhabdomyolysis, Am J Emerg Med 2005;23(1):1–7. 3. Kasaoka S. et al.: Peak value of myoglobine predicts acute renal failure induced by rhabdomyolysis, J Crit. Care 2010;25(4):601–4. 4. Lappalainen H. et al. Elimination kinetics of myoglobin and creatine kinase in rhabdomyolysis: implications for follow up, Crit Care Med 2002;30(10):2212–5. 5. Melli G. et al. Rhabdomyolysis: an evaluation of 475 hospitalized patients, Medicine (Baltimore) 2005;84(6):377–85. 6. Mikkelsen et al.: Prognostic value, kinetics and effect of CVVHDF on serum of the myoglobin and creatine kinase in critically ill patients with rhabdomyolysis, Acta Anaesthesiol Scand 2005;49:859–864.

0623

VASCULAR ACCESS LOCATION AND FILTER LIFESPAN DURING CONTINUOUS RENAL REPLACEMENT THERAPY WITH CITRATE ANTICOAGULATION

R. Jacobs[1], P.M. Honoré[1], M. Diltoer[1], J. De Regt[1], V. Van Gorp[1], E. De Waele[1], J. Troubleyn[1], H. Spapen[1]

[1]UZ Brussel, ICU, Brussels, Belgium

INTRODUCTION. According to recent guidelines, the right internal jugular (RIJ) vein should be preferred above the femoral veins to obtain venous access for continuous renal

replacement therapy (CRRT). Still, some studies suggest an equally long filter lifespan with the femoral approach.
OBJECTIVES. To determine whether CRRT performed through a RIJ approach is associated with a more optimal filter lifespan as compared to the femoral access.
METHODS. We conducted a 6-month observational study in consecutive patients undergoing CRRT. A double-lumen CRRT catheter was inserted either in the RIJ or in one of the femoral veins. CRRT was delivered according to a dedicated "homemade" protocol. This protocol runs two bags in a continuous veno-venous mode performed at a dose of approximately 25 ml/kg/h with 75 % in predilution. Anticoagulation was provided using diluted (0.5 %) citrate. Blood flow was started at 150 ml and adapted according to protocol thereafter. Citrate flow aimed to target strictly confined ionized calcium levels into the circuit. Access and venous pressures were recorded on a regular base. The CRRT catheter was promptly flushed when a sudden increase of these pressures occurred. Analysis of variance and Mann–Whitney *U* test were used to compare the two venous access locations. Values are expressed as means (range). Left and right femoral access were taken together as "femoral access". Only the first inserted catheter was evaluated.
RESULTS. Fifty-seven patients were studied. 33 subjects had a catheter inserted in the RIJ and 24 had catheters located in the femoral veins. Filter lifespan did not differ between the two different venous access groups [femoral 3.21 days (1.46–4.96) vs. RIJ 3.78 days (1.33–6.23); $p = 0.45$].
CONCLUSIONS. In patients receiving CRRT under citrate anticoagulation, filter lifespan is not affected by the choice of the right jugular or femoral veins as initial access. Its observational design, the fact that only the first inserted catheter was considered, and the lack of discrimination between left and right femoral approach, are obvious limitations of our study that require further prospective evaluation.

0624
POSTOPERATIVE LIVER TRANSPLANTATION. BASILIXIMAB INDICATION IN PATIENTS WITH RENAL DYSFUNCTION AND/OR ASCITIES

V. Olea Jiménez[1], M.E. Banderas Bravo[1], M. Lebrón Gallardo[1], A.M. Cabrera Calandria[2], J.M. Mora Ordóñez[1], G. Quesada García[1]

[1]Carlos Haya Regional University Hospital, Intensive Care Unit, Málaga, Spain, [2]La Línea Hospital, Intensive Care Unit, Cádiz, Spain

INTRODUCTION. Renal dysfunction (RD) is a common complication in the postoperative period of liver transplantation, especially in patients with ascites. Basiliximab is used as postoperative inmunosuppression in renal transplantation, and as compassive use in postoperative liver transplantation because it is not nephrotoxic, so it is possible introduce the anticalcineurin later.
OBJECTIVES. To determine the profile of patients who used Basiliximab and to analyze the presence of RD in the immediate postoperative period of liver transplantation, and follow-up at 3 and 6 months.
METHODS. Retrospective study which included 170 patients admitted in our ICU after liver transplantation from January 2008 to June 2012. Basiliximab was used in patients with previus RD (Creatinine >1.3 mg/dl), in those with a history of frequent hydropic decompensation, in those with ascites over 3 l during surgery and when the indication of transplantation was liver failure acute. We expressed the results as percentages for qualitative variables and mean or median ± standard deviation and interquartile range for quantitative. Statistical analysis was performed using Student t test and Chi square test with a significance level of 95 %.
RESULTS. We analyzed 170 patients with a mean age of 54.52 ± 9.76 years, of which 71.2 % were male. The most common indication for transplantation was HCV cirrhosis (25.9 %), followed by alcoholic cirrhosis (24.7 %) and both (18.8 %). Of the 170 patients, 46.5 % had ascites, RD baseline 18.2 %, RD ICU discharge 32.3 %, requiring CRRT during admission 15.3 %. At 3 months showed 27.1 % RD, and at 6 months 24.1 %. The median ICU stay was 4 (2-7) days. In 62.3 % of patients Basiliximab was used as the inmunosuppressive of choice, with the indication of intraoperative ascites in 64.2 % of cases. In this group, presented RD ICU discharge 35.8 % of patients, needing CVVHDF (22.6 %). RD continuing at 3 months 32 % and at 6 months 31.1 %. No significant differences were found between the group with ascites and previous RD group. In 62 patients was used cyclosporine or tacrolimus, and as expected, only two cases had basal RD, and 11 ascites. 11.3 % had RD at ICU discharge, and only one of them needed CVVHDF, RD at 3 months was 19.4 % and only 12.9 % at 6 months. No significant differences were found in the comparison between patients with and without ascites except at 6 months, at which the RD in the ascites is greater ($p < 0.05$). A small group of patients with ascites (6.5 %) not receiving Basiliximab however none developed RD to ICU discharge, and only two had RD at 3 and 6 months.
CONCLUSIONS. RD is a major problem in postoperative liver transplantation, especially in patients who have it previously and/or have ascites, in fact almost exclusively CVVHDF was necessary in this group. With the use of Basiliximab we try to reduce the long-term RD in this population because it allows the introduction of anticalcineurin delay between 5 and 7 days.

Echocardiography and haemodynamic monitoring: 0625–0638

0625
FEASIBILITY AND MEAN VALUES OF RIGHT VENTRICULAR FUNCTION INDICES AND 2D STRAIN IN MECHANICALLY-VENTILATED ICU PATIENTS

L. Potton[1,2], C. Schwebel[1,3], J.-C. Cartier[1], A. Bonadona[1], C. Ara-Somohano[1], R. Hamidfar[1], M. Lugosi[1], C. Minet[1], J.-P. Baguet[3,4], J.-F. Timsit[1,5]

[1]Grenoble University Hospital, Medical Intensive Care Unit, Grenoble, France, [2]HP2 Laboratory, INSERM U 1042, UJF-Grenoble 1, La Tronche, France, [3]Bioclinic Radiopharmaceutics Laboratory, INSERM U 1039, UJF-Grenoble 1, Grenoble, France, [4]Department of Cardiology, University Hospital, Grenoble, France, [5]Albert Bonniot Institute, Team 11 U 823, UJF-Grenoble 1, Grenoble, France

INTRODUCTION. Mechanical ventilation is associated with an increase in right ventricular (RV) afterload that can lead to RV dysfunction and failure in the more severe cases. Echocardiography has become a first choice tool to assess RV function at the bedside. However, this evaluation is challenging under mechanical ventilation because of the supine position, the presence of positive end-expiratory pressure and underlying diseases that can alter echogenicity. Moreover, RV dysfunction is detected by RV dilatation and septal dyskinesia, and one can question whether the diagnosis of RV dysfunction could be done at an earlier stage. Tricuspid annular plane systolic excursion (TAPSE) and tissue Doppler S wave at the tricuspid annulus (St) are indices widely used in cardiology, easy to obtain and closely related to RV function. Only one study has evaluated these indices in ARDS patients showing good feasibility but a weak correlation to commonly used parameters. Speckle tracking imaging is a more recent technique that measures tissue displacement and derives deformation parameters. This technique has shown interesting results in detecting subtle and infra-clinical abnormalities of RV function in the setting of pulmonary hypertension or scleroderma. Mean values of these parameters under mechanical ventilation are not known.
OBJECTIVES. We sought to determine feasibility of these RV parameters and mean values in patients mechanically-ventilated for a non respiratory cause.
METHODS. This is a prospective observational ongoing study conducted in the medical ICU at Grenoble University Hospital, France. Patients under mechanical ventilation for a non respiratory cause with a fraction of inspired oxygen ≤30 % and no history of cardiopulmonary disease were included. Transthoracic echocardiography was performed and loops of five beats were recorded with ECG and ventilation signals for off-line analysis. TAPSE, St and RV strain were measured during inspiration and expiration, and compared using a Wilcoxon test. RV strain (εRV) was obtained for lateral wall divided in three segments: basal, mid and apical.
RESULTS. Twelve patients of 61 ± 13 years were included. Nine patients were ventilated for neurologic disorder and three for digestive hemorrhage. During expiration, feasibility was 92 % for TAPSE and St, 100 % for basal εRV, 83 % for mid and apical εRV. During inspiration, feasibility was 100 % for St and basal εRV, 92 % for TAPSE, 92 % for mid εRV and apical εRV. Mean values during inspiration and expiration respectively were: TAPSE:20 ± 5 mm versus 22 ± 5 mm, $p = 0.03$, St = 11.8 ± 2 cm/s versus 12.8 ± 2.9 cm/s, $p = 0.01$, εRV = -25.8 ± 4 % versus −26.7 ± 4.7 %, $p = 0.58$.
CONCLUSIONS. TAPSE, St and εRV measurement seem to be feasible under mechanical ventilation. Mean values are close to those obtained from non ventilated patients without RV dysfunction. TAPSE and St are significantly lower when insufflation occurs in contrast to εRV. These data deserve to be further explored. Study is still ongoing.

0626
MEAN SYSTEMIC PRESSURE ANALOGUE, HEART PERFORMANCE AND SHOCK INDEX PREDICTS MORTALITY IN SEPTIC SHOCK

E. Monares[1], M.R. Pinsky[2], A. Torres[3], M. Poblano[1], R. Chaires[4], U. Ceron[5], J. Franco[6]

[1]ABC Medical Center, Critical Care, Mexico, Mexico, [2]University of Pittsburgh, Department of Critical Care Medicine, Pittsburgh, United States, [3]ABC Medical Center, Orthopaedics, Mexico, Mexico, [4]ABC Medical Center, Critical Care, Pulmonary Physiology, Mexico, Mexico, [5]UNAM, Hospital Angeles Linda Vista, Critical Care, Mexico, Mexico, [6]ABC Medical Center, Critical Care, Chief Department, Mexico, Mexico

INTRODUCTION. Measure of the upstream pressure for venous return, the mean systemic filling pressure (Pmsf), is essential in the evaluation of the volume state and the control of the circulation. Since recently, these measurements can be performed easily at the bedside. Evaluate if these measurements help in determining prognosis of complex hemodynamic state like the patients in septic shock is a priority.
OBJECTIVES. To evaluate the usefulness of the mean systemic pressure analogue (Pmsa), heart performance (Eh) and shock index (SI) as tools for prediction of mortality in septic shock (SS).
METHODS. The study was conducted in an Intensive Care Unit (ICU) of a tertiary care hospital. All patients diagnosed with SS, admitted to ICU from January 2008 to January 2012 were included. Retrospective data analysis with split calibration and validation subgroups was performed. SI was calculated as systolic pressure to heart rate ratio. Pmsa was estimated from the cardiac output, mean arterial pressure and right atrial pressure (Pra), all measured 24 h after ICU admission and assuming fixed venous-arterial resistance and compliance values. Eh was calculated as (Pmsa-Pra)/Pmsa. Threshold Pmsa, Eh and SI values predictive of mortality were obtained to maximize the ROC curves.
RESULTS. In a first calibration group (G1) ($n = 36$, age = 59 ± 17 years; SOFA = 11 ± 3 points, 50 % predicted mortality), Pmsa > 26 mmHg, SI ≥ 0.9 and Eh < 0.25 mmHg predicted mortality. After split calibration the following values were obtained: Pmsa > 27 mmHg, SI > 0.9 and Eh < 0.25 and reanalyzed in a second group (G2) ($n = 75$, age = 63 ± 17 years, SOFA = 10 ± 3; 48 % predicted mortality). See Table 1.

Sensitivity, specificity and area under the curve

Mesurements	n	Cut-off point	Sen	Sp	LR+	AUC	CI (95 %)	p
Pmsa G1	36	26	0.22	0.95	4.40	0.690	0.50–0.90	0.041
Pmsa G2	75	26	0.87	0.56	1.98	0.714	0.60–0.80	0.014
Pmsa calibration	75	27	0.46	0.97	15.33	0.695	0.595–0.795	0.001
Eh G1	36	0.25	0.50	0.95	10.00	0.740	0.60–0.90	0.014
Eh G2	75	0.25	0.35	0.97	11.67	0.666	0.55–0.80	0.010
Eh calibration	75	0.25	0.57	0.75	2.28	0.673	0.573–0.744	0.002
SI G1	36	0.9	0.55	0.95	11.00	0.800	0.70–0.95	0.001
SI G2	75	0.9	0.87	0.80	4.35	0.839	0.70–0.90	0.001
SI calibration	75	0.9	0.90	0.73	3.33	0.809	0.724–0.894	0.002

CONCLUSIONS. The Pmsa >27 mmHg identifies patients with volume overload and increased mortality. These patients have a decreased Eh, which may identify patients with septic shock and myocardial depression. All SS patients who died had at least one abnormal index (SI > 0.9, HP < 0.25, Pmsa > 26) within 24 h of admission to ICU. These data suggest that early derived measures of cardiovascular state define subsequent mortality from SS. Potentially, such risk stratification could be used to identify SS patient subgroups: ending/increased monitoring/resuscitation.

0627
ASSESSMENT OF STRESSED VOLUME AND VASCULAR COMPLIANCE IN SPONTANEOUSLY VENTILATED PATIENTS

H.D. Aya[1], M. Geisen[2], C. Ebm[2], M. Grounds[1], A. Rhodes[1], M. Cecconi[1]

[1]St George's Healthcare NHS Trust and St George's University of London, Intensive Care Directorate, London, United Kingdom, [2]St George's Healthcare NHS Trust, Intensive Care, London, United Kingdom

INTRODUCTION. Intravascular volume can be divided into unstressed and stressed volume (Vs). According to Guyton's physiology, Vs along with systemic vascular compliance (Csys) determines the mean systemic filling pressure (Pmsf). Maas et al. [1] recently reported these parameters in a group of patients mechanically ventilated after cardiac surgery. Estimation of Vs and Csys can provide an important tool to elucidate the haemodynamic status of a patient.
OBJECTIVES. The aim of the study is to assess Csys and Vs using a mean systemic filling pressure analogue (Pmsa) in non-fully ventilated patients during fluid administration, and to find out if there are any differences between responders and non-responders to a fluid challenge.
METHODS. Patients admitted to the intensive care unit, in spontaneous ventilation, were monitored with invasive arterial blood pressure, a calibrated LiDCO^{TM}plus (LiDCO, UK) and Navigator^{TM} (Applied Physiology, Australia) to estimate Pmsa. A 250 ml fluid challenge was performed over 5 min. Csys was calculated as Dvolume/DPmsa. Vs was estimated multiplying Csys by Pmsa at the end of the fluid challenge. A positive response to a fluid challenge is defined as an increase in stroke volume and cardiac output greater than 10 %. Continuous variables ware presented as mean and standard deviation. Means are compared using t-test statistic.
RESULTS. Eighteen patients were included, seven of them were responders. Mean Csys was 105.2 ± 51.1 mL mmHg^{-1} (1.6 ± 0.8 mL mmHg^{-1} kg^{-1} predicted body weight). Stressed volume was estimated to be 2,097 ± 1,491 ml (58.5 ± 42.7 ml kg^{-1} predicted body weight). There were no significant differences in Csys (99.9 ± 42.5 vs 108.6 ± 57.6 mL mmHg^{-1}, $p = 0.7$) and vs (1,539 ± 833 vs 2,452 ± 1,733 ml, $p = 0.2$) between responders and non-responders respectively.
CONCLUSIONS. Csys and Vs can be estimated at bedside with Navigator^{TM} in spontaneously ventilated patients. No differences in Csys and Vs have been found between responders and non-responders.
REFERENCE(S). 1. Maas JJ, Pinsky MR, Aarts LP, Jansen JR. Bedside assessment of total systemic vascular compliance, stressed volume, and cardiac function curves in intensive care unit patients. Anesth Analg 2012;115(4):880–887.

0628

MITRAL ANNULAR PLANE SYSTOLIC EXCURSION (MAPSE) IN SHOCK: A VALUABLE ECHOCARDIOGRAPHIC PARAMETER IN INTENSIVE CARE PATIENTS

L. Bergenzaun[1], H. Ohlin[2], P. Gudmundsson[3], R. Willenheimer[4], M.S. Chew[5]

[1]Lund University, Department of Intensive Care and Perioperative Medicine, Skane University Hospital, Malmö, Sweden, [2]Lund University, Department of Cardiology, Skåne University Hospital, Lund, Sweden, [3]Malmö University, Department of Biomedical Science, Malmö, Sweden, [4]Lund University, Heart Health Group, Malmö, Sweden, [5]Lund University, Department of Anaesthesia and Intensive Care, Halmstad, Sweden
INTRODUCTION. Assessing left ventricular (LV) dysfunction by echocardiography in ICU patients is common. In patients with cardiovascular disease mitral annular plane systolic excursion (MAPSE) is known to be more sensitive in detecting abnormalities in LV function at an early stage, easily obtainable and related to prognosis.
OBJECTIVES. The aim of this study was to investigate MAPSE in critically ill patients with shock and its relation to LV systolic and diastolic function, myocardial injury and to outcome.
METHODS. In a prospective, observational, cohort study we enrolled 50 patients with SIRS and shock despite fluid resuscitation. Transthoracic echocardiography (TTE) measuring LV systolic and diastolic function was performed within 12 h after admission and daily for a 7-day observation period. TTE and laboratory measurements (high-sensitive troponin T (hsTNT), B-natriuretic peptide [BNP]) were related to 28-day mortality. Spearman rank correlation was used.
RESULTS. MAPSE on day 1 correlated significantly with LV ejection fraction (LVEF), tissue Doppler indices of LV diastolic function (é, E/é) and hsTNT whereas LVEF did not correlate significantly with any marker of LV diastolic function or myocardial injury; tissue Doppler of LV systolic function (TDIs) correlated significantly with LVEF and é (Table 1). Compared to survivors, non-survivors had a significantly lower MAPSE (8 [IQR 7.5–11] versus 11 [IQR 8.9–13] mm; $p = 0.028$). Other univariate predictors were age ($p = 0.033$), hsTNT ($p = 0.014$) and Sequential Organ Failure Assessment (SOFA) scores ($p = 0.007$). By multivariate analysis MAPSE (OR 0.6 (95 % CI 0.5–0.9) $p = 0.015$) and SOFA score (OR 1.6 (95 % CI 1.1–2.3) $p = 0.018$) were identified as independent predictors of mortality. Daily measurements showed that MAPSE, as sole echocardiographic marker, was significantly lower in most days in non-survivors ($p < 0.05$ at day 1–2, 4–6).
CONCLUSIONS. MAPSE seemed to reflect LV systolic and diastolic function as well as myocardial injury in critically ill patients with shock. The combination of MAPSE and SOFA added to the predictive value for 28-day mortality.
REFERENCES. 1. Jones CJ, Raposo L, Gibson DG. Functional importance of the long axis dynamics of the human left ventricle. Br Heart J. 1990; 63(4):215–220. 2. Hu K, Liu D, Herrmann S et al. Clinical implication of mitral annular plane systolic excursion for patients with cardiovascular disease. Eur Heart J Cardiovasc Imaging 2013; 14(3):205–212. 3. Matos J, Kronzon I, Panagopoulos G, Perk G. Mitral annular plane systolic excursion as a surrogate for left ventricular ejection fraction. J Am Soc Echocardiogr. 2012; 25(9):969–974.
GRANT ACKNOWLEDGMENT. Supported by grants from the Scandinavian Society of Anaesthesiology and Intensive Care Medicine and the Region Skane County Council, Sweden.

Table 1

	MAPSE (mm)		TDIs (cm/s)		LVEF (%)	
	r	p	r	p	r	p
LV systolic function						
LVEF (%)	0.594	<0.001	0.649	<0.001		
LV diastolic function						
é (cm/s)	0.309	0.039	0.341	0.022		Ns
E/é	−0.383	0.009		Ns		Ns
Cardiac biomarkers						
hsTNT (ng/L)	−0.428	0.003		Ns		Ns
BNP (pmol/L)		ns		Ns		Ns

0629

RIGHT INTERNAL JUGULAR VEIN DISTENSIBILITY APPEARS TO BE AN ALTERNATIVE TO INFERIOR VENA CAVA VEIN DISTENSIBILITY

G. Friedman[1,2], F.P. Broilo[2]

[1]UFRGS, Internal Medicine, Porto Alegre, Brazil, [2]Complexo Hospitalar Santa Casa, UTII Central, Porto Alegre, Brazil
INTRODUCTION. Echographic evaluation of respiratory variation in inferior vena cava diameter may be difficult in some patients (i.e. obese and after laparotomy).
OBJECTIVES. To investigate whether the respiratory variation in inferior vena cava diameter (ΔDIVC) and in right internal jugular vein diameter (ΔDRIJ) are correlated in mechanically ventilated patients.
METHODS. Prospective clinical study in a Medical ICU of a University Hospital. Mechanically ventilated patients with hemodynamic instability (n = 39). ΔDIVC and ΔDRIJ were assessed by echography. Vein distensibility were calculated as the ratio of (1) $D_{max} - D_{min}/D_{min}$ and (2) $D_{max} - D_{min}$/mean of $D_{max} - D_{min}$, expressed as percentage.
RESULTS. ΔDIVC and ΔDRIJ were correlated by both methods: (1) $r = 0.34$, $p = 0.04$ and (2) $r = 0.51$, $p = 0.001$. Using 18 % as a cut-off value indicating fluid responsiveness for method (1), 16 patients were responders and 35 measurements showed agreement (15 responders). Using 12 % as a cut-off value indicating fluid responsiveness for method (2), 14 patients were responders and 32 measurements showed agreement (13 responders). Both methods agreed in 31 measurements.
CONCLUSIONS. The respiratory variation in inferior vena cava and in right internal jugular vein are correlated and showed reasonable agreement. Evaluation of right internal jugular vein distensibility appears to be an alternative to inferior vena cava vein distensibility.
REFERENCES. 1. Feissel M et al. The respiratory variation in inferior vena cava diameter as a guide to fluid therapy. Int Care Med. 2004; 30:1834. 2. Barbier C et al. Respiratory changes in inferior vena cava diameter are helpful in predicting fluid responsiveness in ventilated septic patients. Int Care Med. 2004; 30:1740.

0630

STRESS ECHOCARDIOGRAPHY DURING WEANING FROM MECHANICAL VENTILATION

A. Gómez Blizniak[1], M. Ruiz Bailén[1], A. Castillo Rivera[1], D.F. Matallana Zapata[1], M.A. Martinez Arco[1], R. Vela Colmenero[1], M. del Carmen Molina[1]

[1]Complejo Hospitalario de Jaen, Critical Care Unit, Jaen, Spain
INTRODUCTION. Critically ill patients may suffer varying myocardial dysfunction. The initial result of this dysfunction is the existence of a heart failure (diastolic failure > 50 % of cases) with pulmonary edema generation, which can produce extubation failure and change the outcome of the patient.
OBJECTIVES. To evaluate the modification of the meso-diastolic wave velocity, the E/E′ ratio and systolic filling fraction (SFF) (as estimators of pulmonary capillary pressure and left atrial pressure) with stress echocardiography on patients surviving from cardiogenic shock, that currently has a good left ventricular ejection fraction (LVEF) and have failed extubation.
METHODS. Inclusion period: 2008–2012. We included patients admitted for cardiogenic shock, which have failed extubation (>15 days of mechanical ventilation), with LVEF > 0.5, TAPSE > 20 mm. Mitral regurgitation ≤2 and with E/e′ ratio <8 or SFF > 0.45. All patients were completely revascularized. All were in sinus rhythm without vasoactive amines. These patients underwent stress echocardiography (dobutamine or ephedrine). The change of the E/e′ ratio and the SFF of the pulmonary veins were evaluated. We used transesophageal and transthoracic echocardiography. The study was performed using transmitral Doppler, DTIp, pulmonary venous flow and the transmitral flow propagation slope. The test was performed up to 20 μg/kg/min of dobutamine, or up to 100 mg of ephedrine, except when we get an important diastolic pressure elevation or present with clinical symptomatology suggestive of heart failure.
RESULTS. 65 patients were selected. Of these the test was performed in 43 patients. 38 patients were male. The median age was 69 years. The average meso-diastolic wave speed and the E/E′ ratio before the stress test were 0.23 ± 0.28 m/s and 8 (2–11) respectively, rising up to 0.41 ± 0.48 m/s and 19 (12–27), $p < 0.001$ during the stress test. The initial mean SFF was 0.47 ± 0.22, going after the stress test to 0.28 ± 0.41. In eight patients there was a significant clinical pulmonary edema. After applying speckle tracking, using strain, strain rate, velocity and displacement (with the U.S. Siemens syngo software) parameters suggestive of ischemia were observed in six patients, and can be successfully revascularized four of them.
CONCLUSIONS. Stress echocardiography may be helpful in detecting silent diastolic dysfunction in patients undergoing mechanical ventilation during the weaning period.
REFERENCES. 1. Mullens W, Borowski AG, Curtin RJ, Thomas JD, Tang WH. Tissue Doppler imaging in the estimation of intracardiac filling pressure in decompensated patients with advanced systolic heart failure. Circulation. 2009; 119(1):62–70. 2. Ruiz Bailen M, Aguayo de Hoyos E, Lopez Martnez A, Daz Castellanos MA, Ruiz Navarro S, Fierro Roson LJ, et al. Reversible myocardial dysfunction, a possible complication in critically ill patients without heart disease. J Crit Care. 2003; 18(4):245–252.

0631

CATHETER SITE CORRECTION FOR TRANSPULMONARY THERMODILUTION (TPTD) WITH FEMORAL VEIN ACCESS: A PROSPECTIVE STUDY

W. Huber[1], B. Frech[1], S. Mair[1], M. Messer[1], T. Lahmer[1], R.M. Schmid[1], B. Saugel[1]

[1]Technical University of Munich, Klinikum rechts der Isar, Munich, Germany
INTRODUCTION. TPTD is usually performed by indicator injection via the *jugular or subclavian* vein. Furthermore, *femoral* access can be used for TPTD. However, two recent studies demonstrated significant overestimation particularly of global end-diastolic volume index (GEDVI) and -to a lower extent- of cardiac index CI and extra-vascular lung water index EVLWI in case of *femoral* injection. One of these studies provided correction formulas for $GEDI_{fem}$, $ELWI_{fem}$ and CI_{fem} (1). As a consequence of these data, one of the commercially available TPTD-devices requires information about the site of injection site, suggesting correction for *femoral* access. However, little is known, how and to which extent TPTD-results are corrected.

OBJECTIVES. To investigate the impact of setting the monitor to femoral *access.*
METHODS. 377 triplicate TPTDs were performed in 37 patients *(*13 female, 24 male) with PiCCO-2 monitoring with the latest software requiring information about the venous catheter site. 123 and 254 TPTDS were performed via femoral and jugular indicator injection, respectively. 32 triplicate TPTDs in 11 patients with *femoral* venous access were performed with the correct information of *femoral* venous access and compared to 32 immediately subsequent TPTDs with setting the monitor to the wrong information of *jugular* venous access (primary endpoint). Statistics: SPSS 20. Wilcoxon-test.
RESULTS. The 32 comparative measurements demonstrated markedly different values for GEDVI when setting the indicator site information from *femoral* (719 ± 130 ml/m^2) to *jugular* despite repeated *femoral* injection (889 ± 201 ml/m^2; $p < 0.001$). By contrast, repeated measurements of CI (4.46 ± 1.28 vs. 4.48 ± 1.26 L/min/m^2; $p = 0.486$) and EVLWI (9.5 ± 3.6 vs. 9.6 ± 3.4 mL/kg; $p = 0.335$) were not different. These data suggest that the algorithm corrects for femoral catheter site regarding GEDVI, but not for CI and EVLWI. Correcting *femoral* TPTD-derived GEDVI with monitor setting of *jugular* injection site for our correction formula resulted in a GEDVI-value of 713.4 ± 134 which was not significantly different to the TPTDs with monitor-setting to *femoral* injection (719 ± 130 mL/m^2; $p = 0.896$; bias 6.01 mL/m^2; percentage error 14.7 %). These data suggest, that the new PiCCO algorithm correcting for femoral indicator injection is based on a formula close to the previously suggested formula.
In all 377 TPTDs, GEDVI was slightly higher in 123 femoral TPTDs with correct information of injection site than for 254 jugular TPTDs (848 ± 172 vs. 795 ± 224; $p < 0.001$). Without the assumed correction, femoral GEDVI-values would have been markedly higher (1,120 ± 316 vs. 848 ± 172 ml/m^2; $p < 0.001$) resulting in a six-fold increase in the difference to jugular TPTD-derived GEDVI.
CONCLUSIONS. The new PiCCO algorithm significantly corrects GEDVI for femoral injection site. The amount of correction is close to our previously suggested formula.
REFERENCES. 1. Saugel, Huber et al. Crit Care. 2010; 14: R95

0632
INFERIOR VENA CAVA VARIATION COMPARED TO PULSE CONTOUR ANALYSIS DURING HEMODYNAMIC MONITORING IN PATIENTS IN SHOCK

N. Carrizo[1], R. Avila[1], I. Ponzo[1], L. Gramaglia[1], C. Zuchella[1]

[1]Hospital Cullen, Santa Fe, Argentina
INTRODUCTION. Hypo-perfusion and volume overload are associated with increased morbidity and mortality. Fluid responsiveness (F_{Res}) allows for optimization of cardiac performance while avoiding fluid overload and prolonged mechanical ventilation. Dynamic parameters such as inferior vena cava respiratory variation ΔIVC and stroke volume variation (SVV) have shown to be accurate and reliable predicting F_{Res} in patients in shock.
OBJECTIVES. To compare the results of both dynamic variables ΔIVC and SVV during mechanical ventilation after initial reanimation with fluids in patients in shock and to measure the variations of the stroke volume after fluid challenge (FC) with colloids—obtained with the Vigileo/Flotrac monitor—in those patients in which either one of the hemodynamic variables plus a surrogate marker of hypo perfusion justify it.
METHODS. We prospectively enrolled patients in shock well adapted to mechanical ventilation and in need of vasopressors. After initial resuscitation with fluids optimizing the preload and the $ScvO_2$, the ΔIVC and the SVV were measured simultaneously. We excluded patients with cardiac arrhythmia, severe pulmonary hypertension, in need for protective mechanical ventilation with tidal volume ≤6 ml/kg and technically impossible to evaluate the inferior vena cava sonographically. The Stroke volume index (SVI) and the SVV were obtained from the Vigileo monitor whereas the ΔIVC was obtained through an ECHO (M-mode). The Vigileo monitor was used to measure stroke volume index (SVI) and to determine the F_{Res} (defined by SVI increase > 15 %). A data set was obtained before and 30 min after a 10-min-FC with 7 cc/kg of a colloid.
RESULTS. 15 patients were prospectively enrolled over a 13-month period. 4 women and 11 men, mean age 33.6 years (SD 14.6), mean APACHE II 19.6 (SD 3.62) and mean SOFA 8.3 (SD 2.71) study enrollment since ICU admission was 5.66 h (SD 3.98). ICU admissions were: polytrauma (n = 7), complicated postoperative (n = 3), severe TBI (n = 2), stab wound (n = 1), gun fire wound (n = 1), sepsis (n = 1).Types of shock: 11 were hypovolaemic and 4 distributive. Out of the 15 patients 9 (60 %) after initial reanimation showed cut off values of <12 and <18 % of SVV and ΔIVC respectively, 3 cases were F_{Res} (SVV > 12 %, ΔIVC > 18 %). In the remaining three cases where the dynamic variables suggested different behaviors: two with SVV > 12 % but ΔIVC < 18 % with FC showed an increase > 15 % of the IC, but in the case with SVV < 12 % and ΔIVC > 18 % FC did not produce a significant increase in the IC (3 % increase).
CONCLUSIONS. Both stroke volume variation and ECHO assessment of the ΔIVC variation during mechanical ventilation may prove to be a useful technique to predict F_{Res} and guide fluid resuscitation in the ICU.
REFERENCES. Michard F, Teboul JL. Predicting fluid responsiveness in ICU patients. A critical analysis of the evidence. 2002; Chest 121: 2000–2008.

0633
THE FEASIBILITY AND IMPACT OF INTRODUCING BASIC LEVEL CRITICAL CARE ECHOCARDIOGRAPHY TRAINING TO CLINICAL PRACTICE

D. Kuriakose[1], P. McCanny[1], R. O'Mahony[2], F. Colreavy[1]

[1]Mater Misercordiae Hospital, Intensive Care, Dublin, Ireland, [2]Connolly Memorial Hospital, Dublin, Ireland
INTRODUCTION. Competencies for basic level critical care echocardiography (BCCE) have been defined (1). We have recently adopted this framework in our Intensive Care Unit (ICU) recognizing that competence in some elements of echocardiography is a core skill of the ICU doctor (2).
OBJECTIVES. This study investigated the process and clinical impact of BCCE training in our ICU.
METHODS. BCCE training began July 2012 for 2 ICU fellows and 2 ICU Consultants. A sonographer (RO'M) delivered 44 h hands-on-training over a 6 month period. 10 h didactic lectures and log book collection of 30 supervised cases were delivered by supervisor of training (FC). Following 2 months BCCE training and ethics approval, data were prospectively collected on all ICU patients undergoing transthoracic echocardiography (TTE) during 6 months; September 2012-February 2013. Data on TTE performed during the 6 months prior to BCCE training were retrospectively collected. The aim of data collection was to ascertain who performed TTE, the clinical question to be answered by TTE and the outcome of TTE on clinical management.
RESULTS. See Table 1.

Table 1

	Pre-BCCE training	Post-BCCE training
Number of TTE	46	144
Operator: % Cardiology/ICU	76/20	57/43
Clinical Question: LV function? tamponade? Volume status ECMO cannulae	67 %, 8 % 0 %, 0 %	47 %, 18 % 17 %, 1 %
Management change: Heart failure rx. Change of vasoactive meds. Fluid therapy	27 %, 6 % 6 %	15 %, 23 % 21 %

There was an increase in number of TTE's performed following introduction of a training programme. Pre-BCCE training the majority (76 %) of TTE were performed by cardiology (sonographer/fellows) and only 20 % by ICU doctors. This ratio changed post-BCCE training. The most common clinical question pre-BCCE training was assessment of left ventricular function (67 %). Although this question was still asked post-BCCE training the questions expanded and included assessment of volume status and assessment of ECMO cannulae. 96 and 97 % respectively of echo questions were answered before and after echo training. Management changes post-BCCE training were more varied compared with pre-BCCE, and most common changes included; change in vasoactive meds, addition of fluid therapy and optimization of heart failure therapy.
CONCLUSIONS. This study shows BCCE training was successfully introduced into our ICU. The TTE's performed by ICU doctors post-BCCE training provided very useful information for the management of critically ill patients. The comparison of management change pre/post-BCCE training reflect the change in operator from predominantly cardiology to mainly ICU doctors performing TTE. ICU operators may have more knowledge of types of haemodynamic shock and more confidence in making changes compared to cardiology operators. It may also reflect the real-time nature of information obtained by ICU operators. There is often a time lag before formal cardiology reporting.
REFERENCES. 1. Cholley et al. ICM. 2011; 37:1077. 2. Mayo P. Ann Int Care. 2011; 1:36
GRANT ACKNOWLEDGMENT. Sonographer training supported by MSD and Pfizer pharmaceuticals.

0634
TRANSTHORACIC ECHOCARDIOGRAPHY AND WEANING OUTCOME: A SYSTEMATIC REVIEW

D. Tsartsalis[1], E. Dragioti[2], C. Georgiadis[1], F. Tsimpoukas[1], E. Panagiotou[1], G. Kyriazopoulos[1], D. Sfyras[1]

[1]Lamia General Hospital, Intensive Care Unit, Lamia, Greece, [2]Sotiria Hospital, Athens, Greece
INTRODUCTION. Transthoracic echocardiography (TEE) is an easy, cheap, reproducible diagnostic tool with growing implementation in intensive care units. There is emerging evidence that when is performed during spontaneous breathing trial (SBT) could predict weaning failure due to cardiac implications.
OBJECTIVES. Our aim was to assess with a systematically manner the effectiveness of TEE to predict weaning failure in intensive care patients.
METHODS. We performed a comprehensive search in Pubmed using the terms (diastolic or echocardiography) and (weaning or spontaneous breathing trial). We included relevant references from the retrieved papers
RESULTS. The original search retrieved 397 studies and finally we identified 5 studies relevant to the topic, including a total of 264 patients with a variety of conditions (cardiac and non-cardiac). Three of them were perspective cohort studies, while the other two studies performed a cross-sectional design. The majority of the studies agree that the major factor predicting weaning failure during SBT is impaired cardiac diastolic relaxation as it is calculated by Tissue Doppler (TDI) velocities in mitral annulus. Measurement of E/Ea which represents left ventricular filling pressures could be of a significant value, with a cut-of value of 7.8 could identify patients at greater risk. One study provided evidence concerning right heart functioning by using parameters of tricuspid annulus such as TDI velocities or TAPSE (tricuspid annular plane systolic excursion), with the limitation of a cross-sectional design concerning a small group of patients.
CONCLUSIONS. Transthoracic echocardiography evaluating left ventricular diastolic functioning could be a useful tool during the weaning process, provided that it performed by experienced users. More studies are needed to confirm the previous findings and the replicability of the results
REFERENCES. 1. Moschietto S, Doyen D, Grech L, Dellamonica J, Hyvernat H, Bernardin G. Transthoracic echocardiography with Doppler tissue imaging predicts weaning failure from mechanical ventilation: evolution of the left ventricle relaxation rate during a spontaneous breathing trial is the key factor in weaning outcome. Crit Care. 2012;16(3): R81. [Epub ahead of print]. 2. Papanikolaou J, Makris D, Saranteas T, Karakitsos D, Zintzaras E, Karabinis A, Kostopanagiotou G, Zakynthinos E. New insights into weaning from mechanical ventilation: left ventricular diastolic dysfunction is a key player. Int Care Med. 2011 Oct 6. [Epub ahead of print]. 3. Caille V, Amiel JB, Charron C, Belliard G, Vieillard-Baron A, Vignon P. Echocardiography: a help in the weaning process. Crit Care. 2010; 14(3): R120. [Epub 2010 Jun 22].

0635
ECHOCARDIOGRAPHIC ASSESSMENT OF CARDIAC INDEX AND PULMONARY CAPILLARY WEDGE PRESSURE

E. Trujillo-García[1], C. Joya-Montosa[1], E. Curiel-Balsera[1], M.C. Martinez Gonzalez[1], M.P. Benitez Moreno[1], H. Molina-Diaz[1], M. Alvarez-Bueno[1], G. Gomez-Gallego[1], G. Quesada-Garcia[1]

[1]Carlos Haya Regional Hospital, Intensive Care, Málaga, Spain
INTRODUCTION. The Swan-Ganz catheter (SGC) remains the gold standard for cardiac output (CO) measurements. We aim to compare with a non invasive method, like echocardiography, in critically ill patients.
OBJECTIVES. Assessing echocardiograph reliability relative to SGC or the PiCCO system upon the measurement of the cardiac index (CI) and capillary pulmonary wedge pressure (PCP) in critical patients.

METHODS. Echocardiography and cardiac Doppler imaging were performed on ICU-admitted patients with SG or PiCCO system between September 2012 and March 2013. All echographic measurements were carried out by the same operator. Values are given as either mean and standard deviation, or ratio and absolute value. The Wilcoxon signed-rank test and Spearman's rho were used for related samples. Maximum alpha error was 5 %.
RESULTS. The sample comprised 26 patients (average age = 62 ± 7.8; 65.4 % were males). Echographic measurements were compared to SGC in 22 patients and to PiCCO in 4 patients. Therefore, no PCP could be obtained. Most patients were heart surgery post-operation cases (73.1 %) in their 2nd day after admission, with no mechanical ventilation (MV) in 84.6 % of the cases. After echographic exploration, 65.4 % (no = 17) showed no valvular heart disease. Significant differences were found between SG-measured IC (2.6 +0.67) and ECO-measured IC (3.07 +0.75), p = 0.007; yet not in PWP values, p = 0.22. Correlation between both measurements was moderate; CI coefficient was 0.66 and 0.68 for PWP, both of them being significant (p = 0.0001).The analysis of the subgroup of 17 patients with no valvular heart disease rendered no differences in CI or echocardiography- or SG-measured PWP (p = 0.49 and p = 0.32, respectively), and better correlations (0.76 for IC, and 0.70 for PWP) were observed relative to the whole sample of patients.

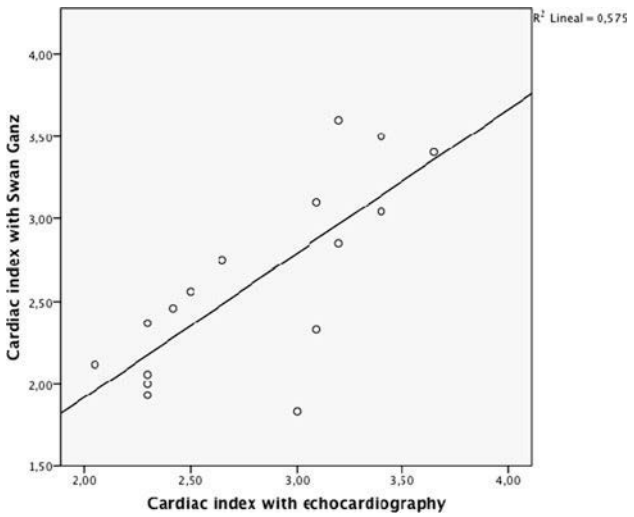


Fig. 1 Cardiac output

CONCLUSIONS. The use of echocardiography for CI and PWP measurement in critical patients with no associated valvular heart disease seems a likely alternative to commonly-used invasive methods.
REFERENCE(S). Alhashemi JA, Cecconi M, Hofer CK. Cardiac output monitoring: an integrative perspective. Crit Care. 2011; 15:214.

0636
RIGHT VENTRICULAR DYSFUNCTION IN VENO-VENOUS ECMO FOR ARDS

G. Tavazzi[1], S. Canestrini[2], M. Bojan[3], M. White[2], S. Price[2]

[1]University and Foundation Policlinico San Matteo IRCCS, Intensive Care Dept 1, Pavia, Italy, [2]Royal Brompton Hospital, Adult Intensive Care, London, UK, [3]Necker-Enfants Malades University Hospital, Paris, France
INTRODUCTION. Acute cor pulmonale (ACP) is described in patients with adult respiratory distress syndrome (ARDS) and can be worsened by applying mechanical ventilation with high ventilator pressure (1). The diagnosis of ACP can be rapidly obtained by bedside echocardiography.
Veno-venous ECMO potentially allows lung protective ventilation, providing an increase in oxygenation, pumping blood flow across the artificial lung, a reduction of CO_2 and could reduce the incidence of ACP.
OBJECTIVES. We aimed to describe right ventricular function in patients with ARDS treated with vv-ECMO.
METHODS. An observational analysis of retrospectively collected data in mechanical ventilated patients requiring extracorporeal assistance, who underwent bedside echocardiography. We collected LV/RV function data in addition to clinical and ventilator factors. We used Mann–Whitney test for continuous data and Fisher test for categorical data.
RESULTS. Patients were 37 (age 40 ± 14 years), 18 male (48 %), admission APACHE II was 19.19 (± 5.9). All the patients were admitted as ECMO retrieval; the diagnosis were H1/N1 for 13 patients, 1 drug intoxication, 5 aspiration pneumonia, 18 pneumonia. Four patients had features of ACP. Results are summarized in Table 1.

Table 1

Lactate	1.7, 0.6–8	2.5, 0.8–15	0.02
Peak inspiratory pressure	26, 19–36	29.5, 24–39	0.04
iNO	2.2, 0–18	7.3, 0–19	0.05
Adrenaline	0.01, 0–0.15	0.05, 0–0.24	0.005
LVEF (%)	56.18, 28.6–78.7	43.22, 20.5–60	0.01
TAPSE	1.7, 0.9–2.1	1.5, 0.9–2.2	0.17
Fluid balance	542, −1,337 to +2,863	1570, +160 to +5,207	0.01

CONCLUSIONS. There was no difference in term of mortality between male and female. Peak inspiratory pressure, lactate, inotrope requirement, LV ejection fraction and fluid balance were related to increased mortality. A significant correlation was found between RV systolic impairment (TAPSE < 2 cm) and raised pCO_2 (p = 0.002) (Graph 1).

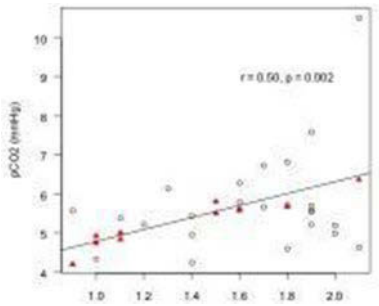


Fig. 1

Moreover, we found a correlation between LV longitudinal systolic dysfunction (MAPSE < 1 cm) and high serum lactate (Graph 2).

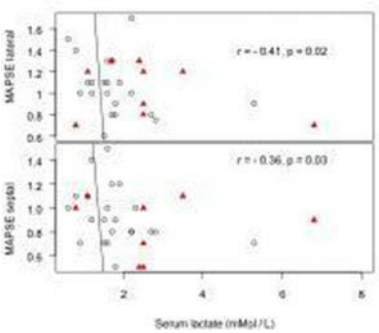


Fig. 2

More studies looking at systolic and diastolic function in patients undergo vv ECMO are needed.
REFERENCES. 1. Vieillard-Baron A. et al. Crit Care Med. 2001; 29(8): 1551–5.

0637
ECHO IN ITU: DO WE NEED TO DO IT OURSELVES?

F. Kovari[1], T. Hazarika[2]

[1]North Middlesex University Hospital, Critical Care, London, UK, [2]North Middlesex University Hospital, London, UK
INTRODUCTION. Echocardiography is increasingly used in the management of the critically ill patient as a non-invasive diagnostic and monitoring tool especially for the rapid assessment of cardiac function.
OBJECTIVES. The aim of this audit was to analyse our current practice in regards of ECHO studies for patients admitted to our unit. Our goal was to point out to the importance and the necessity of the ECHO training which could easily solve our constant struggle to get a study out of hours and especially during the week-end.
METHODS. A single centre retrospective audit in an eight bed mixed ICU of a non-tertiary university hospital. During this audit period (2011–2012 to date) 30 patients were admitted to critical care. We audited data of the initial diagnosis, ACS protocol, ECHO, the timing of ECHO, the performer of the ECHO study, the quality of ECHO report, the follow up and the outcome.
RESULTS. We identified 30 patients for the last 12 months admitted to our unit with the diagnostic criteria. Almost all the patients (96 %) were started on the ACS protocol, interestingly only 40 % in the A/E 53 % in the ITU. In the first 24 h only 66 % of the cardiac patient had had an ECHO study done the follow up rate was 25 %. We analysed the report quality regarding basic cardiac function results such as ejection fraction (EF-90 %),left ventricular function (LVF-100 %), right ventricular function (RVF-95 %), pulmonary hypertension (PHT-65 %), wall motion abnormalities (WMA-90 %) and pericardial fluid (PF-80 %).The studies were performed either by technicians (75 %) or physicians (25 %).
CONCLUSIONS. Our audit suggest that the number of ECHO studies done in this highly selected patients group is not adequate. One-third of our cardiac patient are not having the basic cardiac study within the first 24 h. 20 % of the reports are not answering the basic question of the existence of pericardial fluid. This is down to the unavailability of an otherwise over stretched service during the week-end or out of hours. Recently, intensivists have started to seek the chance to develop echocardiographic skills. It can save time and help managing both cardiac and non cardiac patients better. We would like to point out that it is crucial and beneficial for any Trust to let and help their intensivists obtain the necessary echocardiographic training. Our aim in our unit is to get all consultants competent in peri-resuscitation echocardiography and support some to undergo higher level of training. Eventually we would like to practice ITU ECHO not in isolation but in conjunction with consultant cardiologist
REFERENCES. Echocardiography practice, training and accreditation in the intensive care: document for the World Interactive Network Focused on Critical Ultrasound (WINFOCUS). The Use of Echocardiography in the Critically Ill; The Role of FADE (Fast Assessment Diagnostic Echocardiography) Training.

0638
CHANGES IN AORTIC MOTILITY THROUGH RISING PEEP LEVELS

D.F. Matallana Zapata[1], M. Ruiz Bailén[2], A. Castillo Rivera[2], A. Gómez Blizniak[2], M.A. Martínez Arcos[2], R. Vela Colmenero[2], M.D. Pola Guzman[2]

[1]Complejo Hospitalario de Jaen, Jaen, Spain, [2]Complejo Hospitalario de Jaen, Critical Care, Jaen, Spain
INTRODUCTION. The interaction between mechanical ventilation and the aorta is not well known. The aorta is not usually assigning a clear role in hemodynamic function. The

behavior of the aorta may be subject to changes in peep's levels, this potential interaction can be observed and quantified by evaluating the torsional rate, the change of strain, strain rate and their longitudinal and radial displacement.
OBJECTIVES. Using Speckle Tracking echocardiography, we try to asses if there are changes in aortic's deformity, longitudinal and radial velocity or displacement with increasing in peep's levels.
METHODS. Observational pilot. Study protocol. Patients undergoing mechanical ventilation (MV) in IPPV, with protective MV, which only changes the level of PEEP during the making of the ETT. Zero PEEP is part and is increased to PEEP's levels at intervals of 5, 10, and 15 cmH_2O. The echocardiography was performed with a minimum of 15 min after the changes in the peep's level. Echocardiography was performed with acoustic and a frame rate's captures >160 i/s, which are reevaluated with speckle tracking, by U.S. Syngo Siemens software. We only make changes in the level of PEEP during the performance of echocardiography. The aorta short axis is evaluated in the parasternal long axis and long-axis projection parasternal modified. The variables studied by Wilcoxon test for paired variables. Are expressed as means, and 95 % confidence interval (CI).
RESULTS. In 12 patients, we found that with increasing in PEEP levels, occurred an increase in the fractional shortening, radial and rotational's velocities, strain rate, longitudinal and radial's displacements. However this is a pilot study with low sample, which can only suggest hypotheses. (See Image number 1)

PEEP	N	Media	CI for the mean 95%	
'AC AORTIC			upper limit	lower limit
.00	16	0. 35250	0. 26721	0.43779
5.00	9	0.51889	0. 37687	0.66091
10.00	11	0.39545	0. 33393	0.45698
15.00	7	0.39286	0.29258	0.49314
Total	43	0.40488	0. 35800	0.45177
AORTIC ROTATIONAL SPEED AVERAGE			upper limit	lower limit
.00	15	57.75944	32.31625	83.20263
5.00	9	103.15188	33.60303	172.70072
10.00	11	65.70559	33.10119	98.30999
15.00	7	46.65127	22.77415	70.52839
Total	42	67.71616	49.60198	85.83035
AVERAGE SPEED RADIAL AORTIC			upper limit	lower limit
.00	15	0.95094	0.32215	1.57973
5.00	9	2.29887	0.05492	4.54281
10.00	12	1.05628	0.65040	1.46215
15.00	7	0.63050	0.26002	1.00098
Total	43	1.21030	0.72141	1.69918
AVERAGE AORTIC STRAIN			upper limit	lower limit
.00	15	-8.98457	-12.79829	-5.17085
5.00	9	-10.23183	-15.90845	-4.55522
10.00	11	-7.66599	-11.44376	-3.88822
15.00	7	-9.05911	-14.75382	-3.36441
Total	42	-8.91892	-10.91188	-6.92597
AORTIC STRAIN RATE AVERAGE			upper limit	lower limit
.00	15	- 99874	-1.55766	- 43982
5.00	9	-2.00740	-4.02806	0.01326
10.00	11	-1.33497	-2.06828	- 60167
15.00	7	- 86224	-1.26758	- 45691
Total	42	-1.28019	-1.74142	- 81897
ROTATIONAL DISPLACEMENT			upper limit	lower limit
AVERAGE AORTIC			3.99182	8.14564
.00	15	6.06873	24.66733	4.09136
5.00	9	14.37934	2.46720	6.55294
10.00	11	4.51007	2.98708	9.56121
15.00	7	6.27414	5.10947	9.84171
Total	42	7.47559		
RADIAL DISPLACEMENT AORTIC			upper limit	lower limit
.00	15	0.97657	0.42879	1.52435
5.00	9	1.57312	0.26445	2.88179
10.00	11	0.82709	0.11291	1.54127
15.00	7	1.02507	0.54449	1.50565
Total	42	1.07334	0.71944	1.42724

CONCLUSIONS. The aorta may have a motility that can be modified by different PEEP's levels and it can be measured by echocardiography.
REFERENCES. Favreau JT, Nguyen BT, Gao I, Yu P, Tao M, Schneiderman J, et al. Murine ultrasound imaging for circumferential strain analyses in the angiotensin II abdominal aortic aneurysm model. J Vasc Surg. 2012; Apr 13.
GRANT ACKNOWLEDGMENT. University Hospital Complex of Jaén.

Fungal infections: 0639–0651

0639
EFFECTS OF ULINASTATIN IN TREATMENT OF INVASIVE CANDIDIASIS

S. Huang[1], X. Li[1], X. Guan[1]

[1]First Affiliated Hospital of Sun Yat-Sen University, SICU, Guangzhou, China
OBJECTIVES. To investigate the effects and mechanism of Ulinastatin (UTI) combined with antifungal agents in treatment of Invasive Candidiasis (IC).
METHODS. 60 Kunming mice were randomly assigned to control group, low-dose group and high-dose group (each n = 20). The model of IC was reproduced by intraperitoneal injection of White monilial suspension after CTX pretreatment. Mice in control group were treated with antifungal agents. Mice in low-dose group and high-dose group were treated with UTI (10^4 U/kg or 5×10^4 U/kg) and antifungal agents. Survival rate, cytokine in liver tissue and blood lymphocyte subsets were compared among these groups.
RESULTS. There was significant difference in survival rate between control group and high-dose group (30 % [6/20] vs. 70 % [14/20], $p = 0.011$). There was no significant difference in survival rate between other groups ($p > 0.05$). There were significant differences in IL-10 among three groups (94.1 ± 9.11 vs. 93.9 ± 4.91 vs. 82.5 ± 14.0, $p < 0.05$). There were significant differences in CD3+ rate, CD4+ rate and CD8+ rate between control group and high-dose group (22.5 ± 5.24 vs. 26.4 ± 3.63, 14.6 ± 1.26 vs. 16.7 ± 2.19, 6.60 ± 1.51 vs. 4.50 ± 0.97, $p < 0.05$). There were significant differences in CD4+/CD8+ rate among three groups (2.32 ± 0.59 vs. 2.90 ± 0.87 vs. 3.82 ± 0.82, $p < 0.05$).
CONCLUSIONS. High-dose UTI could improve survival rate in mice with IC through improving cellular immune and reducing immunosuppression.
REFERENCES. 1. Olivier Leroy, Jean-Pierre Gangneux, Philippe Montravers, et al. Epidemiology, management, and risk factors for death of invasive Candida infections in critical care: a multicenter, prospective, observational study in France (2005–2006). 2009; 37(5): 1612–1618. 2. Taira M, Katsura H, Kadoriku C, et al. A case of chronic necrotizing pulmonary aspergillosis successfully treated with combination therapy of antifungal drugs and Ulinastatin. Nihon Kyobu Shikkan Gakkai Zasshi. 1997; 35(9): 991–995. 3. Benoit P. Guery, Maiken C. Arendrup, Georg Auzinger. Management of invasive candidiasis and candidemia in adult non-neutropenic intensive care unit patients. Intensive Care Medicine. 2009; 35: 55–62. 4. N. R. Webster, H. F. Galley. Immunomodulation in the critically ill. British Journal of Anaesthesia. 2009; 103(1): 70–81. 5 Ken-ichiro Inoue, Hirohisa Takano, Rie Yanagisawa, et al. Protective effects of urinary trypsin inhibitor on systemic inflammatory response induced by lipopolysaccharide. J Clin Biochem Nutr. 2008; 43: 139–142. 6. Masaaki Ueki, Satoshi Taie, Kousuke Chujo, et al. Urinary trypsin inhibitor reduces inflammatory response in kidney induced by lipopolysaccharide. J of Biosci Bioeng. 2007; 104: 315–320.
GRANT ACKNOWLEDGMENT. Medical Research Fund of Guangdong Province (No. A2010150), The Techpool Research Fund (No. 01200909), Sun Yat-sen University Students Amateur Research Fund (2010045)

0640
ASPERGILLOSIS IN CRITICALLY ILL PATIENTS: RESULTS FROM A LARGE MULTICENTER COHORT

F.S. Taccone[1], P. Bulpa[2], A.-M. Van den Abeele[3], G. Dimopoulos[4], J. Rello[5], B. Misset[6], J.A. Paiva[7], K. Vandewoude[8], D. Vogelaers[8], S.I. Blot[8], AspICU Investigators

[1]Hopital Erasme, Bruxelles, Belgium, [2]Mont Godinne University Hospital, Yvoir, Belgium, [3]St Lucas Hospital, Ghent, Belgium, [4]Attikon University Hospital, University of Athens Medical School, Athens, Greece, [5]Vall d'Hebron University Hospital, Barcelona, Spain, [6]Hopital Saint Joseph, Paris, France, [7]University of Porto, Porto, Portugal, [8]University of Ghent, Ghent, Belgium
INTRODUCTION. Invasive aspergillosis (IA) is a fungal infection particularly affecting immuno-compromised hosts. Recently, several reports indicate an important occurrence rate of IA in ICU patients; however few data are available on epidemiology and outcome of patients with IA in this setting.
OBJECTIVES. We report data from the AspICU project, a multicenter (n = 30) observational study including all patients with a positive *Aspergillus* culture, from November 2006 to January 2011. IA was defined according to a clinical and validated algorithm that discriminates *Aspergillus* colonization from putative or proven IA in ICU patients (1).
METHODS. We report data from the AspICU project, a multicenter (n = 30) observational study including all patients with a positive *Aspergillus* culture, from November 2006 to January 2011. IA was defined according to a clinical and validated algorithm that discriminates *Aspergillus* colonization from putative or proven IA in ICU patients (1).
RESULTS. A total of 563 patients were included. Of these, 296 cases (46.9 %) were classified as IA (of which 93 proven and 203 putative IA). The lung was the most frequent site of infection (94 %) and *Aspergillus fumigatus* the most common isolated species (92 %). The median APACHE II score at admission was 23 (17–28) and the median SOFA score at time of diagnosis of IA was 8 (4–12). Overall 12-week mortality was 54 %. Patients with proven and putative IA had more frequently cancer and organ transplantation than those with colonization. Also, both groups were more frequently diagnosed with sepsis on ICU admission and received more frequently vasopressors and renal replacement therapy (RRT) during ICU stay than others. Particularly, in patients with proven IA, COPD was less frequently observed than in putative IA; in addition, proven IA patients were more frequently admitted for medical reasons, had higher incidence of ARDS on ICU admission and higher SOFA score on IA diagnosis than putative IA. Finally, RRT and antifungal therapy were more commonly used among patients with proven IA. Calculation of proportion of survival at 100 days yielded that the patients with putative and proven IA had significantly lower survival than those in the colonization group (log rank $p < 0.001$), even after adjustment for several confounders. Interestingly, among those patients with proven and putative IA, the use of antifungal therapy was associated with an increased survival when compared to untreated patients.
CONCLUSIONS. IA among critically ill patients is associated with high mortality. Patients diagnosed with both proven and putative IA showed higher severity of illness and needed more frequently vasopressors and RRT than those colonized by *Aspergillus* spp. Prompt and adequate therapy may influence mortality among patients with proven and putative IA.
REFERENCES. 1. Vandewoude K, et al. Crit Care; 2006.
GRANT ACKNOWLEDGMENT. (1) Pfizer Belgium, (2) Ghent University, (3) iMDSoft Patient Safety Award 2008.

0641
IMPACT OF YEAST ISOLATION IN COMMUNITY-ACQUIRED AND NON POSTOPERATIVE NOSOCOMIAL COMPLICATED INTRA-ABDOMINAL INFECTIONS

M. Guilbart[1], E. Zogheib[1], M. Perquin[2], A. Ntouba[2], J.M. Régimbeau[3], T. Chouaki[4], H. Dupont[1]

[1]University Hospital, Surgical Intensive Care, Amiens, France, [2]University Hospital, Anesthesiology, Amiens, France, [3]University Hospital, Surgery, Amiens, France, [4]University Hospital, Laboratory, Amiens, France
INTRODUCTION. The usefulness of antifungal therapy in community-acquired (CAP) and non postoperative nosocomial peritonitis (NPNP) remains a matter of debate [1]. The presence of *Candida* species in peritoneal fluid culture has been described as a risk factor of poor outcome in critically ill surgical patients with peritonitis [2]. This current study attempts to determine the pathogenic role of yeasts in CAP and NPNP.
METHODS. A descriptive and retrospective study was performed in a university-affiliated hospital (2009–2011) including all the CAP and NPNP. Patients were divided in two groups according to the presence of yeasts in the culture of peritoneal fluid. A multivariate analysis was performed to find independent risk factors of yeast isolation in peritoneal fluid. A score was then constructed using the weight of the odds ratio of independent variables, and a classification was made according to the number of risk factors present.

RESULTS. Among 310 patients, 223 (71.9 %) had a CAP and 87 (28.1 %) a NPNP. Yeasts were found in peritoneal fluid in 39 cases (12.6 %). The main characteristics of the two groups are presented in the Table. Isolation of yeasts was associated with more surgery (25.6 *vs.* 11.4 %, p = 0.028), hemodynamic failure (46.2 *vs.* 15.1 %, p < 0.001), duration of mechanical ventilation (6 ± 13 days *vs.* 2 ± 9, p < 0.001), length of stay in ICU (9 ± 16 days *vs.* 3 ± 9, p < 0.001), and in hospital (24 ± 26 days *vs.* 14 ± 17, p < 0.001), and death (25.6 *vs.* 7.7 %, p = 0.014). Four independent risk factors of yeast isolation were found: nosocomial infection (OR 3.3; CI 95 % [1.5–7.2], p = 0.002, 1 point), upper gastro-intestinal tract location (OR 2.8; CI 95 % [1.3–6.4], p = 0.01, 1 point), generalized peritonitis (OR 6,9; CI 95 % [2.8–16.9], p = 0.001, 2 points), and peroperative hemodynamic failure (OR 3.4; CI 95 % [1.5–7.5], p = 0.002, 1 point). For a score ≥3, sensitivity was 74 %, specificity was 77 %, positive and negative predictive values were 33 % and 95 % respectively, and overall accuracy was 77 %.

Main characteristics of the 2 groups

	Yeast+ (n = 39)	Yeast− (n = 271)	p value
ASA score	3 (1–5)	3 (2–4)	0.001
Malignancy (%)	7 (17.9)	14 (5.2)	0.008
Risk factor of multidrug resistant bacteria (%)	21 (53.8)	66 (24.4)	<0.001
APACHE II score	14 ± 11	8 ± 8	<0.001
Nosocomial origin (%)	20 (51.3)	57 (21)	<0.001
Generalized peritonitis (%)	31 (79.5)	100 (26.9)	<0.001
Ongoing antimicrobial therapy (%)	12 (30.8)	38 (14)	0.015
Hemodynamic failure (%)	12 (30.8)	41 (15.1)	<0.001
Upper gastrointestinal tract location (%)	18 (46.2)	78 (28.8)	0.044

CONCLUSIONS. The presence of yeasts in CAP and NPNP was associated with an increase of morbidity and mortality. Only two independent risk factors were similar to those described in ICU patients [2] (upper gastro-intestinal tract location and cardiovascular failure). The high negative predictive value of the score could help not to introduce an empirical antifungal treatment.

REFERENCES. 1. Crit Care Med. 2006; 34: 646–652. 2. Crit Care Med. 2003; 31: 752–757.

0642

CEREBRAL ASPERGILLOSIS IN ADULT CRITICALLY ILL PATIENTS: A DESCRIPTIVE REPORT OF 10 PATIENTS FROM THE ASPICU COHORT

H. Spapen[1], J. Spapen[2], F.S. Taccone[3], G. Dimopoulos[4], J. Rello[5], S. Blot[6], and the AspICU study investigators

[1]University Hospital Brussels, ICU Department, Brussels, Belgium, [2]University Hospital Brussels, Brussels, Belgium, [3]Erasme University Hospital, Brussels, Belgium, [4]Attikon University Hospital, University of Athens Medical School, Athens, Greece, [5]Hospital Universitari Vall d'Hebron, Barcelona, Spain, [6]Ghent University, Ghent, Belgium

INTRODUCTION. An unexpectedly high incidence of invasive pulmonary aspergillosis has been reported in intensive care unit (ICU) patients without underlying immunosuppression. Next to the respiratory tract, the brain is most often affected by invasive aspergillosis. However, little is known about brain involvement by *Aspergillus* in critically ill patients.

OBJECTIVES. To study demographics, risk profile, diagnosis, treatment, and outcome of central nervous system aspergillosis in ICU patients.

METHODS. Retrospective analysis of proven cases of invasive cerebral aspergillosis taken from a cohort of 563 adult patients in whom *Aspergillus* involvement was evidenced during their ICU stay.

RESULTS. Ten patients with central nervous system aspergillosis were identified. All had one or more host factors predisposing for invasive aspergillosis. Clinical presentation was subtle and, apart from unexplained fever, mostly devoid from "classical" neurological manifestations. All but one patient had proven or probable/putative invasive pulmonary aspergillosis. On cerebral CT scanning, lesions appeared to be either solitary and hyperdense or were multiple and randomly distributed throughout the brain. One patient presented with sole meningeal infestation. *Aspergillus* infection was confirmed by brain biopsy in three subjects. Voriconazole was used as primary treatment in only half of the patients. Nine patients died, six of them receiving antifungal treatment for <2 weeks.

CONCLUSIONS. Central nervous system aspergillosis was not frequently observed in adult ICU patients. Diagnosis should be considered in patients at risk presenting with proven or probable/putative invasive pulmonary aspergillosis in association with suggestive neuroradiological findings. The brain most likely was affected through haematogenous dissemination from the lungs. Current treatment recommendations were not always applied and outcome remains dismal.

GRANT ACKNOWLEDGMENT. The AspICU project received an unrestricted educational grant from Pfizer Belgium and a research grant from the Special Research Fund of Ghent University.

0643

THE PROTECTIVE EFFECT OF PROTEASE INHIBITORS ON LIVER MITOCHONDRIA IN INVASIVE CANDIDA INFECTION MICE

S. Huang[1], X. Li[1]

[1]The First Affiliated Hospital of Sun Yat-Sen University, SICU, Guangzhou, China

OBJECTIVES. To investigate the effects and mechanism of Ulinastatin (UTI) combined with antifungal agents in treatment of invasive candidiasis (IC).

METHODS. 60 Kunming mice were randomly assigned to control group, low-dose group and high-dose group (each n = 20). The model of IC was reproduced by intraperitoneal injection of White monilial suspension after CTX pretreatment. Mice in control group were treated with antifungal agents. Mice in low-dose group and high-dose group were treated with UTI (10^4 or 5×10^4 U/kg) and antifungal agents. To observe the three groups of mitochondria generate indicators and nitride stress indicators in 7 days were compared among these groups.

RESULTS. In 7th days, PGC-1α mRNA of high-dose group was significantly higher than the low-dose group and the control group (2.12 ± 0.24 vs 1.52 ± 0.22 vs 0.64 ± 0.12, p < 0.05).There was no significantly difference in PGC-1α mRNA between the low-dose group and the control group (1.52 ± 0.22 vs 0.64 ± 0.12, p > 0.05). In 7th day, the nitride stress indicators (NO, Total NO and iNOS) in high dose group was significantly lower than the low-dose group and the control group (0.5 ± 0.1 vs 1.6 ± 0.3 vs 2.8 ± 0.5,1.2 ± 0.2 vs 2.5 ± 0.2 vs 4.2 ± 0.5, 0.6 ± 0.1 vs 1.0 ± 0.5 vs 3.8 ± 0.4, p < 0.05). There was no significantly difference in nitride stress indicators between the low-dose group and the control group in 7th days (p > 0.05).

CONCLUSIONS. By inhibiting nitride stress, Ulinastatin protects liver mitochondria and promotes liver mitochondria generate in invasive candida infection mice.

REFERENCES. 1. Pfaller MA, Diekema DJ. Epidemiology of invasive candidiasis: a persistent public health problem. Clin Microbiol Rev. 2007; 20: 133–163. 2. Singer M. Mitochondrial function in sepsis: acute phase versus multiple organ failure. Crit Care Med. 2007; 35(91): S441–448. 3. Ken-ichiro Inoue, Hirohisa Takano, Rie Yanagisawa, et al. Protective effects of urinary trypsin inhibitor on systemic inflammatory response induced by lipopolysaccharide. J Clin Biochem Nutr. 2008; 43: 139–142. 4. Masaaki Ueki, Satoshi Taie, Kousuke Chujo, et al. urinary trypsin inhibitor reduces inflammatory response in kidney induced by lipopolysaccharide. J Biosc Bioeng. 2007; 104: 315–320. 5. Zhou LW, Wang YL, Yan XT, et al. Urinary trypsin inhibitor treatment ameliorates acute lung and liver injury resulting from sepsis in a rat model. Saudi Med J. 2008; 29(3): 369–373. 6. Hirohisa Takano, Ken-ichiro Inoue, Akinori Shimada, et al. Urinary trypsin inhibitor protects against liver injury and coagulation pathway dysregulation induced by lipopolysaccharide/D-galactosamine in mice. Lab Invest. 2009; 89: 833–839.

GRANT ACKNOWLEDGMENT. Medical Research Fund of Guangdong Province (A2010150), college students in Guangdong Province innovative experiment plan (2010), Techpool Research Fund (01200909), Sun Yat-sen University students amateur Scientific Research Fund (2010045).

0644

POSTPONING THE ADMINISTRATION OF PARENTERAL NUTRITION REDUCES THE NEED FOR ANTIFUNGAL THERAPY: A POST-HOC ANALYSIS OF THE EPANIC CLINICAL TRIAL

T. Fivez[1], M.P. Casaer[1], S. Vanderheyden[1], P. Wouters[1], F. Beyls[1], T. De Rijdt[2], G. Van den Berghe[1], D. Mesotten[1]

[1]KU Leuven, Intensive Care Medicine, Leuven, Belgium, [2]KU Leuven, Department of Pharmacy, Leuven, Belgium

INTRODUCTION. In a large randomized controlled trial, postponing parenteral nutrition, when enteral nutrition was insufficient (Late-PN), enhanced recovery as compared to Early-PN (1). The duration of ICU dependency and organ dysfunction was shortened by Late-PN. Moreover, the incidence of ICU acquired infections was significantly reduced from 26.2 to 22.8 %. PN use is associated with fungemia and is a factor in the candida score for early antifungal treatment (2). However costs may be high as often prolonged administration of sometimes expensive antifungal drugs is needed.

OBJECTIVES. To analyze the impact of Late-PN on the need for antifungal drugs.

METHODS. This post hoc analysis of antifungal drug costs is based on prospectively collected pharmacy warehouse data in the participating hospitals. The pharmacy warehouse collaborators were blinded for the study intervention (3).

Patients' pharmacy costs were classified by the Anatomic Therapeutic Chemical (ATC) system. Total systemic antifungal drug (ATC J02A) costs during hospitalization were split in costs generated during ICU stay and after ICU discharge. Between group differences were compared by mean drug costs per patient (*t* test) and the distribution of costs was analyzed by medians and interquartile range (IQR) and Mann–Whitney U test.

RESULTS. Pharmacy costs were available for all patients in the intention-to-treat population (n = 4,640). Total costs for systemic anti-fungal drugs during the entire hospitalization were 606180,04 EUR with Late-PN as compared to 1017399,54 EUR with Early-PN. This is a mean reduction of 179,67 EUR per patient (p = 0.015).

Baseline characteristics (including type and severity of disease) of patients requiring antifungal drugs in ICU were comparable in the Late and Early-PN group. In the ICU, Late-PN reduced the mean anti-fungal cost per patient by 107,87 EUR (p = 0.049). This reduction was not explained by the proportion of patients who received one ore more doses of antifungal drugs in the ICU: 13.8 % (321/2328) with Late PN versus 14,6 % (337/2312) with Early-PN (p = 0.44). However, in these treated patients, the median and IQR of antifungal therapy costs in ICU were 69,01 [31,62 - 313,57] in the Late-PN group as compared to 106,40 (37,39–736,69) EUR in the Early-PN group (p < 0.001).

CONCLUSIONS. Postponing parenteral nutrition in the ICU reduced total in-hospital antifungal drug costs. In ICU, cumulative antifungal drug costs in Late-PN patients requiring therapy were much lower. Whether this is caused by shorter treatment or a reduced need for higher generation antifungal is yet unknown. Both would possibly reflect fewer patients suffering from invasive fungal infections.

REFERENCES. 1. Casaer MP ea. N Engl J Med. 2011. 2. Pasero D ea. ICVTS. 2011. 3. Vanderheyden S ea. Crit Care 2012.

GRANT ACKNOWLEDGMENT. FWO-Vlaanderen, Methusalem.

0645

THE IMMUNE RESPONSE AFTER STIMULATION WITH WALL COMPONENTS OF FUNGI

S. Aloizos[1], E. Tsigou[2], P. Myrianthefs[2], S. Gourgiotis[1], A. Tsakris[3], G. Baltopoulos[2]

[1]NIMTS Hospital, Athens, Greece, [2]Agioi Anargiroi Hospital, Athens, Greece, [3]Athens Medical School, Athens, Greece

INTRODUCTION. Although fungi are a leading cause of serious infections, induction of inflammation by fungi has not been extensively studied.

OBJECTIVES. The purpose of this study was to evaluate the immune response of patients (pts) susceptible to infection by fungi after ex vivo provocation using wall components of fungi (mannan) and to compare the reaction to the one of healthy volunteers.

METHODS. Blood sample was obtained from ten healthy volunteers, ten pts with end stage chronic renal failure (ESRD-CRF) immediately before hemodialysis, 10 pts with type II diabetes mellitus (DM) and ten Intensive Care Unit (ICU) pts on the 2nd day of hospitalization, who suffered non septic Systemic Inflammatory Response Syndrome and had an Acute Physiology and Chronic Health Evaluation II score >25. After suitable treatment the samples were incubated with 100 mg of mannan for 8 h and maintained at −20 °C until the

measurement of the cytokines TNF-α, IL-6, IL-1b, and IL-10, using the ELISA method. The results are presented as mean values ± SEM, the variation of each cytokine for each group of patients was assessed by Student′s t-test and the differences between the four groups with ANOVA. Graph Pad 4.0 was used for data analysis.

RESULTS. Baseline cytokine values in the three groups were increased compared to control group, but the difference was statistically significant only for the ICU group (Table 1). The quotient IL-10/IL-6 of baseline values was found between 0.23 and 0.96 among healthy, hemodialysis, and diabetic persons, while the quotient was 1.32 among severely ill pts. In all examined groups, the levels of cytokines increased significantly after stimulation with mannan, with a differential expression between examined groups (five–seven-folds for ICU pts and ten–twenty-one-folds for the other groups).

Table 1 Levels of cytokines before and after stimulation

Values in pg/ml	Control Baseline	Control Mannan	ESRD Baseline	ESRD Mannan	DM Baseline	DM Mannan	ICU Baseline	ICU Mannan
TNF-α	5.70 ± 0.80	110.00 ± 17.89	24.90 ± 5.92	459.10 ± 91.41	15.80 ± 2.93	293.40 ± 57.26	337.10 ± 60.64	2,354.00 ± 518.10
IL-6	8.90 ± 0.76	156.00 ± 18.63	86.60 ± 45.55	842.10 ± 35.37	15.90 ± 1.89	176.00 ± 28.92	372.40 ± 120.6	2,385.00 ± 741.10
IL-1β	4.30 ± 0.56	75.80 ± 11.07	23.50 ± 7.32	487.20 ± 72.82	14.30 ± 2.35	274.30 ± 64.40	277.10 ± 53.36	1,722.00 ± 383.10
IL-10	3.00 ± 1.08	38.60 ± 9.54	19.20 ± 7.14	295.90 ± 94.77	15.30 ± 2.08	266.70 ± 62.08	492.60 ± 66.72	2,812.00 ± 343.70

CONCLUSIONS. Severely ill pts and secondarily hemodialysis and diabetic pts are in a pro-inflammatory state. The response of all pts groups was tested as sufficient and comparable to that of healthy individuals, with a different cytokine production capacity between examined groups, reflecting different immune status.

REFERENCES. 1. Monerret G, et al. Medical mycology. 2011; 49: S17–23.

0646

EPIDEMIOLOGY OF FUNGAL INFECTION IN MEDICO-SURGICAL ICU: OBSERVATIONAL STUDY

M.A. Mikaszewska-Sokolewicz[1], A. Roziewska[2], A. Sawicka[2], T. Lazowski[2], M. Mikaszewska[2]

[1]The Medical University Warsaw, 1st Clinic of Anaesthesiology and Intensive Care, Warsaw, Poland, [2]The Medical University Warsaw, Warsaw, Poland

INTRODUCTION. Invasive fungal infection are increasingly common in ICU population. Morbidity and mortality remains very high despite new diagnostic and therapeutic possibilities.

OBJECTIVES. Epidemiology of fungal infections on admission and acquired during ICU stay.

METHODS. Prospective observational study of population of patients hospitalized in medico-surgical ICU in 18 month period.

RESULTS. There were 352 patients admitted to ICU; 33 medical and 49 surgical patient were admitted to ICU with fungal infection. During ICU stay 47 patient acquired fungal infection. *Candida albicans* was the most frequent pathogen (88 %) followed by *Candida glabrata* and *Candida parapsilosis*. Invasive aspergillosis was diagnosed in four patients. Previous exposure to steroid and antibiotics was the main predisposing factor. Positive blood cultures were obtained in 10 % of patients. Severity scores and mortality was highest in Aspergillosis. Susceptibility to fluconazole was observed in 64 % of *Candida albicans*. Appropriate antifungal therapy was implemented in 80 % of patients hospitalized longer than 3 days in the ICU. Suboptimal fluconazole dose was given to 62 % of patients. Mortality rate was highest in Aspergillosis (100 %) and candida glabrata infection. Immunosuppression, diabetes and shock were independently associated with death in the ICU.

CONCLUSIONS. Mortality in fungal infection remains very high despite progress in diagnosing and treatment possibilities. Suboptimal dosing of antifungal medication is worrisome and may be responsible for high treatment futility rate

REFERENCES. Leroy O, Gagneux JP, Montraves P et al. Epidemiology, management, and risk factors for death of invasive *Candida* infections in critical care: a multicenter, prospective, observational study in France (2005–2006). Crit Care Med. 2009; 37: (5):1612–1618.

GRANT ACKNOWLEDGMENT. PROSAFE 2007331.

0647

ÉPICO PROJECT DEVELOPMENT OF EDUCATIONAL RECOMMENDATIONS USING THE DELPHI TECHNIQUE ON INVASIVE CANDIDIASIS IN NON NEUTROPENIC CRITICALLY ILL ADULT PATIENTS

R. Zaragoza[1], R. Ferrer[2], P. Llinares[3], E. Maseda[4], A. Rodriguez[5], THE EPICO PROJECT GROUP

[1]Hospital Universitario Dr. Peset, Sepsis Unit, Intensive Care Unit, Valencia, Spain, [2]Hospital Universitario Mutua de Tarrasa, ICU, Tarrasa, Spain, [3]Hospital Universitario Juan Canalejo, Infectious Diseases, A Coruña, Spain, [4]Hospital Universitario La Paz, Anestesiology, Madrid, Spain, [5]Hospital Universitari Joan XXIII, ICU, Tarragona, Spain

INTRODUCTION. Although there has been an improved management of Invasive Candidiasis in the last decade, still controversial issues remains, specially in the diagnostic and therapeutic approach.

OBJECTIVES. We sought to identify the core clinical knowledge and to achieve high agreement recommendations required to care for critically ill adults patients with invasive candidiasis.

METHODS. Prospective Spanish survey reaching consensus by the Delphi technique, conducted anonymously by electronic e-mail in a first term to 25 *national* multidisciplinary experts in invasive fungal infections from five national scientific societies including intensivists, anesthesiologists, microbiologists, pharmacologists and infectious diseases specialists, answering 47 questions prepared by a coordination group after an a strict review of literature in the last 5 years. The educational objectives spanned five categories, including epidemiology, diagnostic tools, prediction rules, treatment and deescalation approach. The agreement among panellist in each item should be higher than 75 % to be selected. In a second term, after extracting recommendations from the selected items, a presential meeting was performed where more than 80 specialists in a second round were invited to validate the preselected recommendations.

RESULTS. In the first term 20 recommendations were preselected (Epidemiology 4, scores 3, diagnostic tools 4, treatment 6 and de-escalation approach 3). After the second round the following 12 were validated

Epidemiology (2): Think on Candidiasis in your ICU and do not forget that non- albicans species also exist.

Diagnostic tools (4): Blood cultures should be extracted under suspicion each 2–3 days, and if positive each 3 days until the first negative one. Obtain sterile fluids and tissue if possible (direct examination of sample is important). Use non culture microbiological tools if you can. Determination of antifungal susceptibility is mandatory.

Scores (1): As screening tool in high risk patients use Candida score and determine multi colonization.

Treatment (4): Start early. Choose Echinocandins. Withdraw the catheter. Fundoscopy is needed.

De-escalation (1): Only applied when knowing susceptibility and after 3 days of clinical stability. The higher rate of agreement was achieved in the optimization of microbiological tools and the withdrawal of catheter whereas the lower rate corresponded to deescalation therapy and the use of scores.

CONCLUSIONS. Care of Invasive candidiasis in ICU patients requires a broad range of knowledge application and skills that our recommendations resume. These recommendations may help to identify the potential patients, to standardize the global management of these patients and improve their outcome based on DELPHI methodology.

0648

STUDY OF THE ASSOCIATION BETWEEN THE TYPE OF ANTIFUNGAL MEDICATION AND THE CAUSE OF PRESCRIPTION WITH THE PROGNOSIS OF THE CRITICAL PATIENT

V. Trasmonte[1], D. Pérez[1], V. Jerez[1], M. Robles[1], P. Martínez[1], P. Nieto[1], M.Á. Santiago[1], B. Amores[1], B. Bermejo[1], V. Farje[1], J.A. Rubio[1], J. Ballesteros[1], J.D. Jiménez[1], Á. López[1], R. Bayo[1], J.A. Juliá[1]

[1]Hospital Infanta Cristina, Intensive Care Unit, Badajoz, Spain

INTRODUCTION AND OBJECTIVES. The purpose of this poster is to determine if either the use of certain types of antifungal medications or the cause of the prescription have an influence in the prognosis of the critical patient.

METHODS. Retrospective observational study based on the patients treated with antifungal therapy in our Intensive Care Unit between 01/01/2010 and 12/12/2012. The patients were treated as prophylactic, empiric or therapeutic therapy.

RESULTS. 161 patients (micafungin 26.7 %, amphotericin B 6.2 %, anidulafungin 18.6 %, caspofungin 9.9 %, voriconazole 26.1 %, fluconazole 12.4 %), female 38.5 % (62/161). Mean age 58 ± 14.8. The average pre-admission APACHE II: 18.5 ± 7 and SOFA: 6.4 ± 3.4. Diabetes mellitus and prior steroid treatment were the most frequent findings in the medical history. The beginning of the treatment was empiric in 50 %, prophylactic in 40 % and therapeutic in 10 %. The mortality was 44 % during this period (72 patients).

We found statistically significant differences with regard to:

-The most commonly used as prophylactic therapy was anidulafungin (32.3 %), as empiric voriconazole (33.8 %) and fluconazole as therapeutic treatment (37.5 %) ($p = 0.002$)

-Despite micafungin was the antifungal agent most commonly used in surgery patients, a statistical significance was only observed in patients who underwent surgery for tertiary peritonitis ($p = 0.016$). If extrarenal depuration procedures were required, micafungin was the most commonly used antifungal (56 %, $p < 0.002$).

-Micafungin was also the most commonly used antifungal in patients with multi-colonization (46.2 % $p = 0.016$), and its use was higher with statistical significance in multi-colonized patients who developed invasive fungal infections (IFIs).

-Statistically significant differences with regard to death rate were observed for each antifungal agent ($p = 0.03$).

-Mortality was higher in the group of patients treated with empiric (48.3 %) or prophylactic (40.4 %) antifungal therapy than in those with therapeutic strategy (11.3 %), but this association was not statistically significant ($p = 0.8$). The need for mechanical ventilation in the three different groups showed a similar association as mortality.

CONCLUSIONS. Although a high morbi-mortality was noted, we observed that the therapeutic strategy is associated with lower mortality rates and need for mechanical ventilation. Death rate was higher in the group treated with micafungin, probably related to the greater severity of those patients (more preadmission risk factors, higher APACHE II and SOFA scores, more surgery procedures and extrarenal depuration procedures, longer duration of mechanical ventilation and higher rates of IFIs). Echinocandins were the antifungal agents more commonly used in the critical patient, whereas we used azoles for therapeutic treatments aimed at certain fungal infections.

0649

THE PROTECTIVE EFFECT OF PROTEASE INHIBITORS ON LIVER IN INVASIVE CANDIDIASIS MICE

S. Huang[1], X. Li[1]

[1]The First Affiliated Hospital of Sun Yat-Sen University, SICU, Guangzhou, China

OBJECTIVES. To investigate the effects and mechanism of Ulinastatin (UTI) combined with antifungal agents in treatment of Invasive Candidiasis (IC).

METHODS. 60 Kunming mice were randomly assigned to control group, low-dose group and high-dose group (each n = 20). The model of IC was reproduced by intraperitoneal injection of White monilial suspension after CTX pretreatment. Mice in control group were treated with antifungal agents. Mice in low-dose group and high-dose group were treated with UTI (10^4 or 5×10^4 U/kg) and antifungal agents. To observed survival and liver enzymology and liver morphological changes were compared among these groups in 7 days.

RESULTS. Invasive candidiasis mouse model was successfully made. In 7 days, survival of the high dose group was significantly higher than that of the control group (70 vs. 30 %, $p = 0.011$). In 7th days, total bilirubin, aspartate aminotransferase and alanine aminotransferase in high dose group were significantly lower than low dose group and the control group (12.1 ± 1.9 vs. 18.9 ± 2.6 vs. 21.0 ± 2.4, 624.8 ± 89.5 vs. 1,026.1 ± 162.5 vs. 1,633.4 ± 160.2, 426.5 ± 78.0 vs. 934.9 ± 49.1 vs. 1,494.1 ± 123.1, $p < 0.05$). Total bilirubin, aspartate aminotransferase, alanine aminotransferase were no significantly difference between low-dose group and the control group (18.9 ± 2.6 vs. 21.0 ± 2.4, 1,026.1 ± 162.5 vs. 1,633.4 ± 160.2, $p > 0.05$). Under microscope after H&E staining, liver sinusoidal congestive in the high-dose group was better than the control group. Under the electron microscope, liver mitochondrial integrity in the high-dose group was better than the control group.

CONCLUSIONS. Ulinastatin can improve the mice survival and reduce liver injury on invasive candida infections in 7 days.

REFERENCES. 1. Pfaller MA, Diekema DJ. Epidemiology of invasive candidiasis: a persistent public health problem. Clin Microbiol Rev. 2007; 20: 133–163. 2. Olivier Leroy, Jean-Pierre Gangneux, Philippe Montravers, et al. Epidemiology, management, and risk factors for death of invasive Candida infections in critical care: a multicenter, prospective, observational study in France (2005–2006). 2009; 37(5): 1612–1618. 3. Singer M. Mitochondrial function in sepsis: acute phase versus multiple organ failure. Crit Care Med. 2007; 35(91): S441–448. 4. Ken-ichiro Inoue, Hirohisa Takano, Rie Yanagisawa, et al. Protective effects of urinary trypsin inhibitor on systemic inflammatory response induced by lipopolysaccharide. J Clin Biochem Nutr. 2008; 43: 139–142. 5. Masaaki Ueki, Satoshi Taie, Kousuke Chujo, et al. Urinary trypsin inhibitor reduces inflammatory response in kidney induced by lipopolysaccharide. J Biosci Bioeng. 2007; 104: 315–320.

GRANT ACKNOWLEDGMENT. Medical Research Fund of Guangdong Province (A2010150), college students in Guangdong Province innovative experiment plan (2010), Techpool Research Fund (01200909), Sun Yat-sen University students amateur Scientific Research Fund (2010045).

0650

EFFECTS OF CASPOFUNGIN ON RENAL FUNCTION IN CRITICALLY ILL CHILDREN

V. Van Gorp[1], R. Mauel[1], M. Diltoer[1], E. De Waele[1], H. Spapen[1], P.M. Honoré[1]

[1]Universitair Ziekenhuis Brussel, Intensive Care, Jette, Belgium

INTRODUCTION. Caspofungin may cause renal injury in adult ICU patients. The effect of this antifungal drug on kidney function in critically ill children has not been described.

OBJECTIVE. To study renal function before and after treatment with caspofungin in a cohort of children hospitalized in a paediatric intensive care unit (PICU).

METHODS. Over a 3-year period, we retrospectively studied all consecutively admitted PICU patients who received caspofungin. Baseline pathology, demographic characteristics, and PRISM scores were recorded. Dose and duration of antifungal therapy were noted. Renal function (blood urea nitrogen (BUN), creatinine and urinary output [mL/kg/h]) was monitored before start of caspofungin (T0), at day 1 of treatment (T1), at the end of therapy (T2), and at ICU discharge (T3). ANOVA was used to compare renal function parameters at the different time points. Electrolytic disturbances, C-reactive protein (CRP), potential side-effects of caspofungin and occurrence of adverse events were recorded.

RESULTS. 12 children, 6 male, mean age 7 years (range 0.16–15 years) were included. Mean duration of ICU stay was 24 days (range 4–102 days). Mean duration of caspofungin treatment was 11 days (range 1–33 days). No difference in renal function was observed between the T0, T1, T2 and T3 time points (BUN [$p = 0.217$], creatinine [$p = 0.337$] and urinary output [$p = 0.775$]). CRP values also did not change significantly over time ($p = 0.722$). Levels of significant ions (sodium, potassium, chloride, and phosphorus) did not differ between time points.

CONCLUSION. Caspofungin did not cause significant renal injury in critically ill children. Since our observations are based on easily accessible biological parameters, further studies, e.g. using biomarkers of kidney function, should be considered to definitely proof that caspofungin does not harm the kidney.

0651

INVASIVE FUNGAL INFECTION IN A PICU

S. Ilia[1], L. Vogiatzi[2], A.M. Spanaki[1], E. Vasilaki[1], E. Geromarkaki[1], D. Fytrolaki[1], E. Blevrakis[1], V. Chatzidaki[1], G. Briassoulis[1]

[1]University of Crete/University Hospital, PICU, Heraklion, Greece, [2]Hippokration Hospital/Aristotelion University of Thessaloniki, Thessaloniki, Greece

INTRODUCTION. Candidemia is an emerging bloodstream infection (BSI), but little is known on its course in hospitalized critically ill children.

OBJECTIVES. In this study we investigated predisposing factors, clinical characteristics and outcome of invasive candidiasis in a Pediatric Intensive Care Unit (PICU).

METHODS. Retrospective study of invasive candida episodes occurred in critically ill children hospitalized in our PICU during 2005–2012. For each case, two PICU patients without invasive fungal infection hospitalized at the same period having similar length of stay served as controls.

RESULTS. 12 patients with candidemia were identified (6.4/1,000 admissions, male: female 1:1) with median age 8.35 (0.25–17) years, length of PICU stay (LOS) 44 (14–137) days, and LOS prior to infection 21 (11–54) days. Study group did not differ from controls in either severity of illness (PRISM 10.25 ± 4.29 vs. 11.3 ± 6.5) or day-28 mortality (8 vs. 4 %). Non-albicans (58 %) did not differ from albicans Candida BSI regarding mortality ($p = 1.0$) or LOS ($p = 0.78$). *C. parapsilosis* was the most common non-albicans isolate (43 %) followed by *C. tropicalis* (29 %). An incidence rise in the last 4 years was noted compared to previous 4 years (4 cases vs. 3 cases), yet small numbers did not allow for reliable analysis. Most patients with candidemia had an underlying disease compared to controls (83.3 vs. 29.1 %, $p = 0.004$). Mechanical ventilation, urine catheter, central venous catheter, total parenteral nutrition, surgery, and history of malignancy, as risk factors, did not differ between study group and controls (75 vs. 66.6 % $p = 0.71$, 100 vs. 83.3 % $p = 0.28$, 100 vs. 71 % $p = 0.07$, 50 vs. 21 % $p = 0.12$, 16.6 vs. 21 % $p = 1.0$, 8 vs. 0 % $p = 0.33$, respectively). Previous colonization of candida ($\geq$1 site) was reported in nine cases vs. 11 controls ($p = 0.16$). All patients, in both groups, had received antibiotics with anaerobic activity prior to candidemia. Previous antifungal treatment was not significantly associated with fungal BSI.

CONCLUSIONS. Candidemia shows an increasing trend, especially with non-albicans species, and becomes a common cause of BSI in critically ill children. Multicenter studies are urgently needed to identify children at high risk and redraw preventive measures.

REFERENCE(S). 1. Zaoutis T. Candidemia in children. Curr Med Res Opin. 2010; 26(7):1761–1768. 2. Zaoutis TE, Prasad PA, Localio AR, Coffin SE, Bell LM, Walsh TJ, et al. Risk factors and predictors for candidemia in pediatric intensive care unit patients: implications for prevention. Clin Infect Dis. 2010; 51(5): e38–e45. 3. Filioti J, Spiroglou K, Panteliadis CP, Roilides E. Invasive candidiasis in pediatric intensive care patients: epidemiology, risk factors, management, and outcome. Int Care Med. 2007; 33(7):1272–1283.

Surviving intensive care: 0652–0665

0652

CARDIAC ARREST IN CORONAROPATHIC PATIENTS: IMPROVEMENT OF SURVIVAL AFTER IMPLEMENTATION OF NEW TREATMENT PROCEDURES IN THE MONZA AND BRIANZA AREA

L. Avalli[1], M. Scanziani[1], A. Coppo[1], E. Lupieri[1], M. Avogadri[1], B. Cortinovis[1], T. Mauri[2], G. Rossi[1], A. Pesenti[2]

[1]San Gerardo Hospital, Monza, Italy, [2]University of Milan-Bicocca, Monza, Italy

INTRODUCTION. Out of Hospital Cardiac Arrest (OHCA) in patients suffering by ischemic coronary arteries disease (CAD) from Monza and Brianza (MB) area (a highly populated northern Italy region) was associated with extremely poor prognosis in 2003. Since 2006, thanks also to release of new international OHCA treatment guidelines in 2005, a program of widespread use of Automated External Defibrillation, dispatcher-assisted cardio-pulmonary resuscitation (CPR) and therapeutic hypothermia started in the MB area.

OBJECTIVES. We hypothesized that implementation of such program might have had relevant impact on outcome of coronaropathic OHCA patients.

METHODS. We analyzed data collected in the OHCA registry of the MB area between September 2007 and August 2011 and compared them with data from 2003, including only adult patients with OHCA and proven history of ischemic CAD. We compared 28-day survival and described factors associated with favorable outcome in latest observation years.

RESULTS. In 2007–2011 study period, 1,110 OHCA events occurred in the MB area, 471 of which in patients with ischemic CAD. Compared with the 178 patients studied in 2003, survival increased from 5.8 to 13.8 % ($p < 0.0001$). In the 2007–2011 group, lower age, No-Flow and Low-Flow times, witnessed event, CPR started by bystanders, rescue by advanced life support teams, shockable rhythm at presentation and ICU length of stay significantly correlated with increased survival. ROC curve analysis showed that lower No-Flow time is an independent predictor of 28-day survival (AUC 0.779, 95 % CI 0.726–0.826; $p < 0.0001$; Fig. 1) and that a cut off No-Flow time $\leq$6 min is associated with 61 % sensitivity and 83 % specificity for survival.

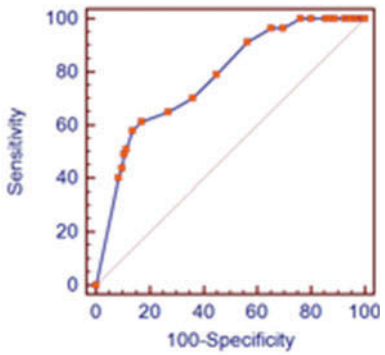


Fig. 1

CONCLUSIONS. Introduction of new procedures like diffuse availability of AED, dispatcher guided CPR and therapeutic hypothermia in MB area significantly increased survival of ischemic OHCA patients, likely by extended myocardial vitality in time and optimized post-arrest end-organ protection. Still, timely arrival of trained CPR team remains critical for patients' survival.

GRANT ACKNOWLEDGMENT. Institutional.

0653

THE IMPACT OF POST-INTUBATION HEMODYNAMIC INSTABILITY ON PATIENT OUTCOMES IN HIGH RISK VASCULAR SURGERY PATIENTS

R.S. Green[1], M.B. Butler[1]

[1]Capital District Health Authority, Division of Critical Care, Halifax, Canada

INTRODUCTION. Post-intubation hemodynamic instability (PIHI) is a common adverse event that has been associated with poor patient outcomes in emergency department endotracheal intubations.

OBJECTIVES. The objectives of this study were to determine the incidence of PIHI and its impact on patient outcomes following tracheal intubation by anesthetists.

METHODS. A structured chart audit was performed of adult patients intubated for a vascular surgery procedure at a Canadian quaternary centre over a 3-year period. Patients were identified and data collated from multiple electronic databases. Data not available electronically was abstracted from the chart by a co-investigator. PIHI was defined as a decrease in systolic blood pressure (SBP) to $\leq$80 mmHg, or a decrease in SBP of $\geq$20 % from baseline, or a decrease in mean arterial pressure to $\leq$50 mmHg, or the initiation of any vasopressor medication at any time in the 15 min following intubation.

To determine the association of PIHI with important patient outcomes, we assessed a composite endpoint of in-hospital mortality, ventilator-free days, inotrope days and length of ICU stay with a multivariate analysis. On multivariate analysis, potential confounding factors (severity of illness and patient morbidities) were controlled for.

RESULTS. Overall, the incidence of PIHI was 60 % (837/1395) in the 1,395 patients were identified from 2007 to 2009. Patients who developed PIHI were similar to those who did not (67.1 years PIHI vs. 67.8 years no-PIHI, $P = 0.294$; proportion male, $P = 0.139$). Patients were generally healthier (ASA $\geq$ 2) in the PIHI group (OR = 2.27; $P = 0.008$; CI: [1.19, 4.65]), but patients in the PIHI group were 2.95 times more likely to require an OR within 24 h (OR = 2.95; $P < 0.0001$; CI: [2.32, 3.76]).

Patients who developed PIHI had increased mortality (8.8 vs. 5.2 %; $P = 0.015$), ICU admission (26.4 vs. 5.4 %; $P < 0.0001$), post-op vasopressor requirements (9.3 vs. 1.6 %; $P < 0.0001$), and post-op ventilation (20.7 vs. 3.8 %; $P < 0.0001$) on univariate analysis. When controlling for confounding conditions, PIHI was not associated with increased mortality (OR = 0.96; $P = 0.878$; CI: [0.54, 1.69]). However, PIHI was associated with increased post-op vasopressor requirements (OR = 3.22; $P = 0.003$; CI: [1.47, 7.03]), ICU admission (OR = 3.25; $P = 0.005$; CI: [1.44, 7.36]) and post-op ventilation (OR = 3.01; $P < .0001$; CI: [1.76, 5.16]).

Patients who developed PIHI were 85 % more likely to develop the composite endpoint (OR = 1.85; P = 0.002; CI: [1.25, 2.73]).
CONCLUSIONS. PIHI occurs in 60 % of vascular surgery patients, and is associated with adverse patient outcomes: need for ICU admission, post-op vasopressor requirement, or post-op ventilation.
Prospective research is required to clarify the importance of PIHI in patients undergoing intubation under general anesthesia.
GRANT ACKNOWLEDGMENT. Partial funding from a Clinician Scientist Award, Dalhousie University, Faculty of Medicine.

0654
EVALUATION OF TIMI AND KILLIP SCALES SUPPLEMENTED WITH AGE IN ST ELEVATION MYOCARDIAL INFARCTION PATIENTS

E. Aguilar-Alonso[1], M.D. Arias-Verdu[2], R. Rivera-Lopez[3], T. Garcia-Paredes[2], F.J. Gomez-Jimenez[4], M. Rojas-Amezcua[4], R. Rivera-Fernandez[2], G. Quesada-Garcia[2]

[1]Hospital Infanta Margarita, Cabra, Spain, [2]Hospital Carlos Haya, Malaga, Spain, [3]Hospital Virgen de las Nieves, Cardiology, Granada, Spain, [4]Granada University, Granada, Spain
INTRODUCTION. The general critical care prognostic indexes have not been systematically applied AMII patients.
OBJECTIVES. To evaluate the usefulness of Killip class, TIMI scale and age for initial risk stratification of patients with ST-elevation myocardial infarction (STEMI).
METHODS. This cohort study used data between 2004 and 2008 from all patients admitted for STEMI to the Carlos Haya Hospital Intensive Care Unit in Malaga (Spain).We analyzed age, sex, Killip class, TIMI points, previous cardiovascular events, location, length of ICU stay, treatment times and ICU and hospital mortality. Data was expressed as mean ± SD for continuous variables and % for qualitative variables. Student's t was used for comparison of two means. ANOVA and Newman–Keuls tests were used for multiple comparisons. The χ^2 test was used to compare proportions. Predictive models were generated using multivariate logistic regression. The area under the ROC curve was used to assess discrimination capacity. $p < 0.05$.
RESULTS. The study cohort consisted of 806 patients, of which 75.6 % male. Mean age was 63.1 ± 12.83 years (3 missing) and TIMI score was 3.57 ± 2.38 points. 656 patients (81.4 %) were classified as Killip 1. ICU mortality was 10.3 % (83 patients) and hospital mortality was 11.3 % (91 patients). Dead patients were older (72.73 ± 10.88 vs. 61.90 ± 12.61 years, $p < 0.001$), higher TIMI score and longer hospital stay.
When age was categorized in intervals according to TIMI scale groups, the mortality was 4.3 % in < 65 years, 13 % in 65–74 years and 25.4 % > 75 years ($p < 0.001$). Mortality was 5.2, 29.6, 35.5, and 81 % for Killip scale 1, 2, 3, and 4, respectively. After multiple linear regression, the relationship between the scale TIMI with Killip, the R was 0.626 and R^2 was 0.369. Including the intervals age variable (by TIMI scale categories), the R is 0.792 and the R^2 was 0.608. 61 % of TIMI scale variability could be explained by Killip class and intervals age variables. Hospital mortality discrimination assessed by area under the ROC curve was 0.832 (0.786–0.878) according TIMI scale, 0.76 (0.698–0.822) according Killip scale, and 0.846 (0.803–0.888) according age-Killip class model.
CONCLUSIONS. TIMI scale discriminates well hospital mortality in STEMI patients. Discrimination capacity was higher than Killip class, but similar to a simple model using Killip class and age. This simple model (with only two variables) can be useful to classify STEMI patients.
REFERENCES. 1. Steg PG, James SK, Atar D, et al. ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. Eur Heart J. 2012; 33(20):2569–619. 2. Morrow DA, Antman EM, Charlesworth A, et al. TIMI risk score for ST-elevation myocardial infarction: a convenient, bedside, clinical score for risk assessment at presentation: an intravenous nPA for treatment of infracting myocardium early II trial substudy. Circulation. 2000; 102(17):2031–2037.

0655
FUNCTIONAL STATUS AT ONE YEAR IN ICU PATIENTS WITH TRAUMATIC BRAIN INJURY AND ITS RELATION WITH CRANIAL CT USING THE MARSHALL CLASSIFICATION

M. Arias-Verdú[1], E. Curiel-Balsera[1], E. Castillo-Lorente[2], J. Mora-Ordóñez[1], A. Muñoz-López[1], C. Aragón-González[1], R. Gutierrez-Rodriguez[1], M.A. Prieto-Palomino[1], R. Rivera-Fernández[1]

[1]Hospital Carlos Haya, Intensive Care Unit, Málaga, Spain, [2]Hospital Neurotraumatologico, Intensive Care Unit, Jaen, Spain
OBJECTIVE. To study the relation between the radiological findings on admission assessed with the Marshall scale and the functional status at 1 year in patients with traumatic brain injury (TBI).
METHODS. A prospective cohort study of patients with TBI admitted to Carlos Haya Hospital, Malaga, between 2004 and 2008.
RESULTS. N = 531. Age 40.35 ± 19.75 years. In-hospital mortality 28.6 %. 1 year mortality 171 (32.2 %), (missing: 6.6 %). At 1 year 22.8 % of the patients had a normal status and 42.7 % had a good evolution (GOS 4-5). These latter were younger (33.75 ± 16.44 vs. 45.35 ± 20.80; $p < 0.001$), had a higher GCS (9.06 ± 3.57 vs. 6.04 ± 3.32; $p < 0.001$) and lower APACHE II (14.47 ± 5.37 vs. 20.06 ± 6.73; $p < 0.001$), and had less severe injuries on the admission CT.
Of 52 patients with diffuse type I injury 63.4 % had a good evolution (GOS 4-5); of 135 with diffuse type II injury 60.7 % had a good evolution, of 126 with diffuse type III injury 36.5 % had good evolution, of 44 patients with diffuse type IV injury 2.3 % had good evolution, of 51 patients with evacuated mass lesion 32.1 % had good evolution and of 30 patients with non-evacuated mass lesion 16.7 % had good evolution. ($p < 0.001$).
Logistic regression showed that the GOS at 1 year coded for two categories (poor and good evolution) was related with the CT injury, with the OR increasing as the injury worsened, (diffuse grade I injury: OR 1; grade II: OR 1.77 [0.42–7.48]; grade III: OR 5.48 [1.39–21.52]; grade IV: OR 22.13 [4.69–104.41]; surgically evacuated mass: OR 8.27 [2.05–33.34]; non-evacuated mass: OR 23.24 [4.10–131.53]); with the ISS: OR 1.04 (1.02–1.07), APACHE II: OR 1.12 (1.06–1.19); length of stay: OR 0.85 (0.81–0.89), GCS: OR 0.83 (0.74–0.93), and age: OR 1.03 (1.01–1.05).
CONCLUSIONS. This study shows a high relation between functional status at 1 year with the type of CT cranial lesion on admission evaluated with the Marshall classification. At 1 year there was a worse functional status in the more severe lesions, given the same age, level of consciousness and severity assessed on admission with the APACHE II and the ISS.

0656
A REVIEW OF THE PERI-OPERATIVE MANAGEMENT OF PATIENTS UNDERGOING AN EMERGENCY LAPAROTOMY AT A UK TERTIARY CENTRE

A.L. Paterson[1], R. Gokhale[1], J. Davies[2], R. Mahroof[1]

[1]John Farman Intensive Care Unit, Addenbrooke's Hospital, Cambridge, UK, [2]Department of Surgery, Addenbrooke's Hospital, Cambridge, UK
INTRODUCTION. Acute general surgical admissions constitute a high-risk patient group that accounts for a significant number of intensive care (ICU) admissions and the largest proportion of surgical deaths[1], with an overall mortality of 13–15 %[2,3].
OBJECTIVES. We explored the care of patients undergoing an emergency laparotomy at a UK tertiary centre, Addenbrooke's Hospital, with particular focus on ease of theatre access, clinician seniority and the location of post-operative care.
METHODS. All laparotomies in patients aged 16 or over undertaken on the emergency list between 1st Aug 2011 and 31st July 2012 were identified. Transplants were excluded but laparotomies for complications following elective or transplant surgery were included.
RESULTS. Over 12 months, 453 emergency laparotomies were undertaken in 388 patients. The median age was 65 (range 16–96) and over 83 % met published criteria[1] for being high-risk (>10 % predicted mortality). The majority, 64 %, were admitted via Accident and Emergency (A&E).
134 (30 %) cases required surgery within an hour and a further 169 (37 %) cases within 6 h. A significant minority of laparotomies, 124 (27 %), were started out-of-hours (10 p.m.–8 a.m.); 77 % of these had required surgery within 6 h. A consultant surgeon was present in 87 % of laparotomies whilst a consultant anaesthetist was present in 43 %.
Post-operatively, 202 (45 %) patients were transferred to the ICU and a further 72 (16 %) to a High-Dependency Unit. The median APACHE II score for ICU admissions was 16 (range 4–33); 80 % required mechanical ventilation and 32 % renal replacement therapy. However the median length of ICU stay was short, 3 days (range 1–75).
The in-hospital mortality was 38/388 (10 %), including three intra-operative deaths. 30/35 (86 %) patients had been managed on the ICU post-operatively and 23/35 (66 %) deaths occurred on the ICU.
The median length of hospital stay (LoS) was 15 days. Tertiary centre referrals had the longest median LoS (29 days) and A&E admissions the shortest (13 days).
CONCLUSIONS. This is the largest UK single-centre review of outcomes following an emergency laparotomy. Over 80 % of patients had a predicted mortality in excess of 10 % at presentation. Consultant surgeon presence intra-operatively was excellent, whilst that of a Consultant anaesthetist was lower and is under review. 45 % of patients were managed on ICU post-op, usually for a short duration; with 61 % overall receiving Level 2 or 3 care. An overall mortality of 10 % confirms the high-risk nature of an emergency laparotomy but compares favourably to published data[2,3].
REFERENCES. 1. The higher risk general surgical patient—towards improved care for the Forgotten Group. RCS 2011. 2. Knowing the risk: a review of the peri-operative care of general surgical patients. NCEPOD 2010. 3. Variations in mortality after emergency laparotomy: The First Report of the UK Emergency Laparotomy Network. Brit J Anaesth. 2012; 109(3) 368–75.

0657
THE STRONG ION GAP AS PREDICTOR OF SURVIVAL IN THE EMERGENCY DEPARTMENT

J. Grundlingh[1], C. Episkopos[2], B. Bloom[1], T. Harris[1]

[1]Barts Health NHS Trust, London, UK, [2]Queen Mary, University of London, London, UK
INTRODUCTION. With the advent of the different methods of interpretation of blood gas abnormalities, there has been debate regarding which method best predicts survival. The classic methods of interpretation have been well established as reliable, but have now been superseded by the Stewart approach. This approach has been shown to be better at predicting mortality in the paediatric intensive care setting (1) and is also better at identifying the cause of the disturbance by analysing the underlying biochemical abnormalities. Correlation of the Stewart approach with hospital survival in an adult emergency department setting has never been studied before and it is unknown whether this method can be used as a modifiable treatment end-point.
OBJECTIVES. Our objective was to evaluate the different methods of blood gas interpretation (base excess, bicarbonate, anion gap, corrected anion gap and strong ion gap) and compare which method was better at predicting survival at 28 days in adults presenting to an Emergency Department.
METHODS. A convenience sample of patients presenting to the Emergency Department who had arterial and venous blood gas analysis performed (AVL800 flex, *Radiometer*) were included. The presence of a metabolic acidosis as described by the different methods of interpretation was correlated with outcome. Patients were followed up to hospital discharge or death and the primary outcome was survival at 28 days.
RESULTS. A total of 98 patients were included in the study of which 18 (18.7 %) were dead at 28 days. The strong ion gap was 100 % sensitive for death at 28 days and had a negative predictive value of 100 %. The sensitivity of the combined actual base excess, bicarbonate and corrected anion gap was 55.6 % with a negative predictive value of 80.5 %. The sensitivity of the combination of base excess and bicarbonate approach was 50 % with a negative predictive value of 83 %.
CONCLUSIONS. The strong ion gap method of blood gas interpretation was better than all other methods at predicting 28-day survival in this group of patients. The Stewart method of blood gas analysis should be regularly calculated and included in routine blood gas analysis in the Emergency Department if it is to be used as a predictor of survival.
REFERENCES. 1. Balasubramanyan N, Havens PL, Hoffman GM. Unmeasured anions identified by the Stewart–Fencl method predict mortality better than base excess, anion gap and lactate in patients in the paediatric intensive care unit. Crit Care Med. 1999; 27:1577.

0658
ACUTE CARE INDEX OF FUNCTION PREDICTS HOSPITAL DISCHARGE DESTINATION IN INTENSIVE CARE PATIENTS EXPECTED TO BE VENTILATED FOR GREATER THAN 72 HOURS

S. Latham[1], M. Green[2,3], I. Mitchell[1,2], I.A. Leditschke[1,2], B. Bissett[3,4], T. Neeman[5]

[1]Australian National University Medical School, Canberra, Australia, [2]Intensive Care Unit Canberra Hospital, Canberra, Australia, [3]Department of Physiotherapy Canberra Hospital,

Canberra, Australia, [4]Department of Physiotherapy University of Canberra, Canberra, Australia, [5]Australian National University, Statistical Consulting Unit, Canberra, Australia
INTRODUCTION. Over the last decade there has been increasing recognition of the long term adverse functional sequelae for intensive care unit (ICU) survivors, particularly in the physical domain [1–3]. However assessment of outcomes has been hampered by the lack of tools validated for the assessment of functional status in critically ill patients. The Acute Care Index of Function [4] (ACIF) has been extensively used and validated in patients with acute brain injury [5] and has been found to be feasible, reliable and sensitive to change in function and provides objective information for use in determining an appropriate discharge destination [4–6].
OBJECTIVES. We performed this study to determine whether ACIF reflects changes in functional status in critically ill patients at different time points during hospital admission and to investigate the utility of ACIF at ICU discharge in predicting hospital discharge destination.
METHODS. A prospective, observational study of all adult patients admitted over 5 months to a single centre tertiary ICU with a predicted mechanical ventilation time of >72 h was performed. Main outcome measures were ACIF at ICU admission, ICU discharge and hospital discharge, and hospital discharge destination.
RESULTS. 67 patients were analyzed. Mean total ACIF increased from 0.08 (SD 0.11) at ICU admission to 0.39 (SD 0.25) at ICU discharge ($p < 0.001$), with a further increase to 0.79 (SD 0.28) at hospital discharge ($p < 0.001$–ICU discharge to hospital discharge). Mean total ACIF at ICU discharge was significantly higher in the 26 patients discharged home from hospital compared to those transferred to another hospital or rehabilitation unit (24 patients), palliative care (2 patients) or deceased (5 patients). A receiver operating characteristic curve demonstrated that an ICU discharge total ACIF > 0.4 predicted discharge home with a sensitivity of 0.89 and specificity of 0.71.
CONCLUSIONS. ACIF is a responsive measure able to detect changes in functional status in ICU patients during hospital admission. ACIF is able to predict discharge home as early as the time of ICU discharge.
REFERENCES. 1. Dowdy DW et al. Int Care Med. 2005; 31(5): 611–20. 2. Herridge MS et al. N Engl J Med. 2011; 364(14): 1293–304. 3. Cuthbertson BH et al. Crit Care. 2010; 14(1): R6. 4. Roach KE, Van Dillen LR. Phys Ther. 1988; 68(7): 1102–8. 5. Van Dillen LR, Roach KE. Phys Ther. 1988; 68(7): 1098–101. 6. Scherer SA, Hammerich AS. Cardiopulm Phys Ther J. 2008; 19(3): 94–7.

0659
PROGNOSTIC IMPACT OF NEW-ONSET ATRIAL FIBRILLATION IN INTENSIVE CARE UNIT PATIENTS

M. Labakis[1], S. Makrygiannis[1], A. Margariti[1], D. Rizikou[1], S. Labakis[1], P. Tselioti[1], I. Laspiti[1], A. Prekates[1]

[1]Tzanio General Hospital of Pireas, ICU, Pireas, Greece
INTRODUCTION. Data regarding new onset atrial fibrillation (nAF) in non-cardiac intensive care unit (ICU) patients are limited. However, it has been suggested that nAF is associated with worse clinical outcome in these patients.
OBJECTIVES. The purpose of the present work was to study the prognostic impact of nAF regarding ICU mortality in this setting.
METHODS. We prospectively studied all patients admitted to a single ICU for a period of 12 months. Patients admitted for brief postoperative monitoring, patients with chronic, intermittent atrial fibrillation and atrial fibrillation present upon admission, were excluded. Death during ICU stay (ICUD) was the pre-specified study end-point. Length of ICU stay (LOS) was also reported. A number of factors related to the occurrence of AF and the present disease were recorded for each patient.
RESULTS. The study population was comprised of 139 patients. 20 of them manifested nAF. All nAF patients were successfully cardioverted during their first episode. Half of them, however, relapsed during their stay in ICU. The end-point of ICUD was observed in 27.3 % of the patients. The median LOS reported was 12 days. Patients with nAF seem to have significantly worse prognosis, compared to those who did not manifest nAF (ICUD 50 vs 23.5 %, $p = 0.014$). Additionally, nAF patients appear to require significantly extended LOS ($p = 0.001$). There was no statistical difference in the risk for the study end-point between nAF patients who relapsed and those who maintained sinus rhythm ($p = 0.6$). Moreover, when ICUD was adjusted for sepsis, there was also no statistically significant difference between patients manifesting AF and not.
CONCLUSIONS. Patients suffering nAF seem to have worse prognosis during ICU stay. However, it seems that nAF is rather a marker of disease severity without a direct impact on mortality.

0660
THE COMPLICATIONS OF AIRWAY MANAGEMENT IN CRITICALLY ILL PATIENTS IN A SUB-SAHARAN TEACHING HOSPITAL

O.O. Adekola[1,2], O.T. Kushimo[1,2], E.I. Ohuoba[2], G.K. Asiyanbi[2], O.O. Olusoji[3], M.K. Rotimi[2], Babatunde V Ogundana

[1]College of Medicine, University of Lagos, Anaesthesia and Intensive Care, Lagos, Nigeria, [2]Lagos University Teaching Hospital, Anaesthesia and Intensive Care, Lagos, Nigeria, [3]Lagos University Teaching Hospital, Cardiothoracic Surgery, Lagos, Nigeria
INTRODUCTION. Critically ill patients have poor physiological reserves, and therefore they are at increased risk of cardiopulmonary complications especially during periods of apnoea as seen during airway management. These complications include life threatening events such as oesophageal or endobronchial intubation, hypoxia and cardiac arrest.
OBJECTIVES. To determine the complications of airway management in critically ill patients at the Lagos University Teaching Hospital.
METHODS. 120 critically ill patients who required airway management were recruited in the study. All patients were induced with intravenous midazolam 0.15 mg/kg and intubation was facilitated with IV suxamethonium 1.5 mg/kg. An appropriate sized endotracheal tube was inserted, bilateral air entry was confirmed and endotracheal tube secured. Information on personal data and complications arising from endotracheal intubation was documented. All analyses were performed using the Statistical Package for Social Sciences for Windows version 17 (SPSS, Chicago, IL).
RESULTS. The mean age for the study population was 36.66 ± 17.51 years, male patients constituted 68 (56.6 %) and female 52 (43.4 %). The mean duration of ICU admission was 5.06 ± 3.41 days. The first time intubation success rate was 75 %, five patients required more than three attempts at intubation of which two had surgical tracheostomy. Life threatening complications occurred in 65 (54.2 %) of patients. Profound hypoxaemia was reported in 9 (7.5 %), severe hypotension in 12 (10 %), and cardiac arrest in 7 (5.8 %). A significant correlation existed between cardiac arrest and hypotension. Other reported complications included oesophageal intubation 12 (10 %), endobronchial intubation 7 (5.8 %), aspiration of gastric content 6 (5 %), accidental extubation in 19 (15.8 %), and tube blockade in 65 (54.2 %) of patients after a mean period of 39.18 ± 18.04 h. 75 % of intubations were performed by an anaesthetist with more than a year training, though three anaesthetists with <6 months exposure intubated under senior supervision.
CONCLUSIONS. This study demonstrates that airway management in the critically ill is not without untoward effects that might be as grave as cardiac arrest. Therefore highly skilled airway management is necessary to avoid adverse outcomes related to intubation.
REFERENCES. 1. Bowles TM, Freshwater-Turner DA, Janssen DJ, Peden CJ. Out-of-theatre tracheal intubation: prospective multicentre study of clinical practice and adverse events. Br J Anaesth. 2011; 107(5): 687–692. 2. Schwartz DE, Matthay MA, Cohen NH. Death and other complications of emergency airway management in critically ill adults: a prospective investigation of 297 tracheal intubations. Anesthesiology. 1995; 82: 367–376.

0661
THE ASSOCIATION OF RED CELL DISTRIBUTION WIDTH AT HOSPITAL DISCHARGE IN CRITICAL ILLNESS SURVIVORS AND HOSPITAL READMISSION: A REGISTRY BASED COHORT STUDY

S.W. Purtle[1], C.K. McKane[2], F.K. Gibbons[3], K.B. Christopher[4]

[1]Brigham and Women's Hospital, Department of Medicine, Boston, United States, [2]Brigham and Women's Hospital, Department of Nursing, Boston, United States, [3]Massachusetts General Hospital, Pulmonary and Critical Care Medicine, Boston, United States, [4]Brigham and Women's Hospital, Renal Division, Boston, United States
INTRODUCTION. Hospital readmissions contribute significantly to the cost of inpatient care and are targeted as a marker for quality of care. Little is known about risk factors associated with hospital readmission in survivors of critical illness.
OBJECTIVES. As increased RDW reflects the presence of proinflammatory cytokines and chemokines and oxidative stress we hypothesized that an increase in RDW at hospital discharge in patients who survived critical care would be associated with increased risk of 30-day post discharge hospital readmission.
METHODS. We performed a two center observational study of patients treated in medical and surgical intensive care units in Boston, Massachusetts. We studied 43,212 patients, age ≥ 18 years, who received critical care between 1997 and 2007 and survived hospitalization. The exposure of interest was RDW within 24 h of hospital discharge and categorized a priori in quintiles as ≤13.3, 13.3–14.0, 14.0–14.7, 14.7–15.8, and >15.8 %. The primary outcome was hospital readmission in the 30 days following hospital discharge. Secondary outcomes included 90-day readmission following hospital discharge. Associations between discharge RDW and readmission status were estimated by bivariable and multivariable logistic regression models. Adjustment included age, race, gender, Deyo–Charlson Index, patient type (medical versus surgical), sepsis, acute organ failure and length of hospital stay.
RESULTS. In patients who received critical care and survived hospitalization, the RDW at discharge was a robust predictor of hospital readmission and remained so following multivariable adjustment. Patients with a discharge RDW of 14.0–14.7 % have an OR for readmission in the 30 days following hospital discharge of 1.45 (95 % CI 1.32–1.59; $P < 0.001$) and an adjusted OR of 1.20 (95 % CI 1.09–1.33; $P < 0.001$) relative to patients with a discharge RDW ≤ 13.3 %. Patients with a discharge RDW 14.7–15.8 %, have an OR for readmission in the 30 days following hospital discharge of 1.82 (95 % CI 1.66–1.99; $P < 0.001$) and an adjusted OR of 1.40 (95 % CI 1.27–1.54; $P < 0.001$) relative to patients with a discharge RDW ≤ 13.3 %. Patients with a discharge RDW > 15.8 %, have an OR for readmission in the 30 days following hospital discharge of 2.46 (95 % CI 2.27–2.68; $P < 0.001$) and an adjusted OR of 1.74 (95 % CI 1.58–1.91; $P < 0.001$) relative to patients with a discharge RDW ≤ 13.3 %. Similar significant robust associations post multivariable adjustments are seen with readmission by 90 days post-discharge.
CONCLUSIONS. In patients treated with critical care who survive hospitalization, an elevated RDW at the time of discharge is a robust predictor of subsequent unplanned hospital readmission. The underlying process that skews the red cell distribution width may be persistent among a high-risk group of ICU survivors even at the time of hospital discharge.

0662
NON MEDICAL FACTORS INFLUENCE LIKELIHOOD OF ADMISSION TO CRITICAL CARE OF ACUTELY UNWELL PATIENTS

A. Tridente[1], A. Chick[2], S. Keep[2], S. Furmanova[3], S. Webber[2], D. Bryden[2]

[1]Sheffield Teaching Hospitals, Critical Care, Sheffield, UK, [2]Sheffield Teaching Hospitals, Sheffield, UK, [3]University Hospital of Cardiff, Cardiff, UK
INTRODUCTION. Critical Care resources are limited and demand is higher than availability. Guidance for triage exists but may no longer reflect current practice [1–2]. We previously identified factors such as comorbidities, acute physiological derangement and functional status as predicting the likelihood of admission of urgently referred patients to Critical Care [3–4].
OBJECTIVES. We aimed at establishing whether non-medical factors (referral timing, grade and specialty of referrer) influenced admission, over and above the known medical factors.
METHODS. Urgent patient referrals were prospectively enrolled in a review cohort. A predefined case report form included data on the referral, acute physiological parameters, hospital length of stay (LOS), demographic and functional status, dependency and comorbidities. A post hoc set of logistic regression analyses was used to assess whether non medical factors influenced admission, using STATA 10.1 (http://www.stata.com).
RESULTS. Between July 2011 and July 2012, 402 patients were referred to critical care, of whom 186 (46.7 %) were accepted. 160 (39.8 %) were referred by acute medical specialties, the rest by other specialties including surgery, emergency medicine, orthopaedics, trauma, oncology and others. Median age (inter-quartile range = IQR) was 67 (49–78) years, 219 (54.75 %) were male, median LOS (IQR) prior to referral was 0.5 (0–3) day, median (IQR) Early Warning Score (EWS) was 5 (3–8). Age ($p = 0.07$), gender ($p = 0.06$), ethnic origin ($p = 0.78$), LOS ($p = 0.15$), referral reason ($p = 0.33$) and comorbidities did not impact on likelihood of admission.
On the contrary, odds ratios (OR) (95 % Confidence Intervals = 95 % CI) for admission were 2.16 (1.03–4.53, $p = 0.041$) for self-caring status and 1.21 (1.1–1.33, $p < 0.001$) for each unit increase in EWS, after inclusion in multivariate analysis. When non-medical factors were explored, both self caring status (OR = 3.47, 95 % CI = 1.78–6.73, $p < 0.001$) and EWS (OR = 1.23, 95 % CI = 1.12–1.36, $p < 0.001$) remained strong predictors of admission, with referrals from medical specialties being far less likely to be accepted than those by any other specialty (OR = 0.46, 95 % CI = 0.24–0.88, $p = 0.02$). Timing of referral and grade of referrer had no influence.

CONCLUSIONS. While decision making about admitting to critical care is based mainly on the assessment of patients' functional status and acute physiological disturbance, our findings suggest that specialty of referrer may influence likelihood of admission, even after adjusting for age, functional status, acute physiological derangement and other known medical factors.
REFERENCES. 1 ACCCM Guidelines for ICU admission, discharge, and triage. CCM. 1999; 27: 633–638. 2 ATS Fair allocation of intensive care unit resources. AJRCCM. 1997; 156: 1282–1301. 3 Trident factors affecting critical care admission to a UK University Hospital ISICEM 2012. 4 Trident functional status as predictor of admission to critical care in acutely unwell patients ESICM 2012.

0663
LACK OF AWARENESS OF SEVERITY OF ILLNESS IS A COMMON FACTOR AFTER ICU DISCHARGE

A. Das Neves[1], D. Vasquez[1,2], C. Loudet[1], J. Moreira[1], D. Intile[2], M.G. Saenz[1], C. Marchena[1], A.L. Gonzalez[1], S. Carino[1], R. Reina[1], E. Estenssoro[1]

[1]HIGA Gral San Martin, La Plata, Argentina, [2]Sanatorio Anchorena, Caba, Argentina
INTRODUCTION. Health related quality of life (HRQoL) after ICU discharge improves over time but remains below the general population standard. This condition can be assessed with the EuroQol-5d (EQ5d), which includes tests for objective and subjective conditions (respectively EQ-index and EQ-VAS [visual analogue scale]). In a pilot study, (1) we observed a discrepancy between these evaluations.
OBJECTIVES. Our aim was to describe the behavior of HRQoL measured with EQ-VAS and EQ Index at 1, 3, 6 and 12 months after ICU discharge, in a general ICU population and in different admission categories.
METHODS. We prospectively followed a cohort of ICU survivors who received mechanical ventilation (MV) for ≥48 h (4/1/2010–4/30/2011). The analysis was conducted considering admission categories: trauma, medical, emergency and elective surgery; and in patients with/without brain injury. Data are shown according to its characteristics. Comparisons were analyzed with Wilcoxon rank sum test. A $P < 0.05$ was considered significant. Analysis was performed with STATA 11.
RESULTS. 112 patients were followed. Age was 33 (24–49), male 68 %, APACHE II 14.6 ± 5, SOFA 7 (3–9), Charlson Score 0 and Glasgow 12 ± 4. Admission categories were: trauma 50 %, medical 29 %, emergency and elective surgery 13 and 8 %. Acute brain injury occurred in 46 %. Main ICU events were shock in 75 % of patients, ARDS 25, 33 % AKI and 10 % dialysis; 32 % were readmitted to the hospital and 10 % to the ICU in the first year after discharge. MV duration was 15 (9–37); ICU and hospital LOS were 21 (11–43) and 47 (28–79) days.
We confirmed the divergent behavior of EQ-5d components in the whole population (Fig. 1), in patients with/without brain injury (Fig. 2), and in all categories (not shown).
CONCLUSIONS.
1. Most patients were young, previously healthy and mainly admitted for trauma. 2. Survivors experienced long term consequences that affected HRQoL. Interestingly, while a gradual, significant improvement in EQ index was noticed in all patients, EQ-VAS exhibited high values from the beginning. 3. This persistent lack of awareness of disease (also known as anosognosis) was prevalent in all patients, notwithstanding the cause of admission and, presence of brain injury.
REFERENCES. Am J Resp Crit care Med. 2012; 185: A2288.
GRANT ACKNOWLEDGMENT. This study was founded by the grant Ramon Carrillo of National Heath Ministry of Argentina.

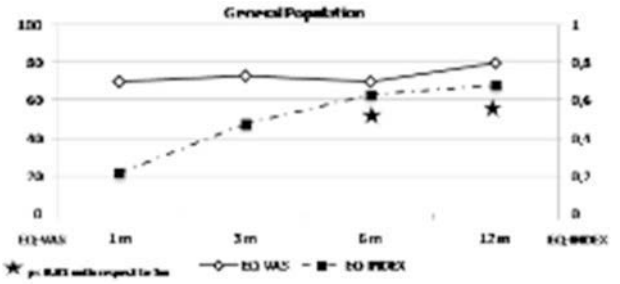


Fig. 1 EQ VAS vs EQ EVA general population

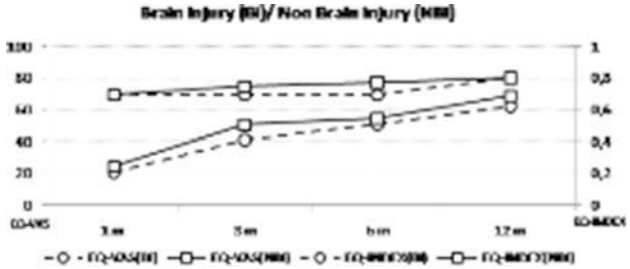


Fig. 2 EQ VAS vs EQ index in BI vs NBI

0664
DOES TIME OF TRANSFER FROM CRITICAL CARE TO GENERAL WARDS AFFECT ANXIETY? (TRACING ANXIETY)

A.J. McCairn[1], C. Jones[1,2], J. Wood[1]

[1]Whiston Hospital, Critical Care, Prescot, UK, [2]Liverpool University, Institute of Aging and Chronic Disease, Liverpool, UK
INTRODUCTION. Night time transfer from critical care to the general wards is associated with increased hospital mortality and transfer from critical care areas to the general ward between 22:00 and 07:00 should be avoided whenever possible[1]. In addition the timing of transferring a patient from the critical care unit to the general ward may have psychological effects and exacerbate patients' anxiety[2]. It was hypothesised that day time (07:00–21:59) transfers are less anxiety provoking for patients than night time transfers (22:00–06:59).
OBJECTIVES. To examine the impact of transfer time on patient anxiety.
METHODS. A pragmatic prospective cohort study of critically ill patients over the age of 16 years was undertaken in a 14 bed adult critical care unit in a National Health Service teaching hospital trust in the UK. Included criterion was critically ill patients staying on the critical care unit for at least 24 h and clinically ready for transfer to the general ward within the same hospital setting. Study participants completed the Hospital Anxiety and Depression Scale (HADS) questionnaire[3]. The HADS questionnaire was completed at: pre-transfer—on the critical care (when they were clinically ready for transfer to the general ward), post-transfer—on the general ward therefore capturing the transfer process.
RESULTS. 47 patients were included, 1 patient did not complete the pre-transfer HADS but went on to complete the post-transfer HADS and 3 patients were discharged from hospital before completion of the post-transfer HADS. The post-transfer incidence of cases for the anxiety sub-group of the HADS was 22 % (8/36) for day time and 64 % (7/11) for night time; this was found to be statistically significant using the Kruskal–Wallis test, $H = 7.26$, $p = 0.007$. The post-transfer median score for the anxiety sub-group of the HADS was 6 (CI 5.7–8.6) for day time and 12.5 (CI 8.3–15.7) for night time; this was found to be statistically significant using the Kruskal–Wallis test, $H = 6.40$, $p = 0.011$.
CONCLUSIONS. This pragmatic prospective cohort study suggests that transfers at night time are more anxiety provoking for patients than transfers in the day time.
REFERENCES. 1. National Institute for Health and Clinical Excellence (NICE) clinical guideline. 2007; 50: 68-72. 2. Lethbridge B, Somboom OP, Shea HL. The Canadian Nurse. 1976; 72: 39–40. 3. Zigmond AS, Snaith RP Acta Psychiatr Scand. 1983; 67: 361–370.

0665
CAN WE PREDICT HOSPITAL MORTALITY AFTER ICU DISCHARGE?

D. Arias-Verdu[1], G. Seller-Perez[1], P. Benitez-Moreno[1], J. Barruecos[1], G. Quesada-Garcia[1], M.E. Herrera-Gutiérrez[1]

[1]University Hospital Carlos Haya, ICU, Malaga, Spain
INTRODUCTION. Mortality after ICU discharge is in many occasions an unexpected event and we need tools to help us avoid this problem. To define which variables predict mortality after ICU discharge could be an aid in clinical decision making.
OBJECTIVES. To define predictors of early and late mortality after ICU discharge.
METHODS. Exploratory epidemiologic study. Prospective cohorts comprising all patients admitted to our unit for 6 months with a stay longer than 24 h. First we registered anthropometric data, previous diseases, SOFA at admission and APACHE II mortality probability; during ICU stay all those considered relevant for the outcome of patients; posterior ICU consultations; readmissions and mortality until hospital discharge. A logistic regression was used for analysis. The Ethics Committee of our centre approved the study.
RESULTS. Recruited 502 patients but we had 17 readmissions and data for 5 cases was incomplete so we studied 480 patients.
Overall mortality was 30.9 %. 22.7 % died during the first ICU admission (ICU-M), 2.1 % the first 3 days after ICU discharge (Early-M) and 6.1 % afterward (Late-M) (median day 2 for the second group and 16 for the third).
Age and those variables related to severity of the process (predicted mortality, organs failure, need for mechanical ventilation or renal replacement, presence of nosocomial infection or need for transfusions) were related to ICU-M, but not to Early-M or Late-M.
Medical admissions carried a higher mortality than emergency surgery or elective surgery for ICU-M but this relation was lost for Early-M and Late-M.
While diabetes, cerebrovascular disease, chronic kidney disease or immunodepression were related to ICU-M, only cancer was related to Late-M. The sum of the number of antecedents was predictive for all the groups.
41.4 % of patients in the Late-M group had a DNR order but only 11.1 in the Early-M group.
The Sabadell score was closely related to mortality after ICU discharge but did not discriminate between Early-M and Late-M.
In the multivariate analysis, a longer hospital stay previous to the first ICU admission (OR 1.05, CI 1.02–1.08, p 0.001), antecedent of cancer (OR 2.38, CI 0.86–6.63, p 0.095) and Sabadell Score (reference stage 0, for stage 1 OR 13.6, CI 2.89–63.9, p 0.001, for stage 2 OR 21.9, CI 3.8–123.2, p 0.0001 and stage 3 OR 203, CI 18.6–570.6, p 0.0001) were the only variables predicting mortality after ICU discharge. None of these variables let us differentiate between Early-M or Late-M.
CONCLUSIONS. Number of antecedents is related to outcome after ICU discharge but not severity scores at admission neither other variables registered before of during ICU stay. Sabadell score behaved well as predictor of late outcome. We did not find any indicator that could be of aid predicting early mortality after ICU discharge.

Nursing care and practices: 0666–0679

0666
MEASURING NURSING WORKLOAD USING NURSING ACTIVITY SCORE (NAS) IN A PATIENT DATA MANAGEMENT SYSTEM (PDMS)

E.K. Armstrong[1], M.C. de Waarde[1], R.H. Driessen[1], A.R.J. Girbes[1], J.J. Spijkstra[1]

[1]VU Medical Center, Intensive Care, Amsterdam, Netherlands
INTRODUCTION. It has long been recognized that accurate measurement of nursing workload is essential for effective and efficient deployment of nursing resources [(1)]. Several recent studies have used Nursing Activity Score (NAS) to measure nursing workload per patient, per shift on Intensive Care (ICU) and Medium Care (MC) units. [(2,3)] In this feasibility study, we incorporated NAS into a patient data management system (PDMS) and automated as many responses as possible with the aim of minimize the nursing time required for registration and generate good, reliable data for all patients on every shift.
OBJECTIVES. To investigate the feasibility of incorporating NAS in a PDMS (Metavision®, Tel Aviv Israel); maximizing the number of questions answered automatically and including a mechanism whereby registration of the NAS score was ensured.
METHODS. 17 of the 23 questions from NAS were identified as requiring 'Yes' or 'No' responses. These were designated to be answered automatically by the system, whilst the

remaining six questions requiring subjective answers from the nurses were incorporated into a dropdown menu, to be completed at shift-end. The manual responses were confirmed by the system to be within specified limits and the required end-of-shift report could not be accessed before NAS was completed. This guaranteed the collection of good, reliable data for every patient, on every shift.
RESULTS. Between 4th September 2012 and 28th February 2013 NAS were collected using Metavision® from a total of 1,306 adult patients, on each shift, on three units of the VU University Medical Centre, Amsterdam, The Netherlands (477 patients on ICU 1, 387 on ICU 2, and 442 on MC). Incorporating NAS into Metavision® was shown to reduce the time required per patient, per shift from between 10–12 min to less than 1 min. Due to the mandatory nature of their completion, NAS was obtained from every patient on every shift. Checking of manual responses also ensured the quality of the data as demonstrated by the considerable reproducibility of NAS between the IC units. As anticipated, these were higher than the Mean NAS from the MCU.

Table 1

	Number patients	Male	Female	Mean age M	Mean age F	Mean NAS day	Mean NAS evening	Mean NAS night
ICU 1	477	319	158	63.3	61.7	48.05	47.92	36.92
ICU 2	387	245	142	62.2	64.1	49.07	48.02	38.56
MCU	442	247	195	57.2	55.8	42.81	43.40	33.00

CONCLUSIONS. Incorporating NAS into Metavision® is not only feasible but also provides a quick and efficient method of collecting nursing data without compromising valuable nursing time.
REFERENCES. 1. Miranda, et al. Nursing activity score. Crit Care Med. 2003; 31: 374–382. 2 Armstrong, et al. Using nursing activity scores (NAS) to assess nursing workload on medium care (MC) units. Int Care Med. 2010; 36: 1232. 3.) Dieter et al. Measuring the nursing workload per shift in the ICU. Int Care Med. 2012; 38(9): 1438–1444.

0667
CLINICAL SUSPICION OF NURSING PERSONNEL IN THE IDENTIFICATION AND PREVENTION OF ATRIAL FIBRILLATION IN INTENSIVE CARE UNIT PATIENTS

D. Rizikou[1], A. Margariti[1], M. Labakis[1], S. Vangelis[1], S. Makrygiannis[1], S. Labakis[1], I. Laspiti[1], A. Prekates[1]

[1]Tzanio General Hospital of Pireas, ICU, Pireas, Greece
INTRODUCTION. Atrial fibrillation (AF) seems to be a frequent arrhythmia even in non-cardiac intensive care units (ICU). Moreover, it might appear as a pressing clinical condition since the loss of atrial kick and the irregular and often substantially shortened ventricular filling time may further destabilize a critically ill patient. The identification of AF is rather problematic as it requires ECG interpretation. Furthermore data on its epidemiology are limited concerning ICU patients and it is unknown whether any factors and triggers can be detected by nurses and modified to minimize the occurrence of AF.
OBJECTIVES. We assessed the possible impact of a brief training course on successful AF identification and studied a number of known risk-factors for AF to investigate if any of them can serve as focus for AF prevention by nursing personnel.
METHODS. A nursing team was trained in AF diagnosis. The training included ECG criteria plus the detection of variation in invasive blood pressure tracing and hemodynamic destabilization. We prospectively studied all patients admitted to our ICU for a 12-month period. The performance of the trained team was compared to the rest of the nurses. AF confirmation by the absence of a waves in the cardiac echo acquired transmitral flow signal served as the standard for comparison of both groups. A number of factors incriminated for the occurrence of AF from demographics, medical history and present disease, as well as circumstances of AF onset, were recorded for all patients.
RESULTS. The study population consisted of 139 patients. AF was observed in 14.4 % of them. The trained nursing team better identified AF (sensitivity 95 % vs. 55 %, specificity 96.6 vs. 90.8 %). AF occurred in generally older patients (mean age 67.3 [±13.7] vs. 51.4 [19.7] years, $p < 0.001$). Hypertension ($p = 0.047$) and systematic inflammatory response syndrome ($p < 0.001$) were also associated with manifestation of AF. As regards to the circumstances under which AF occurred, electrolyte disorders, especially hypokalaemia, was observed in 40 % of the cases and hypovolaemia in 30 % of them.
CONCLUSIONS. A brief training in AF identification may significantly improve diagnosis. A further targeted training on specific factors, easily accessible by nursing personnel might contribute to AF prevention in ICU patients.

0668
NURSES' EXPERIENCES OF CARING FOR AWAKE, NON-SEDATED, MECHANICALLY VENTILATED CRITICALLY ILL PATIENTS IN THE ICU: A QUALITATIVE STUDY

E. Laerkner[1,2], I. Egerod[3], H.P. Hansen[2]

[1]Odense University Hospital, Department of Anesthesiology and Intensive Care, Odense, Denmark, [2]University of Southern Denmark, Health, Man and Society, Odense, Denmark, [3]University of Copenhagen Health and Medical Sciences, Rigshospitalet, Trauma Center HOC 3193, Copenhagen, Denmark
INTRODUCTION. In recent years, there has been a trend towards lighter sedation of critically ill patients in need of mechanical ventilation. In 2010, a Danish RCT showed that a protocol of no sedation was feasible and decreased the duration of mechanical ventilation, ICU stay and hospital length of stay (1). At the same time, a US survey demonstrated that most nurses considered mechanical ventilation as a stressful event that required sedation to ensure patient comfort (2). These findings show that nurses' attitudes need to be taken into consideration when changing the sedation strategy, and that more knowledge is needed to understand nursing care related to awake mechanically ventilated patients.
OBJECTIVES. To explore nurses' experiences with and attitudes towards caring for awake, non-sedated critically ill patients requiring mechanical ventilation in the ICU.
METHODS. The study had a qualitative design including 13 months of fieldwork in two intensive care units in Denmark using a protocol of no sedation for mechanically ventilated patients. Data were generated during participant observation and by semi-structured interviews with 16 nurses. The strategy of analysis was inductive, using qualitative thematic description.
RESULTS. The main findings were that nurses preferred caring for awake rather than sedated mechanically ventilated patients, and that nurses appreciated caring for just one patient at a time. The overall theme that emerged was: demanding yet rewarding. The demanding aspects of caring for awake intubated patients included ambiguity between conflicting needs and actions, while the rewarding aspects included human and personal interaction. Three sub-themes were identified: 1. Unpredictability: caring for and interacting with the patient; 2. The double gaze: integrating human and instrumental care, and 3. Physical and emotional proximity: closeness without distance. The protocol of no sedation afforded the opportunity for more respectful interdisciplinary dialogue regarding patient comfort and transformed the unit to an environment where the human and personal characteristics of the patients were valued.
CONCLUSIONS. Despite the caring complexity, nurses preferred to care for awake rather than sedated patients. Nurses were required to act in the interface between conflicting possibilities and needs, which was both demanding and rewarding. Our study demonstrated the human benefits of interacting with critically ill patients.
REFERENCES. 1. Strøm T et al. A protocol of no sedation for critically ill patients receiving mechanical ventilation: a randomised trial. Lancet. 2010; 375: 475–480. 2. Guttormson, JL et al. Factors influencing nurse sedation practices with mechanically ventilated patients: A US national survey. Int Crit Care Nurs. 2040; (26): 44–50.
GRANT ACKNOWLEDGMENT. University of Southern Denmark, Odense University Hospital and Danish Nursing Research Society.

0669
A MULTICENTER STUDY ON RELIABILITY AND VALIDITY OF TRIAGE EMERGENCY METHOD, A NEW FOUR-LEVEL EMERGENCY TRIAGE SYSTEM

N. Parenti[1], D. Sangiorgi[2], M. Cavazza[3], G. Cervellin[4], G. Rastelli[5], R. Petrino[6], C. Camaniti[1], T. Lenzi[7]

[1]University of Parma, Parma, Italy, [2]University of Bologna, Bologna, Italy, [3]Policlinico Sant'Orsola, Bologna, Italy, [4]AUSL Parma, Parma, Italy, [5]Aix-Marseille Univ, URMITE CNRS-UMR 6236, Hôpital Nord, Fidenza, Italy, [6]AUSL Vercelli, Vercelli, Italy, [7]AUSL Imola, Imola, Italy
INTRODUCTION. Triage Emergency Method (TEM), a four-level emergency triage system, (Urgency Category UC 1 = immediate response; UC 2, 3, 4 assessment within 20, 60, 120 min respectively) showed a good validity and reliability in previous studies (1, 2). There are few multicenter studies which test these quality indicators among Triage Scales; there are not Italian studies on this topic.
OBJECTIVES. The goal of this study is to assess the inter-rater reliability and validity in predicting a Reference Standard rating of the TEM among six Italian hospitals.
METHODS. This is a multicenter before–after study conducted from June to August 2011. 12 nurses (2 from each Hospital) were included to independently assign triage scores to 66 scenarios before and after (3 months) a 2 h course on TEM. Scenarios included patient demographic and clinical characteristics, nurse triage category, admission status, presenting complaint. For each scenario, the most frequent UC (the mode) has been considered as "true triage". Weighted kappa (K) was used to calculate inter-rater reliability. Validity was evaluated by studying the relationships between the triage category assigned by the nurses and the rating of a Reference Standard (3 nurses expert in triage and TEM).
RESULTS. Of the 66 patients included in scenarios 40 (60 %) were women, the mean age was 43.7 years (SD ± 26.3); there were 20 hospital admissions; trauma was the most frequent symptom at triage (44 %). The median years of experience in Emergency Triage among nurses was 3 (range 1–6). The UC assigned were: 30 % with UC 4, 49 % UC 3, 18 % UC 2, 3 % UC 1. Interrater reliability among the 12 nurses was K = 0.75 (CI 0.58–0.84). We found 22/66 (33 %) scenarios with a complete agreement in assigning code, 1 scenario with a "marked discordance" (2 or more points) among nurses who used the TEM. Hospital admission by our triage system was as follows: UC 1 (100 %), 2 (30 %), 3 (12 %), 4 (2 %). Accuracy in predicting the Reference Standard's code was 80 % (CI 70–90 %).
CONCLUSIONS. The TEM shows a good inter-rater reliability and validity in predicting a Reference Standard' triage code. To our knowledge, this is the first multicentre Italian study which tests the validity and reliability of a Triage System.
REFERENCES. 1. Parenti N et al. Reliability and validity of two four-level emergency triage systems. Eur J Emerg Med. 2009; 16: 115–120. 2) Parenti N et al. Effect of a triage course on quality of rating triage codes in a group of university nursing students: a before–after observational study. World J Emerg Med 2013; 4(1): 20–25

0670
DEVELOPMENT OF A RAPID INTER-PROFESSIONAL ULTRASOUND ASSESSMENT OF CRITICALLY ILL PATIENTS IN A LARGE CENTRAL LONDON INTENSIVE CARE UNIT

S. Casboult[1], A. Skorko[1], K. Heelas[1], G. Parsons[1], P.A. Hopkins[1]

[1]King's College Hospital NHS Foundation Trust, London, UK
INTRODUCTION. International competencies have now been agreed to support the use of focussed ultrasound by non-radiologists in critical illness for shock assessment; the primary trauma survey; and placement of lines and drains (1, 2). However, despite an increasing role for nursing staff in the use of complex near patient devices used in supportive critical care (renal replacement therapies; ECMO; left-ventricular assist devices); this has not included involvement in assessment and treatment of critically-ill patients with US. Here we describe the development and testing of a nurse-led inter-professional US imaging schedule in the 32-bedded general ICU of a busy central London teaching hospital.
OBJECTIVES. To develop a nurse-led interprofessional ultrasound assessment protocol for use in critically ill patients.
METHODS. Baseline survey, peer-review, round-table discussion and inter-professional interviews were conducted with imaging and critical care staff to document baseline perceptions and attitudes towards the development of a nurse-led inter-professional ultrasound assessment protocol for critically-ill patients. This baseline analysis was also used to generate consensus for the required number and format of essential ultrasound windows that could be beneficially and safely utilised by the whole inter-professional ICU team. Delphi rounds were conducted to refine the shortlist. Training tools were developed using the consensus windows and competency acquisition trajectory compared between professions.
RESULTS. Key outcomes from the Delphi exercise were the need to develop a common inter-professional language; clearly identify anatomical targets for imaging and provide a

list of achievable binary questions. Based on these principles, a 10-window inter-professional ultrasound schedule was developed, including thoracic, abdominal and vascular sonographic assessments. Excluded windows included venous Doppler of leg vessels and cerebral Doppler. 91 % of nurses wanted to learn basic ultrasound techniques. 65 % of nurses and 82 % of doctors and physiotherapists felt it would change the medical management of patients. Nurses and doctors achieved level-1 competency for all 10 windows after an equivalent number of supervised and solo (reviewed) examinations.
CONCLUSIONS. We have developed a 10-window inter-professional ultrasound survey for use in the assessment and care of critically-ill patients. Critical care nurses were able to acquire the necessary competencies at a similar pace to physician colleagues. A randomised controlled trial is now planned to test whether the inter-professional ultrasound survey produces benefits such as enhanced detection of complications of critical illness; reduced reliance on ionizing radiation and better inter-professional working.
REFERENCES. Neri L et al. Crit Care Med. 2007; 35: S290–S304. Volpicelli G et al. Int Care Med. 2012; 38: 577–591.
GRANT ACKNOWLEDGMENT. Silver Bullet award (Philips Healthcare).

0671
COMPLIANCE EVALUATION OF THE SEMIRECUMBENT POSITION IN CRITICALLY ILL PATIENTS SUBMITTED TO MECHANICAL VENTILATION

M. Llaurado[1,2], R. Güell[3], Y. Alabart[3], J. Mariné[3], L. Bordonado[3], M. Peralvo[3], N. Dalmau[3], L.M. Vallejo[3], S. Molina[3], B. Coloma[3], M.C. Portal[3], A. López[3], X. Alabart[3], S. Hidalgo[3], M.L. Fortes[3], M.F. Jiménez-Herrera[2], M.A. Bodí[1,2], A. Rodriguez[1,2]

[1]Institut d'Investigació Sanitària Pere Virgili, Intensive Care Unit, University Hospital Joan XXIII, Tarragona, Spain, [2]Universitat Rovira i Virgili, Tarragona, Spain, [3]University Hospital Joan XXIII, Intensive Care Unit, Tarragona, Spain
INTRODUCTION. Semirecumbent position (SP) at 30°–45° is included in the recommendations for the prevention of ventilation associated pneumonia. Its evidence is controversial, besides its implementation is below the optimal.
OBJECTIVES. To evaluate the compliance of the SP in different periods and compare them in mechanically ventilated patients. Identify some factors that may influence its compliance.
METHODS. Observational, prospective and longitudinal study carried out in an intensive care unit of 14 beds. The study was performed from January 2012 until March 2013.
All patients with invasive mechanical ventilation and no clinical contraindication for SP were included.
The SP was audited in four periods. The first was on January 2012 without the knowledge of the staff (P1). After this month, an informative session was performed to all the healthcare workers (HCW) and the results from P1 were explained. On February until March 5th, SP was still audited but with the HCW's knowledge (P2). As follow-ups, on September SP was audited during 31 days (P3) and on March 2013, was audited for the last time (P4).
The variables were type of bed (with SP displayer or without), airway (tracheostomy (TCH) or endotracheal tube [TET]), working shift (morning, afternoon, night), day of the week (weekday, weekend), degree of head of bed elevation (HOBE).
The statistical analysis is expressed with median and interquartile range (IQR 25–75) and relative and total frequencies when appropriate. To evaluate the differences among periods, χ^2 and Mann–Whitney tests were used as appropriate with variables with non-normal distribution. Statistical significance has been considered as $p < 0.05$.
RESULTS. During P1, from all the possible observations, 557 were obtained (77.6 %), on P2, 773 observations (75.6 %); on P3, 590 (89.3 %) and on P4, 719 (79.4 %).
The global SP compliance was 24.0 % and the median of HOBE was 24.0° (IQR 18.8–30.0). The compliance (c) and median (m) was increased in all periods: P1: c:13.8 %, m:21,1° (IQR 16.3–24.4); P2: c:25.5 %, m: 24.3° (IQR 18.8–30.2); P3: c 22.7 %, m: 24,4° (IQR 18.9–29.6); P4: c:31.4 %, m: 26,7° (IQR 21.3–32.6). Statistical significance was found in all comparisons ($p < 0.001$) except from P2 with P3.
In the global sample, the airway type (24.8° [IQR 19.7–30.7] in patients with TET vs 22.4° [IQR 17.4–28.7] in patients with TCH, $p < 0.001$) and type of bed (24.7° [IQR 20.1–30.5] in patients without SP displayer vs 23.2° [IQR 18–29.4] in patients with the tool, $p < 0.001$) were associated with the HOBE. Other factors were not associated with HOBE. Analysing the different periods, airway type had statistical significance in P0, P1 and P2 but not in P3, type of bed in P0, P1 and P3 and working shift in P0, P2 and P3 ($p < 0.05$).
CONCLUSIONS. Despite the compliance is lower than optimal, it increased significantly during the study and the session was successful. The presence of TET and no displayer in the bed for the HOBE, are associated with a higher HOBE.

0672
INTRODUCTION OF A DELIRIUM-CARE-BUNDLE TO IMPROVE THE DETECTION OF DELIRIUM

V.E. Geenen-Rijniers[1], G. Roks[2], J.J.D. Tilanus[3], P. van Berkom[1], A.W. Oldenbeuving[1]

[1]St. Elisabeth Hospital, Intensive Care Medicine, Tilburg, Netherlands, [2]St. Elisabeth Hospital, Neurology, Tilburg, Netherlands, [3]St. Elisabeth Hospital, Psychiatry, Tilburg, Netherlands
INTRODUCTION. The diagnosis of delirium on the ICU is often not recognized (1, 2). This was also the case in our ICU where we showed that clinical observation alone is not enough to recognize delirium (3). Introduction of the Confusion Assessment Method for the Intensive Care Unit (CAM–ICU) in 2010 did not improve delirium recognition on our ICU (4). Persistent doubts arose within the medical team about the necessity for delirium screening (4).
OBJECTIVES. To evaluate the recognition of delirium on a large Dutch ICU before and after introduction of a Delirium-Care-Bundle (DCB).
METHODS. This prospective observational study was conducted on the medical ICU at the St. Elisabeth Hospital, Tilburg, The Netherlands. The study of de Laet et al. from 2010 was used as a baseline. Prior to the introduction of the DCB, the CAM–ICU was introduced to the ICU nursing staff. The DCB consisted of an adjustment of the CAM–ICU in which the first step was left out. Ten delirium-care-nurses on the ICU ensured delirium-screening was undertaken. We used a pocket-sized flow-chart of the CAM–ICU and guaranteed good accessibility and guidance of a Neural Practitioner in daily practice. Stimulative actions before, during and after the introduction of the DCB, were used to draw attention to nurses and doctors on delirium on the ICU.
RESULTS. During an 8 week study period, a total of 91 patients were included of whom a total of 304 CAM–ICU scores were assessed. Before introduction of the DCB, delirium was often not recognized by nurses and the CAM–ICU showed a sensitivity of 18 % and a specificity of 98 % (4). Introduction of the DCB caused an increase in the sensitivity to 68 %. The specificity remained high (94 %). Also the recognition of delirium through nurses clinical observations improved from 24 to 56 %. Besides, this study demonstrated an increased risk for delirium in certain groups, such as the mechanically ventilated patients and emergency admissions.
CONCLUSIONS. Introduction of the DCB improves delirium recognition in daily practice on patients in the ICU.
REFERENCES. 1. Spronk PE et al. Int Care Med. 2009; 35: 1276–80. 2. van Eijk MM et al. Crit Care Med. 2009; 37: 1881–1885. 3. van Eck van der Sluis JF et al. Ned Tijdschr Geneeskd. 2010; 154: A 1290. 4. de Laet NA et al. Submitted.

0673
AN ENDOTRACHEAL TUBE FIXATION DEVICE WHICH REDUCES LIP PRESSURE ULCERS IN CRITICALLY ILL PATIENTS

N. Embregts[1], P. van Berkom[1], F. van Beers[1], A. van Hees[1], P. Vos[1], W. van den Wildenberg[1]

[1]St. Elisabeth Hospital, ICU, Tilburg, Netherlands
INTRODUCTION. Most patients on the intensive care unit (ICU) who are mechanically ventilated have an oral endotracheal tube (ETT). ETTs are commonly secured using adhesive tape, non-adhesive tape or commercial devices. One of the risks of these products is the development of lip pressure ulcers (lip PUs). Studies have shown that commercial devices had a lower incidence of lip PUs than the tapes[1]. In order to address this problem we, the Ventilation Practitioners on our ICU, have been trying different products. The most recent commercial device we implemented was the Anchor Fast™ (Hollister, Inc., Libertyville, IL, USA).
OBJECTIVES. In this study we compared the Anchor Fast to our standard care for ETT fixation by the Fixsond® (CAIR LGL, Civrieux d'Azergues, Rhône, France). We wanted to determine whether the Anchor Fast could lead to a reduction of lip PUs and whether the product was safe.
METHODS. We conducted a prospective observational study. In the first 3 months, the standard care for ETT fixation was given to all intubated patients ($n = 69$). In the second period, the Anchor Fast was given to all intubated patients ($n = 80$). The ICU nurses checked the lips daily to ascertain whether there were signs of PU. Only patients who were intubated longer than 24 h, who were not in prone position and who had the prescribed ETT fixation were included. The primary outcome was the incidence of category II PU or higher. The secondary outcome was the incidence of unplanned extubation to see if the product was safe to use.
RESULTS. Neither patient groups differed in gender, age, APACHE II score, time they were intubated or use of norepinephrine (NE). The incidence of lip PUs in the standard care group was 17 % ($n = 12$) vs 4 % ($n = 3$) in the Anchor Fast group ($p = 0.013$). A subanalysis was performed to a known risk factor of PUs, the use of NE[2]. In the group with NE, there were significantly fewer lip PUs by using the Anchor Fast 2 % ($n = 1$) vs the standard care 25 % ($n = 11$) ($p = 0.005$). In the group without NE, there was no significant difference ($p = 1.00$). The used dosage of the NE was equal in both groups ($p = 0.613$). There was no correlation found between the dosage of NE and the occurence of PUs. The incidence of unplanned extubation was not significantly different, 13 % ($n = 9$) in the standard care group vs 11 % ($n = 9$) in the Anchor Fast group ($p = 0.934$).
CONCLUSIONS. There were significantly fewer lip PUs when using the Anchor Fast compared to the standard care. When an intubated patient needs NE, the Anchor Fast gives a lower risk for lip PUs. The Anchor Fast was just as safe in securing the ETT as the standard care.
REFERENCES. 1. Kaplow R, Bookbinder M. A comparison of four endotracheal tube holders. Heart Lung. 1994; 23 1. 2. Cox J. Predictors of pressure ulcers in adult critical care patients. Am J Crit Care. 2011; 20(5): 364–374.

0675
INTENSIVE CARE EXPERIENCES OF CARDIOVASCULAR SURGERY PATIENTS

B. Tosun[1], O. Aslan[1]

[1]Gulhane Military Medical Academy School of Nursing, Fundamentals of Nursing, Ankara, Turkey
INTRODUCTION. Studies have demonstrated that patients may experience phenomena such as stress, panic, nightmares, hallucinations, insecurity, helplessness, technical equipment and various nursing procedures in ICU (1, 2).
OBJECTIVES. This study was conducted in order to determine the intensive care experiences of patients having cardiac surgery.
METHODS. This cross-sectional study was conducted on 106 patients having cardiac surgery, staying in the ICU at least 24 h and volunteering to participate between January and July 2012. Two enquiries for socio-demographic features, treatment protocols and interventions plus the Intensive Care Experience Questionnaire (2, 3) was used for data collection. Data were obtained by face to face interviews managed by the researchers and SPSS 15.0 was used for statistical analyses. Results were given as frequency, percentages, means and standard deviations. $p \leq 0.05$ was accepted as statistically significant.
RESULTS. The majority of the patients (71.7 %) were male and 54.7 % were primary school graduate with the mean age 59.73 ± 13.20 years. Mean staying time in the ICU was 53.60 ± 69.52 h and leading complaints were stink (27.4 %), excessive illumination (19.8 %). Mean Intensive Care Experience Questionnaire score was 64.15 ± 6.56. Patients over 65 years old had lower mean remembering experiences subscale scores ($t = 2.160$, $p = 0.033$) and higher mean bad experiences subscale scores ($t = -2.223$, $p = 0.028$) compared to patients under 65 years old. Primary school graduates had higher mean bad experiences subscale scores compared to high school graduates ($t = 2.78$, $p = 0.006$). Patients having complaint of stink had higher mean bad experiences subscale scores than clients not having such a complaint ($t = 2.78$, $p = 0.006$). Patients having complaint of excessive illumination had lower mean satisfaction from care scores than clients not having such a complaint ($t = -3.241$, $p = 0.002$).
CONCLUSIONS. Our findings indicated that age, educational status and environmental factors in the ICU affect experiences. It was suggested that elimination of environmental factors in the ICU that negatively affect the experiences of patients in the ICU, would enhance the quality of nursing care and contribute to recovery process.
REFERENCES. 1. Schoua L, Egerodb AI. Qualitative study into the lived experience of post-CABG patients during mechanical ventilator weaning. Int Crit Care Nurs. 2008; 24: 171–179. 2. Rattray JE, Johnston M, Wildsmith JA. Predictors of emotional outcomes of intensive care. Anaesthesia. 2005; 60:1085–1092. 3. Demir Y, Korhan E A, Eşer İ, Khorshıd

L. Yoğun bakım deneyim ölçeğinin geçerlik ve güvenirlik çalışması. Turkiye Klinikleri J Nurs. 2009; 1: 1–11.

0676

CREATION AND DISTRIBUTION OF A DELPHI QUESTIONNAIRE TO EVALUATE THE FACTORS INFLUENCING THE COMPLIANCE OF THE SEMIRECUMBENT POSITION IN CRITICALLY ILL PATIENTS REQUIRING MECHANICAL VENTILATION

M. Llaurado[1,2], L. Bordonado[3], Y. Alabart[3], A. López[3], J. Mariné[3], L.M. Vallejo[3], R. Güell[3], A. Lobo[4], N. Montesinos[4], S. Radaidan[4], N. Calpe[5], A. Ventura[5], A. Piñol[6], M. Treso[6], R. Zamorano[7], É. Bernal[7], C. Paños[8], L. Martínez[8], M. Pi[9], A. Valeiras[9], M.L. Fortes[3], M.F. Jiménez-Herrera[2], CAPCRI Study Group

[1]Institut d'Investigació Sanitària Pere Virgili, Intensive Care Unit–University Hospital Joan XXIII, Tarragona, Spain, [2]Universitat Rovira i Virgili, Tarragona, Spain, [3]University Hospital Joan XXIII, Intensive Care Unit, Tarragona, Spain, [4]University Hospital Doctor Josep Trueta, Intensive Care Unit, Girona, Spain, [5]Hospital General de Cataluña, Intensive Care Unit, Barcelona, Spain, [6]University Hospital Verge de la Cinta, Intensive Care Unit, Tortosa, Spain, [7]Hospital Universitario de Torrejon, Intensive Care Unit, Torrejon, Spain, [8]University Hospital Sant Pau i Santa Tecla, Intensive Care Unit, Tarragona, Spain, [9]Hospital Sant Joan Despi Moisses Broggi, Intensive Care Unit, Barcelona, Spain

INTRODUCTION. Delphi method has been used to get consensus, create guidelines in a topic where there is controversy and questionnaires. Semirecumbent position (SP) is a recommended measure to prevent ventilator associated pneumonia (VAP) but its implementation is below the optimal.

OBJECTIVES. To create and distribute a questionnaire that aims to evaluate the factors that healthcare workers (HCW) think may influence in the compliance of the SP in patients requiring mechanical ventilation as a prevention measure for VAP.

METHODS. Initial questionnaire was obtained from literature review of factors influencing the SP compliance and patient safety. It included 65 items distributed in 5 areas (patient's factors [A1], related to HCW [A2], to task [A3], to training [A4] and equipment [A5]). 14 participated and three rounds were made. In every round, each item was evaluated from 1 to 7 according to its importance. Items with a score <5 from ≥80 % of the experts were deleted. Items with variability were reworded. When the final version was approved, a pilot test was done with nine HCW to evaluate its understanding and possible mistakes.

This questionnaire was distributed to seven intensive care units from 2012 to February 2013.

RESULTS. In the first round, 37 items with low score and variability were reworded and 8 items were added. In the second, 28 items were deleted and 8 were reformulated. Finally, in the third, four were removed and four reworded. The final questionnaire includes 35 items (21 items in A1, 5 in A2, 4 in A3, 3 in A4 and 2 in A5) evaluated according to Likert scale (1 strong disagreement–5 strong agreement).

During pilot test, six comprehension problems and eight improvements comments were identified. 337 questionnaires were obtained. Response rate was 70.4 %. 64 (19.1 %) were from nursing assistants, 215 (64.8 %) from nurses, 41 (12.2 %) from staff physicians and 15 (4.5 %) from fellow physicians. 83.2 % were women, participants were 37.7 ± 10.6 years old and intensive care experience was 10.0 ± 8.34 years. 73 (25 %) nurses had postgraduate training in intensive care.

The factors reported as related to not follow the SP recommendations were clinical contraindications to SP (median 5 [IQR 4–5]) and patient's discomfort when awake (median 4 [IQR 2–4]). Patient's wishes, abdominal surgery and open abdomen and the lack of feedback when an intervention is implemented in the unit had disparity on the results (median 3 [IQR 2–4]). There were no statistical differences among HCW, neither experience nor postgraduate training.

CONCLUSIONS. Delphi method allowed creating the questionnaire with experts' consensus in three rounds, pilot test was very useful to asses it is understanding.

The only factors that seem to interfere with SP recommendation compliance from HCW opinion are patient's discomfort and clinical contraindications for SP.

GRANT ACKNOWLEDGMENT. Funded by the National Nursing Research Award from University Hospital "Marques de Valdecilla".

0677

ARTIFACT PATTERNS IN CONTINUOUS NONINVASIVE MONITORING OF PATIENTS

M. Hravnak[1], L. Chen[2], E. Bose[1], M. Fiterau[2], M. Guillame-Bert[2], A. Dubrawski[2], G. Clermont[3], M.R. Pinsky[3]

[1]University of Pittsburgh, School of Nursing, Pittsburgh, US, [2]Carnegie Mellon University, Auton Lab, Pittsburgh, US, [3]University of Pittsburgh, School of Medicine, Department of Critical Care Medicine, Pittsburgh, US

INTRODUCTION. Instability can be missed in monitored patients. One contributing factor is alarm fatigue when false alarms originating from monitoring artifact desensitizes clinicians to real alarms. Based on our clinical observation, we hypothesized that artifact is not random, but for each monitored parameter manifests in a small subset of patterns.

OBJECTIVES. We aimed to describe monitor artifact patterns, extract their numeric features, and develop featurized rules for each pattern. Such information could be used to decrease false alarms by automated artifact filtering, and assist clinicians to target action to eliminate artifact.

METHODS. We prospectively recruited admissions for 8 weeks in a 24 bed trauma unit. Noninvasive vital sign (VS) monitoring data recorded at a frequency of 1/20 Hz consisted of heart rate (HR), respiratory rate (RR; bioimpedance), noninvasive (oscillometric) systolic (SBP) and diastolic (DBP) blood pressure, and peripheral oximetry (SpO_2). VS deviations (events) beyond stability thresholds (HR < 40 or > 140, RR < 8 or > 36, SBP < 80 or > 200, DBP > 110, SpO_2 < 85 %) were visually adjudicated by two reviewers (MRP, MH) as real alerts or artifact. The reviewers developed a limited set of expert rules describing perceived patterns in the artifacts. For each parameter type of artifact (HR, RR, SpO_2, etc.) we extracted numeric features in the VS artifact signal data as guided by the expert rules (e.g. data density of signal; gap to next time stamp, signal slope). We visualized artifact events for each parameter type in a 1D or 2D space spanned by the extracted features and derived decision boundaries for numeric featurized rules that discriminated between artifact patterns and evaluated which patterns were most useful in achieving discrimination, and whether any cases did not fit any pattern.

RESULTS. 308 admissions and >29,000 patient-hours of monitoring data were studied, yielding 812 events of VS beyond stability thresholds. Of these, 214 events (26 %) were judged to be artifact. Artifacts were most common in RR (65 %), followed by SpO_2 (17 %), DBP (11 %), SBP (5 %) and HR (2 %). All RR artifacts were captured by two featurized patterns, with the majority (91 %) associated with a pattern of abnormal RR in the absence of HR signals, and the remaining 9 % due to oscillatory/sparse signal patterns without change in other VS. All SpO_2 artifacts were captured by three patterns, with the majority (57 %) associated with a pattern of oscillatory step increases and decreases, 24 % with a pattern of abrupt step increase at conclusion, and 19 % due to sparse signal, also without changes in other VS.

CONCLUSIONS. VS artifact events are common in monitored data, and most artifacts follow predictable patterns for specific VS. Building monitoring systems and sensors to detect artifact based on featurized numeric rules for common artifact patterns could minimize false alarms and improve monitoring utility and patient safety.

GRANT ACKNOWLEDGMENT. NIH NINR R01NR013912

0678

TEMPERATURE MEASUREMENT IN THE ICU: NOT ALL METHODS ARE EQUAL

V. Bosschem[1], N. Mauws[1], D. Van Der Jeught[1], E. Hoste[1], J. Decruyenaere[1], J. De Waele[1]

[1]University Hospital, Surgical Intensive Care, Ghent, Belgium

INTRODUCTION. Accurate measurement of body temperature is important in critically ill patients both as a diagnostic tool and as during therapy (e.g. during therapeutic hypothermia). Various methods for core temperature measurement in critically ill patients are available, but the accuracy of the different methods has been poorly investigated.

OBJECTIVES. To prospectively evaluate different commonly used non-invasive methods for temperature measurement in critically ill patients.

METHODS. We conducted a prospective, comparative analysis of the accuracy of five non-invasive methods for temperature measurement compared with the temperature measured in the bladder (reference core temperature). Body temperature was thereby measured simultaneously with the digital axillary thermometer, the digital inguinal thermometer, the tympanic ear thermometer, the temporal scan thermometer and the frontal non-contact thermometer. Patients were eligible for the study if they were admitted to the surgical ICU of the Ghent University Hospital (Belgium), had their bladder temperature monitored, were expected to stay in the ICU for at least 4 days and if informed consent from the patient or his/her relatives was available. Temperature was measured simultaneously with the different techniques three times per day, and was compared with the core temperature recorded by the bladder catheter. Demographic data were retrieved from the PDMS. Descriptive analysis of data was performed with SPSS 20.0, and Medcalc 12.0 was used for Bland and Altman analysis.

RESULTS. A total of 1,314 temperatures were obtained from 25 patients (15 men, 10 women) using the different methods, resulting in 147 paired data sets. The median age of the patients was 58 years (IQR 35–64), median APACHE-II and SOFA score were 11 (5–24) and 7 (6–10) respectively. Mean core temperature was 37.11 °C (SD 0.79); mean temperatures of the other methods are in Table 1. Inguinal, axillary and tympanic temperature measurement underestimate core temperature by 0.40–0.56 °C on average; temporal scanner method on the other hand overestimated the core temperature. Bias averages calculated by the Bland and Altman methodology are summarized in Table 1.

Table 1 Summary of Bland and Altman analysis of D

Method	Mean temperature recorded (SD) (°C)	Bias average compared to bladder temperature (Bladder temperature–method studied) (°C)	Lower limit of agreement (Bladder temperature–method studied) (°C)	Upper limit of agreement (Bladder temperature–method studied) (°C)
Inguinal	36.73 (0.81)	0.43	−0.33	1.18
Axillary	36.59 (0.86)	0.56	−0.33	1.46
Tympanic	36.70 (0.92)	0.40	−0.85	1.65
Temporal scanner	37.62 (0.77)	−0.46	−1.53	0.61
Frontal non-contact	37.10 (0.80)	0.05	−1.21	1.32

CONCLUSIONS. In ICU patients, temperature measurements may differ considerably from core temperature measurements in the bladder. None of the methods for measuring temperature at the bedside are perfect. Consequently, these methods should not be used when accurate temperature measurement in the intensive care is required.

0679

RESEARCHES ON STUDENT NURSES IN TURKEY: A DESCRIPTIVE ANALYSIS

O. Aslan[1], T. Basak[1], S. Aciksoz[1], B. Tosun[1]

[1]Gulhane Military Medical Academy School of Nursing, Department of Fundamentals of Nursing, Ankara, Turkey

INTRODUCTION. The important part of nursing literature in Turkey are on researches related to student nurses.

OBJECTIVES. The purpose of this study was to examine the characteristics of researches on student nurses in Turkey during a 10 years period.

METHODS. This study was planned as a retrospective and descriptive. Articles on student nurses between 2001 and 2011 were examined in the "Turkish Index of Reference Database", "Turkish Medline Database of National Health Sciences Journals" and "Turkish National Ulakbim Database" by the key word "student nurse". 108 articles were the universe of this research. After discarding repeated articles in these three databases, totally 86 full text articles were accessed online in the sample. Data were collected with a data form prepared by researchers. Descriptive statistics were used to analyze the data in SPSS 15.0 program.

RESULTS. Studies were mostly descriptive (89.5 %). Most of the authors were academic nurses (81.5 %). Mean number of authors was 3.2 ± 1.5. Articles were published in medical journals (53.5 %), nursing journals (37.2 %) and health sciences journals (9.3 %). Topics were mostly on the characteristics of student nurses (59.3 %), practical education (22.1 %), theoretical education (11.6 %). Mostly searched areas were knowledge, attitudes and

behaviors (31.5 %), perspectives (23.9 %) and psychological issues (17.4 %). Proposes were mostly on theoretical education (38.4 %), future research (25.7 %) and practical education (10.5 %).
CONCLUSIONS. This study revealed that types of researches on student nurses were mostly descriptive in Turkey. This result implied that sufficient literature was not available related to experimental designs. That the researches on theoretical and practical nursing education had low ratios should lead us to these issues in the future researches in Turkey.
REFERENCES. 1. Avsar G, Kasikci M, Hemşirelik Yüksekokulu Öğrencilerinde Duygusal Zeka Düzeyi. J Anatolian Nurs Allied Sci. 2010; 13(1) (in Turkish). 2. Capik C, Ozbicakci S, Factors affecting levels of smoking addiction of students attending to the nursing high school. J Int Human Sci. 2007; 4(2) (in Turkish).

Artificial airway: instrumentation and ventilatory management: 0680–0693

0680
HISTOLOGICAL EVALUATION OF THE RECOVERY OF CUFF-INDUCED TRACHEAL INJURY: ASSESSMENT AT 72 HOURS FROM EXTUBATION

F. De Rosa[1,2], G. Li Bassi[2], J.D. Martí[2], M. Cabanas[3], M. Rigol[2], T. Comaru[2], S. Terraneo[2], E. Aguilera[2], M. Rinaudo[2], M. Di Pasquale[2], R.C. Peralta[2], N. Luque[2], V. Giunta[2], J. Ramirez[3], A. Torres[2]

[1]Università degli Studi di Milano, Anesthesia and Intensive Care, Milano, Italy, [2]Hospital Clínic, Pulmonary and Critical Care, Barcelona, Spain, [3]Hospital Clínic, Pathology Department, Barcelona, Spain
INTRODUCTION. High-pressure low-volume (HVLP) endotracheal tube (ETT) cuffs were developed to regulate pressure exerted to the tracheal mucosa and avoid tracheal injury. Lately, novel HVLP cuff designs were created to improve tracheal sealing; however, potential injury associated with these new cuffs has yet to be explored in published literature.
OBJECTIVES. We assessed in pigs histologic recovery from cuff-induced tracheal injury.
METHODS. 20 pigs (38.3 ± 3.3 kg) were anesthetized and randomized to be intubated with 7.0 ETTs comprising cylindrical PVC cuffs: ETT1 Ruschelit Safety Clear plus (3 pigs), ETT2 Hi-Lo™ (3 pigs); cylindrical polyurethane cuff: ETT3 Kimvent Microcuff (2 pigs); conical PVC cuffs: ETT4 Sacett™ (3 pigs); ETT5 Taperguard™ (3 pigs); ETT6 Sheridan HVT (3 pigs); and conical polyurethane cuff: ETT7 SealGuard™ (3 pigs). Cuff pressure was kept at 28 cmH_2O. In ETTs 2, 4, 5 and 7, every 2 h patency of the subglottic lumen was tested and secretions aspirated through a 10 mL syringe. Following 72 h of mechanical ventilation, pigs were weaned, extubated and housed. After 72 h from extubation, pigs were sacrificed, and the trachea in contact with the cuff analyzed. Injury of this area was measured and scored grossly (0 no injury, 1 erythema/edema, 2 erosion. 3 exposed cartilage). The region was excised and fixed in formalin. The worst histologic injury of the first and last tracheal rings in contact with the cuff, and every other ring between these two segments, was scored by a pathologist blinded to the ETT used (0 no injury, 1 epithelial layer compression, 2 cilia loss, 3 epithelial denudation, 4 subepithelial/glandular inflammation, 5 perichondrium inflammation). Injury of the area adjacent to the subglottic aspiration opening was also studied.
RESULTS. The length of the excised trachea was 3.3 ± 0.4 cm, without difference among groups (N = 17, p = 0.07) and the injury extended 1.48 ± 0.4 cm (N = 17, p = 0.45 among groups). We analyzed 6.85 ± 1.74 tracheal rings per pig. Gross injury score was 0.9 ± 0.4 (range 0–2) with no differences among groups (N = 17, p = 0.45). The mean histologic injury score in ETT1 was 2.7 ± 0.8; ETT2 2.6 ± 0.9, ETT3 2.6 ± 0.51, ETT4 2.7 ± 0.6, ETT5 2.7 ± 0.6, ETT6 2.6 ± 0.6, ETT7 2.5 ± 0.8 (N = 91, p = 0.99). No difference in histologic score was found between cuffs of different shapes (N = 91, p = 0.79) or materials (N = 91, p = 0.16). We collected 0.23 ± 0.34 ml of subglottic secretions per aspiration. The histologic score of the area adjacent to the evacuation lumen in ETT2 was 3.3 ± 0.6; ETT4 2.7 ± 0.8, ETT5 1.8 ± 1.2, ETT7 2.6 ± 0.9 (N = 20, p = 0.10).
CONCLUSIONS. Following 72 h of tracheal intubation and intermittent subglottic aspiration, the histologic recovery of the tracheal mucosa is incomplete up to 72 h from extubation, and ranges from cilia loss to full epithelial denudation. Mucosal injury is consistent among commercially available ETTs.
GRANT ACKNOWLEDGMENT. Covidien Ltd., the manufacturer of Hi-Lo™ and Taperguard™.

0681
THE ROLE OF HIGH FLOW CONDITIONED OXYGEN THERAPY ON REDUCING TIME TO DECANNULATION IN CRITICALLY ILL TRACHEOSTOMIZED PATIENTS: A PRELIMINARY COHORT STUDY

G. Hernandez[1], C. Vaquero[1], P. Gonzalez[1], S. Garcia[1], A. Villasclaras[1], C. Pardo[1], E. De la Fuente[1], R. Cuena[2], R. Fernandez[3]

[1]Hospital Universitario Infanta Sofia, Intensive Care, Madrid, Spain, [2]Medical Council, Research Unit, Toledo, Spain, [3]Hospital Sant Joan de Deu-Fundacio Althaia, Intensive Care, Manresa, Spain
OBJECTIVES. To determine the role of high flow conditioned oxygen therapy (HFO) applied continuously after weaning from mechanical ventilation (MV) in tracheotomized patients, on decannulation time
METHODS. General ICU of a University Hospital without neurocritical patients. *Patients* Tracheostomized patients after liberation from MV is completed. *Interventions* Prospectively recorded patients with HFO (applied directly to the tracheal cannula and continuously until decannulation to the maximum flow tolerated and warmed up to 37 °C) and a historical cohort matched for frequency of suctioning, age (>60 years) and gender. *Measurements* The primary endpoint was time from weaning from MV to decannulation. Secondary end-points were diagnosis of respiratory infection after weaning from MV, ICU length of stay and suctioning frequency. Statistical analyses included logistic multivariate model.
RESULTS. Each cohort included 51 patients. Decannulation time and ICU length of stay were shorter in cases (10.1 ± 10.9 vs. 12.1 ± 11.3 days, p = 0.06; 37.2 ± 18.8 vs. 42.8 ± 23.3 days, p = 0.08, respectively). Cases developed a non-significantly reduced number of respiratory infections (3 episodes of tracheobronchitis vs. Five tracheobronchitis plus one pneumonia episode, p = 0.08). Despite the small sample size the multivariate analysis selected the following variables: HFO (OR −0.64, 95 % CI −0.4/−2.8, p < 0.01), medical diagnosis (OR−0.52, 95 % CI −0.3/−2.3, p = 0.02), and age (OR 1.9, 95 % CI 1.1/2, p = 0.05). The multivariate analysis for suctioning frequency at decannulation selected HFO (OR −0.41, 95 % CI −0.3/−5.5, p < 0.01) and suctioning frequency at weaning (OR 0.26, 95 % CI 0.2/0.6, p < 0.01).
CONCLUSIONS. The use of HFO after weaning from MV in tracheotomized patients probably reduces decannulation time and improves respiratory secretions management. The heterogeneity of the tracheotomized patient's population requires a larger sample to define the role of HFO.

0682
REPEATED INTUBATION ATTEMPTS AND FEMALE SEX ARE ASSOCIATED WITH ADVERSE EVENTS DURING EMERGENCY INTUBATION IN THE EMERGENCY DEPARTMENTS: AN ANALYSIS FROM A MULTICENTER PROSPECTIVE OBSERVATIONAL STUDY

H. Okamoto[1], A. Kuriyama[1], T. Fukuoka[1], K. Hasegawa[2], Japanese Emergency Medicine Network (JEMNet)

[1]Kurashiki Central Hospital, Emergency Medicine, Kurashiki, Japan, [2]Massachusetts General Hospital, Emergency Medicine, Boston, US
INTRODUCTION. Emergency intubation is associated with a higher incidence of adverse events compared with intubation for the elective surgery. However, comprehensive studies assessing the predictors of adverse events during emergency intubations are lacking.
OBJECTIVES. Our objective was to examine predictors of airway-related adverse events during emergency intubation in the Emergency Department (ED).
METHODS. We conducted a secondary analysis using a cohort from a multicenter prospective registry of 13 Japanese EDs between April 2010 and August 2012[1)]. All consecutive patients who underwent emergency intubation in the EDs were included. Patients who underwent surgical airway management or who failed to be intubated were excluded. The primary outcome was the occurrence of airway-related adverse events. Potential predictors of airway-associated adverse events examined were age, weight, sex, initial method of intubation, number of intubation attempts, primary indication, first intubator, sedatives. These predictors were selected according to the previous study and clinical importance. We present descriptive data of airway-related adverse events as number with proportions. Predictors of airway-related adverse events were determined using multivariable logistic regression analysis.
RESULTS. During the study period, 4,268 consecutive patients were intubated in the EDs. Among these, database recorded 4,094 intubations (capture rate 95.9 %). We excluded 37 patients who met the exclusion criteria. A total of 4,057 patients were eligible for the analysis. The mean age of patients were 64 years and 40 % were female. Half of the indication of intubation was medical emergencies. 452 patients (11.1 %) had airway-related adverse events (esophageal intubation with delayed recognition 4.3 %, hypotension 1.3 %, regurgitation 1.0 %, hypoxia 0.1 %, dysrhythmia 0.1 %, cardiac arrest 0.1 %, dental/lip trauma 2.6 %, main stem bronchus intubation 2.0 %, and airway trauma 0.6 %). Multivariable analysis revealed number of intubation attempts (OR per each incremental attempt, 2.12; 95 % CI, 1.92–2.35), female sex (OR 1.37; 95 % CI 1.10–1.71), non-video laryngoscopy (OR 2.15; 95 % CI 1.03–5.27), benzodiazepine (OR 1.47; 95 % CI 1.04–2.08) were independently associated with airway-related adverse events. Main stem bronchus intubation was increased in female (OR 1.88; 95 % CI, 1.16–3.03).
CONCLUSIONS. Repeated intubation attempts and female sex were clinically important risk factors for adverse events during emergency intubation in ED.
REFERENCES. 1. Hasegawa K, Hagiwara Y, Chiba T, et al. Resuscitation. 2012; 83: 428–33.

0683
RELATIONSHIP BETWEEN TIME TO REINTUBATION AND OUTCOME IN REINTUBATED PATIENTS FOLLOWING SCHEDULED EXTUBATION

N. Umei[1], K. Atagi[1], H. Okuno[1], Y. Otsuka[1], A. Ujiro[1], H. Shimaoka[1]

[1]Osaka City General Hospital, Critical Care Medicine, Osaka, Japan
INTRODUCTION. Approximately 10–15 % of patients who are extubated from mechanical ventilation require reintubation. Extubation failure prolongs the duration of mechanical ventilation, increases the length of ICU and hospital stay, increases the need for tracheostomy, and is associated with higher hospital mortality. Consequently, great emphasis has been placed on accurately predicting extubation outcome. In addition, we considered that the outcome of extubation failure may be associated with delayed intervention.
OBJECTIVES. We studied the relationship between the interval of reintubation and outcome in reintubated patients following scheduled extubation.
METHODS. A single-center retrospective clinical study of a 10-bed adult general ICU was carried out over 24 months. Included patients met the extubation criteria of ≥48 h of mechanical ventilation due to acute respiratory failure after following the ICU weaning protocol. Reintubation was determined by the doctor in charge on the basis of specific criteria such as consciousness level, respiratory frequency, SpO_2, heart rate, and blood pressure. We then studied the duration of ventilation prior to extubation and the time to reintubation.
RESULTS. A total of 29 patients required reintubation for failed extubation. The mortality rate due to extubation failure was relatively high at 34.5 %. The tracheostomy rate was 86.2 %. The mortality rate of patients with early reintubation (<24 h) was 15 % (tracheostomy rate 61 %). On the other hand, the mortality rate of patients with delayed reintubation (>24 h) was 50 % (tracheostomy rate 90 %). Extubation failure, especially due to delayed reintubation, prolongs the duration of mechanical ventilation, length of ICU and hospital stay, need for post-acute care hospitalization, and need for tracheostomy.
CONCLUSIONS. We consider that early reinstitution of ventilatory support has the potential to reduce the increased mortality associated with extubation failure.
REFERENCES. Scott K, Ronald L. Effect of failed extubation on the outcome of mechanical ventilation. Chest. 1997; 112: 186–192.

0684
WEEKENDS AND NIGHT SHIFTS INFLUENCE THE NONINVASIVE VENTILATION FAILURE?

J.A. de Araujo Neto[1], R.F. Bomfim[1], F.B. Lima[1], F.F. Amorim[1], E.B. Moura[1], J.R. Trindade Junior[1], A.C. Gouveia[1], G.F. Amaral[1], F.M. Garrido[1], M.O. Maia[1]

[1]Hospital Santa Luzia, Physiotherapy, Brasilia, Brazil
INTRODUCTION. Noninvasive ventilation has been extensively used in the patients with acute respiratory failure for more than 2 decades. Several factors interfere the result of the

application of noninvasive ventilation. The expertise of the interface type, the place of performance and the time utlização are factors that influence the outcome of the application.
OBJECTIVES. To investigate the episodes of failure of NIV application in night shifts and weekends
METHODS. This was a retrospective study, which analyzed the episodes of failure of NIV application in night shifts and weekends in the Adult ICU of the Hospital Santa Luzia, Brasilia-DF, between March 2010 and May 2012.
RESULTS. We analyzed 120 episodes of failure NIV application for the treatment of respiratory failure. The failure occurred primarily in days of weekend and night shifts (62.5 %) compared with weekdays (37.5 %). However this result did not impact the length of hospital and ICU stay. Other variables such as APACHE II, age, total time and average time/day showed no statistical difference.

Table 1 Analysis of variables of patients who received niv

	DAY OFF(n=75)		WEEKDAY (n=45)		p value
Gender	Male (n=40)	Female (n=35)	Male (n=31)	Female (n=14)	0.32
Age (years)	73.4 ± 16		71.9 ± 13.1		0.62
APACHE II score	15.2 ± 7.5		15.7 ± 6.6		0.81
Length of stay in Hospital (days)	26.1 ± 16.2		24.5 ± 19.9		0.25
Length of stay in ICU (days)	19.1 ± 12.5		21.1 ± 18.6		0.89
Total Time of NIV(hours)	4.1 ± 4.8		4.8 ± 5.2		0.14
Arerage time of NIV(hours)	2.1 ± 1.5		2.1 ± 1.2		0.39

Fig. 1 Failure rate in the application of NIV in the tree

CONCLUSIONS. Episodes of application of NIV failure occur more frequently on weekends and night shifts. Time we observe a follow less horizontal, without the presence of professional routine that could explain this result. However this result did not change the outcome of the hospital stay or ICU stay.
REFERENCES. 1. Wang S, et al. Epidemiology of noninvasive mechanical ventilation in acute respiratory failures: a retrospective population-based study. BMC Emerg Med. 2013; 13:6. 2. Antonelli M, et al. Noninvasive ventilation: practice advice. Curr Opin Crit Care. 2013; 19: 1–8.

0685
PHYSIOLOGIC COMPARISON BETWEEN A NEW HELMET AND THE CONVENTIONAL HELMET IN DELIVERING NONINVASIVE VENTILATION

F. Longhini[1], C. Olivieri[2], V. Repetto[1], M. Candriella[1], A. Miziara Pagni[1], G. Cammarota[2], F. Della Corte[2,3], P. Navalesi[3,4,5]

[1]Eastern Piedmont University 'Amedeo Avogadro', Anaesthesia and Intensive Care, Novara, Italy, [2]Universitary Hospital "Maggiore della Carità", Intensive Care Unit, Novara, Italy, [3]Eastern Piedmont University "Amedeo Avogadro', Translational Medicine Department, Novara, Italy, [4]Ospedale Sant'Andrea, Vercelli, Italy, [5]CRRF Mons. L Novarese, Moncrivello, Italy

INTRODUCTION. The helmet is an interface for non-invasive ventilation (NIV) that is well tolerated for prolonged time, but is characterized by poor patient-ventilator interaction (PVI). A new helmet (NH) has been recently introduced in the clinical use that has the potential to improve PVI, compared to the standard helmet (SH). In a recent bench study NH was shown to outperform SH with respect to triggering performance, rate of pressurization, and patient-ventilator synchrony (1). However, experimental data on patients receiving NIV are lacking.
OBJECTIVES. To compare NH with SH in patients undergoing NIV for prevention of extubation failure NIV.
METHODS. 14 patients receiving NIV, delivered in Pressure Support (PS) mode, after extubation underwent three 30-min trials, while intubated and then with SH and NIV with NH, the last two treatments randomly assigned.
We measured airway pressure (Paw)-time product (PTP) of the initial 200 ms (msec) from the onset of ventilator pressurization (PTP_{200}), PTP of the initial 300 and 500 ms from the onset of the EAdi swing, with respect the ideal pressurization ($PTP_{300\text{-index}}$ and $PTP_{500\text{-index}}$, respectively) as indexes of the rate of ventilator pressurization. We also computed inspiratory trigger delay ($DelayTR_{insp}$), expiratory trigger delay ($DelayTR_{exp}$) and time of synchrony ($Time_{synch}/Ti_{neu}$) as indexes of PVI, and the PTP of the triggering area ($PTP_{trigger}$) as indexes of triggering performance. Peak of electrical activity of the diaphragm ($EAdi_{peak}$) was also assessed to evaluate patient's neural drive and effort. Comfort, as assessed by Visual Analogue Scale (VAS_c) and arterial blood gases (ABGs) were also assessed at the end of each trial.
RESULTS. $DelayTR_{insp}$, and $PTP_{trigger}$ were significantly reduced by NH, as opposed to SH (0.25 [0.18–0.31] vs. 0.31 [0.22–0.43], and 14.5 [10.0–14.5] vs. 23.0 [21.8–33.9] cmH_2O/s respectively, $p < 0.05$). Quite the opposite, PTP_{200}, $PTP_{300\text{-index}}$ and $PTP_{500\text{-index}}$ were significantly higher with NH, compared to SH (30.4 [24.9–38.4] vs. 13.6 [10.1–19.6] cmH_2O/s, 7.09 [2.72–10.00] vs. 0.79 [0.07–1.80] %, 27.30 [16.21–34.84] vs. 4.7 [2.50–9.86] % respectively; $p < 0.05$). $Time_{synch}/Ti_{neu}$, was also significantly higher with NH than with SH (0.71 [0.61–0.81] vs. 0.64 [0.48–0.72], $p < 0.05$). $DelayTR_{exp}$, $EAdi_{peak}$ and ABGs did not show significant differences between the two interfaces, while VAS_c was higher with NH, as opposed to SH (8.0 [8.0–8.0] vs. 5.5 [5.0–6.0] $p < 0.05$).
CONCLUSIONS. Compared to SH, NH improved PVI, by enhancing triggering performance and pressurization rate, and resulted in an improved comfort, without determining significant changes in ABGs and neural drive and effort.
REFERENCE(S). 1. Olivieri C, Costa R, Spinazzola G, et al. Bench comparative evaluation of a new generation and standard helmet for delivering non-invasive ventilation. Int Care Med. 2013; 39(4): 734–738.

0686
HUMIDIFIED HIGH FLOW NASAL CANNULA SUPPORTIVE THERAPY IMPROVES OUTCOMES IN LUNG TRANSPLANT RECIPIENTS READMITTED TO THE INTENSIVE CARE UNIT DUE TO ACUTE RESPIRATORY FAILURE

M. García de Acilu[1], O. Roca[1,2], J.R. Masclans[1,2], B. Caralt[1], J. Sacanell[1], J. Rello[1,2], CRIPS Investigators.

[1]Hospital Universitario Vall d'Hebron, Intensive Care Unit, Barcelona, Spain, [2]CibeRes (Instituto de Salud Carlos III), Madrid, Spain

INTRODUCTION. There has been an important increase in the number of Lung transplants in the last 20 years (66 patients underwent transplantation in our center in 2012), many of whom require readmission to an ICU. These patients have a particularly poor prognosis, mainly related to the need of mechanical ventilation.
OBJECTIVES. To evaluate the effectiveness of humidified high flow nasal cannula (HFNC) in lung transplant (LTx) recipients readmitted to ICU due to ARF patients.
METHODS. Retrospective analysis of a prospective assessed cohort of LTx patients who were readmitted to ICU due to ARF over a 5-year period. Patients received conventional oxygen therapy (COT) or HFNC (Optiflow™, Fisher & Paykel, New Zealand) supportive therapy according to the attending's physician criteria. Treatment failure was defined by their need of subsequent MV.
RESULTS. 37 LTx recipients required ICU readmission with a total of 40 episodes (18 COT vs 22 HFNC). At ICU admission, no differences in comorbidities, pulmonary function and SOFA (COT 4 [4–6] vs HFNC 4 [4–7]; $p = 0.51$) were observed. A reduction of need of MV (89 vs 59 %; $p = 0.07$) and ICU mortality (72 vs 46 %; $p = 0.09$) was observed with HFNC use. Relative risk of MV in patients with COT was 1.5 (95 % CI 1.02–2.21). In this series, the absolute risk reduction for MV with HFNC was 0.3 and, therefore, only three patients need to be treated with HFNC to prevent one intubation. Compared with COT failure patients, HFNC failure was not associated with higher LOS or ICU mortality (81.3 vs 76.9 %; $p = 1.0$). No adverse events were related with HFNC use.
CONCLUSIONS. HFNC O_2 therapy improves outcomes of the LTx recipients readmitted to the ICU.
REFERENCE(S). Hadjiliadis D et al. Outcome of lung transplant patients admitted to the medical ICU. Chest. 2004; 125(3): 1040–5. Roca O et al. High flow oxygen therapy in acute respiratory failure. Respir Care. 2010; 55(4): 408–413.
GRANT ACKNOWLEDGMENT. This study has been funded in part with CibeRes (PCI Neumonia). Dra. García de Acilu has received a non-restricted travel grant from Fisher & Paykel. Fisher & Paykel has not participated neither in the study design or interpretations of results.

0687
PHYSIOLOGICAL EFFECTS OF NASAL HIGH-FLOW CANNULA: A BENCH STUDY USING SPONTANEOUS BREATH SIMULATOR

Y. Onodera[1], R. Akimoto[1], K. Kurihara[1], S. Oda[1], M. Okada[1], M. Nakane[1], K. Kawamae[1]

[1]Yamagata University Faculty of Medicine, Anesthesiology and Intensive Care Medicine, Yamagata, Japan

INTRODUCTION. The recently-invented nasal high-flow cannula (HFNC) system is used as respiratory therapy, easier than noninvasive positive pressure ventilation and more effective than conventional oxygen therapies. Although there are studies reporting the clinical effects of HFNC vs. conventional oxygen therapies, HFNC's respiratory physiological effect is not well evaluated.
OBJECTIVES. To evaluate the respiratory physiological effect of HFNC by using a lung model.
METHODS. Optiflow™ (Fisher and Paykel Healthcare, Auckland, NZ) was used as HFNC system under simulated spontaneous breaths by LUNGOO (Air Water Safety Service, Kobe, Japan). An artificial nose was made of plastic tubes, and the holes were adjusted to generate PEEP of 3 cmH_2O with tidal volume (V_T) of 400 mL and respiratory rate of 15 breaths/min in the normal lung model (compliance 50 mL/cmH_2O, resistance 5 $cmH_2O/L/s$, inspiratory time 1 s) and the HFNC flow of 35 L/min. Inspiratory effort as P_{mus} was changed in 4 levels as 5, 10, 15 20 cmH_2O with changing the HFNC flow up to 60 L/min and PEEP, V_T, and maximum inspiratory flow were measured.
RESULTS. The weaker inspiratory effort model had higher PEEP, increasing up to 11 to 17 cmH_2O as HFNC flow increased. In the two stronger inspiratory effort models, V_T initially increased, but over some point of HFNC flow, V_T gradually decreased (800–600 mL in the strongest inspiratory effort model) as HFNC flow increased. In the weaker inspiratory effort model, V_T decreased (230–110 mL) as HFNC flow increased.
In the three higher inspiratory effort lung models, maximum inspiratory flow increased initially but started to decrease as HFNC flow was increased. (The maximum inspiratory flow decreased from 65 to 45 L/min in the strongest inspiratory effort model.) In the weakest inspiratory effort model, maximum inspiratory flow simply decreased (20–10 L/min) as HFNC flow increased.
To evaluate the change in work of breathing (WOB), we changed the P_{mus} to maintain the initial V_T in each initial P_{mus} (900, 680, 460, 240 mL). In the two larger V_T models, WOB slightly decreased (0.89–0.75 J/breath in largest V_T model) until the HFNC flow of 20 L/min, and started to rise as HFNC flow increased (increased up to 1.28 J/breath in the largest V_T model). In the two smaller V_T models, WOB increased (0.04–0.10 J/breath in smallest V_T model) as HFNC flow increased. The amount of change of WOB was larger in the larger

V_T models. When comparing them by increased ratio, the smaller V_T models had larger changes which increased about 2.5 times the initial WOB.
CONCLUSIONS. Our study showed that PEEP rises as HFNC flow increases, while V_T decreases and WOB increases from some point of HFNC flow. This suggests that there are probably different indications and optimal flows of HFNC for various types of respiratory failure and patient conditions according to the need for PEEP and the influence of HFNC flow on V_T or WOB.
GRANT ACKNOWLEDGMENT. No conflicts of interest.

0688
CURRENT PRACTICE OF MECHANICAL VENTILATION: PRELIMINARY RESULTS OF NATIONAL SURVEY IN UKRAINE

M.M. Pylypenko[1]

[1]National Medical Academy Postgraduate Education named by P.L. Shupyk, Department of Anaesthesiology and Intensive Care, Kyiv, Ukraine
INTRODUCTION. Up to date more than half of respirators in Ukrainian ICUs are old fashioned and allow only volume control ventilation. During the last decade the situation has been changing and the majority of ICUs receiving different new ventilators, but this process is rather unsystematic and often ICU received 3–4 respirators all of them are from different producers. The different user interface and unconformity of the names of regimens and ventilation parameters arouse difficulties for the medical staff.
OBJECTIVES. To characterize the equipment of ICUs with ventilators, evaluate the current practice on selections of ventilation regimens and parameters and the physicians' knowledge, believing and misunderstandings in this area.
METHODS. The crosssectional, prospective, observational study, based on the filling of the survey about ICU equipping with respirators and current practice regimens/ventilation parameters of selections has been started aimed evaluation the situation over all regions of Ukraine. The intermitted analysis has been performed after completing of questionnaires by the 98 physicians in 38 ICUs in 8 districts in Ukraine.
RESULTS. In surveyed ICUs were indicated more than 25 models of respirators produced over the world (mostly from the budget and middle class) and more than 10 models of produced in post-soviet union area. Physicians selected more than 10 ventilation regimens; CMV and SIMV were the most frequently used. It has to be noticed that physicians often were prone to use controlled modes and SIMV instead of respiratory support and regimens with closed loop control even in cases that they have good enough ventilators. More than in half of questionnaires revealed some misunderstanding in writing of the names of regimens and their classification. Thus to the category of "intellectual" regimens sometimes assigned CMV, SIMV and PS that is not corresponds to internationally accepted classification. The correct answers about the terms of controlled ventilation and respiratory support were found in less than half of questionnaires as well. The absolute value of inspiratory pressure in both volume and pressure controlled regimens for the patients with normal static respiratory compliance was often higher than predicted. It may suggest for the use of the higher values of tidal volume and, that is more likely, for the increased resistance of the airways or/and respiratory circuit. More than in 10 % of questionnaires have been found that the level of the plato pressure is higher than the peak inspiratory pressure that could suggest about the occurring of expiratory efforts at the end of inspiratory phase or about the physicians' misunderstanding of the interrelations between these parameters.
CONCLUSIONS. The interim analysis of the observational study has revealed valuable information ICU equipping with respirators and new interesting and, sometimes, unexpected data corresponding to current ventilatory practice.

0689
EFFECTS OF AMBU AND LAERDAL VALVES ON VENTILATORY PARAMETERS: A COMPARATIVE STUDY

A. Khoury[1,2], P. Valero[1], R. Sailley[1], L. Pazart[2], R. Martarello[1,3], F.S. Sall[1,2], A. De Luca[1,2], G. Capellier[1], SIM Team

[1]University Hospital of Besancon, Emergency Medicine and Critical Care, Besancon, France, [2]INSERM CIC-IT 808, University Hospital of Besancon, Besancon, France, [3]Home Care Division, Don Du Souffle, Besancon, France
INTRODUCTION. Airway management is an important challenge for medical and paramedical staff in emergency situations; optimizing the settings and providing good-quality ventilation remain the key issues. Bag Valve Mask ventilation (BVM), although the mostly-worldwide-used technique for assisting respiratory-failing patients, remains the less preferred one in comparison with transport ventilators and other ventilation devices. The most widespread BVM are the Ambu© and Laerdal© devices with unidirectional valves. Our study aims to define whether there are differences in ventilation parameters according to the device used.
MATERIALS AND METHODS. We carried the tests on the experimental lung model Ingmar© ASL 5000, to simulate patients with different pulmonary profiles/characteristics/parameters: normal, obstructive and restrictive. During the testing scenario, the patient ventilated spontaneously; first without any device, then after several respiratory cycles, we connected the Ambu© valve, and then the Laerdal© one. We simulated patients having a—10 cmH_2O inspiratory effort, with two different respiratory frequencies: 15 and 30 bpm. The collected data were the Inspiratory tidal volume (Vt_{insp}), the inspiratory and expiratory work, and the peak flow. The results are shown in Table 1. Statistical study was made by repeated measures analysis of variance, a $p < 0.05$ is considered as relevant. Analyses were performed using SAS v9.3 (SAS Institute Inc.; Cary, NC).
RESULTS. The effects of Ambu valve and Laerdal valve in inspiratory tidal volume (Vt_{insp}), inspiratory and expiratory work and peak flow determined for normal, obstructive and restrictive patients at two different respiratory frequencies are presented in Table 1 with a $p < 0.0001$ for all.

Table 1 Effects of Ambu and Laerdal valves ($p < 0.0001$)

	Normal patient with a respiratory frequency of 15 bpm	Normal patient with a respiratory frequency of 30 bpm	Obstructive patient with a respiratory frequency of 15 bpm	Obstructive patient with a respiratory frequency of 30 bpm	Restrictive patient with a respiratory frequency of 15 bpm	Restrictive patient with a respiratory frequency of 30 bpm
Inspiratory Vt (mL)with Ambu© valve (mean ± standard deviation)	388.83 ± 2.82	247.69 ± 2.72	60.65 ± 1.22	27.36 ± 0.58	238.51 ± 1.79	183.91 ± 1.41
Inspiratory Vt (mL)with Laerdal© valve (mean ± standard deviation)	397.03 ± 4.15	255.55 ± 3.44	70.21 ± 1.15	32.62 ± 0.62	240.96 ± 1.98	186.17 ± 1.98
Inspiratory Work (mJ)with Ambu© valve (mean ± standard deviation)	239.60 ± 3.57	136.93 ± 2.42	48.10 ± 0.89	22.30 ± 0.42	160.54 ± 1.30	116.61 ± 1.54
Inspiratory Work (mJ)with Laerdal© valve (mean ± standard deviation)	231.82 ± 4.81	132.06 ± 3.09	57.18 ± 1.01	27.35 ± 0.46	157.32 ± 2.81	113.29 ± 2.39
Expiratory Work (mJ)with Ambu© valve (mean ± standard deviation)	61.36 ± 1.56	28.63 ± 1.17	3.50 ± 0.36	1.61 ± 0.17	58.70 ± 0.92	30.42 ± 0.57
Expiratory work (mJ)with Laerdal© valve (mean ± standard deviation)	53.23 ± 1.63	21.19 ± 1.24	0.94 ± 0.28	0.41 ± 0.19	57.95 ± 1.23	26.94 ± 0.91
Peak flow (mL/s)with Ambu© valve (mean ± standard deviation)	1,173.92 ± 12.07	1,205.03 ± 12.68	153.51 ± 2.10	145.00 ± 1.57	997.61 ± 9.26	1,114.33 ± 9.74
Peak flow (mL/s)with Laerdal© valve (mean ± standard deviation)	1,160.41 ± 13.85	1,214.54 ± 15.47	166.77 ± 1.94	159.02 ± 2.00	965.53 ± 13.68	1,106.56 ± 12.62

DISCUSSION AND CONCLUSION. For all patients, even in severe dyspnea, the Laerdal© valve seems to facilitate ventilation. When it comes to obstructive situations, although the Laerdal© valve ensures much better Vt_{insp} than the Ambu© one, the inspiratory work is lower with the Ambu© valve, which means an easier ventilation for the patient. These different results are probably due to the particular "duckbill" shape of the Laerdal© valve, which may need less inspiratory effort to open. These tests should also be done with a ventilation bag connected to the valve, in order to see whether it is possible to override these differences.

0690
EVALUATION OF MANUAL AND AUTOMATIC MANUAL-TRIGGERED VENTILATION PERFORMANCE AND ERGONOMY

E. L'Her[1,2], N. Marjanovic[1], S. Le Floch[1], M. Jaffrelot[1]

[1]CHU de Brest/Université de Bretagne Occidentale, Réanimation Médicale et Urgences Adultes, Brest, France, [2]Université de Bretagne Occidentale, CHRU de Brest, LATIM INSERM UMR 1101, Brest, France
INTRODUCTION. Manual bag-valve is the most frequent ventilation method during resuscitation, in the absence of endotracheal intubation. Efficiency of other devices has been fewly studied.
OBJECTIVES. The objectives of this bench-test study were to evaluate the potential impact of training and professional category on manual bag-valve ventilation efficiency, and to assess the effectiveness of an automatic manual-triggered system.
METHODS. A respiratory system analog was built up using a lung simulator connected to a manikin, in order to simulate a patient with unprotected airways. Five professional groups, emergency physicians, residents, advanced paramedics, nurses and paramedics) ($n = 10$ per group) evaluated manual bag-valve ventilation, as compared to an automatic manual-triggered device (EasyCPR). Three pathological situations were simulated (restrictive, obstructive, normal). Standard ventilatory parameters were recorded; Ergonomy was

assessed at the end of recordings using a standard numerical scale.
RESULTS. Tidal volume was within range (400–600 ml) for 26 % (0.6–45) breaths using manual bag-valve ventilation, and for 29 % (0.3–80) breaths using EasyCPR ($p < 0.001$), but with a lower dispersion with the EasyCPR (see Figure). Peak inspiratory airway pressure was lower using EasyCPR (10.6 ± 5 cmH_2O vs 15.9 ± 10 cmH_2O; $p < 0.001$). Ventilation rate was consistent with guidelines, solely when using the EasyCPR (10.3 ± 2 versus 17.6 ± 6; $p < 0.001$). Significant pulmonary over distension was observed while using manual bag-valve device during the normal and obstructive sequences. Nurses and paramedics considered EasyCPR ergonomy higher.

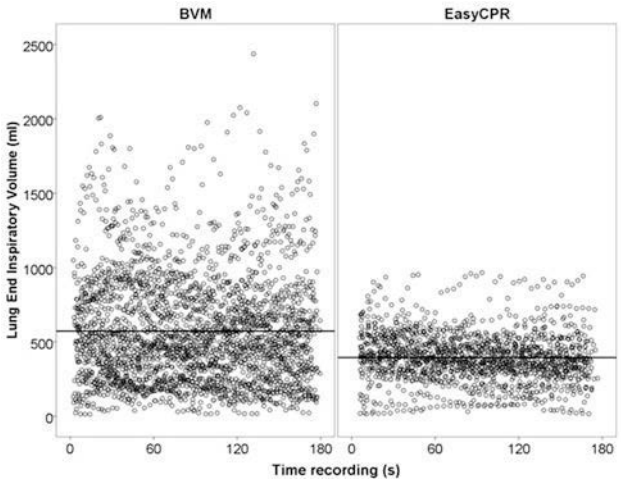


Fig. 1

CONCLUSIONS. The use of an automatic manual-triggered device may improve ventilation efficiency and decrease pulmonary over distension risk while decreasing ventilation rate.

0691
EXPIRATORY VENTILATOR FILTER EXCHANGE DOES NOT REDUCE INTRATRACHEAL AIRWAY PRESSURE BELOW PEEP WITH ASSISTED PRESSURE CONTROLLED VENTILATION: A BENCH STUDY

J. Engström[1], H. Reinius[1], G. Hedenstierna[2], A. Larsson[1]

[1]Uppsala University, Surgical Sciences, Anesthesia and Intensive Care, Hedenstierna Laboratory, Uppsala, Sweden, [2]Uppsala University, Medical Sciences, Clinical Physiology, Uppsala, Sweden

INTRODUCTION. Disconnection of the endotracheal tube (ETT) from the ventilator circuit immediate reduces positive airway pressure, inducing rapidly developing lung collapse in acute respiratory distress syndrome (ARDS). However, in a pilot study we could not demonstrate any negative effect on lung function in ARDS patients after disconnection of the expiratory ventilator tubing from the ventilator during the daily routine exchanges of HEPA-filters. However, the ventilators are, in our ICU, set with assisted pressure controlled ventilation (PCV) with flow triggering (1 l/min). We hypothesized that; (1) the ventilator sensed the loss of airway pressure as an inspiratory attempt, and the following inspiratory flow, producing a positive airway pressure, was the reason to that lung function, despite the interruption of the ventilator circuit patency, was maintained (2) that with volume controlled ventilation (VCV) the constant flow rate would not produce adequately high tracheal airway pressure (P_{aw}).
OBJECTIVES. To measure the P_{aw} drop in a bench test using clinically relevant compliance and resistance values and ETT sizes after simulated exchange of expiratory filters.
METHODS. A Fluke ACCU LUNG precision test lung was set at compliance-values 10 or 20 ml/cmH_2O, resistance 5 cmH_2O/l/s, and was connected through a ETT (ID 6 or 8 mm) and a tubing circuit (2 m, ID 2 cm) to a Servo-i ventilator (Maquet) set at either PCV (end-inspiratory pressure (EIP) 25 cmH_2O, 10 cmH_2O PEEP, or VCV with the same EIP and PEEP as during PCV. The I:E ratio was 1:2 and the rate 15 or 25/min. Paw was measured 3 cm below the ETT tip. At each of the above combinations (randomized) the expiratory circuit was disconnected from the ventilator during 2, 3, 4, 5 and 6 s to simulate filter exchange. Flow triggering of 1 l/min and pressure triggering of -20 cmH_2O was used at every step. In addition, the "suctioning support" was activated at the end of each sequence.
RESULTS. With the flow trigger the ventilator delivered four inspirations with a total 3–10 s duration according to I:E ratio and rate. With PCV P_{aw} was kept above the set PEEP (12.1 ± 1.2 cmH_2O) independent of other settings and tube size, but with VCV Paw decreased to 4.3 ± 1.2 cmH_2O. In both PCV and VCV, Paw decreased to 0 cmH_2O 0.7 ± 0.2 s after the triggered inspirations discontinued. With -20 cmH_2O trigger setting or with activated suction support Paw fell to 0 cmH_2O within 1.7 ± 0.4 s after disconnection.
CONCLUSIONS. We found that ventilator auto-triggering at disconnecting from the expiratory circuit kept the tracheal pressure above PEEP for at least 3 s with PCV, but not with VCV. This might explain that lung function does not deteriorate at routine filter exchange and encourages clinical use of positive trigger settings, PCV and avoidance of "suctioning support" at ventilator filter exchange.

0692
MODIFICATION OF THE DYNAMIC RESPONSE TO OXYGEN WITHIN A SUBJECT. IMPACT ON AUTOMATED OXYGEN TITRATION

F. Lellouche[1,2], P.-A. Bouchard[1], N. Zoso[2], M.-C. Ferland[1], E. L'Her[2,3]

[1]Institut Universitaire de Cardiologie et de Pneumologie de Québec, Intensive Care Unit, Québec, Canada, [2]Oxynov, Québec, Canada, [3]CHU La Cavale Blanche, Brest, France

INTRODUCTION. We previously showed that the dynamic response to oxygen (variations of oxygenation secondary to the variations of oxygen flows) is very variable in a mixed population[1]. Time constant and gain could differ from a factor ten in the studied population. We also anticipate variations of the dynamic response to oxygen for a given patient in relation with the phase of the respiratory disease. This may influence the accuracy of automated oxygen titration[2].
OBJECTIVES. To illustrate the variability of the dynamic response to oxygen for a given patient. To demonstrate the impact of this variability on automated oxygen titration.
METHODS. We measured the time constant and the gain defining the dynamic response to oxygen in a subject during an episode of bilateral pneumonia and 2 months after resolution of this episode. We simulated with Matlab the automatic adaptation of oxygen flows using the parameters (time constant and gain) of this subject during and after pneumonia, with different type of controllers (aggressive–medium–slow responses).
RESULTS. We present the curves describing the dynamic of response to oxygen during and 2 months after bilateral pneumonia in a 33 years old subject without respiratory disease before pneumonia occurred (Fig. 1). The simulated oxygen titrations with three controllers are displayed in the Fig. 2.

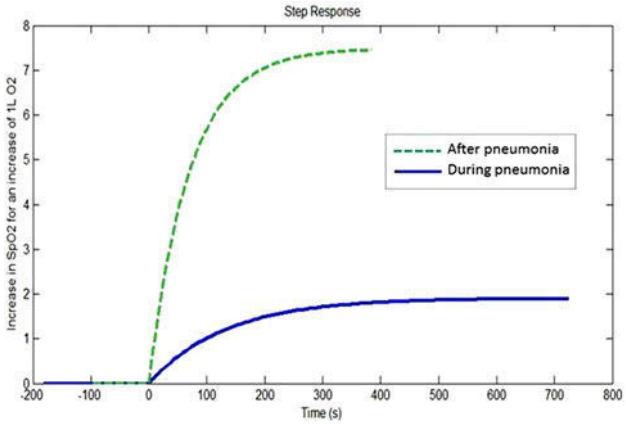


Fig. 1 Dynamic of response to oxygen during and 2 months after bilateral pneumonia

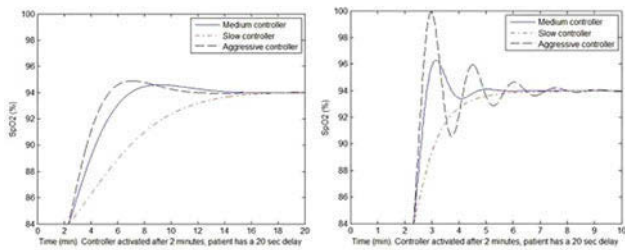


Fig. 2 Simulation of the responses to three controllers with parameters of oxygen response during pneumonia (left panel) and 2 months after the resolution of pneumonia (right panel)

CONCLUSION. Variations of the dynamic response to oxygen exist also within a patient. This may have a significant impact on automated titration of oxygen. During the acute phase, slow controller would result in delays of several minutes to correct severe hypoxemia and after resolution of the lung injury; aggressive controller would result in instability with oscillatory response. In this regard, controllers with fixed parameters may not fit for all patients and even for a given patient and advanced complex controllers should be used instead.
REFERENCES. 1. Lellouche F, Zoso N, Bouchard PA, Bouchard C, L'Her E, Desbiens A. Characterization of oxygen dynamic response for patients and healthy subjects. Int Care Med. 2011 Ab. 2. Lellouche F, L'her E. Automated oxygen flow titration to maintain constant oxygenation. Respir Care. 2012; 57(8): 1254–62. doi: 10.4187/respcare.01343. [Epub 2012 Feb 17]
GRANT ACKNOWLEDGMENT. Fond de recherche en Santé du Québec, Canadian Fundation for Innovation.

0693
IMPACT OF TUBE SIZE AND VENTILATOR SETTING ON TUBE IMPEDANCE

P. Blankman[1], D. Hasan[1,2], D. van der Woude[3], D. Gommers[1]

[1]Erasmus MC University Medical Centre Rotterdam, Intensive Care Adults, Rotterdam, Netherlands, [2]Maasstad Hospital, Intensive Care, Rotterdam, Netherlands, [3]Rotterdam, Netherlands

INTRODUCTION. The purpose of this study was to analyze the effect of the Endo-Tracheal Tube (ETT) and different ventilator settings on the pressures measured before and behind the ETT. It is well known that a reduction in ETT diameter results in a quadratic increase in impedance. However, it is unclear what the effect of ventilator settings is on impedance.

OBJECTIVES. To define the effect of different ventilatory settings on tube impedance.
METHODS. In the present study we performed in vitro measurements on two different ETT sizes (6 and 8 mm) and two different ventilators (Servo-I, Maquet, Sweden) and (Engström Carestation, GE Healthcare, USA). Using a gas flow analyzer we measured pressures before and behind the ETT simultaneously; and the flow before the ETT. The effect of different ventilator settings on tube impedance was measured during different combinations of PEEP, positive inspiratory pressures (P_{insp}) and respiratory rates. Clinically relevant pressure differences are defined as post-tube pressures <80 % of the simultaneously measured pre-tube values, during at least 25 % of the inspiratory cycle.
RESULTS. As expected the smallest tube resulted in higher tube impedance. However, this was not the most important contributor to tube impedance. The tube impedance was mainly reduced by the application of high PEEP levels, followed by low respiratory rate, tube size and changes in P_{insp}.
CONCLUSIONS. Changes in PEEP levels had a much stronger effect on tube impedance than changes in tube size in in vitro measurements.

Management of sepsis: 0694–0707

0694

VENOUS-ARTERIAL CO_2 TO ARTERIAL-VENOUS O_2 CONTENT DIFFERENCE RATIO COMBINED WITH LACTATE LEVELS AS A MARKER OF RESUSCITATION IN SEPTIC SHOCK

G.A. Ospina Tascon[1], M. Granados Sánchez[1], M. Umaña Perea[1], W. Bermúdez[1], D.F. Bautista Rincón[1], B. Salazar[2], C.A. Arango Dávila[1], G. Hernandez[3], D. De Backer[4]

[1]Fundación Valle del Lili, Universidad ICESI, Intensive Care Unit, Cali, Colombia, [2]Universidad del Valle, Basic Sciences Department, Cali, Colombia, [3]Pontificia Universidad Católica de Chile, Departamento de Medicina Intensiva, Santiago, Chile, [4]Erasme University Hospital, Intensive Care Department, Brussels, Belgium

INTRODUCTION. Identifying tissue perfusion derangements and anaerobic metabolism have been a challenge for monitoring critically ill patients. Under aerobic steady-state conditions, CO_2 production (VCO_2) approximates oxygen consumption (VO_2), and venous-arterial CO_2 content difference ($Cv\text{-}aCO_2$) approximates to arterial-venous O_2 content difference ($Da\text{-}vO_2$). Likewise, under tissue hypoxia conditions, a decrease in global O_2 supply should be accompanied by a decrease in aerobic CO_2 production (VCO_2). Thus, we hypothesized that during normal or even high blood flow states, a $Cv\text{-}aCO_2$ to $Da\text{-}vO_2$ ratio >1.0 could reflect an excess of CO_2 production as result of anaerobic metabolism and it could increase the ability of lactate levels to identify risk of adverse outcomes during early stages of septic shock.
OBJECTIVE. To test the prognostic value of $Cv\text{-}aCO_2/Da\text{-}vO_2$ ratio in septic shock patients achieving both normo and hyperlactatemia during the early phases of resuscitation.
METHODS. We included patients with a first septic shock episode admitted to a mixed ICU in a University Affiliated Hospital over a 24-month period. Time 0 (T0) was set when a pulmonary artery catheter was placed. Hemodynamic, respiratory and blood gas analysis were performed at T0 and 6 h after (T6). For analysis, patients were classified according to lactate levels and $Cv\text{-}aCO_2/Da\text{-}vO_2$ ratio achieved at T6:
Group 1: Lactate $\geq$ 2.0 mmol/L and $Cv\text{-}aCO_2/Da\text{-}vO_2$ ratio > 1.0;
Group 2: Lactate $\geq$ 2.0 mmol/L and $Cv\text{-}aCO_2/Da\text{-}vO_2$ ratio $\leq$ 1.0;
Group 3: Lactate < 2.0 mmol/L and $Cv\text{-}aCO_2/Da\text{-}vO_2$ ratio > 1.0; and
Group 4: Lactate < 2.0 mmol/L and $Cv\text{-}aCO_2/Da\text{-}vO_2$ ratio $\leq$ 1.0.
Multiorgan failure at day-3, ventilator-free days and mortality at day-28 were the clinical outcomes evaluated. We used a Kruskal–Wallis test for continuous variables followed by a Tukey–Kramer test for multiple comparisons. Survival probabilities at day-28 were estimated using the Kaplan–Meier method and log rank test was used to estimate their differences. A p value $\leq$ 0.05 was considered significant.
RESULTS. 132 patients were included. Mortality at day-28 was 42 %. Time from first hypotension episode to PAC insertion was 3.0 h (2.5–3.8). We did not find significant differences for hemodynamic and oxygen parameters at T0. Hyperlactatemic patients evolving with a high $Cv\text{-}aCO_2/Da\text{-}vO_2$ ratio exhibited the lesser oxygen consumption ($_iVO_2$) even though cardiac output, SvO_2 and iDO_2 were no significant different. SOFA scores were significant higher for group 1 when compared to groups 2 and 4 ($p < 0.05$, Fig. 1). Kaplan–Meier curves demonstrated significant differences for survival probabilities at day-28 among groups. ($p < 0.0001$, Fig. 2)
CONCLUSION. A high $Pv\text{-}aCO_2/Da\text{-}vO_2$ ratio during early stages of resuscitation of septic shock can increase the ability of lactate levels to detect patients at high risk of adverse outcomes. Combined with lactate levels, measurements of $Pv\text{-}aCO_2/Da\text{-}vO_2$ ratio may be useful for the guidance of resuscitation in septic shock.

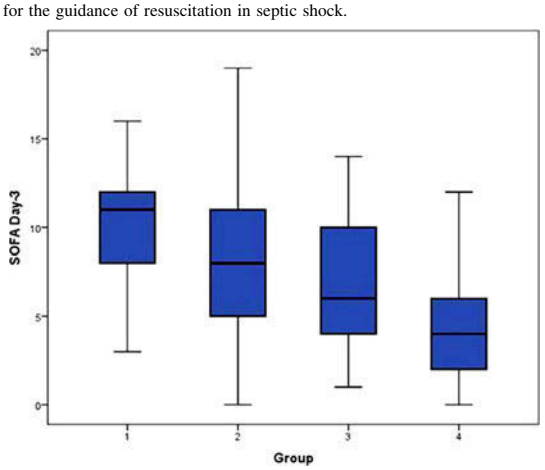


Fig. 1 SOFA at day-3

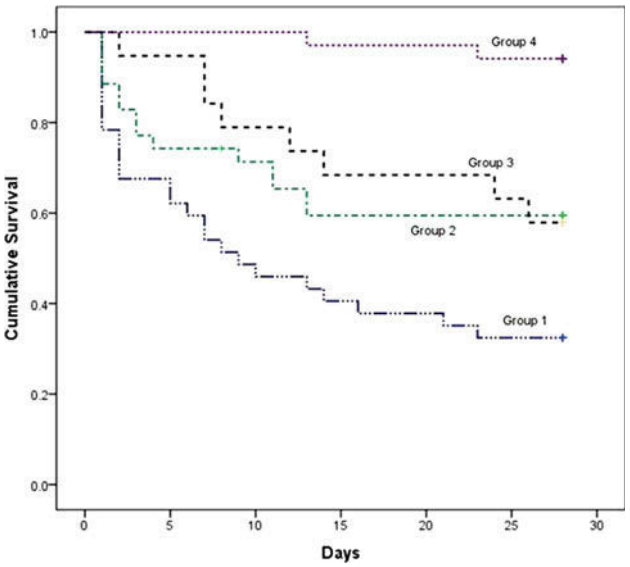


Fig. 2 Survival probabilities at day-28

0695

CMV REACTIVATION IN CRITICALLY ILL PATIENTS: INCIDENCE AND RISK FACTORS

F.G. Frantzeskaki[1], E.-S. Karampi[1], C. Kotarridi[2], A. Mourtzikou[2], N. Nikitas[1], M. Lignos[1], M. Theodorakopoulou[1], E. Paramythiotou[1], A. Armaganidis[1], V. Papaevangelou[3], I. Dimopoulou[1]

[1]Attikon University Hospital, University of Athens Medical School, Intensive Care Unit, Athens, Greece, [2]Attikon University Hospital, University of Athens Medical School, Cytopathology Department, Athens, Greece, [3]P&A Kyriakou Childrens Hospital, University of Athens, 2nd Department of Pediatrics, Athens, Greece

INTRODUCTION. Cytomegalovirus (CMV), an important viral pathogen in immunosuppressed patients, has been receiving increasing attention as a potential pathogen in critically ill immunocompetent patients. During critical illness, the reactivation and subsequent replication of latently infecting CMV, might be associated with increased morbidity and mortality.
OBJECTIVES. The objective of this study is to define the incidence and risk factors of CMV reactivation in critically ill immunocompetent patients
METHODS. This prospective observational study was performed in a 21-bed polyvalent adult intensive care unit, between June 2010 and July 2012. Mechanically ventilated patients with positive anti-CMV IgG titers were included in the study. Exclusion criteria were: age < 18 years old, imminent death, mechanical ventilation >72 h prior to ICU admission, and known immunosuppression or cancer disease. Enrolled patients were evaluated for CMV plasma DNAemia on ICU admission day (day 0) and further followed once a week (days 7, 14, 21 and 28 after ICU admission). CMV DNA quantization was performed with Real-time Alert CMV Q-PCR (Nanogen) test. In addition to demographic data, laboratory examination tests and clinical information regarding disease severity scores (SOFA, APACHE II), presence of sepsis or septic shock, use of vasoreactive agents, total parenteral nutrition, use of corticosteroids, along with total number of red blood units transfused, were recorded during each protocol day.
RESULTS. 63 patients CMV seropositive patients were included in the study (21 women and 42 men, median age: 67.5 yo). CMV reactivation occurred in 9 of the 63 patients (14 %). Median day of reactivation post ICU admission was day 7. There were no statistical differences in terms of age, APACHE II, SOFA score and in the presence of septic shock between patients with or without reactivation. Patients with CMV reactivation had on day 0 higher serum lactate (2 vs. 1.1 mmol/L, $p = 0.008$), higher CRP (156 vs. 67 mg/L, $p = 0.05$) and higher serum glucose (240 vs. 135 mg/dl, $p = 0.05$). Similarly, the number of transfused red blood units was higher in patients with CMV reactivation (1 vs. 0 unit, $p = 0.005$). The number of patients receiving corticosteroids, vasopressors or total parenteral nutrition was comparable in the two groups.
CONCLUSIONS. Reactivation of latent CMV infection occurred in 14 % of critically ill patients. Risk factors associated with reactivation included the degree of inflammation, the number of red cell blood units transfused and specific metabolic alterations. The clinical significance of CMV reactivation needs to be further explored.
REFERENCE(S). 1. Heininger A, Haeberle H, Fischer I, Beck R, Riessen R, Rohde F, Meisner C, Jahn G, Koenigsrainer A, Unertl K, Hamprecht K. Cytomegalovirus reactivation and associated outcome of critically ill patients with severe sepsis. Crit Care. 2011; 15(2): R77.

0696

PREDICTORS OF 30-DAY MORTALITY IN MEDICAL PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK

A. Sinkovic[1], A. Markota[1], J. Fluher[1], D. Rehar[1]

[1]University Medical Centre Maribor, Maribor, Slovenia

INTRODUCTION. Severe sepsis and septic shock are associated with increased mortality. Admission APACHE II score is the gold standard to assess prognosis. However, a variety of other predictors of mortality were evaluated in clinical studies, including inflammatory markers such as CRP, lactate clearance, cardiac biomarkers such as troponin and ejection fraction (EF), multi-organ failure syndrome (MOFS), etc.

OBJECTIVES. To evaluate independent predictors of 30-day mortality in patients with severe sepsis and septic shock in 12-bed University hospital medical ICU.
METHODS. We retrospectively studied 102 patients (63 men, 39 women, mean age 65.1 ± 13.3 years) with severe sepsis and septic shock. Patient treatment followed the guidelines goals. Adequate oxygenation was established by oxygen delivery with or without mechanical ventilation. Adequate perfusion was established by iv. infusion of fluids, iv. noradrenalin and dobutamine to reach mean arterial pressure > 65 mmHg, $ScvO_2$ > 70 %, urine output > 0.5 ml/kg/h within the first 24 h. EF < 50 %, assessed by echocardiography, confirmed systolic cardiac dysfunction. Infection was controlled by iv. antibiotics, administered within an hour after prior microbiological samples were drawn. Low dose hydrocortisone and insulin iv. were administered if necessary. Among predictors of 30-day mortality we evaluated demographic data, admission APACHE II score, admission and in-hospital laboratory parameters, EF, organ failures and treatments.
RESULTS. 30-day mortality of patients with severe sepsis and septic shock was 62.7 %. There were nonsignificant differences between survivors and nonsurvivors in age, gender, MOFS, in proven bacterial infection, positive hemocultures, admission and peak CRP, Troponin, serum creatinine levels, admission lactate, EF. Nonsurvivors were significantly more likely than survivors treated by noradrenalin (89 vs 73.7 %, p = 0.046), veno-venous hemofiltration (26.6 vs 7.8 %, p = 0.024), mechanically ventilated (85.9 vs 65.8 %, p = 0.024), had more likely fungal infection (20.3 vs 5.2 %, p = 0.045), decreased admission pH (7.250 ± 0.15 vs 7.33 ± 0.13, p = 0.005), increased admission APACHE II score (30.5 ± 7.8 vs 26.6 ± 8.7, p = 0.02), and peak lactate level (5.6 ± 6.2 vs 3.1 ± 1.75, p = 0.021). However, binary logistic regression demonstrated that peak in-hospital lactate level was most significant independent predictor of 30-day mortality (OR 1.367, 95 % CI 1.041–1.795, p = 0.025).
CONCLUSIONS. Peak in-hospital lactate level was the only significant independent predictor of 30-day mortality in our patients with severe sepsis and septic shock.
REFERENCE(S). 1. Surviving Sepsis Campaign; International guidelines for management of severe sepsis and septic shock: 2012. Int Care Med 2013; 39: 165–228.

0697
COMPARATIVE ANALYSIS OF SURVIVAL BETWEEN ELDERLY AND NON-ELDERLY SEVERE SEPSIS AND SEPTIC SHOCK RESUSCITATED PATIENTS

H. Palomba[1], T.D. Correa[1], M. Assunção[1], A. Pardini[1], D.R. Melo[1], E. Silva[1]

[1]Hospital Israelita Albert Einstein, Intensive Care, São Paulo, Brazil
INTRODUCTION. Advanced age has been associated with increased mortality in severe sepsis and septic shock patients. However, the impact of an early resuscitation following the Surviving Sepsis Campaign Guidelines in this population of patients is unclear.
OBJECTIVE. To compare the in-hospital mortality between elderly (EP) and non-elderly patients (N-EP) resuscitated according to the Surviving Sepsis Campaign Guidelines.
METHODS. Retrospective observational study. All patients with severe sepsis and septic shock admitted to the intensive care unit (ICU) between January 2006 and March 2012 were studied. Comparisons were performed between elderly (≥65 years) and non-elderly patients (<65 years).
RESULTS. A total of 913 patients with severe sepsis and septic shock were included in this analysis. Elderly patients accounted for 63 % (573/913) of patients and non-elderly for 37 % (340/913) of patients. The median (IQR) age was, respectively for EP and N-EP, 80 y/o (73–85) and 51 y/o (40–59). The incidence of severe sepsis (43 vs. 44 %) and septic shock (57 vs. 56 %) did not differ between the EP and N-EP groups (p = 0.78). Elderly patients had higher median (IQR) APACHE II score (23 [18–28] vs. 19 [16–24], respectively for EP and N-EP, p < 0.001) although the median number of organ dysfunctions (3 vs. 2, respectively for EP and N-EP, p = 0.57) did not differ between the groups. EP were more likely to have hypertension (51 vs. 29 %, p < 0.001), diabetes (33 vs. 24 %, p = 0.02), ischemic heart disease (16 vs. 7 %, p < 0.001) and chronic renal failure (8.5 vs. 4.2 %, p < 0.03) when compared to N-ED patients. Solid organ transplantation (24 vs. 4 %, p < 0.001) and liver cirrhosis (17 vs. 5 %, p < 0.001) were more frequently in N-ED patients. There was no significant between-group difference in the in-hospital mortality (33 % in the EP group and 28 % in the N-EP group; odds ratio 1.27; 95 % CI 0.94–1.70; P = 0.12). The length of hospital stay (14 [7–29] vs. 12 [6–21] days (median [IQR]), p = 0.001) was significantly higher in EP patients compared to the N-EP.
CONCLUSIONS. In this population of severe sepsis and septic shock patients, early resuscitation of elderly patients was not associated with increased mortality. However, prospective studies addressing the long term impact of the resuscitation maneuvers on outcomes are necessary.

0698
PROCALCITONIN VS MULTIDISCIPLINARY TEAM MANAGEMENT OF ANTIBIOTICS IN A DGH

F. Arif[1], A. Race[1], A. Myer[1], C. Pillay[1], P. Morgan[1]

[1]East Surrey Hospital, Anaesthesia, Redhill, UK
INTRODUCTION. Procalcitonin (PCT) is a peptide precursor of calcitonin produced by parafollicular cells of the thyroid and, in health, levels are below 0.05 mcg/L. Levels rise markedly in proinflammatory conditions, especially in sepsis of bacterial or fungal origin, when it is produced by neuroendocrine cells of the lung and intestine, when levels may increase to >100 mcg/L (1, 2).
PCT is being used to differentiate sepsis due to a bacterial cause from SIRS or a viral cause. It has a sensitivity of 88 % and a specificity of 81 % compared to CRP which has a sensitivity of 75 % and specificity 67 % and may be used to guide antibiotic prescribing in ICU (3).
PCT levels <0.5 mcg/L may indicate local infection but severe systemic infection is unlikely. Levels between 0.5 and 2 mcg/L have a moderate risk of progression to severe sepsis. Between 2–10 mcg/L indicate that severe sepsis is highly likely and those >10 mcg/L indicate severe bacterial sepsis or septic shock (1).
OBJECTIVES. Our aim was to determine whether PCT would be a useful test in our population of patients presenting with sepsis in guiding antibiotic therapy compared to our standard decision making by the multidisciplinary team (MDT).
METHODS. 38 consecutive patients admitted with acute sepsis or septic shock were enrolled. Patient demographics, temperature, blood pressure, inotrope requirement, ventilatory support, WCC and CRP were documented on days 1, 3, 5 and 7 of ICU admission. All subsequent antibiotic plans and any changes were documented. PCT samples were also taken on these days but investigators were not aware of the results.
RESULTS. Day 1 PCT result. Number of patients <0.5 mcg/L = 6 0.5–2 mcg/L = 5 2–10 mcg/L = 4 >10 mcg/L = 13 PCT not taken = 9 Of the 28 patients who presented with sepsis and had a PCT level on day 1, 6 had a PCT of <0.5 mcg/L. In 5/6 cases antibiotics were stopped or de-escalated by the MDT by day 5 of admission. If the PCT results had been known to the clinician, and antibiotics had not started, 30 days of antibiotic treatment could have been prevented from 140 days (21.4 %).
CONCLUSIONS. By a MDT approach to antibiotic treatment, in our unit, antibiotics were stopped in 5/6 patients who did not require them. However, the unwarranted use and cost of antibiotic treatment may be avoided by routine PCT testing on the day of admission to ICU, in our audit by 21.4 %.
REFERENCE(S). 1. http://www.procalcitonin.com. 2. Balc IC, Sungurtekin H, Gürses E, Sungurtekin U, Kaptanoglu B. Usefulness of procalcitonin for diagnosis of sepsis in the intensive care unit. Crit Care 7(1): 85–90. doi:10.1186/cc1843. PMC 154110. PMID 12617745. 3. Jones AE, Fiechtl JF, Brown MD, Ballew JJ, Kline JA. Procalcitonin test in the diagnosis of bacteremia: a meta-analysis. Ann Emerg Med 50(1): 34–41. doi: 10.1016/j.annemergmed.2006.10.020. PMID 17161501.

0699
ASSESSMENT OF THE SKELETAL MUSCLE MÉTABOLISM IN PATIENTS WITH SEPTIC SHOCK BY MUSCULAR MICRODIALYSIS

A. Messaoudi[1], Z. Hajjej[1], M. Nasri[1], W. Sallemi[1], H. Gharsallah[1], I. Labben[1], M. Ferjani[1]

[1]Military Hospital of Tunis, Intensive Care Unit, Tunis, Tunisia
INTRODUCTION. In vivo microdialysis (MD) is a bedside advanced technique for immediate analysis of markers of cell injury and metabolites in the interstitial fluid. (1)
OBJECTIVES. The aim of our study was to assess the muscular energetic metabolism by microdialysis and its association with mortality in septic shock patients.
METHODS. We have conducted a preliminary prospective study. We included septic shock patients hemodynamically optimized according to international recommendations. A Microdialysis catheter was inserted in the femoral quadriceps. Interstitial fluid samples were collected every 6 h for 5 days. The determination of muscular lactate, pyruvate, glycérol and glucose was performed by the CMA 600 analyzer (CMA/Microdialysis AB, Sweden). We also performed a dosage of concomitant blood lactate and glucose. The study population was divided into two groups according to hospital mortality. Statistic analysis: Mann–Whitney test and χ^2 were used for comparisons between groups. Quantitative variables were expressed as mean ± standard deviation or median (Interquartile range) as appropriate
RESULTS. We have included 12 patients with septic shock. Mortality rate was 50 %. Demographics were comparable between groups except for age (66 ± 9 vs. 41 ± 12; dead patients vs. survivors; respectively; p = 0.002). Pneumonia was the major cause of septic shock (10 patients).
We analysed 167 blood samples and respectively 162, 153,165 et 166 muscular lactate, pyruvate, glycerol and glucose samples. Muscular lactate is higher than blood lactate during all the study period. Tissue glucose was significantly higher among dead patients compared with survivors at the 2nd day. The lactate/pyruvate ratio is most high at the 1st day of the study. Glycerol kinetics is similar in two groups. We also find, comparing all the data, blood lactate and blood glucose were significantly higher in dead patients.
CONCLUSIONS. Our data suggest that skeletal muscle produces lactate during sepsis. The muscular glucose and lactate assessed by microdialysis tool are associated with mortality. These two tissue métabolites may reflect the metabolic alterations and microcirculatory dysfunction induced by septic shock.
REFERENCE(S). 1. Kopterides PJ Crit Care. 2012; 27(6): 9–18.

0700
UTILISATION OF THE SEPSIS SIX PATHWAY IN CRITICALLY ILL PATIENTS

N. Emilie[1], K. Keens[1], T. Owen[2], C. Roberts[2]

[1]Lancashire Teaching Hospitals Foundation NHS Trust, Postgraduate Department, Education Centre 1, Preston, UK, [2]Lancashire Teaching Hospitals Foundation NHS Trust, Critical Care, Preston, UK
INTRODUCTION. Sepsis has one of the highest mortality rates worldwide with approximately nearly 37,000 deaths annually within the UK [1]. The Surviving Sepsis Campaign was formed to produce international guidelines to increase survival of sepsis. The non-specialist tasks amongst these are now referred to as the "Sepsis Six" [2]. Royal Preston Hospital, UK has created a local hospital sepsis proforma based on Sepsis Six guidelines. This proforma should be completed on every patient as soon as sepsis is diagnosed.
OBJECTIVES. This audit aims to identify if patients admitted into critical care with sepsis within Royal Preston Hospital are being assessed and treated in accordance with international guidelines produced by the Surviving Sepsis Campaign.
METHODS. We prospectively collected information from patients admitted to critical care at Royal Preston Hospital with sepsis over a 6-month period from January 2012. Patients were sub-grouped to compare those that had a proforma for sepsis within the medical notes with patients that had no proforma. Completed elements of the sepsis six were recorded along with whether these were completed within the recommended time frame.
RESULTS. 43 patients were included; 20 female and 23 male. 14 patients had the proforma present within the notes and 29 did not. Out of all the 43 patients, 4 were compliant with the sepsis six proforma; 2 with the proforma being present and two with no proforma. Out of all the elements of the sepsis six; administering oxygen appropriately had 100 % compliance with guidelines. More elements of sepsis six were completed if a sepsis proforma was present. Statistical analysis was performed; however with the limited sample size no significance was demonstrated.
CONCLUSIONS. 9 % of patients in this audit had all elements of Sepsis Six completed and within the 1 h time boundary. Complete compliance with fulfilling Sepsis Six criteria in the recommended time frame is still inadequate with or without the presence of a proforma. Encouragingly, this audit demonstrates that the presence of a local Sepsis Six proforma does increase the number of completed elements of Sepsis Six. This highlights the usefulness of a proforma as a prompt and underlines its importance when managing a septic patient.

REFERENCES. 1. R daniels. Surviving the first hours in sepsis: getting the basics right (an intensivist's perspective). J Antimicrob Chemoth. 2011; 66 Suppl 2: ii11–ii23.
2. http://www.survivingsepsis.org/Background/pages/barcelona_declaration.aspx.

0701
GLUCOSE MONITORING DURING SEVERE SEPSIS: UP/DOWN?

V. Inal[1], O. Mert[2], A. Cotos[3]

[1]Trakya University Faculty of Medicine, Medical Intensive Care Unit, Edirne, Turkey, [2]Trakya University Faculty of Medicine, Department of Internal Medicine, Medical Intensive Care Unit, Edirne, Turkey, [3]Trakya University Faculty of Medicine, Edirne, Turkey

INTRODUCTION. Strict glucose control in ICU has been debated almost 10 years now. Range of allowed glucose levels narrowed and lowered in order to save lives, not so long ago, but shown to increased mortality.
OBJECTIVES. This study was planned retrospectively overview the conflicting issue of glucose monitoring in relation with mortality. Since, sepsis situation is a balance (or an imbalance) of inflammatory and anti-inflammatory surge, neurohumoral and counter-regulatory systems. Distorted tissue perfusion and lack of nutrient—chiefly glucose—worsens the situation. On the other hand, it is known that higher the glucose, higher the toxic end products and radicals, will not improve the condition.
METHODS. Data of severe sepsis patients admitted to MICU were retrospectively evaluated. Patients were randomly assigned into study. Patients' files, medical records, daily follow-up sheets, monitored parameters and laboratory results were collected in a data base. Statistical data were also adjusted for patients' APACHE-II scores and CRP levels. Patients' blood glucose levels have been assessed hourly with insulin infusion protocols. Whole monitored data were statistically analyzed for mortality prediction by correlation, ROC–AUC and regression analysis (CI 99 %, $p < 0.01$).
RESULTS. Randomly assigned 30 patients with severe sepsis, mean age was 64.1 ± 18.3 years, mean LOS was 4.1 ± 2.3 days, mean APACHE-II score was 19.4 ± 7.9 (predicted mortality 40–60 % based on score), mean blood glucose level was 164.3 ± 53.9 mg/dl, showed 40 % mortality, 12 patients died and remaining 18 patients were survived at the end of 30-day follow up period. Analyzed blood glucose trends showed up levels ensured in between 105 and 145 mg/dl pointed out the patients' survival. On the other hand, daily mean glucose levels of below 104 mg/dl and higher that 227 mg/dl indicated higher mortality. Strikingly, for every 10 % deviation of mean daily glucose levels from upper level of 227 mg/dl and lower level of 104 mg/dl doubled mortality risk.
CONCLUSIONS. Our results were convenient with previous strict glucose control strategy with some minor but significant differences. In contrast, data analysis showed that lower glucose limit would have been better if assigned to 105 mg/dl from previous 95 mg/dl. So far, re-evaluated strict glucose control strategy possibly thought to be failed because of uncontrollable hypoglycemic episodes during the course. In this study, it can be postulated that the lower limit of glucose should be drawn to 105 mg/dl, because of every 10 % decrease in blood glucose level below 105 mg/dl (odds 2.0) naturally has more power on increased mortality than effect on the upper limit of 227 mg/dl. This study seemed weak, but highly supported strict glucose control strategy which has inevitably been debated again. This result inspire to new prospective studies that will re-evaluate strict glucose control strategy but taken lower limit of 105 mg/dl and so on.

0702
ESTIMATED TIME LAG FROM ZERO TIME POINT TO THE TIME OF HOSPITAL ADMISSION IN PATIENTS WITH SEVERE SEPSIS OR SEPTIC SHOCK

K.-P. Chung[1], H.-T. Chang[2], C.-J. Yu[3]

[1]National Taiwan University Hospital, Department of Laboratory Medicine, Taipei, Taiwan, Republic of China, [2]Far Eastern Memorial Hospital, Department of Critical Care Medicine, New Taipei, Taiwan, Republic of China, [3]National Taiwan University Hospital, Department of Internal Medicine, Taipei, Taiwan, Republic of China

INTRODUCTION. CD69 expression after lymphocytic activation is important for subsequent proliferation [1]. The half life of *CD69* mRNA is less than 60 min [2], and *CD69* mRNA transiently increased within 24 h in activated T lymphocytes [3]. Increased early activation marker CD69 and proliferation index Ki67 were found in septic patients [4]. Therefore, through measuring *CD69* and *Ki67* mRNA expression amounts in peripheral mononuclear cells (PBMCs), the average time lag from zero time point to the time of intensive care unit (ICU) admission could be estimated, based on the results from in vitro lymphocyte activation studies.
OBJECTIVE. We measured *CD69* and *Ki67* mRNA expression in PBMCs to estimate the average time lag from true zero time point to the time of ICU admission in septic patients.
METHODS. PBMCs from healthy investigators were stimulated by anti-CD3/anti-CD28, and were subsequently harvested at different time points (6, 12, 24, and 36 h). *CD69* and *Ki67* mRNA expressions were measured by quantitative PCR (qPCR). Adult patients admitted to medical ICUs for severe sepsis or septic shock were prospectively enrolled from Oct 2010 through Jan 2012. After written informed consent, 10 mL blood was collected at the time of ICU admission. 12 blood specimens from healthy investigators ($n = 12$) were collected as control. The relative expressions of *CD69* and *Ki67* mRNA in PBMCs were measured by qPCR as described above.
RESULTS. The in vitro experiments showed that *CD69* mRNA expression reached the peak after stimulation for 12 h, while the *Ki67* mRNA expression started to increase 24 h after stimulation. 92 patients admitted to medical ICUs for severe sepsis or septic shock were enrolled during study period. Compared to healthy investigators, septic patients had higher *Ki67* mRNA expression in PBMCs ($P < 0.001$), but did not have significantly higher *CD69* mRNA expression ($P = 0.760$). The average time lag from zero time point to the time of hospital admission in septic patients was estimated after 24 h. Based on the median *CD69* mRNA expression in health subjects, the study population was divided into two groups: early presentation ($n = 46$), and low presentation ($n = 46$). The clinical features, SOFA score, and 28-day mortality were not significantly different between these two patient groups.
CONCLUSIONS. The estimated time lag from the zero time point was about 24–36 h in septic patients. However, patients present early did not have significantly different 28-day mortality, compared to those present late.
REFERENCES. 1. Cebrian M, et al. Eur J Immunol. 1989. 2. Santis AG, et al. Eur J Immunol. 1995. 3. Lopez-Cabrera M, et al. J Exp Med. 1993. 4. Roger PM, et al. J Crit Care. 2012.

GRANT ACKNOWLEDGEMENT. This work was supported by the Far Eastern Memorial Hospital National Taiwan University Hospital Joint Research Program (grants 100-FTN-01).

0703
FLUIDS MANAGEMENT IN KIDNEY DYSFUNCTION AND MORTALITY IN SEPTIC PATIENTS WITH SPECIAL EMPHASIS IN THE ROLE OF ADMINISTRATION OF HYDROXYETHYL STARCH

M. Herrera Gutierrez[1], D. Arias-Verdu[1], R. Lozano-Saez[1], J. Barruecos[1], G. Quesada-Garcia[1], G. Seller-Perez[1]

[1]University Hospital Carlos Haya, ICU, Malaga, Spain

INTRODUCTION. A harmful effect of an aggressive resuscitation with fluids in sepsis has been demonstrated. There are confusing reports regarding hydroxyethyl starch (HES) and acute kidney injury (AKI) and mortality in septic patients.
OBJECTIVES. Study relation between fluids and HES use with AKI development or mortality.
METHODS. Prospective cohorts. We registered the first 3 days total volume and balance (as % of total body weight) of fluids and HES infused. Outcome studied were KDIGO-3 during ICU stay or 28-day mortality. HES used was 130/0.4. Multivariate logistic regression and propensity score for factors related to HES were used. The Ethics Committee of our centre approved the study.
RESULTS. 129 out of 131 patients recruited were included in the study and 117 survived the first 3 days and were included in the final analysis, aged 56.8 ± 16.7 years, 41.2 % female. APACHE II at admission was 23.9 ± 7.7 and SOFA 12.2 ± 5.1. Median stay 11.7 days.
AKI outcome: net cumulative fluid balance at the 3rd day was 0.23 ± 6.3 % for KDIGO-0 patients, 6.65 ± 2.15 % (p 0.08) for KDIGO-1, 6.95 ± 1.67 (p 0.08) for KDIGO-2 and 7.87 ± 6.29 % ($p < 0.001$) for KDIGO-3 (reference KDIGO-0). Net cumulative balance was also related to AKI developed after the first 3 days (0.68 ± 6.3 % in no AKI vs 7.9 ± 5.9, $p > 0.01$ with AKI) but total fluid administrated was not. Net HES administration did not relate to any KDIGO stage. For AKI at the 3rd day or AKI developed after this day, differences in HES were not significant.
Mortality outcome: 28 days mortality was 38.9 %. Total fluid administrated was 15.5 ± 5.9 l in survivors vs 19.1 ± 7.8 ($p < 0.01$) and net fluid balance was 0.7 ± 6.4 % in survivors vs 6.7 ± 6.6 ($p < 0.001$).
In a first multivariate analysis for 28-day mortality we detected a positive relationship for balance (as % of body weight) (OR 1.13, CI 1.06–1.22) and HES (categorical yes/no) (OR 2.4, CI 1.01–5.68). We then performed a regression analysis looking for variables related to HAS and included age, gender, markers of severity, hemodynamic failure, volume of fluid and balances. Only cumulative balance was related to HES, and being this variable related to mortality as well, we computed a propensity score matching patients by HAS and cumulative balances and performed a final regression analysis with 28-day mortality as variable of interest and found that only HES (OR 2.47, CI 1.02–6.01)) was maintained in the model.
CONCLUSIONS. A high volume of resuscitation with a positive cumulative balance can be related to AKI development in septic patients, an effect not found in our series for the use of HES. A positive initial balance of fluids and the use of HES seem to be related to a worse prognosis but we could not define the exact role of each parameter that seem to be closely related.

0704
SEPSIS INCREASES MORBIDITY OF CRITICALLY ILL INFANTS WITH COMPLETE DIGEORGE ANOMALY TREATED WITH THYMUS TRANSPLANTATION

J.H. Lee[1,2], M.L. Markert[3], C.P. Hornik[4], E.A. McCarthy[3], S.E. Gupton[3], I.M. Cheifetz[4], D.A. Turner[4]

[1]KK Women's and Children's Hospital, Children's Intensive Care Unit, Singapore, Singapore, [2]Duke Clinical Research Institute, Durham, USA, [3]Duke Children's Hospital, Pediatric Allergy and Immunology, Durham, USA, [4]Duke Children's Hospital, Pediatric Critical Care, Durham, USA

INTRODUCTION. Infants with complete DiGeorge anomaly are successfully treated with thymus transplantation. During the peri-transplant period, they remain immunodeficient and at high risk for sepsis and emergent pediatric intensive care unit (PICU) admission.
OBJECTIVES. To describe the morbidity and mortality associated with septic episodes in infants requiring PICU admissions after thymus transplantation.
METHODS. Retrospective cohort study of infants referred to a single institution for thymus transplantation between 1993 and 2010. We examined emergent PICU admissions within 6 months after transplantation and excluded elective admissions. Primary outcomes were PICU length of stay (LOS) and survival to PICU discharge. For continuous and categorical variables, we report medians with ranges and proportions, respectively, and used Wilcoxon rank-sum and Fisher exact tests for comparisons.
RESULTS. 60 infants underwent thymus transplantation and 13 (22 %) required 26 emergent PICU admissions. Bacteremia was present in 9/26 (35 %) admissions in eight separate infants. Three of these eight infants developed bacteremia within the first 24 h of admission, with two of these three infants having central lines at the time of PICU admission. Bacteremia within the first 24 h of admission was not a risk factor for increased duration of mechanical ventilation (MV) or PICU LOS. Beyond the first 24 h, there were six episodes of bacteremia and one episode of fungemia in seven infants during seven separate admissions. Of the nine episodes of bacteremia, the most common pathogens were coagulase negative *Staphylococcus aureus* (44 %) and *Enterococcus fecalis* (22 %). Bacteremia after 24 h in the PICU was associated with prolonged duration of MV (21 [0, 78] vs. 6 [0, 38] days, $p = 0.006$) and LOS (31 [14, 82] vs. 7 [1, 62] days, $p = 0.002$). Despite increased morbidity, there was no increase in odds of mortality (OR 0.64, 95 % CI 0.10–8.50).
CONCLUSIONS. Bacteremia developed in more than 25 % of emergent PICU admissions for infants following thymus transplantation. Episodes of bacteremia that developed during PICU admission were associated with increased duration of MV and PICU LOS. Meticulous nursing care, adoption of central line bundles, appropriate antimicrobial usage, and isolation precautions are important to reduce the risk of bacteremia following PICU admission and decrease morbidity in this vulnerable population.

0705
THE EARLY BENEFITS OF A SEPSIS UNIT IN A TEACHING HOSPITAL. RESULTS FROM THE FIRST 100 SEVERE AND SEPSIS SHOCK PATIENTS TREATED

R. Zaragoza[1], C. Hurtado[1], S. Sancho[1], M. Crespo[1], L. García[1], C. Huertas[1], P. Llopis[2], D. Estellés[3], E. Villanueva[3], A. Valero[4]

[1]Hospital Universitario Dr. Peset, Sepsis Unit, Intensive Care Unit, Valencia, Spain, [2]Hospital Universitario Dr. Peset, Sepsis Unit, Pharmacy, Valencia, Spain, [3]Hospital Universitario Dr. Peset, Sepsis Unit, Informatics Department, Valencia, Spain, [4]Hospital Universitario Dr. Peset, Sepsis Unit, ER, Valencia, Spain

INTRODUCTION. The mortality of severe sepsis and septic shock remains unacceptably high. The development of a multidisciplinary sepsis rapid response team (Sepsis unit) based on SSC could improve the survival of these patients and could also diminish their length of stay.

OBJECTIVES. The aims of this study were to describe the principal characteristics of the first patients treated by a Sepsis unit and to analyse the possible early benefits in terms of mortality and length of stay after the implementation of this unit in a teaching hospital.

METHODS. During a 4 months period, 100 severe sepsis and septic shock patients in a teaching hospital were prospectively evaluated, clinical and microbiological variables were recorded. Two different periods were analyzed in order to analyse the possible differences in mortality rates and length of stay. Period A: From 22-November-2102 to 15-January-2013 when a electronic check list to guide the management of these patients was applied without active interventions of sepsis team and Period B: From 16-January-2013 to 23-February-2013 when Sepsis team began to work actively. A univariate analysis was performed to define the possible differences between to periods using SPSS package (15.0). Statistical significance was considered when p value < 0.05.

RESULTS. Among 140 electronic activations 100 of them corresponded to severe sepsis (72) and septic shock (28). Their mean APACHE II and SOFA score were 17.04 ± 7.02 and 5.20 ± 3.19 respectively. The most frequent sources of infections were the respiratory focus (43 %), urinary (29 %) and abdominal (17 %). Global mortality was 22 %. The principal place of activation was ER in the 85 % of the cases. Only 27 % of patients were admitted in ICU. The number of activations was higher in period B (43 vs. 57). Length of stay was 9.15 ± 10.44 days. The global mortality rate was lower in period B without statistical significance (23.3 vs 21.1 %) whereas the length of stay dramatically diminished in a significant way also in Period B (11.1 ± 13 vs 6.79 ± 7 days, $p = 0.03$). No differences in APACHE II and SOFA scores were found between two periods.

CONCLUSIONS. These preliminary results showed a clear an early benefit of a sepsis unit in terms of detection, mortality and length of stay.

0706
SURVIVING SEPSIS: THE MANAGEMENT OF SEPSIS, EMERGENCY DEPARTMENT RAIGMORE HOSPITAL

R. Kuo[1]

[1]NHS Highland, Raigmore Hospital, Emergency Department, Inverness, UK

INTRODUCTION. Surviving sepsis campaign has recommended early administration of antibiotics within 1 h as each hour delay associated to increase of mortality[1]. This is a departmental audit performed in Emergency Department (ED) Raigmore Hospital to assess and to improve the compliant of timely management of septic patient.

OBJECTIVES. The objectives is to improve early recognition of septic patient and instigate timely investigation, improve the delivery time of antibiotics to septic patient in ED and to maintain a continuous education and feedback to ED staffs on management of sepsis.

METHODS. The data was collected retrospectively from reviewing clinical notes of patient who were diagnosed sepsis. First round of audit was carried out in November 2011 to assess percentage of antibiotics given, time of antibiotics given from the time a patient was triaged and percentage of lactate measured. 'Think sepsis even with SEWs (Scottish early warning sign) 0 or 1' campaign was introduced.

After 3 months, 2nd set of results were presented and we introduced the sepsis board which was updated monthly on above three measures. A sepsis trolley was also introduced (resuscitation items including Highland antimicrobial prescription guidelines). Following that a 3rd set of data was collected.

RESULTS. The results following the 3rd cycle of audits showed the time of antibiotics given has improved significantly from mean time of 104 min in December 2011 to 72.6 min in July 2012. The antibiotic that was administered within 1 h has improved from initial <20 % to average of 47 %. Lactate measurements have improved and maintained at above 70 % in July 2012.

CONCLUSIONS. 'Sepsis six bundle' is relatively difficult to achieve within one hour of patient presenting to ED. However, the duration of antibiotics given and percentage of lactate measured has significantly improved with above interventions. The cause of delay is usually due to uncertainty of diagnosis. Continuous education is essential to improve and maintain the standard of sepsis management. Think sepsis even if patient has low SEWS score but appear unwell. A common broad spectrum antibiotic could be considered as an attempt to avoid delay in antibiotics given due to uncertainty of which antimicrobial regimen is appropriate. The regimen should be reviewed daily for potential de-escalation and prevent resistance.

REFERENCE(S). 1. Dellinger RP, Mitchell ML, Rhodes A. Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and septic shock. 2012; 41.

0707
RISK FACTORS FOR ICU-ACQUIRED GRAM-NEGATIVE INFECTIONS

C. Chelazzi[1], E. Pettini[1], G. Villa[1], A.R. De Gaudio[1]

[1]University of Florence, Department of Critical Care, Section of Anesthesiology and Intensive Care, Florence, Italy

INTRODUCTION. Infections due to multidrug-resistant Gram-negative bacteria have become a common problem in ICUs [1]. Antagonistic interactions between fungi and bacteria have been reported: *Candida albicans* can inhibit the virulence and the viability of human pathogens such as *P. aeruginosa* and *A. baumannii* [2]. The suppression of fungal growth could therefore lead to a higher risk of bacterial infections.

OBJECTIVES. Endpoint of this study was to determine the risk factors for ICU-acquired Gram-negative infections, with particular attention to the possible role of an antifungal therapy.

METHODS. A preliminary retrospective case–control study was conducted. We collected data from all patients admitted to ICU between January and December 2011. Patients admitted for <48 h were excluded. Patients who developed a Gram-negative, ICU-acquired infection were included in the study group, all the other patients were included in the control group. A preliminary analysis was conducted using χ^2 test for categorical data and t test for continuous data. Univariate logistic regression was used to confirm preliminary significant associations and to determine the odds ratio of found risk factors (OR). Outcome data, such as ICU mortality and length of stay and duration of mechanical ventilation, were collected from all patients.

RESULTS. Out of 193 enrolled patients, 15 (7.8 %) developed an ICU-acquired, Gram-negative infection; 40 % of patients who developed a ICU-acquired infection due to Gram-negative bacteria already had an infection on ICU admission ($p < 0.0001$, OR = 2.22, 95 % CI 1.03–3.40) and 60 % of patients with a Gram-negative ICU-acquired infection had been treated with antifungal drugs ($p < 0.0001$, OR = 2.30, 95 % CI 1.17–3.44). Outcome data showed a significantly higher ICU-mortality rate in patients with Gram-negative infections than in the control group (77.3 vs 14.6 %), and a higher length both of ICU stay and mechanical ventilation (24.07 ± 21.91 days vs 5.01 ± 402 days and 17.5 ± 17.23 days vs 2.15 ± 3.48 days respectively).

CONCLUSIONS. Our preliminary data show that infection on admission and antifungal therapy are significantly associated with a higher risk of Gram-negative ICU-acquired infections. The real need of an antifungal therapy should always be carefully evaluated, and its unnecessary use should be avoided.

REFERENCE(S). 1. Vincent et al. JAMA 2009; 302(21): 2323–9. 2. Peleg et al. Nat Rev Microbiol 2010; 8(5): 340–9.

Cardiac surgical intensive care: 0708–0721

0708
EFFECTS OF RED BLOOD CELL TRANSFUSION ON MODERATE ANEMIA IN POST-OPERATIVE CARDIAC SURGERY: A COHORT STUDY

F. Bagate[1], G. Abehsira[1], D. Denjean[1], P. Estagnasié[1], A. Brusset[1], P. Squara[1]

[1]Clinique Ambroise Paré, Intensive Care Unit, Neuilly-sur-Seine, France

INTRODUCTION. Transfusion criteria are not consensual in non-bleeding patients with moderate anemia (NBMA). Several studies have suggested that transfusing patient with moderate anemia can be detrimental in ICU.[1]

OBJECTIVES. To evaluate the impact on mortality and morbidity of transfusing NBMA patients in the immediate postoperative period of cardiac surgery.

METHODS. Retrospective, single center, cohort study, including 2,608 patients admitted in ICU after the end of the Aprotinin use. For all these patients, 85 items investigating the pre-, peri-, and post-operative status were available, including the logistic EuroSCORE (EuroSCORE), the length of stay (LOS), the duration of mechanical ventilation (MV), the post-operative Troponin IC serum concentration (Troponin). "Non-bleeding" was defined as total peri-operative blood transfusion ≤4 units. "Moderate anemia" was defined as hemoglobin rate nadir >75 g/L. The 30-days mortality was the primary outcome. Secondary outcomes were the postoperative occurrence of three composite indices of: (1) left ventricle dysfunction (LVD), (2) infection, (3) ischemic complication.

RESULTS. Of the 2,160 NBMA patients, 1,016 (47 %) received a blood transfusion. Transfusion was associated with higher mortality, OR = (4.1–1.2), $p < 0.0001$. The probability of transfusion was higher according to female gender (71 vs. 38 % for males), age (71.5 vs. 65.3), EuroSCORE (10.1 vs. 4.5), combined surgery (69 vs. 45 % for other interventions), duration of the extra corporeal circulation (65 vs. 58 min), Troponin (7.2 vs. 5.2 mg/L) and MV (7.7 vs. 15.1 h), all $p < 0.0001$. When all peri-operative items were included into a logistic regression, mortality was only linked to the EuroSCORE OR = (1.09–1.03), $p = 0.0003$, the MV OR = (1.01–1.00), $p = 0.006$, and the Troponin OR = (1.2–4.1), $p = 0.01$. The number of transfused red blood cells units was not linked to the ischemic composite index but was linked to infectious complications, OR = (1.34–1.05), $p = 0.0002$, in combination with LOS, OR = (1.12–1.05), $p < 0.0001$, body mass index OR = (1.08–1.03), $p = 0.0009$, and Troponin OR = (1.02–1.00), $p = 0.02$. The number of transfused red blood cells units was also linked with LVD, with OR = (1.65–1.01), $p < 0.0001$, in combination with preoperative LVEF OR = (1.07–1.03), $p < 0.0001$, Troponin OR = (1.07–1.02), $p < 0.0001$ and EuroSCORE OR = (1.05–1.02), $p < 0.002$.

CONCLUSIONS. In this large retrospective study in the postoperative period of cardiac surgery, restrictive blood transfusion in NBMA patients did not independently predict death, or ischemic complications, but predicted postoperative left ventricle dysfunction and infections.

REFERENCE(S). Herbert P et al. A multicenter, randomized, controlled clinical trial of transfusion requirements in Critical Care. NEJM. 1999; 340:409–417.

0709
5-YEAR MORTALITY IN CARDIAC-SURGERY PATIENTS WITH POSTOPERATIVE HEART FAILURE TREATED WITH LEVOSIMENDAN: PROGNOSTIC EVALUATION OF NT PRO-BNP AND C-REACTIVE PROTEIN AND CLINICAL RISK FACTORS

H.R. Torrado[1], J.C. López-Delgado[1], E. Farrero[1], E. Periche[1], M.J. Castro[2], D. Rodríguez-Castro[1], J.E. Toscano[3], M.L. Carrió[1], C. Javierre[4], J.L. Ventura[1]

[1]Hospital Universitario de Bellvitge, Intensive Care, L'Hospitalet de Llobregat, Spain, [2]Hospital Universitario de Bellvitge, Clinic Laboratory, L'Hospitalet de Llobregat, Spain, [3]Hospital Universitario de Bellvitge, Cardiac Surgery, L'Hospitalet de Llobregat, Spain, [4]Universitat de Barcelona, Physiology Department, L'Hospitalet de Llobregat, Spain

OBJECTIVES. The aim of this study was to determine clinical risk factors for 5-year mortality in cardiac-surgery patients with perioperative myocardial dysfunction treated with levosimendan and if there is any relationship with NTpro-BNP and C-reactive protein (CRP) levels.

METHODS. Prospective observational study.

A group of 30 cardio surgical patients, 12 men and 18 women, with postoperative heart failure dependent on inotropic support, received levosimendan at the standard dose 0.1 mcg/kg/min during 24 h without a loading dose.

All of them underwent elective surgery, 20 valve replacement, 8 coronary artery bypass grafting, 1 aortic surgery and 1 aortic valve replacement plus bypass grafting.

The mean age was 64.7 ± 11.8 years.

The APACHE II was 13.2 ± 3.3 and EuroSCORE 8.2 ± 4.3.

NT pro-BNP and CRP serum levels were measured before levosimendan administration, and 48 h and 7 days later.
Hemodynamic parameters were recorded.
Statistical analysis was performed using SPSS 13.0.
We made the follow-up at 5 years for dead or alive.
RESULTS. One patient died during hospital stay.
The 5-year mortality in the study group was 12.1 % (n = 11). The NT pro-BNP levels showed no significant changes during the study, nor were associated with 5-year mortality. CRP levels changed over the period of 7 days:
we found a significant decrease between CRP pretreatment and on day 7 (172 ± 79 vs 94 ± 64 mg/L, P (t student: 5.00) = < 0.001) and between CRP 48 h post-treatment and on day 7 (144 ± 88 vs 94 ± 64 mg/L, P (t student: 2.97) = 0.006). In the univariate analysis, dilated cardiomyopathy 26.3 vs 72.7 %, P = 0.05), lower systolic blood pressure (132 ± 15 vs 120 ± 9 mmHg; P = 0.003), higher central venous pressure (CVP) at 48 h after treatment (11 ± 4 vs. 14 ± 2 mmHg, P = 0.02) and a decrease in CRP on day 7 (109 ± 73 vs 61 ± 34 mg/L, P = .03) were associated with increased 5-year mortality. In Cox regression the presence of dilated cardiomyopathy (HR = 36.909 [95 % CI 1.901–716 0.747], P = 0.017), a higher PVC 24 h after levosimendan administration (HR = 2.686 [95 % CI 1,383–5,214], P = 0.004) and lower CRP levels on day 7 (HR = 0.963 [95 % CI 0933–0994], P = 0.021) were found to be risk factors for 5-year mortality.

Table 1 NT pro-BNP levels

NT pro-BNP pg/ml	All patients n 30	Survivors n 18	Non Survivors n 11	p value
Pre treatment	29,300 ± 11,572	41,683 ± 14,784	10,081 ± 8,533	NS
48 h	7,716 ± 9,364	7,734 ± 11,146	8,059 ± 6,133	NS
7 days	6,868 ± 7,175	6,563 ± 7,740	7,709 ± 6,716	NS

CONCLUSIONS. In cardiac-surgery patients with postoperative heart failure, the presence of dilated cardiomyopathy, a higher CVP and lower CRP levels on day 7 after levosimendan administration were associated with 5-year increased mortality. Although NT pro-BNP levels showed no significant changes, there was a trend to higher initial levels in survivors, suggesting that sicker patients benefit more from levosimendan treatment in terms of survival.
REFERENCES. Mebazaa A et al. Clinical review: practical recommendations on the management of perioperative heart failure in cardiac surgery. Crit Care. 2010; 14:201. Landoni G et al. Effects of levosimendan on mortality and hospitalization. A meta-analysis of randomized controlled studies: CCM. 2012; 40: 634.

0710
A COMPARISON OF HEMODYNAMIC EFFECTS OF ETOMIDATE-MIDAZOLAM AND KETAMINE-MIDAZOLAM FOR ANESTHESIA INDUCTION IN CORONARY ARTERY BYPASS GRAFTING SURGERY

A. Pirat[1], O. Komurcu[1], A. Camkıran[1], G. Arslan[1], N. Bayraktar[1], A. Sezgin[1]

[1]Baskent Universty Hospital, Anesthesiology, Ankara, Turkey

INTRODUCTION. The stable hemodynamic profile of etomidate makes this drug the agent of choice for anesthesia induction during CABG. However, the undesirable effect of etomidate on steroid synthesis in adrenal glands has given rise to the search for an appropriate alternative for anesthesia induction during CABG.
OBJECTIVES. The aims of this study were to compare the effects of anesthesia induction with ketamine-midazolam or etomidate-midazolam combinations on hemodynamic parameters and adrenal suppression in CABG.
METHODS. 40 adult patients undergoing CABG were randomly allocated into two groups for this prospective randomized double-blinded study. Anesthesia was induced with ketamine 1 mg/kg in ketamine group (n = 20) and with etomidate 0.3 mg/kg in etomidate group. All patients also received midazolam 0.025 mg/kg during anesthesia induction. Standard opioid-based anesthesia maintenance, cardiopulmonary bypass (CPB), and surgical technique were used in all patients. Intra- and post-operative hemodynamic parameters including systolic, diastolic, and mean arterial pressures and heart rate were recorded. In order to investigate the etomidate induced adrenal suppression blood cortisol levels were measured before anesthesia, 5 min after anesthesia induction, and during rewarming (at 35 °C). In addition, at postoperative days 1 and 4 adrenocorticotropic hormone (ACTH) stimulation tests were performed
RESULTS. The groups were not significantly different in terms of demographic features except for a higher number of females in ketamine group than etomidate group (9/11 vs 1/19, p = 0.04). This difference was due to the randomization. Intra- and post-operative hemodynamic parameters were not significantly different between the groups (p > 0.05). However, compared with their matching baseline values, the systolic, diastolic, and mean arterial pressures significantly decreased in both groups (p < 0.05). Despite similar baseline measurements, cortisol levels were significantly higher 5 min after induction, during rewarming, and after ACTH stimulation test at postoperative day 1 in group ketamine than group etomidate (p < 0.05). Cortisol levels were similar in both groups after postoperative day 4 ACTH stimulation test (p > 0.05). The groups were not significantly different in terms of duration of surgery, intraoperative usage of inotropic/vasopressor use, intraoperative use of fluids and blood products, duration of postoperative mechanical ventilation, frequency of postoperative delirium, and intensive care unit and hospital lengths of stay (p > 0.05).
CONCLUSIONS. Ketamine-midazolam combination is an acceptable alternative to etomidate-midazolam combination in terms of hemodynamic stability. Compared with ketamine-midazolam combination, etomidate-midazolam combination significantly decreased cortisol levels during the intraoperative and early postoperative periods.

0711
INCIDENCE AND RISK FACTORS FOR SERIOUS DIGESTIVE COMPLICATIONS AFTER CARDIAC SURGERY

M. Rodríguez Gómez[1], E. Velasco López[1], S.H. De Miguel Martín[1], D. Janeiro Lumbreras[1], L. Muñoz Méndez[1], B. Jordán Arias[1], M.J. Jiménez Martín[1]

[1]Hospital Clínico San Carlos, Madrid, Spain

OBJECTIVES. To study the incidence and risk factors of serious gastrointestinal complications (CDG) after major cardiac surgery (CCM).
MATERIALS AND METHODS. Retrospective study of patients admitted to ICU after CCM from January 2005 to June 2010. Variable recorded: age, sex, type of CCM, priority, type of CDG (bleeding, liver disease, intestinal ischemia, pancreatitis, cholecystitis), preoperative risk factors (obesity, smoking, high blood pressure, heart failure [HF], EuroSCORE, renal failure [RF], treatment with antiplatelet therapy, anticoagulant therapy and inotropic intravenous treatment [IV]), perioperative complications (myocardial infarction [IMP], surgery for bleeding) and mortality. Descriptive analysis by percentage for qualitative variables and mean or median for quantitative variables. Univariate test for qualitative variables and quantitative variables χ^2, student t test or Mann–Whitney test. Multivariate analysis using logistic regression model. Null hypothesis was rejected for alpha error = 0.05. Relative risk by odds ratio (OR) and confidence interval (95 %).
RESULTS. We included 3,242 patients after CCM, medium age 66 ± 12; 62.2 % male patients. 42 patients (1.3 %) had CDG: 30 hemorrhagic (71.4 %), 5 pancreatitis (11.9 %), 5 cholecystitis (11.9 %), 8 liver disease (19 %), hemoperitoneum (2.4 %), intestinal ischemia (2.4 %). Univariate analysis showed higher incidence of CDG: obesity OR 2.1 (1.1–4), p = 0.018, high blood pressure OR 3.3 (1.4–7.4), p = 0.002; EuroSCORE p = 0.001; RF OR: 3. (2–7), p = 0.001; inotropic IV p = 0.01 OR 6.3 (2.5–15.3); Heparin Na p = 0.007 OR 3.16 (1.3–7.6), CI p = 0.038 OR 2.1 (1.2–5.5) p priority = 0.004 OR 2.8 (1.3–5.7), IMP p = 0.001 OR 4.1 (1.8–9), surgery for bleeding p = 0.002 OR: 3.6 (1.5–8.7). The regression model were associated independently with CDG: Obesity p = 0.044 OR 2.05 (1.04–4); RF p = 0.046 OR 2.13 (1.04–4.3); inotropic IV: p = 0.047 OR 3.18 (1.09–9.2); IMP p = 0.004 OR 3.9 (1.7–9.1) and EuroSCORE p = 0.01 OR 1.17 (1.06–1.2). The total mortality was 1 %. The mortality of patients with CDG was 33 % and 2 deaths were directly caused of digestive complication. The CDG is associated with higher mortality p = 0.001 OR 6.8 (3.5 to 13.2).
CONCLUSIONS. 1. Incidence of CDG after CCM is low. 2. Independent risk factors are high EuroSCORE, obesity, RF, previous treatment with inotropic and IMP. 3. CDG are associated with increased mortality, but are a direct cause of death in some cases.

0712
DOES APROTININ INFLUENCE OUTCOMES IN REDO CARDIAC SURGERY

C. Kalluri[1], S. Orathi[1]

[1]Freeman Hospital, Cardiothoracic Anaesthesia, Newcastle Upon Tyne, UK

INTRODUCTION. Redo cardiac surgery is associated with a high risk of numerous complications including the risk of bleeding. Serine protease inhibitors tranexamic acid and aprotinin are the two most commonly used agents worldwide to prevent bleeding after cardiac surgery. There have been numerous studies comparing the effects of these agents and have failed to ascertain a superior pharmacological effect of one agent over the other. A large multicentre trial in the middle of last decade highlighted the risks associated with the use of aprotinin. The use of aprotinin has since reduced significantly and is used only some centres for high risk cardiac surgery. Administration of aprotinin in our regional cardiothoracic centre located in the north of England is restricted to use in redo cardiac surgery where a high risk of post-operative bleeding is anticipated. We designed the study to analyse the effects of aprotinin in our patients.
OBJECTIVES.
To study the frequency of Aprotinin utilization.
To study and compare the incidence of renal failure with patients who did not receive Aprotinin.
To study the effect of co-morbidity and other confounding factors in the development of renal failure.
To study the incidence of post-operative renal failure and mortality in both groups of patients.
METHODS. Retrospective analysis of case notes of all elective redo cardiac surgery in Freeman Hospital over 3 years. The data was collected on a proforma. The patients were grouped into those who received Aprotinin versus those who had alternate drug, tranexamic acid. The data was analysed using Microsoft excel spread sheet.
RESULTS. A total of 97 redo surgeries were performed during the period. Aprotinin was administered in 45 patients. The most common surgery performed was Aortic valve replacement with CABG. Patient demographics in both groups including age, sex height and weight were comparable in both group. Co-morbidities, length of surgery, bypass time and aortic cross clamp time were comparable in both groups. No significant difference was observed between the groups with respect to renal failure, need for replacement therapy or mortality. This was true of even in the subset of patients with premorbid renal failure. A significant difference in favour of aprotinin was noted for the requirement of blood and blood products perioperatively.
CONCLUSIONS. Use of aprotinin was not associated with increased risk of renal failure and death in redo cardiac surgery in Freeman Hospital. The need for blood and blood products was reduced peri-operatively in patients who were administered Aprotinin.
REFERENCES. Mangano DT, et al. The risk associated with Aprotinin in cardiac surgery. NEJM. 2006; 354: 353–365. Ferguson DA, et al. A comparison of Aprotinin and Lysine analogue in high risk cardiac surgery (BART Study). NEJM. 2008; 358: 2319–2331.

0713
PREDICTIVE MODEL FOR LONG-STAY IN ICU AFTER CARDIAC SURGERY

M. Nieto[1], E. Velasco[1], M. Rodriguez[1], J. Larryverri[1], C. Fernandez[2], M. Sanchez[1]

[1]Hospital Clínico San Carlos, Intensive Care, Madrid, Spain, [2]Hospital Clínico San Carlos, Preventive Medicine, Madrid, Spain

INTRODUCTION. The prolonged stay Care Unit (ICU) is associated with higher mortality rates and it will include an important consumption care resources [1]. In cardiac surgery is now recognized as an important component of outcome evaluation [2] and may influence decision-making in the management of this patients.
OBJECTIVE. Analyze the perioperative risk factors of very prolonged ICU stay and survival at hospital discharge in patients undergoing cardiac surgery.
PATIENTS AND METHODS. We reviewed patients after cardiac surgery admitted in a cardiovascular ICU of a tertiary University Hospital for 5 consecutive years (Jan 2007–Dec 2011), following the analysis of data collected prospectively. It was classified as very prolonged stay in ICU if exceed 20 days of admission. We analyzed the variables pre, intra and postoperative, by univariate and multivariate analysis, and we built a logistic regression model in which assessed its capacity of discriminate in the odds requested and the sensitivity and specificity in classifying the model. Survival at discharge was analyzed by Kaplan–Meier curve. Independent risk factors were expressed by OR (CI 95 %).
RESULTS. Of the 2,929 patients treated, 119 (4.1 %) were admitted to the ICU more than 20 days. In univariate analysis statistically significant variables associated (p < 0.05) with prolonged stay were: age > 70 years, hypertension, chronic obstructive pulmonary disease (COPD), chronic renal failure, obesity, NYHA functional class III/IV, urgent surgery, valve surgery and aortic arch, cardiogenic shock, postoperative critical condition, CPB time, ischemia time, EuroSCORE, vasoactive support >24 h, prolonged intubation, re-operation,

re-operation for bleeding and/or cardiac tamponade. We identified as independent risk factors: age >70 years (OR 1.59, CI 1.008–2.590) COPD (OR 2.9. CI 1.70–4.98), chronic renal failure (GFR < 60 ml/min) (OR 1.93, CI 1.23–3.03), obesity (BMI > 35) (OR 2.68, CI 1.47–4.91), CPB time (OR 1.01. CI 1.07–1.13), urgent surgery (OR 5.24, CI 3.20–8.59), re-operation (OR 2.03, CI 1.22–3.35), re-operation for excessive bleeding (OR 3.55, CI 1.80–7.02), cardiac tamponade (OR 2.87, CI 1.08–7.59). ROC curve shows an AUC of 0.83, a sensitivity of 75.8 % and a specificity of 78.2 %. Mortality at discharge was 39.7 % in patients with prolonged stay while the rest was 5.7 % ($p < 0.001$).

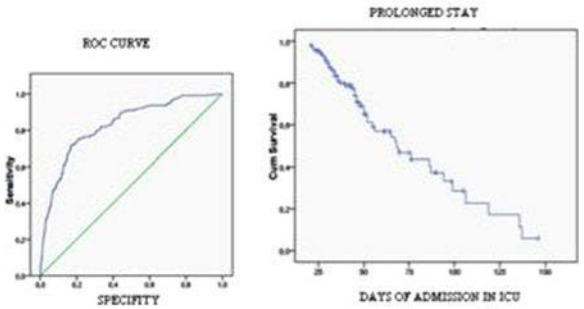


Fig. 1 Curve ROC survival

CONCLUSION. In our study a significant proportion of these patients die after along and costly stay in ICU. The model generated enables to identify patients with an increased risk of prolonged stay in ICU and consequently to provide specific strategies and adapt peri-operative care and resources to reduce the high morbidity and mortality.
REFERENCE(S). 1. Higgins TL, et al. Crit Care Med. 2003; 31: 45–51. 2. Soppa G et al. Interactive cardiovascular and thoracic surgery. 2013; (1–5).

0714

CHANGES IN CUTANEOUS EAR-LOBE CO_2 TENSION ($PTCO_2$) REGARDING FLOW RATE DURING CARDIO-PULMONARY BYPASS

R. Pirracchio[1,2], A. Neuschwander[1], J. Fink[1], G. Pinot[1], A. Lagrange[1], D. Journois[1]

[1]Hôpital Européen Georges Pompidou, Anesthesiology and Critical Care, Paris, France, [2]Unité INSERM UMR-S 717, Biostatistiques et Informatique Médicale, Paris, France

INTRODUCTION. Optimal criteria to choose the blood flow to be targeted in patients under extracorporeal life support (ECLS) are currently unknown. Transcutaneous carbon dioxide tension ($ptCO_2$) has been advocated to be a reliable, non-invasive surrogate for peripheral microcirculation[(1)]. If a predictable relationship would exist between the blood flow and the $ptCO_2$, it could then be a useful tool to investigate in patients under ECLS.
OBJECTIVES. As a first step, before testing $ptCO_2$ as a goal for optimizing the flow rate during ECLS, the aim of the present study was to assess whether alterations in blood flow would directly affect $ptCO_2$ in patients under cardiopulmonary bypass (CPB).
METHODS. We included patients scheduled for cardiac surgery, under cardiac arrest and CPB. Informed consent was obtained before surgery. No specific modification in usual protocols was needed. The $ptCO_2$ a 37 °C measured at ear lobe, as well as usual vital signs, catecholamine use, fluid loading blood gases and ECLS parameters were collected. To take into account the repeated measures, pair wise associations between variables were examined using generalized estimating equations, with clusters defined at the patient level.
RESULTS. The present results on 11 patients are preliminary, representing a total of 61 observations. $PtCO_2$ monitoring at 37 °C seemed to be a reliable non-invasive monitoring of $PaCO_2$ during CPB (Fig. 1; $\beta = 1.524$, SE = 0.220, $p < 0.001$). The gradient $PtCO_2$–$PaCO_2$ was low and close to the one previously reported[(1)] in non-septic patients (6 mmHg [1–14]). Flow rate, $PtCO_2$ temperature increased over time during CPB (Fig. 2; $p < 0.05$ for all), but the gradient $PtCO_2$–$PaCO_2$ remained constantly low. Contrary to the septic shock patients, a significant positive association was found between the $PtCO_2$–$PaCO_2$ and the ECLS flow rate ($\beta = 3.74$, SE = 1.51, $p = 0.013$). Interestingly, discarding the observations with additional sources of microcirculation alterations (i.e. vasopressors administration) resulted in a much stronger association between the flow rate and the $PtCO_2$ gradient (Fig. 3; $\beta = 5.07$, SE = 1.56, $p = 0.001$). This relationship was still significant after controlling for the time and temperature.
CONCLUSIONS. Cutaneous Ear lobe $PtCO_2$ monitoring at 37 °C seemed to be a reliable non-invasive monitoring of $PaCO_2$ during CPB. In the preliminary cohort, increases in flow rate seem to be associated with increases in the $PtCO_2$. A possible explanation would be that the higher the inflammatory status, the higher the flow rate and the peripheral tissue CO_2 release. More patients are being included to confirm such results and hypotheses.

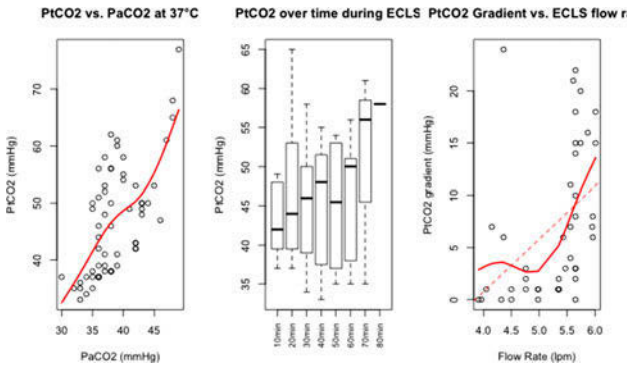


Fig. 1 $PtCO_2$ vs. $PaCO_2$ at 37 °C, $PtCO_2$ over time during ECLS $PtCO_2$, Gradient vs. ECLS flow rate

REFERENCES. 1. Vallée F, Mateo J, Dubreuil G, et al. Cutaneous ear lobe PCO_2 at 37 °C to evaluate micro perfusion in patients with septic shock. Chest. 2010; 138: 1062–1070.

0715

PERIOPERATIVE MANAGEMENT AND EARLY OUTCOME AFTER CARDIOVASCULAR SURGERY WITH CEREBROVASCULAR COMPLICATIONS

H. Murayama[1], H. Kito[1], S. Asano[1], M. Hirano[1], M. Oba[1], M. Kabasawa[1], N. Hirose[1], H. Hasegawa[1]

[1]Chiba Prefectural Cardiovascular Center, Cardiovascular Surgery, Chiba, Japan

INTRODUCTION. Evidence regarding the optimal timing interval between cerebrovascular complications (CVCs) and cardiovascular surgery remains controversial because of lack of prospective controlled study. The optimal timing for the operation depends on the type of CVCs and the severity, and urgency of the cardiovascular disease.
OBJECTIVES. The study aim was to examine perioperative factors and timing for surgery affecting early outcomes in patients with CVCs who underwent cardiovascular surgery in a tertiary care hospital.
METHODS. A retrospective observational study of consecutive patients who admitted to ICU between January 2001 and December 2012 with CVCs before cardiovascular operation.
RESULTS. A total of 13 patients (mean age 67 years, range 22–94, 9 males and 4 females) were included. Types of CVCs included cerebral infarction in eight patients, intracranial hemorrhage (including hemorrhagic infarction) in five patients. The surgical treatment were valve surgery for active infective endocarditis (n = 8) and graft replacement for type A acute aortic dissection (n = 5). The incidence rate of CVCs were 21 and 4.3 %, respectively. Mean preoperative EuroSCORE II was 12.5 ± 11.3 % (range 1.4–37.8). Seven patients (54 %) were seen with focal neurologic findings. 11 patients (85 %) presented with multiple lesion and mean size of lesion measured by cranial imaging was 22.1 mm (range 5–60). The mean interval between onset of the cerebrovascular event and surgery was 6.5 ± 5.5 days. The interval was longer in the group with intracranial hemorrhage compared with the group with cerebral infarction alone (10.4 days vs 4.7 days $p < 0.05$). The in-hospital mortality was 7.7 % (n = 1). Two patients (15 %) developed postoperative exacerbation. One patient with preoperative infarction by active infective endocarditis died of secondary cerebral hemorrhage (SAH) during operation. The other patient with preoperative hemorrhagic infarction developed secondary multiple infarction due to low perfusion. In one patient with active endocarditis, craniotomy for removal of hematoma was performed 9 days before cardiac operation with favorable result. As a whole, there was no exacerbation of the preoperative intracranial hemorrhage in this series. In the patients who survived operation without exacerbation presented with relatively small lesion (mean infarct size 15.1 mm, range 5–36 mm), and neurological status at discharge was mostly favorable with mean modified Rankin Scale of 2.7 ± 1.5 (range 0–4).
CONCLUSIONS. Patients with CVCs who presented with small lesion may safely undergo cardiac operation after an average interval of 10 days with favorable neurological result. In the specific patients when earlier control for the cardiac lesion is required, surgical treatment for cerebral hemorrhage might have possibility to reduce the risk of cerebral damage at the following cardiovascular operation.

0716

PROPER METHOD FOR PRE-OPERATIVE CHEST PREPARATION OF PATIENTS LISTED FOR CARDIAC SURGERY

M.M.H. Al-Najjar[1], M.F. Rajab[1], W. Abukhudair[1], S.A. Sirajuddin[1], K. Eman[1]

[1]King Fahd Armed Forces Hospital, Jeddah, Adult Cardiac Surgery Department, Jeddah, Saudi Arabia

INTRODUCTION. Postoperative pulmonary complications (PPCs) after cardiac surgery are a major source of morbidity and mortality, and increase length of hospital stay and resource utilization. The preoperative period before Cardiac surgery may be used to improve a patient's pulmonary condition[(1)].
OBJECTIVES. To evaluate the prophylactic efficacy of our new preoperative chest preparation strategy including application of BiPAP and CPAP (strategy A) on the incidence of PPCs in high-risk patients scheduled for elective CARDIAC surgery compared with classic routinely used one (strategy B).
METHODS. A single-blind, randomized clinical trial conducted at the Cardiac Center of King Fahd Armed Forces Hospital, Jeddah, Saudi Arabia, with enrollment between November 2011 and October 2012. Of 600 patients referred for elective cardiac surgery, 170 (28 %) met criteria for high risk of developing PPCs, of whom 144 were enrolled and followed up until discharge from hospital after dividing him to tow groups, our new preoperative chest preparation strategy group (group A) and classic routinely used group (group B).
Patients were randomly assigned to receive either preoperative A strategy (n = 72) or usual care B strategy (n = 72). Both groups received the same postoperative physical therapy.
The main outcome measures are incidence of PPCs, especially pneumonia, duration of postoperative intubation and invasive ventilation, Intensive Care Unit (ICU) stay and hospitalization and incidence of requiring re-intubation and impact of both strategies on post operative patient compliance to respiratory therapy.
RESULTS. Both groups were comparable at baseline. After CARDIAC surgery, PPCs were present in 13 (18 %) of 72 patients in the A group and 25 (35 %) of 72 patients in the B group (odds ratio [OR] 0.414 95 % confidence interval [CI] 0.30–0.92). Median duration of post operative invasive mechanical ventilation was 9 h (range 4–24 h) in the A group vs 10 h (range 6–21 h) in the B group; P value = 0.029. Median duration of ICU stay was 5 days (range 2–11 days) in the A group vs 5 days (range 2–23 days) in the B group; P value = 0.0067. Median duration of postoperative hospitalization was 9 days (range 6–19 days) in the A group vs 11 days (range 7–48 days) in the B group; P value = 0.00017.
CONCLUSIONS. Preoperative A strategy reduced the incidence of PPCs and duration of postoperative mechanical ventilation, ICU stay and hospitalization in patients at high risk of developing a pulmonary complication undergoing cardiac surgery. Also, post operative patient compliance to respiratory therapy was significantly improved.
REFERENCE(S). 1. Ng CS, Wan S, Yim AP, Arifi AA. Pulmonary dysfunction after cardiac surgery. Chest. 2002; 121: 1269–1277.

0717
THE ASSESSMENT OF THE INTRA-ABDOMINAL PRESSURE AFTER THE ELECTIVE AND "ON PUMP" CARDIAC SURGERY: AN OBSERVATIONAL STUDY

S. Caroleo[1], F. Serraino[2], M. Muratgia[1], F. Tropea[1], M. Rossi[2], A. Renzulli[2], B. Amantea[1]

[1]University of Catanzaro, Anaesthesia and Reanimation, Catanzaro, Italy, [2]University of Catanzaro, Cardiac Surgery, Catanzaro, Italy

INTRODUCTION. Interest and clinical investigation into intra-abdominal hypertension (IAH) and Abdominal Compartment Syndrome (ACS) as causes of significant morbidity and mortality among the critically ill patients have increased exponentially over the past decade (1, 2).

OBJECTIVES. To evaluate the influence of postoperative Intra-Abdominal Pressure (IAP) on: 1. Perfusion and hemodynamic parameters; 2. Admission SOFA score; 3. ICU Length of Stay (ICU–LOS) and weaning duration.

METHODS.

Design: analysis of a prospective collected database.

Setting: an Intensive Care Unit (ICU) in a University Hospital.

Patients: a total of 80 patients aged 30–80 (38 M and 42 F) with an ASA score II–III submitted to elective and "on pump" cardiac surgery from November 2011 to November 2012. At the end of the observation patients were divided in five groups based on the intra-abdominal pressure trend recorded during ICU stay (mmHg): group 1 (12) < 10; group 2 (19) < 12; group 3 (28) < 15; group 4 (15) < 20; group 5 (6) > 20.

Data collection: preoperative and intraoperative main data. Heart rate (HR), central venous pressure (CVP), mean arterial pressure (MAP), urinary output (UO), lactate blood levels and central venous saturation ($ScVO_2$) (Roche OMNI S Blood Gas Analyzer®, Roche Diagnostics GmbH, Mannheim, Germany) and intra-abdominal pressure with the UnoMeter™ Abdo-Pressure™ method (ConvaTec, Inc. 200 Headquarters Park Drive Skillman, NJ 08558) were recorded at ICU admission (T0) and after 6 h (T1), 12 h (T2), 24 h (T3), 48 h (T4). Admission SOFA score, weaning duration and ICU LOS were also recorded.

Statistics: χ^2 test, Mann–Whitney test, unpaired t-test and Fisher exact test were used when appropriate. A p value of <0.05 was considered statistically significant.

RESULTS. No differences in pre- and intraoperative main variables (p = NS for all measurements). Patients of groups 4 and 5 showed a significantly worse clinical trend in comparison with the other groups: HR (T1, T2, T3) and CVP (T2, T3) were higher ($p = 0.035$ and $p = 0.025$ respectively) while MAP (T1, T2, T3) was lower ($p = 0.039$); lactate blood levels (T1, T2, T3) were higher ($p = 0.042$) while $ScVO_2$ (T2) was lower ($p = 0.04$) and UO (T2, T3) was decreased ($p = 0.038$). Moreover Admission SOFA score was higher ($p = 0.029$) while weaning and ICU LOS were longer ($p = 0.03$ and $p = 0.021$ respectively).

CONCLUSIONS. In our opinion assessment of IAP could be a valid and integrative clinical tool in this setting.

REFERENCE(S). 1. Malbrain MLNG et al. Int Care Med. 2006. 2. Hedenstierna G, Larsson A. Curr Opin Crit Care. 2012.

0718
CARDIAC SURGERY IN OCTOGENARIANS: A SINGLE CENTRE EXPERIENCE

F. Ampatzidou[1,2], M. Agrafiotis[1], O. Ananiadou[2], M. Sileli[1], C.P. Koutsogiannidis[2], K. Diplaris[2], G. Drosos[2]

[1]G. Papanikolaou' General Hospital, ICU Department, Exohi Thessaloniki, Greece, [2]G. Papanikolaou' General Hospital, Cardiothoracic Surgery Department, Exohi Thessaloniki, Greece

INTRODUCTION. The number of octogenarians, who undergo cardiac surgery is increasing. Refinement of surgical techniques, anaesthetic and critical care management has improved postoperative outcome in this group of patients, although early postoperative mortality is still higher compared to younger patients.

OBJECTIVES. To evaluate early postoperative outcome in patients ≥80 years old, after open heart surgery in our hospital.

METHODS. Our department's electronic database was searched for patients older than 80 years that underwent cardiac surgery from January 2010 to March 2013. Type of surgery ventilation hours, length of stay in the ICU and mortality is reported and compared to that of the rest of the cohort.

RESULTS. 1,268 patients underwent cardiac surgery in our institution from January 2010 to March 2013. 52 of these patients were ≥80 years old (mean 81.69 ± 1.45). In 37 cases (71.1 %) isolated coronary artery bypass grafting (CABG) was performed, in 9 cases (17.3 %) isolated aortic valve replacement, in 3 (5.76 %) combined aortic valve and CABG, in 2 mitral valve surgery (3.84 %), and in 1 case off pump CABG was performed. Mean EuroSCORE was 15.05. (Table) Hospital mortality in octogenarians was 7.69 % compared to 4.2 % mortality of a total 1,268 patients (mean age 64098 ± 10.3) underwent cardiac surgery over the same period. Mechanical ventilation median time was 18 h and median ICU stay was 2 days.

Table 1 Results of specific cardiac surgery procedures

Procedure	Number	EuroSCORE (mean)	Vent hours (median)	ICU days (median)	Mortality (%)
CABG	37	15.91	18	2	10.81
Aortic valve	9	12.85	19	1	0
Mitral valve	2	17.06	30	2	0
OPCABG	1	9.87	16	1	0
CABG +AVR	3	11.31	17	1	0
Total ≥ 80	52	15.05	18	2	7.69
Total patients	1,268	6.37	10	1	4.2

CONCLUSIONS. Postoperative mortality rate in octogenarians undergoing cardiac surgery is higher than in younger patients. However, these rates are acceptable, taking into account the health care cost and the risk/benefit ratio, because of the better long term survival and the postoperative quality of life.

REFERENCE(S). 1. Koln P. Cardiac surgery in octogenarians. Peri-operative outcome and long-term results. Eur Heart J. 2001; 22(14): 1235–1243. 2. Zingone B. Early and late outcomes of cardiac surgery in octogenarians. Ann Thorac Surg. 2009; 87: 71–78.

0719
DOES STATINS PROVIDE BETTER OUTCOMES IN CARDIAC SURGERY? A PROPENSITY SCORE ANALYSIS

R. Rivera Fernandez[1], E. Curiel Balsera[1], V. Olea Jimenez[1,2], E. Sanchez Cantalejo[3], A. Reina-Toral[4], R. Hinojosa Perez[5], M.D. Fernandez Zamora[1], ARIAM Adult Cardiac Surgery

[1]Carlos Haya Regional University Hospital, Intensive Care Unit, Málaga, Spain, [2]Galvez Hospital, Intensive Care Unit, Málaga, Spain, [3]Escuela Andaluza de Salud Publica, Granada, Spain, [4]Virgen de las Nieves Hospital, Intensive Care Unit, Granada, Spain, [5]Virgen del Rocio Hospital, Intensive Care Unit, Seville, Spain

INTRODUCTION. Some authors suggest better outcomes of patients treated with statins in different scenarios.

OBJECTIVES. We analyzed outcomes in cardiac surgery in patients treated with statins before surgery.

METHODS. Prospective, observational and multicentre patients included in ARIAM registry of cardiac surgery from 2008 to 2012. We compared patients treated or not with statins before cardiac surgery. Outcomes analyzed were ICU mortality and in-hospital mortality. Binary logistic regression was used for multivariate analysis and a propensity score-matched analysis was performed to compare outcomes in patients treated or not with statins previous major cardiac surgery.

RESULTS. In a cohort of 7,276 patients, 3,749 were treated with statins before surgery. ICU mortality in patients treated with statins was 6.6 and 8.6 % in non-treated ($p = 0.001$). After adjusted with EuroSCORE, by-pass time >120 min and urgent surgery, statins was protective ICU mortality (OR 0.81, CI 95 % 0.67–0.97).

In the propensity score-matched patient population realized in 3,056 (1,528 with statins and 1,528 without), 7.1 % with statins died while 8.8 % without statins. After adjusted with EuroSCORE, by-pass time >120 min and urgent surgery, there were no statistic relationship between statins treatment and ICU mortality 0.827 (0.629–1.087), or in-hospital mortality 0.835 (0.68–1.11).

CONCLUSIONS. Although multivariate analysis suggests better outcomes in patients treated with statins, propensity analysis did not confirm this effect in cardiac surgery.

REFERENCE(S). Liakopoulos OJ, Kuhn EW, Slottosch I, Wassmer G, Wahlers T. Preoperative statin therapy for patients undergoing cardiac surgery. Cochrane Database Syst Rev. 2012; 18(4): CD008493.

GRANT ACKNOWLEDGMENT. Josele Benitez Parejo (ARIAM Secretary).

0720
LEVOSIMENDAN INCREASES 28-DAY SURVIVAL RATE IN PATIENTS WITH LOW CARDIAC OUTPUT AFTER CARDIAC SURGERY

J. Fernández[1], C. Novoa[1], A. Cariñena[1], A. Baluja[1], S. Selas[1], P. Vázquez[1], P. Otero[1], J. Álvarez[1]

[1]Complexo Hospitalario Universitario Santiago de Compostela, Anestesioloxía, Reanimación e Tratamento da Dor, Santiago de Compostela, Spain

INTRODUCTION. The low cardiac output syndrome is a quite frequent complication in cardiac surgery patients (about 20 % of incidence) with a mortality around 17–20 %. Levosimendan is a calcium sensitizer that improves myocardial contractility without increasing oxygen consumption.

OBJECTIVES. The aim of our study was assess the influence of levosimendan therapy in the 28-day outcome of patients with low cardiac output after cardiac surgery.

METHODS. Patients underwent cardiac surgery admitted in our intensive care unit between 2003 and 2011 were reviewed. Data were recovered from medical charts and digital record system. Those with low cardiac output (cardiac index < 2.2 L/min/m^2) were included in our study according to inclusion and exclusion criteria. Multivariate logistic regression and Cox regression analysis were calculated. Statistical models were adjusted for age, sex, kind of surgery, use of pulmonary artery catheter, left ventricular ejection fraction, use of catecholamines, EuroSCORE II and APACHE II score (at arrival to our unit) in order to assess the impact of the levosimendan on 28-day mortality.

RESULTS. 895 patients were included in the study. In 519 of them (57.99 %) levosimendan was dispensed. Observed overall mortality was 17.15 % (89 of 519) among levosimendan-treated patients and 21.28 % (80 of 376) in the other group. Logarithmic regression evidenced an OR = 0.427 ($p < 0.01$, 95 % CI 0.249–0.731) and the adjusted Cox regression showed a Hazard Ratio = 0.547 ($p < 0.01$, 95 % CI 0.386–0.775) for levosimendan treatment.

CONCLUSIONS. Levosimendan-treated patients have shown a relative risk reduction close to 50 % in 28-day mortality.

Our study shows that levosimendan might separately reduce 28-day mortality in patients with low cardiac output after cardiac surgery.

REFERENCES. 1. Álvarez J. Levosimendán en el síndrome de bajo gasto cardiaco. ¿Disminuye realmente la mortalidad? [Editorial]. Rev Esp Cardiol. 2008; 61(5): 454–7. 2. Pérez JL, Martín JC, Carrasco M, De la Cal MA, Hinojosa R et al. Guías de práctica clínica para el manejo del síndrome de bajo gasto cardíaco en el postoperatorio de cirugía cardíaca. Med Intensiva. 2012; 36(4): e1–e44. 3. Mebazaa A, Pitsis AA, Rudiger A, Toller W, Longrois D, Ricksten SE et al. Clinical review: practical recommendations on the management of perioperative heart failure in cardiac surgery. Crit Care 2010; 14: 201. 4. Landoni G, Biondi-Zoccai G, Greco M, Greco T, Gignami E, Morelli A et al. Effects of levosimendan on mortality and hospitalization. A meta-analysis of randomized controlled studies. Crit Care Med 2012; 40(2): 634–46.

GRANT ACKNOWLEDGMENT. None of the authors has any relation that would pose a conflict of interest.

0721
PULMONARY ARTERY CATHETER MIGHT REDUCE RISK OF DEATH IN PATIENTS WITH LOW CARDIAC OUTPUT AFTER CARDIAC SURGERY

J. Fernández[1], G. Mariño[1], S. Selas[1], M. Rial[1], M. Domínguez[1], G. Prada[1], J. Álvarez[1]

[1]Complexo Hospitalario Universitario Santiago de Compostela, Anestesioloxía, Reanimación e Tratamento da Dor, Santiago de Compostela, Spain

INTRODUCTION. The low cardiac output syndrome is a quite frequent complication in cardiac surgery patients (about 20 % of incidence) with a mortality around 17–20 %. Advanced hemodynamic monitoring is recommended to guide therapeutic decisions, but the best method for cardiac output measurement remains unclear.

OBJECTIVES. The aim of our study was evaluate the influence of the pulmonary artery catheter (PAC) in the 28-day outcome of patients with low cardiac output after cardiac surgery.

METHODS. Patients underwent cardiac surgery admitted in our intensive care unit between 2003 and 2011 were reviewed. Data were recovered from medical charts and digital record system. Cardiac output was monitored by using a PAC (Continuous pulmonary artery thermodilution) or a FloTrac®/Vigileo® device connected to a peripheral arterial line (pulse contour algorithm). Those with low cardiac output (cardiac index < 2.2 L/min/m^2) were included in our study according to inclusion and exclusion criteria. Multivariate logistic regression and Cox regression analysis were calculated. Statistical models were adjusted for age, sex, kind of surgery, EuroSCORE II and APACHE II score (at arrival to our unit).

RESULTS. 895 patients were included in the study. The PAC was used in 564 of them (63.02 %). Observed global mortality was 18.88 % (169 events). 102 events in the group with PAC (18.09 %) and 67 in the other group (20.24 %). The adjusted Cox regression showed a Hazard ratio = 0.266 ($p < 0.001$, 95 % CI 0.180–0.393) for PAC group.

CONCLUSIONS. Our study shows the PAC separately associated with less 28-day mortality in patients with low cardiac output after cardiac surgery. Relative risk of death was reduced close to 75 % in the group with PAC for each moment of the study. These outcomes could be related to a better understanding of the PAC and its measurements, no comparability of both methods or low reliability of pulse contour based algorithms in high risk unstable patients.

REFERENCE(S). 1. Pérez JL, Martín JC, Carrasco M, De la Cal MA, Hinojosa R et al. Guías de práctica clínica para el manejo del síndrome de bajo gasto cardíaco en el postoperatorio de cirugía cardíaca. Med Intensiva. 2012; 36(4): e1–e44. 2. Senn A, Button D, Zollinger A, Hofer CH. Assessment of cardiac output changes using a modified FloTrac/Vigileo™ algorithm in cardiac surgery patients. Crit Care. 2009; 13: R32. 3. Carrillo A, Fiol M, Rodríguez A. El papel del catéter de Swan-Ganz en la actualidad. Med Intensiva. 2010; 34(3):203–214. 4. Mebazaa A, Pitsis AA, Rudiger A, Toller W, Longrois D, Ricksten SE et al. Clinical review: practical recommendations on the management of perioperative heart failure in cardiac surgery. Crit Care. 2010; 14:201.

GRANT ACKNOWLEDGMENT. None of the authors has any relation that would pose a conflict of interest.

Sedation and delirium: 0722–0735

0722

ARE PERIOPERATIVE HEMODYNAMIC AND PERFUSION PARAMETERS ASSOCIATED TO POSTOPERATIVE DELIRIUM IN ELECTIVE OPEN COLON SURGERY?

E. Tobar[1], M. Abedrapo[2], J. Godoy[3], J.L. Llanos[2], C. Luengo[1], C. Romero[1], J.L. Navarro[1]

[1]Universidad de Chile, Departamento de Medicina, Unidad de Paciente Crítico, Santiago, Chile, [2]Universidad de Chile, Departamento de Cirugía, Santiago, Chile, [3]Universidad de Chile, Departamento de Anestesiología, Santiago, Chile

INTRODUCTION. Postoperative delirium (POD) is a relevant complication in older surgical patients and is associated to worse outcomes. Besides already recognized preoperative risk factors, it has been suggested that perioperative hypotension as well as detriments in global and brain perfusion could be involved in POD. However, there are no conclusive data regarding this hypothesis.

OBJECTIVES. To explore the association between perioperative hemodynamics, brain oxygenation, and global perfusion with POD in older patients undergoing elective open colon surgery.

METHODS. We enrolled older patients with indication of elective open colon surgery excluding patients with dementia (MMSE lower than 24). Informed consent was obtained from patients and protocol was approved by IRB. Standard hemodynamic monitoring was started before anesthetic induction including blood pressure, heart rate, arterial oxygenation and urine output. In addition, non invasive cerebral oxygenation (rSO_2 %) measured by near infrared spectroscopy (NIRS, INVOS 5100, Somanetics ®), and global perfusion assessed by continuous central venous oxygen saturation ($ScvO_2$, Presep catheter, Edwards® and intermittent lactate levels were monitored during surgical procedure and the first 24 postoperative hours. All surgical and anesthetic procedures were standardized to minimize potential confounding factors. Patients were managed with balanced intravenous and inhalatory anesthesia guided to BIS 45–65 and postoperative pain was controlled with i.v. and peridural analgesia. Delirium was evaluated with CAM twice a day for 5 days. Associations between baseline characteristics, intraoperative and postoperative data values with postoperative delirium were evaluated using Fisher exact test, or Mann Whitney U test. All analysis were bilateral, with p value <0.05.

RESULTS. We enrolled 28 patients, ages 73 ± 7 years, female 17 (60.7 %). 23 patients underwent resection for colorectal cancer. Baseline: albumin 3.4 ± 0.7 g/dl, hematocrit 34 ± 5 %. Surgical and anesthetic times were 157 ± 62 min 216 ± 64 min, respectively. Mean arterial pressure was 77 ± 7 mmHg intraoperative, and 76 ± 8 mmHg before surgery. Regarding perfusion, 11 patients (39 %) had $ScvO_2$ below 70 % during surgery, and 71 % had values below 70 % during postoperative period. 14 patients (50 %) had lactate values higher than 2.5 mEq/l, and 7 cases (25 %) were > 4 mEq/l. rSO_2 was 20 % below the baseline level in 35 % of the patients during surgery and in 28 % during postoperative period. Two patients developed DPO (7.1 %). Neither the hemodynamic data nor perfusion parameters ($ScvO_2$ and lactate) or brain oxygenation (rSO_2) showed association with POD. The only baseline risk factor associated with POD were the years of education.

CONCLUSIONS. These preliminary results suggest that there are not association between perioperative hemodynamics or global perfusion and POD.

GRANT ACKNOWLEDGMENT. Fondecyt Initiation into research 11100246 Chilean gov.

0723

EFFECT OF SEDATIVES ON GUINEA PIG'S SMALL BOWEL MOTILITY IN VITRO

M. Schörghuber[1], E. Tatzl[1], P. Holzer[2], W. Toller[1], S. Fruhwald[1]

[1]Medical University of Graz, Department of Anaesthesiology and Intensive Care Medicine, Graz, Austria, [2]Medical University of Graz, Institute of Experimental and Clinical Pharmacology, Graz, Austria

INTRODUCTION. Adequate sedation is essential for critically ill patients. Adverse effects of sedatives on gastrointestinal motility aggravate gastrointestinal motility disorders, which these patients frequently develop. An in vitro setting allows to compare the effect of sedatives on small bowel motility.

OBJECTIVES. The aim of this study was to evaluate the inhibitory potency of propofol, midazolam, S-ketamine and dexmedetomidine on guinea pig's small bowel motility in vitro.

METHODS. Guinea pig's small bowel segments of 8 cm length were set up in parallel organ baths containing oxygenated Tyrode's solution. Peristalsis was elicited by luminal perfusion (0.5 ml/min) against an aboral resistance of 400 Pascal (Pa). Perfusion of the segments resulted in an increase of the intraluminal pressure up to a pressure threshold (PT; mean ± standard error), where peristaltic contractions were triggered. The pressures were recorded at the aboral end of the segments. An increase of the PT was interpreted as an inhibition of peristalsis, while a decrease of the PT was interpreted as a stimulation of peristalsis. A PT of 400 Pa was equated with a complete block of peristalsis. Starting from a basic PT (base) without any substances added, increasing concentrations (level 1-6, Table 1) of propofol, midazolam, S-ketamine and dexmedetomidine were evaluated.

Statistic calculations were performed using the general linearized model for repeated measures of IBM SPSS 20.0.

Table 1

table 1

level of concentration		1	2	3	4	5	6
Propofol	µM	1	3	10	30	100	300
Midazolam	µM	1	3	10	30	100	300
S-Ketamine	µM	1	3	10	30	100	300
Dexmedetomidine	nM	0,1	0,3	1	3	10	30

RESULTS. All tested substances had a dose dependent inhibitory effect on peristalsis (partial η^2: S-ketamine, dexmedetomidine = 0.995, midazolam, propofol = 0.994; observed power = 1.00).

Lowest doses (level 1 + 2) of the tested substances had no remarkable influence on peristalsis.

Dexmedetomidine and S-ketamine extended their inhibitory effect early, followed by midazolam, while propofol increased PT quite late (level 5). Midazolam was the only substance which blocked peristalsis already at level 5.

The inhibitory effect on peristalsis of propofol was significantly lower compared to dexmedetomidin ($p = 0.038$) and tended to be lower compared to midazolam ($p = 0.078$). There was no significant difference between propofol and S-ketamine ($p = 0.174$).

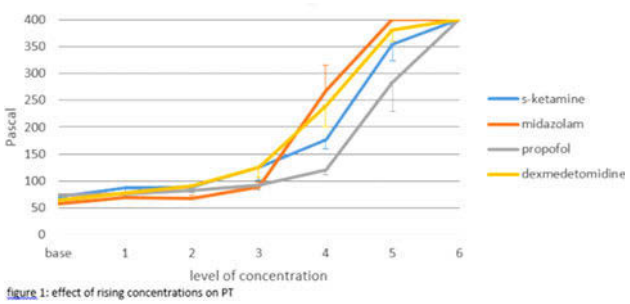


figure 1: effect of rising concentrations on PT

CONCLUSIONS. Our results demonstrate that all tested sedatives have a negative effect on small bowel motility, among them propofol has the least pronounced effect. These results support the idea that a combination of sedatives—i.e. lower doses, less side effects—seems to be beneficial to sustain peristalsis compared to the use of a single substance at high concentrations.

GRANT ACKNOWLEDGMENT. Styrian Department for Science and Research.

0724

PHYSICAL AND PHARMACOLOGICAL RESTRAINT IN THE ICU: CLINICAL SETTINGS AND ADVERSE EVENTS

A. Perren[1], D. Corbella[2], E. Iapichino[3], V. Di Bernardo[4], A. Leonardi[1], C. Buschbeck[1], R. Di Nicolantonio[4], L. Boegli[5], A. Pagnamenta[5], R. Malacrida[4]

[1]ICU–Ospedale San Giovanni, Bellinzona, Switzerland, [2]Anaesthesia Dept, Ospedali Riuniti di Bergamo, Bergamo, Italy, [3]Clinical Psycology, Ospedale San Paolo, Milano, Italy, [4]ICU–Ospedale Civico, Lugano, Switzerland, [5]ICU–Ospedale Beata Vergine, Mendrisio, Switzerland

INTRODUCTION. Analgo-sedation is widely used in ICUs to achieve patient comfort and eliminate various forms of distress. Although their excessive use is associated with increased morbidity/mortality, an inadequate reduction of sedation or the presence of delirium may induce patients to cause harmful events. Thus, pharmacological/physical restraint may be applied in order to protect both patients and caregivers. The aim of this study was to depict the clinical scenario of restraint practices and the occurrence of adverse events.

METHODS. This prospective, observational and multicentric study included patients ≥18 years (informed consent), NEMS ≥ 21, SAPS II ≥ 32 at 25 h. Excluded were acute psychosis or major cerebral damages. Prospectively registered were (1) at recruitment and discharge: general characteristics, diagnoses, comorbidities, pre-existing psychiatric medications; (2) for every nurse shift (8 h): adverse events, level of sedation (SAS), change in analgo-sedation, NEMS, SAPS II, presence of physical restraint. A logistic analysis with stepwise procedure and Propensity score was performed.

RESULTS. 120 patients (66.3 ± 15.7 years) with a preceding Karnofsky score of 75.5 ± 22.7: SAPS II 52.0 ± 19.0, NEMS at admission 31.46 ± 7.41, length of ICU stay 12 ± 11.1, mortality 19 %. In 43 % of all nurse shifts (1,411 of 3,296) some kind of physical restraint was applied and 79.8 % had a pharmacological sedation. Physical restraint was positively associated with a SAS ≥ 6 (OR 14.2 ± 6.5) and a reduction in analgo-sedation (OR 2.7 ± 0.8). There was a negative association between physical restraint and NEMS and SAPS II. The most discriminating variable was the treating ICU (centre A: OR 1; centre B: OR 0.06 ± 0.01 and centre C: OR 0.32 ± 0.06) whereas this variable had no effect on the presence of sedation. A total of 86 adverse events were observed (Table 1); physical restraint had a

protective role against adverse events (OR 0.28, 95 % CI 0.16–0.51) and major adverse events ([autoextubation, removal of CVC and dialysis catheter] OR 0.05, 95 % CI 0.01–0.40), whereas analgo-sedation did not ($p = 0.523$; 2.6 % of shifts with an adverse event for both, sedated and not sedated patients).
CONCLUSIONS. Physical restraint is generally applied in patients perceived as too awake or agitated. Frequently, this phenomenon concerns the almost recovered patient. The most important variable associated with physical restraint is the treating ICU, whereas pharmacological restraint is extremely frequent among all ICUs. Physical restraint, but not analgo-sedation, has a protective role against adverse events.

0725
SLEEP AND DELIRIUM ON CRITICAL CARE: DOES PATIENT ENVIRONMENT MATTER?

C. Small[1], J. Pilsbury[1], C. Snelson[1]

[1]Queen Elizabeth Hospital, Critical Care Unit, Birmingham, UK

INTRODUCTION. Recovery from critical illness can be compromised by neuropsychological disturbances such as sleep disruption and delirium. Contributing factors include noise, pain, light and nursing interventions[1]. In our newly built critical care unit it is perceived that patients' sleep and incidence of delirium can be improved by locating them in areas of natural light to aid day–night orientation, or in side rooms to reduce noise disturbance. Consequentially, efforts are made to move recovering patients to these areas.
OBJECTIVES.
1. To determine whether patient location within the critical care unit affects sleep quality and incidence of delirium.
2. To determine whether factors reducing quality of sleep vary according to location on critical care.
METHODS. Patients were interviewed on a UK critical care unit. Data collected included pre-admission sleep quality (Likert scale), sedative use, previous night sleep quality (Richards Campbell sleep questionnaire–RCSQ) and factors affecting sleep. Bedside charts were used to collect demographic data and overnight RASS, pain and SOFA scores. All patients were screened for delirium using the CAM–ICU tool. Patients were interviewed on alternate weekdays over a period of 1 month.
RESULTS. 71 patients completed 96 questionnaires during March 2013. 15 patients completed more than one questionnaire. Patient location was divided into four zones:
1. Single rooms: all have natural light.
2. Inner zone: with no natural light.
3. Outer zone: with large windows and natural light.
4. Critical care annexe: distant from nursing station and quieter, with natural light.
The rate of delirium was 13.3 %, with no correlation found between CAM–ICU positive scores and critical care zone or presence of natural light. Sleep quality in the side rooms (RCSQ 28.4/100) was less than for zones 2–4 (RCSQ 41.2, 44.2, 42.4 respectively.). No correlation was found between sleep quality and length of critical care stay, SOFA score, organ support, night sedation use, pre-admission sleep quality or smoking and alcohol status. The most common causes of sleep disturbance are summarised in Table 1.

Table 1 Summary of results

Cause of sleep disturbance (in rank order)	Zone 1 (% of respondents in each zone)	Zone 2	Zone 3	Zone 4
1	Anxiety (71.4 %)	Medical/ nursing Interventions (39.4 %)	Staff talking (36 %)	Monitor alarms (35.3 %)
2	Too hot or too cold (57.1 %)	Monitor alarms (33.3 %)	Medical/ nursing Interventions (36 %)	General discomfort (35.3 %)
3	Nightmares (42.9 %)	Staff talking (30.3 %)	Monitor alarms (32 %)	Anxiety (29.4 %)
4	Hallucinations (28.6 %)	Patient noise (27.3 %)	People traffic (32 %)	Pain (23.5 %)
5	Medical/nursing Interventions (14.3 %)	Too hot or too cold (27.3 %)	Too hot or too cold (28 %)	Medical/ nursing Interventions (23.5 %)

CONCLUSIONS. Patients in single rooms reported poorer sleep quality than the other areas of critical care and reported higher incidences of neuropsychological disturbance. No differences in patient variables between areas were identified so could isolation be the cause?
Presence of natural light did not appear to improve sleep. However these bed spaces are in areas of high traffic and noise, causing night time disturbance. Over half of respondents reported poor sleep (RCSQ < 50/100); many causes of this are environmental and modifiable.
REFERENCES. 1. Figueroa-Ramos MI, Arroyo-Novoa CM, Lee KA, Padilla G, Puntillo KA. Sleep and delirium in ICU patients: a review of mechanisms and manifestations. Int Care Med. 2009; 35(5): 781–95.
GRANT ACKNOWLEDGMENT. Dr. Small is supported by a grant from the Defence Medical Services.

0726
EARLY POST-TRAUMATIC STRESS DISORDER, DEPRESSION AND ANXIETY SYMPTOMS DURING POST-ICU HOSPITAL STAY ARE NOT ASSOCIATED WITH ICU DELIRIUM

E. Klop[1], A.R.H. van Zanten[1], A. Janse[1], Y. van Dokkum[1], M.S. van der Steen[1]

[1]Ziekenhuis Gelderse Vallei, Ede, Netherlands

INTRODUCTION. Development of PTSD, anxiety and depression symptoms after critical illness are frequently encountered [1]. Recall of delusions rather than factual memories of the ICU experience are associated with the development of PTSD symptoms [2]. Associations of ICU delirium and these symptoms have rarely been studied. We recently instituted a nurse-driven service to post-ICU patients to take structured interviews and provide information as part of a multidisciplinary aftercare approach. Results of interviews are used in multidisciplinary rounds, to optimize treatment. Several domains of experiences are tested among which the TSQ instrument to detect early signs of PTSD and the HADS instrument to detect early signs of anxiety and depression.
OBJECTIVES. To assess occurrence of early signs of PTSD, anxiety and depression in non-deliric post-ICU patients still in the hospital 1–2 weeks after ICU discharge and to study associations with delirium during ICU stay.
METHODS. We designed a single-center prospective observational cohort study. Patients admitted to the ICU were eligible when admitted from December 2012 until March 2013 for >48 h and still in the hospital 7–14 days after ICU discharge and able to perform TSQ- and HADS-testing. Exclusion criteria were: active delirium on ward, mental retardation or unable to participate in the interview. Delirium definition on ICU and wards used was: positive CAM–ICU or DOS-testing and/or haloperidol treatment. Positive PTSD was considered in patients scoring ≥6 points (TSQ), and depression and anxiety ≥8 using HADS-subscales. Missing tests were considered negative. Comparisons were tested using χ^2 tests. $P < 0.05$ was considered significant.
RESULTS. In total 244 patients were admitted to the ICU. 96 patients met inclusion criteria. Of those 51 were excluded (for reasons of active delirium (n = 15), early discharge (n = 25), refusal (n = 5) and some other reasons (n = 6)). ICU delirium was present in 23 of 45 (51 %), PTSD in 8 of 45 (18 %), anxiety in 11 of 45 (24 %) and depression in 9 of 45 (20 %) evaluable patients, respectively (Table 1). No statistical significant associations were observed comparing PTSD, anxiety or depression symptoms with ICU delirium.

Table 1 Outcomes related to ICU delirium

	Delirium during ICU-stay (N = 23)	No Delirium during ICU-stay (N = 22)	P-value
PTSD+	5 (22 %)	3 (14 %)	0.48
PTSD−	18 (78 %)	19 (86 %)	0.48
Anxiety+	4 (17 %)	7 (32 %)	0.26
Anxiety−	19 (83 %)	15 (68 %)	0.26
Depression+	6 (26 %)	3 (14 %)	0.30
Depression−	17 (74 %)	19 (86 %)	0.30

CONCLUSIONS. PTSD, anxiety and depression symptoms evaluated 7–14 days post-ICU during the same hospital stay are not associated with delirium during ICU stay. It is unlikely that patients at risk for anxiety, depression and PTSD can be selected using ICU delirium as a criterion. Therefore, structured interviews and visits after ICU discharge are warranted to facilitate early diagnosis and therapy.
REFERENCES. 1. Myhren H, et al. Posttraumatic stress, anxiety and depression symptoms in patients during the first year post intensive care unit discharge. Crit Care. 2010; 14(1): R14.2. 2. Jones C, et al. Memory, delusions, and the development of acute posttraumatic stress disorder-related symptoms after intensive care. Crit Care Med. 2001; 29(3): 573–80.

0727
EVALUATION OF BIOMARKERS ASSOCIATED WITH ALCOHOL DEPENDENCE AND WITHDRAWAL IN PATIENTS RECEIVING ADJUNCTIVE DEXMEDETOMIDINE FOR THE TREATMENT OF ALCOHOL WITHDRAWAL

P.M. Reynolds[1], S.W. Mueller[1], T. Kiser[1], R. Maclaren[1]

[1]University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Pharmacy, Aurora, United States

INTRODUCTION. Biomarkers such as brain-derived neurotrophic growth factor (BDNF), glial-derived neurotrophic growth (GDNF) factor, nerve growth factor (NGF) and carbohydrate deficient transferrin (CDT) have been studied as predictors of alcohol withdrawal and the adequacy of neuro-adaptation during abstinence. Dexmedetomidine (DEX) is frequently used as adjunctive therapy in acute alcohol withdrawal and may blunt catecholamine activity. No studies have described the effects of DEX on concentrations of biomarkers or catecholamines during the withdrawal period.
OBJECTIVE. To evaluate the effects of DEX on BDNF, GDNF, NGF, CDT and epinephrine (EPI) during acute withdrawal.
METHODS. Blood was collected at 0, 48, 96, and 168 h after starting study drug from 24 patients enrolled in a randomized, double-blind trial comparing high dose (HD) 1.2 mcg/kg/h DEX, low dose (LD) 0.4 mcg/kg/h DEX, and placebo (P) as adjunctive therapy to a lorazepam (LOR)-based symptom triggered withdrawal protocol (clinical trials identifier NCT00936377). Plasma concentrations of biomarkers and EPI were determined by enzyme linked immunoassays. Standard curves were generated through the correlation of assay optical density to standardized concentrations. Concentrations in each group were then analyzed for associations with severity of withdrawal (daily LOR requirements and withdrawal severity scores as defined by the Clinical Institute Withdrawal Assessment of Alcohol Scale [CIWA]), hemodynamic status, serum DEX concentrations (by HPLC-mass spectrometry), and likelihood for intubation. A multivariable linear regression analysis was also conducted to generate a model to describe the relationships.
RESULTS. Concentrations of biomarkers and EPI were similar between treatment and P groups overall and over time. Median GDNF concentrations over the first 48 h increased with DEX and decreased with P (Δ 3.02 vs. −2.68 pg/mL, $p = 0.043$). DEX and EPI concentrations did not correlate with each other during the study. Lorazepam did not correlate with any withdrawal related biomarkers during the study.
In the multivariate analysis, a trend existed between EPI concentrations and withdrawal severity ($p = 0.08$). GDNF and CDT were negatively correlated with one another (ρ − 0.3695, $p = 0.0125$). NGF and CDT were positively correlated (ρ 0.33, $p = 0.0253$) with one another. No biomarker or EPI were significantly associated with daily LOR requirements or withdrawal severity.
Patients were stratified by intubation status at study enrollment. The 10 patients that were intubated upon enrollment trended towards a lower median GDNF level compared to non-intubated patients (23.62 vs. 34 pg/mL $p = 0.089$).
CONCLUSIONS. DEX is associated with a reduction in the rebound of GDNF during acute alcohol withdrawal. Daily LOR requirements did not modulate withdrawal biomarkers. Further study is needed to quantify the effects of alcohol withdrawal pharmacotherapy on these biomarkers and EPI.

0728
EFFECT OF PROPOFOL ON HEPATIC MITOCHONDRIAL OXYGEN CONSUMPTION

S. Djafarzadeh[1], A.J. Pereira[1], J. Takala[1], S.M. Jakob[1]

[1]University Hospital (Inselspital) Bern, and University of Bern, Department of Intensive Care Medicine, Bern, Switzerland

INTRODUCTION. The sedative drug propofol is used to provide continuous sedation in intensive care patients.

OBJECTIVES. The aim of the present study was to investigate whether propofol interacts with hepatic mitochondrial function.

METHODS. The human hepatoma cell line HepG2 was exposed to a clinically relevant concentration of propofol (30 μM) for 1 h. The mitochondrial complex I-, II- and IV-dependent oxygen consumption rates of permeabilized cells were measured using a high-resolution oxygraph (Oxygraph-2k, Oroboros Instruments, Innsbruck, Austria). The respiratory electron transfer capacity of intact cells was evaluated using FCCP *(carbonyl cyanide p-trifluoromethoxyphenylhydrazone)*. Mitochondrial ATP synthase enzymatic activity and cellular ATP content were measured using commercially available kits. The mitochondrial electrochemical potential gradient in intact cells was measured using the cationic dye JC-1 (5,5′,6,6′-tetrachloro-1,1′,3,3′-tetraethylbenzimidazolocarbocyanineiodide).

RESULTS. Incubation of HepG2 cells with propofol (1 h, 30 μM, N = 30) induced an increase in complex I-dependent respiration (38 ± 9 in controls vs. 43 ± 9 pmol/[s × million cells] in stimulated cells; p = 0.005), complex II-dependent respiration (63 ± 13 in controls vs. 72 ± 14 pmol/[s × million cells] in stimulated cells; p = 0.002), and complex IV-dependent respiration (81 ± 19 in controls vs. 93 ± 21 pmol/[s × million cells] in stimulated cells; p = 0.002) (Fig. 1). Treatment with propofol (1 h, 30 μM) led to an increase in cellular ATP content (5.07 ± 1.21 in controls vs. 5.99 ± 0.81 pmol/μg cellular protein in stimulated cells; p = 0.01, N = 18), and mitochondrial membrane potential, expressed as the increase in JC-1 590/530 nm fluorescence ratios (0.34 ± 0.11 in controls vs. 0.43 ± 0.23 in stimulated cells; p = 0.04, N = 32). We did not observe any differences in mitochondrial ATP synthase enzymatic activity (not shown, N = 8) and basal respiration of cells treated with propofol (1 h, 30 μM, N = 30) compared to controls, however propofol tended to increase (p = 0.068) uncoupled respiratory control ratio (uRCR: the ratio of state 3 uncoupled/state 4 oligomycin) (Table 1).

CONCLUSIONS. Propofol at a clinically relevant concentration increases cultured human hepatocyte mitochondrial respiration, membrane potential and cellular ATP content. Further investigation will be needed to clarify how propofol exerts its effect on hepatic mitochondrial function, and the potential clinical relevance of this effect.

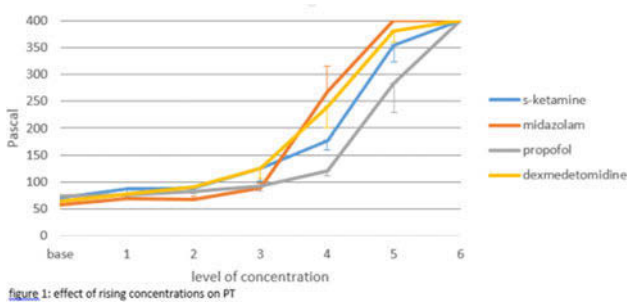


Fig. 1 Cellular oxygen consumption after incubation with propofol. Statistics: paired t-test, # p < 0.01 control vs. profpofol

Table 1

	Control	Propofol	p-value
Basal respiration	27.0±4.7	27.6±6.1	0.66
Oligomycin-sensitive respiration	17.8±3.3	18.3±4.4	0.55
Oligomycin-insensitive respiration	9.3±1.9	9.3±2.2	0.96
Uncoupled respiration rate	70.5±15.7	73.7±15.5	0.36
uRCR	7.6±0.8	8.1±1.2	0.07

0729

EVALUATION OF NALOXON AND METHYLNALTREXONE (MNTX) TO ANTAGONISE OPIOID INDUCED DISORDERS OF COLONIC PERISTALSIS IN VITRO

M. Schörghuber[1], E. Tatzl[1], P. Holzer[2], W. Toller[1], S. Fruhwald[1]

[1]Medical University of Graz, Department of Anaesthesiology and Intensive Care Medicine, Graz, Austria, [2]Medical University of Graz, Institute of Experimental and Clinical Pharmacology, Graz, Austria

INTRODUCTION. Opioids are well known for their adverse effect on gastrointestinal motility. This influence on peristalsis can be reduced by the administration of the μ-antagonists Naloxon and MNTX. An in vitro setting allows to evaluate their potency to antagonise the effect of different opioids on colonic motility.

OBJECTIVES. The aim of this study was to evaluate opioid dependent differences in the restoration of peristalsis.

METHODS. Guinea pig's colonic segments of 10 cm length were fixed on a polyacrylic tray in a tissue bath. The speed (mm/s) of an intraluminally placed pellet along these segments was measured before and after administration of the test substances to the tissue bath. The difference (Δ) of the two transit speeds was calculated. A Δ = 0 shows no influence on peristalsis of the tested substance, Δ > 0 shows an inhibition, Δ < 0 shows a stimulation of peristalsis. Sufentanil 1 nM, Remifentanyl 30 nM, Piritramid 300 nM, and Tramadol 30 μM were tested alone and in combination with Naloxon 0.1 μM or MNTX 1 μM.

RESULTS. All tested opioids inhibited colonic peristalsis.

Sufentanil (0.71, 1.13 mm/s): MNTX (0.3, 0.75 mm/s, p = 0.015) reduced the inhibitory effect but not Naloxon (0.75, 0.57 mm/s).

Remifentanyl (1.46, 1.02 mm/s): Naloxon (0.32, 0.43 mm/s, p = 0.002) showed high potency to diminish the influence on peristalsis but not MNTX (0.81, 1.68 mm/s).

Piritramid (0.92, 0.62 mm/s): Both, Naloxon (0.36, 0.37 mm/s) and MNTX (0.24, 0.7 mm/s), had an antagonistic effect, which was not statistically significant (p < 0.09).

Tramadol (0.88, 0.47 mm/s): Neither Naloxon (1.19, 0.78 mm/s) nor MNTX (0.86, 0.41 mm/s) were able to restore peristalsis.

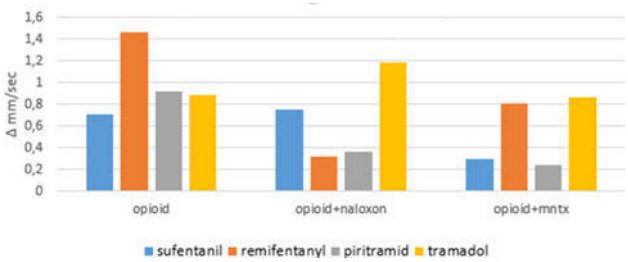


Fig. 1 Antagonistic effect of naloxon and mntx opioizds and antagonists

CONCLUSIONS. The potency of Naloxon and MNTX to antagonise opioid induced inhibition of colonic peristalsis depends very much on the culprit substance. While MNTX seems appropriate to reduce the influence of Sufentanil on colonic peristalsis Naloxon seems to be more suitable to diminish the effect of Remifentanyl. Both substances are almost equal in their antagonistic potency concerning Piritramid.

Colon motility disorders caused by Tramadol are very hard to restore compared to the other tested opioids.

GRANT ACKNOWLEDGMENT. Styrian Department for Science and Research.

0730

A RANDOMIZED CONTROLLED STUDY TO COMPARE THE EFFICACY AND SAFETY OF PROLONGED SEDATION WITH DEXMEDETOMIDINE VS MIDAZOLAM FOR MECHANICALLY VENTILATED PATIENTS IN THE INTENSIVE CARE

R. Gupta[1], Y. Mehta[1], T. Ali[1], G.V. Joby[1]

[1]Medanta, Medicity Hospital, Critical Care, Delhi, India

INTRODUCTION. Sedation is often used to improve comfort, reduce anxiety and stress, and facilitate nursing care of critically ill patients in the intensive care unit (ICU). Midazolam is the standard of care sedative for patients ICU. Dexmedetomidine has been shown to be a safe and acceptable ICU sedative agent that shown to reduce ICU stay.

HYPOTHESIS. A sedation strategy using Dexmedetomidine will result in decreased number of ventilator days in the ICU.

OBJECTIVES. Compare the efficacy as assessed by the number of ventilator days as primary objective in patients admitted in the ICU when on Dexomedetomidine or Midazolam and secondary objective by a comparison of adverse events like ventilator associated pneumonia, secondary infection, and the incidence of bradycardia or any other side effect in each group.

METHODOLOGY. Prospective randomized control study was carried out in two groups of patients each having 40 sedated patients either on Dexmedetomidine or midazolam on mechanical ventilation in control mode with endotracheal tube in place for more than 48 h. It was conducted in Medanta. The Medicity hospital Gurgaon, India among medical/surgical ICU patients with expected mechanical ventilation for more than 72 h.

RESULTS. There was no significant difference in mean mechanical ventilation days, mean ICU length of stay or infections in patient group receiving Dexmedetomidine vs midazolam. The mean ventilator days in Dexmedetomidine group and midazolam group was 6.37 and 5.89 with (p value 0.5687). The mean length of ICU stay was 10.73 days in Dexmedetomidine group and 9.06 days in midazolam group respectively (p value 0.2077). Secondary infection occured in (9/40) 22.5 % patients in Dexmedetomidine and (10/40) 25 % in midazolam group. Bradycardia occured in 20 % of patients receiving Dexmedetomidine although severe bradycardia requiring stoppage of drug occured in one patient only. The statistical test used was student t test.

CONCLUSIONS. As compared to midazolam, Dexmedetomidine did not have any difference in days on ventilator, ICU length of stay or secondary infections. Although Dexmedetomidine was responsible for 20 % cases of bradycardia but it was not life threatening. This study establishes non-inferiority of Dexmedetomidine use over midazolam, furthermore as it was only used for 24 h, further studies are warranted to investigate longer periods of its use.

REFERENCE(S). 1. Venn et al. Comparison between dexmedetomidine and propofol for sedation in the intensive care unit: patient and clinician perceptions. Br J Anaesth. 2001; 87(5): 684–690. 2. Differentiating midazolam over-sedation from neurological damage in the intensive care unit. Crit Care. 2005; 9: R32–R36. 3. Catherine A, McKenzie, et al. Dexmedetomidine vs midazolam for sedation of critically ill patients. JAMA. 2009; 301(5): 489–99.

0731

EFFECTS OF DEXMEDETOMIDINE ON SLEEP QUALITY IN MECHANICALLY VENTILATED CRITICALLY ILL PATIENTS

C. Alexopoulou[1], E. Kondili[1], E. Diamantaki[1], C. Tzanidakis[1], E. Maridakis[1], D. Georgopoulos[1]

[1]University Hospital of Crete, ICU, Heraklion, Greece

INTRODUCTION. It has been recently shown that in critically ill patients ventilated on assisted modes, propofol administration to achieve the recommended level of sedation does not increase the sleep efficiency and by suppressing the REM sleep stage further worsens the poor sleep quality of these patients. Dexmedetomidine, a potent alpha-2-adrenergic agonist with anaesthetic-sparing, analgesia and sympatholytic properties, is the newest agent introduced for sedation in intensive care unit (ICU). Compared to GABA agonists, dexmedetomidine sedation more closely resembles natural sleep since the patients are more easily aroused and more cognitively intact when aroused. However the effect of dexmedetomidine on sleep in critically ill patients is not clear.

OBJECTIVES. To access the effect of dexmedetomidine on sleep quality in mechanically ventilated critically ill patients.

METHODS. Open-label, cross-over study with three study periods conducted in an adult ICU at a tertiary Hospital. Polysomnography was performed for three consecutive nights (1st, 2nd, 3rd) in critically ill mechanically ventilated patients, while dexmedetomidine was given the 2nd night. Other sedatives were not used throughout the study. Dexmedetomidine was given for 9 h starting at 9:00 p.m. with a loading dose of 0.5 μg/kg over 20 min and followed by a continuous infusion at rate adjusted (0.2–0.7 μg/kg/h) to maintain a sedation

level of −1 to −2 on Richmond Agitation–Sedation Scale. Sleep architecture was analyzed manually using predetermined criteria.
RESULTS. Ten patients were studied. One patient was withdrawal from the study due to bradycardia during the infusion of loading dose of dexmedetomidine. With or without dexmedetomidine all patients demonstrated abnormal sleep architecture, expressed by lack of sequential progression through sleep stages and their abnormal distribution. With dexmedetomidine sleep efficiency (median [IQR]) was significantly higher than that without (1st night 22 % [0.4–54 %], 2nd 65 % [44–86] and 3rd 11.6 % [0.6–32], p = 0.01). Duration of stage 2 sleep was significantly greater (p = 0.008) during 2nd (258 min [126–350]) than 1st (43 min [0–200] and 3rd nights (30 min [0–108]). Stage 1, slow wave and REM sleep duration did not differ among study nights.
CONCLUSIONS. In mechanically ventilated critically ill patients, dexmedetomidine administration to achieve the recommended level of sedation improves the sleep quality by increasing the sleep efficiency and stage 2 of sleep.

0732
ASSESSING ICU NIGHT NOISE LEVELS USING AN IPHONE® APP: A POINT OF CARE ASSESSMENT IN THE DELIRIUM CARE PACKAGE

T. Price[1], J. Hinds[1]

[1]Craigavon Area Hospital, Department of Anaesthetics and Intensive Care, Northern Ireland, UK
INTRODUCTION. Noise, defined as any unwanted or undesirable sound which is subjectively annoying or disrupts performance, can be physiologically and psychologically stressful to patients, and is well known to contribute to ICU delirium.
The World Health Organisation Night Noise Guidelines for Europe (2009) recommend the average background noise in hospitals should not exceed 30 decibels (dB) and that peaks during night time should be <40 dB[3]. The guidelines set an Interim Target for local policies of <55 dB[3]. Studies have shown that average noise levels in ICU are 60–70 dB with peaks of over 90 dB[1]. The generation of noise is multifactorial and can be broadly divided into behavioural or equipment related. Behavioural noise can be due to medical staff, visitors, and other patients. Equipment noises can originate from monitor alarms, nebulisers and mechanical ventilators.
Reducing excessive night noise within the ICU minimises disturbance to the sleep wake cycle and is a modifiable factor in the delirium care package.
OBJECTIVES. The aim of the audit was to assess whether noise levels in our ICU were higher than the WHO Interim Target level of <55 dB. Furthermore we aimed to assess whether an iPhone® decibel meter app could be used by ICU staff to assess noise levels 'live' at the bedside, allowing rapid implementation of noise reduction measures to at risk patient groups.
METHODS. Noise levels recorded 'live' at the bedside during ICU quiet time at night, using Studio Six SPL Meter® app (Version 6.4) on Apple iPhone 5® (Fig. 1). Each bedspace was analysed once a night for 5 min over a seven night period, at a distance of <4 m from the patients head. Nursing staff were unaware of the app recording noise levels. Mean and maximum decibel levels were recorded from each bedspace.

Fig. 1.

RESULTS. 38 Bedspace readings collected over seven nights
Mean noise level = 62 dB (n = 38)
Maximum noise level recorded = 94 dB (n = 38)
CONCLUSIONS. Noise levels recorded in our ICU at night were higher than the WHO Night noise interim target level of <55 dB, and correlated broadly with other ICU studies[1]. The iPhone® app provided a readily available, inexpensive and portable method of monitoring noise levels in our ICU.
It provides medical and nursing staff with an easy method of assessing noise levels in the bedspaces of patients at risk of ICU delirium and disturbed sleep wake cycle.
This could enable clinicians to implement noise reduction measures as part of a modifiable factor in the delirium care package.
The audit however did not show clinical outcome or effect and the data recorded was only a 'snapshot' in time.
REFERENCES. 1. Wenham T, Pittard A. Intensive care unit environment. Cont Edu Anaesth Crit Care Pain. 2009; 9(6): 178–83. 2. Langevoort et al. Sleep disturbances in the ICU. Crit Care Med Int Synop. 2011; 15(1): 539. 3. World Health Organisation Night Noise Guidelines for Europe 2009 (http://www.euro.who.int/document/e92845.pdf).

0733
EVALUATION OF DELIRIUM IN CRITICALLY ILL PATIENTS AND ITS IMPLICATIONS FOR A SUBSEQUENT PHARMACOLOGIC APPROACH- AN AUDIT OF CURRENT PRACTICE

S. Krotsetis[1], P. Clark[2], E. Muhl[1], J.-C. Lewejohann[1]

[1]University Medical Center Schleswig–Holstein, Campus Lübeck, Surgery–Intensive Care Unit, Lübeck, Germany, [2]Cardiff and Vale University Health Board, ICU, Cardiff, UK
INTRODUCTION. The deleterious effects of sedative agents on the development and aggravation of delirium in its various forms have been identified by contemporaneous evidence. In order to detect a delirium, national and international guidelines recommend the implementation of a reliable tool.
OBJECTIVES. We attempted to determine whether evidence was sufficiently reflected in local clinical practice.
METHODS. The audit included 212 retrospective observations of a consecutive sample of n = 54 non sedated patients, cared for on a University Hospital Surgical Intensive Care Unit. We monitored data of delirium symptoms based on the subjective impression of caregivers. Additionally we scored the agitation, linked to delirium by local healthcare professionals or sedation using the Richmond Agitation and Sedation Scale (RASS) and the ensuing pharmalogic treatment with sedative agents. The χ^2 test and the Fisher exact test were used to evaluate the patients mental status and delirium related symptoms following the administration of drugs. Alpha was set at 0.05 to demonstrate statistical significance.
RESULTS. An agitated mental status of the patient alone or set in context with a subjectively assessed symptom of delirium led significantly to the administration of a benzodiazepine. In contrast a calm or drowsy mental status combined with a symptom assigned to delirium led to no further pharmacologic treatment.
In patients with RASS +1 to +2 and the symptom of agitation Lorazepam and Midazolam were applied (p < 0.001), while in RASS +1 to +2 with the symptom of a disturbed wake-sleep cycle lorazepam, midazolam and zopiclone were used (p < 0.003) and in those with RASS 0 to +1 and the symptom of disorientation Lorazepam and Midazolam were applied (p < 0.001).
CONCLUSIONS. To introduce evidence into practice, the implementation of a valid and reliable patient assessment is crucial in order to assess all aspects of care in the critically ill and to avoid the underestimation of delirium. A tightly focused pharmacologic approach with appropriate medication, to reduce the detrimental factors, causing and affecting delirium, should be practiced.
REFERENCE(S). Pandharipande P, et al. Lorazepam is an independent risk factor for transitioning to delirium in intensive care unit patients. Anesthesiology. 2006; 104(1): 21–26. Martin J, et al. Evidence and consensus-based German guidelines for the management of analgesia, sedation and delirium in intensive care-short version. German Medical Science. National Institute for Health and Clinical evidence. 2010. NICE clinical guideline 103. Delirium: diagnosis, prevention and management. 2010.

0734
ASSESSMENT OF THE ROLE OF DEXMEDETOMIDINE AS AN ANAGLO-SEDATIVE ADJUNCT IN AN ADULT INTENSIVE CARE UNIT (ICU)

R.Y.Y. Wan[1], D.J.P. O'Callaghan[2], C.J. Langrish[2]

[1]Guy's and St Thomas' NHS Foundation Trust, Department of Pharmacy, London, UK, [2]Guy's and St Thomas' NHS Foundation Trust, Department of Critical Care, London, UK
INTRODUCTION. Dexmedetomidine, an alpha-2-adrenoceptor agonist, has been studied as an alternative sedative in anaesthesia [1] and as a means of minimising ICU delirium [2]. However, its inability to produce deep sedation and its high cost preclude routine use. Thus, experience with use as an adjunct anaglo-sedative agent remains limited. This opioid and hypnotic sparing agent could be beneficial in critically ill high-risk groups, where anxiolysis/light sedation is preferred over deep sedation/analgesia [3]. A local guideline was developed for rescue therapy in critically ill high-risk groups with refractory hyperactive delirium [4].
OBJECTIVES. A retrospective case-based review to assess appropriateness, efficacy and side effect profile as an adjunct sedative on a 43 bedded University Medical-Surgical ICU.
METHODS. Over 1 year (Dec 2011–Dec 2012) data were extracted from the pharmacy JAC medicines management system and ICU clinical informatics system (Intellivue Clinical Portfolio [ICIP] Philips) for patients who received dexmedetomidine. A retrospective review was completed to audit appropriateness, efficacy and adverse effects against the guideline.
RESULTS. A total of 25 patients received dexmedetomidine. As a sedative adjunct, initiation in 88 % (22/25) of patients deemed appropriate. Initiated for agitation/delirium control; 14 % (2/14) of patients were on none or one, 43 % (6/14) on two and 43 % (6/14) on three sedative agents. Patients achieved light sedation with successful weaning of other sedatives in 48 % (11/23) of cases. Adverse effects were experienced in 8 % (2/25) of patients. Treatment duration varied widely from 1 to 18 days, median 3 days.
CONCLUSIONS. Dexmedetomidine was initiated appropriately in accordance with the guideline. Dexmedetomidine was efficacious in 48 % of high-risk patients; suggesting other multi-factorial problems may exist. Few patients experienced adverse effects, correlating with known safety profile. We recommend sedative regimens reviewed and maximised where appropriate prior to using dexmedetomidine. Structured sedation plans should be employed and reassessed. Further study is required to understand this complex area of ICU sedation in order to utilise dexmedetomidine most effectively and target use in those who receive maximal benefit.
REFERENCE(S). Jakob SM, et al. Dexmedetomidine vs midazolam or propofol for sedation during prolonged mechanical ventilation two randomized controlled trials. JAMA. 2012; 307: 11. 2. Shehabi Y, et al. Delirium duration and mortality in lightly sedated, mechanically ventilated intensive care patients. SEDCOM (safety and efficacy of dexmedetomidine compared with midazolam) Study Group. Crit Care Med. 2010; 38: 2311–8. 3. Hughes CG, et al. Sedation in the intensive care setting. Clin Pharmacol. 2012; 4: 53–63. 4. Critical Care Guideline for Dexmedetomedine. Perioperative, Critical Care and Pain. Guy's and St Thomas' NHS Foundation Trust, London. UK.

0735
LORAZEPAM MAY OFFER HELP WHEN WEANING PATIENTS FROM PROLONGED SEDATION WITH OPIOIDS IN THE INTENSIVE CARE UNIT

N.D. Altintas[1], S. Izdes[2], F. Alaybeyoğlu[3], M. Aksoy[2]

[1]Ankara University Faculty of Medicine, Department of Intensive Care (Internal Medicine), Ankara, Turkey, [2]Yildirim Beyazit University, Medical Faculty, Ataturk Training and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey, [3]Ankara Ataturk Training and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey
INTRODUCTION. Sedation in the intensive care unit (ICU) is a delicate issue. Certain conditions and treatment modalities require prolonged sedation resulting in development of tolerance and withdrawal symptoms.[1] These symptoms may prolong weaning from the ventilator, and discharge from the ICU. There are no standard guidelines for treating withdrawal symptoms that develop from ICU practices. However, long-acting benzodiazepines have been used to treat addicts.[2]
OBJECTIVES. Recently, we have started using lorazepam, a long-acting benzodiazepine, to wean our patients from opioids. We aimed to, retrospectively, analyze the results of our patients to develop a common approach.

METHODS. Patients whom lorazepam was administered to wean opioids were retrospectively tracked starting from 2010 until end of 2012. Their demographic features, admission diagnosis, infused drugs, dose and time of lorazepam, hemodynamic variables were noted.
RESULTS. A total of 37 patients with a mean age of 56.6 were included in the analysis. Of these 30 (81 %) were men. Main admission diagnoses were multi-trauma in ten patients, respiratory problems (pneumonia/ards) in 16 patients, neurologic in 5 patients and post-cardiac arrest in 4 patients. Lorazepam was started at a dose of 3 × 1 mg per nasogastric tube, when hemodynamic instability and/or severe agitation occurred when weaning from opioids were tried. After a median treatment duration of 10 days, patients were free of opioids and benzodiazepines. After last dose of lorazepam the hemodynamic variables had significantly improved ($p < 0.01$). Longer duration of sedation with lorazepam was generally a result of additional co-morbidities that required prolonged sedation. No adverse effect associated with lorazepam administration was observed.
CONCLUSIONS. Long-acting benzodiazepines may offer help during weaning of opioids in patients who have been sedated more than 72 h. We suggest opioid weaning be started after lorazepam administration with careful observation of withdrawal symptoms. Lorazepam may be stopped after opioids have been withdrawn. Provision of analgesia, with alternative agents should not be overlooked in these patients if required.
REFERENCES. 1. Delvaux B, Ryckwaert Y, Van Boven M, De Kock M, Capdevila X. Remifentanil in the intensive care unit: tolerance and acute withdrawal syndrome after prolonged sedation. Anesthesiology. 2005; 102: 1281–2. 2. Ockert DM, Volpicelli JR, Baier AR Jr, Coons EE, Fingesten A. A nonopioid procedure for outpatient opioid detoxification. J Addict Med. 2011; 5(2): 110–4.

Nutrition performance: 0736–0749

0736

COST-EFFECTIVENESS ANALYSIS (CEA) OF EARLY ENTERAL NUTRITION (EEN) IN CRITICALLY ILL MECHANICALLY VENTILATED PATIENTS

H. Chevrou-Séverac[1,2], G.S. Doig[2]

[1]Nestlé Health Science, Health Economics, Vevey, Switzerland, [2]University of Sydney, Northern Clinical School Intensive Care Research Unit, Sydney, Australia
INTRODUCTION. eEN, defined as enteral nutrition provided within 24 h of admission to an intensive care unit (ICU), has been shown in a meta-analysis (MA) to decrease the risk of mortality (1). However results regarding length of stays or mechanical ventilation days were not reported.
OBJECTIVES. The purposes of this study are to expand the meta-analysis of Doig et al. to investigate the effect of eEN on measures of healthcare resource consumption and to conduct a cost-effectiveness analysis of eEN.
METHODS. The following measures of resource consumption were abstracted from the randomised clinical trials included in the published MA: hospital length of stay (LOS), ICU LOS and mechanical ventilation (MV) days. MA of these outcomes was conducted using a fixed effects model of the weighted mean difference metric in Revman 4.2. From the perspective of the acute care hospital system, a CEA was undertaken to compare costs associated with the use of eEN versus standard care (SC). A stochastic model was developed to generate a 1,000 patient database to reflect patient-types included in the published MA and a Monte Carlo simulation was conducted to create 1,000,000 unique copies of the database to provide accurate estimates of confidence intervals around costs. Daily costs of ICU care were extracted from the published literature (2). All costs are reported in 2012 US dollars. Sensitivity analyses to assess uncertainty around parameters were undertaken.
RESULTS. Based on updated MA, eEN did not have any effect on hospital LOS (wMD 0.6 days, 95 % CI −1.8 to 3.1, $I^2 = 0$ %), however there was a strong trend ($p = 0.06$) towards a reduction in ICU LOS (wMD −2.3 days, 95 % CI −4.8 to 0.1, $I^2 = 0$ %) and MV days (wMD −2.5 days, 95 % CI −5.1 to 0.0, $I^2 = 0$ %).To maintain consistency with the MA, the stochastic patient database was composed of 389 major surgery patients, 538 trauma patients and 73 medical patients. The stochastic model used to generate 1,000 patient database was based on ICU LOS estimates from the MA and a matrix of daily cost estimates from Dasta et al. that adequately captured the reduction in MV days. The large-scale Monte Carlo simulation required 1 h 42 min to create 1,000,000 unique copies of the 1,000 patient database. Overall, the use of eEN resulted in a net savings of $14,813 per patient (95 % CI $5,811–$23,987). These savings do not change significantly if the patient population mix of mechanically ventilated patients is varied.
CONCLUSIONS. eEN, provided to mechanically ventilated critically ill patients is a dominant nutritional approach compared to SC: it saves lives as demonstrated by a published MA, and may significantly reduce costs of care as demonstrated in this cost-effectiveness analysis.
REFERENCE(S). 1. Doig et al. Int Care Med. 2009; 35(12): 2018–27. 2. Dasta et al. Crit Care Med. 2005; 33:1266–1271.
GRANT ACKNOWLEDGMENT. No funding was received to conduct this CEA.

0737

INCREASED CALORIE AND PROTEIN INTAKE BY ENTERAL NUTRITION IS ASSOCIATED WITH IMPROVED OUTCOME IN SEPTIC PATIENTS: SECONDARY ANALYSIS OF A LARGE INTERNATIONAL NUTRITION DATABASE

G. Elke[1], M. Wang[2], N. Weiler[1], A.G. Day[2], D.K. Heyland[2]

[1]University Medical Center Schleswig–Holstein, Campus Kiel, Department of Anaesthesiology and Intensive Care Medicine, Kiel, Germany, [2]Kingston General Hospital, Clinical Evaluation Research Unit, Kingston, Canada
INTRODUCTION. Recent international sepsis guidelines recommend low dose enteral nutrition for the first week [1]. This guideline contradicts nutrition guidelines for heterogenous groups of ICU patients [2]. Data on the optimal dose of enteral nutrition (EN) in septic patients are lacking.
OBJECTIVES. The objective was to evaluate the effect of energy and protein amount on clinical outcomes in a large cohort of critically ill septic patients.
METHODS. Secondary analysis of pooled data from the International Nutrition Survey (INS) and baseline data from the Enhanced Protein–Energy Provision via the Enteral Route in Critically Ill Patients (PEPuP) study [3, 4]. Ethics approval was obtained from Queen's University, Kingston, ON, Canada. Eligible patients had a diagnosis of sepsis and/or pneumonia and were admitted to the ICU for ≥3 days, mechanically ventilated within 48 h of ICU admission. Moreover only those patients receiving EN only were included to account for possible confounding effects of different routes on the amount of nutrition. Baseline demographics and data including relevant nutrition information were collected from ICU admission up to a maximum of 12 days and clinical outcomes were collected at 60 days. Logistic regression models—both unadjusted and adjusted for days with nutrition, BMI, age and APACHE score, respectively—were used to estimate 60-day mortality and ventilator-free days (VFDs) as predicted by the daily average of total energy and protein received during the first 12 ICU days.
RESULTS. Of the 13,630 patients included in the dataset, 2,270 (12.9 %) met the study inclusion criteria where of 1,029 patients (45.3 %) had a diagnosis of sepsis and 1,241 (54.7 %) pneumonia. Patients received a 1,057 ± 481 kcal/day (14.5 ± 7.2 kcal/kg/day, mean ± SD) and 49 ± 24 g protein/day (0.7 ± 0.3 g/kg/day) by EN alone. 60-day mortality was 30.5 % and patients were mechanically ventilated for median 8.4 (interquartile range 4.6–19.2) days with a length of ICU stay of 11.5 (6.9–21.4) days. An increase of 1,000 calories was associated with reduced 60-day mortality (odds ratio 0.61; 95 % confidence intervals (CI) 0.48–0.77, $p < 0.001$) and more VFDs (2.81 days, 95 % CI 0.53–5.08, $p = 0.02$). An increase of 30 g protein per day was also associated with lower mortality (odds ratio 0.76, 95 % CI 0.65–0.87, $p < 0.001$) and increase in VFDs (1.92 days, 95 % CI 0.58–3.27, $p = 0.005$).
CONCLUSIONS. In critically ill septic patients, a daily increase in calorie as well as protein intake by EN was associated with improved clinical outcomes.
REFERENCES. 1. Dellinger RP et al. Crit Care Med. 2013; 41: 580–637.
2. http://www.criticalcarenutrition.com/index.php?option=com_content&view=category&layout=blog&id=21&Itemid=10.
3. Alberda C, et al. Int Care Med. 2009; 35: 1728–1737. 4. Heyland DK, et al. Crit Care. 2010; 14: R78.

0738

REDUCING THE ENERGY DEFICIT AFTER CARDIAC SURGERY BY IMPLEMENTING A NUTRITIONAL PROTOCOL AND INDIVIDUALIZED COUNSELING: A PROSPECTIVE AUDITING STUDY

E. De Waele[1], K. De Bondt[1], S. Mattens[1], D. Nguyen[1], P.M. Honoré[1], H. Spapen[1], F. Wellens[2], L. Huyghens[1]

[1]Universitair Ziekenhuis Brussel, Intensive Care, Jette, Belgium, [2]Universitair Ziekenhuis Brussel, Cardiac Surgery, Jette, Belgium
INTRODUCTION. Cardiac surgery patients suffer considerable physical, physiological and inflammatory stress which may significantly alter metabolic processes and influence energy demands. Care of these patients definitely requires adequate nutritional support as malnutrition was found to enhance morbidity and mortality.
OBJECTIVES. We studied baseline caloric intake in these patients under non-protocolized standard nutritional conditions and subsequently evaluated the effect a nutritional quality improvement program.
METHODS. At first, we determined the non-intentional intravenous and oral caloric intake of consecutive patients who underwent coronary artery bypass or valve surgery (observational group). Calculated caloric deficit was recorded daily throughout the entire hospitalization. Then, a nutritional policy was implemented which consisted of daily computerized caloric intake calculations, personal coaching by a dietician and goal-oriented interventions such as meal adaptation, administration of oral supplements, and tailored tube feeding and parenteral nutrition (treatment group).
RESULTS. In the observational group (19 patients; age 70 ± 10 years; 74 % male; mean APACHE II score 13 ± 6), mean caloric intake was 765 ± 450 kcal/day, representing only 37 % of the theoretical needs. In the intervention group (41 patients; 64 ± 13 years; 80 % male; mean APACHE II score 13 ± 6), caloric intake increased to 1,318 ± 279 kcal/day, representing 63 % of nutritional requirements.
CONCLUSION. A nutritional protocol, driven by a dedicated "nutrition team" significantly improved nutritional support and reduced the energy deficit in cardiac surgery patients.

0739

FOOD FOR THOUGHT: DELIVERY OF ENTERAL NUTRITION IN THE CRITICALLY ILL PATIENTS CAN BE IMPROVED BY INTRODUCING SIMPLE AND INEXPENSIVE CHANGES IN THE CLINICAL PRACTICE

P. Gandre[1], J. Hadley[1], R. White[1], E. Kyriakidou[1], G. Mandersloot[1]

[1]Royal London Hospital, Adult Critical Care Unit, London, UK
INTRODUCTION. Negative energy balance in critically ill patients is associated with increased number of complications, particularly infections, and the resulting energy debt cannot be compensated at a later stage during the critical illness. Berger et al. have considered the findings of EPaNIC, SPN, TICACOS trials and ESPEN guidelines and postulated that energy deficit of >4,000 kcal must be avoided at all times. The suggested timing for initiating the enteral feed is <24 h of the intensive care admission.
Based on the results of our survey in 2010, we introduced some changes in the clinical practice of the intensive care nurses and doctors in order to address and correct the avoidable causes of the resultant energy deficit. The changes included educating the intensive care nurses about the importance of providing enteral nutrition and to calculate the target feed rate before the input from the dieticians and introduction of administering feed at a higher catch up rate in case the feed remains suspended for >4 h. We introduced a mandatory nutrition delivery sheet for use of every patient which allowed nurses to easily calculate the above. In order to avoid unnecessary preoperative starvation, we also encouraged our nurses and doctors to follow the preoperative starvation guidelines for intubated and tracheostomized patients.
OBJECTIVE. We repeated the same survey 10 months after the introduction of these changes to assess if the intended improvements had occurred.
METHODS. We collected the data over a 2 week period in November 2011. As per our feed escalation policy, the final feed rate is expected to be reached at 8 h after initiation.
RESULTS. Out of the 51 consecutive admissions, we analysed data of 33 patients. 18 patients were excluded from the study because they were planned not to receive nasogastric feed. The enteral nutrition was commenced within 24 h of admission in 76 % of the patients. The main reasons for not achieving >80 % of the calculated energy requirement per day are presented in Graph 1.

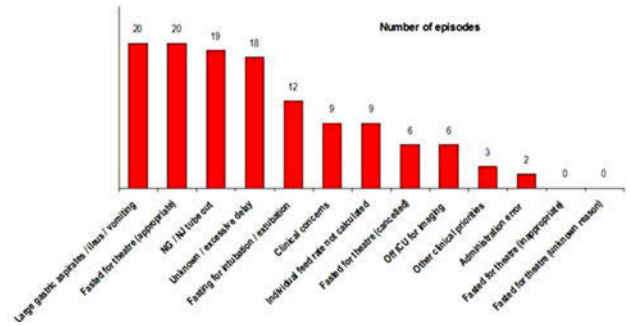


Fig. 1

Table 1 Number of episodes

	Year 2010	Year 2011
Average delay in starting the feed from the time of admission (h)	15.5	14.6
Patients achieving the target rate within 8 h of initiation of feed (%)	12	30
Patients with target rate calculated by nurses (%)	0	30
Patients with catch up rate used where applicable (%)	0	21
Average daily feed delivery (% of total requirement)	63	68.7

CONCLUSION. Following the implementation of the changes we have made considerable improvements in the enteral nutritional delivery. We have nearly eliminated inappropriate preoperative fasting and majority our patients start receiving enteral feed within 24 h of admission. The caloric delivery still remains well below the calculated requirement which needs to be addressed and optimised further.

REFERENCES. 1. Stéphane Villet et al. Negative impact of hypo caloric feeding and energy balance on clinical outcome in ICU patients. Clin Nutr. 2005; 24(4): 502–509. 2. Berger et al. Best timing for energy provision during critical illness. Crit Care. 2012; 16: 215. http://ccforum.com/content/16/2/215 (Last accessed on 22/04/2013. 3. Kreymann et al. ESPEN Guidelines on enteral nutrition: intensive care. Clin Nutr. 2006; 25: 210–223.

0740

A CRITICAL APPRAISAL OF FORMULAS CALCULATING RESTING ENERGY EXPENDITURE IN CRITICALLY ILL ADULT PATIENTS

E. De Waele[1], T. Opsomer[1], S. Mattens[1], M. Diltoer[1], P.M. Honoré[1], H. Spapen[1], L. Huyghens[1]

[1]Universitair Ziekenhuis Brussel, Intensive Care, Jette, Belgium

INTRODUCTION. In intensive care unit (ICU) patients, indirect calorimetry (IC) is considered to be the standard method for estimating energy requirements. Nevertheless, most ICU clinicians still rely on various mathematical formulas to calculate caloric requirements in their patients.

OBJECTIVES. We assessed whether measurements obtained by IC correlated with the results of such commonly used equations.

METHODS. Retrospective study in consecutively hospitalized patients in a mixed medicosurgical adult ICU. In all patients, resting energy expenditure (REE) was measured by IC as a standard part of the development of a nutritional care plan between January 2011 and December 2012. We simultaneously calculated 10 distinct predictive equations. IC was performed with the VmaxTM Encore 29n calorimeter (VIASYS Healthcare Inc, Yorba Linda, CA). The Bland–Altman method and regression analysis was used to assess agreement between measured and calculated REE.

RESULTS. 191 critically ill patients were studied (age 62; 57 % males), 161 subjects (84 %) were mechanically ventilated. Measured REE was 1,571 ± 423.5 kcal/24 h with VO_2 0.23 ± 0.06 L/min and VCO_2 0.18 ± 0.05 L/min. Calculated values very weakly correlated with IC-derived measurements with none of the equations reaching an $R^2 > 0.5$ with the exception of the Swinamer equation (R^2 0.51) Formulas that are widely used in daily ICU practice such as the Harris Benedict 1984, Faisy–Fagon and ESICM '98 statement equations reached R^2 values of respectively 0.44, 0.49, and 0.41. Under-as well as overestimations occurred.

CONCLUSIONS. In critically ill adult patients, measured resting energy expenditure poorly correlated with calculated values, regardless what formula was used. Our findings underscore the important role of IC to adequately estimate energy requirements in this particular frail population.

0741

DO PATIENTS RECEIVE A HYPER CALORIFIC DIET WHEN NON NUTRITIONAL MEANS ARE INCLUDED

M. Topping[1], E. O'Neil[1], M. Carpenter[1]

[1]Sunderland City Hospital Foundation Trust, ICCU, Sunderland, UK

INTRODUCTION. In our ICU, all patients' nutritional requirements are individually calculated, by a dietician using the Henry Equation[1], which are provided via enteral/parenteral (EN/PN) feeding. It is recommended that 35 % of calories be delivered by lipids[2]. Hyper calorific diets are shown to prolong artificial ventilation by increasing CO_2 production[3]. They also cause metabolic abnormalities, such as increased incidence of non alcoholic fatty liver disease[3]. Following sedation policy changes (benzodiazepines to propofol) we audited the calorie intake by nutritional (EN/PN) and non-nutritional (drugs and IV fluids) means, and the proportion of calories delivered by lipids.

OBJECTIVES. To establish if patients are receiving a hyper-calorific diet. To establish the proportion of calories from lipids and compare to the guidance[2].

METHODS. We prospectively studied all patients receiving level 2/3 care, who were EN/PN fed over a 3 week period in a general UK ICU. The amount of calories and percentage lipids delivered from feed, IV Propofol and IV Dextrose were calculated. This and the percentage of calories via lipids were compared to their calculated requirements.

RESULTS. 13 patients were studied for 88 bed days, of which 18 were level 2, 70 level 3 (18 tracheostomy, 52 intubated). Mean excess calories for level 2, and tracheostomy level 3 patients were 0.2 and 4.6 kcal per day. Percentage calories via lipids were 34.5 and 35 % respectively. Level 3 patients without tracheostomy had mean excess calorie intake of 294 kcal per day (range 0–904 kcal), and calories via lipids of 45 % (range 36–58 %) showing them to be most at risk of a hyper calorific and hyper lipid diet. 88 % of these were admitted with sepsis. Dextrose provided no more than 50 kcal each day and therefore does not contribute as much as propofol to the increased calorie intake.

CONCLUSIONS. This increased calorie intake and high lipid levels may cause complications as discussed above. Evidence shows impaired phagocytosis and neutrophil activity[1] important factors when considering that most patients were admitted with sepsis. The reduction of propofol usage would be beneficial however to ensure patients tolerate their ET tube this can be impractical. Reducing the EN feed would reduce the calories and lipids but would leave the patients protein deficient. Use of a high protein feed would allow the EN feed to be decreased while still maintaining a nutritionally complete diet.

REFERENCE(S). 1. Henry CJ. Basal metabolic rate studies in humans: measurement and development of new equations. Public Health. 2005; 8(7A): 1133–1152. 2. Dietary composition. Department of Health. Dietary reference values for food, energy and nutrients for the UK. 1991. 3. Klein CJ, Stanek GS, WILES CE. Overfeeding macronutrients to critically ill adults: metabolic complications. J Am Diet Assoc. 1998; 98: 795–806.

GRANT ACKNOWLEDGMENT. Sunderland ICU.

0742

INDIRECT CALORIMETRY VERSUS ESTABLISHED FORMULAS FOR EVALUATION OF ENERGY EXPENDITURE IN ELDERLY CRITICALLY ILL PATIENTS

D. Bläser[1], G. Elke[1], M. Kott[1], I. Frerichs[1], N. Weiler[1]

[1]University Medical Center Schleswig–Holstein, Campus Kiel, Department of Anesthesiology and Intensive Care Medicine, Kiel, Germany

INTRODUCTION. Up to now indirect calorimetry is not commonly used in daily clinical routine and data about energy expenditure (EE) especially in elderly critically ill patients are rare.

OBJECTIVES. The aim of our study was to compare EE determined by indirect calorimetry with EE estimated by the simplified (25 kcal kg^{-1} per day), Harris–Benedict and Faisy–Fagon formulas.

METHODS. This was a prospective observational study in postsurgical elderly patients (age > 75 years) admitted to our multidisciplinary intensive care units. This study was approved by our ethics committee and the need for informed consent was waived as collected data were part of clinical routine. All patients were mechanically ventilated in a pressure-controlled mode with a fraction of inspired oxygen of 0.4 ± 0.1. Sedation was maintained by a continuous infusion of propofol (4–8 mg kg^{-1} h^{-1}) and sufentanil (10–20 μg h^{-1}) achieving a sedation level 8 ± 2 according to Richmond Agitation Sedation Scale. EE measurement was established by indirect calorimetry (M-COVX, Datex Ohmeda, Helsinki, Finland) once within day 2 ± 2 after implementation of mechanical ventilation. Less than 10 % variation of metabolic gas exchange was arbitrarily defined as a stable metabolic equilibrium. EE was also calculated using the simplified formula (25 kcal kg^{-1} per day), the Harris-Benedict (including activity and trauma factors) and the Faisy-Fagon equation. Data are presented as mean values ± standard deviation. Statistical evaluation of the data was performed using the Bland–Altman analysis (GraphPad Prism version 5.01, GraphPad Software, Inc., La Jolla, CA, USA).

RESULTS. To date we evaluated a total of 57 patients (30 men, 27 women, age 80 ± 5 years, body mass index 27 ± 5 kg m^{-2}). At the time of examination the arterial partial pressures of oxygen and carbon dioxide were 116 ± 39 and 45 ± 9 mmHg, respectively. Respiratory quotient and EE measured by indirect calorimetry were 0.76 ± 0.1 and 1,634 ± 506 kcal/day, respectively. EE estimated by the simplified formula, the Harris–Benedict and the Faisy–Fagon equations were 1,890 ± 450, 1,978 ± 381 and 1,826 ± 296 kcal/day, respectively.

CONCLUSIONS. Our preliminary data revealed a systematic overestimation of EE assessed by established predictive equations as compared to indirect calorimetry in elderly postsurgical critically ill patients.

0743

INCIDENCE OF MALNOURISHMENT IN THE INTENSIVE CARE SETTING: RESULTS FROM THE PARIS STUDY: A ONE-DAY PREVALENCE MULTICENTER OBSERVATIONAL STUDY

J.H. Militão[1], A. Pontes-Arruda[1], V.D.A. do Ceará[1], H. Monte-Coelho Neto[1], A.P. Lima[1], A.P. Magalhães-Júnior[1], D. Guimarães[1], H.P. Moreira[1], F.E. Mendonça-Neto[1], B. Furtado-Lima[1], L.G. de Castro[1], M.F. Colares[2], M. Martins[2], I.S. Bonfim[3]

[1]Christus University Center, School of Medicine, Fortaleza, Brazil, [2]Hospital Fernandes Távora, Fortaleza, Brazil, [3]Hospital Regional do Cariri, Juazeiro do Norte, Brazil

INTRODUCTION. Malnutrition is a debilitating and highly prevalent condition in the acute hospital setting, with international studies reporting rates of approximately 40 %. Malnutrition is associated with many adverse outcomes including depression of the immune system, impaired wound healing, muscle wasting, longer lengths of hospital stay, higher treatment costs and increased mortality. Referral rates for dietetic assessment and treatment of malnourished patients have proven to be suboptimal, thereby increasing the likelihood of developing such aforementioned complications. Nutrition risk screening using a validated tool is a simple technique to rapidly identify patients at risk of malnutrition, and provides a basis for prompt dietetic referrals.

OBJECTIVES. To conduct a multicenter one-day prevalence study in Brazilian ICU's to evaluate the incidence of malnourishment in the Brazilian Intensive Care Units in accordance with the Subjective Global Assessment.

METHODS. After institutional review board approval was obtained data from all ICU patients in 30 ICU's in 15 Brazilian hospitals were collected during a single day in April 2012. All relevant parameters were collected in loco using patients' original medical records. Each patient was evaluated by a trained professional who fulfill the subjective global assessment form with the available data and also by conducting interviews when necessary. Predicted body weigh was calculated in loco using a standard and validated equation. Categorical variables were compared between the two groups using the χ^2 test or Fisher's exact test as appropriate. Quantitative normally distributed variables between the groups were compared using an unpaired two-sample *t*-test. For quantitative non-normally distributed data, the nonparametric Wilcoxon rank-sum test was used. Normality was assessed by using the Shapiro–Wilk test.
RESULTS. Data from 207 patients were collected, out of which 35.3 % of them (n = 73) were considered adequately nourished, 38.6 % moderately malnourished (n = 80), and 26.1 % severely malnourished (n = 54). The three populations were considered well balanced in terms of their baseline characteristics and also severity scores.
CONCLUSIONS. After an extensive and in loco audit procedure the incidence if hospital malnourishment was considered extremely high with over 60 % of the evaluated patients being considered either moderately or severely malnourished. Due to the clear association of weigh loss, malnourishment and worse outcomes, more attention should be taken to perform an adequate nutrition evaluation and implement adequate nutrition support for patients being treated in the intensive care setting.

0744
EVALUATION ABOUT THE EFFICACY OF MANAGEMENT OF FECAL EVACUATION IN CRITICALLY ILL PATIENTS RECEIVING EARLY ENTERAL NUTRITION

H. Tatsumi[1], Y. Masuda[1], H. Imaizumi[1], S. Yoshida[1], E. Sakawaki[1], K. Goto[1], S. Kazuma[1], K. Takahashi[1], M. Yamakage[1]

[1]Sapporo Medical University, Department of Intensive Care Medicine, Sapporo, Japan
INTRODUCTION. Although the importance of early enteral nutrition has been recognized, constipation and/or diarrhea may disturb early enteral feeding in critically ill patients. Especially, continuation of watery diarrhea may cause dehydration, electrolyte disturbances and dermatopathy around the anus, and force to cancellation of the enteral nutrition. In Nutritional guidelines, however, management of fecal evacuation has not been discussed enough.
OBJECTIVES. We developed a protocol for management of fecal evacuation depending on feces volume only. We also evaluated the efficacy of this protocol in critically ill patients receiving early enteral nutrition.
METHODS. 53 critically ill patients who received enteral feeding for a period of 7 days in the intensive care unit of our hospital during the past 3 years were included in this study. Pediatric patients under 18 years old and patients who had the artificial anuses were excluded. Patients were divided in a pre-protocol group (n = 24) and a post-protocol group (n = 29). Enteral nutrition was started at 20–25 mL/h as soon as possible after the admission to ICU, and gradually increased by 200–250 mL/day to reach the nutritional target on the 7th day. The nutrition target was set in 25 kcal/kg of ideal body weight. Daily volume of feces was measured for 7 days from the initiation of enteral feeding, and was retrospectively compared between two groups. The protocol for fecal management was a flow chart form, which decides the continuation of mild cathartics and the necessity of measures and inspections depending on feces volume only. Diarrhea and constipation were defined as more than 300 g/day of feces and no evacuation for 48 h, respectively. The change in daily amount of feces and the frequencies of diarrhea and constipation for 7 days were examined.
RESULTS. Daily volume of feces in the post-protocol group was significantly decreased compared with that in the pre-protocol group on ICU day 5 and 7 (p = 0.018 and p = 0.018, respectively), and the interaction between use of the protocol and time was statistically significant (two way ANOVA; p = 0.0011). Mean volume of daily feces was 218 ± 21 g in the post-protocol group, fewer than that in the pre-protocol group (297 ± 53 g, not significantly). Frequency of diarrhea showed no significant difference between the two groups. Frequency of constipation and frequency of both diarrhea and constipation in the post-protocol group were significantly lower than those in the pre-protocol group (1.5 ± 0.3 vs 0.7 ± 0.2 days and 4.0 ± 0.3 vs 2.6 ± 0.3 days, respectively).
CONCLUSIONS. We introduced a protocol for management of defecation using daily fecal volume. This protocol decreased fecal volume and incidence of diarrhea and constipation in critically ill patients. Appropriate management of evacuation of feces using this protocol may facilitate enteral nutrition, resulting in improvement of prognosis in critically ill patients.

0745
AUDIT EVALUATING THE ADEQUACY OF ENTERAL TUBE NUTRITION WITH RESPECT TO ENERGY AND PROTEIN REQUIREMENTS IN THE GENERAL ADULT INTENSIVE CARE UNIT

M.J. Abu-Asi[1], S.R. Strachan[1]

[1]King's College Hospital NHS Foundation Trust, Anaesthetics & Critical Care, London, UK
INTRODUCTION. Inadequate nutrition in the critically ill results in increased rates of complications, delayed recovery and thus prolonged lengths of stay with increased costs (1). Studies have stratified risk according to cumulative energy balance but recent research suggests protein content of enteral feed may also influence patient outcome (2).
OBJECTIVES. To evaluate the adequacy of enteral tube nutrition with respect to energy and protein balances in the ICU, auditing against local and ESPEN guidelines (3).
METHODS. Data was collected from 1st September to 30th October 2012. All ICU patients were screened. If a patient was receiving only enteral feed for more than 3 days by the NG or NJ route, data were captured. 23 patients were identified. The number of audit days per patient on average was 14 days (range 5–44 days).
RESULTS. Correct enteral feeding dose of (25 kcal/body weight/day) was prescribed for 100 % patients. Administered enteral feed volumes were documented for 100 % patients. 74 % patients were identified as at risk of poor nutritional state due to underlying medical or surgical problems. Despite adequate prescription our patients accumulated a negative energy balance; 39 % patients received less than 60 % calories prescribed (Graph 1).
Our guidelines at the time of the audit did not recommend higher protein targets for any groups of patients. Negative protein balance was revealed (Graph 2). 26 % patients were identified as recommended to receive a higher protein target e.g. trauma, bariatric or hemofiltration patients (3).

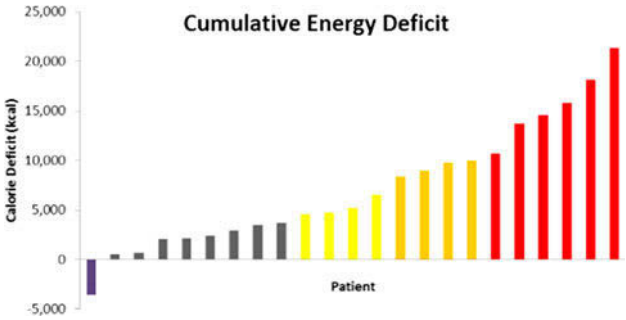


Fig. 1 Cumulative energy deficit

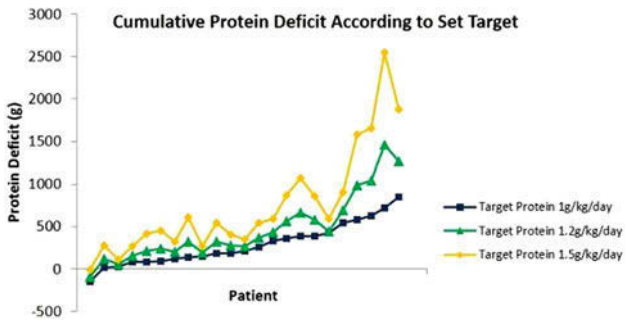


Fig. 2 Cumulative protein deficit according to set target

DISCUSSION. The characteristics of an ideal feed would be to meet both the energy and protein requirements for patients. These requirements will alter dependent on the nature and phase of the critical illness, as well as necessary supportive treatments. Currently our standard feed, if delivered according to energy requirements, will provide 1 g/kg/day protein. A negative energy balance will furthermore negatively impact on protein balance.
CONCLUSIONS. Protein is seldom considered when prescribing enteral feed. In order to adequately nutritionally support critically ill patients energy and protein requirements must be considered and daily balances calculated. Newer nutritional products on the market may help to reduce the difference between the desired and actual quantities of nutrients delivered.
REFERENCE(S). 1. Thibault R, Pichard C. Nutrition and clinical outcome in intensive care patients. Curr Opin Clin Nutr Metab Care. 2010; 13: 177–83. 2. Allingstrup et al. Provision of protein and energy in relation to measured requirements in intensive care patients Clin Nutr. 2012; 31: 462–8. 3. Kreymann KG et al. ESPEN guidelines on Enteral Nutrition. Int Care Clin Nutr 25: 210–223.

0746
THE CORRELATION OF DAILY CALORIC INTAKE, ROUTE OF NUTRITION SUPPLEMENT AND OUTCOMES OF CRITICALLY ILL MEDICAL PATIENTS

S. Tongyoo[1], C. Permpikul[1]

[1]Mahidol University, Medicine, Bangkok, Thailand
INTRODUCTION. Energy requirement are generally increased among critically ill patients due to a state of hypermetabolism, however, the instability of patients' hemodynamic and organs dysfunction usually compromise the patients' ability to receive adequate caloric intake. Nutritional support guidelines have been developed to prevent malnutrition associated with poor outcomes.
OBJECTIVES. To identify the nutritional supplement factors, including route of nutrition administration, total caloric intake, the percentages of target caloric intake according to European Society for Clinical Nutrition and Metabolism (ESPEN) guideline recommendations, which determine the ICU outcome.
METHODS. A prospective cohort study included the medical critically ill patients, admitted in a 16-bed ICU of Siriraj hospital, a University hospital in Bangkok, Thailand, during August 2011–October 2012. The information including baseline characteristic, underlying condition, reason for ICU admission, treatment modalities, total caloric intake and route of administration were recorded. The uni-variated and multi-variated analysis was performed to identify the factor associated with the 30 days mortality.
RESULTS. A total of 100 medical critically ill patients were enrolled, 46 patients died in 30 days. The non-survivors had higher APACHE II score (24.5 ± 10.2 vs 19.2 + 8.5, P = 0.008), lower hemoglobin level (7.6 ± 2.6 vs 10.7 ± 0.8 g/dL, P = 0.05) and serum albumin (2.6 ± 0.6 vs 3.0 ± 0.7 g/dL, P = 0.005), higher proportion of atrial fibrillation (19.6 vs 6.6 %, P = 0.06) and proportion of acute respiratory distress syndrome diagnosis (28.3 vs 7.4 %, P = 0.007) than the survivors. During ICU admission, the non-survivors received norepinephrine in higher proportion (89.1 vs 63 %, P = 0.003). According to the ESPEN guideline, the average daily caloric intake in the 1st week was lower among the non-survival group (68.6 ± 34.1 vs 82.0 ± 30.4 %, P = 0.04) while the proportion of the patients who received the parenteral nutrition >50 % of caloric intake was higher among the non-survival group (37 vs 13.5 %, P = 0.009). From the multi-variated analysis, the factors that associated with 30 days mortality were atrial fibrillation (Odds ratio 6.1, 95 % CI 0.9–29.4, P = 0.07), receiving norepinephrine (Odds ratio 3.5, 95 % CI 0.8–14.2, P = 0.09) and receiving parenteral nutrition >50 % (Odds ratio 3.4, 95 % CI 0.9–13.0, P = 0.07).
CONCLUSIONS. The total caloric intake may not be the only factor determining the ICU outcomes. The parenteral nutrition administration during the 1st week of critically illness might associate with poor prognosis.
REFERENCE(S). 1. Giner M, Laviano A, Meguid MM, Gleason JR. A correlation between malnutrition and poor outcomes in critically ill patients still exists. Nutrition. 1996; 12: 23–9. 2. Lochs H, Allison SP, Meier R, et al. Introductory to the ESPEN guidelines on enteral nutrition : Intensive care. Clin Nutr. 2006; 25: 210–223.
GRANT ACKNOWLEDGMENT. Siriraj Hospital. Mahidol University.

0747
SEQUENTIAL AUDIT OF ARTIFICIAL NUTRITION PERFORMANCE OVER A 3 YEAR PERIOD IN A UK GENERAL INTENSIVE CARE UNIT

E. O'Neill[1], E. Emmerson[1], P. McAndrew[1], M. Carpenter[1]

[1]City Hospitals Sunderland NHS Foundation Trust, Integrated Critical Care Unit, Sunderland, UK

INTRODUCTION. The importance of nutrition within the Intensive Care Unit (ICU) is supported by UK and international recommendations (1). Previous work has shown variable delivery of prescribed calories for a number of reasons, with delivery of between 49 and 79 % of prescribed calories reported. We present sequential audit results over a 36 month period in a general UK intensive care unit.

OBJECTIVES. To determine the percentage of prescribed artificial nutrition (AN) patients on an 18-bedded integrated (level 2 and 3) critical care unit received, identify barriers to, and devise strategies to improve the provision of AN. Our initial target was greater than 75 % of feeding achieved, raised to >90 % in 2010.

METHODS. A sequential, monthly audit of feeding performance over a 36 month period (April 2009–March 2012) was performed, with the percentage of the prescribed AN received recorded daily for all patients requiring AN for >24 h. Reasons for deviation from the feeding regime, for stopping feeding, and for reduction in delivered calories were recorded and discussed monthly at a multidisciplinary meeting.

RESULTS. Percentages of calories received versus prescribed calories were calculated in 319 patients over the 36 month period (Fig. 1).

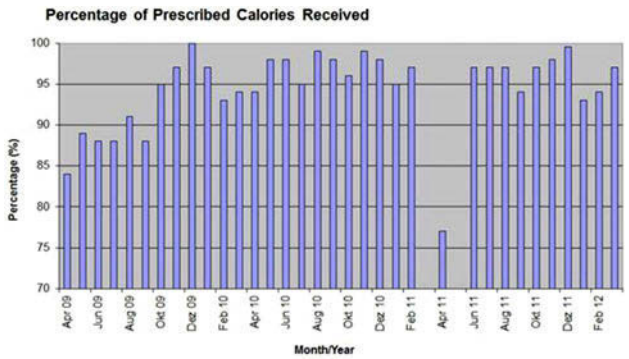


Fig. 1 Percentage of prescribed calories received

Calories received increased from 80 % in 2009 to > 90 % throughout late 2011. During March–May 2011 there was no full-time dietetic input into critical care. Results collected retrospectively for April 2011 show a marked reduction in performance. Following multidisciplinary team meetings the following changes have been introduced (May 2009–April 2010): • Reduction in starvation times for procedures (e.g. transfer to CT scan)

• Stopping the practise of reducing AN to encourage oral nutrition

• Increasing the importance of changes to nutrition: all nutrition decisions to be made by dietician or consultant Intensivists

• Increasing the residual volume allowable before reduction in feeding rate (300–500 ml)

• Changes to promotility agent protocol (72 h only then trial of post-pyloric feeding)

CONCLUSIONS. The presence of full-time dietetic input coupled with sequential audit of feeding performance, multidisciplinary team discussion and changes to feeding policies, can improve feeding performance over a 3 year period in a UK critical care unit

REFERENCE(S). 1. Canadian Clinical Practise Guidelines. http://www.criticalcarenutrition.com/ Accessed 10.04.2013. 2. Alberda C et al. The relationship between nutritional intake and clinical outcomes in critically ill patients: results of an international multicentre observational study. Int Care Med. 2009; 35: 1728–37.

0748
THE IMPORTANCE OF BODY WEIGHT MEASUREMENT IN CRITICAL CARE

N. Gavin[1], E. Clarke[1], S. Strachan[1]

[1]King's College Hospital, ICM, London, UK

INTRODUCTION. Incorrect nutritional support in critical care has deleterious consequences including sepsis, increased mortality and prolonged lengths of stay[1–2]. The gold standard for determining correct energy requirements in ICU is indirect calorimetry which is often unavailable. Pragmatic simplistic formulas and predictive equations use body weight to calculate energy requirements[3]. Thus, the accuracy of enteral nutrition prescriptions and subsequent calculations (e.g. calorie deficit) using these depends on the accuracy of the weight used.

OBJECTIVES. Review the difference in calculated cumulative energy balance by considering actual, estimated and ideal body weights and consider the potential impact this may have for interpreting research in this field.

METHODS. Data was collected on 23 consecutive ICU patients fed solely via the nasogastric or naso-jejunal route for 3 or more days. Body weight measurements were recorded as estimated (EBW), actual (ABW) and ideal (IBW). Nutrition was prescribed at 25 kcal/kg (ABW or EBW)/day. Calorie balances (difference between prescribed and delivered nutrition) were calculated and subsequently recalculated basing energy requirements on IBW.

RESULTS. Enteral nutrition requirements were always weight-based using EBW in 87 % patients. ABW was later realised in 11 of these patients and in 6 patients the EBW used to calculate energy requirements was inaccurate (±5 %). EBW was on average a 7 % over-estimate of ABW, although this was not statistically significant ($p = 0.075$).

When the cumulative calorie balance was calculated the majority of patients accrued a calorie deficit. When this data was modelled according to IBW the magnitude and sometimes the sign of this deficit was altered (Fig. 1).

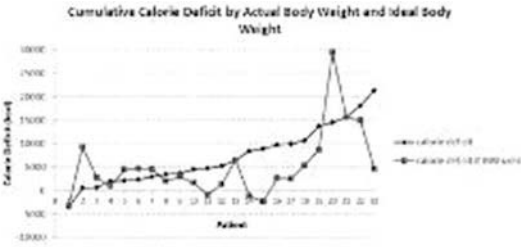


Fig. 1 Cumulative calorie deficit by actual body weight and ideal body weight

DISCUSSION. When considering the impact of this phenomenon, researchers have stratified risk according to caloric deficit[4–5]. However, mortality rates for our patients altered depending on whether cumulative calorie deficit was calculated using ABW/EBW or IBW (Fig. 2).

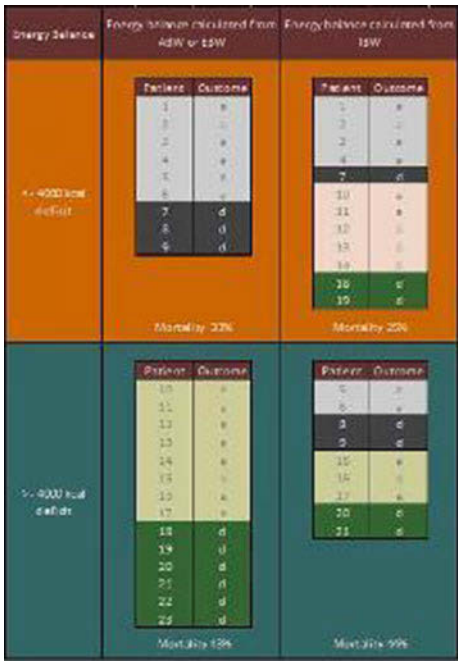


Fig. 2

CONCLUSION. ABW is rarely measured in critical care and EBW is notoriously inaccurate. In contrast, IBW (calculated from height) is fixed. The use of IBW in determining patient energy requirements has been recommended but requires incorporation into European nutrition guidelines[6]. Adopting this convention may improve the adequacy of ICU nutrition when indirect calorimetry is unavailable. Standardising body weight used in research and practice is crucial to allow correct interpretation and extrapolation of data from studies reporting patient outcome in association with nutrition practice.

REFERENCE(S). 1. Alberda. Int Care Med. 2009; 35: 1728–37. 2. Villet. Clin Nutr. 2005; 24: 502–9. 3. Kreymann. Int Care Clin Nutr. 2008; 25: 210–23. 4. Dvir. Clin Nutr. 2006; 25: 37–44. 5. Bartlett. Surgery. 1982; 92: 771–9. 6. Berger, Pichard. Crit Care. 2012; 16: 215.

0749
THE EFFECT OF BASELINE NUTRITIONAL STATUS TO THE ICU OUTCOMES

T. Surat[1], P. Promsin[1], C. Permpikul[1]

[1]Siriraj Hospital, Mahidol University, Bangkok, Thailand

INTRODUCTION. Malnutrition is one of the most common problems in critically ill patients and associated with poor outcomes. There are many tools to evaluate nutritional status, but most of them are complicated to use. Subjective Global Assessment (SGA) is one of the simple and effective tools. The previous studies showed the correlation between nutritional status evaluated by SGA and mortality rate. But there is still no data concerning this issue in critically ill patient in Thailand.

OBJECTIVES. This study was aimed to evaluate the association between pre-hospital nutritional status measured by SGA and mortality rate during medical ICU admission.

METHODS. Prospective observational study, operated during Oct 2012–Dec 2012. Patients whom admitted to medical ICU, Siriraj Hospital, Thailand were enrolled. The Subjective Global Assessment (SGA) was used to interview the patient' relatives or care givers and the patients were divided into well nourished, moderate nourished and malnourished group. The information including baseline characteristics, APACHE II score, ICU admission diagnosis, initial laboratory investigation, hospital course during ICU admission and mortality rate were collected and analyzed.

RESULTS. A total of 34 patients were enrolled, 18 patients were in well nutritional status group and 15 patients were in moderate malnourished group. None of them were in severely malnourished group. Baseline characteristics, APACHE II score, underlying conditions and ICU admission diagnosis were similar between groups. The leading cause of ICU admission was septic shock (63.7 %), following with congestive heart failure (16.7 %) and acute renal failure, requiring renal replacement therapy (6.3 %). The moderate malnutrition patients had lower baseline mean hemoglobin level (9.2 ± 1.5 vs 11.1 ± 3.5 g/dL, $P = 0.06$) and mean

serum albumin level (2.4 ± 0.3 vs 2.8 ± 0.7 g/dL, P = 0.05) than the well nutritional status group. During ICU admission, both groups received hemodynamic support, including fluid resuscitation and vasopressors administration, renal replacement therapy in the same proportion, however, the malnourished group required ventilator support for longer duration (14.5 ± 11.4 vs 6.8 ± 5.6 days, P = 0.02). Comparing with the normal nutrition status patient, the moderate malnutrition, assessed by SGA, associated with higher ICU mortality (61.1 vs 38.9 %, P = 0.048) and ventilator associated pneumonia (46.7 vs 16.7 %, P = 0.06).

Table 1 Patients' outcome

Outcome	Normal nutritional status (n = 18)	Moderate malnutrition (n = 15)	P value
ICU mortality	31.9	61.1	0.048
30 day mortality	44.4	73.3	0.095
Ventilator associated pneumonia	16.7	46.7	0.06
Catheter related blood stream infection	11.1	6.7	0.66

CONCLUSIONS. Among the medical critically ill patients, pre-hospitalized malnutritional status, evaluated by SGA, is a predictive factor for ICU mortality. Treatment strategy, aiming to improve patient's nutritional status early after admission, might improve the patient's outcome.

REFERENCES. 1. Sacks GS, Dearman K, Replogle WH, et al. Use of subjective global assessment to identify nutrition-associated complications and death in geriatric long-term care facility residents. J Am Coll Nutr. 2000; 19: 570–7.

GRANT ACKNOWLEDGMENT. Siriraj Hospital.

Weaning: a perfect recipe?: 0750–0762

0750

TIME COURSE OF ELECTRICAL ACTIVITY OF THE DIAPHRAGM (EADI) IN THE POST-EXTUBATION PERIOD IN DIFFICULT TO WEAN PATIENTS: EXTUBATION SUCCESS AND FAILURE

T. Maraffi[1,2], F.J. Parrilla[1], S. Italiano[1], H. Aguirre-Bermeo[1], F. Roche-Campo[1], J. Mancebo[1]

[1]Hospital de la Santa Creu i Sant Pau, Intensive Care Unit, Barcelona, Spain, [2]Università degli Studi di Milano, Dipartimento di Fisiopatologia Medico-Chirurgica e dei Trapianti, Milano, Italy

INTRODUCTION. Mechanically ventilated patients who successfully tolerate a weaning trial (WT) are subsequently extubated; however, 20 % of these patients will go on to develop extubation failure (1). The pathophysiology of extubation failure has been poorly studied.

OBJECTIVES. To continuously monitor EAdi—a surrogate measure of respiratory muscle effort—from the initial WT up to 48 h after extubation.

METHODS. We prospectively enrolled patients with difficult weaning (2) and inserted a neurally-adjusted ventilatory assist (NAVA) catheter for EAdi monitoring. The attending clinician was responsible for deciding when to initiate a standardized weaning trial (pressure support of 7 and 0 cmH_2O of PEEP) based on individualized clinical criteria. We continuously recorded the EAdi peak value starting 1 h before the successful WT until patient discharge (for a maximum of 48 h) or until reintubation, whichever occurred first. We divided the EAdi recording in six different phases (see Table 1) for analysis and obtained a mean EAdi peak for all six phases in each patient. Continuous variables were compared with the Wilcoxon test and results are presented as medians with the interquartile range (IQR).

RESULTS. We enrolled 18 patients; of these, 4 (22 %) were reintubated within 48 h of extubation. The median age was 72 years (IQR 60–77), median SAPS III was 61 points (IQR 54–77), and median duration of mechanical ventilation was 10 days (IQR 7–12). The mean EAdi peaks in each phase for the individual patients are presented in Fig. 1.

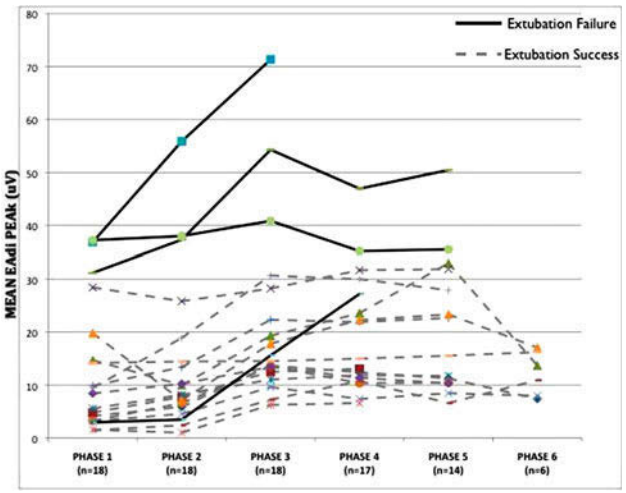


Fig. 1 Mean EAdi peak for each individual patient

We observed a significant increase in the EAdi peak between the weaning trial and the first hour after extubation in all patients (9 [5–21] uV vs 15 [12–28] respectively, p < 0.05). In the 14 successfully extubated patients, the EAdi peak increased significantly between the weaning trial and 1 h post-extubation (p < 0.05) and remained stable in the post-extubation period (Table 1).

Table 1 EAdi peak in extubation success pts

PHASE (n of patients)	EAdi peak in uV median (IQR)
60 min before WT–phase 1 (n = 14)	7 (3–14)
Weaning trial–phase 2 (n = 14)	8 (5–14)
1st hour post extubation–phase 3 (n = 14)	14 (11–20)
3rd hour post extubation–phase 4 (n = 14)	13 (11–23)
24th hour post extubation–phase 5 (n = 12)	14 (10–27)
48th hour post extubation–phase 6 (n = 6)	12 (8–16)

Among the four extubation failure patients, three had severe COPD with a significantly higher EAdi peak during the weaning trial compared to non-reintubated patients (38 [37–56] uV vs 8 [5–14] respectively, p < 0.05). The other reintubated patient, a neurosurgical admission, showed a low mean EAdi peak during the weaning trial (3 uV) which increased progressively without stabilizing after extubation in the context of impaired cough.

CONCLUSIONS. The EAdi significantly increases between a standardized weaning trial and the post-extubation period, reaching a plateau shortly after successful extubation. EAdi values were already high (>30 uV) during the clinically well-tolerated weaning trial in three out of the four extubation failures.

REFERENCE(S). 1. Epstein SK. Extubation failure: an outcome to be avoided. Crit Care. 2004; 8(5): 310–2. 2. Boles J-M, Bion J, Connors A, et al. Weaning from mechanical ventilation. Eur Respir J. 2007; 29(5): 1033–1056

GRANT ACKNOWLEDGMENT. Maquet Sweden provided all the NAVA catheters for this study free of charge.

0751

THE EFFECT OF THEOPHYLLINE ON DIAPHRAGM DYSFUNCTION IN WEANING FROM MECHANICAL VENTILATION

S.H. Park[1], J.W. Huh[1], S.-B. Hong[1], Y. Koh[1], C.-M. Lim[1]

[1]University of Ulsan College of Medicine/Asan Medical Center, Department of Pulmonary and Critical Care Medicine, Seoul, Korea, Republic of

INTRODUCTION. Diaphragmatic dysfunction is one of the main causes of difficulty weaning. In a recent study, diaphragm dysfunction was known to occur up to 30 % in patients in medical ICU. In previous studies theophylline was shown to improve diaphragm contractility. However, it is not known yet whether theophylline would improve weaning outcome in patients with diaphragm dysfunction.

OBJECTIVES. The purpose of this study is to investigated the effect of theophylline on diaphragm function, weaning success rate, and weaning time.

METHODS. Study subjects were those who were mechanically ventilated 72 h or longer and were diagnosed with diaphragm dysfunction by M-mode ultrasonography during spontaneous breathing trial (excursion of one of the hemi diaphragms <10 mm). Theophylline group received theophylline 200 mg bid, while control group did not receive the drug. Clinical characteristics and outcomes related with weaning were retrospectively collected.

RESULTS. During July 2010 to Sept 2012 39 patients were diagnosed with diaphragm dysfunction. 20 patients were theophylline group, and 19 were control group. Clinical characteristics including age, APACHE II score were not different between the groups. The total excursion of diaphragmatic excursion of both hemi diaphragms were not different on day 1 of weaning trial (13.0 ± 6.9 mm in theophylline group, 13.5 ± 6.9 mm, in control group: p = 0.692). On day 3 of weaning trial, total diaphragmatic excursion was greater in theophylline group compared with the control group (20.1 ± 7.8 mm vs. 14.8 ± 7.8 mm, respectively: p = 0.0024). The increase in diaphragm excursion was significantly different on dysfunctional diaphragm (6.7 ± 8.0 vs. 1.1 ± 5.0, respectively, p = 0.003), but not in normal diaphragm (−0.8 ± 3.0, vs. −1.3 ± 1.5, respectively, p = 0.43). Rate of successful weaning tended to be higher in theophylline group (80 % [16/20] vs. 68 % [13/19], respectively, p = 0.48).

CONCLUSIONS. Theophylline improved diaphragm contractility in patients with diaphragm dysfunction and showed a tendency to reduce the mechanical ventilator time.

REFERENCE(S). 1. Kim WY, et al. Diaphragm dysfunction assessed by ultrasonography: influence on weaning from mechanical ventilation. Crit Care Med. 2011; 39(12): 2627–30. 2. Aubier M, et al. Aminophylline improves diaphragmatic contractility. N Engl J Med. 1981; 305(5): 249–52. 3. McConville JF, JP Kress. Weaning patients from the ventilator. N Engl J Med. 2012; 367(23): 2233–9.

0752

RELATIONSHIP BETWEEN PEAK AND INTEGRAL OF THE INSPIRATORY ELECTROMYOGRAPHIC ACTIVITY OF THE DIAPHRAGM: INSIGHT FOR A NEW WEANING PREDICTOR

S. Muttini[1], P.G. Villani[2], R. Trimarco[1], G. Gallioli[1], S. Magni[1], G. Grasselli[3], N. Patroniti[3,4]

[1]Ospedale Civile of Vimercate, Department of Emergency Medicine and Intensive Care, Vimercate, Italy, [2]Ospedale Maggiore, Crema, Italy, [3]San Gerardo Hospital, Monza, Italy, [4]University of Milano-Bicocca, Monza, Italy

INTRODUCTION. We reasoned that in presence of an imbalance between ventilatory workload and respiratory muscle efficiency the relationship between peak ($EAdi_{peak}$) and area under the curve ($EAdi_{AUC}$) of diaphragm electrical activity becomes non-linear and their ratio ($EAdi_{peak}/EAdi_{AUC}$, called P/I index) tends to increase due to the uncoupling between respiratory drive and diaphragm efficiency.

OBJECTIVE. To investigate the relationship between $EAdi_{peak}$ and $EAdi_{AUC}$ and to evaluate the validity of P/I index as weaning predictor.

METHODS. Prospective physiological study on 18 ready to wean patients ventilated with Neurally Adjusted Ventilatory Assist (NAVA) undergoing to two decreasing levels of NAVA ($NAVA_{100\ \%}$ and $NAVA_{50\ \%}$) followed by a weaning trial with continuous positive airway pressure (CPAP) according to which patients were classified as success or failure. Tidal volume (V_T), respiratory rate (RR), $EAdi_{peak}$, $EAdi_{AUC}$, rapid shallow breathing index (RR/V_T), neuroventilatory index ($V_T/EAdi_{peak}$), and P/I index were obtained at the end of each step.

RESULTS. Slope of regression line between $EAdi_{peak}$ and $EAdi_{AUC}$ (a mathematical equivalent of P/I index) and P/I index ware significantly higher in failures. Pooling all support levels of a same group, linear regression equation was $EAdi_{peak} = -3.464 + EAdi_{AUC} \times 4.163$ ($R = 0.973$, $p < 0.001$) for the failure group and $EAdi_{peak} = -2.715 + EAdi_{AUC} \times 2.531$ ($R = 0.985$, $p < 0.001$) for the success group (Fig. 1). P/I index was 3.3 ± 0.4, 3.3 ± 0.4, and 3.8 ± 0.8 s^{-1} during respectively $NAVA_{100\ \%}$, $NAVA_{50\ \%}$, and CPAP in failures, and 2.3 ± 0.3, 2.1 ± 0.3, 2.2 ± 0.3 s^{-1} during respectively $NAVA_{100\ \%}$, $NAVA_{50\ \%}$, and CPAP in success. At variance with other variables P/I index did not varied with support level. At $NAVA_{100\ \%}$only P/I index demonstrated significant weaning predictability performance. At $NAVA_{50\ \%}$ and CPAP predictive performance of P/I index comparable to that of RR/V_T).

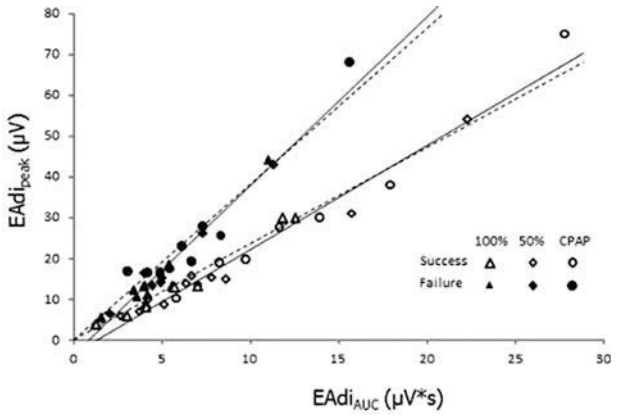


Fig. 1

CONCLUSIONS. Relation between $EAdi_{peak}$ and $EAdi_{AUC}$ and the P/I index give important information on the balance between respiratory drive and inspiratory demand sustainability. P/I index showed independent from the support level and may predict wean ability at clinical support level.

0753
COMPARISON BETWEEN A NEW INTEGRATIVE WEANING INDEX AND THE RAPID SHALLOW BREATHING INDEX AS PREDICTORS OF WEANING FROM MECHANICAL VENTILATION

A.S. Okasha[1], M.M. Megahed[2], M.G. Abousaleh[2]

[1]Alexandria Faculty of Medicine, Department of Anaesthesia and Surgical Intensive Care, Alexandria, Egypt, [2]Alexandria Faculty of Medicine, Department of Critical Care, Alexandria, Egypt

INTRODUCTION. Mechanical ventilation (MV) is associated with numerous complications, and should be discontinued at the earliest possible time in the course of a patient's illness. Weaning decisions based only on clinical expert are not always correct. Premature discontinuation of mechanical ventilation leads to severe cardiovascular and respiratory stresses. While unnecessary delays can lead to increase in the morbidity and mortality besides increase in the ICU stay and cost of the care. Large spectrum of weaning predictors has been studied to assess the readiness of the patient to be weaned from mechanical ventilation (MV).

OBJECTIVES. The aim of this study was to compare between a new integrative weaning index (IWI) and the rapid shallow breathing index (RSBI) as predictors of weaning from MV.

METHODS. This study was conducted on 70 patients admitted to Alexandria Main University Hospital who were mechanically ventilated for at least 24 h and were considered candidates for weaning (judged by the physician in charge). RSBI and IWI were measured in all patients before discontinuing MV according to the following formulas: RSBI = respiratory rate/tidal volume and IWI = static compliance x oxygen saturation/RSBI. Success of weaning was determined by the ability to breath apart from MV for at least 48 h. Patients were divided into two groups: group 1 who failed in trial of weaning and group 2 who succeeded the trial. RSBI and IWI were compared in the two groups to get sensitivity; specificity, positive and negative predictive values (PPV, NPV) and accuracy for both indices and then the receiver operating characteristic (ROC) curves were drawn to calculate area under the curve for both of them.

RESULTS. Success of weaning observed in 55 patient (78.5 %) while 15 patients failed (21.5 %).IWI presented higher sensitivity, specificity, PPV, NPV and accuracy than RSBI. On comparing the ROC curves, the area under the curve (AUC) of IWI (0.934) was higher than the AUC of RSBI (0.878).

CONCLUSIONS. We conclude that the new integrative weaning index has the best predictive performance for weaning of the patients from mechanical ventilation.

0754
DIAPHRAGMATIC THICKNESS AND EFFICIENCY IN ICU PATIENTS UNDER CONTROLLED MECHANICAL VENTILATION

E. Kotco[1], E. Kiourtzieva[1], C. Pazvanti[1], C. Sahpazis[1], E. Soilemezi[1], D. Matamis[1]

[1]Papageorgiou General Hospital, ICU, Thessaloniki, Greece

INTRODUCTION. It has been recently shown that controlled mechanical ventilation (CMV) leads to diaphragmatic inactivity and induces diaphragmatic atrophy and weakness (ventilator induced diaphragmatic dysfunction, VIDD). [1, 2]. This diaphragmatic atrophy can be measured by sonography, which is a non invasive bedside method that allows repetitive measurements of diaphragmatic thickness, thickness ratio and excursion.

OBJECTIVES. To evaluate the degree and rate of diaphragmatic atrophy (decrease in thickness) in ICU patients under CMV, using daily sonographic measurements of diaphragmatic thickness.

METHODS. All ICU patients with the perspective of more than 2 days of CMV were included in the study. Diaphragmatic thickness was daily measured by sonography, using a 10 MHz probe, until extubation, tracheostomy, spontaneous mode of mechanical ventilation or death. Diaphragmatic excursion and thickness ratio were measured in all patients at their first spontaneous breathing trial. Data were analyzed using descriptive statistics and linear regression.

RESULTS. 38 consecutive patients were included in the study, among them 23 were subsequently excluded, due to CMV < 3 days or death. The remaining 15 patients received CMV for 4.2 (min 3, max 8) days. Diaphragmatic thickness on day 0 in the 38 patients initially included in the study was 2.4 ± 0.24 mm. Among the 15 patients remaining in the study, 13 patients significantly decreased their diaphragmatic thickness from 2.6 ± 0.8 to 1.7 ± 0.2 mm ($p < 0.01$). In the two other patients diaphragmatic thickness remained constant (2.3 mm) for 5 days. These last two patients retained spontaneous respiratory activity documented by diaphragmatic echography during the 5 days on MV. Linear regression analysis showed a significant decrease in diaphragmatic thickness by 0.12 mm per day ($r = 0.88$, $p < 0.01$). However, in all 15 patients diaphragmatic excursion and thickness ratio in their first spontaneous breathing trial were within normal limits (1.4 ± 0.5 cm and 0.22 respectively).

CONCLUSIONS. Controlled mechanical ventilation seems to induce diaphragmatic atrophy, as it can be documented by daily diaphragmatic thickness measurements by sonography. As to whether this sonographic atrophy induces diaphragmatic weakness and may impede weaning from mechanical ventilation, it remains to be demonstrated.

REFERENCE(S). 1. Jaber S, Petrof BJ, Jung B et al. Rapidly progressive diaphragmatic weakness and injury during mechanical ventilation in humans. Am J Respir Crit Care Med. 2011; 183: 364–71.

0755
A COMPARISON BETWEEN ADAPTIVE SUPPORT VENTILATION AND PRESSURE SUPPORT VENTILATION IN THE WEANING OF PATIENTS WITH ACUTE EXACERBATION OF COPD

A.M. Fayed[1], M.M. Megahed[1], M.S. El-Bourini[1]

[1]Alexandria Faculty of Medicine, Critical Care Medicine, Alexandria, Egypt

INTRODUCTION: Patients with COPD are frequently hospitalized for acute exacerbations (AECOPD), which may cause respiratory failure and death. [(1)]Adaptive support ventilation (ASV) is a fully automatic system of ventilation,[(2)] where it determines target minute ventilation based on the principle proposed by Otis et al. [(3)] A recent case report, in using ASV in AECOPD patients describes the capacity of ASV to reduce weaning time to less than a week. [(3,4)] Pressure support ventilation (PSV) is an attractive weaning mode, however at higher pressure support levels, many patients displayed expiratory muscle activation indicating that the patient is "fighting the ventilator"[(5)].

OBJECTIVE. Comparing between ASV and PSV in the weaning of AECOPD patients.

METHODS. The study was conducted on 60 patients admitted to the Department of Critical Care Medicine, at the Alexandria Main University Hospital with the diagnosis of AECOPD. Exclusion criteria included those with severe cardiac or neurological disease, those managed by non-invasive ventilation and those on tracheostomy tube. All patients were subjected on admission to complete history taking, complete physical examination and Laboratory investigations and were treated according to guidelines of treatment of AECOPD. [(6)] At the time of weaning patients were randomly divided into two equal groups; group A: patients weaned using ASV and group B: patients weaned using PSV.

RESULTS. The weaning success rate was (93.3 %) in ASV group, and (70 %) in PSV group ($p < 0.042$). ASV was associated with 2 days reduction in the mean days of mechanical ventilation, 2.5 days reduction in the mean days of ICU stay, and 2.8 days reduction in the mean days of hospital stay in comparison to PSV group ($p < 0.001$, for each).

CONCLUSION. ASV was associated with reduction of days of mechanical ventilation, ICU, and hospital stay.

REFERENCE(S). 1. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: executive summary 2011. Global initiative for chronic obstructive lung disease (GOLD). @ http://www.goldcopd.org. 2. Laubscher TP, Heinrichs W, Weiler N, Hartmann G, et al. An adaptive lung ventilation controller. IEEE Trans Biomed Eng. 1994; 41: 51–9. 3. Otis AB, McKerrow CB, Bartlett RA, Mead J, et al. Mechanical factors in distribution of pulmonary ventilation. J Appl Physiol. 1956; 8: 427–43. 4. Linton DM, Potgieter PD, Davis S, Fourie ATJ, et al. Automatic weaning from mechanical ventilation using an adaptive lung ventilation controller. Chest. 1994; 106: 1843–50. 5. Parthasarathy S, Jubran A, Tobin MJ. Cycling of inspiratory and expiratory muscle groups with the ventilator in airflow limitation. Am J Respir Crit Care Med. 1998; 158:1471. 6. Peter B. Bach, Cynthia Brown, Sarah E. Gelfand, Douglas C. McCrory. Management of acute exacerbations of chronic obstructive pulmonary disease: a summary and appraisal of published evidence. Ann Int Med. 2001; 134: 600–20.

0756
FACTORS ASSOCIATED WITH A WEAK COUGH STRENGTH DURING WEANING FROM MECHANICAL VENTILATION

P. Beuret[1], C. Roux[1], F. Farissier[1], J.-C. Chakarian[1], B. Philippon-Jouve[1], X. Fabre[1], M. Kaaki[1]

[1]Centre Hospitalier, Intensive Care Unit, Roanne, France

INTRODUCTION. Several studies have identified the measure of peak cough expiratory flow (PCEF) before extubation as a predictive criterion of extubation outcome.

OBJECTIVES. This retrospective study aimed to identify the factors associated with a weak cough strength before extubation in patients under mechanical ventilation for more than 24 h who passed successfully the spontaneous breathing trial.

METHODS. From 2006, the PCEF was measured with an electronic flowmeter, the Piko-1 (Ferraris Respiratory, Hertford, UK) by the respiratory therapist—if present in the intensive care unit—before extubation for the patients mechanically ventilated for more than 24 h and who passed successfully a spontaneous breathing trial of 30 min of pressure support at 8 cmH_2O. The patients were extubated irrespective of the value of PCEF. The factors associated with cough strength were compared between the group of patients with a low PCEF ≤ 35 l/min (cut-off value identified by a previous study [1]) and the group of patients with a PCEF > 35 l/min.

RESULTS. 422 patients were studied. The measure of PCEF was impossible to achieve because of lack of understanding in 36 patients (8.5 %). 98 patients (23.2 %) exhibited a

low PCEF. There was no significant difference between the two groups regarding the typology of admission (medical or surgical), the presence of an underlying COPD, and the severity of the patients, evaluated by the SPAS II at admission and the number of organ failures developed during the ICU stay. Conversely, three factors were significantly associated with a low PCEF before extubation: age (70.6 ± 14.6 in patients with a low PCEF vs 66.4 ± 17.6 in the group with PCEF > 35 l/min; p = 0.02), female sex (49 vs 34 %; p = 0.006), and previous duration of mechanical ventilation (16.9 ± 15.7 vs 12.4 ± 14.2 days; p = 0.015). The time on volume-controlled mode was similar (9.5 ± 11 vs 8.1 ± 16.2 days; p = 0.36), however the time from the first day on pressure support to extubation was significantly longer in patients with a low PCEF (9.2 ± 9.5 vs 6.4 ± 7.8 days; p = 0.019).
CONCLUSIONS. The feasibility of measuring routinely PCEF is good. 23 % of the patients mechanically ventilated for more than 24 h and who passed successfully a spontaneous breathing trial had a weak cough strength. This study suggests that a weak cough strength before extubation is associated with age, female sex, and a prolonged weaning time.
REFERENCE(S). 1. Beuret P. Interest of an objective evaluation of cough during weaning from mechanical ventilation. Int Care Med. 2009; 35: 1090–1093.

0757
48 HOURS-FLUID BALANCE DOES NOT PREDICT WEANING OUTCOMES IN A MIXED MEDICAL–SURGICAL ICU POPULATION

A.C.P. Antonio[1,2], P.S. Castro[1,2], J. Maccari[2], R. Oliveira[2], F. Schaich[2], L. Tagliari[2], C. Teixeira[2]

[1]Hospital Mãe de Deus, Adult Intensive Care Unit, Porto Alegre, Brazil, [2]Hospital Moinhos de Vento, Porto Alegre, Brazil
INTRODUCTION. As weaning contributes to about 40 % of the total duration of mechanical ventilation, optimizing this process may be quite impacting on ICU length of stay and its potential complications. Some reports suggest that positive fluid balance could contribute to weaning failure, particularly of cardiac origin.
OBJECTIVES. To examine the relationship of the fluid balance in the 48 h prior spontaneous breathing test (SBT) and weaning outcomes.
METHODS. A prospective, multicentric study. We collected demographic, physiologic, 48 h-fluid balance (measured inputs minus outputs), lung ultrasound findings and outcomes data from 179 patients candidates to weaning from mechanical ventilation (MV).
RESULTS. Weaning success (n = 146) and weaning failure (n = 37) patients were similar in relation to age, sex, APACHE II score, reason for MV and comorbidities. Mean duration of MV was 6 days. 81 % of all patients were simple-weaned. Positive fluid balance in the 48 h prior to SBT did not differ between weaning success and weaning failure group (1,185 ± 2,836 ml and 1,175 ± 2,957 ml, respectively). Neither was the effect of fluid balance significant in heart failure or chronic obstructive pulmonary disease (COPD) patients when analyzed separately.
CONCLUSIONS. In a mixed medical–surgical ICU population, with a high percentage of simple weaning, positive fluid balance in the 48 h prior to weaning is not distinct between weaning success and weaning failure patients. Also, it does not seem to influence outcome significantly in heart failure or COPD individuals. We recognized that nor intervention was performed in order to accelerate weaning process.
The low prevalence of systolic heart failure and the predominance of patients weaned at first attempt could explain our results. Brain natriuretic peptide (BNP) levels were not available.
REFERENCE(S). 1. Upadya A, Tilluckdharry L, Muralidharan V, Amoateng-Adjepong Y, Manthous CA. Fluid balance and weaning outcomes. Int Care Med. 2005; 31: 1643–1647. 2. Epstein CD, Peerless JR. Weaning readiness and fluid balance in older critically ill surgical patients. Am J Crit Care. 2006; 15: 54–64. 3. Mekontso Dessap, Roche-Campo, Kouatchet, et al. BNP for fluid management during ventilator. Am J Respir Crit Care Med. 2012; 186(12): 1256–1263.

0758
ADDITIONAL WORK OF BREATHING IMPOSED BY A T-PIECE BREATHING CIRCUIT VERSUS A TRACHEOSTOMY COLLAR MASK USING A LUNG MODEL

T. Lawton[1], S. Fletcher[1]

[1]Bradford Teaching Hospitals NHS Foundation Trust, Bradford, UK
INTRODUCTION. T-pieces are an evidence-based weaning tool but may increase work of breathing (WoB) compared to a tracheostomy mask (TM). The use of closed suction devices may increase WoB still further.
OBJECTIVES. The study aimed to quantify the extra imposed work of breathing when a T-piece breathing circuit with and without closed suction was used instead of a TM.
METHODS. A model lung driven by a Draeger Evita XL ventilator simulated spontaneous breathing through a range of tracheostomy tube sizes (7, 8, 9 mm) at a range of rates (10,20,30,40/min) and tidal volumes (300,500,700,900 ml), and with two fresh gas flow rates (30 and 80 l/min). Each setup was tested using a TM, and a T-piece breathing circuit with and without a closed suction system. Flow and pressure measurements were taken at 50 Hz using a VT PLUS HF Gas Flow Analyzer. This was used to calibrate the respiratory efforts of the model lung/ventilator combination, and to construct flow/pressure loops to determine the work of breathing. At least 10 breaths were captured with each setup to minimise the effect of random variation. The effect of the circuit on the work of breathing was analysed using a regression model with all other factors and their interactions controlled for.

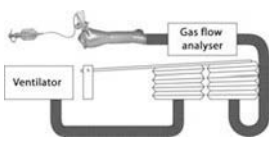


Fig. 1 Model lung diagram

RESULTS.

Table 1 Relative work of breathing (& 95 % CIs)–Circuit

	Inspiratory WoB	Expiratory WoB	Total WoB
Mask	Mean 0.50 J/l	Mean 0.34 J/l	Mean 0.83 J/l
T-piece	+1.3 % (1.0–1.7 %)	+8.8 % (8.5–9.2 %)	+4.7 % (4.4–5.0 %)
T-piece with closed suction	+18.5 % (18.2–18.9 %)	+22.0 % (21.6–22.4 %)	+20.2 % (19.8–20.5 %)

The addition of a T-piece increased the total WoB by 4.7 % across the experiment. This was more pronounced with a size 9 tube (5.5 %) and less with a size 7 tube (3.3 %). The increased work was mainly a result of increased expiratory work, with only a modest change in inspiratory work.
The effect was more marked at higher fresh gas flows; at 80 l/min with a size 9 tube a T-piece added 7.7 % to the total WoB.
A T-piece circuit containing closed suction apparatus increased total WoB by 20.2 % over a TM. Again, this was more marked at high flows and larger tubes (27.4 % at 80 l/min with a size 9 tube). The suction apparatus increased both inspiratory and expiratory WoB by similar amounts.
The effect of the T-piece was broadly similar regardless of minute volume, being slightly less at higher minute volumes over 10 l/min (4.2 vs 5.3 %). The suction catheter increased total WoB much more at higher minute volumes (23.6 vs 14.6 %); changes in minute volume having a greater effect on inspiratory WoB.

Table 2 Relative work of breathing (& 95 % CIs)–Tube size

	Inspiratory WoB	Expiratory WoB	Total WoB
Size 9	Mean 0.38 J/l	Mean 0.31 J/l	Mean 0.69 J/l
Size 8	+38.8 % (37.7–39.8 %)	+21.9 % (21.5–22.2 %)	+31.8 % (31.0–32.5 %)
Size 7	+55.8 % (53.5–58.1 %)	+31.0 % (30.2–31.7 %)	+44.8 % (43.2–46.3 %)

The effect of changes in tracheostomy tube size was in line with previous research on the topic(1).
CONCLUSIONS. The use of a T-piece breathing circuit increases WoB compared with a tracheostomy mask. The addition of a closed suction system increases this even further. High fresh gas flows can also increase WoB, possibly by a 'CPAP'-like effect. Doctors should be aware of these effects on a patient's respiratory workload when a patient undergoes a weaning trial.
REFERENCE(S). 1. Carter A et al. The effect of inner tube placement on resistance and work of breathing through tracheostomy tubes: a bench test. Anaesthesia. 2013; 68(3): 276–82.

0759
PATIENT–VENTILATOR ASYNCHRONY IN PRESSURE SUPPORT VENTILATION (PSV) AND IN A FULLY CLOSED LOOP CONTROL SOLUTION (INTELLIVENT) DURING WEANING FROM MECHANICAL VENTILATION

F. Galia[1], N. Claviéras[1], M. Conseil[1], Y. Coisel[1], S. Jaber[1]

[1]Saint-Eloi Hospital, ICU and Anaesthesiology, Montpellier, France
INTRODUCTION. Patient–ventilator asynchrony refers to the uncoupling between the mechanically delivered breath and the patient's respiratory efforts. No study has been performed to evaluate patient–ventilator interaction in Intellivent, an automated-mode of PSV which adjusts automatically both ventilation[1] and oxygenation parameters. We compared the incidence of patient–ventilator asynchrony in critically ill patients during PSV and Intellivent.
METHODS. This was a secondary analysis of a previous prospective randomized crossover physiological study[2]. This study was approved by the ethical review board and informed consents were obtained. 14 patients were ventilated with Intellivent and PSV for two periods of 24 h. Asynchronies were detected visually on 1 h recordings of flow and airway pressure waveforms as previously described[3]. To quantified asynchronies we used an asynchrony index, defined as the number of asynchrony events divided by the total respiratory rate computed as the sum of the number of ventilator cycles (triggered or not) and of wasted efforts.
Definitions of asynchronies:
(1) Ineffective triggering exp = abrupt airway pressure drop simultaneous to a flow decrease and not followed by an assisted cycle during the expiratory period;
(2) Ineffective triggering insp which happen during the inspiratory period but related to a flow increase;
(3) Double-triggering = two cycles separated by a very short expiratory time,
(4) Autotriggering = a cycle delivered by the ventilator without a prior airway pressure decrease, indicating that the ventilator delivered a breath that was not triggered by the patient;
(5) A short cycle = an inspiratory time less than one-half the mean inspiratory time. A prolonged cycle was defined as an inspiratory time greater than twice the mean inspiratory time.
RESULTS

Table 1 Ventilation parameters and asynchronies with PSV and intellivent in median [interquartiles]

	PSV (n = 13)	Intellivent (n = 13)
PINSP, cmH_2O	8 (7–12)	13 (10–20)*
RR, breaths/min	24 (23–29)	19 (17–22)*
VT, ml/kg PBW	7.2 (5.7–8.1)	8.2 (8.0–8.7)*
Total asynchronies index, %	1.9 (0.6–3.4)	3.7 (1.9–8.7)
Ineffective triggering exp, %	0.5 (0.3–0.9)	2.1 (1.0–3.0)*
Ineffective triggering insp, %	0.5 (0.1–1.0)	0.5 (0.3–2.5)
Double triggering index, %	0.4 (0.2–0.6)	0.3 (0.2–0.9)
Short cycle index, %	0.1 (0.0–0.4)	0.4 (0.1–0.7)*
Prolonged cycle index, %	0.1 (0.0–0.1)	0.0 (0.0–0.1)

PINSP inspiratory pressure level above PEEP delivered by the ventilator, *PEEP* positive end-expiratory pressure, *RR* respiratory rate, *VT* tidal volume, *PBW* predicted body weight,* $p < 0.05$

CONCLUSIONS. Only one patient with PSV and three with Intellivent had a high incidence of asynchrony (total asynchrony index > 10 %). No autotriggering was observed in both modes. Furthermore there was no significant difference of total asynchrony index between PSV and Intellivent. Total asynchrony indexes were low in both modes and probably not clinically relevant. The significant higher incidence of ineffective triggering with Intellivent may be related to excessive levels of ventilator support. The use of automated mode is probably safe regarding the low incidence of asynchronies during weaning of mechanical ventilation with intellivent.

REFERENCE(S). 1. Otis. J Appl Physiol. 1950; 2: 592–607. 2. Claviéras, Anesthesiology. 2013. 3. Thille. Int Care Med. 2006; 32: 1515–1522.

0760

POST-EXTUBATION RESPIRATORY FAILURE IN CRITICALLY ILL PATIENTS: INCIDENCE AND RISK FACTORS

E.S. Thieme Groen[1], R.J. Bosman[1], P.H.J. Van der Voort[1]

[1]OLVG Amsterdam, ICU, Amsterdam, Netherlands

INTRODUCTION. Post-extubation respiratory failure is defined as reintubation within 24–72 h after planned endotracheal tube removal of mechanically ventilated patients. It occurs in 5–25 % of mechanically ventilated patients and is associated with significant morbidity and mortality. Several patient related risk factors for extubation failure have already been identified and spontaneous breathing trials have been suggested as a predictor of outcome of extubation.

OBJECTIVES. We explored the incidence of post-extubation respiratory failure in our Intensive Care Unit, as well as pre-extubation risk factors that might be used to predict extubation failure.

METHODS. A retrospective cohort study over 25 months was performed using data gathered in a 20-bed medical/surgical ICU in a teaching hospital in The Netherlands. The cohort included all consecutive mechanically ventilated patients who underwent planned endotracheal tube removal. Post-extubation failure was defined as reintubation within 72 h after elective tube removal. Patient data was extracted from our Patient Data Management System (MetaVision Suite, iMDsoft) and differences between groups were analysed.

RESULTS. A total of 2,817 patients was included in the analysis. 93 patients met the criteria for failed extubation (3.5 %), 5 patients experienced post extubation failure twice. Significant differences between groups were observed for APACHE IV, SOFA, Rapid Shallow Breathing index (RSBi), length of stay in ICU and hospital mortality (see Table).

Table 1 Characteristics of extubated patients

	All patients N = 2,823	Failed extubation N = 98 (3.5 %)	Succesful extubation N = 2,725 (96.5 %)	p-value
Age	68 (60–76)	72 (62–77)	68 (60–75)	0.065
Male/female	1,902/921	62/36	1,840/885	0.38
APACHE IV	0.032 (0.01–0.19)	0.19 (0.04–0.53)	0.03 (0.01–0.18)	0.001
SOFA day of extubation	5 (3–6)	7 (5–8)	5 (3–6)	0.001
PEEP 2 h before extubation	8 (7–8)	8 (6–8)	8 (7–8)	0.03
RSBi 2 h before extubation	19 (10–32)	31 (13–46)	19 (10–32)	0.001
Length of stay ICU in hours	26 (20–75)	252 (141–461)	25 (20–70)	0.001
Hospital mortality (%)	12.0	19.4	11.8	0.038
After cardiac surgery	1,794 (64 %)	42 (45 %)	1,752 (64 %)	

CONCLUSIONS. Extubation failure occurs in a small subset of ICU patients and is associated with increased length of stay in the ICU and increased hospital mortality. RSBi 2 h before extubation might be used as a predictor of possible extubation failure.

0761

PREDICTORS FOR SUCCESS OF EARLY SPONTANEOUS BREATHING TRIAL IN COPD PATIENTS AFTER ACUTE RESPIRATORY FAILURE

S. Salim[1], T. Fahmy[2], A. Yehia[2], N. Abed[2], S. Mokhtar[2]

[1]Cairo University, Cairo, Egypt, [2]Cairo University, Critical Care Department, Cairo, Egypt

INTRODUCTION. In weaning COPD patients there is a trade-off between the risks associated with premature extubation and the complications associated with prolonged intubation (1, 2), Simple bedside parameters can help in selecting patients capable of a sustained SBT.

OBJECTIVES. To evaluate pulmonary physiologic and mechanical parameters to predict the success of SBT after a short period (48–72) hours of invasive mechanical ventilation in COPD patients.

METHODS. The study included 46 COPD patients admitted for respiratory failure for 48–72 h and fulfilling general criteria for readiness of SBT. Lung mechanics, spontaneous breathing parameters, arterial blood gases were measured on admission and prior to initiating the SBT.

RESULTS. 16 patients were successfully weaned while 30 patients failed the SBT. On admission the successful group had a significantly lower APACHE IV score (56.25 ± 12.73 vs 69.50 ± 10.48), SAPS II score (30.56 ± 7.91 vs 38.77 ± 7.66) ($P = < 0.001$),lower RSBI (143.0 ± 14.29 vs 183.3 ± 24.14) ($P = < 0.001$), Airway resistance (13.31 ± 1.20 vs 15.07 ± 2.38) and HCO_3 (29.20 ± 1.67 vs 31.85 ± 4.66) ($P = < 0.05$), and higher static and dynamic compliance (30.63 ± 4.94 vs 22.21 ± 4.29), (19.69 ± 2.94 vs 13.27 ± 3.03) ($P = < 0.001$) as well as negative inspiratory pressure NIP (12.31 ± 2.12 vs 10.47 ± 2.92) ($P = < 0.05$). The independent predictors of success on admission were RSBI and Dynamic compliance ($P = < 0.05$ and 0.001) respectively, Prior to SBT the successful group showed a lower RSBI (70.94 ± 7.41 vs 125.43 ± 13.98) ($P = < 0.001$), Airway resistance (8.94 ± 1.24 vs 10.42 ± 1.97) ($P = < 0.05$), PO.1 (3.65 ± 0.35 vs 7.75 ± 1.25), PO.1/NIP (0.13 ± 0.02 vs 0.40 ± 0.15) ($P = < 0.001$), and higher both static and dynamic compliance (60.00 ± 11.54 vs 39.33 ± 11.09), (39.44 ± 7.67 vs 25.83 ± 7.51) ($p < 0.01$), NIP (28.38 ± 2.68 vs 21.03 ± 4.39 $p < 0.001$) and PO_2/FIO_2 (271.63 ± 18.01 vs 203.53 ± 12.20 $P = < 0.001$).The independent predictors of success prior to SBT were RSBI and PO_2/FIO_2 ($P = < 0.05$ and 0.001) respectively

CONCLUSIONS. In COPD patients, evaluation RSBI and dynamic compliance on admission as well as before initiating an early SBT may predict success of the early weaning trial

REFERENCE(S).1. Epstein SK, Ciabotaru RL, Wong JB. Effect of failed extubation on the outcome of mechanical ventilation. Chest. 1997; 112: 186–92. 2. Grinnan DC, Truwit JP. Clinical review: respiratory mechanics in spontaneous and assisted ventilation. Crit Care, 2005; 9(5): 472:84 [Epub 2005 Apr 18].

0762

LOAD TEST WITH PEEP VALVE DURING HALF HOUR BEFORE EXTUBATION

Y. Diaz[1], A. Vázquez[1], M.P. Gracia[1], A. Zapatero[1], I. Dot[1], A.F. Villasboa[1], M. Basas[1], F.D. Vasco[1], S. Valles[1]

[1]Parc de Salut Mar, Hospital del Mar, Critical Care, Barcelona, Spain

INTRODUCTION. The weaning is one of the topics that interest generated in critically ill patients. Various reports in the literature predictors seek to try to reduce the number of failed extubation

OBJECTIVES. The aim of this study is to evaluate the impact of adding a PEEP valve of 10 cmH_2O to endotracheal tube during 30 min, before extubation.

METHODS. This prospective study were included 38 patients undergoing mechanical ventilation (MV), after 2 h TT and when his physician considered that met criteria for extubation. At this time add the PEEP valve to MIXO adjusted to 10 cmH_2O during 30 min. All patients were monitored clinically and hemodynamically getting constant, arterial blood gas, measurement tidal volume (Vt) at the start of the test (I) and after 30 min (F). If the patient had no respiratory failure criteria, we proceeded to extubation.

RESULTS. We collected 38 patients, mean age 61.5 ± 13.89, APACHE II 18 ± 7.5, with average stay 14.6 ± 12.14. Required MV for 7.79 ± 5.28 days. Clinical variables were monitored including PAM_I 92 ± 13.45, 20.66 ± 6.5 FR_I, FC_I 84.63 ± 16.35 before the test and PAM_F 92.87 ± 17.53, 21.74 ± 5.59 FR_F, FC_F 84.87 ± 16.75 at the end of it. Vt which was measured pre and post-test values were 478 ± 129.61 VT_F VTI 493 ± 130, respectively. At the same time arterial blood gases were collected pO_{2I} pO_{2F} 101 ± 44.36 183 ± 78.37 and 39.24 pCO_{2I} pCO_{2F} ± 7.36 and 38.92 ± 7.13. All patients were extubated at the end of the test, since none of them showed changes that require its reconnection of the VM, there was extubation failure in 9 (23.7 %) patients.

We observed an increase in the pO_2 in all patients which was statistically significant ($p < 0.0001$), finding no differences between patients that have failed and those who tolerated extubation.

When compared to patients who failed extubation with non failed, patients were more days of MV (13.22 ± 4.8 vs 6.10 ± 4.2), higher average ICU stay (29.5 ± 10.6 vs 10 ± 8.3) and higher APACHE II (22.3 ± 5.1 vs 16.7 ± 7.6) ($p < 0.01$).

Patients who failed extubation to show increased pCO_2 (+1.88 ± 3.9) while patients who tolerate extubation decreased pCO_2 (−1 ± 3.5), resulting in the ΔpCO_2 between both groups was statistically significant ($p < 0.05$).

CONCLUSIONS. Patients who have failed to extubation have a tendency to increase ΔpCO_2 during load test with PEEP in spontaneous. We should continue in this line of research to confirm the usefulness of it.

Brain dysfunction and brain death: 0763–0776

0763

BRAIN DEATH CAUSES RELEASE OF HISTONES FOLLOWED BY HYPER COAGULATION AND DISCORDANT LOSS OF CLOT STABILITY. SOLUTION PARTIALLY CORRECTS THE HAEMOSTATIC ABNORMALITIES

C.L. Hvas[1,2], B. Sørensen[2], E.K. Tønnesen[1], C. Rea[3]

[1]Aarhus University Hospital, Department of Anaesthesiology, Aarhus, Denmark, [2]Aarhus University Hospital, Institute of Clinical Medicine, Aarhus, Denmark, [3]Guy's and St Thomas' Hospital and NHS Trust Foundation, Haemostasis Research Unit, Centre for Haemostasis and Thrombosis, Department of Haematology and Oncology, King's College London School of Medicine, London, UK

INTRODUCTION. Intracerebral haemorrhage (ICH) is the most hazardous type of stroke and a common cause of brain death (BD). Pathological mechanisms of systemic disturbances of coagulation, fibrinolysis and clot stability are unknown and effective treatments to preserve organ function after BD do not exist. We have recently shown that release of tissue factor (TF) is not the main driver of hyper coagulation following BD. Others suggest that trauma and systemic inflammation may cause release of histones that may trigger pathological coagulation changes. Activation of protein C has been suggested to mitigate the pathological effects of histones. Soluble thrombomodulin (sTM) (Solulin; provided by PAION Deutschland GmbH, Germany) is an investigational drug that activates TAFI and Protein C, hence modifying clot stability and thrombin generation (TG).

OBJECTIVES. Investigate aetiology of haemostatic changes in a porcine model of ICH and BD and test the in vitro effect of sTM on TG and clot stability. Hypotheses: (1) BD causes hyper coagulation and decreased clot stability, (2) Pathological coagulation changes are temporally associated with release of histones, and (3) In vitro addition of high dose sTM decreases the initial hyper coagulation following BD by reducing TG, and (4) low dose sTM increases clot stability.

METHODS. Using a model of ICH and BD, 20 pigs were randomized to healthy control (n = 10) or BD (n = 10). Blood samples were taken at eight time points during an 8 h observation period. Clot stability was measured in plasma by an automated lysis test with porcine TF (1/1,200) and tPA (120 nM). Outcome variable was area under the curve for turbidity. TG was recorded by the CAT method activated with porcine TF (1/1,200). Histones and PAI-1 were measured by ELISA. Following titration studies, experiments with in vitro addition of sTM at 10 and 50 nM were performed.

RESULTS. TG peaked 60–90 min after BD (Peak thrombin increased 68 nM (60–77) vs. 56 (46–65), $P = 0.04$, lag time shortened 3.1 s (2.9–3.3) vs. 4.9 (4.2–5.7) min, $P = 0.0001$, time to peak shortened 5.3 s (5.0–5.7) vs. 7.8 (6.7–9.0) min, $P = 0.0002$). Clot stability changed in two phases after BD: an initial steep increase followed by a sudden loss. Interestingly clot stability was lost when TG was highest. PAI-1 peaked 180 min after BD (23 [18–28] vs. 12 [8–15] IU/ml, $P = 0.0008$), when clot stability was low. The loss of clot stability and the following hyper coagulation was temporally preceded by a significant release of histones. sTM (50 nM) added to plasma from BD pigs reduced TG peak approximately 60 % at all times (mean 46–79 %). Addition of 10 nM sTM induced minor changes in TG, but increased clot stability significantly.
CONCLUSION. This is the first study to suggest that release of histones is the main trigger of pathological coagulation changes following BD. Furthermore, the study proposes that Solulin may constitute a potential treatment option to correct the coagulation abnormalities.

0764
DONOR AGE AS A PREDICTOR OF RISK FOR SHORT-TERM COMPLICATIONS AFTER LIVER TRANSPLANT IN AN INTENSIVE CARE UNIT

A. Ruiz Rodríguez[1], J.L. Sanmartín Monzó[1], R. Jara Rubio[1], J. Ros Martínez[1], A.M. Sanmartín Monzó[1], B. Jiménez Ruano[1]

[1]University Hospital Virgen de la Arrixaca, Intensive Care Unit, Murcia, Spain
INTRODUCTION. The successful outcomes of orthotopic liver transplant (OLT) has led to an increase in the number of patients admitted to the waiting list, and thus a growing need to increase the number of available organs. Today the increase has come mainly through the acceptance of elderly donors, which is increasing the donor pool and reducing the waiting list.
OBJECTIVES. To asses the influence of donor age in the short-term outcome of patients following OLT in an Intensive Care Unit (ICU).
METHODS. From January 2006 to December 2012, 368 adult patients underwent OLT in a third level hospital. After surgery, the patients were admitted in a 32 bed ICU. Deceased donors were classified into two groups: group 1, aged ≤70 years, group 2, aged >70 years. Demographic and clinical characteristics of OLT recipients and clinical and surgical short-term complications and mortality were analyzed comparing results between groups. Statistical analysis was performed with SPSS® 15.0. The independent two-tailed *t* test was used to compare the means of variables in case of continuous normally distributed data. The χ^2 test was used for comparison of categorical variables between groups.
RESULTS. During the study 368 OLT were performed, 271 (73.64 %) from group 1 and 97 (26.5 %) from group 2. Mean age of older grafts recipients was significantly higher compared with recipients of group 1 (57.5 ± 9 vs 52.8 ± 11; p = 0.002). Most elderly livers were used in recipients with HCC (53 %; p = 0.000) and HCV (41.5 %; p = 0.002). Patients who received an older liver had significantly lower MELD (12 ± 5.6 vs 14.3 ± 5.9; p = 0.03). Mortality in ICU was lower in group 2 (1.5 vs 7.9 %; p = NS), but it did not reach statistical significance. Table 1 shows demographic and clinical characteristics of OLT recipients according to donor age. Table 2 illustrates complications and mortality after OLT in the ICU according to donor age.

Table 1 Comparison between groups

	Group 1 (≤70 years) N = 271	Group 2 (>70 years) N = 97	p value
Female (%)	27.5	21.5	NS
Age (years, mean ± SD)	52.8 ± 11	57.5 ± 9	0.002
Pretransplant characteristics (%) COPD/zero code	8.2/9	9.5/3.1	NS/NS
Primary diagnosis (%) HCC/ HBV/HCV/alcoholic cirrhosis	15/4.2/21.7/52	53/10.8/41.5/46	0.000/ 0.05/ 0.002/ NS
MELD (mean ± SD)	14.3 ± 5.9	12 ± 5.6	0.03

HCC hepatocellular carcinoma, *HBV* hepatitis B virus, *HCV* hepatitis C virus, *LT* liver transplant, *COPD* chronic obstructive pulmonary disease, *NS* non significant

Table 2 Comparison between groups

	Group 1 (≤70 years) N = 271	Group 2 (>70 years) N = 97	p value
Surgery/ICU blood products (mean ± SD)	22 ± 15/ 11 ± 23	24 ± 20/ 11 ± 24	NS/ NS
Primary graft dysfunction (%)	18	25	NS
Acute rejection (%)	3.9	0.0	NS
Hepatic artery stenosis (%)	0.6	3.1	NS
Renal replacement therapy (%)	12.8	9.5	NS
Reoperation (%)	11.7	9.5	NS
Retransplantation (%)	1.1	4.7	NS
Sepsis (%)	11.7	9.4	NS
Mechanical ventilation hours (median, IQR)	20.5, 12–36	22, 14–35	
Length of stay (days, mean ± SD)	8.6 ± 12	8.5 ± 15	NS
Mortality (%)	7.9	1.5	NS

IQR interquartile range

CONCLUSIONS. Our study showed that OLT using organs from older donors (>70 years) is not associated with a higher mortality rate or short-term complications. This could be related to the lower recipients MELD. Careful donor selection, avoidance of additional donor risk factors and a vigilant allocation can offer acceptable early functional recovery even with elderly livers.

REFERENCES. 1. Singhal A, Sezginsoy B, et al. Orthotopic liver transplant using allografts from geriatric population in the United States: is there any age limit? Exp Clin Transplant. 2010; 8(3): 196–201. 2. Macedo FI, Miranda LE, et al. Donor age as a predictor of risk for short-term outcomes after liver transplant. Exp Clin Transpl. 2010; 8(3): 202–9.
GRANT ACKNOWLEDGMENT. There is no conflict of interest regarding the material discussed in the study.

0765
ORGAN TRANSPLANTATION FROM TYPE III MAASTRICHT DEATH CARDIAC DONORS

M. Lebrón Gallardo[1], M.E. Banderas Bravo[1], V. Olea Jiménez[1], M.Á. Frutos Sanz[2], F. Guerrero Gómez[3], D. Daga Ruiz[4]

[1]Carlos Haya Regional University Hospital, Intensive Care Unit, Málaga, Spain, [2]Carlos Haya Regional University Hospital, Transplant Coordination, Málaga, Spain, [3]Torrecárdenas Hospital, Intensive Care Unit, Almería, Spain, [4]Virgen de la Victoria Hospital, Intensive Care Unit, Málaga, Spain
INTRODUCTION. Organ transplant from death cardiac donors is growing trend in Spain. In our country, the majority of these organs come from uncontrolled donors (type II Maastricht). Recently, the donor died after limiting life-sustaining treatments (LIST) defined as Maastricht III controlled donor, has been initiated in some Spanish hospitals.
OBJECTIVES. We present a series of eight donors type III Maastricht in three different hospitals from Malaga.
METHODS. After agreeing upon a protocol for evaluating the potential of a patient for organ donation after the decision for LIST, the patients' families were given the option of organ donation. The preservation of the kidneys was performed using a Porges double balloon catheter, which was placed in aorta after family agreement, and before the LIST, to minimize hot ischemia injury. We recorded the main characteristics of the donor and the most important periods in the process.
RESULTS. In half of the donors, the reason for ICU admission was a haemorrhagic stroke, and the others were anoxic encephalopathy and brain trauma. The ICU stay until LIST decision was <2 weeks in all cases. The care at the end of life (LIST) were performed in 4 patients in the ICU and another four in the operating room, intervening in all of them, intensivists who had participated in the previous treatment. The time from extubation to cardiac arrest was always <45 min and functional hot ischaemia times were 60 and 61 min. 13 of the 14 kidney transplants are well and with functioning organ today. One patient had bleeding complications in the immediate postoperative and he needs transplantectomy. Liver transplantation was performed successfully and the patient was discharged on day 7.
CONCLUSIONS. The Maastricht III donors provide valid organs for transplantation and the intensivists play an important role in both, as the detection as the development of care at the end of life. Although the first kidney transplants in our centers had long functional hot ischaemia time, which had reflected in graft function, the actions to preserve the viability of the organs are improving and the results of the last four donors are better. Thus, Maastricht III donors must be considered today as an additional source of organs for transplantation.

0766
CHARACTERISTICS OF POTENTIAL ORGAN DONORS GENERATED IN AN INTENSIVE CARE UNIT (MEDICAL ICU) IN A SECOND LEVEL HOSPITAL DURING AN EIGHT-YEAR PERIOD (2005–2012)

J.L. Martínez Melgar[1], E. Moreno Lopez[2], E. Alemparte Pardavila[1], A. Ortega Montes[1], T. Sanchez de Dios[1], A. Pais Almozara[1], J.I. Cenoz Osinaga[1], C. Galbán Rodríguez[1]

[1]Complexo Hospitalario de Pontevedra, Intensive Care Unit, Pontevedra, Spain, [2]Complexo Hospitalario Universitario Ferrol, Anesthesiology, Ferrol, Spain
OBJECTIVE. To know the general characteristics, in terms of tissue and organ procurement and maintenance of potential donors (PD), generated in our ICU, in a second level Hospital, during a period of 8 years (2005–2012).
METHODS. Descriptive and prospective study of patients who were declared brain death (BD) in a medical ICU. We analyzed PD that included family refusal, failure in donor maintenance, judicial refusal and real donors (RD) and excluded patients with contraindications to organ donation (COD). In the PD group the following parameters were analyzed: gender, age group, blood group, cause of BD (acute cerebrovascular accident [ACVA] [ischemic or hemorrhagic], hypoxic-ischemic encephalopathy [HIE], central nervous system (CNS) infections and others), detection of BD, time interval until BD diagnosis, medical history, alterations in PD maintenance: haemodynamic instability (need for inotropic support), polyuria such as diabetes insipidus (DI) treated with desmopressin or osmotic polyuria (OP), or oliguria, hyperglycemia (continuous insulin infusion needed), hypoxemia(required $FiO_2 > 60$ %), hypothermia, coagulopathy or blood transfusion needed, blood test alterations: hydroelectrolytic (hypokalemia, hypomagnesemia), renal (creatinine > 1.1 mg/dL) or hepatic (bilirubin > 1.1 mg/dL), hyperamylasemia, as well as abdominal and thoracic organs and tissues (cornea, bone, heart valve) retrieved.
RESULTS. 82 BD were detected (11 % ICU mortality), being excluded for donation 14 (18 % of BD): tumour 5, infection 7 (unknown 4, viral 3), atherosclerosis 2. PD: 68 (82 % of BD); RD: 49(59 % of BD), family refusal 16, judicial refusal 2, failure in donor maintenance 1; gender: 42 male, 26 female; age group: >35 years old (y): 4.35–50 y: 19.65–75 y: 21 and >75 y: 17; blood group: A: 32, O: 31, AB: 3 and B: 2; cause of BD: ischemic ACVA 10, hemorrhagic ACVA 44 (extended into the ventricular system: 12), traumatic subarachnoid hemorrhage 4, HIE 9, CNS infection 1. Detection of BD: hemodynamic alterations (hypotension 18, hypertensive crisis 6, bradycardia 3), bilateral mydriasis 23 and Bispectral Index-Suppression Ratio 18. Time interval before BD: > 24 h (h): 23 24–72 h: 33 and >72 h: 12. Medical history: hypertension 34, smokers 15, diabetes 11, alcoholism 11 and drug abuse 2. Alterations in maintenance: hypotension 31, polyuria 30 (22 DI, 8 OP), oliguria 5, hyperglycemia 4, cardiac arrest 2, coagulopathy 2 (transfusion needed 1), hypoxemia 2. Blood test alterations: hepatic 11, renal 7, hyperamylasemia 2, hypokalemia 6, hypomagnesemia 4. Retrieved organs from RD: abdominal: 42 kidneys, 37 liver, thoracic: heart 7, lung 5 and tissues: 29 cornea, 10 bone and 2 valves.
CONCLUSIONS. Mortality in BD means 11 % in our ICU (88 patients), of whom 68 patients were PD (82 % of the BD) and 49 were RD (59 % of the BD). Medical COD means 18 and 19 % of the loss of PD were due to family refusal. Patient type in our series: male between 65 and 75 years, diagnosed of hemorrhagic ACVA extended into the ventricular system, blood group A/O, hypertensive and smoker who is declared BD within the first 72 h (82 %).

0767
ANOXIC ENCEPHALOPATHY IN AN INTENSIVE CARE UNIT. A REPORT OF 14 YEARS OF EXPERIENCE

A. Estella[1], L. Pérez Bello Fontaiña[1], J. Sánchez[1], V. Pérez Madueño[1], M. Recuerda[1], M. Jaén[1], A. Jareño[1]

[1]Hospital del SAS de Jerez, Intensive Care Unit, Jerez de la Frontera, Spain

INTRODUCTION. Cardiac or respiratory arrests are the main potential causes of cerebral anoxia. Anoxic encephalopathy is a dreaded complication in critically ill patients after cardiopulmonary resuscitation manoeuvres and involves a high mortality and long-term morbidity.

OBJECTIVES. The aim of the present study is to describe clinical profile of patients who develop anoxic encephalopathy during ICU admission, to identify the causes of this complication and to analyze clinical outcome and mortality of these patients.

METHODS. Retrospective study performed in a 17 beds medical/surgical ICU of a community hospital. Consecutive patients who developed hypoxic-ischemic encephalopathy during their stay in the ICU were reviewed. Time of study analysed was 14 years. Age, gender, origin prior admission, ICU length of stay, tracheotomy requirements, duration of cardiopulmonary resuscitation manoeuvres, defibrillations, ICU mortality, hidden mortality and functional outcomes of survivors were collected. Statistical analysis: Data were analyzed by SPSS 18.

RESULTS. 116 patients, 84 male and 32 female, were analyzed. 50 % of patients were initially treated in extra hospitalary site. Half of patients had shockable rhythms with a mean of 4.75 ± 5.3 defibrillations required; mean time of cardiopulmonary resuscitation was 17 min with a range (4–45). Mean age was 60.5 ± 14 years. ICU length of stay was 8.2 ± 7.1 days. Only 15.5 % had not any risk vascular factor, 37.9 % were smoker, 40.5 % were hypertensive, 29.3 % had diabetes mellitus, 20.7 % dyslipidemia and 8.6 % were obese. In 13.8 % of patients the cause of cardiac arrest was unknown. Main initial cause for initiating cardiopulmonary resuscitation were acute coronary syndrome, 40.5 %, and respiratory insufficiency, 25.9 %, other causes were ventricular fibrillation, 6.9 %, and haemorrhagic shock, 3.4 %. Tracheotomy was performed in 25.9 % of patients, and 7.8 % were organ donors. 80 of 116 patients died in ICU (69 %), hidden mortality was 44.4 %, 14 of 36 survivors died in hospital ward in the first month in a mean time of 7.5 ± 5.8 days after ICU discharge, and two patients died 6 months after ICU admission. Only nine patients survived with a reasonable meaningful quality of life, the remaining survivors had severe neurological sequelaes.

CONCLUSIONS. ·Anoxic encephalopathy is a severe complication associated with a high mortality and morbidity.

·A low percentage of patients who develop anoxic encephalopathy in ICU survive to a meaningful life.

·Predominant clinical profile was: 60 years old male patients with vascular risk factors associated and cardiac arrest due to acute coronary syndrome.

0768
POTENTIALITY OF DONATION AFTER CONTROLLED ASYSTOLE (DCA) PROGRAM IN A SPANISH HOSPITAL

A. Sandiumenge[1,2,3], M. Llauradó[2,3], E. Cos[1], V. Blazquez[1], P. López[4], J. Twose[4], M. Bodí[1,2,3]

[1]University Hospital Joan XXIII, Intensive Care Unit, Tarragona, Spain, [2]Universitat Rovira i Virgili, Tarragona, Spain, [3]Institut d'Investigació Sanitària Pere Virgili, Intensive Care Unit-University Hospital Joan XXIII, Tarragona, Spain, [4]Catalan Transplant Organization, Barcelona, Spain

INTRODUCTION. In an effort to increase the pool of organs harvested for transplantation new legal regulation and the publication of recommendations of DCA have been released in Spain. However, before investing human and technical resources in its implementation is advisable to evaluate its potentiality.

OBJECTIVE. To analyse the potentiality of a DCA program in our setting.

METHODS. Prospective, observational, 9-months study of all patients who died after live support therapy limitation (LSTL) in a 30-bed adult polyvalent intensive care unit (ICU) of a university tertiary hospital.

Patient's characteristics and LSTL actions were described. Potentiality for DCA was assessed through analysis of clinical, analytical and total ischemia times (Tit) in patients in whom withdrawing of mechanical ventilation (MV) and/or vasoactive support (VAS) was performed as a form of LSTL.

A total of 604 patients were admitted in the ICU during the study period with a mortality rate of 20.5 % (n = 122; 7 utilized brain death donors).

RESULTS. During the study period, 123 patients underwent LSTL, 74 of whom (60.6 %) died after LTST initiation (66.2 % male; 68.4 ± 14.2 years old; APACHE II 21.9 ± 6.7; 73.0 % medical, 23.0 % surgical, 6.8 % trauma, and 21.6 % neurocritical).

Main reasons to initiate LSTL were comorbidity (58.0 %) and futility of therapy (40.5 %) being withdrawal the main LSTL action implemented (n = 61, 82.4 %). LSTL actions were initiated 8 days (d) and 10 h (h) ± 10 d and 18 h after admission and 58 % (n = 43) of the patients had already underwent a previous LSTL action.

Patients died 14 h and 25 min (min) ± 29 h, 29 min after LTSL initiation, being MV or/and VAS (n = 39) discontinuation the measures showing the shortest time to cardiac arrest (3 h, 45 min ± 4 h, 15 min). Of patients in whom VAS and/or VM was withdrawn, 21 were ≤ 70 years old and 15 of them (38.5 %) were medically eligible. Of these patients seven had Tit ≤60 min and two of them had no organ-specific contraindications for organ donation. A total of four kidneys, two livers and one lung could have been harvested.

CONCLUSIONS. The initiation of a DCA program in our hospital would have increased by 28 % our potential donor number (22.2 % kidneys, 33.3 % livers, 33.3 % lungs). It is important to evaluate the potentiality of DCA in a hospital prior to its implementation.

0769
BENEFICIAL EFFECT OF CORTICOSTEROID USAGE ON NUMBER OF RETRIEVED ORGANS PER ORGAN DONOR IN OUR HOSPITAL FROM 2004 TO 2012

Z. Gavranovic[1], A. Horvat[1], A. Gopcevic[1], M. Vucic[1], B. Rode[1]

[1]Clinical Hospital Center Sestre Milosrdnice, Zagreb, Croatia

INTRODUCTION. Brain death is followed by significant endocrine alterations due to hypothalamic disfunction. The secretion of hormones is impaired which is clinically manifested as fluid and electrolyte disturbances that contribute to hemodynamic instability of the donor. Brain death also causes a systemic inflammatory response due to release of proinflammatory cytokines which contributes to lower number of retrieved organs and worse graft survival. Routine corticosteroid usage in donors decreases such an inflammatory response and increases number of retrieved organs.

OBJECTIVES. To evaluate effect of corticosteroid usage on number of retrieved organs per organ donor in our hospital from 2004 to 2012 comparing donors who did not receive corticosteroid therapy and donors who received such therapy.

METHODS. Retrospective study.

RESULTS. We had 146 brain-dead organ donors in our intensive care unit in the period from 2004 to 2012. Organ donors in year 2004 did not receive corticosteroid therapy and corticosteroid usage was routinely implemented as the part of organ donor management from year 2005. Hydrocortisone was given in boluses of 100 mg intravenously three times daily. Mean number of retrieved organs per organ donor in year 2004 was 1.6, and in the period from 2005 to 2012 it was 2.6 ($P < 0.001$). All other pharmacological therapy regarding organ donor management did not differ in year 2004 from the period 2005–2012.

CONCLUSIONS. Our results show a statistically significant increase in number of retrieved organs per organ donor when comparing donors who did not receive corticosteroid therapy and donors who received such therapy. Since all other pharmacological therapy was the same in both two periods analyzed, we conclude that corticosteroid usage had beneficial effect in terms of increasing the number of retrieved organs per organ donor.

REFERENCE(S). 1. Phongsamran PV. Critical care pharmacy in donor management. Prog Transpl. 2004; 14: 105–13. 2. Barklin A. Systemic inflammation in the brain-dead organ donor. Acta Anaesthesiol Scand. 2009; 53(4): 425–35. 3. Novitzky D, Cooper DK, Rosendale JD et al. Hormonal therapy of the brain-dead organ donor: experimental and clinical studies. Transplantation. 2006; 82(11): 1396–401. 4. Rosendale JD, Kauffman HM, McBride MA et al. Aggressive pharmacologic donor management results in more transplanted organs. Transplantation. 2003; 75(4): 482–7.

0770
EVALUATION OF SEPSIS IN ORGAN DONATION AND ITS IMPACT ON PROCUREMENT

T. Goranovic[1], D. Bejuk[2], Z. Milan[3], I. Bielen[4], M. Martinac[5], D. Tonkovic[1]

[1]Sveti Duh University Hospital, Department of Anaesthesiology and Intensive Care Medicine, Zagreb, Croatia, [2]Sveti Duh University Hospital, Department of Microbiology, Zagreb, Croatia, [3]King's College Hospital, Department of Anaesthesia, London, UK, [4]Sveti Duh University Hospital, Department of Neurology, Zagreb, Croatia, [5]Sveti Duh University Hospital, Department of Surgery, Zagreb, Croatia

INTRODUCTION. Sepsis has been considered as a relative contraindication to organ donation. Blood culture screening is standardised and mandatory in all potential organ donors.

OBJECTIVES. The purpose of this study was to examine the impact of evaluation of sepsis amongst potential organ donors on procurement process.

METHODS. All neurological intensive care unit patients, who were admitted to Sveti Duh University Hospital and were reported to the hospital transplant coordinator as potential organ donors from 01/2008 to 04/2013, were identified. Demographics, clinical, laboratory and procurement data including the causes of procurement failure were abstracted.

RESULTS. During a 5-year period, a total of 35 patients were evaluated for organ donation and a total of 11 patients were actual organ donors. Mean age of potential organ donors was 61.26 ± 9.38 years; 18 (51 %) were male, 35 (100 %) were Caucasians, 4 (11 %) patients with ischaemic stroke, and 31 (89 %) patients with a traumatic intracerebral and subarachnoid haemorrhage. Mean age of actual organ donors was 61.36 ± 10.60 years; 4 (36 %) were male, 11 (100 %) were Caucasians, 1 (10 %) patients with ischaemic stroke, and 10 (90 %) patients with a traumatic intracerebral and subarachnoid haemorrhage. In potential organ donors, suspected positive blood cultures were found in one patient (3 %) and definite positive blood cultures in five patients (14 %). In one case of suspected positive blood cultures, the samples were recultivated, and after receiving negative results the procurement was finalized. In three cases of definitive positive blood cultures brain death was not confirmed by paraclinic study. In one case of definite positive blood cultures the family denied consent, so the support was further withdrawn. In another case of definite positive blood cultures, the organs were maintained until laboratory data proved the treatment control over sepsis, so organ procurement was possible. Time to procurement in non-sepsis actual organ donors was significantly shorter (12.77 ± 2.38 vs 20.00 ± 2.83 h, $p < 0.05$).

CONCLUSIONS. Of all our patients screened for organ donation, sepsis was identified in 14 %. Since it was well controlled, we can conclude that in our pool of patients, sepsis had no impact on the final organ procurement. However, suspicion or prove of sepsis required more diagnostics and treatment engagement and prolonged time to organ procurement.

0771
REVERSIBLE CARDIOMYOPATHY AFTER STATUS EPILEPTICUS IN INTENSIVE CARE UNIT: INCIDENCE AND RISK FACTORS

D. Belcour[1], J. Jabot[1], B. Grard[1], L. Ursulet[1], A. Roussiaux[1], C. Ferdynus[2], D. Vandroux[1], P. Vignon[3]

[1]Hopital Félix Guyon CHU de la Réunion, Service de Réanimation Polyvalente, Saint-Denis, Reunion, [2]Hopital Félix Guyon CHU de la Réunion, DRCI, Saint-Denis, Reunion, [3]CHU de Limoges, Service de Réanimation Polyvalente, Limoges, France

INTRODUCTION. Epilepsy is a common etiology for stress-related reversible cardiomyopathy [1–3]. Its incidence after a status epilepticus requiring ICU admission has not been described yet. We hypothesize that Reversible Cardiomyopathy associated with Status Epilepticus (ReCaSE) is underestimated.

MATERIALS AND METHODS. This prospective observational study was conducted in a 23-bed university hospital unit, from April 2011 to September 2012. Primary endpoint was the occurrence of ReCaSE in patients admitted in our intensive care unit. Secondary endpoint was to discover potential risk factors for ReCaSE. All adults admitted in our center for status epilepticus were included. Data collection was conducted from admission (H_0) to H_{48}. At every time of the study (H_0, H_6, H_{12}, H_{24} and H_{48}), were collected hemodynamic data (obtained from transthoracic echocardiography and transpulmonary thermodilution), biological data (troponin, arterial blood lactate, creatine kinase serum level and central venous blood oxygen saturation) and an electrocardiogram (ECG). Echocardiographic data were analyzed a posteriori by an independent and blinded expert. ReCaSE was defined as a 20 % increase in left ventricular ejection fraction (LVEF) from H_0 or H_6 to H_{48}, which was considered as the steady state (recovery from admission).

RESULTS. 32 patients (21 male and 11 female) were included and 56 % of them developed reversible cardiomyopathy. Identified risk factors for ReCaSE were age and SAPS II. No statistical difference was found for other studied parameters, like age, gender, status epilepticus duration, seizure number, delay to treatment and thiopental administration. When compared to H_{24} and H_{48}, cardiac index was significantly lower at H_0 and H_6 with no influence upon arterial blood pressure. Arterial blood lactate was higher at H_0 than H_{12}, H_{24} and H_{48}. Over the observation period, other biological data were comparable and echocardiographic findings did not vary significantly. Catecholamine infusion (dobutamine and/or norepinephrine) was significantly more frequent in the ReCaSE group ($n = 13$ vs. $n = 4$, $p = 0.03$).
CONCLUSION. In our study, the occurrence of ReCaSE is high and should incite physicians caring for status epilepticus patients to use hemodynamic monitoring widely. Age and SAPS II are the only two risk factors identified.
REFERENCE(S).
1. Stollberger C, Wegner C, Finsterer J. Seizure-associated Takotsubo cardiomyopathy. Epilepsia. 2011; 52(11): e160–167. 2. Stollberger C, Wegner C, Finsterer J. Seizure-induced Takotsubo syndrome is more frequent than reported. Int J Cardiol. 2011; 150(3): 359–360. 3. Le Ven F, Pennec PY, Timsit S, Blanc JJ. Takotsubo syndrome associated with seizures: an underestimated cause of sudden death in epilepsy? Int J Cardiol. 2011; 146(3): 475–479.

0772
MEASUREMENT OF RADICAL OXYGEN SPECIES IN CEREBROSPINAL FLUID FOR RAPID DIAGNOSIS OF NOSOCOMIAL MENINGITIS: A MULTICENTRE STUDY

A.-C. Lukaszewicz[1], V. Faivre[1], H. Bout[2], E. Gayat[1], T. Lagergren[1], C. Damoisel[1], D. Bresson[1], J. Mantz[2], D. Payen[1]

[1]Université Paris Diderot, Sorbonne Paris Cité, Paris, France, [2]Université Paris Diderot, Sorbonne Paris Cité, Clichy, France
INTRODUCTION. Nosocomial meningitis is a daily concern after traumatic brain injury or neurosurgery, that imposes multiple microbiological and biochemical analyses of cerebrospinal fluid (CSF). Precautionary attitude leads to administer wide-spectrum antibiotics waiting for results of analyses.
OBJECTIVES. To test the interest of radical oxygen species (ROS) measurement by luminescence in CSF for rapid diagnosis of meningitis (ref).
METHODS. Patients were included in surgical ICU and neurosurgery department of Lariboisière and Beaujon Hospitals (Assistance Publique Hôpitaux de Paris), because of fever in the context of brain trauma or postoperative period of neurosurgery, with or without external ventricular drainage. Test of ROS measurements was first applied in a monocentre training cohort (cohort 1, $n = 54$) then in a multicentre testing cohort (cohort 2, $n = 136$). Luminescence was measured in presence of luminol in basal condition and after stimulation by phorbol 12-myristate 13-acetate (condition PMA). Because there is no consensus on definition of nosocomial meningitis, the performance of the test was compared to diagnosis made by two experts blinded for the results.
RESULTS. Incidence of meningitis was 25.9 % in cohort 1 and 15.4 % in cohort 2 ($p = 0.1$). Basal and PMA-stimulated production of ROS were higher in CSF of patients with meningitis than in negative CSF in both cohorts ($p < 0.001$). In cohort 2, prediction of meningitis was associated with AUC at 0.812 (0.680–0.815) in basal condition and 0.834 (0.723–0.836) in PMA stimulation. Specificity of the test (0.9) and negative predictive value (0.95) were excellent.
CONCLUSIONS. Interest of rapid ROS measurement was confirmed in suspicion of meningitis and should oriented diagnosis and eventually treatment. Such bedside diagnostic tool may reduce the number of specialised analysis, over-treated febrile patients and resistances in bacterial ecology.
REFERENCE(S). 1. Lukaszewicz AC, Gontier G, Faivre V, Ouanounou I, Payen D. Ann Int Care. 2012; 2:10.
GRANT ACKNOWLEDGMENT. Patent: PCT/IB2011/053329 no. publication WO 2012/014156.

0773
ACQUIRED PSEUDOCHOLINESTERASE DEFICIENCY IN CRITICAL ILLNESS POLYMYOPATHY

R.S. Prager[1], C.A. Reid[2], L.J. Simon[1], A.A. Pastewski[1], D. Bayard[1], T.J. Diaz[1], J.S. Socha[1]

[1]University of Miami, Jackson Health System, Jackson South Community Hospital, Department of Intensive Care, Palmetto Bay, USA, [2]University of MIami, Jackson Health System, Jackson South Community Hospital, Department of Intensive Care, Palmetto Bay, USA
INTRODUCTION. Critical illness polymyopathy causes substantial limb weakness, contributes to ventilator dependency, and is associated with prolonged hospital stays and considerable morbidity. This retrospective study identifies acquired serum Pseudocholinesterase deficiency occurrence as a pathologic mechanism for critical illness polymyopathy. The finding that critically ill patients may develop acquired pseudocholinesterase deficiency that leads to muscle weakness and paralysis, allows for better intervention and reversal of this important, severe and often persistent complication among critically ill patients admitted to the intensive care unit.
OBJECTIVES. Our retrospective study aimed to identify acquired pseudocholinesterase deficiency as a cause of critical illness polymyopathy and how initiating treatment can reverse the progression of this disease.
METHODS. 14 patients (7 males, 7 females) mean 64 ± 16 years; (range 42–92 years) participated in this study review. The patients were affected by sepsis syndrome, pneumonia, respiratory failure and myopathy. Pre and Post serum pseudocholinesterase was measured before and after treatment and muscle strength against gravity.
RESULTS. The mean hospital length of stay was 39 ± 18 and intensive care unit length of stay 29 ± 20 days respectively. The mean predicted mortality was 25.4 ± 22.5 % (range 6.6–83 %) and APACHE II score mean 15.1 ± 8.5. The serum pre pseudocholinesterase level was mean 2.09 ± 0.98 ($n = 14$, range 0.70–4.10 mU/ml) (normal > 5.9 mU/ml). The serum post pseudocholinesterase level rose from mean 2.11 ± 1.07 to 4.48 ± 1.11 mU/ml ($P = 0.0001$, $n = 12$, paired sample t-test, SPSS, Data, version 20.0) (2 by attrition) after receiving fresh frozen plasma mean 12 ± 11 units (range 2–46 units) over a period of days mean 7.1 ± 5.5 (range 1.0–18). All patients muscle strength improved against gravity with treatment.
CONCLUSIONS. Our findings suggest that acquired pseudocholinesterase deficiency in critically ill patients leads to critical illness myopathy and initiating treatment can reverse and prevent the progression of this disease and should be considered as therapeutic benefit and cause for critical illness polymyopathy. Accordingly, clinical trials of acquired pseudocholinesterase deficiency treatment in critically ill patients should be considered and are warranted.

0774
ELEVATED AMMONIUM LEVELS DURING TREATMENT WITH VALPROIC ACID

L. Khattar[1], A. Brasseur[1], E. Antonucci[1], J.-L. Vincent[1], F.S. Taccone[1]

[1]Hopital Erasme, Bruxelles, Belgium
INTRODUCTION. Elevated ammonium levels (EAL) are one of the side effects of valproic acid (VPA) treatment. This complication has been described during long-term VPA treatment, but less in critically ill patients.
OBJECTIVES. The aim of this study was to evaluate the incidence and the factors associated with EAL in those patients.
METHODS. A retrospective study in a mixed 35-bed ICU care of a tertiary university hospital was conducted over a 4-year period (2007–2010). Inclusion criteria were; (a) VPA therapy for more than 72 h; (b) age >18 years; (c) at least one measurement of ammonium levels during the ICU stay; (d) Child C liver cirrhosis. EAL was defined as ammonium levels above 50 mcg/dL. Demographic data, comorbidities, reason for VPA treatment, biological data, concomitant therapies, presence of infection and ICU mortality were collected.
RESULTS. A total of 168 patients met the inclusion criteria (median age 64 years, 95 male gender). Most of them (137/168) were admitted for neurological reasons. Overall ICU mortality was 23 %. Median ammonium levels were 88 (55–121) mcg/dL. EAL was found in 121 (72 %) patients; of those, 38 (31 %) had ammonium levels between 100 and 150 mcg/dL, 11 (9 %) between 150 and 200 mcg/dL and 13 (11 %) above 250 mcg/dL. Median time from start of VPA therapy to EAL was 4 (3–5) days. Median maximum VPA level during therapy was 72 (51–88) and was significantly higher in EAL patients than in the others (76 [58–92] mcg/mL vs. 56 [39–81] mcg/mL, $p < 0.01$). EAL were more frequently observed in patients with sepsis ($p < 0.01$) and in those treated with mechanical ventilation ($p < 0.01$), vasopressors ($p = 0.05$) and at least one other antiepileptic drug ($p = 0.02$); these patients tended to have a higher ICU mortality (28 vs. 13 %, $p = 0.06$).
CONCLUSIONS. Ammonium levels are often elevated during treatment with valproic acid in ICU patients, especially in those with the greatest severity. This alteration may contribute to their alteration in brain function.

0775
STATUS EPILEPTICUS IN CIRRHOTIC PATIENTS: IMPACT OF A EXPERIMENTED PHYSICIANS AND ELECTROPHYSIOLOGIST'S INPUT TO AVOID OVER DIAGNOSIS IN PATIENTS WITH HEPATIC ENCEPHALOPATHY

C. Marois[1], M. Rudler[2], H. Benosman[2], S. Mouri[2], D. Thabut[2], N. Weiss[1], V. Navarro[3]

[1]Groupement Hospitalier Pitié-Salpêtrière-Charles Foix–Assistance Publique–Hôpitaux de Paris, Neurological ICU, Neurology Department, Paris, France, [2]Groupement Hospitalier Pitié-Salpêtrière-Charles Foix–Assistance Publique–Hôpitaux de Paris, Hepatology ICU, Paris, France, [3]Groupement Hospitalier Pitié-Salpêtrière-Charles Foix–Assistance Publique–Hôpitaux de Paris, Neurophysiology Department, Paris, France
INTRODUCTION. Status epilepticus (SE) is a rare condition in cirrhotic patients. However (1) myoclonic jerks of hepatic encephalopathy (HE) can be misdiagnosed as seizures and (2) subtle SE be cumbersome to distinguish from HE by non expert electrophysiologists. Therefore, SE may be overdiagnosed in cirrhotic patients, leading to abusive prescription of antiepileptic drugs like benzodiazepine, which worsen HE.
OBJECTIVES. To assess the proportion of confirmed SE in cirrhotic patients previously diagnosed with SE, using a critical reading of medical reports and EEG by experimented physicians and electrophysiologists.
METHODS. We retrospectively reviewed all the files of patients hospitalized in Hepatology ICU for complication of cirrhosis in whom SE diagnosis was retained by the physicians in charge of the patients. Medical reports and EEG were critically reviewed by an expert electrophysiologist, a senior hepatologist and a senior neurologist. Final diagnosis of SE was made by consensus.
RESULTS. 12 patients were included in the study (age 62 [56–68], male gender 50 %). Etiologies of cirrhosis were: alcohol alone in 9 patients (75 %), alcohol and HCV in 2 patients (17 %), HCV alone in 1 patient (8 %). Median MELD score was 25 (16–30); 1 patient (8 %) was Child-Pugh A, 1 patient (8 %) Child-Pugh B and 10 patients (83 %) Child-Pugh C. Out of these 12 patients, 9 patients (75 %) presented generalized tonicoclonic seizures, 2 partial seizures and one was comatose. After critical review, nine diagnosis of SE (75 %) were finally retained. SE was overdiagnosed in three comatose patients. In those patients, two EEG showed figures of benzodiazepine impregnation, and one showed slow waves without epileptic discharges.
CONCLUSIONS. This preliminary study suggests that the diagnosis of SE was made in excess 25 % of patients. In an emergency setting, precise physical examination by a skilled physician is often impossible, and myoclonic jerks of HE could be misdiagnosed as seizures. Similarly, detailed EEG analysis is cumbersome to perform in this condition. The critical review of medical files and EEG seems able to minimize overdiagnosis of SE and abusive prescription of antiepileptic drugs.

0776
APNEA TESTING FOR DETERMINATION OF BRAIN DEATH ON VENO-ARTERIAL ECMO: A PEDIATRIC CASE SERIES

S.J. Ajizian[1], R. Jarrah[1], T.A. Nakagawa[1]

[1]Wake Forest University School of Medicine, Anesthesiology, Section on Pediatric Critical Care, Winston Salem, USA
INTRODUCTION. The updated guidelines for the determination of brain death for infants and children in the US provide important direction for clinicians tasked with determining death.[1] However, the consensus guidelines lack direction for apnea testing when a patient is supported on extracorporeal membrane oxygenation (ECMO), as no supporting literature

exists for this clinical situation. This is the first pediatric report with a simple algorithm for apnea testing in this situation.
METHODS. Retrospective observational case series.
RESULTS. Three pediatric patients (pts), ages 5 months, 2, and 14 years, were supported on veno-arterial (VA) ECMO following cardiopulmonary arrest. Despite maximal resuscitative efforts, all pts developed a neurologic exam consistent with brain death. Apnea testing on VA ECMO was performed using the following method: 1. Normalizing $PaCO_2$ by adjusting ECMO sweep gas flow and obtaining a baseline ABG analysis. 2. Preoxygenation on VA-ECMO by increasing sweep gas FiO_2 to 1.0. 3. Removing mechanical ventilation support by using a self-inflating bag system with continuous positive airway pressure and FiO_2 1.0. 4. ECMO sweep gas flow was reduced as low as possible while maintaining the ECMO sweep gas FiO_2 at 1.0. The rate of $PaCO_2$ rise on the CDI blood parameter monitoring system was monitored with correlating arterial blood gas to confirm the $PaCO_2$ level reached the appropriate threshold to support the diagnosis of brain death. 5. The apnea test was terminated if respiratory effort was noted, desaturation to <85 %, or development of hemodynamic instability occurred.[1] Maintaining circulatory support for hypotension on VA-ECMO may be accomplished by increasing circuit flow, or using additional inotropic agents.

CONCLUSIONS. This is the first pediatric case series to describe a protocol to conduct apnea testing while supported on VA ECMO. To date, there are no other reports in children. We address an important clinical scenario not described in for pediatric pts undergoing brain death testing.
REFERENCES. Nakagawa TA, Ashwal S, Mathur M, et al. Guidelines for the determination of brain death in infants and children: an update of the 1987 Task Force recommendations. Crit Care Med. 2011; 39(9): 2139–2155.

VAP: prediction, prevention, outcomes: 0777–0790

0777

EFFICACY OF A NOVEL CLOSED SUCTIONING SYSTEM FOR THE REMOVAL OF ENDOTRACHEAL TUBE BIOFILM: A PRELIMINARY ASSESSMENT IN AN ANIMAL MODEL OF SEVERE *P. AERUGINOSA* PNEUMONIA

G. Li Bassi[1], E. Aguilera[1], J.D. Martí[1], D. Wyncoll[2], G. Ntoumenopoulos[2,3], L. Fernández[1], S. Terraneo[1], M. Rigol[1], T. Comaru[1], F. De Rosa[1], R.C. Peralta[1], M. Rinaudo[1], N. Luque[1], A. Torres[1]

[1]Hospital Clinic, IDIBAPS, CibeRes, Barcelona, Spain, [2]Guy's and St Thomas' NHS Foundation Trust, London, UK, [3]School of Physiotherapy, Australian Catholic University, Sydney, Australia
INTRODUCTION. Following endotracheal intubation, biofilm forms on the internal surface of the endotracheal tube (ETT). A novel closed suctioning system was developed to dislodge and mechanically remove ETT biofilm through high-pressure jets of sterile saline and an inflatable balloon.
OBJECTIVES. We tested the efficacy of the novel closed suctioning system in an animal model of tracheal intubation and severe pneumonia.
METHODS. We studied 10 pigs (32.4 ± 1.8 kg) with severe *P. aeruginosa* pneumonia (1). In five animals (control group) standard tracheal suctioning was performed using the KIMVENT* Closed Suction Systems (Kimberly Clark, USA); in five animals (study group) tracheal suctioning was carried out with the novel catheter (Airway Medix Closed Suction System, Biovo Technologies, Israel). During suctioning, the new catheter was advanced up to the proximal trachea to aspirate retained secretions. The catheter was then pulled back to the tip of the ETT and the balloon inflated to adhere against the ETT wall. Finally, the catheter was gently withdrawn, while saline jets and aspiration operated simultaneously to displace biofilm and remove biofilm debris. Upon autopsy—following 76 h from intubation—the animal was extubated and the ETT longitudinally cut open. A 3 and 1 cm-long hemi-sections of the dependent part of the ETT were dissected for quantitative microbiology studies and confocal microscopy, respectively. Confocal axial images of representative biofilm accumulations were recorded. Biofilm area, maximal and minimal thickness were computed through dedicated software (ImageJ, NIH, Bethesda, MD, USA). During the analyses, investigators were blind to treatment allocation.
RESULTS. Both suctioning systems were easy to use. In the control and study group 9.5 ± 4.5 and 8.5 ± 3.5 tracheal aspirations/day were carried out, respectively (N 30, p = 0.50). ETT *P. aeruginosa* colonization in the control group was 5.9 ± 0.8 log cfu/ml, in the study group was 4.5 ± 2.6 log cfu/ml (N: 10, p = 0.41). We examined 3.4 ± 1.5 and 2.6 ± 1.7 pictures per pig in the control and study group, respectively (N: 10, p = 0.47). We found, in the control group, a mean biofilm area of 78,950 ± 184,111 μm^2 (max 779,448, min 3,743 μm^2) in comparison with 46,098 ± 74,466 μm^2 (max 237,558, min 864.42 μm^2) in the study group (N: 30, p = 0.28). The maximal biofilm thickness in the control and study groups were 210 ± 302 and 126 ± 128 μm, respectively (N: 30, p = 0.17). The minimal biofilm thickness in the control group was over twice that of the study group, 79.1 ± 146.7 and 35.9 ± 86.9 μm, respectively (N: 30, p = 0.04).
CONCLUSIONS. This very preliminary assessment shows that the novel closed suctioning system was slightly more effective in reducing biofilm accumulation from the ETT lumen in intubated and ventilated swine with *P. aeruginosa* colonization.
REFERENCE(S). 1. Luna CM et al. Chest 132(2): 523–31.
GRANT ACKNOWLEDGMENT. Biovo Technologies Inc.

0778

INCIDENCE OF VENTILATOR-ASSOCIATED PNEUMONIA IN PATIENTS INTUBATED IN THE EMERGENCY DEPARTMENT

L.A. DeLuca[1], L.R. Stoneking[1], K. Grall[1], L. Cox[1], B. Munzer[1], J. Rosell[1], A. Vira[1], J. Gonzaga[1], W. Larson[1], A. Westergard[1], K.R. Denninghoff[1]

[1]University of Arizona, Department of Emergency Medicine, Tucson, USA
INTRODUCTION. Ventilator-Associated Pneumonia (VAP) is a nosocomial infection that increases morbidity and mortality in critically ill patients. Eckert (2006) demonstrated that trauma patients intubated in the Emergency Department (ED) had significantly higher rates of VAP than those intubated in the ICU, despite higher Glasgow Coma Scale (GCS) scores, lower Injury Severity Scores (ISS), and lower Revised Trauma Scores. Carr (2007) described a relationship between duration of time in the ED and pneumonia rate in intubated patients. Green and McIntrye (2011) have shown that in Canadian ED's critically ill patients are frequently housed for many hours with a significant proportion of their care provided by ED physicians.
OBJECTIVES. We sought to determine the overall VAP rate for patients intubated in the ED, and the VAP rate for the "at-risk" population (those who remained intubated >48 h).
METHODS. Patients intubated in the ED were identified from an existing hospital registry over two 6-month periods. VAP was defined as a new infiltrate on chest X-ray (CXR) 48 or more hours after intubation that was not present at the time of intubation. Patients were excluded for pneumonia on presentation, new infiltrate within 48 h of intubation, and extubation or death within 48 h.
RESULTS. A total of 311 patients were intubated over the two 6-month periods. Of those patients, 40 (12.8 %) developed VAP. After excluding patients who were extubated or died within 48 h (131), patients who had pneumonia at presentation (50), those who developed pneumonia in <48 h (14), and those lost to followup (7), an at-risk subset of 109 patients was identified. The resulting VAP rate was 37.0 % (40/109) in the at-risk population.
CONCLUSIONS. Patients intubated in the ED are at significant risk of developing VAP. Further research should be aimed at identifying the risk factors that predispose patients intubated in the ED to VAP and to applying measures to reduce VAP rates in the ED.
REFERENCE(S). 1. Carr BG, Kaye AJ, Wiebe DJ, Gracias VH, Schwab CW, Reilly PM. Emergency department length of stay: a major risk factor for pneumonia in intubated blunt trauma patients. J Trauma. 2007; 63: 9–12. 2. Eckert MJ, Davis KA, Reed L, et al. Ventilator-associated pneumonia, like real estate: location really matters. J Trauma. 2006; 60: 104–110. 3. Green RS, McIntyre J. The provision of critical care in emergency departments at Canada. J Emerg Trauma Shock. 2011; 4(4): 488–493.

0779

IMPACT OF DIAGNOSTIC CRITERIA ON THE INCIDENCE OF VENTILATOR-ASSOCIATED PNEUMONIA (VAP)

A. Ego[1], J.-C. Preiser[1], J.-L. Vincent[1]

[1]Université Libre de Bruxelles, Department of Intensive Care, Erasme University Hospital, Brussels, Belgium
INTRODUCTION. The development of ventilator-associated pneumonia (VAP) is sometimes used as an index of the quality of care. However, the criteria used to diagnose VAP are variable. Using less strict criteria to diagnose VAP may result in a lower reported incidence of VAP and misleadingly suggest better quality of care.
OBJECTIVES. We postulated that the use of different criteria to diagnose VAP would lead to substantial differences in the incidence of VAP.
METHODS. We included all adult patients who were treated with mechanical ventilation for more than 48 h over a 7-month period (January–July 2012), and who had no lung infection during the first 48 h of ventilation. We applied 89 algorithms composed of different criteria, including respiratory deterioration, inflammatory response, purulent tracheal secretions, abnormal chest radiography, and positive microbiologic findings.
RESULTS. Of 1,806 patients admitted during the study period, 144 (8 %) were treated with mechanical ventilation for more than 48 h; 91 of these patients had no evidence of lung infection during the first 48 h of mechanical ventilation. The application of the 89 algorithms resulted in a highly variable incidence of VAP, ranging from 0 to 44 % (Graph 1). The mortality rate and delay before the diagnosis of VAP increased with increasing strictness of the criteria used, from 50 to 80 % and from 4 to 8 days, respectively.
CONCLUSIONS. Applying different diagnostic criteria in a given patient population can result in a wide variation in the apparent incidence of VAP, and even eliminate it completely. The inverse correlation between the incidence of VAP and mortality, suggests that stricter criteria are more specific for VAP. Stricter criteria also result in delayed diagnosis.

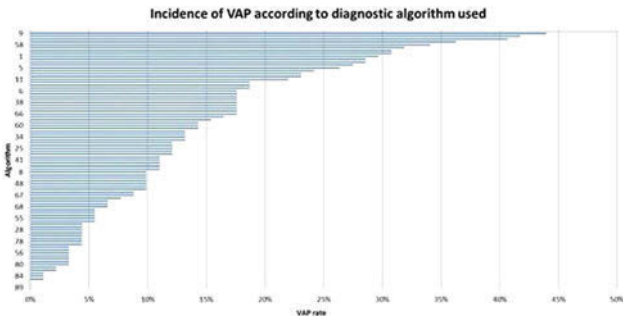


Fig. 1 Incidence of VAP according to algorithm used

0780

EARLY DIAGNOSIS OF VENTILATOR-ASSOCIATED PNEUMONIA WITH MICROBIOLOGICAL MONITORIZATION AND SERIAL EVALUATION OF CYTOKINES AND BIOMARKERS IN BLOOD, MINI-BRONCHOALVEOLAR LAVAGE AND EXHALED BREATH CONDENSATE. PILOT STUDY

S. Borrás[1], J. Blanquer[2], A. Serrano[2], J. Ferreres[2], M. Mata[3], A. Carratala[4]

[1]Hospital de Manises, Intensive Care Unit, Valencia, Spain, [2]Hospital Clínico Universitario, Intensive Care Unit, Valencia, Spain, [3]Hospital General Universitario, Fundacion de Investigacion, Valencia, Spain, [4]Hospital Clínico Universitario, Laboratory, Valencia, Spain
INTRODUCTION. Early diagnosis of Ventilator-associated pneumonia (VAP) is important because prompt treatment improves prognosis. Mini-bronchoalveolar Lavage (MBAL) is an accepted method to identify pathogen. Exhaled breath condensate (EBC) for the assessment of inflammation in lung disease is spreading and biologic markers can be used to support diagnosis.
OBJECTIVES. Improve early diagnosis of VAP by: (1) Microbiological monitoring of respiratory samples with MBAL. (2) Sequential determination of cytokines (TNFα, IL-1ß, IL-6, IL-8, IL-10), and biomarkers (CRP, hsCRP and Procalcitonin-PCT-) in blood, MBAL and EBC.
METHODS. Prospective, observational study. We included adult patients, under MV more than 48 h, without lung infection. At baseline, and then, every 3 days until VAP development (follow-up), MBAL for microbiological analysis and blood, MBAL and EBC samples for cytokines and biomarkers determination were obtained. MBAL involved the infusion and aspiration of three aliquots of 20 cc of saline through a Combicath™ catheter. EBC was collected by a device for breath condensate collecting into the expiratory limb of ventilator

for 30 min. Diagnosis of VAP was based upon CPIS score and clinical criteria (1). For cytokines determination was used ELISA.
RESULTS. 41 patients were included, 11 (26 %) developed VAP. APACHE II 24 ± 7. Development of VAP was associated with higher ICU stay, time under MV and mortality. *Baseline* Those who developed VAP presented worst pO_2/FiO_2 ratio 152 vs 259 ($p < 0.01$). In 24 % of patients was identified a microorganism, (26 % of non-VAP patients and 18 % in VAP-patients, in which were multi-resistant). VAP-patients, showed significantly higher TNF-α blood levels 7.6 vs 5.5 pg/ml ($p < 0.05$); MBAL TNF-α and IL-6 levels were lower 6.4 vs 19.6 pg/ml (p 0.08) and 5.4 vs 9.2 pg/ml (p 0.06) respectively. There were no differences with other cytokines or biomarkers.CPR or hs-CPR were not detectable in EBC. *Follow-Up*: VAP-patients: in three cases (27 %), causal microorganism was present in previous cultures. With regard to cytokines and biomarkers: blood TNF and MBAL IL-8 levels were significantly lower in samples previous to diagnosis of VAP (6.6 vs 7.7 pg/ml and 446 vs 2,460 pg/ml respectively). Those who developed VAP, at diagnosis, presented significant higher levels of: blood IL-8 and CRP; and MBAL, hs-CRP. PCT was also higher in blood and MBAL but not significantly.
CONCLUSIONS. Only in 27 % of patients who developed VAP, precious cultures were helpful in diagnosis. We could not find a definite profile of any cytokine or biomarker that could anticipate diagnosis of VAP. Blood levels of IL-8 and CRP and MBAL levels of hs-CRP and PCT are elevated in VAP patients.
REFERENCE(S).
1. ATS, IDSA. Guidelines for the management of VAP. Am J Respir Crit Care Med. 2005.
2. Bayley DL. Validation of assays for inflammatory mediators in exhaled breath condensate. Eur Respir J. 2008.
GRANT ACKNOWLEDGMENT. This study was sponsored by Pfizer.

0781
HIGH DOSE NEBULIZED AMIKACIN: A PILOT STUDY IN VENTILATED PATIENTS WITH HEALTHCARE ASSOCIATED PNEUMONIA

S. Ehrmann[1], F. Darrouzain[2,3], T. Boulain[4], D. Garot[1], E. Masseret[1], A. Petitcollin[2,3], A. Legras[1], E. Mercier[1], J. Badin[1], A. Guillon[1,5], D. Ternant[2,3], L. Vecellio[5], D. Perrotin[1], G. Paintaud[2,3], P.-F. Dequin[1]

[1]CHRU de Tours, Service de réanimation polyvalente, Tours, France, [2]Université François Rabelais, Faculté de Médecine, UMR CNRS 7292, Equipe GICC, Tours, France, [3]CHRU de Tours, Laboratoire de pharmacologie-toxicologie, Tours, France, [4]Hôpital de la Source, Centre Hospitalier Régional d'Orléans, Réanimation médicale polyvalente, Orléans, France, [5]Université François Rabelais, Faculté de Médecine, Centre d'Etude des Pathologies Respiratoires, INSERM U1100/EA6305, Tours, France
INTRODUCTION. High-dose nebulized antibiotics, as a complement to intravenous treatment, may improve pneumonia treatment efficacy, thanks to increased concentrations at the site of infection. Up to 60 mg/Kg of amikacin have been successfully nebulized in animal studies and to healthy subjects undergoing mechanical ventilation[1,2]. However, the pharmacokinetics and safety of such high doses have not been assessed in patients suffering of pneumonia.
OBJECTIVES. To evaluate serum pharmacokinetics and safety of 60 mg/Kg amikacin nebulization during mechanical ventilation
METHODS. Patients undergoing invasive mechanical ventilation with a suspicion of hospital acquired, healthcare- or ventilator-associated pneumonia were included. Aside of an intravenous betalactam antibiotic, each patient received 20 mg/Kg amikacin intravenously at inclusion; thereafter amikacin was administered *qd*. for 3 days: 60 mg/Kg nebulized (prototype jet-nebulizer in a dry circuit or with a heated humidifier) or 20 mg/Kg intravenously. 10 serum concentration of amikacin were measured over 24 h after each administration for non-compartmental pharmacokinetic analysis. Safety/efficacy data were recorded until day 10. Patients in whom pneumonia was not confirmed (amikacin sensitive bacterial documentation) or experiencing a side effect linked to amikacin administration were excluded from the study, but safety assessment was pursued until day 10.
RESULTS. 22 patients were included in the study, after informed consent. Six patients were excluded because pneumonia was not confirmed (n = 5) or because of renal failure before the second amikacin administration (n = 1), leaving 16 patients with at least 2 amikacin administrations: median age 59 years (interquartile range 51–72); n = 2 female; weight 75 Kg (63–78); body mass index 26 Kg/m^2 (24–28); baseline serum creatinine 62 μmol (51–73).
Overall 32 nebulizations were analysed: 4.5 g (4.1–4.9) nebulized over 2h15 (1h31–2h48); the area under the serum amikacin concentration curve (AUC) was 27 mg h/L (13–46), significantly lower than the AUC after intravenous administration: 396 mg h/L (paired $p < 0.01$). Serum bioavailability was 2.8 % (2.1–4.8), not significantly different, wether or not, active humidification was present. Without humidification, two patients experienced tracheal tube obstruction possibly related to amikacin nebulization, whereas this never happened in case of active humidification.
CONCLUSIONS. Nebulization of up to 60 mg/Kg appeared feasible in intubated patients. Systemic toxicity is very unlikely to occur as serum AUC appeared well below those observed after intravenous infusion. Active humidification may prevent tracheal tube obstruction without significant changes in bioavailability and thus in probable alveolar drug deposition.
REFERENCES.
1. Goldstein I et al. Am J Respir Crit Care Med. 2002; 166: 1357–81.
2. Ehrmann S et al. Int Care Med. 2008; 34: 755–62.

0782
PHARMACOKINETICS OF COLISTIN AFTER THE ADMINISTRATION OF A LOADING DOSE OF 4.5 MU OF COLISTIN METHANESULFONATE (CMS) IN OBESE CRITICALLY ILL PATIENTS VERSUS REGULAR WEIGHT CRITICALLY ILL PATIENTS

M.E. Pachón-Ibáñez[1], F. Doboco[2], A. Gutiérrez-Valencia[3], A. Puppo-Moreno[4], A. Gutiérrez-Pizarraya[5], R. Ruiz-Valderas[3], E. Fernández-Hinojosa[4], C. Milara-Ibáñez[5], S.R. Leal-Noval[4], P. Moreno-Martínez[3], R. Amaya[4], C. Rosso[6], L. López-Cortes[7], J.M. Cisneros[5], J. Garnacho-Montero[4]

[1]Hospital Universitario Virgen del Rocío/Instituto de Biomedicina de Sevilla (IBiS), Infectious Diseases, Sevilla, Spain, [2]University Hospital Macarena, Microbiology, Sevilla, Spain, [3]University Hospital Virgen del Rocío/Instituto de Biomedicina de Sevilla (IBiS), Infectious Diseases, Sevilla, Spain, [4]University Hospital Virgen del Rocío, Critical Care and Emergency, Sevilla, Spain, [5]University Hospital Virgen del Rocío, Infectious Diseases, Sevilla, Spain, [6]University Hospital Virgen del Rocío, Pharmacology Clinical, Sevilla, Spain, [7]University Hospital Virgen del Rocío, Sevilla, Spain
INTRODUCTION. Although it is known the difficulty of the antimicrobial dosing in obese patients so far there are no pharmacokinetic studies of colistin for these kinds of patients.
OBJECTIVES. The aim of the study is to describe the pharmacokinetics (PK) of CMS of two different critically ill populations of patients, obese vs. regular weight using a loading dose of 4.5 MU of CMS.
METHODS. A clinical trial (MagicBullet) is in progress at the ICUs of Virgen del Rocío University Hospital, Seville, Spain, since January of 2012. Critically ill patients who met the following inclusion criteria were enrolled: Age ≥ 18 years, >96 h of mechanical ventilation, ventilator-associated pneumonia, CPIS > 4, tracheo-bronchial culture, non-pregnant women, and normal renal function. The following data was collected: gender, age, weight, height, APACHE II score, body max index (BMI), plasma creatinine (Cr) and creatinine clearance (CL_{CR}) on days 1 (1st CMS dose) and 3 (7th CMS dose), using the Cockcroft–Gault formula. Patients were treated with a loading dose of CMS of 4.5 MU (360 mg, 1 h infusion, followed by 3 MU (240 mg) every 8 h (30 min infusion). Venous blood samples were drawn after the loading dose at 1, 2, 4, and 8 h after the beginning of the CMS infusion and at the steady state (7th dose) at 1, 4, and 8 h after the beginning of the CMS infusion. All blood samples were immediately chilled and centrifuged, and the plasma was stored at − 70 °C until assayed. Plasma colistin concentrations were determined by a HPLC–MS/MS method. A non-compartmental analysis of data was done (PKSolver 2.0). Due to the small number of cases in each group, only descriptive analyses were performed (SPSS 15.0).
RESULTS. Seven patients have been included: four in the obese group and three in the regular weight group. Demographic, clinical, and PK data are shown in Tables 1, 2 and 3. No deterioration of renal function was observed during the study in any of the patients included. With regard to the PK at the steady state important differences in the maximum plasma colistin concentrations (total colistin and unbound colistin) 1.89 vs. 3.42 and 0.62 vs. 1.13 were found between obese and regular weight patients.
CONCLUSIONS. Although a higher number of patients have to be included to confirm these results, it looks like the actual dose regimen used for the treatment of obese patients is suboptimal. If these results are confirmed with the inclusion of more patients a higher dose of colistin for obese patients should be considered to treat severe infections caused by MDR bacteria.
GRANT ACKNOWLEDGMENT. MagicBullet is a project funded by the European Union–Directorate General for Research and Innovation through the Seventh Framework Program for Research and Development (Grant Agreement 278232) and has been running since January 1st 2012 (duration 36 months).

Table 1 Demographic and clinical data

No	APACHE II Score	Demographic data					
		Gender	Age (year)	Weight (kg)	Height	BMI	Diagnosis
1	25	M	68	120	174	39.6	VAP
2	19	M	47	80	178	25.3	VAP
3	17	M	76	110	175	35.9	VAP
4	26	F	67	90	150	40	VAP
5	24	F	57	57	168	20.2	VAP
6	12	M	54	100	185	29.2	VAP
7	15	M	68	150	164	55.7	VAP

Table 2 Renal function data

No	Plasma creatinine (mg/dL)		Creatinine clearance (mL/min)	
	Creatinine level Day 1	Creatinine level Day 3	Creatinine clearance Day 1	Creatinine clearance Day 3
1	0.67	0.54	179.10	222.22
2	0.75	0.75	137.78	137.78
3	1.36	1.29	71.90	75.80
4	0.51	0.39	152.08	198.88
5	0.9	1.16	62.06	48.15
6	0.79	0.99	151.20	120.65
7	0.47	0.35	319.15	428.57

Table 3 Pharmacokinetics data

		Loading dose (1st dose)		Steady state (7th dose)	
		Obese	Regular weight	Obese	Regular weight
Total colistin	Cmax (μg/mL)	2.71	2.62	1.89	3.42
Total colistin	Tmax (h)	2.00	2.00	2.00	4.00
Total colistin	T1/2 (h)	12.37	9.11	14.89	21.38
Total colistin	AUC0–8 h (μg/mL × h)	14.57	15.37	10.99	22.75
Unbound colistin	fCmax (μg/mL)	0.94	0.87	0.62	1.13
Unbound colistin	fTmax (h)	2.00	2.00	2.00	4.00
Unbound colistin	fT1/2 (h)	10.67	8.72	14.59	20.79
Unbound colistin	fAUC0-8 h (μg/mL × h)	4.87	5.06	3.56	7.51

0783
EVALUATING THE AMBU® ASCOPE™ 3 SYSTEM FOR BRONCH-ALVEOLAR LAVAGE AND BRONCHIAL WASH IN INVASIVELY VENTILATED PATIENTS

B.A. McGrath[1], A.M. Bentley[1]

[1]University Hospital of South Manchester, Acute Intensive Care Unit, Manchester, UK
INTRODUCTION. The Ambu® aScope™ 3 system is a novel disposable bronchoscope (5.5 mm maximum external diameter with 2.2 mm suction/working channel) which connects to a separate portable aView™ monitor. The range of tip movement is 150° upwards and 130° downwards. We report the first observations in practice of this system for bronch-alveolar lavage (BAL) and bronchial wash (BW) in invasively ventilated patients.
OBJECTIVES. To evaluate the functionality and ease of use of the aScope™ 3 system.
METHODS. 20 CE-marked aScope™ three bronchoscopes and two aView™ monitors were supplied by Ambu® for the evaluation. Patients receiving invasive mechanical ventilation via endotracheal or tracheostomy tube who had a clinical indication for either BAL

or BW were included. Ten procedures were carried out by each author, both of whom are experienced bronchoscopists. A 5-point Likert scale was used (1 fully disagree, 3 neutral, 5 fully agree) to evaluate functionality and ease of use of the system, applied to ten statements concerning functionality (see Table 1). Number of major lung segments visualised (out of 6) along with overall impressions of performance (satisfactory: yes/no) and whether the operator felt that the aScope™ three system could replace our existing non-disposable system (yes/no) were also recorded.

RESULTS. All 20 procedures (7 BW only, 4 BAL only, 9 both BW and BAL) were completed between 26/2/13 and 9/4/13 by the 2 authors (10 procedures each). Data were explored using the Shapiro–Wilk test and the results (mean Likert scores for functionality and ease of use) shown in Table 1. All six major segments of the bronchial tree were visualised for all endoscopies. Overall functionality and performance was rated as satisfactory in all procedures and the system was felt to be able to replace the existing non-disposable system in 19 procedures.

Table 1 Mean Likert scores for functionality

	Mean	95 % CI
Easy to advance bronchoscope	4.9	4.6–5.1
Easy to inject via working channel	4.6	4.3–4.8
Ease of performing suction	4.4	4.1–4.8
Suction capability adequate	4.4	4.1–4.7
Functionality of working channel satisfactory	3.7	2.9–4.5
Image quality adequate to perform procedure	4.7	4.4–4.9
Lens clearing was easy	4.3	4.0–4.6
Lightweight handle was a benefit	3.2	2.0–3.4
Easy to record images on aView™ monitor	2.7	1.7–3.6

CONCLUSIONS. Our evaluation by two independent, experienced clinicians has demonstrated that the Ambu® aScope™ three system was assessed as easy to use and performs satisfactorily for BAL and BW in invasively ventilated critically ill patients. The system is portable and easy to assemble and position at the bedside and although the monitor display is smaller and of lower resolution (800 × 480 pixel, 8.5 in. colour TFT LCD screen) than our non-disposable 'stack' system, image quality was good enough to perform the procedures. The suction capabilities were comparable to our non-disposable bronchoscope. The lowest scores were in relation to the functionality of the aView™ monitor, which had pre-release software installed. The lightweight handle was not perceived as a particular advantage in this evaluation, although this did not affect the overall impressions of functionality. The disposable nature of the system may have infection control and cost advantages.

GRANT ACKNOWLEDGMENT. Ambu® provided a donation to our ICU research fund for conducting this evaluation.

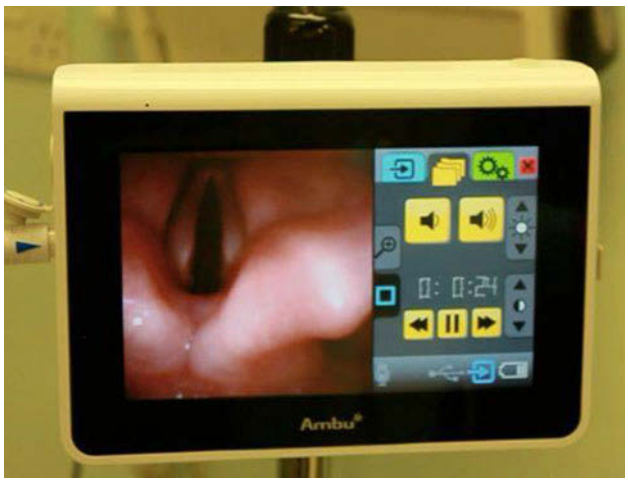


Fig. 1 A view monitor

Fig. 2 A scope 3 and a view monitor

0784
INSPIRATORY FLOW BIAS AND THE INCIDENCE OF VAP

J.A.D.S.B. Salge[1], C.M. Neiva[1], M.S. Volpe[2]

[1]University of Franca, Franca, Brazil, [2]Federal University of Triangulo Mineiro, Uberaba, Brazil

INTRODUCTION. Ventilator-associated pneumonia (VAP) is the most frequent nosocomial infection in the intensive care unit (ICU). VAP prolongs the duration of mechanical ventilation (MV) and hospital stay, and increases mortality. Since the 1980s, there has been increasing evidence that ventilator settings can produce a flow bias that may clear or embed mucus during MV. The ratio between the peak inspiratory flow (PIF) and the peak expiratory flow (PEF), or the difference between the two, are described as possible critical factors that may influence secretion movement.

OBJECTIVES. To investigate in mechanically ventilated patients the effect of flow bias on the incidence of VAP.

METHODS. Participated in the study patients under MV for <24 h and that were expected to continue under MV for >72 h. Exclusion criteria were: suspicion of pneumonia prior to MV, aspiration during intubation and severe hypoxemia. Respiratory mechanics were registered at the time of entering in the study and every each 12 h during the first 60 h using $CO_2SMO^{®}$ monitor. VAP diagnostic was made based on new or worsening radiographic infiltrates and leukocytosis or leucopenia, fever or purulent sputum. Total time of MV, ICU and hospital lengths were registered. Patients that developed VAP were classified as VAP group and patients that did not presented VAP as control group. Statistical analysis was performed using unpaired t-test or Mann–Whitney and a two-way analysis for repeated measures as appropriate.

RESULTS. 30 patients were included in the study, 17 of them presented VAP (Table 1). Although the differences were not significant, the VAP group compared to the control group was older and had a slightly higher APACHE score. Total time of MV, ICU and hospital lengths were significantly higher in the VAP group compared to the control.

Table 1

	Age (years)	APACHE	Total MV time (days)	ICU length stay (days)	Hospital length stay (days)
VAP (n17)	60±18	13,8±5,1	12 [8-21]*	15 [9-23]*	21 [9-42]*
Control (n13)	50±18	12,2±5,0	6 [5-8]	7 [5-10]	11[6-21]

Data are expressed as mean±DP or median [IQR].
*P<0,05 vs control.

There were no differences between the PIF/PEF ratio ($p = 0.080$) and the PEF − PIF difference ($p = 0.110$) during the first 60 h of MV between the two groups. The mean ± SE PIF/PEF ratio and PEF − PIF difference were in the VAP group 1, 5 ± 0.5 and − 14.1 ± 1.5 and in the control 1.6 ± 0.7 and − 17.5 ± 1.4, respectively.

CONCLUSIONS. These preliminary results of a current study suggest that an inspiratory flow bias during the first 60 h of MV does not influence the incidence of VAP. Both groups, VAP and control, were ventilated with a PIF/PFE ratio much higher than the threshold described in the literature—PIF/PFE ratio > 0.9—which, theoretically, is sufficient to move mucus towards the lungs. The negative mean PEF–PIF differences, in both groups, also indicated that secretion was moved deeper into the lungs. As expected, patients with VAP had longer time of MV, ICU and hospital length.

0786
EFFECT OF DIFFERENT TRACHEAL TUBE CUFF MATERIAL, SHAPE AND SIZE FOR FLUID LEAKAGE ACROSS THE CUFF

N. Harayama[1], K. Nagata[1], Y. Isa[1], M. Nakamura[2], T. Endo[1], A. Kanazawa[1], H. Arai[1], S. Nihei[1], K. Aibara[1], M. Kamochi[1], T. Sata[2]

[1]University of Occupational and Environmental Health, University Hospital, Critical Care Medicine, Kitakyushu-City, Japan, [2]University of Occupational and Environmental Health, Department of Anesthesiology, Kitakyushu-City, Japan

INTRODUCTION. Micro aspiration of oral secretions across the tracheal tube cuff is one of the most important causes of ventilator-associated pneumonia (VAP). The formation of folds in the inflated cuff is the major cause of micro aspiration and the cuff material and shape affect the leakage volume across the cuff. Although there are various types of tracheal tubes, the effects of each tube size to cuff leakage are not clear. Even if the internal diameter is same size, cuff size and shape are different greatly in each tube type.

OBJECTIVES. To compare fluid leakage across the cuff in each different tracheal tube type and size in a bench-top model.

METHODS. We compared fluid leakage across the cuff in a bench-top model. Tracheal tubes were inserted into a vertical artificial glass trachea with 22 mm internal diameter. Four different types of tracheal tubes with secretion drainage, SealGuard Evac with polyurethane cuff (Covidien), TaperGuard Evac (Covidien) with polyvinylchloride cuff, Hi-Lo Evac with polyvinylchloride cuff (Covidien), Portex BlueLine SACETT with polyvinylchloride cuff (Smiths Medical), and five different sizes (6.5, 7.0, 7.5, 8.0, 8.5 mm internal diameter) of each tube type were used in this study. Intracuff pressure was set at 25 cmH_2O. 20 ml dyed water was applied above the unlubricated tube cuff and fluid leakage was measured at 2 min. Each experiment was carried out five times. Data were shown as mean ± SEM (ml).

RESULTS. Figure 1 showed the relation between the tube size and fluid leakage across the cuff in different tube types. Tube size to minimize the cuff leakage was different by each tube type. Taper shape cuff with both polyvinylchloride and polyurethane showed similar property.

CONCLUSIONS. Each tracheal tube has its own property in the view of cuff fluid leakage. These results indicate that the best tracheal tube size to prevent VAP is different in each tube type. We need to pay attention not only to tube internal diameter but also to cuff size in each tracheal tube to avoid trachea–cuff size mismatch.

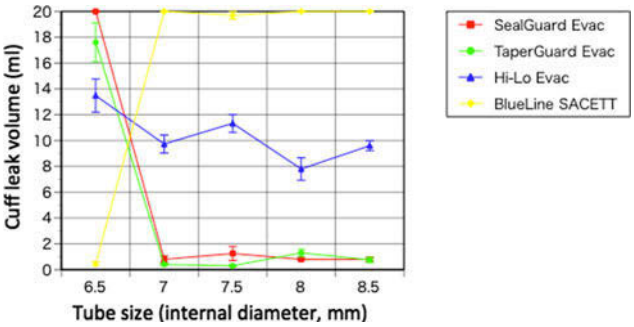


Fig. 1

0787

ABILITY OF SINGLE TRANSPULMONARY THERMODILUTION TO DETECT TIME COURSE VARIATION OF EXTRAVASCULAR WATER AFTER BRONCHO-ALVEOLAR LAVAGE

M. Dres[1,2], J.-L. Teboul[1,2], L. Guerin[1,2], N. Anguel[1], V. Amilien[1], M.-P. Clair[1], A. Grüner[1], C. Richard[1,2], X. Monnet[1,2]

[1]Hôpital de Bicêtre, Hôpitaux universitaires Paris-Sud, Assistance Publique - Hôpitaux de Paris, Service de réanimation médicale, Le Kremlin Bicêtre, France, [2]EA4533, Université Paris-Sud, Le Kremlin Bicêtre, France

INTRODUCTION.
Measuring extravascular lung water (EVLW) is of great interest in critically ill patients with lung injury. Nevertheless, the accuracy of single transpulmonary thermodilution to detect small short-term changes has not been fully investigated.

OBJECTIVES. To test the ability of single transpulmonary thermodilution to detect variations of EVLW induced by a broncho-alveolar lavage (BAL).

METHODS. Single transpulmonary thermodilution (PiCCO device) were repeated to estimate the time-course variation of EVLW before and after BAL in mechanically ventilated patients. The values of three thermodilution measurements were averaged at the following steps: before BAL, after BAL, 1 h after BAL, 2 h after BAL, 4 h after BAL and 6 h after BAL.

RESULTS. 22 patients suspected of ventilator-associated pneumonia were included. For performing the BAL, the airway inspiratory flow was decreased from 60 to 40 L/min but the others ventilator settings were not modified during all the study period: mean tidal volume 420 ± 44 mL and mean positive end expiratory pressure 8 ± 4 cmH_20 (ANOVA). An average of 194 ± 25 mL of saline solution was injected for the BAL and the averaged amount of fluid left in the lung was estimated to be 136 ± 37 mL. The pulmonary vascular permeability index was 2.31 ± 1.14 before performing the BAL. EVLW increased significantly from 11.9 ± 3.9 to 14.8 ± 5.1 mL/kg between before and after the BAL. After the BAL, the time-course of EVLW was as followed: 13.9 ± 4.8, 13.5 ± 4.4, 13.3 ± 5.2, 12.6 ± 3.8 mL/kg for 1 h after BAL, 2 h after BAL, 4 h after BAL and 6 h after BAL respectively. The differences between before and after BAL values of EVLW were significant until the 2nd hour included.

CONCLUSIONS. Single transpulmonary thermodilution is able to detect small short-term variation of extra-vascular lung water in patients with ventilator-associated pneumonia.

0788

ASSESSING FEASIBILITY AND COMPLIANCE WITH A VENTILATOR-ASSOCIATED PNEUMONIA BUNDLE IN AN ACADEMIC EMERGENCY DEPARTMENT

L.A. DeLuca[1], L.R. Stoneking[1], K. Grall[1], A. Vira[1], J. Rosell[1], J. Gonzaga[1], W. Larson[1], A. Westergard[1], B. Munzer[1], L. Cox[1], K.R. Denninghoff[1]

[1]University of Arizona, Department of Emergency Medicine, Tucson, USA

INTRODUCTION. Ventilator associated pneumonia (VAP) is a nosocomial infection associated with significant morbidity and mortality. VAP is pneumonia not present at the time of intubation that develops greater than 48 h after the initiation of mechanical ventilation. In the ICU setting, straightforward patient care interventions have been shown to reduce the incidence of VAP. Currently, no studies exist examining the effects of these interventions on VAP prevention in the Emergency Department (ED).

OBJECTIVES. To determine compliance rates with VAP prevention bundle elements for patients intubated in the ED. To determine the effect of ongoing feedback from nurse leaders on VAP bundle compliance.

METHODS. An observational prospective design was used to identify consecutive patients intubated in the ED at an urban Level I trauma center. Core measures were chosen based on previous studies demonstrating their effectiveness in preventing VAP in the ICU setting. An electronic order set was implemented for ventilated patients. Core measures assessed were: head of the bed elevation, oral care, periodic suctioning, minimizing sedation, sedation vacations, daily spontaneous breathing trials, and stress ulcer/DVT prophylaxis. Data was obtained from nursing documentation. Nursing staff was given periodic feedback to increase compliance. Data was cross-checked with a clinical nursing supervisor who directly supervised nursing staff for compliance.

RESULTS. A total of 107 intubated patients were enrolled in the study: 72 patients in Phase I and an additional 35 patients in Phase II. Overall compliance data is depicted in Table 1. Nursing feedback between Phases I and II resulted in improved compliance with head of bed elevation and subglottic suctioning.

CONCLUSIONS. It is feasible to implement a VAP prevention bundle in the ED. Compliance can be improved with core measures with nursing feedback. Some bundle aspects (e.g., sedation vacation) may not be appropriate for ED patients. Further research is necessary to clarify the degree to which documentation, compliance, and differences in patient acuity may impact bundle compliance.

REFERENCE(S). 1. Carr BG, Kaye AJ, Wiebe DJ, Gracias VH, Schwab CW, Reilly PM. Emergency department length of stay: a major risk factor for pneumonia in intubated blunt trauma patients. J Trauma. 2007; 63: 9–12. 2. Eckert MJ Davis KA, Reed L, et al. Ventilator-associated pneumonia, like real estate: location really matters. J Trauma. 2006; 60: 104–110. 3. Green RS, McIntyre J. The provision of critical care in emergency departments at Canada. J Emerg Trauma Shock. 2011; 4(4): 488–493. 4. Miller RS, et al. Systems initiatives reduce healthcare-associated infections: a study of 22,928 device days in a single trauma unit. J Trauma. 2010; 68(1): 23–31.

Table 1 Compliance with VAP bundle core measures

	Phase I (N = 72)	Phase II (N = 35)	Total (N = 107)
VAP prevention measure	N (%)	N (%)	N (%)
Head of bed elevated 30-45 degrees	35 (49)	22 (63)	57 (53)
Oral care with chlorhexidine	39 (54)	19 (54)	58 (54)
Periodic subglottic suctioning	28 (39)	14 (40)	42 (39)
Titrated sedation/analgesia	18 (31)	5 (14)	23 (24)
Daily sedation vacation	0	0	0
Spontanous breathing trial	0	0	0
GI or DVT prophylaxis	1	0	1
Soft restraints	6 (8)	NR	–

0789

CLINICAL PULMONARY INFECTION SCORE AS A SCREENING TOOL IN VENTILATORY INDUCED PNEUMONIA

S. Basyiğit[1], N. Akgun[1], M. Karaman[1], B. Bilgili[2]

[1]Fatih Sultan Mehmet Teaching and Research Hospital, Istanbul, Turkey, [2]Marmara University, Istanbul, Turkey

INTRODUCTION. Ventilatory induced pneumonia (VIP) is the leading nosocomial infection in ICU, causing high mortality and increased health care costs. Early diagnosis and treatment reduces mortality and morbidity.

OBJECTIVES. Our aim is, to test the efficacy of Clinical Pulmonary Infection Score (CPIS) in early diagnosis in VIP.

METHODS. CPIS parameters; body temperature, leukocyte count and morphology, volume and character of tracheal secretions, arterial oxygenation, pulmonary infiltration on chest X-ray, progression of pulmonary infiltration, microbiological culture results were recorded. At admission, basal CPIS using the first five parameters of CPIS, after 48 h, using seven parameters with the tracheal aspirate culture results, CPIS were calculated. As the mechanical ventilation continued, tracheal aspirate (ETA) cultures were done every 3 days and CPIS were calculated. Patients were grouped as VIP(+) and VIP(−).

RESULTS. Basal CPIS were similar in two groups ($p > 0.05$). 48 h and 5th day CPIS were significantly higher in VIP(+) group ($p < 0.01$). CPIS calculated before the diagnosis of VIP, were significantly higher in VIP(+) group ($p < 0.01$).

CONCLUSIONS. Serial CPIS calculations can help the clinician in early diagnosis and treatment of VIP.

REFERENCE(S). 1. Zilberberg MD, Shorr AF. Ventilator-associated pneumonia: the clinical pulmonary infection score as a surrogate for diagnostics and outcome. Clin İnf Dis. 2010; 51(S1): S131–S135. 2. Lauzier F, Ruset A, Cook D, Dodek P, Albert M, Shorr AF, Day A, Jiang X, Heyland D. The value of pretest probability and modified clinical pulmonary infection score to diagnose ventilator-associated pneumonia. J Crit Care. 2008; 23: 50–57

0790

VARIATIONS IN THE PEEP IN PATIENTS UNDERGOING MECHANICAL VENTILATION FIBROBRONCHOSCOPY

J.C. Frías[1], R. Fernández Fernández[1], M.E. Yuste Ossorio[1], L. Peñas Maldonado[1], R. Ramírez Puerta[1]

[1]H.U. San Cecilio, Medicina Intensiva, ICU, Granada, Spain

INTRODUCTION. Fibrobronchoscopy (FBC) is the diagnostic and therapeutic procedure of choice in the explorations of the airway and sampling. In mechanically ventilated patients it is assumed that the intrathoracic pressure is increased, and more specifically in PEEP during its realization. The usual recommendation is to reduce or remove the PEEP during FBC, to avoid the risk of barotrauma and/or hemodynamic changes.

OBJECTIVES. To assess the behavior of PEEP during performance of FBC in patients requiring mechanical ventilation.

METHODS. A single-center, longitudinal prospective inclusion of patients admitted to the ICU, mechanical ventilation and FBC have required during the period 02/01/11 to 10/30/11. The ventilators were the XL model (Draguer) and the model BFP180 bronchoscope (Olympus: 4.9 mm diameter). Informed consent was obtained from all patients. The volume controlled ventilation mode, with Vt 8.6 ml/kg and frequency as required; alarms adjusted to avoid a higher peak inspiratory pressure of 37 hPa. Total PEEP was measured without changing the PEEP imposed before the procedure; FBC was located at the distal end of the artificial airway, in carina and input right and left main bronchus.

RESULTS. A total of 26 patients, mean age 61.8 ± 13.73 years, mean APACHE 24.0 ± 7.48, 73.9 % were men, the main reason about doing FBC, was reviewing airway (52.27 %), bronchoalveolar lavage (BAL) of 27.7 % for culture, the resolution of atelectasis accounted for 13.64 %. 69.5 % of patients, carried an endotracheal tube (TOT) No. 8 and tracheostomy tube No. 9 the rest. The X ± SD with 95 % of the PEEP imposed, total PEEP and delta PEEP with TOT No. Eight were 7.33 ± 2.60 (6.99–7.67), 11.18 ± 3.38 (10.74–11.62) and 1.57 ± 1.83 (1.33–1.81) respectively. To cannula No. 9 values were 6.67 ± 3.25 (6.07–7.26), 8.73 ± 3.15 (8.15–9.31) and 0.28 ± 0.87 (0.12–0.44) respectively. There appeared no complications and hemodynamic study was discontinued in 11.6 % of hypoxemia.

CONCLUSIONS. The increase in PEEP during performance of FBC in mechanically ventilated patients is statistically significant but not clinically relevant and has not conditioned by barotrauma or hemodynamic complications in our series.

Severe trauma: 0791–0804

0791

THE DEPENDENCE OF INFECTIOUS COMPLICATIONS FROM THE TRAUMA SEVERITY

O. Peicheva[1], Y. Nalapko[1], O. Iegorov[1], A. Nekrylov[1]

[1]Lugansk State Medical University, Anesthesiology, Intensive Care and Emergency Medic, Lugansk, Ukraine

INTRODUCTION. During the last years significantly improved volume and condition of intensive care patients with severe combined trauma. Nevertheless the general level of survival of such patients is not increased. It is due to the development in the affected infectious complications (IC), sepsis and multiple organ failure [1]. The development of IC depends on several factors: tissue damage, bleeding, insufficient perfusion of organs, changes in the immune system under the influence of injury.

OBJECTIVES. The purpose of the research was compare the incidence of IC and treatment outcome of patients with combined injury depending on the severity of the injury and the need to use adrenomimetic-drugs support (ADS).

METHODS. The study included 93 victims with combined injury aged 18–60 years. Depending on the severity of the concomitant injury by the Injury Severity Score (ISS) victims divided into two groups:

Group 1: 16–25 points for ISS included 45 victims,

Group 2: 48 patients with 26–40 points by the ISS.

RESULTS. Duration of stay the affected group 1 in the ICU ranged from 4 to 31 days. The course of traumatic disease in nine affected (23.7 % of the victims) was complicated by the development of cardiac arrhythmias, pneumothorax, gastrointestinal hemorrhage, vascular thrombosis. Three patients (7.9 %) from 8 to 14 day stay in the ICU having IC (0.16 per patient), which did not lead to death. The course of traumatic disease in three affected from group 1 (7.9 % of all victims) death. Two victims were died in a non-IC, and one: a result of pneumonia against fat embolism. Injured of group 2 had in the ICU from 5 to 28 days. Among the non-IC leading brain stem dislocation (34.1 % of the non-IC), irregular heartbeat (17.1 %), non-cardiogenic pulmonary edema (14.6 %), pneumothorax (12.2 %). Total number of complications: 128, the number of IC: 87 of 48 (67.9 %) patients. Almost all patients had a combination of two or more IC (1.98 per patient).

Number of patients who need of infusion of ADS in group 1: 6 (13.3 % of total number of victims of this group), in group 2: 21 (43.8 %).

The obtained data testify that among patients who needed ADS number of IC per victim higher than in the relevant group (Group 1: 1.0 in patients with ADS versus 0.16 in patients who did not need ADS, two group: 2.4 vs 1.98). Mortality rate among patients with ADS significantly higher than in patients without the need for these drugs (group 1: 16.7 vs. 8.9 %, group 2: 57.1 vs. 35.4 %).

CONCLUSIONS. These results are due not only to the severity of injuries received, but, in our opinion, the influence AD of the development of IC.

REFERENCES. 1. The Russian Association of Specialists in surgical infections. Sepsis in the beginning of the XXI century. Classification, clinical-diagnostic concept and treatment. Pathologic diagnosis: a practical guide. Moscow: Academy of Medical Sciences, 2004, 130.

0792

A NOVEL PIG MODEL FOR ARDS FOLLOWING BLUNT CHEST TRAUMA AND PULMONARY CONTUSION

N. Carvalho[1], S. Hammermüller[1], S. Huckauf[1], J. Ramm[1], S. Kobelt[1], K. Noreikat[1], A. Beda[2], A. Reske[1], A. Carvalho[3], H. Wrigge[1], A. Reske[1]

[1]University of Leipzig, Anesthesiology and Intensive Care Medicine, Leipzig, Germany, [2]Federal University of Minas Gerais, Department of Electronic Engineering, Belo Horizonte, Brazil, [3]Federal University of Rio de Janeiro, Carlos Chagas Biophysics Institute, Rio de Janeiro, Brazil

INTRODUCTION. Pulmonary contusion (PC) is common after blunt chest trauma and can result in acute respiratory distress syndrome (ARDS). PC usually causes inhomogeneous lung injury, challenging conventional approaches to mechanical ventilation (MV). Experimental studies in large animals, specifically addressing ARDS after PC, are rare and mostly used bolt-shot devices to cause chest contusion. The injury severity produced by these models, however, is affected by uncontrolled factors limiting between- and within-study comparison.

OBJECTIVES. To develop a safe, simple and more standardized model in pigs to study ARDS due to unilateral PC and describe pulmonary and systemic effects of PC and conventional MV during 24 h.

METHODS. Five pigs (37 ± 3 kg) were anesthetized, tracheotomized and received MV. Arterial and venous catheters were placed under sterile conditions; cefuroxime 750 mg was given IV q6 h. Unilateral PC was induced by dropping a 10 kg weight from a height of 1.85 m through a plexiglass tube perpendicularly to a predefined location of the right chest. Following PC, chest tubes were inserted on both sides, conditions comparable to an ICU were established and the animals received MV for 24 h (ARDSnet protocol, lower PEEP table). Cardiorespiratory parameters were recorded, pulmonary ventilation was monitored by electrical impedance tomography (EIT) and lung aeration and mass were quantified by CT, before (pre-PC), 90 min after PC (post-PC) and then every 4 h. For preliminary statistical analyses of changes in parameters over time we used the Friedman-test. Significant changes ($P < 0.05$) are marked (*) in the Table.

RESULTS. Changes in selected parameters are shown as median and interquartile (25th–75th) range in the Table. MV after PC was associated with increasing lung mass (Mlung), lung collapse (%Mnon), pulmonary shunt (Qs/Qt), hypoxemia and hypercapnia. While %Mnon started to increase progressively in both lungs directly after PC, a different pattern was observed for PaO_2/FiO_2, shunt, and distribution of ventilation: During the first hours after PC, PaO_2/FiO_2 and Qs/Qt remained comparable to pre-PC values. Eight hours of MV after PC, clinical signs of a severe systemic inflammatory response developed (fever, tachycardia, vasoplegia) and Qs/Qt and PaO_2/FiO_2 worsened progressively. EIT data suggested a shift of ventilation to the non-injured lung post-PC, followed by gradual redistribution back to the injured lung after 12 h.

TABLE 1 A

	Pre-PC	Post-PC	4 h	8 h	12 h	16 h	20 h	24 h
System. vascular resistance (dyn s cm^{-5})*	1,200 (990–2,815)	1,780 (1,305–2,735)	1,810 (1,705–2,470)	1,510 (1,255–1,605)	1,190 (1,030–1,530)	1,260 (810–1,523)	840 (785–1,315)	800 (690–1,455)
Heart reate (bpm)*	96 (76–115)	77 (72–87)	68 (65–79)	88 (74–97)	100 (77–125)	110 (99–128)	97 (87–129)	122 (112–141)
Temperature (°C)*	36 (36–37)	37 (36–38)	37 (36–39)	37 (38–40)	39 (38–40)	41 (39–42)	41 (40–43)	42 (41–42)
PaO_2/FiO_2 (mmHg)*	443 (335–520)	414 (316–452)	419 (379–497)	430 (332–492)	315 (84–457)	263 (63–319)	76 (63–217)	81 (78–182)
Shunt (%)*	14 (10–15)	12 (11–17)	8 (6–10)	10 (6–12)	11 (7–31)	14 (11–42)	31 (16–35)	26 (22–30)
$PaCO_2$ (mmHg)	44 (38–50)	42 (33–52)	48 (43–52)	47 (43–53)	51 (45–58)	47 (46–52)	51 (50–52)	53 (49–63)
Lung mass (g)	500 (452–599)	556 (528–635)	503 (490–655)	510 (487–697)	560 (462–728)	613 (526–717)	538 (517–686)	588 (529–761)
Nonaerated lung mass (%)*	11 (7–16)	43 (12–58)	49 (19–63)	45 (20–53)	54 (21–61)	59 (31–68)	62 (40–72)	54 (38–60)

CONCLUSIONS. We characterized a simple and highly reproducible model to mimic complications (e.g. PC and ARDS) after unilateral blunt chest trauma. Our preliminary results suggest that MV after PC is associated with progressive respiratory failure and systemic inflammation. Cardiorespiratory functions deteriorated only delayed after PC, which may offer a time window for studying individualized treatment options.

GRANT ACKNOWLEDGEMENT: This work was supported in part by a grant from B.Braun to Andreas Reske.

0793

ASSESSING THE MICROCIRCULATION USING SIDE STREAM DARK FIELD MICROSCOPY IN A PORCINE MODEL OF COMPLEX HAEMMORRHAGIC SHOCK AND TRAUMATIC INJURY

S.D. Hutchings[1,2], J. Wendon[2], S. Watts[1], E. Kirkman[1]

[1]Defence Science and Technology Laboratory, Porton Down, UK, [2]King's Health Partners, London, UK

INTRODUCTION. Haemorrhagic shock is the leading cause of preventable death following traumatic injury. However, our understanding of the effects of haemorrhage on the microcirculation is incomplete. A clearer understanding of this vital area may assist in the development of better haemodynamic targets to aid resuscitation following traumatic injury.

OBJECTIVES. To describe the changes in the porcine microcirculation, during shock and resuscitation in a model of complex injury and haemorrhage, using Side stream Dark Field (SDF) video microscopy.

METHODS. The study was conducted with authority under the Animals (Scientific Procedures) Act 1986. Ten terminally anaesthetised large white pigs were instrumented and subjected to a blast injury or no blast. All animals received a limb injury via a captive bolt gun followed by a controlled haemorrhage (maximum 35 % blood volume). Following a 30 min shock phase resuscitation was commenced using either blood products or crystalloid to maintain hypotensive blood pressure targets for 60 min. Thereafter blood products were administered to all animals to maintain normotension. Sublingual SDF video microscopy was performed at the following time points: pre injury, shock, hypotensive resuscitation, normotensive resuscitation and late normotensive resuscitation. Video sequences were analysed, to determine values for vessel density and flow.

RESULTS. Seven animals survived to the conclusion of the experiment. Both perfused vessel density (PVD) and Microvascular Flow Index (MFI) fell from baseline (14.34 ± 1.01 mm/mm^3) (3) to a nadir during the shock phase (4.10 ± 0.87 mm/mm^3) (0.8, 95 % CI 0.2–1.8) before recovering during hypotensive resuscitation (8.49 ± 1.46 mm/mm^3) (2.38, 95 % CI 0.11–2.94) normotensive resuscitation (11.86 ± 4.68 mm/mm^3) (2.8, 95 % CI 2.0–2.8) and late normotensive resuscitation (10.51 ± 0.72 mm/mm^3) (3, 95 % CI 2–3). All values, except normotensive resuscitation were significantly reduced from baseline ($p < 0.01$). Heterogeneity index increased significantly from baseline (0.39 ± 0.19) to a peak during the shock (1.95 ± 0.27 $p < 0.01$) and hypotensive resuscitation (1.67 ± 0.73 $p < 0.01$) phases reflecting marked variations in flow at these time points. This heterogeneity was less marked during normotensive resuscitation (0.42 ± 0.23) and late normotensive resuscitation (0.44 ± 0.16) ($p = 0.91$, 0.84 vs baseline).

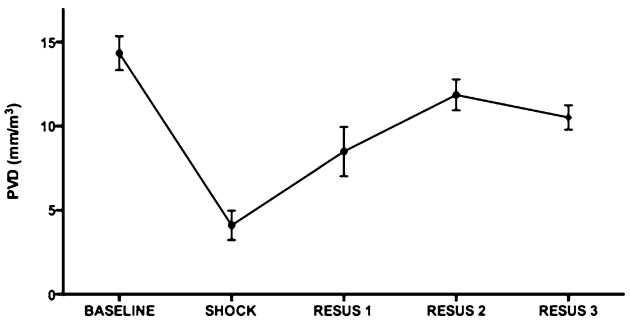


Fig. 1 Perfused vessel density

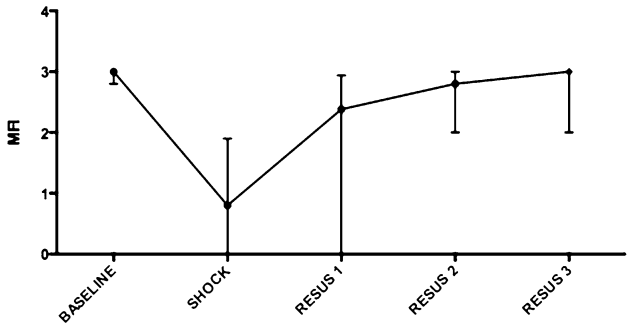


Fig. 2 Microvascular flow index

CONCLUSION. We have demonstrated, for the first time in a porcine model of complex haemorrhagic shock and traumatic injury, the feasibility of SDF video microscopy in assessing the microcirculation. Clear microvascular dysfunction occurred in shock which was only partially restored during hypotensive resuscitation. There was a significant degree of heterogeneity within the microcirculation during shock and early resuscitation. Ongoing work will address the effects of differing resuscitation strategies and examine the relationship between systemic haemodynamic variables and the microcirculation.

0794
VENTILATOR ACQUIRED PNEUMONIA IS INCREASED IN A TRAUMA VICTIMS: A PROSPECTIVE AUDIT IN A LONDON MAJOR TRAUMA INTENSIVE CARE UNIT

S. Soni[1], K. Gaskell[1], S. Sultana[1], A. Jepson[1], M. Stotz[1]

[1]St Mary's Hospital, Intensive Care Unit, London, UK

INTRODUCTION. Ventilator associated pneumonia (VAP) is a common problem in mechanically ventilated patients on the intensive care unit (ICU) with significant burden to patients and the health care system. After becoming a level 3 major trauma centre (MTC), the number of trauma patients admitted to our ICU increased significantly. VAP can be difficult to distinguish from aspiration pneumonia, which can be especially challenging in the trauma setting where gastric aspiration frequently occurs.
OBJECTIVES. We investigated whether the incidence of VAP in patients increased after becoming a MTC. We also examined whether early onset pneumonias in trauma patients could be due to aspiration pneumonia rather than VAP.
METHODS. We prospectively recorded data on all patients intubated for >48 h in our 16 bedded ICU over 6 months before and after being designated a MTC. Diagnosis of VAP was made according to American Thoracic Society criteria. Microbiology results and antibiotic usage were included. No changes in practice or guidelines took place between observation periods. Ethical approval was waived by the local audit committee.
RESULTS. After becoming a MTC, VAP rates on the ICU significantly increased from 11.9 % (8/69) to 30.3 % (46/152) ($p < 0.001$). VAP occurred in trauma patients more often accounting for 52.2 % (24/46), explaining this rise and patients suffering from traumatic brain injury were most at risk. Conversely proportions of patients from other specialities developing VAP were either comparable or improved after becoming a MTC: vascular (37.5 vs. 32.6 %, $p = 0.79$), medical patients (12.5 vs. 8.7 % $p = 0.18$) and general surgery (25 vs. 4.3 %, $p = 0.04$). Microbiology results indicated that in trauma patients with early VAP (<5 days), pathogens more commonly associated with community acquired infection or aspiration pneumonia were present in 50 % of cases vs. 23.1 % in late VAP (>5 days).
CONCLUSIONS. Since becoming an MTC, our VAP rates have increased significantly due to trauma. This has been mirrored in other trauma centres. Causes for increased incidence of VAP in trauma patients may result from traumatic endo-tracheal tube insertion with dirty airways. However as our microbiology results suggest, a predominant factor for this increase may be due to aspiration pneumonia complicating early infections, making the diagnosis of VAP difficult. To minimise the burden for health care, the definition for VAP in trauma cases may need to be revised. This will impact not only on treatment and choice of antimicrobials, but finally on outcomes.
REFERENCES. 1. American Thoracic Society. Am J Respir Crit Care Med. 2005; 171: 388–416. 2. Michetti P et al. Ventilator-associated pneumonia rates at major trauma centers compared with a national benchmark. J Trauma Acute Care Surg. 2012; 72(5): 1165–73. 3. Raghavendran K et al. Aspiration-induced lung injury. Crit Care Med. 2011; 39(4): 818–826.

0795
AGREEMENT BETWEEN ARTERIAL AND PERIPHERAL VENOUS LACTATE LEVELS IN TRAUMA PATIENTS

M. Talayero Gimenez de Azcarate[1], C. García Fuentes[1], M. Chico Fernández[1], J.C. Montejo González[1], E. Alted López[1]

[1]Hospital 12 de Octubre, Madrid, Spain

INTRODUCTION. Elevated arterial lactate level is a sensitive and valuable marker of systemic hypo perfusion. The arterial lactate value traditionally has been considered the standard for lactate determination. Access to arterial blood may be difficult, particularly in the early stages of resuscitation when arterial line access has yet to be established.
OBJECTIVE. The aim of this study was to evaluate the agreement between arterial (L_{art}) and peripheral venous lactate (L_{ven}) values in trauma patients.
METHODS. This study was conducted at a trauma ICU in an urban university hospital. Prehospital and baseline data were collected prospectively from June until December 2012. The study cohort consisted of trauma patients older than 14 years admitted to the trauma ICU. Eligible patients had an arterial blood sample drawn from an arterial puncture and a venous sample from an in situ peripheral venous line, as close to simultaneously as possible at admission. Blood was drawn into blood gas syringes and analysed using ICU based analysers (GEM premier 3000) calibrated according to standard quality assurance protocols.
The quantitative variables are presented as mean ± SD or as median and 25th–75th percentile range. Differences between variables were evaluated using intraclass correlation coefficient. Additionally, the Bland–Altman test was used to determine the bias and the limits of agreement between L_{ven} compared to L_{art}. The results from both test are expressed as bias ± SD (95 % confidence interval), and this confidence interval represents the limits of agreement. The study was approved by ethical committee.
RESULTS. We included a total of 204 samples from 102 patients. Most (70 %) were male, and the mean age was 41.79 ± 18.09 years. The median ISS was 21.5 (9–32) and GCS 13 (7–15). The mean arrival time to hospital was 68 ± 30 min. Hypothermia (<35 °C) was found in a 24.5 % and low blood pressure (SBP < 90 mmHg) in a 18.6 %. The mean haemoglobin was 11.8 ± 2.8 g/dl.
The mean lactate value was 2.41 ± 1.76 for L_{art} and 2.81 ± 1.75 for L_{ven}. The intraclass correlation coefficient using a consistency definition was 0.947 (95 % CI 0.921–0.964) and using an absolute agreement definition was 0.934 (95 % CI 0.865–0.963). In the Bland–Altman test, the mean difference was 0.4 ± 0.78 (95 % CI 0.247–0.557). 52 patients (51 %) had abnormal arterial levels (≥2). In this subgroup the intraclass correlation coefficient was 0.966 (95 % CI 0.94–0.981) using a consistency definition and 0.967 (95 % CI 0.943–0.981) using an absolute agreement definition.
CONCLUSIONS. In the study group, venous levels tended to be higher than arterial levels. A strong linear correlation between arterial and peripheral venous lactate levels was found. This agreement was higher in the subgroup with abnormal arterial values. Therefore, peripheral venous lactate determination could be a useful tool during early resuscitation in trauma patients.

0796
DECREASE IN HAEMOGLOBIN LEVELS WITH PREHOSPITAL FLUID RESUSCITATION AS A PREDICTOR OF HAEMORRHAGIC SHOCK IN TRAUMA PATIENTS

C. Taconet[1], T. Gauss[2], M. Raux[3], S. Hamada[1], A. Harrois[1], J. Duranteau[1], S. Figueiredo[1]

[1]Hôpital Bicêtre, Département d'Anesthésie-Réanimation, Le Kremlin Bicêtre, France, [2]Hôpital Beaujon, Département d'Anesthésie-Réanimation, Clichy, France, [3]Hôpital Pitié Salpêtrière, Département d'Anesthésie-Réanimation, Paris, France

INTRODUCTION. Haemorrhage is the most common preventable cause of death in trauma patients[1]. Fluid resuscitation (FR) is often necessary to maintain adequate tissue perfusion while surgical procedure and/or angioembolization are pending. FR may lead to a decrease in haemoglobin level ([Hb]) by haemodilution. We hypothesized that for a given volume of FR, an important drop in (Hb) could be predictive of the occurrence of a haemorrhagic shock (HS) in trauma patients.
OBJECTIVES. To evaluate the clinical relevance of the variation of capillary [Hb] (DeltaHb = $[Hb_{prehosp}] - [Hb_{hosp}]$), measured by HemoCue® in the prehospital setting and upon admission to the hospital, to predict HS in trauma patients.
METHODS. Prospective multicenter observational cohort study including all trauma patients admitted for primary multiple trauma between January 2010 and January 2013. Patients with cardio-respiratory arrest, osmotherapy or missing data on (Hb) were excluded. The population was divided into two groups: 1/HS (≥4 Red Blood Cells (RBC) during the first 24 h), and 2/« control » (CL): no HS. Clinical and biological data, DeltaHb and ratio of DeltaHb to 1,000 mL of FR ($DeltaHb_{1000} = DeltaHb \times 1{,}000/FR$) were compared between these two groups. The groups were compared by using a Kruskall–Wallis test (associated with a post hoc test if positive). ROC curves were made for $DeltaHb_{1000}$ parameter to assess its ability to predict the occurrence of HS (Youden index and area under the curve (AUC) tested against the value 0.5).
RESULTS. 635 patients were included in the study.

Table 1

	HS n = 109	CL n = 526
FR (mL)	1,000 (700–1,500)***	500 (500–1,000)
$Hb_{prehosp}$ (g dL^{-1})	13 (11–14)***	14 (13–15)
Hb_{hosp} (g dL^{-1})	10 (9–12)***	13 (12–15)
DeltaHb (g dL^{-1})	2 (1–4)***	1 (0–2)
$DeltaHb_{1000}$ (g dL^{-1})	2 (1–3)***	1 (0–3)
ISS	34 (21–45)***	13 (8–21)
Serum Lactate (mM)	4.1 (2.3–6)***	1.8 (1.2–2.6)
Number of RBC in the emergency room	2 (0–4)***	0
Fibrinogen (g L^{-1})	1.5 (1.1–1.9)	2.3 (2–2.7)

Values are expressed as median (interquartile range), *** $P < 0.001$ for each parameter compared in the two groups HS vs CL.
The AUC for $DeltaHb_{1000}$ and HS is 0.62 (0.58–0.67) ($P < 0.0001$ against the value of 0.5). The $DeltaHb_{1000}$ predicted the transfusion of more than four RBC during the first 24 h with a sensitivity of 57 %, a specificity of 57 %, a VPP of 21 % and a VPN of 86 % for a cut-off of 2.
CONCLUSIONS. In trauma patients, decrease in haemoglobin levels with prehospital fluid resuscitation is not a powerful predictor of HS. Adding this parameter to a score which includes other factors could increase its performance.
REFERENCE(S). 1. Kauvar. Crit Care. 2005; 9 (Suppl 5): S1–9.

0797
STRUCTURED TRAUMA COURSES ARE VITAL FOR TEAM EFFECTIVENESS IN INTERPROFESSIONAL TRAUMA CARE

M. Hultin[1], J. Ragnarsson[1], M. Härgestam[2], M. Jacobsson[3], C. Brulin[2]

[1]Umeå University, Dept of Surgical and Perioperative Sciences, Umeå, Sweden, [2]Umeå University, Dept of Nursing, Umeå, Sweden, [3]Umeå University, Dept of Social Work, Umeå, Sweden

INTRODUCTION. A successful teamwork is built on a multitude of factors. In health care in general and trauma care in particular, the performance of the team determines the outcome for the patient. Several different aspects of trauma care have previously been studied

(1, 2) but evidence is still lacking on what key factors to look for to compose a good team and what background factors equips trauma care personnel with tools to manage and rescue severely injured patients.
OBJECTIVES. In this study the impact of education, experience and previous trauma training on team performance is examined. The hypothesis was that both education and experience would benefit teams as measured by the Clinical Teamwork Scale (CTS) (3).
METHODS. Observational study, examining the impact of different background factors on trauma team performance. Participants: 105 health care workers in 18 different teams
SETTING. An emergency room in a tertiary trauma hospital where in situ trauma team trainings were video recorded. Patient simulator (SimMan 3G) preprogrammed with an hypovolemic ISS 25 injury. Three observers independently watched and scored the different teams according to CTS. The observers had previously been trained to use CTS by watching and scoring other trauma team training sessions in a structured CTS-training course. Background information (e.g. previous education and work experience) from the participants was collected in a questionnaire distributed before the trauma team training session. The team CTS-scores were then correlated to education, work experience and earlier trauma training sessions. Rater agreement was analyzed with Intra class correlation (ICC) and Spearman's Rho.
RESULTS. The inter-rater agreement as measured by ICC was 0.67. ATLS education for trauma leaders was associated with improved CTS scores in several domains and the total CTS score. Neither work experience for the leader, nor for the total trauma team, was associated with better scores in any of the domains. Previous trauma team training was correlated to a slight improvement in CTS.
CONCLUSIONS. A solid base in theoretical and basic skills is a key element for successful leadership of interprofessional trauma teams when handling a simulated trauma case.
REFERENCE(S). 1. Holcomb JB, Dumire RD, Crommett JW, Stamateris CE, Fagert MA, Cleveland JA, Dorlac GR, Dorlac WC, Bonar JP, Hira K, et al. Evaluation of trauma team performance using an advanced human patient simulator for resuscitation training. J Trauma. 2002; 52: 1078–1085 [discussion 1085–1076]. 2. Westli HK, Johnsen BH, Eid J, Rasten I, Brattebø G. Teamwork skills, shared mental models, and performance in simulated trauma teams: an independent group design. Scand J Trauma Resusc Emerg Med. 2010; 18: 47. 3. Guise JM, Deering SH, Kanki BG, Osterweil P, Li H, Mori M, Lowe NK. Validation of a tool to measure and promote clinical teamwork. Simul Health. 2008; 3: 217–223.

0798
QUALITY OF LIFE AND REHABILITATION COST FOLLOWING INTENSIVE CARE UNIT STAY IN MULTIPLE TRAUMA PATIENTS

P. Stergiannis[1], G. Fildisis[1,2], G. Intas[3], T. Katostaras[2], T. Katsoulas[1,2], V. Zidianakis[1], N. Kosta[1], G. Baltopoulos[1,2]

[1]General Hospital 'Agioi Anargyroi', ICU, Athens, Greece, [2]University of Athens, Nursing School, Athens, Greece, [3]General Hospital 'Agios Panteleimonas', ICU, Nikea, Greece
INTRODUCTION. Road accidents cause multiple traumas to patients, which leads to serious problems to their Quality of Life (QoL) status. In order to regain their original QoL status, they have to pay high financial cost.
OBJECTIVES. To investigate changes in QoL in multiple trauma patients during a period of 2 years after discharge and how these changes affect financial cost of rehabilitation.
METHODS. This is a prospective observational study of 85 multiple trauma patients due to a road traffic accident and with an ICU stay of more than 24 h (2009–2011) from one Intensive Care Unit (ICU) of one urban hospital in Athens, Greece.
RESULTS. Age, family status, living together with other people, monthly household income and presence of a traumatic brain injury are important determinants of patients' QoL after hospital discharge. QoL after hospital discharge was initially low, but increased over time. Increased monthly household income and absence of traumatic brain injuries were associated with an improved EQ VAS score. Frequency of severe problems in mobility, self-care, usual activities, pain/discomfort and anxiety/depression decreased over time. Financial cost of rehabilitation was initially high, but decreased over time particularly for male patients. Family status, presence of children, monthly household income, presence of traumatic brain injuries and EQ VAS are determinants of financial cost of rehabilitation.

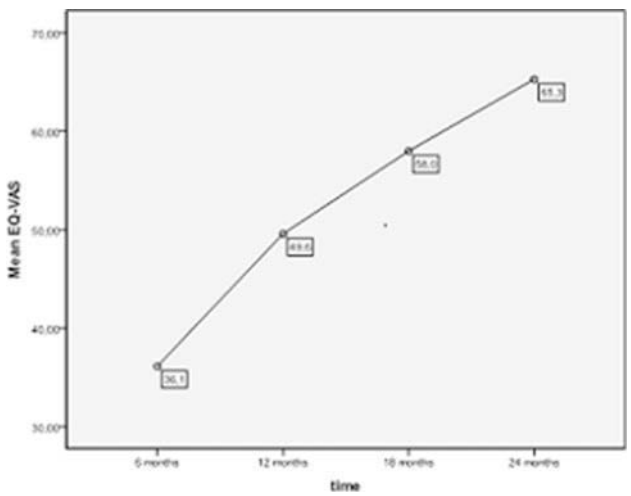


Fig. 1 EQ VAS score at 6, 12, 18, 24 months after hosp

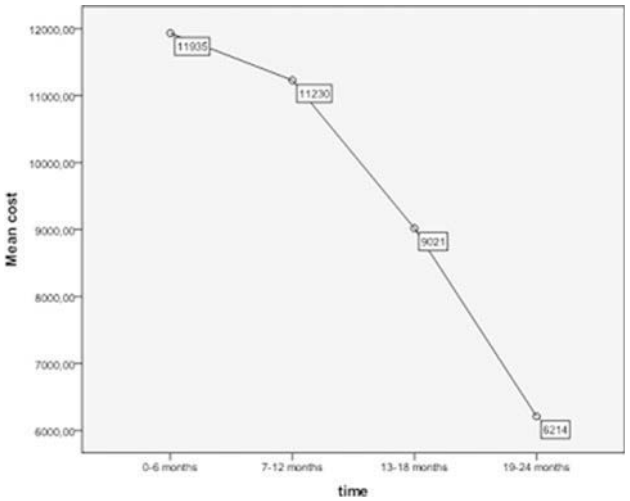


Fig. 2 Rehabilitation cost

CONCLUSIONS. Among patients with multiple traumas due to a road traffic accident, QoL improved up to 2 years after discharge, but nowhere near pre-accident levels. Financial cost of rehabilitation is high but steadily declines over time.
REFERENCE(S). 1. Alves AL, Salim FM, Martinez EZ, et al. Quality of life in trauma victims six months after hospital discharge. Rev Saude Publica. 2009; 43: 154–160.
2. Fildisis G, Zidianakis V, Tsigou E, et al.: Quality of life outcome of critical care survivors eighteen months after discharge from intensive care. Croat Med J. 2007; 48: 814–821.
3. Tøien K, Bredal IS, Skogstad L, et al. Health related quality of life in trauma patients. Data from a one-year follow up study compared with the general population. Scand J Trauma Resusc Emerg Med. 2011; 19:2.

0799
THE FUNCTIONAL PROGNOSIS OF TRAUMATIC BRAIN INJURY: EARLY HAEMODYNAMIC MONITORING COMPARED WITH OTHER FACTORS

R. Gutierrez Rodriguez[1], M.P. Benitez Moreno[1], F.J. De Miguel Aparicio[1], M.D. Arias Verdu[1]

[1]Carlos Haya Regional University Hospital, Critical Care Unit, Malaga, Spain
OBJECTIVES. To determine the importance of blood pressure and heart rate after hospital admission in relation to morbidity and mortality of patients who have suffered traumatic brain injury (TBI).
METHODS. A retrospective observational analytical study of patients with severe TBI associated with multiple trauma or just isolated TBI admitted between December 2009 and December 2012, 150 patients. Exclusion factors: none.
The following variables were studied: APACHE II > 15 on admission, AIS severity scale on admission, GCS score <5 on admission, GCS on discharge (<8, 10–15, 15), Data Bank score, sex, age, prolonged stay, days of mechanical ventilation, percentage of infectious or respiratory complications, pupillary reactivity, hypocapnia (CO_2 < 35), haemoglobin values <10, concentrations of plasma sodium <140 mEq/L, raised intracranial pressure at any time during the evolution, decompressive surgery, percentage of patients with severe functional disability on discharge, and percentage of patients with a good recovery 6 months after discharge.
RESULTS. Various groups were analyzed according to their heart rate (<50, 51–70, 71–90, 91–100, >100) and systolic blood pressure (SBP): (<90, 91–160, 161–180, 181–190, 191–200, >200).
No significant differences were found concerning mortality or the functional result on discharge when the APACHE II was >15, or when the GCS score on admission was <5. There were significant differences when the initial CT severity according to the Data Bank was ≥3 (40 % mortality versus 10 %; P = 0.001) and when the SBP was >180 (60 vs. 4 % mortality; P < 0.05).
The multivariate analysis showed that hypertension was an independent risk factor for death (OR 2.15; P = 0.001; 95 % CI 1.4–3.7).
CONCLUSIONS. Patients with hypertension on arrival at hospital have a higher risk of death, particularly when the SBP > 180.

0800
NATIONAL SURVEY OF THE USE OF PROPHYLACTIC INFERIOR VENA CAVA FILTERS IN MAJOR TRAUMA CENTRES

A. Revill[1], T. Clark[1], R. Appelboam[1]

[1]Derriford Hospital, Intensive Care, Plymouth, UK
INTRODUCTION. Major trauma patients are at high risk of venous thromboembolic (VTE) disease [1] whilst often having contraindications to both mechanical and pharmacological thrombo-prophylaxis. Inferior Vena Caval filters (IVCFs) have been designed to reduce fatal pulmonary embolus when anti-coagulation is inappropriate or ineffective. Despite the publication of non-UK national guidelines [2], there is no high quality evidence supporting prophylactic IVCFs in major trauma.
OBJECTIVES. To establish a consensus opinion on the use and indications of prophylactic IVCF in major trauma patients.
METHODS. Following a literature search we designed a simple, 12 question survey on the use of prophylactic and therapeutic IVCFs in major trauma patients. Each of the 22 UK Major Trauma Centres (MTCs) was contacted by phone or email. The survey was completed by Consultant members of each department. Multiple attempts were made over a 5-month period to optimize recruitment rate.

RESULTS. From the 22 UK MTCs surveyed we received 18 responses (overall response rate 81 %). Of these MTCs, 44 % (8) use prophylactic IVCFs in major trauma patients. Only three centres are aware of guidelines for the use of IVCFs in trauma patients. The majority of centres (70 %) use retrievable filters. All filters are sited by a radiologist and remain in situ for a variable period from 2 weeks to 3 months.
An analysis of the subjective responses suggests that the most common IVCF indication is traumatic brain injury in patients who are considered at high VTE risk. The consensus opinion on which trauma patients are considered to be at high risk of VTE are those with prolonged immobilization from spinal injuries, pelvic and long bone fractures. Other factors suggested include massive transfusion, injury severity and previous medical history.
The majority of UK centres using prophylactic IVCFs report no complications but specify the small numbers being inserted as explanation. Two centres report venous congestion and one reported IVC thrombus.
CONCLUSIONS. Only a minority of UK MTCs use prophylactic IVCFs in major trauma patients. It is difficult therefore to form a consensus opinion. The primary indication is traumatic brain injury and a high risk of VTE. With observational data suggesting possible high rates of VTE despite IVCFs [3], and no randomised control trials examining there use, further research is required before their use as a routine intervention.
REFERENCE(S). 1. Geerts WH, Code KI, Jay RM, Chen E, Szalai JP. A prospective study of venous thromboembolism after major trauma Engl J Med. 1994; 331(24): 1601–6.
2. Rogers FB, Cipolle MD, Velmahos G, Rozycki G. Management of venous thromboembolism in trauma patients. http://www.east.org. 3. Sarosiek et al. Indications, complications and management of inferior vena cava filters: the experience in 952 patients at an academic hospital with a level 1 trauma center. JAMA Intern Med. 2013; 173(7):513.

0801
BLUNT CHEST TRAUMA. POSTTRAUMATIC RESPIRATORY DISTRESS

M.T. Bouza[1], A.V. Aller[2], L. Seoane[2], R. Gómez[3], P. Fernández[3], I. Astola[2], A.I. Suarez[2], V. Rodriguez[2], S. Pita[2]

[1]Complexo Hospitalario Universitario A Coruña, Intensive Care Unit, A Coruña, Spain, [2]Complexo Hospitalario Universitario A Coruña, A Coruña, Spain, [3]Complexo Hospitalario Universitario Ourense, Ourense, Spain
INTRODUCTION. Acute respiratory distress syndrome (ARDS) is an infrequent but serious complication of chest trauma (ChT). It has been associated with a mortality rate of nearly 50 % and a considerable morbidity among survivors. ARDS aetiology and pathophysiology are not widely understood so its early clinical signs may be misinterpreted leading to a considerable delay in correct diagnosis and appropriate treatment. Correctly understanding ARDS epidemiology is an important factor for correctly identifying patients who are at risk of developing it.
OBJECTIVES. To evaluate de characteristics of chest trauma patients admitted in the ICU, ARDS incidence in those patients and its associated variables.
METHODS. We conducted a 2-year period retrospective observational study including 190 consecutive polytraumatized patients admitted in our unit. 73 patients were finally selected for the analysis. Analyzed variables were: age, sex, mechanism of injury, presence of previous pulmonary disease, Sequential Organ Failure Assessment (SOFA) Score, type of trauma (open/close); presence of pneumothorax, haemothorax or flail chest; number of rib fractures, presence of pulmonary contusion, non-thoracic associated trauma (spine, head, bone and abdominal); mechanical ventilation (whether invasive or not) requirement and its indication.
RESULTS. Mean patient age was 48.5 years, male sex predominance (82.2 %). Main trauma aetiology was car accident (43.8 %) and the most frequent specific lesions were pulmonary contusion (72. 6 %), haemothorax (49.3 %) and pneumothorax (43.8 %). Rib fracture number median was 4. SOFA score median was 3.

Table 1 Characteristics of patients with chest trauma

	N	%	Mean	SD	Median	Min	Max
Age	73		48.5	19.7	47	14	85
Male gender	60	82.2 %					
Car accident	32	43.8 %					
SOFA score			3.5	2.5	3	0	12
Haemothorax	36	49.3 %					
Neumothorax	32	43.8 %					
Flail chest	12	16.4 %					
Pulmonary contusion	53	72.6 %					
Costal fractures			4.5	3.8	4	0	15

Non-chest trauma associated injuries incidence were: spine (20 patients, 27.4 %); head (35 pts, 47.9 %), bone fracture (39 pts, 53.4 %) and pelvic fracture (21 pts, 28.2 %). 20 patients (27.4 %) required mechanical ventilation on admission being respiratory failure the main indication for it. 18 (24.7 %) of the 73 patients included developed ARDS. Variables significantly associated with ARDS development were higher SOFA values ($p < 0.001$), number of costal fractures ($p < 0.006$), haemothorax presence ($p < 0.005$ 95 % CI 1.5–1.83), pneumothorax presence ($p < 0.0005$; 95 % CI 2.8–43.7), flail chest presence, and pulmonary contusion.

Table 2 Chest trauma and ARDS development

	ARDS presence		ARDS absence		p		
	Mean	SD	Mean	SD			
Age	52.2	24.6	47.3	18	0.441		
SOFA score	5.5	3	2.8	1.9	0.001		
Costal fractures	7	4.3	3.7	3.3	0.006		
	N	%	*N*	%	*p*	OR	95 % CI
Haemothorax	14	39 %	22	61 %	0.005	5.2	1.5–18.05
Neumothorax	15	47 %	17	53 %	0.0001	11.17	2.8–43.7
Flail chest	7	58.3 %	5	41.7 %	0.003	6.3	1.7–23.8
Pulmonary contusion	18	34 %	35	66 %	0.182	2.4	0.6–9.01

Variables independently associated with ARDS development were a SOFA value higher than 3.5 (OR 1.84, 95 % CI 1.2–2.67); presence of more than four rib fractures(OR 1.2, 95 % CI 0.975–1.474) and pneumothorax presence (OR 20.5, 95 % CI 2.87–146.3).

Table 3 Logistic regression model: ARDS development

	B	p	OR	95 % CI	
				Lower	Upper
Neumothorax	3.02	0.003	20.49	2.871	146.3
SOFA score	0.613	0.001	1.845	1.27	2.67
Rib fractures	0.181	0.086	1.198	0.975	1.474

CONCLUSIONS. Chest trauma associated ARDS is directly related to: severity (assessed by SOFA score) and associated thoracic injuries, being independent predictor a higher SOFA score on admission and the presence of pneumothorax.
REFERENCE(S). White TO, Jenkins PJ, Smith RD, Cartlidge CW, Robinson CM. The epidemiology of posttraumatic adult respiratory distress syndrome. J Bone Joint Surg Am. 2004; 86: 2366–76.

0802
THE USING OF METHOXYFLURANE AS ANALGESIC IN PATIENTS WITH ANKLE INJURY

A. Konkayev[1], S. Baimagambetov[2], M. Sainov[2], N. Bekmagambetova[2], A. Ahmetova[2]

[1]Astana Medical University, Anaesthesiology and Intensive Care, Astana, Kazakhstan, [2]Institution of Traumatology and Orthopaedics, Astana, Kazakhstan
INTRODUCTION. Effective and efficient pain management in the ankle injury is an urgent medical problem.
OBJECTIVES. To conduct a comparative analysis of the effectiveness of analgesia by methoxyflurane (Penthrox, Medical Developments International Ltd., Australia) and the opioid analgesic tramadol in patients with ankle injury.
METHODS. It was a prospective cohort study of 49 patients with ankle injury admitted to the emergency department of Institution of Traumatology and Orthopaedics in the period from November 2012 to May 2013. After obtaining written informed consent and local ethic committee approval 49 adults (aging 32–45, ASA I–II) were randomly allocated to the T and P group. Randomization distribution of patients in the group with tramadol ($n = 24$, T) or Penthrox ($n = 25$, P) were determined by random numbers. Monitored blood pressure, heart rate, recorded comorbidities and patient satisfaction analgesia. Pain was assessed using a visual analog scale at admission, at the 5-th, 15-th, 30-th and 60-th min after using of analgesia. Data were processed unpaired t-test and Fisher's test with Statistica 6.0 (StatSoft Inc., Tulsa, OK, USA); $p < 0.05$ significant. Data are mean ± SD.
RESULTS. Comparing the groups found that pain at the fracture was lower in the group P. Thus, after 5 min after inhalation methoxyflurane pain was stopped, and the pain was estimated at 0–1 points. However, patients in group T, the intensity of pain during this observation period amounted to 4–5. Patients who used the Penthrox HR and RR was significantly lower in all periods of study. Patient satisfaction drug for pain relief compared with other analgesics in the group T was 3.1 ± 0.3 points, which was significantly lower than in group P: 4.5 ± 0.1 points ($p < 0.01$, by Fisher's test). The comparative characteristics of side effects in the group T 100 % of patients reported pain of intramuscular injection, reducing in this way the satisfaction of analgesia. In group P 12 % of patients did not suit a sweet taste in the mouth and the smell of the Penthrox.
CONCLUSIONS. The use of methoxyflurane patients with ankle injury was safe and effective for pain, stabilize hemodynamics and respiratory systems, reducing patient anxiety when performing painful procedures.
GRANT ACKNOWLEDGMENT. The study was carried out with the financial support of the Medical Developments International Ltd., Australia.

0803
CEREBRAL FAT EMBOLISM SYNDROME IN SEVERE TRAUMA PATIENTS

A. Sawamura[1], H. Yamamoto[1], Y. Ono[1], D. Miyamoto[1], T. Wada[1], Y. Yanagida[1], M. Sugano[1], M. Hayakawa[1], S. Gando[1]

[1]Hokkaido University Graduate School of Medicine, Division of Acute and Critical Care Medicine, Department of Anesthesiology and Critical Care Medicine, Sapporo, Japan
INTRODUCTION. Fat embolism syndrome (FES) is an uncommon condition in trauma patients. FES is characterized by both major and minor findings following long-bone trauma. It is important to diagnose FES in patients with multiple injuries. The clinical manifestations can include cerebral and respiratory dysfunction and a subcutaneous rash. An initial asymptomatic interval of 12–72 h is followed by pulmonary, neurological and dermatologic changes. We herein describe five cases of cerebral FES in six FES patients who had experienced severe trauma.
METHODS. This was a retrospective consecutive six cases series from the database at Hokkaido University Hospital.
RESULTS. Six patients were identified in this series (four females and two males), with a mean age of 45.8 years. All patients had been injured in high-energy motor vehicle accidents. The average Injury Severity Score was 22.5. An initial asymptomatic interval of about 3 h was followed by the deterioration of the consciousness level (in four of the six cases). The mean acute physiology and chronic health evaluation score was 25.8. Brain MRI was performed in five cases, and multiple high signal intensity areas were present in DWI and T2-weighted and FLAIR images. The average ICU stay and hospital stay were 15.5 days and 32.3 days, respectively.
DISCUSSIONS. The standard trauma evaluation often fails to document the occurrence of FES. Head CT scans are often normal. MRI of the brain is the most sensitive test available, and correlates well with the clinical severity of the brain injury.
CONCLUSIONS. It is important not to miss the diagnosis of FES in severe trauma patients. If the deterioration of consciousness occurs, brain MRI should be performed as soon as possible.

0804
EFFECTS OF CUMULATIVE FLUID BALANCE ON MECHANICAL VENTILATION AND ICU LENGTH OF STAY IN ISOLATED CHEST AND OR TRAUMATIC BRAIN INJURY PATIENTS

K. Patel[1], K. Idris[1]

[1]Al Ain Hospital, Intensive Care Unit, Al Ain, United Arab Emirates

INTRODUCTION. Many studies have shown positive fluid balance is associated with negative outcome of patients with sepsis, acute kidney injury and ARDS patients. Here we present retrospective observation of effects of cumulative fluid balance on chest trauma and traumatic brain injury patients on MV days and ICU length of stay.

AIM. The primary aim of our study is to find that fluid over load is associated with increased length of ventilator days?

The secondary aim is to find association of fluid on length of ICU and hospital stay?

Inclusion criteria:

Patient admitted to ICU after chest trauma or traumatic brain injury from ER

-Minimum length of stay 5 days in ICU

-Patient did not have any surgical intervention

-Patient did not associated other than brain and chest injuries

-Not associated with any co morbidities

Exclusion criteria:

Patient stayed <5 days in ICU

Patients admitted from ER and transferred to ward and later deteriorated and shifted to ICU

Patient went any surgical intervention procedure during hospital stay

Patients died or transfers out of hospital later

Patient with any co existing disease.

METHODS. Total 50 patients have been included which have trauma or traumatic brain injury over a period of 1 year. Among this ten patients were discharged earlier than 5 days, 3 patients transfer to other hospital and four patient died during hospital or ICU stay. After exclusion criteria, only 33 patients out of 50 patients have been included. Severity of injury is calculated with Revised Trauma Score. All patient have sedation with RASS sedation score and sedated with midazolam and fentanyl. Cumulative fluid balance observed at day 2 and 7 days after ICU admission. It was co related with total days of mechanical ventilation and ICU length and hospital of stay.

RESULTS. Average RTS was 6.66. So it was divided in two groups with RTS 6.66 and below (group A) and another score greater than 6.66 (group B).Each group further subdivided according to severity (Table 1).

Table 1

GROUP A	RTS $\leq$ 5.966
RTS $\leq$ 6.66	RTS > 5.9666
GROUP B	RT S $\leq$ 7.55
RTS > 6.66	RTS > 7.55

Severity of injury was co related with length of mechanical ventilation and length of ICU and Hospital stay. Also cumulative fluid was calculated at D2 and D7 correlated with severity of injury. Patient divided according to D7 fluid balance and cut off value was 9,314 ml which was Mean value at D7. It was correlated with length of mechanical ventilation and length of ICU and hospital stay. (Table 2).

Table 2

Group	A (RTS $\leq$ 6.66) ml ($\pm$SD)	B (RTS > 6.66) ml ($\pm$SD)	P value
D2 balance	5,719 $\pm$ 2,940	5,318 $\pm$ 3,134	0.4779
D7 balance	10,615 $\pm$ 4,534	8,090 $\pm$ 5,556	0.8725
MV days	8.58 $\pm$ 5.83	8.76 $\pm$ 4.28	0.3779
ICU LOS	12.83 $\pm$ 4.28	11.92 $\pm$ 4.85	0.5384
HOS LOS	25 $\pm$ 6.94	30 $\pm$ 11.32	0.7883

In group A, It was further divided in two sub groups according to severity and compared D2, D7 cumulative balance, MV days, ICU and Hospital LOS. (Table 3).

Table 3

			P value
Group A(RTS $\leq$ 6.66)	RTS $\leq$ 5.966	RTS > 5.966	0.3674
D2 Balance	6,034 $\pm$ 2,549	5,719 $\pm$ 2,940	0.9315
D7 Balance	10,418 $\pm$ 4,901	10,768 $\pm$ 4,524	0.8861
MV Days	8.8 $\pm$ 3.19	8.42 $\pm$ 2.43	0.8331
ICU LOS	11.2 $\pm$ 3.27	14 $\pm$ 4.76	0.2550
HOS LOS	24.4 $\pm$ 8.41	25.6 $\pm$ 6.06	0.8030

Group A also divided on basis of fluid received at day 7 and compared with MV days, ICU and Hospital length of stay.

CONCLUSION. Trauma patients with isolated traumatic brain injury or chest injury like lung contusion who did not go any surgical intervention, cumulative fluid balance at D2 and D7, was not associated with significant length of mechanical ventilation, ICU and hospital length of stay.

Renal replacement therapies: 0805–0818

0805

TIMING AND DOSE IN SEPSIS RELATED ACUTE KIDNEY INJURY REQUIRING CONTINUOUS RENAL REPLACEMENT THERAPY

P. Cárdenas[1], J. Sabater Riera[1], V.F. Corral Velez[1], G. Moreno-Gonzalez[1], J. Ballus Noguera[1], J.M. Vazquez Reveron[1], V. Alonso Juste[1], M. Koborzan-Popoviciu[1], X.L. Perez-Fernández[1]

[1]Hospital Universitari de Bellvitge, Critical Care Department, Barcelona, Spain

CONTEXT. Acute kidney injury (AKI) is a serious complication of critical illness that is associated with high morbidity and mortality; one half of the newly onset AKI patients in the intensive care unit (ICU) are reported to be attributed to sepsis. Continuous renal replacement therapy (CRRT) has been an integral part of critical care and is considered an established treatment modality for patients with AKI. Nevertheless, optimal timing for CRRT initiation in AKI is unknown.

OBJECTIVES. To demonstrate that early initiation of CRRT in terms of time from ICU admission improves prognosis in patients with septic shock (SS) and AKI.

METHODS. This is a retrospective cohort study of 197 SS patients with advanced AKI (AKIN 2–3) at ICU admission (baseline day 0), requiring CRRT within the ICU first 5 days. Patients were initiated on CRRT based on clinical criteria. We classified patients in early group (<48 h) and late group (>48 h) based on time from ICU admission to CRRT. Severity of AKI was defined by AKIN score (urine output and serum creatinine). Prescribed renal dose effect was evaluated and patients were classified in four different groups: low dose (<20 ml/kg/h), renal dose (20–35 ml/kg/h), high dose (35–50 ml/kg/h), and very high dose (>50 ml/kg/h). Excluded: Patients with chronic renal failure, patients on CRRT previously (last 2 weeks), and patients who were on CRRT <24 h. Statistical analysis: Kaplan–Meyer 90 days survival analysis was performed to demonstrate differences between both groups (early vs late). Statistical significance was set at $p < 0.05$.

RESULTS. The baseline patient characteristics were: early vs late: population size (133 vs 64); mean age (60.3 vs 63.9 years); SOFA score (14 vs 13); APACHE II (29 vs 27); ICU admission lactate (6.4 vs 4.4 mmol/l); ICU admission creatinine (347.3 vs 230.9 μmol/l); Urine output 24 h at ICU admission (0.32 vs 0.42 ml/kg/h); Lactate at CRRT (7.3 vs 4.2 mmol/l); Creatinine at CRRT (399.2 vs 368.7); Urine output 6 h previous to CRRT (0.32 vs 0.25 ml/kg/h); urine output 24 h previous to CRRT (0.28 vs 0.33 ml/kg/h). 90 days mortality was lower in the early CRRT group (early 51.9 % vs. late 70.3 % $p = 0.020$). Dose groups 90 days mortality: low dose: 81.8 %, renal dose: 45.8 %, high dose: 51.7 %, very high dose: 33.3 % $p = 0.156$. Secondary outcomes: Subgroup analysis was performed in the early and late group to evaluate the effect of prescribed renal dose. Survival differences were observed only in the early group with a trend towards better outcome in the very high dose group and a worst outcome in the low dose group.

CONCLUSIONS. Early initiation of CRRT within the first 48 h from ICU admission improves outcome in SS patients with AKI. Baseline differences were observed between early and late group populations. Presence of low urine output previous to CRRT initiation could worsen prognosis. Septic shock patients with AKI who receive early CRRT could benefit from very high dose and low dose should be avoided.

0806

MORTALITY PREDICTORS IN SEPSIS-RELATED ACUTE KIDNEY INJURY PATIENTS REQUIRING RENAL REPLACEMENT THERAPIES

G. Moreno-Gonzalez[1], X.L. Perez-Fernandez[1], P. Cardenas-Campos[1], V.F. Corral Velez[1], M. Huguet Briva[1], J.M. Vazquez Reveron[1], J. Ballus Noguera[1], J.C. Lopez Delgado[1], J. Sabater Riera[1]

[1]Hospital Universitari de Bellvitge, Intensive Care Unit, Barcelona, Spain

INTRODUCTION. The mortality rates of all-cause acute kidney injury (AKI) in intensive care unit (ICU) are still high (45–65 %). Several factors are related to AKI mortality including the underlying disease, AKI etiology, other organ dysfunctions and severity of AKI. Mechanical ventilation, the use of vasopressors, and fluid overload at initiation of continuous renal replacement therapy (CRRT) are also factors that increase mortality. Sepsis is a risk factor for AKI with increased short-term mortality. There is few data regarding the mortality predictors in septic shock and AKI needing CRRT.

OBJECTIVES. To identify mortality predictors in a cohort of septic shock patients with AKI requiring CRRT.

METHODS. We performed a prospective observational cohort study of 333 septic shock adult patients with AKI requiring CRRT admitted to a polyvalent ICU in a tertiary hospital from 2006 to 2012. All patients were on vasopressor support at starting therapy. We excluded patients with chronic renal failure on dialysis, those who had received renal replacement therapy previous to ICU admission and those who were on CRRT <24 h. CRRT initiation criteria was based on clinician decision. Demographic, clinical, and laboratory data were recorded at initiation of CRRT. Daily fluid balance was calculated. Mortality was assessed at 90 days of follow-up. To analyze the independent predictors of 90-day mortality a Cox regression model was performed. $P < 0.05$ was considered statistically significant.

RESULTS. Mean age was 62 $\pm$ 13 years; 66 % were men; mean SOFA score at CRRT initiation was 12 $\pm$ 4. Sepsis etiology was: 37.5 % abdominal, 24.3 % respiratory, 14.1 % various (including infectious endocarditis, cellulitis), and 10 % cardiac surgery; 52.9 % were medical patients, 3 % traumatic patients, and 44.1 % surgical patients. AKIN score at CRRT initiation was no AKI in 5.1 %, AKIN-I 5.4 %, AKIN-II 18.4 %, and AKIN-III 71.1 %. Hospital mortality was 63 % (61.4 % at 90-days). We observed significance ($P < 0.05$) in the following variables at CRRT initiation related to 90-days mortality (Fig. 1): Age, weight, SOFA score, creatinine, potassium, bicarbonate, and lactate. Fluid balance in the CRRT first 24 h, renal prescribed ultra-filtration dose, days from hospital admission to CRRT, and co-morbidities (chronic liver failure defined as Child A or higher and hematological diseases) also showed significant differences. Dose effect was more protective in patients in whom CRRT was initiated within the first 48 h from ICU admission.

Mortality predictors	HR	CI 95%
Age	1.025	1.011-1.039
Weight	0.987	0.973-0.999
SOFA	1.076	1.031-1.122
Creatinine at CRRT	0.998	0.997-0.999
Potassium at CRRT	1.335	1.136-1.570
Bicarbonate at CRRT	1.053	1.017-1.089
Lactate at CRRT	1.039	1.009-1.070
Fluid Overload at 24h	1.242	1.126-1.371
Days hospital CRRT*	1.022	1.011-1.033
Prescribed CRRT dose	0.984	0.969-0.999
Chronic Liver Failure	1.707	1.163-2.506
Hematological diseases	1.877	1.252-2.815

HR. Hazard ratio. CI. Confidence interval.
*Days in hospital until CRRT was initiated.

Fig. 1

CONCLUSIONS. Fluid overload during the CRRT first 24 h and lactic acidosis at CRRT initiation are associated with increased mortality. Older patients and SOFA score are also related with increased mortality. The major co-morbidities associated with worst prognosis were chronic liver failure and hematological malignancies. Creatinine at CRRT, weight, and prescribed renal dose seem to be protective and statistically correlated.

0807

REVIEW OF RESULTS AND EXPERIENCE OF USE RENAL REPLACEMENT THERAPIES IN SPANISH INTENSIVE CARE UNITS

C. Gomez-Gonzalez[1], D. Herrera-Rojas[2], A. Ubeda-Iglesias[3]

[1]Hospital Infanta Luisa, Intensive Care Unit, Sevilla, Spain, [2]Hospital Universitario Valme, Intensive Care Unit, Sevilla, Spain, [3]Hospital de la Linea, AGS Campo de Gibraltar, Intensive Care Unit, Cadiz, Spain

OBJECTIVES. To present the results and experience in the use of Renal Replacement Therapies (RRT) in the Spanish Intensive Care Units (ICUs) at present.

METHODS. A descriptive study by means of a survey realized by the Working Group of Nephrology Intensive Care of the Spanish Society of Intensive, Critical and Emergency Care Medicine (SEMICYUC) during the period between January and November, 2011. Statistical analysis of the information performed with the program R version 2.9.0. The qualitative variables were expressed as percentages and the quantitative ones as average, standard deviation and median values.

RESULTS. 51 surveys were received, from a total of 99 submitted. Types of participating hospitals included 74 % University, 41 % level I care, 41 % level II, 10 % level III care and 8 % private hospitals. The average number of hospital beds was 565 ± 375 (median of 450), from which ICU beds were 21 ± 15 (median of 18). Average number of ICU admissions per year was 1,001 ± 604 (median of 900). Average diagnosis of acute renal failure (ARF) were 11 ± 10 cases per month, being RRT applied to an average of 5 ± 6 patients for month.

76 % of ICUs have intensive care physicians specially trained in the use of the RRT and there exist written protocols of performance in 72 % of ICUs. There are programs of continued training for 76 % of the doctors and nurses. Intensivists indicate the beginning of the RRT in ARF cases in 92 % of the units. Criteria for the beginning of application include an increase of urea and creatinine (94 %), oliguria (51 %) and overcharge of fluids (51 %). Indications for ending RRT include the increase of the diuresis (54 %), hemodynamic stability (48 %) and the decrease of values of urea and creatinine (30 %).

Most used modalities were CVVHDF in 96 % of centers and CVVH in 84 %. Majority of centers (98 %) use unfractionated heparin as anticoagulant while citrate in only 6 %. 92 % use rehearing prefilter in different proportions. The dose in septic patients was variable: 41 % in a range of 21–35 ml/Kg/h, 33 % in the range of 36–45 ml/Kg/h. 61 % of the participating centers consider that existing studies ATN, RENAL and DOREMI have had impact in their habitual practice.

CONCLUSIONS. There exists a wide interest in the incorporation of these technologies in the units with a high level of commitment in the training of the different sanitary professionals. In the majority of our hospitals, intensivists are the professionals who prescribe the beginning of RRT in ARF cases, mainly before the alteration of the parameters of leaked glomerular. The most used modality is the CVVHDF. Multicenter studies recently published have modified the habitual practice of dosing in septic patients. The anticoagulation with citrate is little introduced in our units.

0808

RENAL HYPERFILTRATION IN CRITICALLY ILL PATIENTS: INCIDENCE, RISK FACTORS AND EFFECTS ON SERUM VANCOMYCIN

M.C. Gonzalez[1], M.L. Campassi[1], F.D. Masevicius[1], A. Risso Vazquez[1], M. Moseinco[1], N.C. Navarro[1], L. Previgliano[1], N.P. Rubatto[1], M.H. Benites[1], A. Dubin[1]

[1]Sanatorio Otamendi y Miroli, Servicio de Terapia Intensiva, Buenos Aires, Argentina

INTRODUCTION. Renal hyper filtration (creatinine clearance >120 mL/min/1.73 m^2) has been described in some populations of critically ill patients. It could produce suboptimal concentrations of drugs eliminated by glomerular filtration.

OBJECTIVES. To determine the incidence of renal hyper filtration in a series of ICU patients, its associated factors, and effects on vancomycin concentration and dosing.

METHODS. We studied 363 patients admitted to the ICU during 1 year. Patients were included if serum creatinine was <1.4 mg %. Creatinine clearance was calculated from 24-h urine collection. Patients were grouped according to presence of renal hyper filtration, and determinants were analyzed with bivariate and logistic regression analysis.

RESULTS. Renal hyper filtration was present in 103 patients (28 %), which were younger (48 ± 15 vs. 65 ± 17 year, $p < 0.0001$), and had more frequent obstetric (16 vs. 7 %, $p = 0.0006$) and trauma admissions (10 vs. 3 %, $p = 0.016$). The only variable independently associated with renal hyper filtration was age (OR 0.94; $p < 0.0001$; 95 % CI 0.93–0.96). 46 patients received vancomycin (12 of them had renal hyper filtration). Patients with renal hyper filtration had lower concentrations despite higher doses.

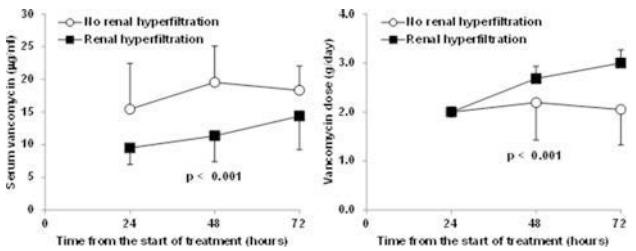


Fig. 1 Vancomycin concentrations and doses

CONCLUSIONS. Renal hyper filtration is a common finding in critically ill patients. Age was the only independent determinant in this cohort. In this way, younger patients might require larger vancomycin dosing.

0809

THREE MONTH PSYCHOLOGICAL OUTCOME IN CRITICALLY ILL PATIENTS RECEIVING RENAL REPLACEMENT THERAPY

K.A. Sharpe[1], N. Boyd[2], K. Burt[2], J.J. Paddle[2]

[1]Royal Cornwall Hospital, Critical Care Unit, Truro, UK, [2]Royal Cornwall Hospital, Critical Care, Truro, UK

INTRODUCTION. Renal replacement therapy (RRT) in critically ill patients is associated with a high morbidity and mortality (1), and is known to have an adverse effect on health-related quality of life (2, 3) in survivors compared to critically ill patients not receiving RRT.

OBJECTIVES. We hypothesised that the added burden of RRT would also adversely affect the long-term psychological outcome for these patients compared to critically ill patients who did not receive RRT.

METHODS. We collected data on all patients receiving RRT on our critical care unit over a 5 year period from 1st January 2007 to 31st December 2011. Patients who survived to 3 months after discharge were sent a standardised quality of life postal questionnaire incorporating the validated Hospital anxiety and Depression Scale (HADS) and Impact of Events Scale (IES). We compared these patients with a cohort of critically ill patients who did not receive RRT, matched for age, sex, APACHE II score and year of admission.

RESULTS. During the study period 395 patients received RRT in our critical care unit, of which 342 met the RIFLE criteria for acute kidney injury. Median age was 66 (SD 15). 58.5 % were male. Median APACHE II score was 25 (SD 7.4). 209 patients (52.9 %) survived to hospital discharge and median survival was 85 days. 188 (47.6 %) survived to 3 months and were sent questionnaires, of which 83 completed a HADS questionnaire and 81 completed an IES questionnaire. For these patients matched controls who did not receive RRT were sought from our database.

24 matched pairs were found for analysis of HADS. On multivariate analysis, mean (SD) HADS in RRT patients was 12.4 (6.2) and in controls was 11.4 (8.1), and this was not significant ($P = 0.52$), although observed power was low. Including age and APACHE II score as co-variates did not affect the statistical significance. Similarly, of 21 matched pairs, mean (SD) IES in RRT patients was 20.0 (15.3) and in controls was 21.0 (16.3). This was not significant ($P = 0.71$) and unaffected by age or APACHE II score.

CONCLUSIONS. Despite the added morbidity and mortality associated with RRT in critically ill patients, we found no additional burden of psychological morbidity (as measured by HADS and IES) 3 months post illness.

REFERENCE(S). 1. Ympa YP, Sakr Y, Reinhart K, Vincent JL. Has mortality from acute renal failure decreased? A systematic review of the literature. Am J Med. 2005; 118: 827–832. 2. Delannoy, B. et al. Six-month outcome in acute kidney injury requiring renal replacement therapy in the ICU: a multicentre prospective study. Int Care Med. 2009; 35: 1907–1915. 3. Hofhuis JGM, van Stel HF, Schrijvers AJP et al. The effect of acute kidney injury on long-term health-related quality of life: a prospective follow-up study. Crit Care. 2013; 17: R17

0810

VARIATION OF ADMINISTRATION AND INDICATIONS FOR RENAL REPLACEMENT THERAPY IN PATIENTS WITH SEPTIC SHOCK ACROSS FINNISH INTENSIVE CARE UNITS

M. Poukkanen[1], J. Koskenkari[2], V. Pettilä[3], S.T. Vaara[4], A.-M. Korhonen[4], S. Karlsson[5], V. Lund[6], T. Ala-Kokko[2], the FINNAKI Study Group

[1]Lapland Central Hospital, Rovaniemi, Finland, [2]Oulu University Hospital, Oulu, Finland, [3]Institute of Clinical Medicine, University of Helsinki, Helsinki, Finland, [4]Helsinki University Central Hospital, Helsinki, Finland, [5]Tampere University Hospital, Tampere, Finland, [6]Satakunta Hospital District, Pori, Finland

INTRODUCTION. The administration of renal replacement therapy (RRT) is highly varying across intensive care units (ICUs) and may be based on clinical decisions rather than guidelines.

OBJECTIVES. We assessed the variation in proportion and indications of RRT in patients with septic shock among Finnish ICUs. In addition, we studied the association between proportion of RRT and 90-day mortality in these patients.

METHODS. We included patients who fulfilled the criteria for septic shock during the FINNAKI study (1). We calculated the proportion of given RRT among patients with septic shock, and divided ICUs into two groups according to the median ratio of the relative proportion of given RRT (high RRT ICU and low RRT ICU). We evaluated the differences in indications of RRT between high and low RRT ICUs. We performed logistic regression analysis to evaluate the possible association between proportion of given RRT and 90-day mortality.

RESULTS. The criteria for septic shock were fulfilled in 726 patients and 131 (18.0 %) were treated with RRT. The proportion of RRT-treated patients among ICUs varied from 3 % up to 36 % (median 19 %). ICUs having proportion of RRT ≥ 19 % belonged to high RRT ICU (9 ICUs, 354 patients). Low RRT ICU included 8 ICUs (372 patients). In the high RRT ICU patients were older ($p = 0.04$) and received more often sepsis cortisone ($p < 0.001$) and mechanical ventilation ($p < 0.001$). The indications for RRT are presented in Table 1. There were no differences in acid–base balance ($p = 0.71$), plasma lactate ($p = 0.60$), serum creatinine ($p = 0.14$), or fluid overload ($p = 0.31$) prior to RRT between high or low RRT ICUs. The 90-day mortality rates for RRT-treated patients with septic shock were 48/111 (43.2 %, 95 % CI 33.8–52.5 %) in high RRT ICU compared to 19/33 (57.6 %, 95 % CI 40.3–74.8 %) in low RRT ICU, $p = 0.39$. In logistic regression analysis age (OR 1.04, 95 % CI 1.02–1.08, $p = 0.006$) and SAPS II (OR 1.05, 95 % CI 1.02–1.09, $p < 0.001$) were associated with 90-day mortality, but the group of ICU was not.

Table 1 The indications for RRT

	High RRT ICU (n = 98)	Low RRT ICU (n = 33)	p-value
Oliguria	83 (84.7)	29 (87.9)	0.65
Acidosis	72 (73.5)	24 (72.7)	0.93
Fluid overload	43 (43.9)	12 (36.4)	0.45
High plasma creatinine	54 (55.1)	25 (75.8)	0.03

CONCLUSIONS. We found a ten-fold variation in proportion of RRT in patients with septic shock among Finnish ICUs. Despite this variation there was no significant differences in 90-day mortality among RRT-treated patients between high RRT and low RRT ICUs.

REFERENCE(S). Nisula S et al. Incidence, risk factors and 90-day mortality of patients with acute kidney injury in Finnish intensive care units: the FINNAKI study. Intensive Care Med. 2013; 39: 420–8.

GRANT ACKNOWLEDGMENT. Clinical Research funding (EVO) from Helsinki University Hospital and Lapland Central Hospital, Grants from Finnish Society of Intensive Care and the Academy of Finland.

0811
RENAL OUTCOME IN CRITICALLY ILL PATIENTS 90 DAYS AFTER RENAL REPLACEMENT THERAPY

W. De Corte[1,2], J. Vanhalst[2], A. Dhondt[3], J. Decruyenaere[2], E. Hoste[2]

[1]AZ Groeninge Hospital, Anesthesia and Intensive Care Medicine, Kortrijk, Belgium, [2]Ghent University Hospital, Intensive Care Medicine, Ghent, Belgium, [3]Ghent University Hospital, Nephrology, Ghent, Belgium

INTRODUCTION. In Intensive Care Unit (ICU) patients, acute kidney injury (AKI) treated with renal replacement therapy (RRT) is associated with worse outcomes such as high mortality and permanent RRT dependency in surviving patients. The incidence of RRT dependency varies among large studies. This may be attributed to differences in baseline characteristics such as age, chronic kidney disease, severity of illness, RRT modality and timing of initiation of RRT.

OBJECTIVES. To evaluate renal outcome in surviving ICU patients treated with RRT for AKI at 30 days (d) and 90 d after initiation of RRT.

METHODS. Retrospective analysis of adult ICU patients who underwent RRT for AKI in the 6 beds burn ICU, 8 beds cardiac surgery ICU, 14 beds medical ICU, and 22 beds surgical ICU. Data were recorded at time of ICU admission, time of initiation of RRT, and 30 resp. 90 days (d 30, d 90) after initiation of RRT. Renal recovery was defined as patients not treated with RRT. Data are presented as median or %.

RESULTS. We analysed a cohort of 874 adult ICU patients treated with RRT for AKI. Mortality at d30 and d90 was 43.1 % resp. 51.4 %. RRT dependency was 23.7 % at d30, and decreased to 10.4 % at d90. Of patients who were RRT dependent at d30, 39.8 % die d, 22.9 % had renal recovery, and 37.3 % remained RRT dependent at d90. Patient mortality at d90 was lower in patients who had renal recovery at d30 compared to RRT dependent patients (6.6 vs. 39.8 %, $p < 0.001$).

Patients who had renal recovery at d90 had similar age (64 vs. 65 y, $p = 0.758$), gender (male 68 vs. 61 %, $p = 0.356$) and SAPS 2 score (52 vs. 64, $p = 0.059$) compared to patients with RRT dependency. Also, severity of illness at time of initiation of RRT, expressed as SOFA score (9 vs. 9, $p = 0.442$) and vasopressor treatment (45 vs. 39 %, $p = 0.438$), was similar in both groups. We found no difference in duration of time from ICU admission to initiation of RRT (2 vs. 2 d, $p = 0.318$), and initial RRT modality (continuous RRT 16 vs. 18 %, intermittent RRT 69 vs. 68 %, and Sustained Low Efficiency Daily Dialysis (SLEDD) 15 vs. 14 %, $p = 0.927$). Patients with non-renal recovery at d90 had worse kidney function at time of ICU admission (creatinine 1.85 vs. 2.86 mg/dL, $p = 0.001$), and also a more positive fluid balance on the day before initiation of RRT (1.7 L vs. 2.8 L, $p = 0.013$).

CONCLUSIONS. Half of ICU patients treated with RRT for AKI had died at d90 after initiation of RRT. In 90 d survivors, one in 10 remained RRT dependent. Of patients who were RRT dependent on d30, two-fifths had died at d90, two-fifths remained RRT dependent, and one-fifth had renal recovery.

Patients with RRT dependency at d90 had worse kidney function at time of ICU admission, and a more positive fluid balance. Other commonly described risk factors for RRT dependency, including RRT modality, were comparable between both groups.

0812
HIGHER URINE OUTPUT IN PATIENTS WITH ACUTE KIDNEY INJURY AFTER DISCONTINUATION OF CONTINUOUS RENAL REPLACEMENT THERAPY IS ASSOCIATED WITH LOWER MORTALITY AND IMPROVED RENAL RECOVERY

T. Ohnuma[1], J. Suzuki[2], H. Sanayama[1], K. Ito[1], T. Fujiwara[1], H. Yamada[1], M. Sanui[1]

[1]Saitama Medical Center, Jichi Medical University, Saitama, Japan, [2]Sendai City Hospital, Sendai, Japan

INTRODUCTION. Recovery of renal function is frequently observed in patients with acute kidney injury (AKI) requiring renal replacement therapy (RRT). There is a paucity of studies regarding the clinical course of patients after discontinuation of continuous renal replacement therapy (CRRT).

OBJECTIVES. This study was undertaken to investigate renal function outcome and mortality after discontinuation of CRRT in AKI patients.

METHODS. We retrospectively reviewed 189 patients who underwent CRRT for AKI in a medical/surgical ICU between January 2009 and February 2013. Exclusion criteria included age <18 years, RRT for end-stage renal disease, withdrawal of treatment or death during CRRT. Renal recovery was defined as freedom from RRT for 7 days after stopping CRRT. Those who were switched to the intermittent hemodialysis (IHD) were categorized in the IHD group.

RESULTS. Overall 109 (58 %) patients discontinued CRRT. The median age was 74 (range 65–79) years, M:F ratio was 72:28 and the simplified acute physiology score (SAPS) II on ICU admission was 50 (range 39–62). The median ICU stay and hospital stay were 11 (range 7–20) and 40 (23–75) days. 63 patients were categorized as renal recovery, and 45 as IHD. Hospital mortality of the renal recovery group vs. the IHD group was 9.5 vs. 33.3 % ($P = 0.002$). Multivariate logistic regression analyses showed that low 24-h urine output before ceasing CRRT (OR 0.99, 95 % CI 0.998–0.999; $P = 0.11$) was a risk factor for mortality. Logistic regression analysis was also used to determine predictors of renal recovery at discharge. Of 88 survivors at discharge, 11 (13 %) were still on IHD. Urine output ($P = 0.005$), female gender ($P = 0.038$) and no chronic kidney disease ($P = 0.015$) were independent predictors of renal recovery.

CONCLUSIONS. Higher urine output at the time of discontinuation of CRRT was a significant predictor of lower hospital mortality and renal recovery at discharge. These findings support future prospective trials to determine the optimal time to discontinue CRRT.

0813
CVVHD IS SAFE AND CHEAPER THAN STANDARD CVVH DURING EXTRACORPOREAL CITRATE COAGULATION IN ICU PATIENTS WITH AKI

A. Dalhuisen[1], P.A. Katinakis[1], H. Steenbergen[1], S. Kamphuis[2], P.E. Spronk[1]

[1]Gelre Hospitals, Intensive Care, Apeldoorn, Netherlands, [2]Gelre Hospitals, Clinical Chemistry, Apeldoorn, Netherlands

INTRODUCTION. The best modality for continuous renal replacement therapy among critically ill patients with acute kidney injury (AKI) is currently unclear.

OBJECTIVES. Our objective was to evaluate the effects of continuous veno-venous hemofiltration (CVVH) versus continuous veno-venous hemodiafiltration (CVVHD)—using citrate as regional anticoagulation—on solute clearance, nurse workload, patient safety and costs.

METHODS. This was a single center prospective cross over study in a cohort of critically ill patients with AKI. We compared urea and creatinine clearance, filter lifespan and membrane performance over 72 h during 15 CVVH and 15 CVVHD sessions. Standard of care was a substitution rate of 35 ml/kg/hr using CVVH, while CVVHD was prescribed with a dialysate flow of 30 ml/kg/hr according to the manufacturer's instructions. Polysulfone filters (Ultraflux AV 600S for CVVH and AV 1000S for CVVHD, Fresenius Medical Care, Homburg, Germany). Anticoagulation was performed with tri-sodium citrate intravenously using a separate Alaris volumetric pump for CVVH. During CVVHD citrate was infused using the integrated Ci–Ca module. Maximal filter runtime was set at 72 h. Direct costs were calculated according the amount of fluids and filters/72 h. Values are shown as median and IQR.

RESULTS. 30 filter runs were evaluated in 15 patients (9 male) with AKI (age 64 [41–86]). Blood flow used was higher during CVVH (250 [200–255]) than during CVVHD (100 [100–100]; $P < 0.001$). Urea and creatinine clearances (42 [34–52] and 37 [29–49] ml/min) were slightly higher during CVVH than during CVVHD (35 [33–36] and 31 [26–33] ml/min, both $P = 0.008$). Keeping in mind that the maximum allowed filter-runtime was 72 h, the survival-time of the filters was longer during CVVHD (72 [43–73 h]) than during CVVH (43 [17–66 h]; $P = 0.004$). CVVHD was considered less time-consuming and more user friendly than CVVH by most nurses, with less down time moments when patients were awake and moving, and less mistakes in citrate and calcium dosages thus increasing safety. Costs per 72 h were lower during CVVHD €419 [€417–€501] than during CVVH €690 [461–862]; $P = 0.002$, with a cost saving of € 201 [€44–€382].

CONCLUSIONS. CVVH in standard dose is sightly superior than CVVHD with respect to creatinine and urea clearance. CVVHD seems to be safer, easier to handle, and cheaper than standard CVVH.

GRANT ACKNOWLEDGMENT. We would like to thank Fresenius Medical Care, Homburg, Germany for granting the product lease during the project.

0814
GENERAL OUTCOMES IN ACUTE KIDNEY INJURY ACCORDING TO THE TIME OF INITIATION OF RENAL SUPPORT IN CRITICAL CARE: DOOR TO DIALYSIS TIME (DDT) STUDY

J.E. Echeverri[1,2,3], J. Vargas[1], P. Rodriguez[2], J.P. Cordoba[2], P. Garcia[2], L. Moreno[4], R. Dachiardi[5], C. Larrarte[2]

[1]Central Military Hospital, Nephrology, Bogota, Colombia, [2]Hospital Universitario San Ignacio, Nephrology, Bogota, Colombia, [3]Universidad Militar Central, Bogota, Colombia, [4]Hospital Universitario San Ignacio, Bogota, Colombia, [5]Universidad Javeriana, Bogota, Colombia

INTRODUCTION. Timing is one of the most important questions that arise when there is a patient that needs acute renal support. In the last decade, the definition of timing has been changing and up to date, it seems important that therapy is started early but it is not clear what this really means.

OBJECTIVE. This study evaluate the influence of door dialysis time (DDT), time between ICU admission to first dialysis, on mortality (3 month) and other important outcomes in critical care patients who required acute haemodialysis.

METHODS. This is a single-centre observational study performed in a cohort of critical patients with AKI and acute haemodialysis requirement during ICU stay. Primary outcome was mortality at 3 months and secondary outcomes were partial or complete renal function recovery, dialysis dependence, length of hospital and ICU stay.

RESULTS. 199 patients were included in the analysis. Sepsis was the primary ICU admission diagnosis (48 %). Mean APACHE II score at 24 h of ICU admission was 23.8. 57 % of patients had oliguria, anuria or fluid overload as an indication of renal support. Mean ureic nitrogen at start of therapy: 70 mg/dL (SD 29). According to times we found that the average days of stay were 32 days (SD 0.33), ICU Stay were 18.4 days (SD 19.4) and DDT were 5.59 days (SD 7.79). Global mortality was 54.8 % and general dialysis dependence was 11.6 %. There was a statistically significant difference in the percentage of patients who died, when they started dialysis in the first 3 days of admission to the ICU (DDT < 3 days), with respect to those who started after 3 days of ICU stay (DDT > 3 days) (45.71 vs. 64.89 %), a difference of 19.18 % (95 % CI 5.61–32.74 %) χ^2 7.3649 $p = 0.007$ OR 2.19 95 (1.19–4.05). Additionally, there were more proportion of patients who required dialysis after 3 month of intervention in the DDT > 3 days (16.2 vs 6.4 % $p < 0,05$). The average hospital stay was 32.41 days longer in patients with DDT > 3 days (42.1 vs. IC 28.26 23.74–36.57) $F = 0.4606$ $p = 0.0001$ and ICU stay was 15.13 days on average longer in patients with DDT > 3 days (95 % CI 10.02–20.24). The time to diagnosis of AKI was 4.44 days longer in patients with DDT > 3 days (CI 2.54–6.33), APACHE II the average was 2.38 points higher in patients with DDT > 3 days (CI 0.89–3.87) and found a higher proportion of patients with sepsis in the group of TPD > 3 days (35.2 vs 55.3 %) $p = 0.007$.

CONCLUSIONS. The analysis according to time of intervention (DDT) showed that mortality, dialysis dependence and length of stay, both hospital and intensive care, were statistically higher in the intervention group after 3 days of ICU stay. Factors that could impact this finding could be related to a greater proportion of septic patients and higher rates of severity found in this group. We believe that prospective multicenter studies are required to clarify the role played by the door-dialysis time (DDT) in critically ill patients requiring acute renal support.

0815
TYPE OF CITRATE SOLUTION AND FILTER LIFESPAN DURING CONTINUOUS RENAL REPLACEMENT THERAPY

R. Jacobs[1], P.M. Honoré[1], J. De Regt[1], E. De Waele[1], S. Lochy[1], J. Troubleyn[1], M. Diltoer[1], H. Spapen[1]

[1]UZ Brussel, ICU, Brussels, Belgium

INTRODUCTION. Recent guidelines propose citrate as first choice anticoagulant for continuous renal replacement therapy (CRRT). However, the most optimal citrate formulation that beneficially influences filter lifespan without aggravating side-effects remains topic of debate.

OBJECTIVES. To compare filter lifespan between two consecutive cohorts of critically ill patients with acute kidney injury (AKI) who received a different predilution citrate solution during CRRT.

METHODS. We conducted an 8-month observational study in consecutively hospitalised critically ill patients with AKI treated with CRRT. All patients had a double-lumen CRRT catheter inserted in the right internal jugular or in one of the femoral veins. CRRT was delivered at a dose of approximately 25 ml/kg/h with 75 % in predilution. Initially, patients received 10/2 mmol Prismocitrate. A subsequent cohort was treated with the novel 18/0 mmol Prismocitrate formulation. In both groups, blood flow was identical and citrate flow adapted to the same target ionized calcium into the circuit. A similar dedicated "homemade" protocol (i.e. running two bags in continuous veno-venous hemofiltration mode whilst titrating substitution to acidosis or alkalosis and global dose) was used in the two groups. Calcium supplementation was administered separately via a central line aiming at comparable body calcium levels in the two groups. Transmembrane pressure (TMP), a marker of filter haemopermeability, was recorded throughout the study period. Analysis of variance and Mann–Whitney U test were used to compare variables (including filter lifespan and TMP) between groups. Values are expressed as means (range).
RESULTS. 59 patients were studied. The first 28 subjects received 10/2 mmol Prismocitrate. Filter lifespan was significantly longer with Prismocitrate 18/0 as compared to Prismocitrate 10/2 solution [4.10 h (2.45–5.75 h) vs. 2.68 h (0.47–4.99); $p = 0.001$]. TMP also remained significantly lower after 72 h of treatment with Prismocitrate 18/0 as compared to Prismocitrate 10/2 [169 mmHg (115–223 mmHg) vs. 93 mmHg (47–139 mmHg); $p = 0.0001$). No confounding variable affecting filter capacities or lifespan between the two study groups could be identified.
CONCLUSIONS. Using similar conditions of continuous hemofiltration and calcium targets, the novel Prismocitrate 18/0 solution significantly improved filter lifespan and haemopermeability as compared to the former Prismocitrate 10/2 formulation. Prospective studies are warranted to confirm this finding.

0816
PROFILE OF USE OF NEPHROTOXIC DRUGS IN THE ICU, A POINT-PREVALENCE STUDY

M. Herrera Gutierrez[1], A. Sanchez[2], R. Hinojosa-Perez[3], T. Tomasa-Irriguible[4], J.L. Flordelís-Lasierra[5], J.A. Ramos-Cuadra[6], L. Lorenzo-de-la-Peña[7], E. Perea-Rodriguez[8], M. Robles-Marcos[9], COFRADE Investigation Group

[1]University Hospital Carlos Haya, ICU, Malaga, Spain, [2]Hospital de Cruces, Bilbao, Spain, [3]Hospital Virgen del Rocio, ICU, Sevilla, Spain, [4]Germans Trials y Pujol, ICU, Barcelona, Spain, [5]Hospital 12 de Octubre, ICU, Madrid, Spain, [6]Hospital Torrecardenas, ICU, Almeria, Spain, [7]Hospital Universitario, ICU, Tenerife, Spain, [8]Hospital Universitario de Burgos, ICU, Burgos, Spain, [9]Hospital Infanta Cristina, ICU, Badajoz, Spain

INTRODUCTION. AKI is a frequent complication in the ICU, and one that does not have a specific treatment. The main approach to this problem is prevention and this implies the detection and restriction in the use of drugs harmful for the kidney.
OBJECTIVES. To define the prevalence of prescription of nephrotoxic drugs in the ICU setting and its relation to kidney function.
METHODS. Prospective multicentre study based in a screening of all patients admitted to 42 Spanish ICUs (32 hospitals and 826 IU beds) in two different days separated 6 months with follow-up until hospital discharge. For creatinine clearance measurement (CrCl), the day of the screening we registered for all patients the serum creatinine and urine creatinine in a 2 h sample of urine volume. Nephrotoxic drugs administered this day were registered. The ethics committee of each centre approved this study and informed consent was required for all patients.
RESULTS. Kidney function measured by CrCl was over 90 in 37.4 %, between 90 and 60 in 14 %, between 60 and 30 in 13.4 % and below 30 in 25.7 %. RRT was indicated in 7.4 %.
Use of non-steroidal anti-inflammatory drugs was detected in 18.9 % and angiotensin enzyme inhibitors/ARA-II in 13.7 % (126). At least one nephrotoxic antibiotic was administered in 16.1 % of cases: in 8.6 % aminoglycoside, 8.8 % vancomycin, 2.4 % amphotericin, 1.8 % colistin and 2 % cotrimoxazol.
As a whole, at least one nephrotoxic drug was found in 35 % of cases (one in 26.1 %, two in 6.9 %, and three or more in 2 %).
Percentage of prescriptions were similar for all stages of kidney function previously defined but use of all these drugs was significantly less frequent in patients with antecedent of chronic kidney disease.
We then analyzed how those antibiotics requiring adjustment to kidney function or RRT were prescribed and detected that in more than 80 % of the cases doses were adjusted for all the drugs evaluated (aminoglycoside, colistin and vancomycin).
Diuretics were administered in 43.7 % of the cases and beside nephrotoxic drugs, we also detected that 8.7 % of our patients were subjected to a radiologic exploration with contrast, 2.5 % had rhabdomyolysis and in 7.7 % at least one episode of low blood pressure were detected.
CONCLUSIONS. Everyday administration of nephrotoxic drugs is alarmingly high in the ICU. This problem is worsened because of a high frequency of other events harmful for the kidney. Being aware of the existence of a kidney disease seems to have a positive influence in the use of these drugs so that an early detection of kidney dysfunction could be critical for an effective prevention for kidney damage.
GRANT ACKNOWLEDGMENT. This study was endorsed by the Spanish Society of ICM (SEMICYUC).

0817
PREOPERATIVE HYPOALBUMINEMIA IS AN INDEPENDENT RISK FACTOR FOR ACUTE KIDNEY INJURY AFTER LIVING DONOR LIVER TRANSPLANTATION

S.-K. Kim[1], J.-G. Song[1], G.-S. Hwang[1]

[1]Asan Medical Center, University of Ulsan College of Medicine, Department of Anesthesiology and Pain Medicine, Seoul, Korea, Republic of

INTRODUCTION. Acute kidney injury (AKI) is known to be a major complication after liver transplantation (LT), and its incidence has been reported to vary between 17 and 95 %. Previous reports have shown that hypoalbuminemia is associated with increased risk of AKI and is an independent risk factor for morbidity and mortality. However, little is known about the relationship between albumin and AKI after living donor LT (LDLT).
OBJECTIVES. The aim of this study was to identify the influence of preoperative albumin level and AKI after LDLT.
METHODS. We retrospectively reviewed 998 consecutive patients who underwent LDLT and divided them into two groups based on their preoperative albumin level. Group 1 included patients whose preoperative albumin levels were <3.3 g/dL ($n = 646$), and group 2 included patients with albumin level ≥3.3 g/dL ($n = 352$). The incidence of AKI was defined by Acute Kidney Injury Network (AKIN) and Risk, Injury, Failure, Loss and End-Stage Kidney (RIFLE) classification. Major adverse cardiac events (MACE), hospital stay, ICU stay, 30-day and overall mortality were analyzed using inverse probability of treatment weighted method (IPTW) and propensity-score matching ($n = 194$ pairs) analysis.
RESULTS. The incidence of AKI was higher in group 1 after adjusting for IPTW ($n = 435$, 67.3 %) and PS-matching ($n = 120$, 61.9 %) defined by both AKIN (odds ratio [OR] = 1.5, 95 % confidence interval (CI) 1.0–2.3, $P = 0.046$ for IPTW, OR = 1.7, CI 1.1–2.5, $P = 0.011$ for PS) and RIFLE criteria (OR = 1.8, 95 % CI 1.2–2.8, $P = 0.007$ for IPTW, OR = 1.5, CI 1.0–2.3, $P = 0.05$ for PS). However, there was no statistically significant difference in 30-day mortality, MACE and overall mortality between the two groups. In multivariable linear regression analysis, AKI was associated with ICU stay by AKIN criteria ($p = 0.034$). In Cox proportional hazards model, the overall mortality was correlated with AKI by RIFLE criteria ($p = 0.014$). However, there was no association with AKI and 30-day mortality, MACE and hospital stay.
CONCLUSIONS. Our results show that preoperative hypoalbuminemia is an independent risk factor of AKI, and postoperative AKI is related to postoperative ICU stay and overall mortality after LDLT.
REFERENCE(S). 1. Inoue Y, Soyama A, Takatsuki M, Hidaka M, Muraoka I, Kanematsu T, Eguchi S. Acute kidney injury following living donor liver transplantation. Clin Transpl. 2012; 26(5): E530–5. 2. Wiedermann CJ, Wiedermann W, Joannidis M. Hypoalbuminemia and acute kidney injury: a meta-analysis of observational clinical studies. Int Care Med. 2010; 36(10):1657–65.
GRANT ACKNOWLEDGMENT. Disclosure none.

0818
EARLY INITIATION OF CONTINUOUS RENAL REPLACEMENT THERAPY IS ASSOCIATED WITH LOWER MORTALITY IN PATIENTS WITH ACUTE KIDNEY INJURY

J. Suzuki[1], T. Ohnuma[2], H. Sanayama[2], K. Ito[2], T. Fujiwara[2], H. Yamada[2], M. Sanui[2]

[1]Sendai City Hospital, Sendai, Japan, [2]Jichi Medical University, Saitama Medical Center, Saitama, Japan

INTRODUCTION. Acute kidney injury (AKI) requiring continuous renal replacement therapy (CRRT) has high mortality in critically ill patients. The optimal timing to initiate CRRT for patients with AKI is unknown.
OBJECTIVES. The purpose of this study was to investigate whether the timing of initiation of CRRT based on severity of AKI is associated with hospital mortality.
METHODS. We retrospectively reviewed 189 patients treated with CRRT for AKI in a medical/surgical ICU between January 2009 and February 2013. Exclusion criteria included age less than 18 or RRT for end-stage renal disease patients. RIFLE classification at initiation of CRRT was used to stratify the patients into two groups. The early group consisted of patients classified as no AKI or risk at initiation of CRRT. The late group was classified into Injury or Failure at initiation.
RESULTS. There were 52 (27.5 %) patients in the early group and 137 (72.5 %) patients in the late group. Median age was 72 (range 61–78) years, M:F ratio was 7:3, and the simplified acute physiology score (SAPS) II on admission to the ICU was 57 (range 44–72). Past medical history of chronic kidney disease (CKD) was 89 (47 %). Median ICU stay and hospital day were 9.9 (4.3–17.9) and 26 (12.5–57.5) days, respectively. Crude early vs. late ICU and hospital mortality were 50 vs. 44 %, and 64 vs. 50 %, respectively. Logistic regression analyses showed that early initiation (OR 0.361, 95 % CI 0.17–0.78, $P = 0.009$), SAPS II (OR 1.04, 95 % CI 1.03–1.06, $P < 0.001$) and no CKD (OR 0.378, 95 % CI 0.19–0.73, $P = 0.004$) were independent risk factors for hospital mortality.
CONCLUSIONS. Early initiation of CRRT was associated with a lower risk of hospital mortality in patients with AKI and RIFLE classification at initiation of CRRT may be a meaningful marker with predicting CRRT timing.

Care of the ventilated patient: a global view: 0819–0832

0819
PRELOAD INDEPENDENCY AS DETECTED BY PASSIVE LEG RAISING IS ASSOCIATED WITH WEANING-INDUCED PULMONARY EDEMA

M. Dres[1,2], J.-L. Teboul[1,2], N. Anguel[2], L. Guerin[1,2], C. Richard[1,2], X. Monnet[1,2]

[1]EA 4533, Université Paris-Sud, Le Kremlin Bicêtre, France, [2]Hôpital de Bicêtre, Hôpitaux Universitaires Paris-Sud, Assistance Publique - Hôpitaux de Paris, Service de Réanimation Médicale, Le Kremlin Bicêtre, France

INTRODUCTION. Fluid overload has been reported as a frequent mechanism responsible for weaning-induced pulmonary edema. In case of fluid overload, with respect to the shape of the Frank–Starling relationship, patients are likely preload-independent.
OBJECTIVES. To predict the occurrence of weaning-induced pulmonary edema by performing a passive leg raising (PLR), which is assumed to detect preload-independency when cardiac output does not increase.
METHODS. In 26 patients who failed at a first 60-min T-tube spontaneous breathing trial (SBT), we performed a PLR before to start a second SBT. Before and at the end of the SBT, we recorded pulmonary arterial occlusion pressure (PAOP) and cardiac index measured by transpulmonary thermodilution (PiCCO device). During PLR, cardiac index was obtained by pulse contour analysis. Weaning-induced pulmonary edema was diagnosed if patients exhibited signs of clinical intolerance associated with an increase in PAOP > 18 mmHg at the end of SBT.
RESULTS. Because some patients performed several SBTs, 53 SBTs were finally analyzed, 30 cases with weaning-induced PE (WPE+) and 23 without (WPE−). During PLR, cardiac index did not change in WPE+ cases whereas it significantly increased in WPE− cases: 4 (IQR 0–5) % vs. 13 (IQR 11–15) %, respectively. The AUC of the ROC curve constructed for the PLR-induced increase in cardiac index as a predictor of weaning-induced PE was 0.90 (95 %CI 0.80–1.00). Considering a threshold of 10 %, the sensitivity was 83 (95 % CI 61–95) % and the specificity of 97 (95 % CI 83–100) %. During PLR, PAOP increased significantly more in WPE+ cases than in WPE− cases: +30 % (IQR 12–58) vs. 15 % (95 % CI 7–28) respectively. The AUC of the ROC curve constructed for the change in PAOP during PLR as a predictor of weaning-induced PE was 0.67 (95 % CI 0.53–0.82). Considering a threshold of 19 %, the sensitivity was 63 (95 % CI 51–85) % and the specificity of 65 (95 % CI 43–84) %.

CONCLUSIONS. Preload-independency as detected before to start a spontaneous breathing trial by a passive leg raising is associated with weaning-induced pulmonary edema. The mechanisms and clinical perspectives of such results deserve further studies.

0820
POSTCONDITIONING EFFECT OF VOLATILE ANESTHETICS ON ALI: EFFECT OF OXYGEN AND EXPOSED DURATION

J. Hong[1], H. Lee[1], J. Kwon[1], H. Kim[1]

[1]Pusan National University Hospital, Anesthesia and Pain Medicine, Busan, Korea, Republic of

INTRODUCTION. Acute lung injury (ALI) is commonly developed in critically ill patients. Several studies that volatile anesthetics have immunomodulating effect on the progression of ALI. Sevoflurane has been known for its pre- or post-conditioning effect and thus reducing severity of ALI. The aim of the current study was to assess postconditioning effect with sevoflurane in vivo model of endotoxin-induced lung injury and moreover, to assess whether the exposed duration with sevoflurane could affect the progression of ALI.
OBJECTIVES. The aim of the current study was to assess postconditioning effect with sevoflurane in vivo model of endotoxin-induced lung injury and moreover, to assess whether the exposed duration with sevoflurane could affect the progression of ALI.
METHODS. Male Sprague–Dawley rats were anesthetized and orally intubated. Lipopolysaccharide (3 mg/kg) was administered intratracheally. Rats were exposed to pure oxygen for 2 h (O_2) or sevoflurane with oxygen (as a carrier gas) for 2 h (S2), 4 h (S4) or 8 h (S8) (N = 5 in each group). After 24 h of injury, arterial blood gas analysis was done and lungs were collected. Expression of mRNA for vascular endothelial growth factor (VEGF), tumor necrosis factor α (TNF-α), interleukin 6 (IL-6), macrophage migratory inhibition factor (MIF) were analyzed. Histologic examination of the lung tissue was also performed.
RESULTS. Compared with O_2 group, sevoflurane's post conditioning effect was not apparent as reported in vitro studies. Only S_2 group showed reduced hemorrhage score in lung damage histology score compared with O_2 group ($p < 0.05$), but other group did not show significant changes. Arterial blood gas analysis and PF ratio did not show significance. The expression of mRNA of VEGF, TNF-α, IL-6, MIF was not differ among the groups.
CONCLUSIONS. Our study showed that the postconditioning effect of sevoflurane was not apparent compared with oxygen only group, and moreover exposed duration of sevoflurane did not effect on the progress of ALI in vivo model of rat.

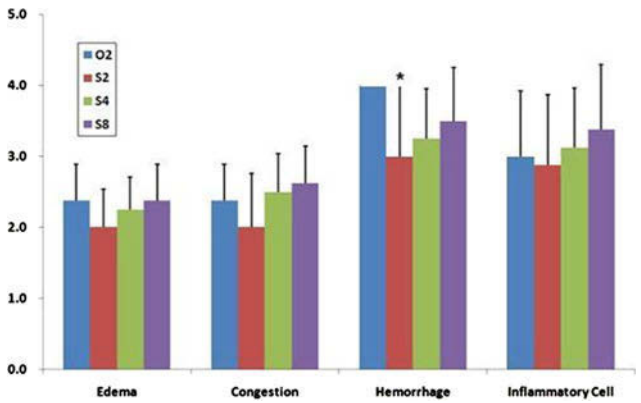


Fig. 1 Histologic finding

Histologic finding was scored for lung injury by a pathologist. Scores of edema, alveolar capillary congestion, hemorrhage or inflammatory cell were assessed. Each was graded according to the following scale: 1 = minimal damage; 2 = mild damage; 3 = moderate damage; 4 = severe damage; 5 = maximal damage. *$P < 0.05$ compared with O_2

REFERENCE(S). 1. Suter D et al. The immunomodulatory effect of sevoflurane in endotoxin-injured alveolar epithelial cells. Anesth Analg. 2007; 104: 638–45. 2. Yue T et al. Postconditioning with a volatile anaesthetic in alveolar epithelial cells in vitro. Eur Respir J. 2008; 31: 118–25 3. Voigtsberger S et al. Sevoflurane ameliorates gas exchange and attenuates lung damage in experimental lipopolysaccharide-induced lung injury. Anesthesiology. 2009; 111: 1238–48

GRANT ACKNOWLEDGMENT. This work was supported by Pusan National University Research Grant 2012.

0821
THE ROLE OF N-ACETYLCYSTEINE IN THE INFLUENCE OF ACUTE INTESTINAL ISCHEMIA–REPERFUSION ON PULMONARY, INTESTINAL AND HEPATIC FUNCTION

P.G. Briasoulis[1], K. Kalimeris[1], C. Batistaki[1], P. Matsota[1], T. Nomikos[2], M. Politi[3], K. Papaparaskeva[4], G. Kostopanagiotiou[1]

[1]University of Athens, Medical School, 2nd Department of Anesthesiology, University General Hospital 'Attikon', Chaidari, Attiki, Greece, [2]Harokopio University, Department of Dietetics and Nutritional Science, Athens, Greece, [3]Department of Hematology and Blood Bank Unit, Areteion Hospital, Medical School of Athens, Athens, Greece, [4]Department of Pathology, Agia Olga Hospital, Athens, Greece

INTRODUCTION. Intestinal Ischemia–Reperfusion (IIR) Injury is an acknowledged condition that presents in several clinical settings such as occlusion of the aorta during open aortic aneurysm surgery, and is a major cause of oxidative stress and distant organ injury. N-acetylcysteine is a free radical scavenger that is being studied for its antioxidant properties.
OBJECTIVES. To determine whether N-acetylcysteine (NAC) attenuates oxidative stress and acute organ injury that is induced by intestinal ischemia–reperfusion in rat models, when administered in different doses. The organs studied were lung, liver and intestine.
METHODS. Thirty male Wistar rats were anesthetized and submitted into occlusion of the superior mesenteric artery for 45 min. Eight rats received 150 mg/kg NAC i.p. before ischemia, 7 300 mg/kg NAC before ischemia, 7 150 mg/kg before ischemia and 150 mg/kg after reperfusion and 8 rats were not treated with NAC (control group). Five rats were used as sham group, with no IIR induced. After 4 h of IIR, the rats were euthanized by exsanguination from the aorta and tissue samples were collected from lung, liver and small intestine, for histology examination. Also, bronchoalveolar lavage fluid was collected to measure cell counts, phospholipid levels and glutathione peroxidase activity.
RESULTS. There was no statistically significant difference in histological score of the lung ($p = 0.25$), liver ($p = 0.29$) and intestinal tissue ($p = 0.6$) among groups, whereas the group that was not treated with NAC presented with the worst tissue lesions. In BALF there was no significant difference observed concerning macrophage and neutrophil counts, phospholipid levels or lipid oxidation. However, glutathione peroxidase activity was significantly lower ($p = 0.01$) in the group treated with 300 mg/kg NAC.
CONCLUSIONS. Preliminary data show a probable positive effect of NAC concerning oxidative stress and acute lung injury after intestinal ischemia–reperfusion in rats.
ACKNOWLEDGEMENTS: This research has been financed by the University of Athens, Medical School.

0822
COMPARISON OF METHODS TO ESTIMATE THE HEIGHT AND PREDICTED BODY WEIGHT OF INTENSIVE CARE PATIENTS

F.R. Shuaib[1], T. Husain[1]

[1]North West London Hospitals NHS Trust, Department of Intensive Care, Harrow, UK

INTRODUCTION. Acute respiratory distress syndrome (ARDS) is a life-threatening situation associated with significant mortality. The only intervention that has convincingly demonstrated a reduction in the mortality in those patients with ARDS is protective ventilation using lower tidal volumes [1]. Such ventilatory strategies rely on accurate assessments of predicted body weight (PBW), which is itself usually derived from calculations based upon patient height. There are a number of proposed methods to estimate patient height and thereby PBW, including measurement of the supine patient, demispan and ulnar length [2].
OBJECTIVES. To compare the estimates of height obtained from intensive care unit (ICU) patients using supine measurement, demispan and ulnar length.
METHODS. On six different days of the week over a 6 week period measurements were taken of all current patients in an 11-bedded general ICU. Measurements were made of ulnar length, demispan and total supine length using standard methods. All measurements were made by a single observer. Each patient was measured once during their ICU admission and those with amputations were excluded.
RESULTS. In total 51 patients were measured, 28 males and 23 females. Single factor ANOVA analysis identified significant variation between the three methods of height estimation ($p = 0.002$). Ulnar length measurement most commonly gave the highest estimated height (36/51), whilst in 59 % (30/51) of patients, supine length gave the lowest height estimate. In 8 of the patients measured (16 %), all three measurements failed to fall within 10 % of the mean of the three values, whilst in less than half of the patients, did all three measurements lie within 5 % of the mean value (21/51). The greatest difference between the three estimates of an individual patient's height was 24 cm.
CONCLUSIONS. There is significant disparity between the values obtaining using three recognised methods of assessing patient height. Ulnar length calculations tend to estimate the greatest height, with formal supine measurement of height giving the shortest. The potential implications of such variation are inaccurate assessment of PBW and thereby potential delirious high tidal volume ventilation. In the worst example, the data indicate a potential 129 ml variation in optimal tidal ventilation at 6 ml/kg. Further studies must be carried out to elucidate the optimal method to estimate patient height within the ICU patient population.
REFERENCE(S). 1. Acute Respiratory Distress Syndrome Network. Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. N Engl J Med 2000; 342: 1301–82.
2. Malnutrition Advisory Group (2003). The 'MUST' Explanatory Booklet. British Association for Parenteral and Enteral Nutrition, Redditch.

0823
THE EFFECT OF INDUCED THERAPEUTIC HYPOTHERMIA ON LUNG MECHANICS IN MECHANICALLY VENTILATED PATIENTS

C.J.P. Beurskens[1,2], J. Horn[2], M.B. Vroom[2], N.P. Juffermans[1,2]

[1]Academic Medical Center–University of Amsterdam, Laboratory of Experimental Intensive Care and Anesthesiology, Amsterdam, Netherlands, [2]Academic Medical Center–University of Amsterdam, Department of Intensive Care, Amsterdam, Netherlands

INTRODUCTION. Induced hypothermia (32–34 °C) is increasingly applied as a therapeutic intervention in Intensive Care Units (ICU). The neurologic benefits are well described, but clinical data on the effect of hypothermia on lung mechanics and gas exchange during mechanical ventilation are scarce. Previous retrospective studies suggest a reduction in minute ventilation needed for CO_2 elimination.
OBJECTIVES. We hypothesized that induced hypothermia (32–34 °C) allows for improved gas exchange while maintaining protective ventilation settings in mechanically ventilated ICU patients.
METHODS. Prospective study in cardiac arrest patients treated with induced hypothermia (32–34 °C) for 24 h (n = 56) and observed for 48 h during protective mechanical ventilation with tidal volumes of 6 ml/kg. At the start and end of the hypothermic phase and after reaching normo-temperature, an arterial blood gas was taken (alpha stat) and data were collected from the electronic patient files. Dead space ventilation was calculated as ($PaCO_2$-$etCO_2$)/$PaCO_2$. Data were analyzed by Friedman and Wilcoxon signed rank tests and expressed as median ± range.
RESULTS. Hypothermia resulted in a drop in $PaCO_2$ levels (5.5 ± 4.8–4.8 ± 3.3 kPa, $P = 0.001$) and levels of exhaled CO_2 ($etCO_2$) (4.0 ± 3.8–3.6 ± 4.6 kPa, $P = 0.04$), while tidal volume and respiratory rate remained unchanged. Also dead space ventilation did not change. During hypothermia, applied PEEP levels could be decreased (6 ± 15 to 5 ± 13 cmH_2O, $P = 0.0001$), while P/F ratio remained unchanged. Plateau pressures dropped slightly during hypothermia (18 ± 41–17 ± 34 cmH_2O, $P = 0.05$). After rewarming, P/F ratio showed a drop (260 ± 370–207 ± 340, $P = 0.0001$) at unchanged PEEP levels. Levels of $PaCO_2$ remained unchanged, whereas $etCO_2$ levels increased (3.6 ± 4.6–4.3 ± 5.5 kPa, $P = 0.0001$) with a concomitant decrease in dead space ventilation (28.6 ± 92–4.9 ± 58.5 kPa, $P = 0.0001$), due to an increase in tidal volume from 434 ± 880–518 ± 884 mL, $P = 0.02$), which was thought to result from the switch from controlled ventilation to spontaneous breathing.
CONCLUSIONS. Hypothermia improves ventilation in mechanically ventilated patients while maintaining lung protective ventilation settings and allows for lower PEEP levels

while maintaining oxygenation. Results provide a rationale to study whether induced hypothermia is a therapeutic option in patients with Acute Respiratory Distress Syndrome (ARDS), in whom protective ventilation is hampered by severe respiratory acidosis or hypoxemia.

0824
IDENTIFICATION OF SUITABLE PATIENTS FOR A RESPIRATORY WEANING STEP-DOWN UNIT AT A LARGE TERTIARY REFERRAL CENTRE

K. Laver[1], K. Nolan[1], S. Mathoulin[1], A. Ghose[1], C. Snelson[1]

[1]Queen Elizabeth Hospital, Anaesthetics and Intensive Care, Birmimgham, UK

OBJECTIVES. Respiratory weaning can be defined as the process during which a patient is removed from mechanical support.[1] The time spent on weaning itself can account for up to 50 % of mechanical ventilation and as up to 20 % of patients will fail in their first weaning attempt, it is important to choose a time when weaning is most likely to be successful.[2] The aim of our study was to identify patients on the critical care unit (CCU) at Queen Elizabeth Hospital Birmingham (QEHB) for whom weaning from mechanical ventilation was the main clinical issue. This allowed us to ascertain if these patients may be suitable for a respiratory weaning step-down unit, potentially reducing pressure on resources in the CCU.
METHODS. Over a 4 month period we identified patients across our 75-bedded CCU using several criteria, including a CCU stay of at least 14 days and the absence of any other organ support. We followed up these identified patients until discharge from hospital and collected information regarding events surrounding admission, time until weaning became the main concern, method of weaning, duration of weaning process, patient co-morbidities and any complications affecting weaning.
RESULTS. We included thirty-nine patients, with a mean age of 62 years. This consisted of 17 general CCU patients, four trauma patients, 7 neurological patients and 11 cardiac patients. Patients admitted as emergencies comprised 61.5 % of the cohort. On average patients spent 16 days on the CCU before weaning became the main clinical issue (range 7–38) and the average respiratory weaning period was 25 days (range 3–131.) The most common method of weaning was a combination of continuous positive airway pressure and reducing pressure support using Puritan–Bennett ventilators. Although 46 % of patients had an uneventful wean 54 % of patients suffered some sort of complication during the weaning process, including cardiac arrest, aspiration pneumonia and 'flash' pulmonary oedema. The average length of stay was 40 days (range 33–54), with trauma patients having the shortest duration of stay and cardiac patients the longest.
CONCLUSIONS. In conclusion, we identified a significant number of patients within our CCU who may potentially have been suitable for care in a respiratory weaning step-down unit. This could reduce pressure on vital healthcare resources required for patients with more complex clinical needs. A specialised weaning step-down unit should be able to focus on respiratory support and rehabilitation in selected patients, but would need resources to deal with complications arising during the weaning process.
REFERENCE(S). 1. Boles JM, Bion J, Connors A et al. Weaning from mechanical ventilation. Eur Respir J. 2007; 29(5): 1033–56. 2. Fang GS, Yeung J. Core topics in critical care medicine. Cambridge University Press, 2010. Cambridge Books Online. http://dx.doi.org/10.1017/CBO9780511712289.032 [last Accessed 21st July 2012]

0825
CORRELATION BETWEEN NURSING STUFF AND MONITORING GENERATED RECORDS OF SAO_2 IN ICU PATIENTS

A. Vakalos[1], A. Ferar Hafuz[1]

[1]Xanthi General Hospital, ICU, Xanthi, Greece

INTRODUCTION. Nursing stuff generated records may be compromised by effort to favor certain outcome, may be planned and may be affected by individual flow. The according error is called systemic bias. On the other hand, monitoring generated records may be compromised by characteristics of the system, like imperfect calibration of measurement instruments, leading to systematic error called systematic bias.
OBJECTIVES. The aim of our study was to compare nursing stuff generated SaO_2 records to monitoring generated SaO_2 records and to find out the kind of bias according to the nursing shift, in ICU patients.
METHODS. During February 2013, we looked for hourly SaO_2 records (%) to ten daily nursing stuff sheets as well as to corresponding monitoring generated records, after accurate time synchrony was obtained. We looked retrospectively for 240 couple records (N) divided per 80 to morning (1st), afternoon (2nd) and night (3rd) nursing shift. Normality test was obtained using Kolmogorow–Smirnov method. Using linear correlation method, we looked for linear slope, correlation coefficient (r), and coefficient of determination (r^2), and by linear regression method using ANOVA test we looked for p value. We operated runs test to measure the points above, below and on to the line.
RESULTS. We found out 236 couple of records. In four cases there was either no nursing stuff or monitoring generated records.

Table 1 Results

	N	Slope	r	r^2	p	Above	Below	On to
1st	76	0.53	0.31	0.09	=0.005	50	26	16
2nd	80	1.25	0.66	0.44	<0.0001	58	22	31
3rd	80	0.73	0.63	0.40	<0.0001	48	32	19

CONCLUSIONS. According to our data, all missing nursing stuff records were marked during the morning nursing stuff shift. Furthermore, the correlation of the parameters was less strong during 1st shift. Although the calculated p value was extremely low in all cases, was greater in 1st shift. On the other hand, the smaller number of points below the line suggests that the systematic error, systemic bias was greater during all shifts. Our data suggests that nursing stuff generated SaO_2 records were more reliable, assuming that individuals try to record the exact value in cases of high noise to signal ratio and revise monitoring record failure.

0826
CARE RESULTS IN A HOME MECHANICAL VENTILATION UNIT OF UNIVERSITY HOSPITAL IN GRANADA

R. Ramírez[1], R. Fernandez[1], S. Narbona[1], M.E. Yuste[1]

[1]Granada University, Granada, Spain

OBJECTIVES. We want to analyze statistically, medical activity by intensivists in an operational unit of home mechanical ventilation (UFVMD) outside the Intensive Care Unit (ICU) and disclose social utility.
METHODS. We performed a retrospective study by managing a own database in UFVMD consisting of 11 beds in the period 2000–2012, collecting the following items for 245 patients: sex, age, pathologies reviews; attention telephone; income therapies, palliative care, surrogate home and family break, fibrobronchoscopy, family rest and cause of death.
RESULTS. Sex: 111 women (45.3 %). Average age: 50.9 ± 17.54. Pathologies: lateral amyotrophy sclerosis 145 (59.9 %); myopathies 54 (22.1 %), thoracic cage 30 (12.5 %); neuropathies 7 (2.9 %), diaphragmatic paralysis 5 (2.1 %); central hypoventilation 4 (1.6 %). Reviews: 2257, 85 % of which has been measured forced vital capacity and peak cough flow. Specific patient care by telephone: 3543 calls. Income: 446, most of which has been subjected to one or more of the following respiratory therapy (patient and carers training in mechanical cough 172 (70.2 %), Aerosol 190 (77.55 %), mechanical ventilation invasive 38 (15.51 %), mechanical ventilation 53 (21.63 %)), there have been income for palliative care too 31 (12.7 %). The rest of the primary caregiver has been one of the objectives of income in 41 (10.09 %) and as a substitute for home in 31 (6.95 %). Fibrobronchoscopy: 227, review of airway. Pneumococcal and influenza vaccinations: 170 (caregivers separately). Exitus most common cause: respiratory infection in 75 % of ventilated patients and respiratory failure 87 % in non-ventilated.
In 14 (5.7 %) patients has not been done so far, no respiratory care, for being the disease at an early stage.
There have been 17 (7 %) patients who have rejected the program for refusing admission to any therapy.
CONCLUSIONS. The results demonstrate the wide range of therapies used and close monitoring conducted in consultation with these patients and also facilitate accessibility by phone. This undoubtedly contributes to reduce the number of primary care, emergency assistance and hospital admissions. Most patients take their treatment at home. The presence of UFVMD is fully justified by the comprehensive monitoring is performed on these patients.
GRANT ACKNOWLEDGMENT. Hospital S. Rafael. UVMD unit

0827
CORRELATION BETWEEN THE THORACIC ULTRASOUND EVALUATION OF THE PLEURAL EFFUSION VOLUME AND THE DRAINED VOLUME

E. Zogheib[1,2], H. Alyami[1], J. Rasata[1], P.G. Guinot[1], A. Musi[1], S. Marx[1], P. Besserve[1], M. Bernasinski[1], F. Trojette[1], M. Moubarak[1], H. Dupont[1,2]

[1]CHU Amiens, Surgical Intensive Care, Amiens, France, [2]Université Jules Vernes Picardy, INSERM U088, Amiens, France

INTRODUCTION. Chest drainage is one of the treatment used in ICU for pleural effusion (PE). The use of thoracic ultrasound (TU) to guide or spot before invasive procedures is increasingly recommended in ICU.
OBJECTIVES. Investigate the correlation between the estimated volume of PE with TU and true drained volume; and changes in drainage points between anatomical landmarks and ultrasound marker.
METHODS. Non-interventional prospective observational study was conducted in surgical ICU, after a favorable opinion of the local ethics committee. After the decision of chest drainage, anatomical location of possible puncture is marked. TU was then carried out on the anatomical spotting, to specify wether maximum PE volume or another organ match with this anatomical location. Then, TU was used to guide the best point of drainage corresponding to the maximum PE: horizontal ultrasonic view was performed to get horizontal surface (HS) of PE, and the two diameters (the largest [DiamH1] and the smallest [DiamH2]); then, at 90° from the horizontal plane, a vertical section was performed with the same measurements (vertical surface [VS], largest [DiamV1] and smallest [DiamV2]). Subsequently, the procedure was performed using standard techniques. The drained volume was measured 1 h after the end of the procedure. TU volumes were calculated using formula: (VolH1 = HS × DiamV1; VolH2 = HS × DiamV2; VolVert1 = VS × DiamH1; VolVert2 = VS × DiamH2). Correlating the calculated volumes and drained volume is achieved by a simple linear regression.
RESULTS. 60 chest drainage were studied in 54 patients, 6 of whom had bilateral drainage. Mean age was 64 ± 15 years with a mean IGS II score of 46.5 ± 15.5 and BMI at 26.6 ± 5.9, 14 patients were considered obese with a BMI > 30. The total drainage was 831 ± 454 ml. The volumes calculated with TU were: VolH1 = 567 ± 353 ml; VolH2 = 399 ± 262 ml; VolV1 = 668 ± 383 ml; VolV2 = 399 ± 293. The best correlation between the drained volume and the ultrasound volume was calculated for VolH1 ($R2 = 0.54$, $p < 0.001$), whereas they were lower for VolH2 ($R2 = 0.47$, $p < 0.001$), VolV1 ($R2 = 0.51$, $p < 0.001$) and VolV2 ($R2 = 0.41$, $p < 0.001$)). In all cases, the calculated ultrasound measurements underestimate the actual volume drained. The drainage point was changed in more than half of the cases between the anatomical and TU guidance (31 drainages, 51.66 %). In the cases where there has been a change in drainage point, the lungs would have been affected in 16 cases, the liver in 3 cases, the spleen in 1 case and the heart in one other case. Other changes in points allowed drainage of the center point of maximum drainage of the effusion.

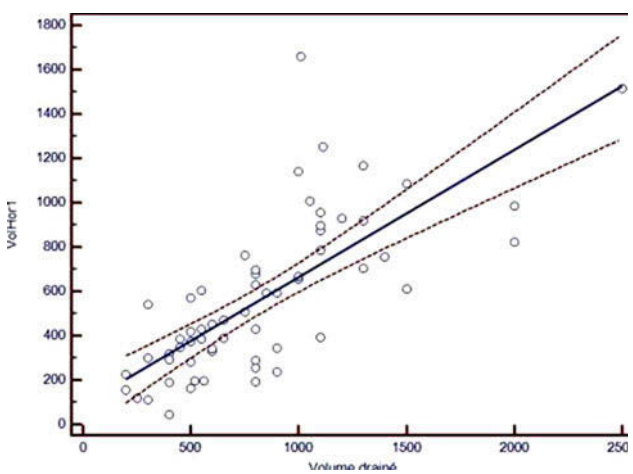


Fig. 1 Linear correlation of VolH1

CONCLUSIONS. TU evaluation of PE volume VolH1 had a good correlation with the real volume drained. The identification of pleural effusion by ultrasonography would secure this procedure and avoid traumatically injuries of vital organs.

0828
VARIABILITY AND ACCURACY OF HEIGHT AND WEIGHT ESTIMATES WITHIN INTENSIVE CARE PATIENTS

P. Tanto[1], F. Manneh[1], A. Fertleman[1], T. Husain[1]

[1]North West London Hospitals NHS Trust, Department of Intensive Care, Harrow, UK

INTRODUCTION. Much of the routine care and interventions within the intensive care unit (ICU), such as appropriate ventilation, drug dosing and nutrition, rely upon accurate assessment of the patients' actual body weight (ABW), ideal body weight (IBW) and height. Often these figures are estimated, rather than formerly measured and calculated, potentially leading to, at the very minimum, suboptimal care.

OBJECTIVES. To assess the variability and accuracy of estimates of patient ABW, IBW and height made by multidisciplinary team members within the ICU.

METHODS. On six different days of the week over a 6 week period, clinical staff within the multidisciplinary team of an 11-bed general ICU estimated the ABW, IBW and height of the current inpatients. All participants based their estimates on visual inspection alone. Estimates of height and IBW were additionally compared with predictions of these values based on measurement of ulnar length [1].

RESULTS. 62 patients had their ABW, IBW and height estimated, with a median of 12 estimates made per patient per study day (IQR 11–12). In total 60 different staff members took part in the study, including doctors, nurses, physiotherapists, dieticians and pharmacists. There was considerable inter-observer variation in all three estimations, with a median range of estimates of individual patient ABW, IBW and height being 28 kg, 25 kg and 18 cm respectively. From a total of 757 assessments, 253 (33 %), 235 (31 %) and 8 (1 %) of estimates lay >10 % from the mean estimate of ABW, IBW and height respectively. Estimates of ABW were statistically more variable than estimates of IBW (paired t-test, $p < 0.004$).

When compared to the predicted values of IBW and height calculated from ulnar length measurements, the mean difference between the estimated and predicted values was 9.0 kg and 6.3 cm, with mean percentage difference 14.9 and 3.7 % respectively; 321 (42 %) and 728 (96 %) of the estimates of IBW and height fell within 10 % of the calculated values respectively. Nurses were more accurate in their estimation of patient height (mean error 3.6 vs 3.8 %), but this did not reach statistical significance.

CONCLUSIONS. Healthcare professional estimations of ICU patient ABW, IBW and height show significant inter-observer variability and are significantly inaccurate. The most accurate and less variable assessment was patient height. Such inaccuracies will lead to inappropriate ventilation and incorrect prescriptions of drugs and nutrition. All ICU patients should be weighed and measured on ICU admission.

REFERENCE(S). 1. Malnutrition Advisory Group (2003). The 'MUST' Explanatory Booklet. British Association for Parenteral and Enteral Nutrition, Redditch.

0829
THE RISING TIDE: IMPROVING ADHERENCE TO LOW TIDAL VOLUME VENTILATION ON THE ROYAL LONDON HOSPITAL ADULT CRITICAL CARE UNIT

E.J. Smith[1], P.J. Holmes[1], C. Stannard[1], S. Turle[1]

[1]Barts Health NHS Trust, The Royal London Hospital Adult Critical Care Unit, London, UK

INTRODUCTION. Mechanically-ventilated patients in critical care were traditionally administered tidal volumes (TVs) of 10–15 ml/kg of ideal body weight (IBW), with the aim of achieving a normal pH and $PaCO_2$. A seminal study by the Acute Respiratory Distress Syndrome Network demonstrated that low tidal volume ventilation (LTVV; 6 ml/kg compared with 12 ml/kg IBW) confers a significant mortality benefit and increase in ventilator-free days.[1]

LTVV has since been widely adopted. It is the policy of The Royal London Hospital Adult Critical Care Unit (RLH ACCU) to employ LTVV in all ventilated patients unless contra-indicated.

OBJECTIVES. 1. To investigate RLH ACCU's level of adherence to LTVV. 2. To make interventions designed to improve compliance 3. To assess the impact of those interventions.

METHODS. We performed a closed-loop, retrospective clinical audit. For each stage, all daily intensive care nursing charts for patient episodes involving invasive ventilation were retrieved for the relevant 30-day period. Exclusions were made for patients with neurosurgical conditions necessitating low $PaCO_2$ targets, and those for whom the charts were unavailable.

Recorded inspired tidal volumes (TV[insp]) were obtained for all remaining patient-hours spent on mandatory modes of ventilation. Values for height, IBW and ideal tidal volume (ITV) listed on the daily charts by nursing staff were noted for each individual patient.

All IBWs and ITVs were recalculated and examined for accuracy. Recorded TV(insp) values were then compared to their respective ITVs.

Interventions prior to re-audit: 1. A new medical daily care bundle was introduced which included a specific box for entering patients' individual ITVs. 2. Our Practice Development Team re-educated nursing staff on double-checking IBW and ITV values with a second member of staff at a time other than patient admission. 3. Our original findings were presented locally and disseminated to all staff.

RESULTS.

1. Demographics

Table 1 Demographics

	Original audit (01/06/12–30/06/12)	Re-audit (01/02/13–02/03/13)
Total patient episodes	118	117
Total patient episodes involving invasive ventilation	89	64
Net episodes post exclusion criteria	50	55
Total unique patients audited	49	54
% female patients	32.7	31.5
Median age (years)	52	60
Age range (years)	17–94	25–89
Net audited patient-hours	2017	2418

Demographics

2. LTVV compliance

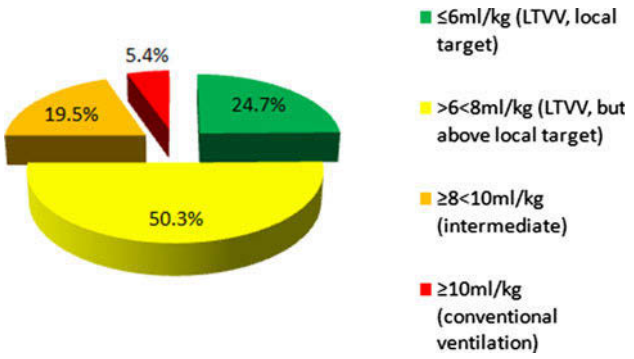


Fig. 1 LTVV adherence: original audit

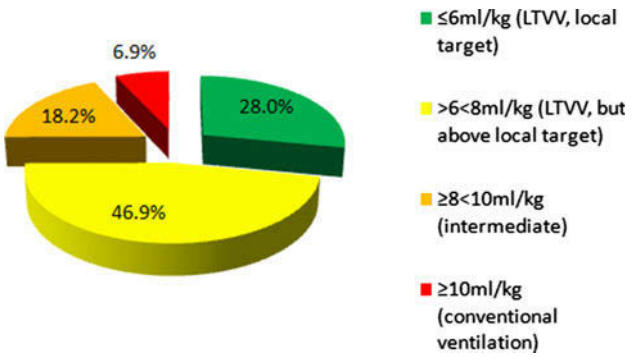


Fig. 2 LTVV adherence: re-audit

In the original audit, under a quarter of the patient-hours examined were compliant with local LTVV policy. The re-audit demonstrated an improvement in this.

3. IBW and ITV calculation accuracy

Table 1 IBW and ITV data

	IBW original audit	IBW re-audit	ITV original audit	ITV re-audit
Correctly calculated (%)	64.0	58.2	48.0	49.1
Under 10 % inaccurate (%)	30.0	36.4	42.0	47.3
Over 10 % inaccurate (%)	6.0	5.5	10.0	3.6

A sizeable error rate in calculated IBW and ITV values was found in both stages of the audit, although the magnitude of the errors was mainly small. A reduction in large errors was seen in both calculations by the time of re-audit.

CONCLUSIONS. This audit demonstrates over-ventilation of our patients, in contravention with both local policy and best available evidence. This is compounded by a high rate of inaccuracy in calculating both IBW and ITV values. Our interventions had a modest positive impact.

REFERENCES. The Acute Respiratory Distress Syndrome Network. Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. N Engl J Med. 2000; 342(18): 1301–8.

0830
ACCURACY OF HEIGHT ESTIMATION AND TIDAL VOLUME SETTING USING ANTHROPOMETRIC FORMULAS AND A SMARTPHONE APPLICATION, IN A CAUCASIAN POPULATION

E. L'Her[1,2], J. Martin[1], Z. Chiche[1], F. Lellouche[3], A. Zemirline[1]

[1]CHU de Brest/Université de Bretagne Occidentale, Réanimation Médicale et Urgences Adultes, Brest, France, [2]Université de Bretagne Occidentale, CHRU de Brest, LATIM INSERM UMR 1101, Brest, France, [3]Université Laval, Centre de Recherche IUCPQ, QC, Canada

INTRODUCTION. Knowledge of patients' height is essential for daily practice in the intensive care unit (ICU), however, actual height measurements are not available on a daily routine and measured height in the supine position may lack consistency. Clinicians do need simple and rapid methods to estimate the patients' height, especially in short height and/or obese patients.

OBJECTIVES. The objectives of the study were to evaluate several anthropometric formulas for height estimation on healthy volunteers, and to test whether several of these estimates will help tidal volume setting in ICU patients.

METHODS. A prospective, observational, study in an emergency and medical intensive care unit of an university hospital. During the first phase of the study, eight limbs measurements were performed on 60 healthy volunteers and 18 height estimation formulas were tested. During the second phase, four height estimates were performed on 60 consecutive ICU patients under mechanical ventilation, using a specifically dedicated Smartphone application [1].

RESULTS. In the 60 healthy volunteers, actual height was well correlated to the gold standard, the measured height in the erect position. Correlation was low between actual and calculated height, using the hand's length and width, the index, or the foot equations. The Chumlea method and its simplified version, performed in the supine position, provided adequate estimates (see Fig. 1). In the 60 ICU patients, calculated height using the simplified Chumlea method was well correlated to measured height ($r = 0.78$; $\partial < 1$ %). Ulna and tibia estimates also provided valuable estimates. All these height estimates allowed calculating IBW or PBW that were significantly different from the patients' actual weight on admission. In most cases, tidal volume set according to these estimates was lower than what would have been set using the actual weight.

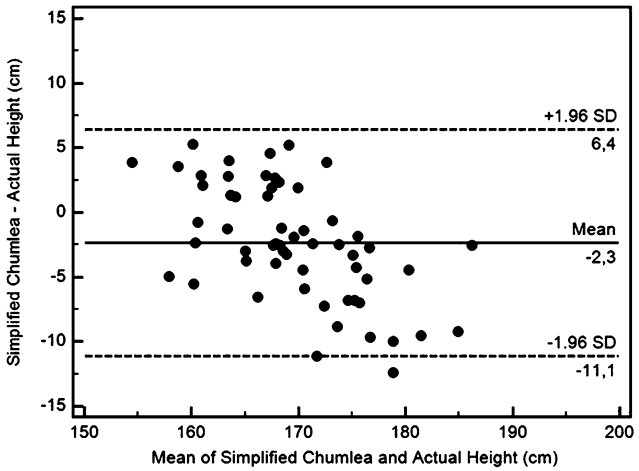


Fig. 1

CONCLUSIONS. When actual height is not available in ICU patients undergoing mechanical ventilation, alternative anthropometric methods to obtain patient's height based on lower leg and on forearm measurements could be useful to facilitate the application of protective mechanical ventilation. The simplified Chumlea method is easy to achieve in a bed-ridden patient and provides accurate height estimates, with a low bias.

REFERENCE(S). 1. https://itunes.apple.com/ca/app/ianthropometer-icu-1/id428778012?mt=8.

0831

STRESSFUL EXPERIENCES IN PATIENTS WHO ARE SUBMITTED TO PROLONGED MECHANICAL VENTILATION IN THE INTENSIVE CARE UNIT

M.A. Riera[1], E. Gallart[1,2], E.P. Afonso[1,3,4], A. Solsona[1], A. Mont[1], M. Lolo[1], J. Gomez[1], M.A. Gallart[1], M. Mey[1], A. Humet[1,3,4], E. Olivera[1], L. Calleja[1], A. Vicálcaro[1]

[1]Vall d'Hebron University Hospital, ICU, Barcelona, Spain, [2]Universitat Autónoma de Barcelona, Barcelona, Spain, [3]Vall d'Hebron Research Institute, CRIPS, Barcelona, Spain, [4]CIBERes de Enfermedades Respiratorias (Instituto de Salud Carlos III), Barcelona, Spain

INTRODUCTION. Stressful experiences in patients who are submitted to prolonged mechanical ventilation (PMV), upon admission in an Intensive Care Unit (ICU), may have a negative impact and, on the long run, be related with post traumatic stress, anxiety and depression.

OBJECTIVES. To determine what are the stressing perceptions related with the ICU environment and the endotracheal tube (ETT) of patients submitted to PMV, evaluated at the time they are discharged from the ICU.

METHODS. Prospective cohort study performed on a tertiary mixed ICU, which includes all patients who are submitted to mechanical ventilation for more than 48 h, during one year. Upon ICU discharge, the ICU Stressful Experience Questionnaire (ICU-SEQ), which evaluates 22 items linked with general aspects of the ICU stay (sleep, family bonding…) and 9 items related with the ETT (distress, communication) is applied to patients.

RESULTS. Results for the first 80 included patients are available. Amid these, 8.75 % did not remember their stay in the ICU at all. The predominantly recalled stressful experiences where "to miss their siblings" (87.5 %), "to be afraid" (85 %), "to feel lonely", "to have periods of panic", "to feel something wrong will happen to him/her", "to feel sad and depressed" (each one respectively 83.7 %) even though not all where remember with the same level of stress. Experiences rated with the highest level of stress where "the discomfort associated with the ETT" (73.9 %), "having trouble sleeping"(63.6 %) and "waking up in the middle of the night" (60 %). Of a total of 31 stressful occurrences, at least 10 where remembered with a high level of stress for more than half of included patients.

CONCLUSIONS. The stressful experience of being admitted in an ICU has a great significance. There is a need to acknowledge the most uncomfortable elements of this experience, with the purpose of adjusting our care towards making the ICU stay less damaging for patients.

REFERENCE(S). 1. Esteban A, Anzuelo A, Frutos F, Alía I, Brochard L, Stewart T et al. Characteristics and outcomes in adult patients receiving mechanical ventilation. JAMA. 2002; 287(3): 345–355. 2. Granja C, Lopes A, Moreira S, Dias C, Costa-Pereira A, Carneiro A. Patient's recollections of experiences in the intensive care unit may affect their quality of life. Crit Care. 2005; 9(2): 96–109. 3. Samuelson K, Lundberg D, Fridlund B. Stressful experiences in relation to depth of sedation in mechanically ventilated patients. Nurs Crit Care. 2007; 12: 93–104

GRANT ACKNOWLEDGMENT. PI11/01113 (Fondo de Investigación Sanitaria del Instituto de Salud Carlos III).

0832

EPIDEMIOLOGY AND RISK FACTORS FOR ACUTE KIDNEY INSUFFICIENCY IN A COHORT OF TRAUMA PATIENTS

B. Soyer[1], T. Gauss[2], H. Sophie[1], M. Raux[3], X. Mazoit[1], J. Duranteau[1], A. Harrois[1], Groupe Traumabase (contact@traumabase.eu)

[1]Hôpital Kremlin-Bicêtre–GHU Sud–APHP, Département d'Anesthésie Réanimation, Kremlin Bicêtre, France, [2]Hôpital Beaujon–GHU Paris Nord Val de Seine–APHP, Service d'Anesthésie Réanimation, Clichy, France, [3]Hôpital Universitaire Pitié Salpétrière–APHP, SSPI–Accueil des Polytraumatisés, Paris, France

INTRODUCTION. Acute kidney insufficiency (AKI) occurs frequently in ICU patients (30–65 %) and is independently associated with mortality (1). Epidemiology and risk factors for AKI are well described in critically ill patients, nevertheless there are few data concerning specifically the trauma patients.

OBJECTIVES. Our purpose is to describe the incidence and risk factors of AKI in a cohort of trauma patients.

METHODS. We conducted a retrospective and multicenter study (three centers) of prospectively collected data (clinical, biological and anamnestic data). AKI was classified according to the RIFLE criteria (2). We constituted two groups of patients: one group with no or mild AKI (0 or R criteria) and one group with severe AKI (R, I or L criteria). An univariate analysis was performed to compare the two groups (t test for parametric data, Mann–Whitney test for non parametric data and χ^2 for proportions). Associated risk factors for the development of AKI were identified after multivariate analysis. Results are expressed as mean ± standard deviation or median (interquartiles) values.

RESULTS. 1,108 patients were included in the study, among them 78.8 % were male. Median age was 37.1 ± 16.9 years. There was a majority of blunt trauma (94 %) with 66 % of road accidents. Median Injury Severity Score (ISS) was 17 (9–26). ICU length of stay was 3 (2–10) days; global mortality was 13 %. Incidence of AKI was 19.7 % with according to RIFLE criteria 11.3 % R ($n = 125$), 4.7 % I ($n = 52$), 3.6 % F ($n = 40$) and 0.1 % L ($n = 1$). The incidence of severe AKI was 8.4 % ($n = 93$) of which 22.5 % ($n = 21$) required renal replacement therapy. After multivariate analysis, lactate level at admission ($p < 1.10^{-5}$), age ($p < 5.10^{-3}$), ISS ($p < 1.10^{-5}$) and minimal systolic blood pressure before admission ($p < 0.05$) were associated with severe AKI. Furthermore, there was an interaction (deleterious synergy) between lactate level and ISS ($p < 1.10^{-3}$).

CONCLUSIONS. In a multicenter cohort of trauma patients, AKI (according to RIFLE criteria) is frequent (19.7 %). It mainly depends on the tissue hypo perfusion (lactate level at admission and prehospital blood pressure level) and the severity of the trauma (ISS). Further analyses are required to explain the deleterious synergy between the hypo perfusion and the severity of trauma.

REFERENCE(S). 1. Dennen P, Douglas IS, Anderson R. Acute kidney injury in the intensive care unit: an update and primer for the intensivist. Crit Care Med. 2010; 38(1): 261–275. 2. Bellomo R, Ronco C, Kellum JA, Mehta RL, Palevsky P. Acute renal failure–definition, outcome measures, animal models, fluid therapy and information technology needs: The Second International Consensus Conference of the Acute Dialysis Quality Initiative (ADQI) Group. Crit Care. 2004; 8(4): R204–212.

Outcome prediction: what's up?: 0833–0846

0833

PERFORMANCE OF PROGNOSIS SCORE SAPS 3 IN CARDIAC SURGERY

M. Delgado-Amaya[1], E. Curiel-Balsera[1], M.D. Arias-Verdú[1], R. Hinojosa-Pérez[2], A. Reina-Toral[3], A. Rodriguez-Sanchez[4], R. Rivera-Fernández[1], G. Quesada-García[1], Proyecto ARIAM

[1]Hospital Regional Carlos Haya, Malaga, Spain, [2]Hospital Virgen del Rocio, Sevilla, Spain, [3]Hospital Virgen de las Nieves, Granada, Spain, [4]Hospital Puerta del Mar, Cádiz, Spain

INTRODUCTION. The aim of the present study is to evaluate the performance of SAPS 3 in ICU patients admitted after cardiac surgery.

METHODS. Observational, prospective and multicenter study of patients included in the ARIAM registry of adult cardiac surgery. We analyzed clinical variables, surgical data and postoperative complications, outcomes and risk scores. Discrimination was assessed using the area under the ROC curve. With the standardized mortality ratio (SMR) evaluated the agreement between predicted and observed mortality. We used multiple logistic regression for multivariate analysis.

RESULTS. 5,462 patients were included, admitted to any five hospitals, consecutively between 2008 and 2012. 43 patients were excluded from study for lack of data to calculate mortality. Mean age was 63.62 ± 12.8 years. Surgery room observed mortality was 1.4 %, ICU mortality was 8 % and in-hospital mortality was 11.2 %. Observed 30 days mortality was 9.7 %.

SAPS 3 was calculated in 5,342 patients, it was 40.91 ± 10.46. The expected mortality rate was 11.1 % (with the Southwestern Europe equation), SMR = 0.873 (0.798–0.948). With the general equation expected mortality was 10.48 %, SMR = 0.925 (0.845–1.005). Expected 30-days mortality with logistic EuroSCORE (version 1) was 7.84 %, SMR = 1.22 (1.12–1.32).

SAPS 3 discrimination was assessed by the area under the ROC curve, it was 0.77 (0.75–0.79). We used the goodness-of-fit test of Hosmer–Lemeshow to evaluate the agreement between expected (with the Southwestern equation) and observed mortality: $\hat{}H = 24.21$ ($p < 0.05$). We did the same analysis with the general equation, $\hat{}H = 15.58$ ($p < 0.05$).

We also analyze observed versus expected mortality with logistic EuroSCORE, $\hat{}H = 88.08$ ($p < 0.05$). Area under the ROC curve was 0.727 (0.702–0.75) for logistic EuroSCORE and 0.729 (0.705–0.75) for additive EuroSCORE.

CONCLUSIONS. Our study shows that in patients undergoing cardiac surgery in the ICU, SAPS 3 has a low but acceptable discrimination. Calibration is not perfect, slightly underestimating mortality, although quite similar values between predicted and observed mortality are observed. SAPS 3 has better discrimination and calibration than EuroSCORE.

0834

ARE WE CORRECTLY PREDICTING THE MORTALITY OF CRITICAL PATIENTS WITH THE SIMPLIFIED ACUTE PHYSIOLOGY SCORE?

R.V. Gomes[1], W.A. Martins[1], P.M.D.M. Nogueira[1], A.R. Felipe[1], M.A.D. Matos[1], M. Assad[1], M.L. Toscano[1], F. Miranda[1], C.N.D. Barros[1], L.A.D.A. Campos[1]

[1]Hospital Unimed Rio, Rio de Janeiro, Brazil

INTRODUCTION. The severity of patients admitted to intensive care units (ICUs) demands the use of a prognostic score to assess the quality of the care provided at ICUs. The Simplified Acute Physiology Score (SAPS3) is the most widely used in Brazil, although with no specific training.

OBJECTIVE. To assess the impact of mortality prediction calculated by using SAPS3, with neither training nor consultation of definitions, identifying the variables that make SAPS3 form completion difficult.

METHODS. From December 2012 to January 2013, 36 physicians completed the form available at http://www.saps3.org. To calculate the first-hour SAPS3 of two test cases (pancreatitis and post-operative period of colectomy). That form completion (29 variables) underwent descriptive analysis and was compared with a standard completion, based on the definitions of appendix C (http://www.saps3.org), performed by three certified intensive care

professionals (core). Variables with disparities were identified, as was the impact on mortality prediction.
RESULTS. The two test cases showed high variability of results (Table below). The median showed a tendency to a reduction in mortality prediction in the pancreatitis case and a high increase (almost 14 %) in mortality prediction in the post-operative case, which was more complex. The large variability in score calculation (table below) might significantly impact mortality prediction. The 29 variables were divided into the following 3 groups: A agreement in form completion, with no disparity (16–55.2 %); B $\leq$ 2 disparities (7–24.2 %); and C > 4 disparities (6–20.6 %). Group A variables were considered of easy understanding. In group B, the errors were interpreted as lack of attention or familiarity with the score. Group C variables were considered of difficult interpretation, but the way they are displayed in the form (no clear definition and no easy access) hinders form completion. In addition, lack of proper training might cause severe distortions in mortality prediction. The following variables were the most troublesome: cardiovascular (types of shock); hospital location; and cancer therapy. Their inadequate management can result in differences of as many as 18 points in SAPS3, corresponding to a difference of as much as 25 % in mortality prediction. This might jeopardize the use of the score.
Table 1 SAPS 3

Case	Minimum	Median	Mean	Maximum	Core
	60.00	71.00	72.26	86.00	72
Pancreatitis	26.47%	48.43%	50.25%	73.61%	50.24%
	77.00	92.00	91.33	104.00	76.00
Colectomy	56.69%	80.74%	78.68%	89.31%	57.88%

Table

CONCLUSION. The SAPS3 form available at http://www.saps3.org is not easily understood and can jeopardize the results of the score. Using the SAPS3 form with neither adequate training nor consultation to definitions results in inadequate mortality prediction.

0835
DIFFERENT PATTERNS IN LONGITUDINAL [DAY 1 TO 4] SOFA TRENDS EXPLAINS HETEROGENEITY IN MORTALITY RISK SEEN WITH AGGREGATED SOFA TRENDS

M. Shankar-Hari[1,2], S. Di-Gangi[1], M. Terblanche[1,2]

[1]Guy's and St Thomas' NHS Foundation Trust, Critical Care Medicine, London, UK, [2]King's College London, Division of Asthma, Allergy and Lung Biology, London, UK
INTRODUCTION. Total admission SOFA score is a predictor of risk of death in critically ill patients. Trends in SOFA score has also been reported as a predictor of risk of death. However, these reports use aggregate trends at the cohort level, dichotomised by mortality[1].
OBJECTIVES. To identify patterns of total SOFA trends at the individual patient level during the first 96 h after admission and evaluate their association with on 28-day mortality.
METHODS. Retrospective cohort study of prospectively collected data extracted from the clinical information system (CIS; CareVue™, Philips, Netherlands) in a single tertiary academic medical-surgical ICU. The study cohort is described using age, sex, admission APACHE II and SOFA scores, ICU and 28-day mortality. The main predictor variables are day 1–4 changes in t-SOFA score; the outcome variable 28-day mortality. At an individual patient level, the differences in t-SOFA score on consecutive days were calculated to define patterns of change. χ^2 test was used compare proportions in patterns observed.
RESULTS. We report data from 1454 admissions. The mean (SD) age was 63.0 (16.9) years; 61.9 % were male. Mean (SD) admission APACHE II score was 19.19 (6.29) and median (IQR) admission t-SOFA sore was 7(5). The ICU and 28-day mortality were 22.6 % and 26.3 %.
We identified seven different patterns of change in t-SOFA between admission day and day 4 (Table 1). Worsening t-SOFA was not always associated with mortality. However, a consistent trend was.
CONCLUSIONS. Using daily trends in t-SOFA, we identified seven different patterns of t-SOFA change which influences the risk of 28-day mortality.

Table 1 Association between t-SOFA pattern and 28D-M

t-SOFA trend pattern	Survivors N (%)	Non Survivors N (%)	p
Non increasing but with at least one reduction	459 (50.6)	91 (28.8)	<0.001
Decrease following an increasing trend	134 (14.8)	53 (16.8)	0.39
Increase following a decreasing trend	123 (13.6)	65 (20.6)	0.003
Decrease following an increase preceded by a decrease	68 (7.5)	22 (7.0)	0.76
Non decreasing	62 (6.8)	54 (17.1)	<0.001
Constant	36 (4.0)	17 (5.4)	0.29
Increase following a decrease preceded by an increase	26 (2.9)	14 (4.4)	0.18

REFERENCE(S). Minne L, Abu-Hanna A, de Jonge E. Evaluation of SOFA-based models for predicting mortality in the ICU: A systematic review. Crit Care. 12: R161.

0836
MORTALITY EVALUATION WITH SAPS3 PROGNOSIS SYSTEM IN ICU PATIENTS WITH ACUTE CORONARY SYNDROME WITH NON-ST SEGMENT ELEVATION MYOCARDIAL INFARCTION

C. López-Caler[1], R. Gutiérrez-Rodríguez[1], J. Moreno-Quintana[1], M. García-Delgado[2], J. Álvarez-Rodríguez[3], C. Lopez Caler[4], R. Rivera-Fernández[1]

[1]Carlos Haya Regional University Hospital, Málaga, Spain, [2]Virgen de las Nieves Hospital, Granada, Spain, [3]Hospital de Fuenlabrada, Fuenlabrada, Spain, [4]Hospital Neurotraumatológico, Jaen, Spain
OBJECTIVES. To analyze patients admitted into ICU with acute coronary syndrome with non ST segment elevation myocardial infarction according to SAPS3 prognosis system.
METHODS. The study has been developed in several Spanish hospitals. Data were collected since 2006–2012. High number of patients were from Motril Hospital (72), Virgen de las Nieves Hospital (63), Carlos Haya (66) y Fuenlabrada (26). Infanta Margarita Hospital in Cabra and Neurotraumatolical in Jaen were also involved. Necessary data to develop SAPS3 score were collected by participant hospitals staff. We have studied ICU mortality and hospital mortality. Data were expressed by mean $\pm$ standard deviation for quantitative variables and frequencies for qualitative data. SMR (Standardized Mortality Reason) and Hosmer–Lemeshow test were used to evaluate calibration and area under ROC curve was used to assess discrimination.
RESULTS. 250 patients were admitted. Age was 67.02 $\pm$ 12.51 years, ICU mortality was 3.2 % and hospital mortality 6 %. SAPS3 score was 43.19 $\pm$ 9.44 points, and probability of death by our geographical area equation was 12.65 % and by general equation 11.88 %. SMR by our geographical area was 0.47 (0.23–0.81) and by general equation was 0.50 (0.25–0.75).We have divided population into five groups depending on the probability of death by SAPS3 score and we compared observed and predicted mortality by Hosmer–Lemeshow test. This value for general equation was 11.50 ($p < 0.05$) and for our geographical area 12.49 ($p < 0.05$).SAPS3 discrimination with respect to hospital mortality was assessed by area under ROC curve was 0.73 (0.60–0.87).
CONCLUSIONS. Our study shows in patients admitted into ICU with coronary acute syndrome with non-ST segment elevation low discrimination by SAPS3 system and also bad calibration with inferior mortality than predicted by SAPS3 system.

0837
MORTALITY ASSESSMENT WITH SAPS-3 AND APACHE-III IN ICU PATIENTS

J. Moreno-Quintana[1], E. Curiel-Balsera[1], C. López-Caler[1], E. Aguilar-Alonso[2], E. Castillo-Lorente[3], J. Álvarez-Rodríguez[4], J. Carpio-Sanz[5], R. Rivera-Fernández[1]

[1]Carlos Haya Regional University Hospital, Málaga, Spain, [2]Hospital Infanta Margarita, Cabra, Spain, [3]Hospital Neurotraumatológico, Jaen, Spain, [4]Hospital de Fuenlabrada, Fuenlabrada, Spain, [5]Hospital Santa Ana, Motril, Spain
OBJECTIVES. Assess SAPS-3 prognosis system and APACHE-III in ICU patients.
METHODS. We have study patients admitted into ICU between 2006 and 2007 in Motril Hospital, in Carlos Haya Hospital, four months between 2011 and 2012. In Cabra Hospital and Jaen, 2 months in 2012. In Fuenlabrada all the patients admitted during 2011 and in Virgen de las Nieves four months in 2006. Data were collected to developed SAPS-3 prognosis system and APACHE-3, and probability of death by these systems, ICU mortality and Hospital mortality (ICU and Floor). Area under ROC curve was used to assess discrimination and Hosmer–Lemeshow test to assess agreement between observed and predicted mortality.
RESULTS. The sample were composed of 2,510 patients, age 61.43 $\pm$ 15.96 years. ICU mortality was 11 % and hospital mortality 16.06 %. Probability of death was 17.35 % by general equation and 17.95 % by our geographical area equation and 16.06 % as we said before. Hosmer–Lemeshow test for general equation was 16.28 ($p < 0.05$) and for the Spanish equation 27.5 ($p < 0.05$). In both cases we can observe differences between observed and predicted mortality, statistically significant. Discrimination of the SAPS-3 for hospital mortality assessed with the area under the ROC curve was 0.842 (0819–0864).We also collected data to calculate APACHE-III in patients admitted into four hospitals (Malaga, Motril, Jaen and Goat). The sample was 1,422 patients, age was 62.27 $\pm$ 15.85 years ICU mortality was 11 and 15.54 % hospital mortality; predicted mortality by APACHE-III was 16.81 %. The Hosmer–Lemeshow test for APACHE-III was 17.21 ($p < 0.05$). The differences were statistically significant. APACHE III discrimination to hospital mortality assessed with the area under the ROC curve was 0.883 (0.858–0.908).SAPS-3 and APACHE-III have good discrimination, being better APACHE-III discrimination.
CONCLUSIONS. Both instruments have differences between predicted and observed mortality and the largest ones with our geographical area SAPS-3 version. There are small differences between observed and expected but statistically significant.

0838
AORTIC VALVE REPLACEMENT: RESULTS AND PREDICTORS OF MORTALITY IN ELDERLY PATIENTS

M.R. Mañas Vera[1], S. Silvente Fernández[1], J.P. Valencia Quintero[1], M. Redondo Orts[1], V. Sáez Chica[1], M.J. García Delgado[1], E. Aguayo De Hoyos[1], A. Reina Toral[1], on behalf of ARIAM Group

[1]Hospital Universitario Virgen de las Nieves, Intensive Care Unit, Granada, Spain
INTRODUCTION. Aortic valve replacement is a common procedure in elderly patients, and its benefits and indications have been clearly established. Among specific predictive models in cardiac surgery, EuroSCORE is currently the most accepted in Europe although it remains controversial, EuroSCORE II has recently been published, and Berstein–Parsonnet (Parsonnet) seems obsolete. A general model as SAPS 3 has also been used for the same purpose.
OBJECTIVES. The study's objective was to evaluate the accuracy of predictive risk models on aortic valve replacement in patients older than 75 years.
METHODS. Data from 124 patients older than 75 years undergoing isolated aortic valve replacement between June 2008 and February 2013 were prospectively collected from ARIAM registry (Andalusian cardiac surgery registry). Preoperative, intraoperative and postoperative variables were analyzed and EuroSCORE, EuroSCORE II, Parsonnet and SAPS 3 were applied. Results were expressed in frequency and percentage, or mean values.
RESULTS. About 57 % of the population studied was female and 43 % was male. All patients underwent univalvular procedure. Overall hospital mortality was 12.1 %. By univariate analysis, no difference was seen between men and women regarding all classical cardiovascular risk factors, COPD, pulmonary hypertension, New York Heart Association class, previous sternotomy or surgical priority. Postoperative complications (acute kidney injury, bleeding, length of mechanical ventilation, reoperation, readmission and stroke) were also comparable between both genders. Additive and logistic EuroSCORE, logistic EuroSCORE II, additive and logistic Parsonnet, and additive and logistic SAPS 3 predictive risk models were calculated as they are published. Their results are showed in the following Tables:

Table 1 Predictive risk models and mortality

	Total population (n: 124)
Additive EuroSCORE	7.75 points
Logistic EuroSCORE	9.6 %
Logistic EuroSCORE II	2 %
Additive Parsonnet	21.2 points
Logistic Parsonnet	6.1 %
Additive SAPS 3	44.3 points
Logistic SAPS 3	12.5 %
Mortality	12.1 %

Tale 2 Results by gender

	Men (n: 51)	Women (n: 71)	p
Additive EuroSCORE	6.94 points	8.35 points	<0.0001
Logistic EuroSCORE	7.14 %	11.45 %	<0.0001
Logistic EuroSCORE II	1.53 %	2.32 %	<0.0001
Additive Parsonnet	16.41 points	24.75 points	<0.0001
Logistic Parsonnet	3.47 %	8.06 %	<0.0001
Additive SAPS 3	44.24 points	44.27 points	NS
Logistic SAPS 3	12.68 %	12.46 %	NS
Mortality	13.21 %	11.27 %	<0.02

CONCLUSIONS. In our population, EuroSCORE, EuroSCORE II, and Parsonnet underestimate global mortality. However, a general predictive risk model as SAPS 3 seems more adequate. Furthermore, they show a paradoxical effect between men and women, and female condition does not seem to be a risk factor in this series.

REFERENCES. 1. Di Eusanio M, Fortuna D, Cristell D, Pugliese P, Nicolini F, Pacini D, Gabbieri D, Lamarra M; RERIC (Emilia Romagna Cardiac Surgery Registry) Investigators. Contemporary outcomes of conventional aortic valve replacement in 638 octogenarians: insights from an Italian Regional Cardiac Surgery Registry (RERIC). Eur J Cardiothorac Surg. 2012; 41(6): 1247–52. 2. Doerr F, Badreldin AM, Heldwein MB, Bossert T, Richter M, Lehmann T, Bayer O, Hekmat K. A comparative study of four intensive care outcome prediction models in cardiac surgery patients. J Cardiothorac Surg. 2011; 6:21.

0839

PREDICTION OF 28-DAY-MORTALITY BY MULTIFACTORIAL SCORES APACHE-II, SAPS AND TISS AND PICCO-DERIVED VARIABLES EVLWI AND PVPI: A STUDY IN 170 CRITICAL CARE PATIENTS

S. Mair[1], N. Kovacs[1], S. Götz[1], J. Tschirdewahn[1], J. Siegel[1], B. Saugel[1], V. Phillip[1], R.M. Schmid[1], W. Huber[1]

[1]Technical University of Munich, Klinikum rechts der Isar, Munich, Germany

INTRODUCTION. Outcome of ICU patients is predicted by multifactorial scores such as APACHE-II, SAPS and TISS. Furthermore, transpulmonary thermodilution (TPTD)-derived markers of single organ function such as extravascular lung water index (EVLWI) and pulmonary vascular permeability index (PVPI) have been suggested as predictors of mortality.

OBJECTIVES. The aim of the study was to compare the prognostic capabilities of APACHE-II, SAPS, TISS, EVLWI and PVPI with regard to 28-day-mortality.

METHODS. Therefore, we evaluated the prognostic capabilities of APACHE-II, SAPS and TISS and the TPTD-derived parameters EVLWI and PVPI in 170 patients with PiCCO-monitoring (Pulsion Medical Systems; Germany). Analysis was based on EVLWI- and PVPI-values of the first triplicate TPTD-measurement per patient and severity-of-disease scores calculated within the first 24 h of ICU-admission. Since femoral venous access for indicator injection has been reported to confound TPTD-derived variables, patients with femoral venous access were excluded from the study. Statistics: Wilcoxon-test (unpaired), ROC-analysis regarding 28-day-mortality and multiple regression analysis regarding 28-day-mortality. IBM SPSS 20.

RESULTS. n = 170, 68/170 (40 %) females, 102/170 (60 %) males, age 62 ± 14 years. Means for the scores were 21.2 ± 7.5 for APACHE-II, 40.2 ± 13.0 for SAPS and 19.5 ± 6.7 for TISS.

Means of EVLWI and PVPI were 9.96 ± 3.63 mL/kg and 1.98 ± 0.83. 47 patients (28 %) died within 28 days of hospitalization. EVLWI (11.68 ± 4.39 vs. 9.31 ± 3.06 mL/kg; $p < 0.01$), PVPI (2.33 ± 1.05 vs. 1.84 ± 0.68; $p < 0.01$), APACHE-II (24.9 ± 8.0 vs. 19.8 ± 6.8; $p < 0.01$), SAPS (49.6 ± 12.5 vs. 36.6 ± 11.3; $p < 0.01$) and TISS (22.8 ± 8.4 vs. 18.2 ± 5.4; $p < 0.01$) were significantly higher in non-survivors compared to survivors. SAPS provided the largest ROC-AUC (AUC = 0.781; $p < 0.01$) regarding 28-day-mortality. ROC-AUCs for APACHE-II (AUC = 0.701; $p < 0.01$) and EVLWI (AUC = 0.685; $p < 0.01$) were larger than for TISS (AUC = 0.669; $p < 0.01$) and PVPI (AUC = 0.637; $p < 0.01$).

APACHE-II, SAPS, TISS, EVLWI and PVPI were included in multiple regression analysis regarding 28-day-mortality. Among these parameters only PVPI ($p < 0.01$), SAPS ($p < 0.01$) and TISS ($p = 0.02$) were independently associated to 28-day-mortality. Based on these independent variables a prediction model was calculated. The predictive capability of SAPS and TISS was further improved by including TPTD-derived PVPI. This model provided a ROC-AUC of 0.816 ($p < 0.01$) regarding the prediction of 28-day-mortality.

CONCLUSIONS. A prediction model including the severity-of-disease scoring systems SAPS and TISS as well as the TPTD-derived PVPI is superior to the single variables APACHE-II, SAPS, TISS, PVPI and EVLWI in the prediction of 28-day-mortality.

0840

COMPARISON OF THREE INTENSIVE CARE SCORING MODELS IN AN ITALIAN INTERMEDIATE CARE UNIT

N. Parenti[1], M.G. Vespignani[2], G. Rossi[2]

[1]Hospital of Imola, Bologna, Italy, [2]Hospital of Imola, Imola, Italy

INTRODUCTION. There are many comparison studies of intensive care scoring models in Intensive Care Units, but there are very few reports on Intermediate Care Units. To our knowledge this is the first study on the comparison of intensive care scoring models in an Italian Intermediate Care Unit.

OBJECTIVES. The goal of this study is to assess the performance of the Sequential Organ Failure Assessment (SOFA), the Simplified Acute Physiology Score (SAPS) II, the Modified Early Warning Score (MEWS) in the 8-bed Intermediate Care Unit of Imola Hospital.

METHODS. This is a retrospective study conducted on consecutive patients admitted from January 2011 to December 2012 at Intermediate Care Unit of Imola, Italy. All patients with complete data for testing previous scores were included. We collected clinical, laboratory and demographic data, the score values of SAPS II, MEMS, SOFA and the nine equivalents of nursing manpower score (NEMS) on admission from a clinical database. We calculate the areas under receiver operating curves (AUROC) for each score at day-1 using hospitality mortality as an independent variable

RESULTS. Of the 1,339 patients included 49 % were male, the mean age was 69.7 years (SD ± 17.2), the main admission diagnosis was stroke (17 %). The admissions after surgery were 27 %,the mean of NEMS on admission was 20.3. There were 99/1,339 deaths (7.4 %). Many patients were excluded from survival analysis for missing data: 850/1,339 for SAPS II, 780/1,339 for SOFA, 600 for MEMS. The mean of score were: 4.5 for SOFA, 1.9 for MEWS and 34.3 for SAPS II. The AUROC for day-1 for scores were: 0.76 for SOFA, 0.80 for SAPS II 0.72 for MEWS.

CONCLUSIONS. In this pilot study the three scores show a similar good validity in prediction of in-hospital mortality on admission at an Italian Intermediate Care Unit. Limitations are that all the models had many missing data and the results have low statistical power because we included few patients.

0841

DOES THE ACUTE PHYSIOLOGY AND CHRONIC HEALTH EVALUATION II SCORE AT ICU DISCHARGE PREDICT IN-HOSPITAL DEATH AND READMISSION AFTER INITIAL DISCHARGE FROM ICU IN A SURGICAL POPULATION?

H. Lee[1], S. Yang[1], H.-P. Park[1], H.-K. Lee[2], Y.J. Shon[1]

[1]Seoul National University Hospital, Seoul, Korea, Republic of, [2]Hallym University, Sacred Heart Hospital, Anyang, Korea, Republic of

INTRODUCTION. We evaluated the efficacy of the discharge Acute Physiology and Chronic Health Evaluation II (APACHE II) score in predicting readmission and in-hospital mortality after intensive care unit (ICU) discharge in a surgical ICU (SICU) population.

OBJECTIVES. In this study, we assessed the efficacy of the discharge APACHE II score in predicting readmission and post ICU mortality in a surgical ICU population. We also sought to identify other risk factors associated with readmission and in-hospital mortality after ICU discharge.

METHODS. We retrospectively evaluated electronic medical records for patients admitted to the SICU from October 2007 to March 2010.

RESULTS. Of 4,352 patients admitted to the SICU, 72 (1.7 %) died after the initial ICU discharge. In a multivariate logistic regression analysis, the discharge APACHE II score, initial ICU length of stay (LOS), hospital LOS before ICU admission, and ICU readmission were associated with in-hospital mortality. The area under the curve of the discharge APACHE II score for predicting in-hospital mortality was 0.711. 191 patients (4.4 %) were readmitted to the SICU after the initial ICU discharge during their hospitalization. Readmitted patients had a longer length of hospital stay after ICU admission and a higher mortality rate than those not readmitted. The most common reason for readmission was unanticipated respiratory problems (39.8 %). The admission APACHE II score, male gender, admission from the emergency room or other ICU, neurosurgical patients, lung resection, and initial ICU LOS were significant predictors for readmission.

CONCLUSIONS. The discharge APACHE II score is associated with in-hospital mortality after initial ICU discharge but is not an independent predictor of readmission. Our results also suggest that providing aggressive respiratory care in patients at high risk for readmission may be helpful in decreasing readmission and subsequent in-hospital mortality.

REFERENCE(S). 1. Kramer AA, Higgins TL, Zimmerman JE. Intensive care unit readmissions in U.S. hospitals: patient characteristics, risk factors, and outcomes. Crit Care Med. 2012; 40: 3–10. 2. Campbell AJ, Cook JA, Adey G, Cuthbertson BH. Predicting death and readmission after intensive care discharge. Br J Anaesth. 2008; 100: 656–62

0842

VALIDATION OF THE ACUTE PHYSIOLOGY AND CHRONIC HEALTH EVALUATION IV AND COMPARISON WITH ACUTE PHYSIOLOGY AND CHRONIC HEALTH EVALUATION II AND SIMPLIFIED ACUTE PHYSIOLOGY SCORE 3 IN A KOREAN SURGICAL INTENSIVE CARE UNIT

H. Lee[1], H.-P. Park[1], H.-K. Lee[2], S.M. Yang[1], Y.J. Shon[1]

[1]Seoul National University Hospital, Seoul, Korea, Republic of, [2]Hallym University/Hallym University Sacred Heart Hospital, Anyang, Korea, Republic of

INTRODUCTION. The Acute physiology and Chronic Health Evaluation (APACHE) IV model was introduced in 2006 for more accurate mortality prediction. But old score system such as APACHE II was still used because of its simplicity and easy accessibility.

OBJECTIVES. The aim of this study was to compare the performance of the Acute Physiology and Chronic Health Evaluation IV to APACHE II and Simplified Acute Physiology Score (SAPS) 3 in a surgical intensive care unit (SICU) population.

METHODS. We retrospectively evaluated electronic medical records for patients admitted to the SICU which had been collected prospectively from March 2011 to February 2012 in a University hospital. Measures of discrimination and calibration were performed using area under the receiver operating characteristic curve (AUC) and the Hosmer–Lemeshow test, respectively. And we also calculated standardized mortality ratios using three score systems.

RESULTS. The study included 3,281 patients. Hospital mortality was 3.1 %. The discriminative powers of all models were similar and good. The AUC were 0.834 for APACHE IV, 0.845 for SAPS 3, and 0.867 for APACHE II. Hosmer and Lemeshow C statistics showed poor calibration for all models ($p < 0.05$). The mortality rates predicted by APACHE IV, SAPS 3, APACHE II were, 15.6 ± 20.7, 14.6 ± 22.0 and 25.1 ± 21.8, respectively.

CONCLUSIONS. The discrimination of APACHE IV was good but the calibration was poor. The overall discrimination and calibration of APACHE IV was similar to that of APACHE II, SAPS 3 and C-SAPS3 in a Korean surgical ICU.

REFERENCE(S). 1. Zimmerman JE, Kramer AA, McNair DS, et al. Acute Physiology and Chronic Health Evaluation (APACHE) IV: hospital mortality assessment for today's critically ill patients. Crit Care Med. 2006; 34: 1297–310. 2. Knaus WA, Draper EA, Wagner DP, et al. APACHE II: a severity of disease classification system. Crit Care Med. 1985; 13: 818–29.

0843

EVALUATION OF RISK FACTORS FOR MORTALITY AND LONGER STAY IN THE MEDICAL/SURGICAL INTENSIVE CARE UNIT

V. Shpata[1], I. Ohri[2], M. Naço[3], N. Kodra[3], E. Mjekaj[3], H. Sula[2]

[1]University of Medicine, Faculty of Medical Technical Sciences, Tirana, Albania, [2]University of Medicine, Anesthesia and Intensive Care, Tirana, Albania, [3]QSUT, Tirana, Albania

INTRODUCTION. Mortality in intensive care unit (ICU) patients remains high. Long stays in ICU are associated with high costs and burdens on the healthcare system, especially in our country, where healthcare resources are constrained.

OBJECTIVES. To investigate risk factors for mortality and prolonged ICU stay in critically ill patients.

METHODS. The prospective study was performed in the surgical and medical ICU of University Hospital Center of Tirana. Variables used for analysis included age, admitting diagnosis, Acute Physiology and Chronic Health Evaluation (APACHE) II score, nosocomial infections, complications, length of ICU stay, ICU mortality, nutritional status (according to Nutritional Risk Screening 2002 any patient with a total score $\geq$3 was considered at nutritional risk, or with malnutrition) and energy deficit (calculated as energy delivery minus requirements).

RESULTS. 432 patients that stayed more than 4 days in ICU, aged 60.9 $\pm$ 16.2 years with 56.3 % being male. 72.68 % of the patients were after gastrointestinal surgery. The overall mortality rate in the ICU was 28.7 %. The results of multiple regression analyses adjusted for confounders estimating the risk factors for mortality ($p < 0.05$) were as follows: the age $\geq$ 65 year (odds ratio [OR] = 1.82, 95 % confidence interval [CI] 1.17–2.82); presence of nosocomial infection (OR = 1.64, 95 % CI 1.06–2.52), APACHE II score > 15 (OR = 1.19, 95 % CI 1.04–1.23), presence of complications (OR = 2.24, 95 % CI 1.44–3.47), presence of organ failure (OR = 3.25, 95 % CI 2.05–5.14); malnutrition (OR = 1.8, 95 % CI 1.17–2.94) and cumulated energy deficits at the end of ICU stay (OR = 1.29; 95 % CI 1.05–1.58).

Multivariate logistic regression model showed that risk factors for ICU stay longer than 14 days ($p < 0.05$) were as follows: the age $\geq$65 year (OR = 1.23, 95 % CI 1.00–1.52), APACHE II score >15 (OR = 1.16, 95 % CI 1.01–1.21), presence of nosocomial infection (OR = 7.13, 95 % CI 3.94–12.9), presence of complications (OR = 4.00, 95 % CI 2.10–7.62), presence of organ failure (OR = 3.03, 95 %CI 1.74–5.26), malnutrition (OR = 3.59, 95 % CI 1.77–7.27) and cumulated energy deficits (OR = 4.13, 95 % CI 3.00–5.70). Multivariate logistic regression model showed that malnutrition and energy deficit were independent risk factors for infections (respectively: OR = 2.2, 95 % CI 1.44–3.52 and OR = 2.54, 95 % CI 1.98–3.26) and malnutrition was independent risk factor for complications (OR = 5.3, 95 % CI: 3.50-8.26). Patients that stayed in the ICU more than 14 days had higher mortality rate: OR = 3.50, 95 % CI 2.02–6.04, $P < 0.0001$.

CONCLUSIONS. The risk factors for longer stay in the ICU and mortality were older age, high APACHE II score, nosocomial infection, organ failure, presence of complications, malnutrition and cumulated energy deficit. A poor nutritional status and energy deficit cumulated during ICU stay affect negatively clinical outcome and they can be modified by appropriate nutrition support.

0844
MORTALITY PREDICTION OF PATIENTS WHO ARE REJECTED FOR ICU ADMISSION

M.D. Ferrandiz-Selles[1], L. Albert-Rodrigo[1], A. Belenguer-Muncharaz[1], E. Bisbal-Andrés[1], S. Altaba-Tena[1], I. Catalán-Monzón[1], J. Rodríguez-Portillo[1], F. Bernal-Julián[1], G. Cebrián-Graullera[1], B. Vidal-Tegedor[1]

[1]General Hospital Universitary Castellón, Intensive Care Medicine, Castellón, Spain

OBJECTIVE. To analyse the mortality of patients who are rejected for ICU admission, and the factors that predict their mortality.

PATIENTS AND METHODS. Retrospective, observational study from patients that were not admitted during 2011 and 2012 in ICU. Data was collected from MBDS (Minimum Basic Data Set): demographic characteristic, SAPS (simplified acute physiologic score) 3, Barthel scale, comorbidities, hemodynamic and respiratory variables. Also recorded cause of rejection and cause of death.

RESULTS. During the period of the study, a total of 495 patient were included, 65 % were men with a mean age of 68 $\pm$ 17. 75 % had some comorbidities, and the previous quality of life was good in 59 % and bad in 36 % of patients.

The most frequent cause of rejection was no severity (61 %) and poor prognosis (14.9 %). Global mortality was 32.7 %. The gender, age >75, comorbidities, bad previous quality of life and severity were included in a multivariate analyses. The OR for the age was 3.305 (CI 95 %: 2.058–5.308); for the previous quality of life was 3.614 (CI 95 % 2.194–5.953); severity 16.81 (CI 95 % 8.287–34.125); with a statistical signification in a predictive model of mortality PPV 92 % and NPV 59 %. COR of 0.84 (CI 95 % 0.807–0.878).

CONCLUSIONS. To know predicting factors of mortality can help us in our decisions about the rejection of patients in ICU.

0845
PREOPERATIVE VERSUS POSTOPERATIVE APACHE II SCORES FOR OUTCOME PREDICTION IN PERFORATION PERITONITIS

A. Tyagi[1], V. Arora[2], S. Kumar[2], A.K. Sethi[2]

[1]University College of Medical Sciences and GTB Hospital, Anaesthesiology and Critical Care, Delhi, India, [2]University College of Medical Sciences and GTB Hospital, Delhi, India

INTRODUCTION. Patients with perforation peritonitis are commonly subjected to emergency laparotomy, followed by care in ICUs. The Acute Physiology and Chronic Health Evaluation-II (APACHE II) scoring system has been used to predict the outcome for patients of perforation peritonitis. The time of scoring of APACHE II for assessing possible relation to the outcome has varied in different studies, ranging from preoperative period to various postoperative days (1, 2).

OBJECTIVES. We aimed to compare the accuracy of APACHE II scoring done preoperatively, or when done on the first postoperative day in ICU for predicting the 30-day mortality in patients with perforation peritonitis.

METHODS. Patients with perforation peritonitis were subjected to APACHE scoring before ($APACHE_{preop}$) or after emergency laparotomy ($APACHE_{postop}$). The accuracy in outcome prediction of the APACHE-II system was assessed by means of receiver operating characteristic (ROC) curve and the Pearson correlation coefficient and its significance test.

RESULTS. Of the 50 patients admitted during the study period, there were 35 (71 %) survivors and 15 (29 %) nonsurvivors. Mean $APACHE_{preop}$ score of the study population was 6.1 with a range of 1 to 12, and the mean $APACHE_{postop}$ score was 10.1 with a range from 1 to 24. Using ROC analysis, the area under the curve for $APACHE_{preop}$ and $APACHE_{postop}$ score was found to be 0.706 ($p = .089$) and 0.951 ($p = 0.038$) respectively (Figs. 1, 2). $APACHE_{postop}$ score of 13 showed a sensitivity and specificity of 90 % each. The mean values of salient physiologic variables used to compute the $APACHE_{postop}$ score are shown in Table 1.

Table 1 Variables used to compute APACHEpostop

Mean arterial pressure (mmHg)	67.3 $\pm$ 9.1
Heart rate (bpm)	120.6 $\pm$ 11.5
Respiratory rate (/min)	31.4 $\pm$ 6.6
PaO_2 (mmHg)	95.1 $\pm$ 32.2
pH	7.37 $\pm$ 1.02
S. sodium (meq/l)	136.6 $\pm$ 6.6
S. potassium (meq/l)	4.5 $\pm$ 0.7
S. creatinine (mg/dl)	1.2 $\pm$ 0.7
WBC count (/mm^3)	1,400–36,900
GCS	13 $\pm$ 2

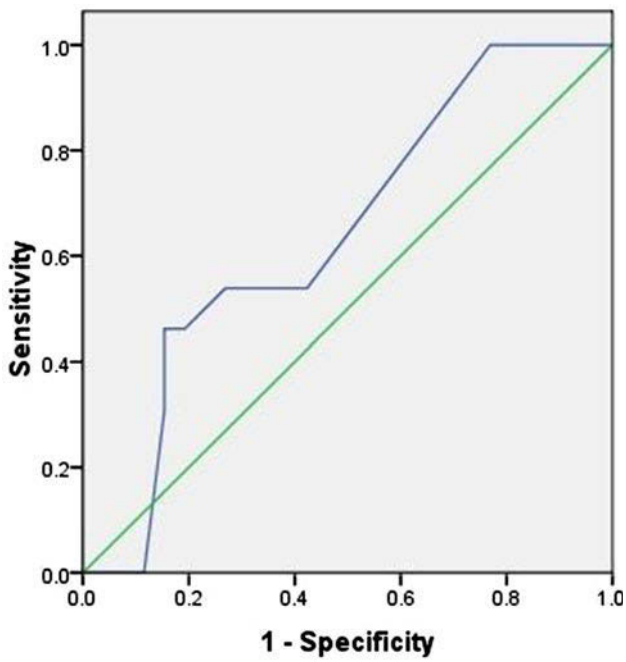


Fig. 1 ROC for APACHEpreop

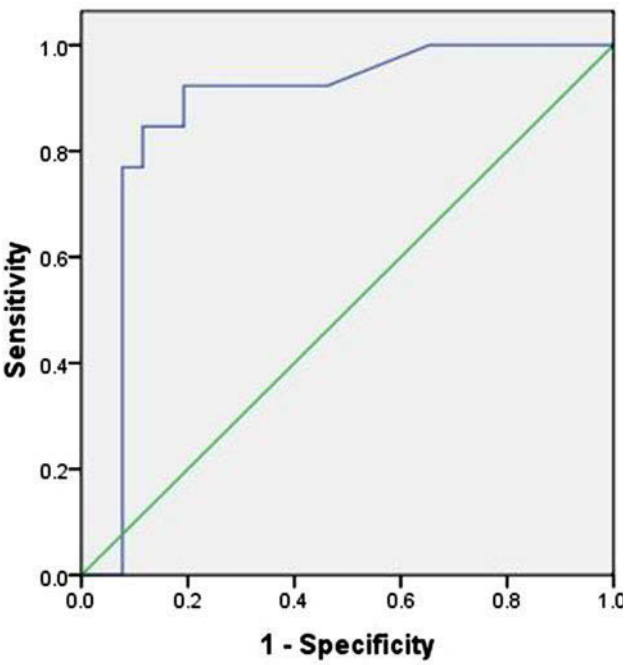


Fig. 2 ROC for APACHEpreop

CONCLUSIONS. APACHE II score is a useful tool to predict the 30-day mortality in patients of perforation peritonitis when assessed on the first postoperative day in ICU, but not if evaluated in immediate preoperative period.
REFERENCE(S). 1. Delibegovic S, Markovic D, Hodzic S. Med Arch. 2011; 65(2): 82–5.2. Kulkarni SV, Naik AS, Subramanian N Jr. Am J Surg. 2007; 194(4): 549–52.

0846
COMPARISON OF PREDICTED FUNC-SCORE BASED OUTCOMES WITH ACTUAL 3-MONTH OUTCOMES OF PATIENTS WITH A PRIMARY INTRA-CEREBRAL HAEMORRHAGE (ICH)

N. Ojukwu[1], R. Jain[2], S. Wijayatilake[2], A. Bellini[2], J. Khan[2], A. Mosharaf[2], G. De la Cerda[2]
[1]Queen's Hospital, Neurocritical Care, Romford, UK, [2]QH, Essex, UK
INTRODUCTION. Accurate prediction of long term functional outcome after ICH is an important adjunct in NITU clinical decision-making. The Functional Outcome Risk Stratification (FUNC) Score is the most recently validated clinical assessment tool[1] that predicts the likelihood of recovering functional independence at 90 days following ICH. Few reports suggest that the FUNC score compares favourably with other prediction models, but its precision remains to be proved.
OBJECTIVES. We aimed to investigate the prognostic performance of the FUNC-score by comparing the predicted FUNC score outcome with the actual 3-month outcome in patients with ICH in our unit.
METHODS. Retrospective analysis of prospective collected data of ICH cases presenting to a tertiary neuroscience centre from January to December 2012. Clinical care was provided in accordance with local guidelines for management of ICH. FUNC score components include age, ICH location, GCS score, pre-cognitive impairment and ICH volume. Scores ranged from 0 to 11 with higher FUNC scores indicating a strong likelihood of attaining good functional independence at 3 months. Actual outcomes were assessed using the Glasgow Outcome Scale (GOS) at 3 months post-ICH via telephone interview. Functional independence is defined as favourable outcome (GOS $\geq$ 4) while a GOS $\leq$ 3 is defined as poor functional outcome.
RESULTS. A total of 28 patients were included in this study (Table 1). We did not find any statistically significant difference (p-value = 0.9273) in the FUNC score between those patients with actual poor functional outcome (Mean 6.048 [±SEM 0.5093], N = 21) and those who were functionally independent at 3 months (Mean 6.143 [±SEM 0.9368], N = 7) (Figure 1). Overall mortality at 3 months was 61 %.

Table 1 Patient demographics

Age (years)	59 (19–91)
Gender (male: female ratio)	1.1:1
Length of mechanical ventilation (days)	6.5 (1–36)
Length of stay in ICU (days)	9 (1–40)
ICU mortality (%)	34 %
Hospital mortality (%)	57 %
90 day mortality (%)	61 %

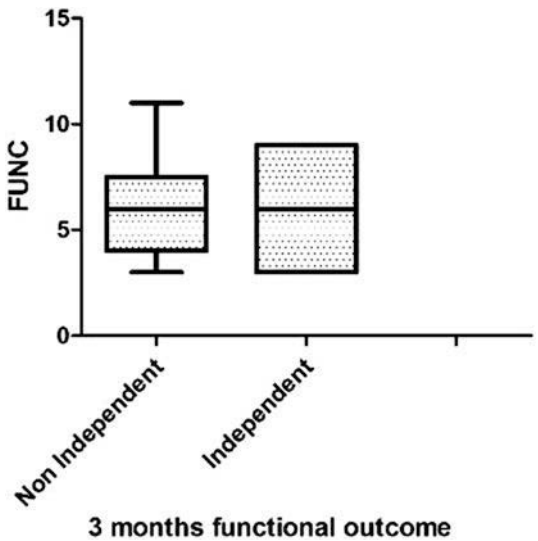


Fig. 1 Box plot of FUNC score vs actual outcome

CONCLUSIONS. In our study population, the FUNC score fails to distinguish, and accurately predict the group of patients that are likely be functionally independent at 90 days post-ICH.
REFERENCE(S). 1. Rost S, et al. Prediction of functional outcome in patients with primary intracerebral hemorrhage: the FUNC score. Stroke. 2008; 39: 2304–2309.

Pathophysiology of sepsis: 0847–0858

0847
EVALUATION OF SOLUBLE CD14 SUBTYPE (PRESEPSIN) IN BURN SEPSIS

Ö. Çakır Madenci[1], S. Yakupoğlu[2], N. Benzonana[3], N. Yücel[1], D. Akbaba[1], A. Orçun Kaptanağası[1]
[1]Dr. Lütfü Kırdar Kartal Research and Training Hospital, Clinical Biochemistry, Istanbul, Turkey, [2]Dr. Lütfü Kırdar Kartal Research and Training Hospital, Burn Center Anaesthesia and Reanimation Clinic, Istanbul, Turkey, [3]Dr. Lütfü Kırdar Kartal Research and Training Hospital, Infectious Diseases and Clinical Microbiology, Istanbul, Turkey
INTRODUCTION. It is difficult to diagnose sepsis in burn patients because of the inflammatory mediators that alter postburn metabolic profile.
OBJECTIVES. Here, we compare a new marker presepsin with current markers.
METHODS. Patients admitted to intensive care burn center of our institute from August 2012 to January 2013 were prospectively investigated. Presepsin, procalcitonin (PCT), CRP and WBC levels were measured at admission and every 6 h for first day and daily thereafter. Blood cultures were taken every 2 days. Wound and other cultures were taken when necessary. At all timing samples, patients were evaluated and classified as sepsis or non sepsis according to the current American Burn Association Consensus Criteria 2007. Individual patients were also grouped as sepsis and nonsepsis according to the same criteria. Plasma presepsin levels were measured by a chemiluminescent enzyme immunoassay (PATHFAST; Mitsubishi Chemical Medicine Corporation, Japan) system. İn statistical analysis sepsis and non sepsis data were compared with the Mann–Whitney U test. Receiver operating characteristics(ROC) analysis in diagnosing sepsis were done and compared. Repeated measures of Anova and serial measurements were used in evaluation of markers in follow up of individual patients.
RESULTS. 37 adult patients were evaluated; 26 sepsis(+) and 11 sepsis(−). A total data of 611 time points (371 non septic episode, 240 septic episode) were supplied. Sepsis time points differ significantly from non-sepsis in PCT, presepsin and CRP levels. Median (2.5–97.5 percentile) values were 2.04 (0.206–87.4) vs 0.293 (0.034–10.55) ng/mL for PCT ($P = 0.0012$); 847 (207–12,364) vs 332 (64–1523) pg/mL for presepsin($P < 0.0001$) and 133 (37–206) vs 52 (3–204)mg/L for CRP($P < 0.0001$). %AUC–ROC values for diagnosing sepsis was %84.7 for PCT, %83.4 for presepsin, %81.9 for CRP and %50.8 for WBC. Optimum cut off for presepsin was 542 pg/mL with a sensitivity of 77.1 % and specificity 76.4 %. Sepsis (+) patients had significantly higher presepsin levels 650 (148–2100) pg/mL; median (2.5–97.5 percentile) on their first day of sepsis compared to previous 2 days 447 (97–874) pg/mL; $p = 0.019$ and 387 (115–1055) pg/mL; $p = 0.026$)
CONCLUSIONS. Plasma presepsin levels has effective and comparable diagnostic performance in burn sepsis
REFERENCE(S). 1. Shozushima T, Takahashi G, Matsumoto N, Kojika M, Okamura Y, Endo S. Usefulness of presepsin (sCD14-ST) measurements as a marker for the diagnosis and severity of sepsis that satisfied diagnostic criteria of systemic inflammatory response syndrome. J Infect Chemother. 2011; 17(6): 764–9. 2. Greenhalgh DG, Saffle JR, Holmes JH, Gamelli RL, Palmieri TL, Horton JW, et al. American Burn Association consensus conference to define sepsis and infection in burns. J Burn Care Res. 2007; 28: 776–90.

0848
MONOCYTE EXPRESSION AND SOLUBLE LEVELS OF THE HAEMOGLOBIN RECEPTOR (CD163/SCD163) AND THE MANNOSE RECEPTOR (MR/SMR) IN SEVERE SEPTIC AND CRITICALLY ILL NON-SEPTIC ICU PATIENTS

A.G. Kjærgaard[1,2], S. Rødgaard-Hansen[3], A. Dige[4], J. Krog[1,2], H.J. Møller[3], E. Tønnesen[1]
[1]Aarhus University Hospital, Department of Anaesthesiology and Intensive Care, Aarhus C, Denmark, [2]Randers Regional Hospital, Department of Anaesthesiology and Intensive Care, Randers, Denmark, [3]Aarhus University Hospital, Department of Clinical Biochemistry, Aarhus C, Denmark, [4]Aarhus University Hospital, Department of Medicine V, Aarhus C, Denmark
INTRODUCTION. The diagnosis of sepsis is challenging and there is an unmet need for sensitive and specific biomarkers able to differentiate between septic and non-septic patients. Following activation of macrophages and monocytes, the haptoglobin–haemoglobin receptor (CD163) and the mannose receptor (MR, CD206) are shed into the circulation (sCD163 and sMR).
OBJECTIVES. We hypothesised that the levels of these soluble and monocyte-bound receptors are elevated during sepsis and could differentiate between septic and non-septic patients.
METHODS. Fifteen patients with severe sepsis or septic shock and fifteen critically ill non-septic patients were included. Fifteen age- and gender-matched healthy volunteers served as controls. The levels of sCD163 and sMR were measured using a sandwich ELISA. The monocyte expression of CD163 and CD206 was evaluated by flow cytometry during the first 4 days of ICU stay. The diagnostic value of the receptors in identifying septic patients at ICU admission was assessed using area under the receiver operating characteristics (AUROC) curves.
RESULTS. At ICU admission and during the observation period, monocyte expression of CD163 and the levels of sCD163 and sMR were significantly higher in the septic patients compared with the non-septic patients and healthy controls ($p < 0.01$ for all comparisons). Monocytes did not express CD206. At ICU admission, sMR had the highest AUROC for the ability to identify septic patients (1; 95 % CI 1–1), followed by sCD163 (0.95; 95 % CI 0.88–1) and monocyte-bound CD163 expression (0.75; 95 % CI 0.58–0.91). The AUROC for sMR was significantly higher than the AUROC for plasma CRP (0.87, 95 % CI 0.76–0.99) ($p = 0.04$).
CONCLUSIONS. The macrophage-specific markers CD163, sCD163, and sMR are increased in septic patients. Particularly sMR is a promising potential new biomarker of sepsis.
REFERENCE(S). 1. Pierrakos C, Vincent JL. Sepsis biomarkers: a review. Crit Care. 2010; 14: R15. Moller HJ, Peterslund NA, Graversen JH, Moestrup SK. Identification of the hemoglobin scavenger receptor/CD163 as a natural soluble protein in plasma. Blood. 2002; 99: 378–380. Moller HJ. Soluble CD163. Scand J Clin Lab Invest. 2012; 72: 1–13. Martinez-Pomares L. The mannose receptor. J Leukoc Biol. 2012; 92: 1177–1186
GRANT ACKNOWLEDGMENT. The A.P. Møller Foundation for the Advancement of Medical Science, The Aase and Ejnar Danielsens Foundation, The Danish Society of Anaesthesiology and Intensive Care Medicines Foundation and the Danish council for strategic research for funding (TRAIN 10-092797, HJM) supported the study.

0849
GAMMA-DELTA T CELL ACTIVATION BY HMB–PP IN EARLY SEPSIS IS ASSOCIATED WITH HIGHER RISK OF DEATH ON THE ICU

M.P. Morgan[1,2], R. Roberts[1], P. Olaniyi[1], M. Eberl[2], J.E. Hall[1], T. Szakmany[1,3]
[1]Cardiff University, Department of Anaesthesia, Intensive Care and Pain Medicine, Cardiff, UK, [2]Cardiff University, Institute of Infection and Immunity, Cardiff, UK, [3]Royal Glamorgan Hospital, Anaesthesia, Critical Care and Theatres, Llantrisant, UK

INTRODUCTION. Sepsis is associated with significant morbidity and mortality; 28 % of adult Intensive Care Unit (ICU) admissions meet the criteria for severe sepsis (1).
We have previously demonstrated that infections stimulating a particular subset of T cells (Vγ9/Vδ2) may be associated with increased early mortality rates.(2) These T cells appear to be activated by microbial-derived HMB–PP ((E)-4-hydroxy-3-methyl-but-3-methyl-but-2-enyl pyrophosphate), resulting in production of pro-inflammatory mediators, monocyte down-regulation of surface CD86 and HLA-DR expression and neutrophil activation, resulting in early immunosuppression (3).
OBJECTIVES. Our study investigates the early outcomes in sepsis according to HMB-PP status.
METHODS. Retrospective database analysis of all adult patients admitted to the ICU over a 4 year period (2009–2012). Patients were selected for analysis if they had positive blood culture within 48 h of admission to ICU.
Details of organism cultured, patient demographics, diagnosis, ICNARC and APACHE II scores, organ support data, duration and outcome of ICU and hospital admission was obtained from the electronic clinical patient information system.
RESULTS. Of the 113 subjects, 75 (66.4 %) had HMB-PP+ sepsis. There was no statistically significant difference in age, ICNARC scores, APACHE II scores or level of organ support between the groups. Subjects with HMB-PP+ sepsis were at increased risk of death on the ICU compared to those with HMB–PP-sepsis (hazard ratio 2.36, CI 1.07–5.23, $p = 0.034$)

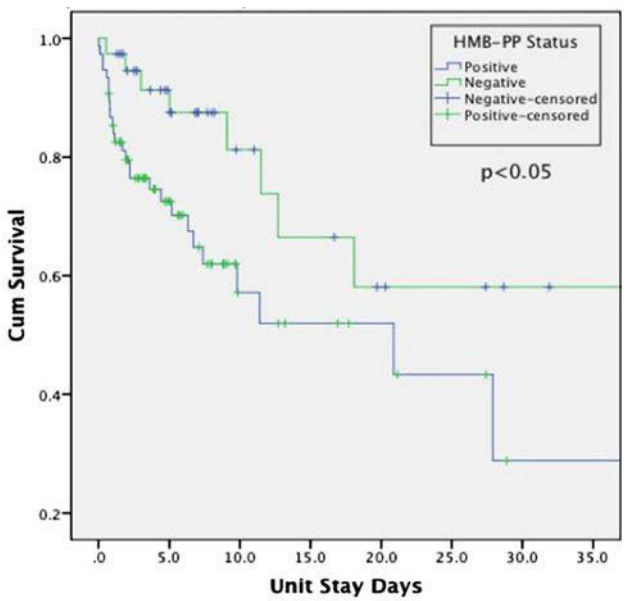


Fig. 1 Cox regression analysis

Despite the majority of HMB–PP+ pathogens also being gram negative bacteria, the immunological differences noted in blood samples taken from patients with HMB–PP+ and HMB–PP− sepsis, could suggest that the observed difference in mortality may go beyond the gram stain classification.
Multicolour flow cytometry of blood samples obtained from the same cohort of patients with HMB–PP+ infections show a higher percentage of γδ T cells and this specific subset of T cells express higher levels of CD69 in comparison with HMB–PP− infections. Additionally, those with HMB–PP+ sepsis had significantly higher levels of IL6 and IFN-γ.
CONCLUSIONS. We have again demonstrated that sepsis caused by HMB–PP+ organisms is associated with higher risk of death in patients admitted to ICU with sepsis (2). Further research needs to be undertaken to clarify the potential second role of γδ T cells and to investigate whether the postulated reduction in late immunosuppression has an effect on mortality in secondary infections (3).
REFERENCE(S). 1. Harrison DA, et al. Crit Care. 2006; 10: R42. 2. Szakmany T, et al. In: European Society of Intensive Care Medicine; 2011, Berlin. Abstract number: 0037.
3. Boomer JS, et al. JAMA. 2011; 306: 2594–2605.
GRANT ACKNOWLEDGMENT. NISCHR-AHSC Clinical Research Fellowship (Dr. Szakmany).

0850
SIGNATURE OF CIRCULATING MICROVESICLES IN SEPSIS

G.F. Lehner[1], U. Harler[1], M. Joannidis[1]

[1]Medical University of Innsbruck, Dept. for Internal Medicine, Intensive Care and Emergency Medicine Unit, Innsbruck, Austria

INTRODUCTION. Microvesicles (MV) are extracellular vesicles between 150 nm and 1 μm which are released by several cell types either constitutively or upon stimulation or apoptosis. Endothelial MV are considered surrogate markers of the endothelial state and have been found to be elevated in various diseases associated with endothelial pathology. Despite its significant involvement in the pathogenesis of sepsis investigations on endothelial derived MV revealed ambiguous results. However, standard flow cytometry, a frequently used method of MV analysis, provides a limited resolution of submicron particles down to approximately 0.5 μm bead-equivalents (EQ). There is evidence that the analysis of MV below this size provides new biological information(1).
OBJECTIVES. The aim of this study was to analyze the signature of circulating MV in early sepsis by applying a new approach allowing analysis down to a size of 0.3 μm bead-EQ, with primary focus on differentiating platelet, endothelial or leukocyte derived MV-subtypes.
METHODS. Platelet free plasma (PFP) was prepared from blood of 17 patients admitted to the ICU for severe sepsis, and 15 healthy controls. MV-containing PFP was analyzed with respect to AnnexinV-binding as well as CD31-, CD41-, CD42b-, CD144-, CD62E- and CD106-positivity. A gating strategy was performed to enumerate particles in a size range of 0.3-1.0 μm bead-EQ that show a positivity concerning the aforementioned markers. Absolute counts of different MV-subtypes were compared between septic patients and healthy controls by using the Mann–Whitney-U test. Results are presented as median and interquartile range.
RESULTS. Elevated levels of CD31+/CD41−/CD42b− (96.5/μl [77.9] vs. 31.2/μl [21.5], $p < 0.05$), CD31+/AnnexinV− (72.0/μl [75.61] vs. 24.4/μl [30.0], $p < 0.05$) and CD62E+ (2.2/μl [1.7] vs. 1.0/μl [1.0], $p < 0.05$) MV-subtypes were found in septic patients compared to healthy controls. A three-fold increase of a more sensitive, but less endothelial-specific MV subtype, CD31+/CD41− (97.5/μl [77.9] vs. 31.7/μl [21.45], $p < 0.05$) was found. No difference in the amount of AnnexinV+, CD31+, CD41+, CD42b+, CD144+ or CD106+ MV could be detected. The amount of endothelial specific MV-subtypes, such as CD62E, CD144 or CD106, are at the lower limit of detection.
CONCLUSIONS. This is the first study analyzing MV down to a size of 0.3 μm bead-EQ in septic patients. Although endothelial dysfunction and activation is considered as a key mechanism during sepsis, even with high-sensitivity flow cytometry only low numbers of endothelium specific MV can be detected. These results indicate that the majority of circulating MV found in septic patients originate from circulating cells rather than from injured endothelium.
REFERENCE. 1. Robert S, et al. High-sensitivity flow cytometry provides access to standardized measurement of small-size microparticles–brief report. Art Thromb Vasc Biol. 2012 ; 32(4): 1054–8.
GRANT ACKNOWLEDGMENT. Austrian Nationalbank.

0851
ADAMTS-13 IN CRITICALLY ILL PATIENTS WITH SEPTIC SYNDROMES

J. Aibar[1], P. Castro[1], S. Fernández[1], G. Espinosa[2], C. Hernández[1], M. Rinaudo[1], M. Butjosa[1], J.C. Reverter[3], J.M. Nicolás[1]

[1]Hospital Clinic, IDIBAPS, University of Barcelona, Medical Intensive Care Unit, Barcelona, Spain, [2]Hospital Clinic, IDIBAPS, University of Barcelona, Department of Autoimmune Diseases, Barcelona, Spain, [3]Hospital Clinic, IDIBAPS, University of Barcelona, Department of Hemotherapy and Hemostasis, Barcelona, Spain

INTRODUCTION. ADAMTS-13 (a disintegrin-like and metalloprotease with thrombospondin type 1 repeats) is an enzyme that cleaves the unusually large multimers of von Willebrand factor (UL-VWF). The decrease in the activity of ADAMTS-13 results in the persistence of UL-VWF and is responsible for the formation of microvascular platelet thrombi in thrombotic thrombocytopenic purpura. States that determine systemic inflammation as septic syndromes have shown a decreased activity of ADAMTS-13. However existing data is scarce and controversial[1−2].
OBJECTIVES. The aim of this study is to assess levels of ADAMTS-13 in critically ill patients with septic syndromes and non-infectious systemic inflammatory response syndrome (SIRS) and to analyze their association with morbidity and mortality.
METHODS. The study population consisted of all patients consecutively admitted to a medical intensive care unit (ICU) during one year period, that presented either with septic syndrome or non-infectious SIRS at admission or within the first 48 h, and that stayed more than 2 days. Levels of ADAMTS-13 were analyzed in these patients in the first 48 h.
RESULTS. We included 178 patients who were admitted with sepsis (21 %), severe sepsis (8 %), septic shock (43 %) or non-infectious SIRS (28 %). Their levels of ADAMTS-13 had a median value of 85.22 ng/mL (interquartile range (IQR) 57.67 ng/mL) and they did not follow a normal distribution. Patients with septic syndromes showed significantly lower levels of ADAMTS-13 compared to patients with non-infectious SIRS. And among septic patients, those with severe sepsis or septic shock presented significantly lower levels than patients with sepsis. Moreover, a significant and negative correlation was found between ADAMTS-13 levels and APACHE II score at admission ($r = -0.2$, $p = 0.03$). Finally, patients who died either in the ICU or in the hospital after ICU discharge had significantly lower levels of ADAMTS-13 compared with survivors, both in the whole population or among the septic patients
CONCLUSIONS. Levels of ADAMTS-13 are decreased in septic patients compared with patients with non-infectious SIRS. Furthermore, among septic patients, lower levels are associated with more severe illness and increased mortality.
REFERENCE(S). 1. Kremer Hovinga JA, Zeerleder S, Kessler P, Romani de WT, van Mourik JA, Hack CE, et al. ADAMTS-13, von Willebrand factor and related parameters in severe sepsis and septic shock. *J Thromb Haemost* 2007; 5:2284-2290. 2. Martin K, Borgel D, Lerolle N, Feys HB, Trinquart L, Vanhoorelbeke K, et al. Decreased ADAMTS-13 (A disintegrin-like and metalloprotease with thrombospondin type 1 repeats) is associated with a poor prognosis in sepsis-induced organ failure. *Crit Care Med* 2007; 35:2375-2382.

0852
NITRITE REDUCTASE ACTIVITY DURING SEPSIS

V. Simon[1,2], A. Dyson[1], M. Feelisch[3], M. Singer[1]

[1]University College London, Bloomsbury Institute of Intensive Care Medicine, London, UK, [2]University Hospital Aachen, Surgical Intensive Care, Aachen, Germany, [3]University of Southampton, Faculty of Medicine, Southampton, UK

INTRODUCTION. Nitric oxide (NO) excess is considered to be the main cause of hypotension in sepsis. Besides endogenous synthesis by NO synthases (NOS), three additional sources may contribute to NO release under (patho)physiological conditions:
(1) reduction of dietary nitrate by oral bacterial flora followed by disproportionation of formed nitrite in the acidic gastric environment,
(2) pre-existing NO storage pools, e.g. S-nitrosylated albumin (SNO-Alb) and haemoglobin (SNO-Hb), and
(3) nitrite reduction by the reductase activity possessed by numerous heme- and pterin-based enzymes.
The temporal contribution of these pathways to NO production in sepsis is currently unclear.
OBJECTIVES. To investigate changes in nitrite reductase activity during sepsis.
METHODS. Male Wistar rats (approx 300 g wt) with tunnelled right jugular venous and left common carotid arterial lines in situ received i.p. injection of either faecal slurry (septic) or n-saline (sham). Fluid (1:1 mixture of 5 % glucose/Hartmann's solution; 10 ml/kg/h) was started 2 h later. At either 6 or 24 h, rats were anaesthetized with isoflurane and underwent tracheostomy. After 30 min stabilisation, blood pressure, blood gas analysis, and echocardiographic cardiac function were recorded before and after fluid challenge (BL, baseline) of a 25 ml/kg bolus of Hartmann's solution given to optimise LV filling. Animals then

received a single dose of sodium nitrite ($NaNO_2$, 15 mg/kg i.v.) to stimulate nitrite reductase activity. Recordings were made over the next 4 h prior to sacrifice.
RESULTS. At 24 h, septic animals showed a significant ($p < 0.05$) decrease in blood pressure with a prolonged time to recovery after sodium nitrite administration (Fig. 1). Methemoglobin (MetHb) and carboxyhemoglobin (COHb) levels peaked at T30 (30 min time point) in both groups, but clearance was significantly delayed in the septic animals (Fig. 1). No differences were seen at the 6 h time point between septic and sham groups (data not shown).

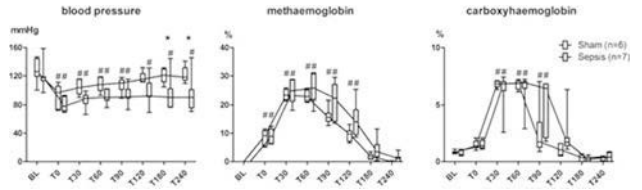


Fig. 1

Effects of $NaNO_2$ in sham and septic animals at 24 h. BL, baseline; T0, after $NaNO_2$ administration (2-way ANOVA + Bonferroni test, $p < 0.05$, compared to BL (#) and between groups (*)).
CONCLUSIONS. Increased nitrite reductase activity is apparent during established (24 h) sepsis, but not at an early (6 h) time point. As NOS activity is known to decrease after 24 h of sepsis, this pathway may provide an alternative source of continuing NO production. Nitrite administration also elevated carboxyhemoglobin levels, presumably by increasing heme oxygenase activity.
GRANT ACKNOWLEDGMENT. Internal lab funds and salary support from University Hospital Aachen.

0853
NEW DIAGNOSTIC STRATEGY OF SEPSIS INDUCED DISSEMINATED INTRAVASCULAR COAGULATION (SEDIC); 2ND VALIDATION STUDY

Y. Nakamura[1], H. Ishikura[1], Y. Kawano[1], R. Ichiki[1], R. Yuge[1], Y. Hoshino[1], T. Umemura[1]

[1]Fukuoka University, Department of Emergency and Critical Care Medicine, Fukuoka, Japan

INTRODUCTION. The majority ill patients with a systemic inflammatory response have coagulation abnormalities. In the pathogenesis of sepsis, inflammation and coagulation play a pivotal role. Evidence of an extensive cross-talk between these two systems is increased recently. However, there are different diagnostic criteria in sepsis and disseminated intravascular coagulation (DIC). So we defined the new diagnostic criteria of sepsis induced DIC (SEDIC) as follow; Presepsin (PSEP) level $\geq$900 pg/ml and Protein C (PC) activity $\leq$45 %.
OBJECTIVES. In this study, we attempted to validate this scoring system.
METHODS. A single center, prospective, observational study was carried out. Patients who had one or more systemic inflammatory response syndrome (SIRS) criteria were included in this study. The blood samples were collected at the time of admission. The patients were classified into the following three groups according to PSEP level and PC activity.
(1) SEDIC: PSEP $\geq$ 900 pg/mL and PC $\leq$ 45 %.
(2) non-SEDIC: PSEP $<$ 650 pg/mL and PC $>$ 45 %, or 650 $\leq$ PSEP $<$ 900 and PC $>$ 55 %.
(3) pre-SEDIC: the range out of SEDIC and non-SEDIC.
SIRS and sepsis were diagnosed according to the American College of Chest Physicians/Society of Critical Care Medicine guidelines. The scoring system for Japanese Association for Acute Medicine (JAAM) DIC was used for diagnosis of DIC. The severity of illness and organ failure of the patients was assessed by the APACHE II score and the SOFA score, respectively. All patients were followed up for 28 days after enrollment in the study, and 28-day all-cause mortality was assessed.
RESULTS. Two hundreds eleven patients were enrolled for this prospective study from July 2011 to February 2013. 33 patients (15.6 %, 33/211) were SEDIC, 76 were pre-SEDIC (36.0 %, 76/211) and 102 were non-SEDIC (48.3 %, 102/211). SEDIC scoring system significantly reflected the positive rate of sepsis ($p < 0.0001$) and JAAM DIC ($p < .0001$), SOFA score ($p < .0001$) and APACHE II score ($p < 0.0001$). The 28-day mortality rate was significantly worsened ($p = 0.0009$ by log-lank test), depending on the cutoff points in the respective criteria (SEDIC 30.3 %; pre-CEDIC 19.7 %; non-SEDIC 5.88 %, $p = 0.0008$).
CONCLUSIONS. From these results, we strongly believed that the SEDIC scoring system has an acceptable property for the diagnosis of sepsis induced DIC. Moreover, PSEP and PC were able to be measured with very simply and quickly. So we strongly suggest that this scoring system can be useful for early treatment in a critical care setting.

0854
POLYMERASE CHAIN REACTION ANALYSIS IN PATIENTS WITH SEPSIS

A. Markota[1], A. Golle[2], A. Sinkovič[1]

[1]University Medical Centre Maribor, Medical Intensive Care Unit, Maribor, Slovenia, [2]Institute of Public Health Maribor, Maribor, Slovenia

INTRODUCTION. Polymerase chain reaction (PCR) based methods enable rapid identification of causal agents in patients with sepsis. The impact of introduction of a PCR based method to every-day clinical environment in a medical intensive care unit is not yet established (1).
OBJECTIVES. We sought to analyze the feasibility of introducing a polymerase chain reaction assay to treatment of patients with severe sepsis and septic shock, concordance of results between PCR and standard blood cultures and the effect it would have on antimicrobial therapy.
METHODS. A retrospective study was conducted comparing the results of whole blood polymerase chain reaction based assay and standard blood cultures in a 12 bed adult medical intensive care unit using a widely available SeptiFast® test (Roche Diagnostics GmbH, Mannheim, Germany).
RESULTS. In all, 35 results from 32 patients were obtained. In 5 (14 %) cases technical difficulties with performing the polymerase chain reaction assay were met. They were most likely the result of contamination en-route to microbiology department (which is on a 4 km distant location via transport route requiring multiple sample hand-overs). There was an agreement between PCR and standard blood cultures in 29 (83 %) cases. Of the results, 26 (74 %) were concordant negative and 3 (9 %) were concordant positive. In 6 (17 %) cases discordant results were obtained. If we consider BC results as "gold standard" then 3 (9 %) false negative results and 3(9 %) false positive result were found (sensitivity 43 %, specificity 89 %). There was no statistically significant difference between PCR and BC tests (χ^2 (1) = 0.25, $p = 0.61$). In 1 (3 %) case the results obtained by polymerase chain reaction assay would have lead to change of antimicrobial therapy (addition of antimycotic). PCR analysis was performed in groups of 5 or 6, so we can only speculate as to the time benefit. In case PCR analysis is performed on a daily basis, short test run-times (around 8 h) should enable significant time benefits. In this study preliminary blood cultures positivity was obtained in 23.42 $\pm$ 8.6 h, and mean time to pathogen isolation and antimicrobial resistance was 116.2 $\pm$ 24.5 h.
CONCLUSION. We detected lower sensitivity compared to other studies and specificity within the range of reported results. The lesson from our study is that separate pathways need to be established and respected in case of introducing a PCR based assay. PCR assay and standard blood cultures should be used in combination.
REFERENCE(S). 1. Bloos F, Hinder F, Becker K, Sachse S, Mekontso Dessap A, Straube E, et al. A multicenter trial to compare blood culture with polymerase chain reaction in severe human sepsis, Int Care Med. 2010; 36: 241–7.

0855
CLINICAL ROLE OF SERUM PRE-B CELL COLONY-ENHANCING FACTOR IN VENTILATED PATIENTS WITH SEPSIS AND ACUTE RESPIRATORY DISTRESS SYNDROME

K. Lee[1], J.W. Huh[2], C.-M. Lim[2], Y. Koh[2], S.-B. Hong[2]

[1]Pusan National University Hospital, Department of Internal Medicine, Busan, Korea, Republic of, [2]Asan Medical Center, University of Ulsan College of Medicine, Department of Pulmonary and Critical Care Medicine, Seoul, Korea, Republic of

INTRODUCTION. Pre-B cell colony-enhancing factor (PBEF) is a mediator of inflammation that is involved in the pathophysiologic mechanisms of sepsis and acute respiratory distress syndrome (ARDS).
OBJECTIVES. We evaluated the clinical utility of measuring PBEF in patients with sepsis and ARDS. We also measured serum interleukin-6 (IL-6) in our ventilated patients and analyzed the relationship between PBEF and IL-6.
METHODS. Serum PBEF was measured in 104 adult patients ($\geq$18 years of age) who had been diagnosed with sepsis (including severe sepsis and septic shock) and received ventilator care in the medical intensive care unit. PBEF was measured using an enzyme-linked immunosorbent assay.
RESULTS. The mean age of our patients was 62.9 $\pm$ 12.1 years, and 62 (59.6 %) patients were male. The median PBEF level was 5.4 ng/mL (range 1.1–150.7 ng/mL). Nonsurvivors (n = 57) demonstrated significantly higher PBEF levels than survivors (18.7 $\pm$ 34.5 vs. 6.9 $\pm$ 6.1 ng/mL; $p = 0.022$). Most particularly, patients with PBEF levels $\geq$10.4 ng/mL (n = 27) demonstrated higher hospital mortality than patients with PBEF levels $<$ 10.4 ng/mL (n = 77; 74.1 vs. 48.1 %; $p = 0.025$). Univariate logistic analysis determined that $\geq$10.4 ng/mL PBEF (hazard ratio = 0.324; 95 % confidence interval = 0.123–0.854; $p = 0.023$) is an independent factor associated with hospital survival. Among patients with sepsis-induced ARDS (n = 59), nonsurvivors (n = 35) demonstrated significantly higher PBEF levels than those of survivors (n = 24), but not IL-6 levels.
CONCLUSIONS. Our findings indicate that a high PBEF is associated with poor clinical outcomes in ventilated patients with sepsis and sepsis-induced ARDS. Serum PBEF might be a better predictor of mortality than IL-6 in patients with sepsis-induced ARDS.

0856
QUALITATIVE EFFECTS OF INDUSTRIAL LIPIDS EMULSIONS ON ACUTE INFLAMMATION MODULATION AND CELL MEMBRANE REMODELING

J. Boisramé-Helms[1,2], X. Delabranche[1,2], A. Berger[1,2], M. Burban[3], F. Toti[3], M. Hasselmann[1], F. Meziani[1,2]

[1]CHU de Strasbourg, Service de Réanimation Médicale, Strasbourg, France, [2]Université de Strasbourg, EA3072, Faculté de médecine, Strasbourg, France, [3]Université de Strasbourg, Laboratoire de Biophotonique et Pharmacologie, Faculté de Pharmacie, Strasbourg, France

INTRODUCTION. Septic shock is associated with an intense cellular activation, responsible for membrane vesiculation and microparticles (MPs) release, which could play a deleterious role by enhancing systemic inflammatory syndrome and vascular dysfunction. Lipids emulsions for parenteral nutrition are implicated in modulation of membrane fluidity and lipid rafts molecular organization, thereby potentially regulating MPs release, key proteins activity, immune function and inflammatory response.
OBJECTIVES. To assess the role of several lipid emulsions for parenteral nutrition on acute inflammation modulation and cell membrane remodeling in an endotoxinic cell culture model.
METHODS. Human monocyte leukemia cells (THP-1) were stimulated with LPS (15 μg/mL) and medium was supplemented with different industrial lipids emulsions (0.50 mg/L) during 18 h. Cell viability was assessed with a Trypan blue exclusion test and apoptosis by flow cytometry. MPs were harvested and measured by prothrombinase assay. Monocytes membrane composition was studied by chromatography in order to establish lipids emulsions integration in cellular membranes.
RESULTS. (a) Lipid supplementation blunt cellular growth over the two first subcultures and from the third subculture, cells do not expend anymore. (b) After LPS challenge, both cellular necrosis and apoptosis are increased (respectively three-folds and two-folds) in medium enriched with medium chain triglycerides (MCT) compared to long chain triglycerides (LCT). (c) After LPS stimulation, MPs release is enhanced in the presence of MCT (three-folds compared to LCT). (d) Monocytes membrane differentially incorporates MCT and LCT after lipid emulsion challenge, whether associated with LPS stimulation or not.
CONCLUSION. Industrial lipid emulsions for parenteral nutrition modulate cell viability, MPs release and monocytes membrane composition and might therefore have differential effects that could potentially alter pro-inflammatory cell injuries.
REFERENCES. 1. Wanten GJ, Calder PC. Immune modulation by parenteral lipid emulsions. Am J Clin Nutr. 2007; 85(5): 1171–84. 2. Calder PC. Fatty acids and inflammation: the cutting edge between food and pharma. Eur J Pharmacol. 2011; 668(Suppl 1): S50-8.
GRANT ACKNOWLEDGMENT. This work has been supported by the French Society of Clinical Nutrition and Metabolism (SFNEP, Société Française de Nutrition Entérale et Parentérale).

0857

C-REACTIVE PROTEIN ADJUSTED THE INTERNATIONAL SOCIETY ON THROMBOSIS AND HAEMOSTASIS DISSEMINATED INTRAVASCULAR COAGULATION CRITERIA IN PATIENT WITH SEVERE SEPSIS AND SEPTIC SHOCK

S.O. Ha[1]

[1]University of Ulsan College of Medicine and Asan Medical Center, Department of Emergency Medicine, Seoul, Korea, Republic of

INTRODUCTION. The standard International Society on Thrombosis and Haemostasis (ISTH) criteria, the Japanese Association for Acute Medicine (JAAM) criteria and the revised JAAM criteria are world widely used for disseminated intravascular coagulation (DIC). However, low sensitivity of ISTH criteria and low specificity of JAAM and revised criteria are disadvantages to complement.

OBJECTIVES. We adjusted fibrinogen level according to C-reactive protein (CRP) level in The International Society on Thrombosis and Haemostasis (ISTH) disseminated intravascular coagulation (DIC) criteria.

METHODS. The data was prospectively collected and retrospectively analyzed in this study during 4-month period. A total of 79 critically ill septic patients with platelet $<150{,}000/\mu L$ or >50 % decrease within 24 h were enrolled. The samples from patients were collected on day 1, 2, 3, 4 and 8. The CRP adjusted ISTH criteria were compared to the three sets of diagnostic criteria, the standard ISTH, the JAAM and R-JAAM criteria in this study.

RESULTS. 49 (62 %) patients were diagnosed with DIC on the standard ISTH criteria for 8 days. According to the standard ISTH criteria, the CRP adjusted ISTH criteria showed same sensitivity (100 %) and higher specificity (80.0 % versus 46.7 % versus 40.0 %) compare to the JAAM criteria and R-JAAM criteria. The CRP adjusted ISTH criteria showed improved the sensitivity (69.0 % versus 51.7 %) compared to the standard ISTH criteria, also improved the specificity (60.0 vs 42.0 vs 40.0 %) compared to of JAAM and R-JAAM criteria for prediction for the mortality in intensive care unit on day 1.

CONCLUSIONS. In critically ill septic patients, the CRP adjusted ISTH criteria applying CRP adjusted fibrinogen score showed possibility of a role to overcome the disadvantage of initial low sensitivity of standard ISTH criteria and low specificity of JAAM and R-JAAM criteria.

REFERENCE(S). 1. Gando S, Saitoh D, Ogura H, Mayumi T, Koseki K, Ikeda T, Ishikura H, Iba T, Ueyama M, Eguchi Y et al. Natural history of disseminated intravascular coagulation diagnosed based on the newly established diagnostic criteria for critically ill patients: results of a multicenter, prospective survey. Crit Care Med. 2008; 36(1): 145–150. 2. Bakhtiari K, Meijers JCM, de Jonge E, Levi M. Prospective validation of the International Society of Thrombosis and Haemostasis scoring system for disseminated intravascular coagulation*. Crit Care Med. 2004; 32(12): 2416–2421. 3. Gando S Evaluation of New Japanese Diagnostic Criteria for Disseminated Intravascular Coagulation in Critically Ill Patients. Clin Appl Thromb Hemost. 2005; 11(1): 71–76. 4. Sivula M, Tallgren M, Pettila V: Modified score for disseminated intravascular coagulation in the critically ill. Int Care Med. 2005; 31(9): 1209–1214.

0858

ANTIOXIDANT STATUS IN ERYTHROCYTES OF SEPTIC SHOCK PATIENTS

M. Karapetsa[1], M. Pitsika[2], N. Goutzourelas[2], D. Stagos[2], A. Tousia Becker[2], E. Zakynthinos[1], D. Kouretas[2]

[1]University Hospital of Thessaly Biopolis, Intensive Care Department, Larissa, Greece, [2]University of Thessaly, Department of Biochemistry and Biotechnology, Larissa, Greece

INTRODUCTION. Nowadays there is compelling evidence that erythrocytes contribute fundamentally to the circulating antioxidant levels[1]. A better understanding of oxidative stress pathophysiology in sepsis may lead to more effective treatment strategies.

OBJECTIVE. To estimate oxidative stress and the antioxidant status in the erythrocytes of septic shock patients.

METHODS. ICU patients with the diagnosis of septic shock were included and healthy volunteers served as controls. Besides other oxidative markers assessed in plasma, reduced (GSH) glutathione and catalase activity were determined in erythrocyte lysate of the patients, at the time of septic shock diagnosis. Measurements were performed with already described methods[2].

RESULTS. 17 septic shock patients with an APACHE II score of 16.4 ± 6.4, a SOFA score of 9.6 ± 2.3 (both without CNS estimation) and a CRP value of 24.4 ± 14.1 (normal range < 0.5) were compared to 11 healthy controls. Levels of GSH were significantly lower than those of healthy controls ($p = 0.02$) (Fig. 1) while catalase activity levels were significantly higher showing a p value of 0.01 (p significant < 0.05) (Fig. 2). Non-significant correlations were found among the markers assessed with APACHE II, SOFA score and CRP.

CONCLUSION. A diverse antioxidant response within the erythrocytes upon the septic insult was certified, compared to healthy controls.

REFERENCES. 1. Nikolaidis M, Jamurtas A. Blood as a reactive species generator and redox status regulator during exercise. Arch Biochem Biophys. 2009; 490: 77–84. 2. Aebi H. Catalase in vitro. Methods Enzymol. 1984; 105: 121–26. 3. Tietze F. Enzymic method for quantitative determination of nanogram amounts of total and oxidized glutathione: applications to mammalian blood and other tissues. Anal Biochem. 1969; 27: 502–22.

Rehabilitation and nursing outcomes: 0859–0872

0859

ACUTE MICROCIRCULATORY EFFECTS OF MEDIUM-FREQUENCY VERSUS HIGH-FREQUENCY NEUROMUSCULAR ELECTRICAL STIMULATION IN CRITICALLY ILL PATIENTS: A RANDOMIZED, PILOT STUDY

E. Angelopoulos[1], E. Karatzanos[1], S. Dimopoulos[1], G. Mitsiou[1], C. Stefanou[1], I. Patsaki[1], A. Kotanidou[1], G. Petrikkos[2], C. Routsi[1], S. Nanas[1]

[1]National and Kapodistrian University of Athens Medical School, 1st Critical Care Department, Evangelismos Hospital, Athens, Greece, [2]National and Kapodistrian University of Athens Medical School, 4th Department of Internal Medicine, Attikon University General Hospital, Athens, Greece

INTRODUCTION. Intensive Care Unit-Acquired Weakness (ICUAW) is a common complication of ICU stay, associated with significant morbidity. neuromuscular electrical stimulation (NMES) has shown promising results as a preventive tool. NMES application acutely affects skeletal muscle microcirculation, and such effects could be related to the favorable outcomes. However, optimal current characteristics have not been defined.

OBJECTIVES. To compare the effects on muscle microcirculation of a single NMES session using medium and high frequency currents.

METHODS. ICU patients with SIRS or sepsis of 3–5 days duration ("acute group") and ICU patients with clinically diagnosed ICUAW ("ICUAW group"). A single 30-min NMES session was applied to the quadriceps, tibialis anterior and peroneus longus muscles bilaterally using symmetric, biphasic current of increasing intensity. Patients were randomly assigned to one of two protocols: HF (75 Hz, pulse 400 μs, cycle 5 s on–21 s off) and MF (45 Hz, pulse 400 μs, cycle 5 s on–12 s off). The peripheral microcirculation was monitored at the thenar eminence using Near-Infrared Spectroscopy (NIRS); a vascular occlusion test was applied before and after the NMES session. Local microcirculation of an exercising muscle (vastus lateralis) was also monitored using NIRS.

RESULTS. 31 patients (19 acute and 12 ICUAW) were randomized. In the HF protocol (17 patients), peripheral microcirculatory parameters responded as follows: thenar O_2 consumption rate (%/min) from 8.6 ± 2.2 to 9.9 ± 5.1 ($p = 0.08$), endothelial reactivity (%/s) from 2.7 ± 1.4 to 3.2 ± 1.9 ($p = 0.04$), vascular reserve (s) from 160 ± 55 to 145 ± 49 ($p = 0.03$). In the MF protocol: thenar O_2 consumption rate (%/min) from 8.8 ± 3.8 to 9.9 ± 3.6 ($p = 0.07$), endothelial reactivity (%/s) from 2.5 ± 1.4 to 3.1 ± 1.7 ($p = 0.03$), vascular reserve (s) from 163 ± 37 to 144 ± 33 ($p = 0.001$). Peripheral microcirculatory parameters improved with both protocols in a similar degree. In the vastus lateralis muscle, average muscle O_2 consumption rate was 61 ± 9 %/min during the HF protocol vs 69 ± 23 during the MF protocol ($p = 0.5$). The minimum amplitude in tissue saturation was 5 ± 4 StO_2 units with the HF protocol vs 7 ± 4 StO_2 units with the MF protocol ($p = 0.3$). Post-exercise hyperemia was 6 ± 7 StO_2 units with the HF protocol vs 5 ± 4 StO_2 units with the MF protocol ($p = 0.6$). Changes in the microcirculatory parameters of the exercising muscle correlated well with the strength of contractions achieved with NMES.

CONCLUSIONS. A single NMES session induced beneficial modifications in both local and peripheral skeletal muscle microcirculation. Medium and high frequency currents were equally effective in this regard. Increasing the current intensity throughout the session to maintain the torque of muscle contraction is crucial for its effects to occur.

0860

EYE CARE IN ICU: MORE THAN WHAT MEETS THE EYE?

V. Joshi[1], J. Nikhilesh[2], M. Joshi[3], J. Vandana[4], P. Bajpai[5]

[1]Rajshree Hospital and Research Centre, Critical Care Unit, Indore, India, [2]CHL Hospitals, Critical Care Unit, Indore, India, [3]Aurobindo Hospital, Ophthalmology, Indore, India, [4]ESI Hospital, Ophthalmology, Indore, India, [5]Aurobindo Hospital, Medicine, Indore, India

INTRODUCTION. Eye care for patients sedated and ventilated in ICU remains a contentious issue. There are various modalities for the same and the optimal modus operandi for the same remains variable depending upon the institutional practice.

OBJECTIVES. Comparison of outcomes in corneal ulcer prevention strategies in ICU using sodium carboxymethyl cellulose 0.5 %(CMC)or polyvinyl alcohol 14 mg, povidone 6 mg (PVA) for adult patients sedated and ventilated in ICUs of tertiary care hospitals.

METHODS. Patients on mechanical ventilation on sedatives were analyzed with a fluorescein staining test (for corneal integrity) with CMC or PVA eye drops in one drop QID schedule for each eye or simple bandage dressing cover. Death/discharge from ICU was considered as end points. The entire cohort was divided in three groups [A] CMC group, [B] PVA group and [C] simple eye pads, getting admitted to hospital in the same duration for almost similar variables. A multivariate logistic regression analysis was done using SPSS version 11.

RESULTS. Eighty patients were enrolled for CMC group (n = 80, M: F-50:30) during April 10–Dec 11 which were compared against a control group of eighty patients where PVA was used (n = 80, M: F-48:32) and simple pad group (n = 40, M: F-28:12). The results were as follows.

Comparison of outcomes in corneal ulcer prevention

Feature	CMC gr.	PVA gr.	Simple eye pad
Age (years)	55.7 ± 7.2	51.9 ± 8.7	54.9 ± 8.7
Stay in ICU	4.6 ± 1.2	6.1 ± 4	5.2 ± 1.8
Corneal ulcer	0(0 %)	6(7.5 %)	12 (30 %)

Highest rates for loss of epithelial integrity were documented with simple eye pads (30 % v/s 7.5 % and 0 for PVA and CMC group respectively). The difference between the CMC group and the eye pads group was statistically significant in terms of integrity of corneal epithelium ($p = 0.012$).

CONCLUSIONS. In our study the CMC group performed best vis-à-vis PVA group and the simple eye pads group. However the sample size remains small and validation with larger groups may be required to push for a standardized therapeutic intervention required for eye care of sedated patients on mechanical ventilation.

0861

DOES THE INTRODUCTION OF THE SARA COMBILIZER® REDUCE THE TIME TAKEN TO FIRST MOBILISATION IN INTENSIVE CARE?

D.J. Mcwilliams[1], T.J. Lea[1]

[1]Queen Elizabeth Hospital, Therapy Services, Birmingham, UK

INTRODUCTION. There is a growing body of evidence to support programmes of early mobilisation within intensive care units (ICU). When utilised, early mobility is associated with reduced ICU and hospital length of stay (1), and improved functional outcomes (2). The exact definition of early mobility is still not defined, and actual ability to mobilise can be limited by certain factors such as haemofiltration, airway stability or the use of inotropes (3). The Sara Combilizer® is a combined tilt table and stretcher chair, which aims to allow earlier transfer of patients into the chair. As transfer is passive via the use of a patslide (or similar), it is hypothesised this should allow patients to sit out earlier in their ICU stay, which may subsequently further improve outcomes.

OBJECTIVES. This study aimed to assess whether the introduction of the Sara Combilizer® reduced time taken to mobilise, defined as sitting out of the bed for the first time.

METHODS. All patients admitted to a large UK teaching hospital during the trial period and ventilated for ≥ 5 days were included in the study. We collected information with regards to time taken to mobilise and final level of mobility achieved prior to obtain a

baseline form 1st April–17th August 2012. The Sara Combilizer® was then introduced on the 20th August and data collected prospectively until 31st December 2012. Primary outcome was time taken to mobilise, with secondary outcomes of mobility level at ICU discharge, assessed via the Manchester mobility score (MMS) and length of stay (LOS).
RESULTS.

Results

	n=	Mean time to mobilise	Mean MMS	ICU LOS	Post ICU LOS
Pre Combilizer	77	10.6 days	3.9	17.5	25.3
Post Combilizer	83	7.6 days	4.6	15.0	16.9
		$p < 0.0025$	$p < 0.05$	$P = 0.072991$	$p < 0.05$

Following the introduction of the Sara Combilizer® mean time taken to mobilise reduced significantly from 10.6 to 7.6 days ($p < 0.0025$) and was associated with a significantly higher level of mobility at ICU discharge ($p < 0.05$). This appeared to be associated with a reduction in ICU LOS although this was not significant, although a significant reduction in post ICU LOS was observed ($p < 0.05$).
CONCLUSIONS. Following its introduction the Sara Combilizer® allowed earlier mobilisation of patients admitted to intensive care and ventilated for ≥ 5 days. This earlier mobilisation was associated with a higher overall level of mobility within ICU and appeared to be associated with reductions in ICU and hospital length of stay. As this trial took place as part of a wider rehabilitation service improvement project a randomised controlled trial is needed to assess the validity of these findings.
REFERENCE(S). 1. Morris PE, et al. (2008) Early intensive care unit mobility therapy in the treatment of acute respiratory failure. CCM. 36:2238–43. 2. Schweickert WD, et al. Early physiotherapy and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial. Lancet 2009;373:1874–82. 3. Garzan-serrano et al. (2011) Early mobilization in critically ill patients: patients′ mobilization level depends on health care provider′s profession. PM&R (4):307–13.

0862
ACUTE EFFECTS AND SAFETY OF ELECTRICAL MUSCLE STIMULATION IN THE ICU

C. Stefanou[1], G. Mitsiou[1], E. Karatzanos[1], E. Angelopoulos[1], S. Dimopoulos[1], C. Routsi[1], E. Boviatsis[1], S. Nanas[1]

[1]Medical School of Athens University, Evangelismos Hospital, Athens, Greece
INTRODUCTION. Electrical muscle stimulation (EMS) has been recently proposed as a preventive and therapeutic tool of ICU acquired weakness.
OBJECTIVES. The aim of this study is to evaluate possible skeletal muscle damage or hemodynamic derangement induced by the EMS, and examine its acute effects in ICU patients.
METHODS. Twenty-one septic adults of the ICU without primary muscular or neurological disease (16 men; mean age 57 years, SD = 14; mean acute physiology and chronic health evaluation score-II = 20, SD = 8) underwent a 30-min session of EMS of the lower extremities [with pulses of 400 μs of duration, 5 s on - 12 s off or 5 s on-21 s off, 45 or 75 Hz respectively]. A series of clinical, biochemical and blood gas exams were performed in all patients before and after the session, which were followed over time.
RESULTS. Patients demonstrated a statistically but not clinically significant raise of CK, an index of muscle damage, by an average of 39 ± 69 IU/L [$P < 0.05$, mean pre = 586, mean after = 625 IU/L, in N = 15 patients]; CK returned to baseline within 24 h. Lactic acid increased by an average of 0.34 mmol/L [$P < 0.01$, pre = 1.19 ± 0.40, after = 1.53 ± 0.5 mmol/L, N = 14], which returned to baseline in a bit longer than 30 min. A trend of raise of blood pressure [mean MAP before = 92 ± 11, mean MAP after 97 ± 18 mmHg, N = 19, P = 0.09], heart rate [mean pre = 93 ± 19, mean after 97 ± 18 bpm, N = 19, P = 0.09], and LDH [mean pre = 339 ± 153, mean after = 383 ± 149 IU/L, N = 11, P = 0.06], was observed after EMS session. No other remarkable change or side effect was noted, including cardiac enzymes, intracranial pressure and cardiac monitoring (arrhythmias etc.) during the sessions. .
CONCLUSIONS. EMS appears safe in ICU patients. EMS induces significant metabolic effects without skeletal muscle damage and no hemodynamic derangement. EMS should be considered in ICU patients for its possible beneficial effects as a preventive and therapeutic tool of ICU acquired weakness.
REFERENCE(S).
1. Christina R, Vasiliki G, Ioannis V, Eleftherios K, Theodore P, Elli T, Vasiliki M, Dimitrios Z, Serafim N. Electrical muscle stimulation prevents critical illness polyneuromyopathy: a randomized parallel intervention trial. Crit Care 2010, 14:R74.
GRANT ACKNOWLEDGMENT. No conflict of interest; special account for grants, National Kapodestrian University of Athens.

0863
IS THE GOAL ATTAINMENT SCALE (GAS) A USEFUL OUTCOME MEASURE ON ADULT INTENSIVE CARE?

C. Purkiss[1], S. Cooke[1], L. Maher[2], C. Brown[1]

[1]Royal Brompton and Harefield NHS Foundation Trust, Physiotherapy, London, UK, [2]Royal Brompton and Harefield NHS Foundation Trust, Occupational Therapy, London, UK
INTRODUCTION. UK guidelines highlight the need for outcome measures during critical care rehabilitation [(1)]. Many standard outcome measures can show floor and ceiling effects, lack of sensitivity and domains do not always correlate with what is important to patients [(2)]. The Goal Attainment Scale (GAS) allows individualised patient goals to be set with patients or care givers which can then be scored in a standardised way to allow statistical analysis. The GAS is used widely in neuro-rehabilitation, but to our knowledge no studies exist investigating its use within Adult Intensive Care Units (AICU).
OBJECTIVES. To determine whether the GAS is a feasible tool to use in an AICU, what goals are most frequently important to patients, and whether there is a statistical change in goal attainment following rehabilitation.
METHODS. The therapy team attended a GAS training day. Data collection started in February 2013. All patients admitted to the 20 bedded cardiothoracic AICU who were ventilated for >10 days and participating in active rehabilitation were included. A goal interview was conducted and GAS goals set by the patients lead therapist once rehabilitation had commenced. A maximum of three goals were set per patient. Goals were recorded on a GAS score sheet and reviewed on discharge from the hospital, or when the time frame for the goals had elapsed. A GAS T-score was calculated based on the level of achievement of the goals as stated by the therapist leading the rehabilitation.
RESULTS. 12 patients were eligible for GAS goals in this time period. The most commonly set goals were walking (n = 7), communication (n = 6) and self care (n = 3). 8 patients were discharged in this time period. The mean achieved GAS T-score for these patients was 44.39 (SD $\pm$ 8.19). To show good achievement of goals scores should be normally distributed around 50 (SD $\pm$ 10). There was a significant change in score following rehabilitation ($p = 0.0318$).
CONCLUSIONS. The GAS highlights goals that are important to patients and is a valuable tool to engage patients and care givers in the rehabilitation process. The most frequently set goal was to walk, showing that physical recovery is an important goal to these patients. This small set of interim data suggests there is a significant change in GAS T-Score following rehabilitation. Goals that were underachieved were mostly due to transfer out of the hospital before the time frame for goal was reached, therefore may represent a false negative. GAS goal time frames could be set at no greater than one month to limit this effect when used on an AICU. Further data is currently being collected to increase the sample size and improve the robustness of this study.
REFERENCE(S). 1. CG83—Rehabilitation after critical illness. National Institute for Clincial Excellence (UK) 2009. 2. Turner-Stokes L. Goal attainment scaling (GAS) in rehabilitation: a practical guide. Clin Rehabil. 2009; 23: 362–70.

0864
LONG-TERM FUNCTIONAL DEFICIENCIES OF ICU-ACQUIRED WEAKNESS: A PROSPECTIVE STUDY

I. Patsaki[1], G. Sidiras[1], V. Gerovasili[1], A. Kouvarakos[1], E. Polimerou[1], G. Mitsiou[1], A. Kardara[1], A. Christakou[1], M. Papadopoulos[1], V. Markaki[1], S. Nanas[1]

[1]1st Critical Care Department, Evangelismos Hospital, National & Kapodistrian University of Athens, Athens, Greece
INTRODUCTION. During the last decades, the survival rate of severe critical ill patients has increased due to the technological development of critical care medicine. There has been a rising interest in the functional outcomes and health related quality of life of ICU survivors as there seems to have increased rehabilitation requirements.
OBJECTIVES. The aim of this study was to assess the long term effect of ICU-acquired weakness (ICU-aw) on functional ability of ICU survivors.
METHODS. 530 consecutive patients were evaluated and eighty (mean $\pm$ SD: Apache II: 14 ± 6, SOFA: 8 ± 3, length of ICU stay :21 ± 18 days) met the inclusion criteria. Twenty eight were diagnosed with ICU-acquired weakness (ICU-aw) within 48 h from ICU discharge. The diagnosis of ICU- acquired weakness was based on muscle strength measurement according to the Medical Research Council (MRC). Functional ability was evaluated by the FIM score (Functional Independence Measure, 18–126) and by the subscale of SF-36 (physical functioning) on hospital discharge, at 3 and 6 months from discharge. The FIM scale includes sections that evaluate mobility, self-care, communication, cognition and sphincters management.
RESULTS. At hospital discharge patients with ICU-acquired weakness had significant lower MRC score (mean $\pm$ SD: 48 ± 9 vs 57 ± 3, $p < 0.001$). In addition, these patients had significant reduced FIM total score (mean $\pm$ SD: 65 ± 22 vs 97 ± 24, $p < 0.001$). The reduced functionality of patients with ICU-AW persists even after 3 and 6 months after hospital discharge according to FIM total score (mean $\pm$ SD: 96 ± 29 vs 118 ± 11, $p < 0{,}001$ and 106 ± 23 vs 123 ± 6, $p < 0.05$ respectively). According to the sf-36 subscale, functional ability in patients with ICU-aw tended to be lower at 3 and 6 months although it did not reach statistical significance (mean $\pm$ SD: 43 ± 40 vs 55 ± 32, and 51 ± 44 vs 76 ± 28).
CONCLUSIONS. The patients who developed ICU-aw had significant inferior muscle strength at their ICU discharge and as a consequence they had significant impaired functional ability at hospital discharge. Functional deficiencies for these patients remain even at 6 months after hospital discharge. Further studies are needed to evaluate the effect of these impairments on the quality of life of these patients and also to assess rehabilitation strategies post ICU.

0865
INCIDENCE AND RISK FACTORS OF HETEROPIC OSSIFICATION IN A GENERAL INTENSIVE CARE UNIT

A. Christakou[1], I. Patsaki[1], M. Alimatiri[1], E. Papadopoulos[1], A. Kouvarakos[1], D. Karakitsos[1], V. Markaki[1], S. Nanas[1]

[1]1st Critical Care Department, Evaggelismos Hospital, National & Kapodistrian University of Athens, Athens, Greece
INTRODUCTION. Heterotopic ossification (HO) is a complication in patients in ICU which expects to provoke long-lasting morbidity impairing basic daily activities. Due to the great importance of the functional status and quality of life during and after the ICU stay, HO's early detection and risk factors are necessary to be thoroughly investigated.
OBJECTIVES. The aim of the study was to determine the incidence and the risk factors associated with the development of HO.
METHODS. One hundred nighty seven consecutive patients evaluated through clinical and laboratory screenings for HO upon admission and discharge and 123 of them were eligible for the study (76 men, 48 women, age 52.77 ± 14.99 years, APACHE II 16 ± 5, SOFA 7 ± 2, SAPSIII 55 ± 9, length of stay in ICU 27.35 ± 22.14 days, mechanical ventilation 21.77 ± 19.84 days). HO was confirmed to 9 patients (7.31 %) (7 with traumatic brain injury) with a mean diagnosed of 65 days (SD = 13.97, Md = 67, Range = 46) by means of ultrasonography and radiography. The risk factors that examined by logistic regression were: sex, age, admission GCS score, Injury Severity Score, length of stay in ICU and hospital, mechanical ventilation, respiratory alkalosis, coma duration, neuromuscular blocking agents, duration in sedation, autonomic dysregulation, presence of deep venous thrombosis, presence of intracranial pressure, and concomitant fractures.
RESULTS. The risk factors that predict the occurrence of HO are:
(a) age (Wc = 5.49, $p < 0.01$, Exp (B) = 1.05),
(b) length of stay in ICU (Wc = 8.49, $p < 0.01$, Exp (B) = 0.97) and in hospital (Wc = 3.84, $p < 0.05$, Exp (B) = 0.94),
(c) duration of mechanical ventilation (Wc = 7.61, $p < 0.01$, Exp(B) = 0.96),
(d) respiratory alkalosis (Wc = 9.48, $p < 0.01$, Exp(B) = 0.89),
(e) coma duration (Wc = 4.90, $p < 0.05$, Exp(B) = 0.97),
(f) admission GCS score (Wc = 3.94, $p < 0.05$, Exp(B) = 1.23),

(g) presence of intracranial pressure (Wc = 4.83, $p < 0.05$, Exp(B) = 0.20), and (h) autonomic dysregulation (Wc = 11.01, $p < 0.01$, Exp(B) = 28.00). In multivariate analysis (included all significant independent variables from the univariate analysis), using stepwise method, are found statistically significant the autonomic dysregulation, the respiratory alkalosis, and the duration of mechanical ventilation (F = 20.98, $p < 0.000$).

CONCLUSIONS. The incidence of HO appears to be significant in a general ICU. A few factors seem to predict the occurrence of HO, thus larger studies are needed to confirm these results for better prevention and early identification of this frequent complication in critical ill patients.

0866

LIMITING FACTORS FOR A COHORT OF PATIENTS DISCHARGED FROM A GENERAL INTENSIVE CARE UNIT TO PARTICIPATE INTO A TELE-REHABILITATION PROGRAM

A. Tsavourelou[1,2], L. Kypri[1], E. Demetriadou[2], S. Kokkoris[1], T.C. Kyprianou[1]

[1]Nicosia General Hospital, Dept of Intensive Care Medicine, Nicosia, Cyprus, [2]Intensive Care Forum NGO, R&D Division, Nicosia, Cyprus

INTRODUCTION. Many patients hospitalised in Intensive Care Units (ICUs) return home suffering from reduced functional capacity, exercise tolerance, health related quality of life and social function 1. Although the evidence demonstrates a clear need for rehabilitation for those patients 2, relevant rehabilitation programs are neither well established nor adequately defined and limiting factors for participating are poorly investigated.

OBJECTIVES. The purpose of this study was to assess eligibility for inclusion to a tele-supervised exercise program, applying certain exclusion criteria (pertaining to low probability of ICU related disability and to physical disability) and to define the prevalence of these limiting factors.

METHODS. We prospectively studied consecutive admissions to the general ICU of Nicosia General Hospital for their eligibility to participate into a home-based tele-rehabilitation program (multiparty video conference and vital sign monitoring sessions). Exclusion criteria were: (a) age below 18 years, (b) poor neurological outcome (Mini Mental Scale Examination <23/30), (c) poor functional ability (Rivermead Mobility Index < 8/15), (d) ICU stay < 92 h., (e) Mechanical Ventilation < 48 h., (f) end stage chronic illness and (g) hospital discharge to chronic health care facilities/other hospitals.

RESULTS. Preliminary analysis was conducted on the first 68 patients (1 month). Of them, 7(10 %) died (hospital mortality), 14 (21 %) were considered as eligible and 47 (69 %) as non-eligible. Not eligible patients were excluded because of (a) age below 18 years 0(0 %), (b) poor neurological outcome (Mini Mental Scale Examination < 23/30) 10(15 %), (c) poor functional ability (Rivermead Mobility Index < 8/15)/end stage chronic illness 7(11 %) (d) ICU stay < 92 h. 0(0 %), (e) Mechanical Ventilation < 48 h 25(36 %), (f) and (g) hospital discharge to chronic health care facilities/other hospitals 5(7 %).

CONCLUSIONS. This study gives preliminary evidence that a large proportion of ICU patients are eligible to participate into a planned home-based tele-rehabilitation program, however, there are significant limiting factors.

REFERENCES. 1. Flaatten H. Mental and physical disorders after ICU discharge. Curr Opin Crit Care 2010; 16:510–15. 2. NICE clinical guideline 83. Rehabilitation after critical care. London: NICE, 2009.

GRANT ACKNOWLEDGMENT. EU INTERREG cross-border co-operation programme 2007–2013: C (2008) 1131/28-03-2008 Call ID: K1, Protocol ID: 9115, Contract No: K1_3_02.

0867

ADVERSE EVENTS BY NURSING PROCEDURES IN CRITICALLY ILL PATIENTS—A CLINICAL OBSERVATIONAL PILOT STUDY

J. Engström[1], H. Reinius[1], E. Bruno[1], C. Fröjd[1], J. Sannervik[1], H. Jonsson[1], A. Larsson[1]

[1]Uppsala University, Surgical Sciences, Anesthesia and Intensive Care, Hedenstierna Laboratory, Uppsala, Sweden

INTRODUCTION. In critically ill patients even minor physiological deteriorations may have severe consequences. Routine nursing procedures, e.g., patient position change or airway suctioning, are considered essential to prevent e.g., pressure sores, contractures, endotracheal tube obstruction and hospital-acquired infections. However, nursing procedures may seriously compromise the patient's condition by reducing oxygen saturation, affecting blood pressure negatively or causing accidental awakening. Our hypothesis was that these complications from routine nursing care are common.

OBJECTIVES. The aim of this study was to carefully assess the incidence and importance of changes in respiratory and circulatory variables as well as in consciousness caused by nursing procedures in ventilator treated critically ill patients.

METHODS. The effects of nursing procedures in 8 consecutively enrolled patients (PaO_2/F_iO_2 ratio $\leq$ 40 kPa) treated in a university general intensive care unit (ICU) with mechanical ventilatory support (PEEP $\geq$ 8 cmH_2O) and vasoactive drugs were registered by an investigator who observed the care of the patients. The observational sessions started 06.00 AM and proceeded for 12 h. All nursing and medical interventions were recorded and when an adverse event occurred, the duration and the type of the event as well as the intervention to ameliorate the physiological deterioration were recorded. Collected data included changes in tidal volume, respiratory rate [RR], peak airway pressure, SpO_2, mean arterial pressure [MAP], pulse rate, ECG, and Richmond Agitation Sedation Scale. An adverse event was defined as a non-intended vital parametric change (RR $\pm$ 5/min, 5 % SpO_2 reduction, coughing, pulse rate $\pm$ 15 strokes/min, MAP $\pm$ 5 mmHg), awakening and mechanical ventilator asynchrony within 5 min after the intervention.

RESULTS. A total of 485 adverse events occurred (61 $\pm$ 20/patient) (mean $\pm$ SD) during the study. 292 nursing and medical interventions were performed (1.7 adverse events/intervention). The majority was associated with patient position change (247 adverse events/117 interventions) and nursing care of the airway (ventilatory disconnection and tracheal suctioning) (74 adverse events/66 interventions).

CONCLUSIONS. In this prospective observational study we found that adverse events caused by nursing procedures are very common during the care of critically ill patients. Patient position change and endotracheal tube suctioning were the most frequent routine interventions and were also followed by the highest incidence of adverse events. This implies that risk versus benefit of routine nursing procedures should be carefully considered particularly in the most severely ill ICU patients.

0869

MEASURING GAINS IN CRITICAL CARE REHABILITATION USING THE FIM + FAM: IS THERE A LINK BETWEEN COGNITIVE AND MOTOR SCORES?

R. Livingston[1], C. Purkiss[1], S. Cooke[1], C. Brown[1]

[1]The Royal Brompton and Harefield NHS Foundation Trust, Physiotherapy, London, UK

INTRODUCTION. Structured assessment is key in critical care rehabilitation (1). The Functional Independence Measure and Functional Assessment Measure (FIM + FAM) is a 30-item global measure of disability. It has been used to assess function in critical care studies (2). The FIM + FAM is used in our adult intensive care unit (AICU) and correlates with muscle and grip strength. It consists of 14 cognitive and 16 motor items. The relationship between cognitive and motor gains from rehabilitation in critical care is unclear.

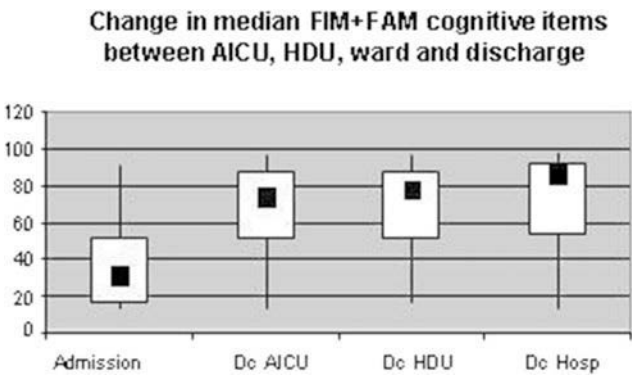
OBJECTIVES. To determine where the biggest change in cognitive and motor items occur; in AICU, the high dependency unit (HDU), or the ward, and determine if there is a relationship between cognitive and motor scores in rehabilitation patients.

METHODS. Data was collected throughout 2012. All AICU patients ventilated for >10 days and participating in active rehabilitation were included. FIM + FAM was recorded on initial therapy assessment and discharge from AICU, HDU and the ward. Therapists were familiar with FIM + FAM from routine use. 23 patients (Group 1) were repatriated to their local hospital from AICU. 41 patients (Group 2) were discharged from AICU to HDU and then to a ward before being discharged to the community.

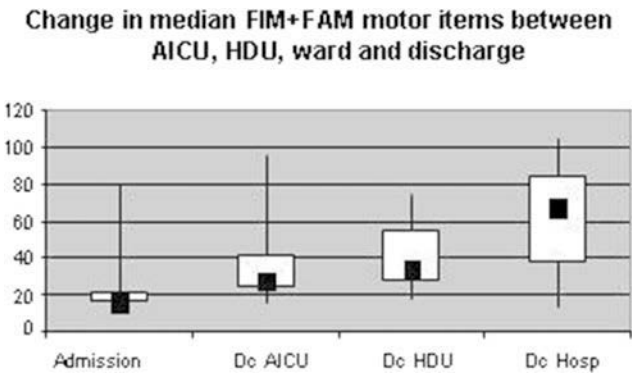
RESULTS.

Group 1 showed a median 23 point increase for cognitive items from assessment to repatriation ($p = 0.003$). Median motor score was unchanged (initial IQR 16–16, repatriation IQR 16–21 $p = 0.009$).

Group 2 showed a median 55 point increase in cognitive score between assessment and discharge ($p = 0.000001$), and an increase in median motor score of 51.5 points ($p = 0.000002$). Cognitive items show the biggest increase during AICU stay (Graph 1). Motor items show the biggest increase on the ward (Graph 2). All increases in median motor and cognitive score at each stage of the patients' journey were statistically significant.



Graph 1



Graph 2

A positive correlation was found between cognitive score on initial assessment and motor score on discharge from hospital (rs 0.430, $p = 0.011$). A statistically significant correlation was found between cognitive and motor function on discharge from hospital (rs 0.640, $p = 0.00006$).

CONCLUSIONS. Critical care patients demonstrated improvements in cognitive and motor function during their rehabilitation journey. Cognitive gains were most notable on AICU, and motor gains on the ward. Motor function may be limited by critical care acquired weakness which has a slow recovery time. These results may also suggest that improvements in motor recovery are dependent on cognitive improvements. Patients with a higher cognitive FIM + FAM score on admission appeared to have greater motor function on discharge from hospital.

REFERENCE(S). 1. NICE Clinical Guideline 83, Rehabilitation after critical illness, 2009. 2. Elliot D, Denehy L, Berney S, Alison JA. Assessing physical function and activity for survivors of a critical illness: a review of instruments. Aust Crit Care 2011; 24:155–166.

0870
STRUCTURED FOLLOW-UP INTERVIEWS DURING POST-ICU HOSPITAL STAY TO INITIATE ICU AFTERCARE: A PILOT STUDY

E. Klop[1], A.R.H. van Zanten[2], Y. van Dokkum[2], A. Janse[2], M.S. van der Steen[2]

[1]Ziekenhuis Gelderse Vallei, ICU, Ede, The Netherlands, [2]Ziekenhuis Gelderse Vallei, Ede, The Netherlands

INTRODUCTION. Admission to an Intensive Care Unit (ICU) may cause various physical, mental and social problems. Discharge from ICU to general wards frequently is experienced as unsafe and frightening. To study effects of early signs and symptoms of these ICU-related problems we recently started a new clinical pathway of ICU aftercare, weeks before the first outpatient ICU meeting, during post-ICU hospital stay. We hypothesized that not all needs of patients involved would be recognized during hospitalization and this could potentially facilitate early intervention. After discharge from hospital patients are followed up to one year through our multidisciplinary ICU outpatient aftercare program.
OBJECTIVES. To describe early post-ICU follow up results of patients' needs during in-hospital structured interviews by a specialized nurse.
METHODS. A descriptive, prospective multi-method study in a single-center teaching hospital with 17 ICU beds. Patients were eligible when admitted to the ICU from December 2012 until March 2013 for > 48 h and still in the hospital 7–14 days after ICU discharge and able to participate in the interview. The exclusion criterion was active delirium on ward. Several domains of experiences were tested among which the TSQ instrument to detect early signs of PTSD and the HADS instrument to detect early signs of anxiety and depression. Results are used in weekly structured multidisciplinary rounds and form a basis for further treatment or interdisciplinary advice.
RESULTS. In total 244 patients were admitted to the ICU, 96 patients met inclusion criteria. Of those 51 were excluded [active delirium (n = 15), early discharge (n = 25), refusal (n = 5) and other reasons (n = 6)]. Early signs of PTSD, anxiety and depression were respectively present in 8 of 45 patients (18 %), 24 % and 20 %. Delirium-associated memories were frequently mentioned as the most unpleasant experiences during ICU stay. Lack of information and ability to express delirium experiences, and use of restraints was mentioned often (50 %). Dreams, hallucinations and delusions were generally experienced as very impressive (27 %). Some patients (40 %) felt very lonely and anxious at ICU. In 10 % of the patients additional psychosocial support and consultation was necessary for delirium, anxiety or depression.
CONCLUSIONS. Post-ICU follow-up interviews during hospital stay showed the need of additional explanation and information concerning delirium-associated problems. Early signs of PTSD, anxiety and depression are present in a relevant percentage of patients. We feel a structured follow-up interview during post-ICU hospital stay may bring some issues to light that may facilitate early intervention and can help multidisciplinary teams to understand needs of post-ICU patients. Both information can be provided and interventions may be initiated. Further studies are warranted to evaluate whether early interventions commenced during hospital stay may beneficially affect long-term outcome.

0871
PHENOMENOLOGY ON THE PATIENTS' EXPERIENCES OF SURGICAL INTENSIVE CARE UNIT IN KOREA

M. Pak[1], M.S. Yi[2]

[1]Seoul National University Hospital, EICU, Seoul, Republic of Korea, [2]Seoul National University, Seoul, Republic of Korea,

INTRODUCTION. In intensive care unit the patients' emotional status can be ignored due to critical situation needed immediate treatment. Particularly in surgical intensive care unit (SICU) the patients have a lot of traumatic or therapeutic experiences involved with surgical intervention.
OBJECTIVES. The purpose of this qualitative study was to understand and describe the patients' experiences of SICU from their point of view.
METHODS. The data were collected by individual in-depth interviews from 7 patients who were transferred from the SICU to the general ward in 2009. The interview data were transcribed and analyzed by Colaizzi's phenomenological method.
RESULTS. The patients' experiences of SICU were classified into eight themes: 'loneliness around the machinery', 'standing in a funeral ceremony', 'rough touch of death', 'treated as a luggage to be thrown down', 'robots carrying out medical experiment on a living body', reliable guardian beside of me', 'the cradle of new life', and 'surgery; new start of life'. These eight themes were finally grouped into two theme clusters: 'situational hardship' and 'positive sublimation'. The theme clusters illustrate that the SICU patients experienced not only negative things in a critical situation, but also positive things through the sincere care with genuine attention of their nurses.
CONCLUSIONS. The results of this phenomenological study demonstrate that SICU nurses should pay more attention to the psychosocial area of the patients to minimize their 'situational hardship' and to maximize their 'positive sublimation'.

0872
PATIENTS NARRATIVES OF LIVED EXPERIENCES OF INTENSIVE CARE DURING AFTER-CARE

K. Nilsson[1], S. Berner[1], I. Hertz[1], C. Hansen[2]

[1]Glostrup Hospital, Intensive Therapy Y13, Glostrup, Denmark, [2]Glostrup Hospital, Anesthesiology Dept. Y, Glostrup, Denmark

INTRODUCTION. Current evidence indicates that emotional problems after intensive care are related both to subjective and objective indicators of a patient's intensive care experience. Research of rehabilitation after critical illness has during the latest years focused on the use of diary and after-care. Several studies have investigated psychological consequences. Additionally, the meaning of dreams and follow-up care been explored. It may therefore seem appropriate to further investigate patients' individual experiences in order to search for a deeper understanding of the dimensions that influence individuals during the trajectory of intensive care and after-care. This, in relation to further develop and targeting after-care interventions in an intensive care unit (ICU) which uses diary as well as after-care as telephone consultations, nurse conversations combined with visits in the ICU at four, eight and 12 months after discharge.
OBJECTIVES. The aim is to illuminate patient experiences and perspective after intensive care during after-care.
METHODS. The study design is qualitative and descriptive the approach was phenomenological-hermeneutic. Five patients who had undergone intensive care were included. Data was obtained using individual interviews twice during after-care: nurse conversations combined with visits in the ICU at 4 months after discharge. Additionally was field notes obtained during the visit in the ICU. Data were analyzed at three levels: naive reading, structural analysis and critical interpretation and discussion.
RESULTS. The preliminary findings indicate that there are three categories of lived experiences of intensive care.
CONCLUSIONS. This clinical nursing research provides new basic knowledge useful in the efforts to enhance patient psychological processing after intensive care and provides health professionals improved opportunities to target support, guide and inform the individual patient.
REFERENCES.
1. Rattray JE, Hull AM. Emotional outcome after intensive care: literature review. J Adv Nursing 2008; 64(1):2–13. 2. Nilsson K, Berner S, Hertz I. Diary and follow-up dialogue-pieces in the puzzle of recovery. World Crit Care Nursing 2011; 8(2):75. [(journal article - abstract) ISSN: 1748–6254]. 3. 4th EfCCNa & FSAIO Congress Copenhagen 2011 http://www.efccna.org/index.php?option=com_content&view=article&id=88&Itemid=96. 4. Storli SL, Lind R. The meaning of follow-up in intensive care: patients' perspective. Scand J Caring Sci. 2009; 23:45–56. 5. Papathanassoglou EDE, Patiraki EI. Transformations of self: a phenomenological investigation into the lived experience of survivors of critical illness. Nursing Crit Care 2003; 8(1):13–21. 6. Ricoeur P. Interpretation Theory: Discourse and the surplus of meaning. Fort Worth: Christian University Press 1976.

Wednesday 09 October 2013

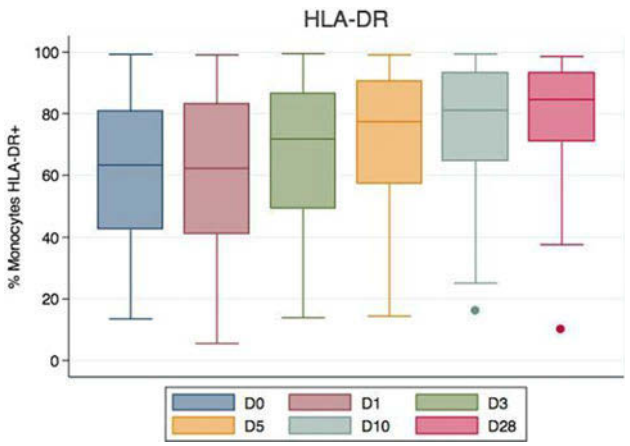
Oral Sessions
Nosocomial infection and immunoparalysis of severe ICU patients: 0873–0877

0873
TIME COURSE OF COMPENSATORY ANTI-INFLAMMATORY RESPONSE SYNDROME (CARS) BIOMARKERS IN A COLOMBIAN COHORT OF SEVERE SEPSIS PATIENTS

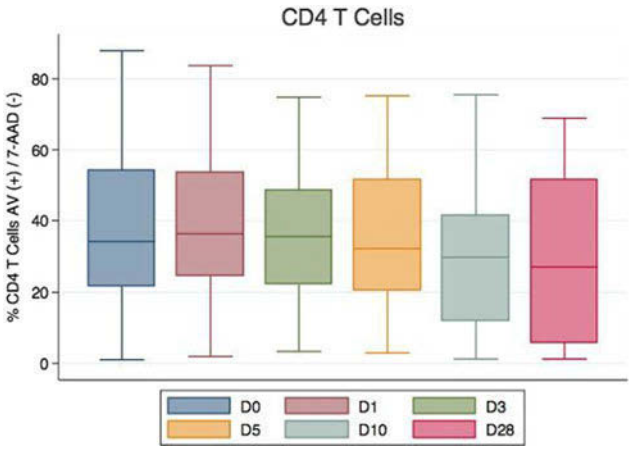
M.T. Rugeles[1], H. Gomez[1], S. Gonzalez[1], P.A. Velilla[1], F. Jaimes[2]

[1]Universidad de Antioquia, Immunovirology Group, Medellin, Colombia, [2]Universidad de Antioquia, Internal Medicine and GRAEPIC, Medellin, Colombia

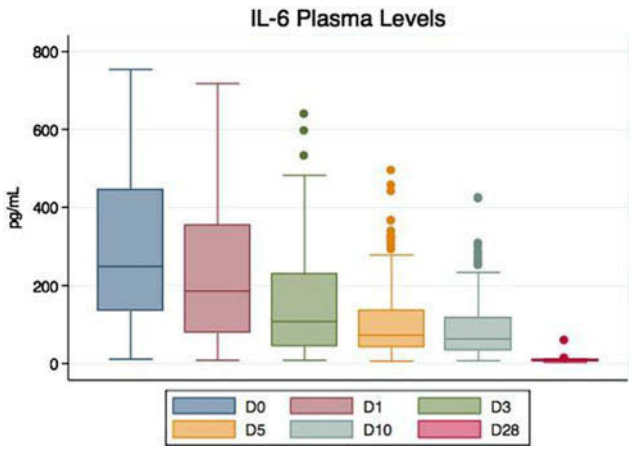
INTRODUCTION. The prevailing theory of sepsis pathogenesis has been an uncontrolled inflammatory response due to infection. However, compelling evidence emerged supporting the theory of sepsis-induced immunosuppression leading to CARS. Although independent cross-sectional studies have substantiated this new paradigm, a complete immunological characterization of septic patients is still missing.
OBJECTIVES. Our aim was to evaluate changes over time of the main immune dysfunctions related to CARS in a single-cohort of patients with severe sepsis.
METHODS. This prospective non-interventional study was conducted in 5 intensive care units from a teaching hospital and enrolled 148 patients with severe sepsis. At days 0, 1, 3, 5, 10, and 28, we determined the expression of HLA-DR in monocytes as well as apoptosis and proliferation index in T lymphocytes by flow cytometry. We also measured TNF-α, IL-6, IL-1β, IL-10, and TGF-β levels in both, plasma and cell culture supernatants of peripheral blood mononuclear cells by ELISA at the same time points. We calculated the estimated daily average change for each variable using a GEE model.
RESULTS. At enrollment, patients had a low percentage of HLA-DR + monocytes, high percentages of CD4 T cells and CD8 T cells in apoptosis, and elevated plasma levels of IL-6 and IL-10. During follow-up, the percentage of HLA-DR + monocytes increased 0.9 % per day (95 %CI = 0.7–1.2 %), the percentage of apoptotic CD4 + and CD8 + T cells diminished at a rate of -0.5 % (95 %CI = −0.7 % to −0.3 %) and -0.3 % (95 %CI = −0.4 % to −0.2 %) per day, respectively. Similarly, there was a decrease in IL-6 (−7.8 pg/mL [95 %CI = −9.5 pg/mL to −6.1 pg/mL]) and IL-10 (−4 pg/mL [95 %CI = −5.1 pg/mL to −2.8 pg/mL]) plasma levels. We did not detect significant changes over time for any other variable analyzed.



HLA-DR+ Monocytes over time



Apoptotic CD4+ T cells



IL-6 plasma levels

CONCLUSIONS. We found no evidence to support a two-phase model of sepsis pathophysiology. Nevertheless, we did characterize a dynamic process: whereas mHLA-DR was low at enrollment and increased over time, T cells in "apoptosis" and cytokines were high at admission and their values decreased as time went by. These findings suggest that our patients were experiencing a mixed antagonist response syndrome (MARS) at ICU admission instead of SIRS or CARS.

GRANT ACKNOWLEDGMENT. This work was supported by COLCIENCIAS (Grant # 111551928175) and Program "Sostenibilidad del Grupo Inmunovirologia y del Grupo Academico en Epidemiologia Clinica 2013–2014, Universidad de Antioquia".

0874

MODIFICATION OF MONOCYTES HLA-DR AND RISK OF ICU ACQUIRED INFECTIONS (IAI): THE IMMUNOR STUDY

A. Lepape[1], N. Voirin[2], F. Venet[3], H. Vallin[1], A. Friggeri[1], A. Portier[3], C. Malcus[3], F. Poitevin[3], J. Bohe[1], G. Monneret[3]

[1]Hospices Civils de Lyon, CHU Lyon Sud, Soins critiques, Pierre Benite, France, [2]Hospices Civils de Lyon, Hôpital Edouard-Herriot, Epidemiology, Lyon, France, [3]Hospices Civils de Lyon, Hôpital Edouard-Herriot, Immunology, Lyon, France

INTRODUCTION. ICU patients are particularly at risk of secondary infections. Invasive devices exposition is the classically the most explored known risk factor. However, other factors such as immunological status are also important. Immunodepression is a consequence of acute states and HLA-DR has been proposed as a valid marker.

OBJECTIVES. To validate the use of HLA-DR as a immunological marker of risk of ICU acquired infections in various type of ICU patients and explore their temporal relationship.

MATERIALS AND METHODS.

Study population

325 consecutive ICU patients aged > 18 years were prospectively followed in two ICUs.

Classification of ICU patients.

Patients were classified into three groups: non infected group with SIRS [n = 85 (26.2 %)] and patients with infections and SIRS divided in two groups: patients with sepsis and severe sepsis [n = 106 (32.5 %)], and patients in septic shock (SS) [n = 134 (41.1 %)], according to the classical definitions.

Statistical methods.

HLA-DR levels and slopes were modeled over time between groups using linear mixed effects models. These models have been used to impute HLA-DR missing values between D1 and D 7 to select the best cut-off value of HLA-DR associated with IAI. According to the cut-offs, HLA-DR was dichotomized (below or equal to threshold vs above threshold) and these modified variables were used as predictors in uni and multivariate competing risks regression of risk of IAI,.

RESULTS. Population characteristics.

Results

	Non septic patients	Septic patients without SS	Patients with SS	Total
SAPS II	50 (24–93)	48 (10–98)	51 (7–97)	50 (7–97)
SOFA score	8 (2–17)	9 (2–16)	11 (2–21)	10 (2–21)
At least one comorbidity	51 (60.0)	78 (73.6)	107 (79.9)	236 (72.6)
At least 1 IAI*	47 (55.3)	40 (37.7)	55 (41)	142 (43.7)
Surviving at D28	65 (75.5)	93 (87.7)	107 (79.9)	265 (81.5)

*p = 0.039

In multivariate analysis performed day by day from D1 to D7, HLA-DR is an independent predictor of IAI after D3 (HR = 2.37 (1.26–4.46) at day 4) in the septic shock group and the septic non shocked group [HR = 2.69 (1.08–6.7)], but never reach the significativity in the SIRS group.

In conclusion, HLA-DR is a valid marker of IAI after severe sepsis or septic shock in ICU and could be a tool to select a population of patients at risk.

0875

IMMUNOMODULATORY EFFECTS OF ANTIBIOTICS ON THE INNATE IMMUNE RESPONSE DURING SEPSIS

C. Bode[1], B. Diedrich[2], S. Muenster[1], P. Knuefermann[1], O. Boehm[1], G. Baumgarten[1]

[1]University of Bonn, Anesthesia and Intensive Care Medicine, Bonn, Germany, [2]Freiburg Institute for Advanced Studies-LifeNet, Freiburg, Germany

INTRODUCTION. The excessive inflammatory response to pathogen-associated molecular patterns such as lipopolysaccharides (LPS) in sepsis is mediated via Toll-like receptors (TLRs). Moreover, TLRs trigger also various immune functions including phagocytosis and the modulation of TLRs is a promising strategy in the therapy of sepsis. Beside their widely appreciated anti-infective efficacy, antibiotics possess immunomodulatory properties.

OBJECTIVES. This study examined the effect of commonly used classes of antibiotics on i) the expression of sepsis-related TLRs and cytokines and ii) phagocytosis in an in vitro sepsis model.

METHODS. THP-1 monocytes were incubated with LPS plus the antibiotics piperacillin, doxycycline, erythromycin, moxifloxacin or gentamicin. After 24 h, mRNA-levels of TNFa, IL-1β, IL-6, TLR2, TLR4, and TLR9 were monitored by RT-PCR or monocytes were incubated with pHrodo-dye labeled *E. coli* for additional 2 h. Phagocytotic activity was determined by flow cytometry as the percentage of cells that performed phagocytosis of *E. coli* from the total number of viable monocytes.

RESULTS. All antibiotics differentially regulated the gene expression of the investigated TLRs and cytokines in LPS-activated monocytes. Thereby, erythromycin, moxifloxacin and doxycyclin displayed the strongest immunomodulatory potential and changed mRNA-levels of the investigated genes up to 5.6-fold (TLR4; $p < 0.01$), whereas piperacillin and gentamicin only altered the mRNA levels up to 2.3-fold (TNFa; $p < 0.05$) compared to LPS-activated controls. The stimulation of monocytes with LPS increased the phagocytosis of *E. coli* by 2-fold ($p < 0.01$). This effect was significantly reduced when cells were co-incubated with piperacillin, doxycyclin or moxifloxacin ($p < 0.05$).

CONCLUSIONS. The current results suggest that antibiotics regulate the immune response in septic conditions through modulation of TLRs, cytokines and phagocytosis. We identified quinolones (moxifloxacin), tetracyclines (doxycyclines) and macrolides (erythromycin) as classes with the most promising immunomodulatory potential. Thus, these antibiotics should be considered for future immunomodulatory studies in sepsis.

0876

INFLAMMATORY MONOCYTES EXERT PROTECTIVE EFFECTS ON KIDNEY DAMAGE DURING POLYMICROBIAL SEPSIS VIA A CX3CR1-DEPENDANT MECHANISM

B.G. Chousterman[1,2], A. Boissonnas[1], L. Poupel[1], F. Licata[1], J. Adam[3], D. Payen[2], C. Combadière[1]

[1]Inserm UMRS 945, Paris, France, [2]Lariboisière Hospital, Département d'Anesthésie-Réanimation-SMUR, EA 3509, APHP, Paris, France, [3]Université Paris Sud, Paris, France

Sepsis is a widespread inflammation secondary to an infection. Monocytes represent the main protagonist of innate immunity responsible for organism reaction to bacteria. Monocytes migration and activation are, in part, controlled by chemokine receptors such as CX3CR1 and CCR2. The mechanism controlling monocyte recruitment and pro- or anti-inflammatory activities are of great importance.

Here, we investigated the role of CX3CR1 on monocyte response in a model of cecal ligation and puncture (CLP)-induced polymicrobial sepsis and in an aseptic model of sepsis (LPS injection).

Using in vivo time lapse imaging of the kidney cortex of transgenic $CSF1R^{cfp}$ (MacBlue) × $CX3CR1^{gfp/+}$ mice, we showed that during CLP inflammatory monocytes accumulated in the luminal side of the vasculature after CLP and interacted with endothelial cells during several minutes. We observed that CX3CR1 deficiency is associated with an increased mortality, increased kidney tissue lesions and elevation of kidney failure markers. No difference in inflammatory monocytes infiltration during sepsis in $CX3CR1^{-/-}$mice was observed compared to WT animals. However, the proportion of arrested cell as well as the duration of the interaction was strongly reduced in CX3CR1-deficient mice suggesting that CX3CR1-dependant adherence of inflammatory monocytes on renal endothelium protect from tissue injury. Mice treatment with CX3CL1 (the natural ligand of CX3CR1) increased the proportion of adherent cells and their duration of interaction and was associated with increased survival. In opposite CX3CR1 blockade using a specific antagonist (F1) reduced monocyte adhesion and was associated with reduced survival. Finally, graft of CX3CR1 +/+ neutrophils depleted bone marrow cells to $CX3CR1^{-/-}$ recipient improved mice survival.

CONCLUSION. All together our data showed that during sepsis, inflammatory monocytes adhere to the endothelium in a CX3CR1-dependent manner and protect kidney from tissue damage. We thus propose that CX3CL1/CX3CR1 axis represent a promising target to reduce lethality in this pathology.
GRANT ACKNOWLEDGMENT. This work was supported by a grant from Fondation pour la Recherche Médicale and an INSERM - Poste d'Accueil grant.

0877
SEPSIS AFTER ON-PUMP CARDIAC SURGERY

G. Prada[1], A. Baluja[1], M. Rial[1], I. Vidal[1], A. Tubío[1], A. Cariñena[1], P. López[1], P. Otero[1], J. Álvarez[1]

[1]Complexo Hospitalario Universitario Santiago de Compostela, Servicio de Anestesioloxía, Reanimación e Tratamento da Dor, Santiago de Compostela, Spain

INTRODUCTION. Sepsis is a potentially deadly complication in cardiac surgery characterized by whole-body inflammatory state (SIRS) caused by severe infection. It is related to acute tissue injury and permanent impairment, worse outcome and prognosis after cardiac surgery[1].
Mitochondria have a central role in energy, heat and free radical O-production, factors that may influence the prognosis of surgical patients[2].
We hypothesize age, sex, mitochondrial DNA (mtDNA) haplogroups and type of surgery may be factors that predispose or protect patient from infection after cardiac surgery.
OBJECTIVES. 1. Detect factors predisposing to infection after cardiac surgery. 2. Descriptive analysis of the origins of infection, in-hospital and ICU length-of-stay related to sepsis in patients undergoing on-pump cardiac surgery.
METHODS. A cohort of 227 patients under on-pump cardiac surgery was prospectively recruited between 2005 and 2010, infected patients on admission and oncologic patients were excluded.
mtDNA analysis was carried out on a PCR for most common haplotypes in our population: Haplogroup H and Haplogroup UK.
The follow up of patients varied from 3.8 to 9.3 years (interquartile range).
Statistical analyzes were performed in R v.2.15.2.
RESULTS. 74 of 227 patients recruited were diagnosed of sepsis (32.6 % of patients). Pneumonia was the most frequently observed infection (59.5 % of diagnosed sepsis).
No significant difference was found between septic and non-septic patients in mtDNA (Haplogroup H 41.9 %, *p* value = 0.0609; Haplogroup UK 22.9 %, p-value = 0.7231), sex (67.6 % of male in septic patients vs. 68.6 % in the other group, p = 0.8722) or type of surgery (sepsis after CABG: 26.37 %, p = 0.1204; sepsis after aortic valve surgery: 35.29 %, p = 0.4038; sepsis after mitral valve surgery: 80.95 %, p = 0.0969).
The median age was significantly higher in septic patients (74 vs. 70 years, p = 0.0071).
The hospital length-of-stay 42.5 vs. 12 days, p = < 2.2e−16; the ICU length-of-stay 22 vs. 3 days, p = < 2.2e−16).
In a logistic regression (excluding patients under corticosteroid therapy) age and low left ventricular ejection fraction (LVEF < 45 %) were both associated with increased infection rates.
CONCLUSIONS. • We have observed higher sepsis frequency after on-pump cardiac surgery with increasing age and LVEF < 45 %.
• No difference were observed by gender, mitochondrial genotype or surgery.
• We have observed longer in-hospital and ICU length-of-stay for patients diagnosed of sepsis after on-pump cardiac surgery.

REFERENCE(S). 1. Winters BD, et al. Long-term mortality and quality of life in sepsis: a systematic review. Crit Care Med. 2010; 38(5):1276–83. 2. Neil H et al. Mitochondrial DNA and survival after sepsis: a prospective study. Lancet. 2005;366(9503):2118–2121.
GRANT ACKNOWLEDGMENT. Work of Baluja was supported by a "Del Rio-Hortega" contract CM10/00112 from the Instituto de Salud Carlos III, Spanish Ministry of Economy and Competitivity.

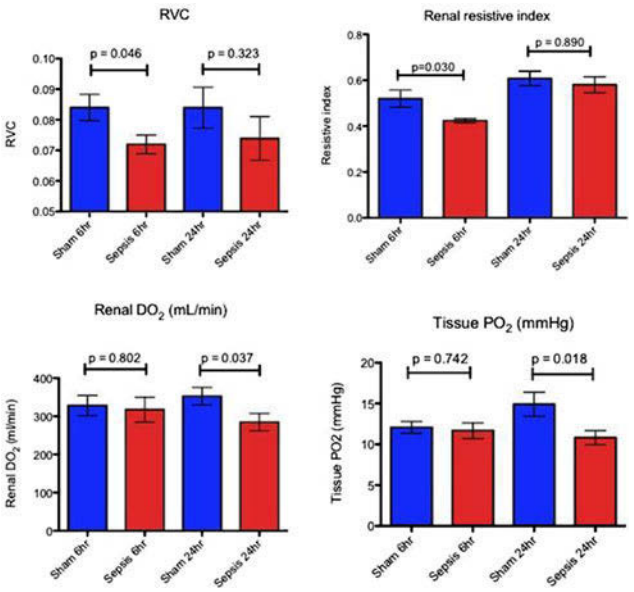
New etiological aspects of acute kidney injury: 0878–0882

0878
TEMPORAL CHANGES IN RENAL HAEMODYNAMICS AND OXYGENATION IN A RAT MODEL OF SEPSIS

N. Arulkumaran[1,2], M.L. Sixma[1,3], P. Bass[4], R.J. Unwin[4], F.W. Tam[2], M. Singer[1]

[1]University College Hospital London NHS Trust, Bloomsbury Institute of Intensive Care Medicine, London, UK, [2]Imperial College, Nephrology, London, UK, [3]University of Groningen, University Medical Center Groningen, Faculty of Medical Sciences, Groningen, The Netherlands, [4]Royal Free Hospital, Centre for Nephrology, London, UK

INTRODUCTION. Postulated mechanisms for sepsis-induced acute kidney injury (AKI) include altered global and intra-renal haemodynamics and bioenergetic dysfunction. However, temporal changes are not well elucidated.
OBJECTIVES. To characterize temporal changes in renal haemodynamics and tissue oxygenation in a long-term, fluid-resuscitated rat model of faecal peritonitis.
METHODS. Tunnelled central venous lines were inserted into male Wistar rats under isoflurane anaesthesia. Twenty-four hours later, sepsis was induced by intraperitoneal injection of faecal slurry (n = 14). Sixteen animals served as sham-operated controls. Fluid resuscitation (10 ml/kg/h) was commenced at 2 h post-slurry. At either 6 h or 24 h animals were terminally anaesthetized and instrumented for measurement of cardiac output (echocardiography), renal blood flow (ultrasonic flow probe), renal cortical tissue oxygen tension (Oxylite sensor), and renal oxygen extraction ratio (from the renal arterio-venous oxygen difference). Statistics were performed using independent t-tests. P values < 0.05 were taken as statistically significant. Data are presented as mean ± standard deviation.
RESULTS. At 6 h, septic animals had a lower renal vascular resistance (MAP/RBF) (0.072 ± 0.001 vs. 0.084 ± 0.011 sham, p < 0.05) and a lower renal resistive index (peak systolic velocity/(peak systolic velocity-diastolic velocity)) (0.42 ± 0.02 vs. 0.52 ± 0.0.9 sham, p < 0.05). No significant differences were seen between groups in global oxygen delivery, renal blood flow, renal oxygen delivery, renal cortical oxygen tension or renal oxygen extraction.
By 24 h, global oxygen delivery, renal vascular resistance and resistive index were similar between septic and sham animals, whereas renal oxygen delivery was lower (285 ± 68 vs. 371 ± 41 mL/min, p < 0.05) in the septic animals. Renal oxygen extraction ratio was however similar (43 ± 7 vs 43 ± 9 % sham, p = 0.876) and this was associated with a significantly lower renal cortical oxygen tension (10.8 ± 3.2 septic vs 14.9 ± 4.2 mmHg sham, p < 0.05).



Changes in renal haemodynamics

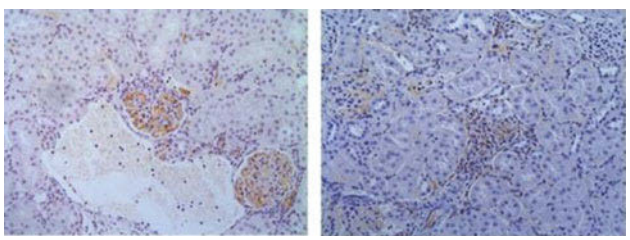
CONCLUSIONS. In early sepsis (6 h), renal autoregulation (fall in renal vascular resistance) maintains renal oxygenation. However, at 24 h, despite a maintained global DO_2, renal autoregulation may be impaired. This results in reduced renal O_2 delivery and renal cortical hypoxia.
GRANT ACKNOWLEDGMENT. NA is supported by a Welcome trust training fellowship.
MLS is supported by the Dutch Kidney Foundation, Kolff Student Grant.

0879
RENAL MACROPHAGE INFILTRATION IN A RAT MODEL OF SEPSIS AND RECOVERY

N. Arulkumaran[1,2], M.L. Sixma[1,3], S. Saeed[1], G. Bhangal[2], P. Bass[4], R.J. Unwin[4], F.W. Tam[2], M. Singer[1]

[1]University College Hospital London NHS Trust, Bloomsbury Institute of Intensive Care Medicine, London, UK, [2]Imperial College, Nephrology, London, UK, [3]University of Groningen, University Medical Center Groningen, Faculty of Medical Sciences, Groningen, The Netherlands, [4]Royal Free Hospital, Centre for Nephrology, London, UK

INTRODUCTION. Despite minimal histological damage (1), survivors of acute kidney injury (AKI) are at risk of developing chronic kidney disease (2). Most of the focus of AKI has been on the acute injury phase but little attention to date has been paid to recovery. Mechanisms underlying resolution or long-term damage of AKI in sepsis are poorly understood.
OBJECTIVES. To investigate temporal changes in renal inflammation and recovery following sepsis in a long-term rat model of zymosan-induced peritonitis.
METHODS. Intraperitoneal zymosan was injected into male Wistar rats under isoflurane anaesthesia. At day 2 or day 14, animals were culled and kidneys taken for analysis. Renal tissue was homogenized and MCP-1 (monocyte chemoattractant protein-1) levels were measured by ELISA (R&D Systems) and normalized for total protein content (pg/mL). MCP-1 is a key chemokine regulating monocyte/macrophage migration and infiltration. Paraffin-embedded kidney sections were stained for macrophages (ED-1 mAb). Statistics were performed using independent t-tests. Data are presented as mean ± standard deviation, p-value.
RESULTS. In this model the severity of illness (clinical severity, organ dysfunction, weight loss, food intake) peaks at day 2 with gradual recovery over the subsequent 12 days. At Day 2 there was minimal renal cell damage with similar renal MCP-1 levels in sham and septic animals (72 ± 15 vs 78 ± 14, p = 0.875) pg/mL. By day 14, renal MCP-1 levels were significantly elevated in septic compared to sham animals (187 ± 55 vs. 86 ± 18 pg/mL, p = 0.009). Macrophage infiltration was evident in glomeruli and interstitium in all day 14 septic animals but in none of the sham animals (Figure 1). At day 2, just 1 septic animal demonstrated renal macrophage infiltration while 1 sham animal had minimal glomerular macrophage infiltration.



Immunohistochemistry for macrophages

CONCLUSIONS. In the recovery phase of sepsis in this long-term rodent model, significant renal macrophage infiltration was present within the glomeruli and interstitium with a corresponding increase in renal MCP-1. These changes were not seen during the acute injury

phase. The source of MCP-1 and the role of the macrophage in renal injury and recovery require further elucidation.

REFERENCE(S). 1. Takasu O, et al. Mechanisms of cardiac and renal dysfunction in patients dying of sepsis. Am J Respir Crit Care Med 2013;187:509–17. 2. Chawla LS, et al. The severity of acute kidney injury predicts progression to chronic kidney disease. Kidney Int 2011; 79:1361–9.

GRANT ACKNOWLEDGMENT.
SS is supported by a Medical Research Council (UK) training fellowship
NA is supported by a Wellcome Trust training fellowship.
MLS is supported by the Dutch Kidney Foundation, Kolff Student Grant

0880

HEMODYNAMIC VARIABLES AND PROGRESSION OF ACUTE KIDNEY INJURY IN CRITICALLY ILL PATIENTS WITH SEVERE SEPSIS. DATA FROM THE PROSPECTIVE OBSERVATIONAL FINNAKI STUDY

E. Wilkman[1], M. Poukkanen[2], S.T. Vaara[1], V. Pettilä[1,3], K.-M. Kaukonen[1], A.-M. Korhonen[1], A. Uusaro[4], S. Hovilehto[5], O. Inkinen[6], R. Laru-Sompa[7], T. Kaminski[8], S. Karlsson[9], FINNAKI Study Group

[1]Helsinki University Central Hospital, Department of Surgery, Division of Anaesthesia and Intensive Care Medicine, Helsinki, Finland, [2]Lapland Central Hospital, Department of Anesthesia and Intensive Care Medicine, Rovaniemi, Finland, [3]University of Helsinki, Department of Clinical Sciences, Helsinki, Finland, [4]Kuopio University Hospital, Kuopio, Finland, [5]South Karelia Central Hospital, Lappeenranta, Finland, [6]Turku University Hospital, Turku, Finland, [7]Central Finland Central Hospital, Jyväskylä, Finland, [8]Middle Ostrobothnia Central Hospital, Kokkola, Finland, [9]Tampere University Hospital, Tampere, Finland

INTRODUCTION. The incidence of acute kidney injury (AKI) in patients with severe sepsis is 40–50 %. Current guidelines suggest maintaining mean arterial pressure (MAP) $\geq$ 60–65 mmHg for prevention of AKI. Limited knowledge exists of association of MAP and progression of AKI.

OBJECTIVES. We studied the association of hemodynamic variables with progression of AKI in patients with sepsis and hypothesized that higher MAP during the first 24 h in ICU would be associated with a lower risk of AKI in patients with severe sepsis.

METHODS. We included 559 patients with severe sepsis and electronically recorded continuous hemodynamic data from 13 Finnish intensive care units (ICUs), from the prospective observational FINNAKI study. The primary (composite) endpoint was progression of AKI defined as worsening of AKI by at least one KDIGO stage, KDIGO stage 3, initiation of renal replacement therapy or death with AKI during days 1 to 5 in the ICU. We calculated the time-adjusted area under the curve (AUC) of MAP and MAP AUC under threshold values (55, 60, 65, 70, 75, 80 and 85 mmHg). We used receiver operating characteristic (ROC) analysis of the MAP AUC to identify the best cut-off value for prediction of progression of AKI. Finally, the time-adjusted MAP AUC below this level was used in multivariable regression analysis for primary endpoint.

RESULTS. Of 559 patients with severe sepsis, 129 (23.1 %) reached the primary endpoint: of these 49 patients (8.8 %) had KDIGO stage 3, 67 (12.0 %) had increased KDIGO stage by $\geq$ 1 stage and 54 (9.7 %) died with AKI. The time adjusted MAP AUC was lower in patients with progression of AKI, than in those without progression: 70.8 (65.8–78.3) vs. 76.4 (71.3–83.2) mmHg, $p < 0.001$. Patients with progression of AKI also received more vasopressors ($p < 0.001$) and inotropes ($p < 0.001$). The cut-off value of time-adjusted MAP AUC for the best prediction of progression of AKI was 72 mmHg (ROC AUC 0.66 [95 %CI 0.60–072], sensitivity 0.42 [95 %CI 0.34–0.50], specificity 0.72 [95 %CI 0.68–0.76]. In a multivariable logistic regression analysis BE (OR 0.82 [95 % CI 0.78–0.87]), non-renal SOFA day1 (OR 1.2 [95 %CI 1.1–1.4]) and time-adjusted MAP AUC under 72 mmHg (OR 2.0 [95 %CI 1.2–3.6]) were independently associated with progression of AKI.

CONCLUSIONS. Lower BE, higher non-renal SOFA score, and time-adjusted MAP AUC under 72 mmHg were independently associated with progression of AKI. Our finding suggests that hypotension under this threshold should be avoided to prevent the progression of AKI.

REFERENCE(S). 1. Dunser MW, Takala J, Ulmer H, Mayr VD, Luckner G, Jochberger S, Daudel F, Lepper P, Hasibeder WR, Jakob SM. Arterial blood pressure during early sepsis and outcome. Intensive Care Med. 2009; 35(7):1225–33.

GRANT ACKNOWLEDGMENT. Clinical Research funding (EVO) form Helsinki University Hospital and Lapland Central Hospital, Grants form Finnish Society of Intensive Care and the Academy of Finland.

0881

A HUMAN MODEL OF INTRA-ABDOMINAL HYPERTENSION: EVEN SLIGHTLY ELEVATED PRESSURES LEAD TO INCREASED ACUTE SYSTEMIC INFLAMMATION AND SIGNS OF ACUTE KIDNEY INJURY

M. Smit[1], H.S. Hofker[2], H.G.D. Leuvenink[2], C. Krikke[2], R.M. Jongman[3], J.G. Zijlstra[1], M. van Meurs[1]

[1]University Medical Centre Groningen, University of Groningen, Department of Critical Care, Groningen, The Netherlands, [2]University Medical Centre Groningen, University of Groningen, Department of Surgery, Groningen, The Netherlands, [3]University Medical Centre Groningen, University of Groningen, Departments of Anesthesiology, Pathology and Medical Biology, Medical Biology Section, Groningen, The Netherlands

INTRODUCTION. Intra-abdominal hypertension may have catastrophic effects in the critically ill, but its pathophysiology is only partially understood.

OBJECTIVES. To study markers of inflammation and renal function in a human model of intra-abdominal hypertension of 12 mmHg.

METHODS. 50 living kidney donors were randomized between hand-assisted laparoscopic nephrectomy and open nephrectomy [1]. In the laparoscopic group intra-abdominal hypertension of 12 mmHg was induced. Markers of inflammation and renal function were obtained in both groups peri-operatively.

RESULTS. CRP was 1.5 times higher after 24 h and 1.3 times higher after 48 h in the laparoscopic group. IL-6 was 1.5 times higher after 12 h in the laparoscopic group. NGAL in plasma was 1.2 times higher just before extraction of the kidney in the laparoscopic group. NGAL in urine did not change.

Although procedure time is shorter, laparoscopic nephrectomy leads to increased inflammation and signs of renal injury.

CONCLUSIONS. Slightly elevated intra-abdominal pressure leads to increased acute CRP, IL-6 and plasma NGAL.

It is tempting to hypothesize that even mild intra-abdominal hypertension leads to mildly increased systemic inflammation and increase in plasma NGAL as a sign of acute kidney injury in this group. Other factors such as operative technique or inflammation caused by carbon dioxide gas may contribute. Further studies to dissect the contribution of inflammation, hemodynamics and local pressure effects on renal injury in intra-abdominal hypertension are warranted.

REFERENCE(S). 1. Hofker HS, Nijboer WM, Niesing J, Krikke C, Seelen MA, van Son WJ, van Wijhe M, Groen H, vd Heide JJ, Ploeg RJ. A randomized clinical trial of living donor nephrectomy: a plea for a differentiated appraisal of mini-open muscle splitting incision and hand-assisted laparoscopic donor nephrectomy. Transplant Int. 2012; 25(9):976–86.

0882

ORGAN FAILURES WITH HYDROXYETHYL STARCH 130/0.42 IN SEVERE SEPSIS - POST-HOC ANALYSES OF A RANDOMISED TRIAL

R.G. Müller[1], N. Haase[1], J. Wetterslev[2], A. Perner[1]

[1]Copenhagen University Hospital-Rigshopitalet, Dept. of Intensive Care, Copenhagen, Denmark, [2]Copenhagen University Hospital-Rigshopitalet, Copenhagen Trial Unit, Centre for Clinical Intervention Research, Copenhagen, Denmark

INTRODUCTION. Resuscitation with hydroxyethyl starch 130/0.42 (HES) increased mortality and adverse events in the Scandinavian Starch for Severe Sepsis/Septic Shock (6S) randomised, blinded trial [1,2]. However, the harmful mechanisms are still not fully elucidated.

OBJECTIVES. To evaluate if resuscitation with HES vs. Ringer's acetate increased organ failures within the first 5 days after randomisation.

METHODS. Post-hoc analyses of organ failures in the 6S trial cohort. Organ failures were analysed as area under the curve (AUC) for daily Sequential Organ Failure Assessment (SOFA) score and any new specific organ failures as SOFA score > 2. Furthermore the rate of renal replacement therapy (RRT) day 1–5 was evaluated in the intervention groups.

RESULTS. All 798 patients were included; median age was 66 years (IQR 56–75), SAPS II at baseline 50 (IQR 39–60) and site of infection 55 % lungs, 33 % abdomen, 13 % urinary tract and 19 % other. The cumulative amount of trial fluid was 3000 ml in both groups, given predominantly within the first 2 days. Median AUC SOFA day 1 to 5 was 37 (IQR 27–54) in the HES group vs. 37 (27–51) in the Ringer's group, Wilcoxon rank-sum test $p = 0.73$. The new organ failures are shown in Table 1. In the first 5 days after randomisation the use of RRT was significantly higher in the HES group vs. the Ringer's group (relative risk (RR) 1.48; 95 % CI 1.04–2.10; $p = 0.02$), and RRT was started earlier in the HES group, (logrank-test $p = 0.03$) (figure 1). The HES group also had increased risk of the composite outcome, new kidney failure or use of RRT (RR 1.31; 95 % CI 1.0–1.70; $p = 0.04$).

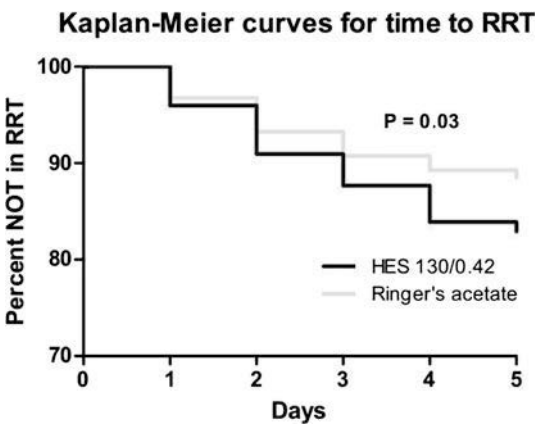
CONCLUSIONS. Masked resuscitation with HES lead to increased and earlier use of RRT within the first 5 days indicating that HES impairs kidney function. There was no statistically significant difference in organ failure between the HES and Ringer's groups as assessed by SOFA scores.

REFERENCE(S).
1. Perner A, Haase N et al. N Engl J Med 2012; 367:124.2. 2. Haase N, Perner A et al. BMJ 2013; 346:839.

GRANT ACKNOWLEDGMENT. The 6S trial was funded by the Danish Research Council and other public foundations and supported by B Braun Medical.

New organ failures

New organ failure SOFA > 2	HES 130/0.42 n = 398	Ringer's Acetate n = 400	Relative Risk (95 % CI)	P value
Coagulation	45/356	41/361	1.11 (0.75–1.66)	0.60
Cardiovascular	58/168	66/179	0.93 (0.71–1.24)	0.65
Respiratory	100/201	94/200	1.06 (0.86–1.30)	0.58
Hepatic	7/387	4/385	1.74 (0.51–5.90)	0.37
Kidney	72/323	57/321	1.25 (0.92–1.71)	0.15



Time to renal replacement therapy

Improving outcomes of prolonged mechanical ventilation: 0883–0887

0883

COMPARISON BETWEEN EXTRAVASCULAR LUNG WATER, B-TYPE NATRIURETIC PEPTIDE AND BLOOD VOLUME CONTRACTION TO DETECT WEANING-INDUCED PULMONARY EDEMA

M. Dres[1,2], J.-L. Teboul[1,2], N. Anguel[2], L. Guérin[1,2], C. Richard[1,2], X. Monnet[1,2]

[1]EA 4533, Université Paris-Sud, Le Kremlin Bicêtre, France, [2]Hôpital de Bicêtre, Hôpitaux Universitaires Paris-Sud, Assistance Publique - Hôpitaux de Paris, Service de Réanimation Médicale, Le Kremlin Bicêtre, France

INTRODUCTION. The gold standard for diagnosing weaning-induced pulmonary edema (PE) is the increase in pulmonary arterial occlusion pressure (PAOP) during a spontaneous breathing trial (SBT). Nevertheless, clinicians might be reluctant to use it because of invasiveness of pulmonary artery catheterization.

OBJECTIVES. To compare the diagnostic ability of the following alternatives tools to diagnose a weaning-induced pulmonary edema: increase in extravascular lung water (EVLW), increases in plasma protein and in hemoglobin concentration and increase in B-type natriuretic peptide (BNP).

METHODS. In 16 patients who failed at a first SBT, we performed a second a 60-min T-tube-SBT. Before and at the end of SBT, we recorded PAOP, EVLW, BNP, hemoglobin and plasma protein concentrations. Weaning-induced pulmonary edema was defined by signs of clinical intolerance and a PAOP $\geq$ 18 mmHg at the end of SBT.

RESULTS. Because some patients performed several SBTs, thirty-one SBTs were finally analyzed, 19 cases with weaning-induced pulmonary edema (WPE+) and 12 without (WPE−). During SBT, EVLW increased only in WPE+ cases [+20 % (IQR: 3–37 %)]. Plasma protein, hemoglobin and BNP also significantly increased only in WPE+ cases (+20 % [13–42 %], +9 % [6–12 %], +8 % [5–12 %], respectively). The areas under the receiver operating characteristics curves to detect weaning-induced pulmonary edema were 0.92 (95 %CI 0.82–1.01) for EVLW, 0.98 (0.94–1.02) for SBT-induced changes in plasma protein concentration, 0.92 (0.82–1.01) for changes in hemoglobin concentration and 0.77 (0.59–0.95) for changes in BNP. An increase in EVLW $\geq$ 14 % diagnosed weaning-induced pulmonary edema with a sensitivity of 68 % (95 %CI 43–87 %) and a specificity of 100 % (95 %CI 74–100 %).

CONCLUSIONS. SBT-induced increases in EVLW, plasma protein and hemoglobin concentrations and BNP level are reliable alternatives to the pulmonary artery catheter for diagnosing weaning-induced pulmonary edema.

0884

RESPIRATORY PATTERN AND EFFORT DURING WEANING OF LONG-TERM MECHANICALLY VENTILATED PATIENTS

F. Ruiz-Ferrón[1], R. Quiros[2], M.A. Martinez[2], E. Ranea[2], D. Matallana[2], A. Gomez[2], A. De la Fuente[2], R. Vela[2]

[1]University Hospital Ciudad de Jaén, Jaen, Spain, [2]Complejo Hospitalario de Jaen, Jaen, Spain

INTRODUCTION. Patients difficult to wean of mechanical ventilation shown a worsening in the respiratory mechanics and increased the work of breathing (WOB) during a T-piece trial (1). In the clinical setting changes in the respiratory pattern are related with WOB. After long term of mechanical ventilation this relationship can change.

OBJECTIVES. Analyzed the respiratory pattern and components of the respiratory effort meassured in pressure time product, during a T-piece trial in long term mechanical ventilation patients.

METHODS. In 30 intubated patients recovering from acute respiratory failure of various etiologies who were scheduled for weaning attempt, flow, airway and esophageal pressure were measured during controlled mechanical ventilation (mv) and then during a 30-min T-piece trial of spontaneous breathing (sb). Dynamic elastance (cmH_2O/l) and total resistances (cmH_2O/l/s), PEEPi (cmH_2O), pressure time product (cmH_2O s/min), and his components elastic (PTP.min.elas), resistive (PTP.min.res) and PEEPi (PTP.min.PEEPi) and the respiratory pattern (RR, Vt, VE, TI, TE) were studied. Weaning failure criteria were respiratory distress or hemodynamic deterioration. Values are mean $\pm$ SD.

RESULTS. The patients were ventilated for 14 $\pm$ 10 days before the study. During mechanical ventilation there were statistical differences between failure (n = 11) and success (n = 19) group. Rrs.mv 21 $\pm$ 5 vs 13 $\pm$ 5; PEEPi.mv 5 $\pm$ 2 vs 2 $\pm$ 1, not in Ers.mv 31 $\pm$ 5 vs 26 $\pm$ 9. These differences increased significantly during spontaneous breathing Ers.sb 73 $\pm$ 4 vs 25 $\pm$ 14; Rrs.sb 29 $\pm$ 12 vs 13 $\pm$ 8; PEEPi.sb 8 $\pm$ 4 vs 3 $\pm$ 3. Respiratory effort index were worst in failure group, significant differences were found in PTPmin 636 $\pm$ 126 vs 367 $\pm$ 133, PTPmin.res 299 $\pm$ 163 vs 163 $\pm$ 56, PTP,min,peepi 222 $\pm$ 117 vs 115 $\pm$ 93, not in PTP.min.elas 115 $\pm$ 60 vs 92 $\pm$ 43, However the spontaneous respiratory pattern was similar between both groups RR/Vt 105 $\pm$ 80 vs 90 $\pm$ 32, RR 30 $\pm$ 8 vs 30 $\pm$ 5 bpm, Vt 0.330 $\pm$ 0.09 vs 0.360 $\pm$ 0.09, VE 9.6 $\pm$ 2.5 vs 10.7 $\pm$ 3.1, TI 0.6 $\pm$ 0.2 vs 0.7 $\pm$ 0.1, TE 1.5 $\pm$ 0.4 vs 1.2 $\pm$ 0.3

CONCLUSIONS. After long term mechanical ventilation, patients who fail T-piece weaning trials shown a worsening in the respiratory mechanics and increased the work of breathing at expenses of the resistance and PEEPi components do not demonstrated by the respiratory pattern.

REFERENCE(S). 1. Jubran A. Am J Respir Crit Care Med. 1997;155(3):916-21.

0885

PROLONGED MECHANICAL VENTILATION IN CANADA: A NATIONAL SURVEY

L. Rose[1], R. Fowler[2], D. Leasa[3], E. Fan[4], I. Fraser[5], C. Mawdsley[3], G. Rubenfeld[2]

[1]University of Toronto, Toronto, Canada, [2]Sunnybrook Health Sciences Centre, Toronto, Canada, [3]London Health Sciences Centre, London, Canada, [4]Mt Sinai Hospital, Toronto, Canada, [5]Toronto East General Hospital, Toronto, Canada

INTRODUCTION. No national Canadian data defines resource requirements and care delivery for patients experiencing prolonged mechanical ventilation (PMV) defined as ventilation for $\geq$ 21 consecutive days and medical stability.

OBJECTIVES. To describe PMV prevalence; care practices specific to PMV patients including: weaning, mobilization, communication, nutrition, psychological support; and discharge follow up.

METHODS. Units delivering care to PMV patients in the previous 12 months were identified using an existing inventory of adult and paediatric ICUs, with additional units identified through snowball referrals. We provided the online survey via secure weblink to a nominated unit champion from April to November 2012. Weekly telephone and email reminders were sent for 6 weeks.

RESULTS. Of the 449 units screened, 218 were eligible; 201 returned surveys (92 % response rate). 185 (92.0 %) were ICUs, 9 (4.5 %) in-house or specialized weaning units accepting external referrals, 3 (1.5 %) medical units, 3 (1.5 %) high dependency units, and 1 (0.5 %) spinal unit. 304 PMV patients were identified on day of survey. On average, 11 % of all ventilator capable ICU beds, and 44 % of non-ICU ventilator capable beds were occupied by PMV patients. Availability of a weaning protocol was reported by 95 (47 %) units, though only 24/95 (25 %) reported guidance specific to PMV patients. Mobilization protocols were available in 75 (37 %) units; 22/75 (11 %) with PMV patient specific content. Most units used individualized plans for weaning (160, 80 %) and mobilization (159, 79 %) while only 60 (30 %) units utilized specialized mobility equipment. Most units (179, 90 %) used traditional communication tools such as alphabet/word/picture/writing boards and had access to speech language pathologists (170, 85 %); use of technological communication applications was infrequent (21, 10 %). Most frequently used techniques to assess safe swallowing comprised trial swallow with soft feed and oral reflex clinical exam (73 % of sites); videofluoroscopic and fibreoptic endoscopic evaluation of swallowing (FEES) were used by 59 % and 15 % respectively. 151 sites accessed psychiatric/counselling services; 42/151 (28 %) routinely referred PMV patients. Eight (4 %) units used a validated tool to measure anxiety. Formal ICU discharge follow up services were reported by 34 (17 %) units.

CONCLUSIONS. PMV patients comprised 11 % of Canadian ICU ventilator bed capacity. Most units individualized weaning and mobilization strategies; however, protocolization of weaning and mobility specific to the PMV population was uncommon. Although most sites utilized psychological services, routine referral was infrequent. Few centres had established formal ICU follow up services.

GRANT ACKNOWLEDGMENT. Canadian Institutes of Health Research.

0886

SYSTEMATIC ASSESSMENT OF SWALLOWING DISORDERS AFTER PROLONGED MECHANICAL VENTILATION

G. Beduneau[1,2], V. Souday[3], J.F. Hamel[4], J.M. Chretien[4], P. Bouchetemble[5], L. Laccourreye[6], D. Carpentier[1], J.C. Richard[1,2], A. Mercat[3], G. Bonmarchand[1,2]

[1]University Hospital, Rouen, France, [2]UPRESS EA 3830, Rouen, France, [3]University Hospital, Département de Réanimation Médicale et Médecine Hyperbare, Angers, France, [4]University Hospital, Angers, France, [5]University Hospital, ORL Department, Rouen, France, [6]University Hospital, ORL Department, Angers, France

INTRODUCTION. Incidence of swallowing disorders (SD) reported in the literature after extubation may vary widely (1). Invasive techniques usually proposed to assess pharyngolaryngeal consequences of intubation (2) or SD (3) are difficult to implement in the routine practice, and may over estimate incidence of SD with clinical consequences.

OBJECTIVES. We perform this study to evaluate incidence of clinically evident SD in patients requiring more than 7 days of invasive mechanical ventilation (MV).

METHODS. All patients ventilated more than 7 days were prospectively screened into 2 intensive care unities of 2 university centers. Patients with pre-existing SD or diagnosis known to cause SD were excluded. Within 48 h after extubation, a standardized clinical swallowing evaluation was performed by experimented physiotherapists. Clinical evaluation of cranial nerves and Medical Research Council (MRC) was also performed. When SD was diagnosed, a subsequent similar test was performed within 48 h after the first one in order to separate transitory (TSD) from persistent SD (PSD). Pneumonia, re-intubation and time for oral feeding were prospectively collected during the 28 days following extubation.

RESULTS. Of 588 patients screened, 138 (24 %) were enrolled. Among 450 patients not included, 89 had end of life therapeutic limitations, 95 were tracheostomized and 28 experienced dysphagia before intubation.

Average age of the SD group was 59 $\pm$ 15 years. Average duration of MV before swallowing evaluation was15 $\pm$ 7 days. Median SAPS II was 55 [17–117]. 132 patients have orotracheal intubation.

The SD detection test, performed within 48 h after extubation, was normal in 103 patients (75 %) and revealed clinical SD in 35 (25 %). SD were transient in 21 (15 %) and persistent in 14 (10 %). Cranial nerve (XII) abnormalities were frequently involved.

8 of the 138 patients were treated for suspected pneumonia and 13 were reintubated within the follow up.

Patient′s main characteristics, depending on whether they had or not persistent swallowing disorders, are presented in table 1 and table 2.

Table 1

	Non persistant SD (n = 124)	Persistant SD (n = 14)	p-value
Age	58 $\pm$ 15	66 $\pm$ 16	0.0387
Weight at admission (kg)	87 $\pm$ 23	76 $\pm$ 15	0.0329
Intubation duration (days)	14 $\pm$ 7	17 $\pm$ 10	02533
Curare administration	81 (66 %)	5 (38 %)	0.0396
Duration of curare treatment (days)	3 $\pm$ 3	1 $\pm$ 2	0.0229
MRC at extubation time	43 $\pm$ 11	37 $\pm$ 10	0.0567
XII disorders	58 (47 %)	11 (79 %)	0.0452

Table 2

	Non persistent SD (n = 124)	Persistent SD (n = 14)	p-value
Length of ICU stay after first extubation (days)	7 $\pm$ 6	11 $\pm$ 9	0.0408
Duration of tube feeding (days)	5 $\pm$ 7	23 $\pm$ 33	0.0151
Suspected pneumonia treatment	7 (6 %)	1 (7 %)	0.5967
Reintubation	10 (8 %)	3 (21 %)	0.1289

Quantitative variables are reported as mean (standard deviation) and qualitative variables as number (percentage).

CONCLUSIONS. In this series, clinically evident SD concerned 25 % of 138 patients ventilated more than 7 days. SD persisted 96 h after extubation for 40 % of them.
Risk factors are higher age, lesser body weight, and absence of myorelaxant drugs (2). SD was responsible of longer duration of stay in ICU after extubation and longer time of enteral feeding. Pneumonia or reintubation was surprisingly never observed in our study.
REFERENCE(S). 1. Skoretz SA et al. Chest 2010; 137(3):665–673. 2. Tadié JM et al. Intensive Care Med 2010; 36(6):991–8. 3. El Solh A et al. Intensive Care Med 2003; 29(9):1451–5.
GRANT ACKNOWLEDGMENT. Acknowledgment 2009 of Société de Réanimation de Langue Française and Association Departementale des Insuffisants Respiratoires.

0887
CAN EARLY TRACHEOSTOMY HAVE ANY BENEFICIAL IMPACT ON SERIOUS PATIENTS RELATIVE TO LATE INTERVENTION?

E. Trujillo-García[1], C. Joya-Montosa[1], E. Curiel-Balsera[1], V. Olea Jiménez[1], J. Mora-Ordoñez[1], M.C. Martinez-Gonzalez[1], E. Banderas-Bravo[1], G. Quesada-Garcia[1]

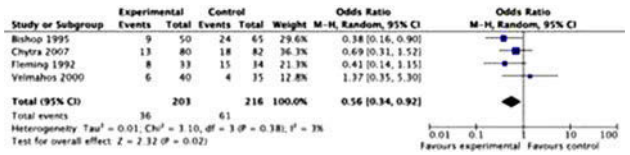
[1]Carlos Haya Regional Hospital, Intensive Care, Málaga, Spain
INTRODUCTION. Tracheostomy is a common technique in intensive care units, in order to reduce mechanical ventilation (MV) and stays. But timing argument is present, we want to compare early tracheostomy versus late.
OBJECTIVES. Analysing results regarding infections, MV duration, sedation and death rate upon comparison of early- and late-tracheostomized patients (<1 week). Differences between early and late tracheostomies in ICU-admitted patients in a third-level hospital.
METHODS. Observational, retrospective and comparative study between early- (7 days) and late-tracheostomized (>7 days) during ICU stay. ICU stay-length, MV duration and sedation—as well as respiratory infections—were analysed. Quantitative variables are expressed as mean and standard deviation, while qualitative variables are expressed as ratios and absolute value. The Mann–Whitney′s test and Fischer′s exact test were used when necessary; alpha error was set at 5 %.
RESULTS. A total number of 134 patients were analysed from January 2012 to February 2013 (76.9 % were males); 67 interventions (50 %) were early tracheostomies —88.8 % were completed percutaneously in the ICU and 11.2 % (no = 15) were completed by ENT in the operating room. No differences were observed in seriousness upon admission (APACHE II $p = 0.82$ and SAPS III $p = 0.34$), or in age between both groups of patients. Early-tracheostomized patients involved a lower number of days of MV (12 ± 10 days) than their late-tracheostomized counterparts (23 ± 13 days), $p = 0.02$, as well as less days under sedation (9 ± 8 vs. 17 ± 9 days, respectively) and shorter ICU stays ($p = 0.042$), yet not hospital stays ($p = 0.38$). No differences were observed regarding both early and late complications between both groups. However, a higher number of ball-cannulated patients were observed among early tracheostomies. Respiratory infection rate (ventilator-associated pneumonia + tracheobronchitis) was 51.5 % in late-tracheostomized patients, and 31.8 % in early-tracheostomized ones, $p = 0.022$, OR 6.2 (1.26–31.08). No differences were observed regarding death rate.
CONCLUSIONS. Patients who were tracheostomized within the first 7 days of MV present less day of sedation, MV and unit stay, as well as lower respiratory infection rate. No differences were observed in hospital stay.
REFERENCE(S). 1. Gomes Silva BN, Andriolo RB, Saconato H, Atallah ÁN, Valente O. Early versus late tracheostomy for critically ill patients. Cochrane Database Syst Rev 2012; Issue 3. Art. No.: CD007271. doi:10.1002/14651858.CD007271.pub2.

Perfusion: assessment and manipulation: 0888–0892

0888
A SYSTEMATIC REVIEW AND META-ANALYSIS OF EARLY GOAL-DIRECTED THERAPY IN SEVERE TRAUMA

C. Corredor[1], N. Arulkumaran[1], M. Cecconi[1], J. Ball[1], M. Hamilton[1], R.M. Grounds[1], A. Rhodes[1], General Intensive Care Unit

[1]St George's Hospital, London, UK
INTRODUCTION. Severe trauma is often associated with significant haemorrhagic shock and impaired organ perfusion interventions to control haemorrhage, decontaminate and repair injured tissues, add to the systemic inflammatory response (SIRS) triggered by the initial injury. SIRS creates a significant demand for the cardiopulmonary system. Therapies aimed at optimising haemodynamics, global oxygen delivery and tissue perfusion (Early Goal Directed Therapy; EGDT) are beneficial in patients with severe sepsis and following high-risk surgery.[1,2]
OBJECTIVES. Primary objective is to establish whether EGDT is beneficial in terms of morbidity and mortality in severe trauma patients. Determine whether EGDT is associated with increased blood transfusion requirements.
METHODS. Medline, Embase and CENTRAL databases were systematically searched for randomized controlled trials (RCTs) of EGDT in patients admitted following severe blunt/penetrating trauma. Head injury, burns and paediatric trauma were excluded. Severe trauma was defined as the presence of an Injury Severity Score (ISS) of 15 or above[3]. Meta-analysis (Mantel Haenzel random effects model) of mortality data was performed and data presented as odds ratios [OR; 95 % confidence intervals (CI) and p-values]. Quantitative analysis of morbidity, volume of fluid infusion and blood loss was not possible due to heterogeneity in data reporting.
RESULTS. Four RCTs were included and all reported mortality as an outcome. Mortality was significantly reduced in GDT- treated patients compared to the control group (OR 0.56 (0.34–0.92), $p = 0.02$). (figure 1) The pulmonary artery catheter was used in 3 (Bishop, Fleming, Velmahos) out of the 4 trials, targeting supranormal values of oxygen delivery. The ODM was used in the other study (Chytra) with FTc and SV as optimization targets. Bishop and Fleming reported a significant reduction in organ failure events per patient in the protocol group. Chytra found a reduction in infectious complications associated with EGDT. There were no significant differences in reported total fluid volume administered and only the Bishop study reported increased blood transfusion requirements in the GDT group.



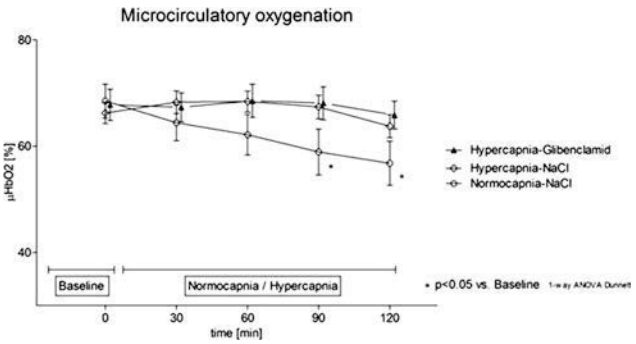
Mortality GDT trauma forest plot

CONCLUSION. EGDT in patients following severe injury appears to be associated with a significant reduction in mortality and may also reduce the incidence of organ failures and infectious complications. It was not possible to establish an association between EGDT and pRBC transfusion. There have been significant changes in the early management of severely injured patients since the included studies were published. Further RCTs of EGDT in patients following severe injury are warranted.
REFERENCE(S). 1. Cecconi M, et al. Crit Care. 2012;17(2):209. 2. Rivers E, et al. NEJM. 2001;345:1368–77. 3. Boyd CR, et al. The Journal of trauma. 1987;27(4):370–78.

0889
THE IMPROVEMENT OF SPLANCHNIC MICROCIRCULATORY OXYGENATION BY ACUTE HYPERCAPNIA IN POLYMICROBIAL SEPSIS IS INDEPENDENT OF REGIONAL FLOW CHANGES AND K^+_{ATP} CHANNEL MODULATION

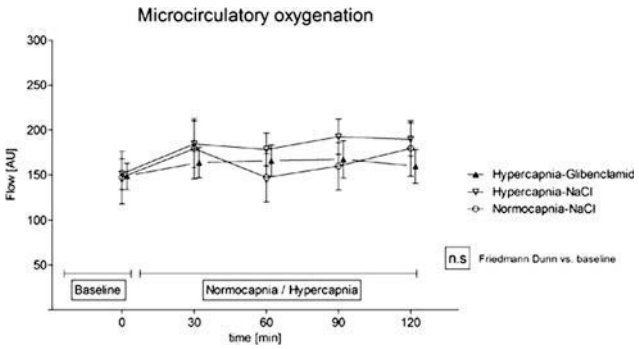
C. Beck[1], F. Barthel[1], A.-M. Hahn[1], C. Vollmer[1], I. Bauer[1], O. Picker[1]

[1]University Hospital Dusseldorf, Anaesthesiology and Intensive Care, Duesseldorf, Germany
INTRODUCTION. Acute hypercapnia improves macrohaemodynamic variables and lactic acidosis comparable to catecholamine infusion, enhances global oxygen delivery [1] and increases microcirculatory oxygenation [2]. The exact mechanisms of action of acute hypercapnia are yet incompletely understood but seem to be partly mediated via activation of vasoactive K^+_{ATP} channels [3].
OBJECTIVES. The aim of this study was the evaluation of the effects of K^+_{ATP} channel blockade on the improvement of microcirculatory oxygenation and alteration of microcirculatory flow induced by acute hypercapnia in a polymicrobial sepsis animal model.
METHODS. The data derive from a total of 60 experiments on rats studied with approval of the local animal care and use committee. 24 h prior to the experiments polymicrobial sepsis was induced by colon ascendens stent peritonitis via laparotomy under general anaesthesia. During the experiments the animals received ongoing fluid replacement and pressure-limited ventilation for 120 min. Ventilation targets were a pCO_2 of either 35–40 mmHg in the normocapnia group or a moderate hypercapnia (pCO_2 65–75 mmHg) by exogenous CO_2 application. In addition, K^+_{ATP} channels were blocked with glibenclamide (1 mg/kg i.v.) (hypercapnia-glib). Microcirculatory blood flow of the colonic wall was measured via laser Doppler and oxygen-saturation (μHbO_2) was measured simultaneously via tissue reflectance spectrophotometry. Data are presented as mean ± SEM, 1way ANOVA Dunnett′s (μHbO_2), Friedman Dunn′s (flow).
RESULTS. 1.) Acute hypercapnia prevents the deterioration of microcirculatory oxygenation in polymicrobial sepsis and this effect is independent of K^+_{ATP} channel activity (μHbO_2: normocapnia-NaCl (from 69 ± 3 to 57 ± 4 %, $p < 0.05$); hypercapnia-NaCl (from 66 ± 2 to 63 ± 2 %); hypercapnia-glib (from 68 ± 3 to 66 ± 3 %)).



Microcirculatory oxygenation

2.) The effect of acute hypercapnia on microcirculatory oxygenation is not mediated via alterations of microcirculatory flow (flow: normocapnia-NaCl (from 147 ± 29 to 179 ± 31AU); hypercapnia-NaCl (from 151 ± 17 to 190 ± 19AU); hypercapnia-glib (from 148 ± 14 to 159 ± 18AU)).



Microcirculatory flow

CONCLUSION. Acute moderate hypercapnia prevents the deterioration of splanchnic microcirculatory oxygenation in polymicrobial sepsis. This effect is not mediated via alterations in K^+_{ATP} channel activity and independent of regional flow changes.

REFERENCE(S). 1. Wang Z et al. Acute hypercapnia improves indices of tissue oxygenation more than dobutamine in septic shock. Am J Respir Crit Care Med. 2008; 177:178–183. 2. Schwartges I et al. Hypercapnia induces a concentration-dependent increase in gastric mucosal oxygenation in dogs. Intensive Care Med. 2008. 3. Wang X et al. Hypercapnic acidosis activates KATP channels in vascular smooth muscles. Circ Res. 2003; 92: 1225–32.

GRANT ACKNOWLEDGEMENT: Supported by the Research Commission of the Medical Faculty of Heinrich-Heine University Duesseldorf.

0890

THENAR OXYGEN SATURATION (STO_2) MEASURED NON-INVASIVELY BY NEAR-INFRARED SPECTROSCOPY DURING WEANING FROM MECHANICAL VENTILATION TO PREDICT EXTUBATION FAILURE

J. Mesquida[1], G. Gruartmoner[1], C. Espinal[1], J. Masip[1], C. Sabatier[1], M.L. Martinez[1], X. García[1], A. Villagra[1], M.R. Pinsky[2], F. Baigorri[1,3], A. Artigas[1]

[1]Critical Care Department, Hospital de Sabadell, Corporació Sanitària Universitària Parc Tauli, Universitat Autònoma de Barcelona, Sabadell, Spain, [2]University of Pittsburgh Medical Center, Department of Critical Care, Pittsburgh, USA, [3]Critical Care Department, Hospital General de Catalunya, Sant Cugat, Spain

INTRODUCTION. Extubation failure, defined as the need for reinstitution of mechanical ventilation (MV) within 24 to 48 h of planned endotracheal tube removal might occur in up to 25 % of patients, and reintubation directly correlates with higher morbidity and mortality. Our group showed that peripheral skeletal muscle oxygenation (StO_2) changes during a weaning trial were associated to the ability to maintain spontaneous breathing[1].

OBJECTIVES. To determine whether changes in StO_2 measured by near-infrared spectroscopy (NIRS) can be used to predict extubation failure.

METHODS. Prospective clinical study in a 26-bed mixed ICU. We recruited adult patients with acute respiratory failure receiving MV for at least 48 h, and considered ready to wean by their physicians. Patients underwent a 30-min spontaneous breathing trial (SBT), and were extubated according to a well-defined protocol. Continuous StO_2 was measured non-invasively on the thenar eminence. A transient arterial occlusion test proximal to the StO_2 probe was performed twice, at baseline and after 30 min within the SBT, in order to obtain the rate of StO_2 deoxygenation (DeOx), and to calculate local oxygen consumption ($nirVO_2$). Respiratory and hemodynamic parameters were recorded at baseline and after 30 min within the SBT. $^*p < 0.05$; $^{**}p < 0.01$.

RESULTS. Two hundred patients were studied. Main measured variables are shown in Table 1. Thirty-six patients (18 %) did not succeed the SBT, and 164 (82 %) passed the SBT and were extubated. Twenty-one patients (12.8 %) needed reinstitution of MV within 24 h. No baseline differences in demographic, hemodynamic, and respiratory variables were observed when comparing extubation success and failure groups, except for higher baseline pCO_2 levels in the failure group. Patients who required reinstitution of MV showed higher relative changes in their DeOx (DeOx Ratio) within the 30-min SBT. The $nirVO_2$ also showed higher relative increases ($nirVO_2$ Ratio) within the SBT in the extubation failure group. DeOx Ratio showed an AUC of 0.72 (95 % CI 0.58–0.85, $p < 0.01$) for predicting extubation failure, and a cut-off value of 1.5 had a positive likelihood ratio of 4 to predict extubation failure (Odds Ratio 4.3, 95 % CI 1.5–12.5).

Table 1

	Extubation success (n = 143)		Extubation failure (n = 21)	
	Baseline	Minute 30	Baseline	Minute 30
RR (resp/min)	19 ± 4	23 ± 5	18 ± 3	23 ± 4
RR/Vt (resp/min L^{-1})	43 ± 14		41 ± 7	
MAP (mmHg)	82 ± 13	85 ± 15	79 ± 14	80 ± 12
$PaCO_2$ (mmHg)	36 ± 6	37 ± 6	41 ± 10*	42 ± 14
DeOx (%/min)	−13.1 ± 8.4	−13.6 ± 10.7	−12.7 ± 7	−17.2 ± 10.3
$nirVO_2$ (U)	139 ± 80	159 ± 135	129 ± 75	174 ± 97
DeOx Ratio		1.1 ± 0.3		1.5 ± 0.6**
$nirVO_2$ Ratio		1.1 ± 0.4		1.5 ± 0.5*

CONCLUSIONS. Extubation failure was associated to significant relative increases in deoxygenation and local muscle consumption rates after 30 min of SBT. Measurement of StO_2-derived parameters within a SBT might be useful in predicting extubation outcome.

REFERENCE(S). 1. Gruartmoner G, Mesquida J, et al. Thenar oxygen saturation (StO_2) during weaning from mechanical ventilation: an observational study. Eur Respir J. 2013.

GRANT ACKNOWLEDGMENT. Supported by a Grant from the European Society of Intensive Care Medicine (ECCRN Clinical Research Award 2009), and a Grant from the Instituto de Salud Carlos III (FIS PS 09/01000).

0891

THE INFLATABLE EXTERNAL LEG COMPRESSION IMPROVES STROKE VOLUME AND PERIPHERAL PERFUSION DURING CENTRAL HYPOVOLEMIA IN HEALTHY VOLUNTEERS

M. Helmi[1], A. Lima[1], D. Gommers[1], J. Bakker[1], J. van Bommel[1]

[1]Erasmus Medical Center, Rotterdam, The Netherlands

INTRODUCTION. External leg compression (ELC) has been used to support blood pressure in patients with circulatory shock [1,2]. However, its use in critically ill patients is not yet adopted because little is known about the magnitude of ELC hemodynamic effects applied on the legs, excluding abdomen compression.

OBJECTIVES. We ought to determine whether ELC around the legs could prevent and restore central hypovolemia induced by head up tilt maneuver (HUT).

METHODS. Twelve healthy individuals participated in this study. The dynamic effect of ELC was determined using the pre-defined 50 cmH_2O inflation pressure. HUT was performed (Figure 1) without ELC (Control model), with ELC inflated before HUT (Prevention model) and after HUT (Restore model). Global hemodynamics included stroke volume (SV), heart rate and mean arterial pressure. Peripheral perfusion parameters included perfusion index (PI) and tissue oxygen saturation (StO_2) respectively assessed by pulse oxymeter and near-infrared spectroscopy.

RESULTS. The decrease of SV (Figure 2) was smaller during Prevention model compared to Control model: 17 ± 9 % vs. 27 ± 9 %, respectively ($P < 0.05$). Restore model was able to increase SV by 24 ± 6 %. Similarly, PI and StO_2 changes (Figure 3) were smaller in the Prevention model than in the Control model: PI, 65 ± 10 % vs. 79 ± 7 %, $P < 0.05$; StO_2, 4 ± 3 % vs. 9 ± 4 %, $P < 0.05$. In the Restore model, PI increased by 117 ± 82 % and StO_2 increased by 3 ± 1 %.

Figure 1

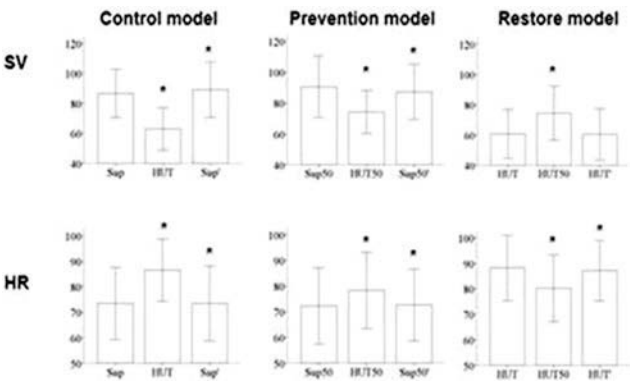


Figure 2

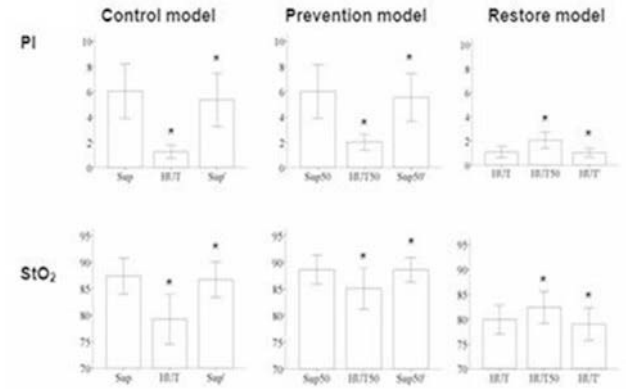


Figure 3

CONCLUSIONS. The inflatable ELC around the legs was able to both prevent and restore SV and peripheral perfusion in a model of acute central hypovolemia.
REFERENCE(S). 1. Gunter JP et al. Am J Respir Crit Care Med. 1995, 151:719–23. 2. Niemann JT et al. Circulation 1986; 74:IV102–07.

0892
CHANGES IN MUSCLE OXYGEN CONSUMPTION (NIRS VO_2) AFTER AN ISCHEMIC CHALLENGE IN CRITICALLY ILL PATIENTS

D. Orbegozo Cortes[1], F. Puflea[1], D. De Backer[1], J.-L. Vincent[1], J. Creteur[1]

[1]Erasme Hospital, Dept of Intensive Care, Brussels, Belgium

INTRODUCTION. Under normal conditions, transient and controlled episodes of ischemia induce modifications in cellular and microvascular physiology, a phenomenon called ischemic preconditioning. Near infrared spectroscopy (NIRS) coupled with a vascular occlusion test (VOT) has been proposed to evaluate tissue oxygenation, vascular reactivity and oxygen consumption in critically ill patients. A VOT could be considered as an ischemic challenge to the microcirculation. We hypothesized that changes in NIRS-derived variables obtained during a VOT could be altered by repetition of these VOTs and that these modifications could be correlated to the severity of disease in critically ill patients.
METHODS. In this prospective evaluation of critically ill patients in a mixed, 35-bed department of intensive care, thenar tissue oxygen saturation (StO_2) was measured continuously using NIRS technology (InSpectra 650, Hutchinson, USA). VOTs were performed by inflating a cuff to 50 mmHg above the systolic pressure for 3 min. Two VOTs were performed 5 min apart. All measurements were performed during a period of hemodynamic stability. For each VOT, we measured the baseline StO_2, the total hemoglobin index (THI), the StO_2 desaturation slope (DescSlope), the StO_2 resaturation slope (AscSlope) and the NIRS VO_2 as the Desc Slope x mean THI over the occlusion time. All statistical analyses were performed using SPSS 19.0 (IBM, USA).
RESULTS. Thirty critically ill patients (age 60 ± 18 years, norepinephrine used in 47 %, APACHE II score of 22 [17–28] and 9 non-survivors) were evaluated. NIRS-derived measurements during the two VOTs are shown in Table 1 for survivors and in Table 2 for non-survivors. There were significant differences between survivors and non-survivors in the evolution of Desc Slope (ANOVA $p = 0.002$) and NIRS VO_2 (ANOVA $p = 0.016$) between the two VOTs.

NIRS-derived variables in survivors

	VOT 1	VOT 2	p
StO_2	79 ± 10	77 ± 10	0.633
THI	10.8 ± 2.8	10.8 ± 2.8	0.952
Asc Slope	3.8 ± 1.3	4 ± 1.2	0.252
Desc Slope	11.8 ± 4	11.4 ± 3.9	0.013
NIRS VO_2	119 ± 47	115 ± 44	0.048

NIRS-derived variables in non survivors

	VOT 1	VOT 2	p
StO_2	74 ± 15	74 ± 15	0.500
THI	9.2 ± 2.9	9.5 ± 2.7	0.134
Asc slope	2.6 ± 1.7	2.6 ± 1.5	0.829
Desc slope	9.7 ± 3.5	10.5 ± 3.6	0.043
NIRS VO_2	86 ± 32	92 ± 32	0.008

CONCLUSIONS. These preliminary results suggest that changes in NIRS VO_2 and Desc Slope under repeated VOTs are correlated with severity of illness in critically ill patients.

Can we improve ICU outcome?: 0893–0897

0893
PREOPERATIVE CARDIAC TROPONIN I AS AN INDEPENDENT PREDICTOR OF OUTCOME POST ADULT CARDIAC SURGERY

M.F. Rajab[1], W. Abukhudair[1], K. Othman[1], M.M.H. Al-Najjar[1], T.S. Saleh[1]

[1]King Fahd Armed Forces Hospital, Jeddah, Adult Cardiac Surgery Department, Jeddah, Saudi Arabia

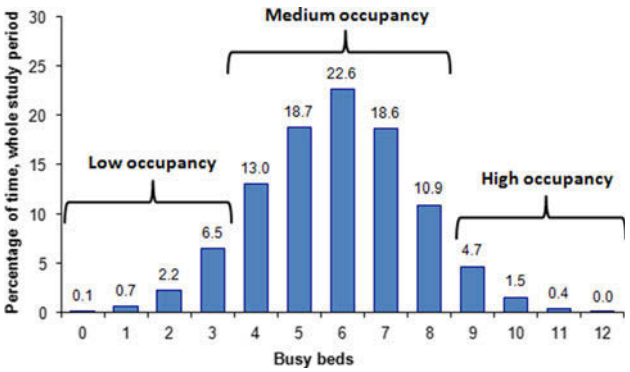
INTRODUCTION. Postoperative morbidity and mortality associated with cardiac surgery affect both the outcome and quality of life, although myocardial injury before cardiac surgery is associated with impaired clinical outcome, there are limited data regarding the prognostic utility of cTnI preoperative in patients undergoing cardiac surgery.
OBJECTIVES. Of this prospective study was to evaluate the prognostic value of preoperative cTnI concentrations in adult patients undergoing coronary artery bypass grafting with or without valve surgery.
METHODS. Perioperative characteristics of 409 consecutive patients undergoing conventional heart surgery during a 2 years period were collected from KFAFH-JEDDAH-KSA data base operated on from January 2007 to December 2008. Preoperative cTnI levels were classified as > or < 5 ng/ml.
RESULTS. Primary outcomes were mortality and in hospital complication.
Bivariate & Multivariate analysis were used to determine the association of each independent variable (age, co-morbidity, elective vs. emergent procedure, and preoperative cardiac troponin I levels) with outcome.
A total of 409 patient with mean age of 59.4 (+10.4) and male gender of 316 (77.2 %) showed elevated preoperative cTnI levels > 5 ng/ml in 82(20 %) of patient (group 2) and 372 (80 %) with cTnI levels < 5 ng/ml (group 1). Multivariate analysis, using a stepwise logistic regression, showed that cTnI concentration was the most important independent predictor of in-hospital mortality, for cTnI concentration > 5 ng/ml, mortality increase from 4.9 % (20 from total of 409) to14.6 % (12 from 82) with $P < 0.001$.
CONCLUSIONS. Our results demonstrated that cTnI concentration measured preoperatively is an independent predictor of in-hospital death after cardiac surgery. In addition, elevated concentrations of cTnI are associated with a cardiac cause of death and with major postoperative complications.
REFERENCE(S). 1. Parsonnet V, Dean D, Bernstein AD. A method of uniform stratification of risk for evaluating the results of surgery in acquired adult heart disease. Circulation 1989;79(Suppl. I):3–12. 2. Alpert JS, Thygesen K, Antman E, Bassand JP. Myocardial infarction redefined—a consensus document of The Joint European Society of Cardiology/ American College of Cardiology Committee for the redefinition of myocardial infarction. J Am Coll Cardiol. 2000;36:959–69.

0894
DOES HIGH ICU OCCUPANCY HAVE ADVERSE EFFECTS ON PATIENT OUTCOMES? AN OBSERVATIONAL MULTICENTRE STUDY OF THE RELATIONSHIP BETWEEN OCCUPANCY, LENGTH-OF-STAY AND MORTALITY

M. Holmberg[1], K. Steins[2], S.M. Walther[3,4], On behalf of the Swedish Intensive Care Registry

[1]Vrinnevi Hospital, Department of Anaesthesia and Intensive Care, Norrköping, Sweden, [2]Linköping University, Department of Science and Technology, Norrköping, Sweden, [3]Linköping University, Department of Medicine and Health Sciences, Division of Cardiovascular Medicine, Linköping, Sweden, [4]Linköping University Hospital, Department of Cardiovascular Anaesthesia and Intensive Care, Linköping, Sweden

INTRODUCTION. Maximizing bed occupancy and maintaining high availability are often two conflicting goals in ICU management. Previous research has been contradictive in how high occupancy affects patients [1,2].
OBJECTIVES. To investigate if discharge from ICU during high occupancy levels was associated with adverse patient outcomes. In particular, the relationships between occupancy, length of stay in ICU (LOS) and mortality were investigated.
METHODS. We analysed ICU admissions (N = 29,723) to 16 Swedish county hospitals from Jan 2009 to Dec 2011 (excluding summer months). LOS, night-time discharges, illness severity (SAPS3) and mortality 30 days after discharge from ICU were compared for patients discharged at medium and high levels of occupancy. Occupancy was partitioned per ICU into low, medium and high by taking the distribution of bed use and defining the bed ranges so that sums for low and high occupancy each were as close to 10 % of time for the whole study period as possible but not higher (Figure). Night-time was defined from 10 PM to 7 AM. Survival was assessed at 30 days after discharge from ICU. Mann–Whitney's and Fisher's exact tests were used with $p < 0.05$ considered significant.



Distribution of busy beds in ICU No. 7

RESULTS. There were no significant differences in SAPS3 probabilities in patients admitted to, or discharged from ICU at medium or high occupancy. Median LOS decreased from 23.7 h (IQR: 12.1–53.8) for patients discharged at medium occupancy to 20.5 h (IQR: 9.3–47.1) for patients discharged at high occupancy ($p < 0.001$). Night-time discharges increased from 4.5 % at medium occupancy to 9.3 % at high occupancy ($p < 0.001$). Mortality at 30 days was 11.8 and 13.8 % for patients discharged at medium occupancy level and high occupancy level, respectively ($p < 0.001$). In patients with SAPS3 probability above median (>0.22), 30-day mortality was 22.2 % for medium occupancy discharges and 26.8 % for high occupancy discharges ($p < 0.001$).
CONCLUSIONS. High ICU occupancy was associated with shorter LOS, increased proportion of night-time discharges and increased crude mortality, the latter especially among patients with higher mortality risk. This suggests that inadequately sized ICUs may have adverse effects on patient outcomes.
REFERENCE(S).
1. Iapichino G, Gattinoni L, Radrizzani D et al. (2004) Volume of activity and occupancy rate in intensive care units. Association with mortality. Intensive Care Med. 30 (2):290–7. 2. Iwashyna TJ, Kramer AA, Kahn JM (2009) Intensive care unit occupancy and patient outcomes. Crit Care Med 37(5):1545–57.
GRANT ACKNOWLEDGMENT. The Swedish Intensive Care Registry is partly funded by grants from the Executive Committee of Swedish Quality Registries.

0895
OUTPATIENT BASED PHYSICAL REHABILITATION FOR SURVIVORS OF PROLONGED CRITICAL ILLNESS—A RANDOMISED CONTROLLED TRIAL

D. Mcwilliams[1], S. Benington[2], D. Atkinson[2]

[1]Queen Elizabeth Hospital, Therapy Services, Birmingham, UK, [2]Central Manchester Foundation Trust, Critical Care, Manchester, UK

INTRODUCTION. Prolonged critical illness has a significant physical and psychological impact on patients with both contributing to the "post-intensive care syndrome" (PICS). The optimal way to address these important sequelae of critical illness following hospital discharge remains unclear (1), although our own previous pilot work has appeared to show some benefit of exercise based rehabilitation programmes (2).
OBJECTIVES. This study aims to assess the impact of a physiotherapy led, out patient based rehabilitation programme for intensive care survivors on physical function and health related quality of life.

METHODS. 73 patients from a UK based ICU tertiary intensive care unit and invasively ventilated for ≥5 days completed the study. A baseline symptom limited maximal bicycle cardio-pulmonary exercise test (CPET) and SF36v2 questionnaire were performed within the first month following hospital discharge. Randomization to either treatment (TG) or control (CG) groups was performed. The TG underwent a 7-week outpatient based structured exercise and education programme with the CG receiving no intervention during the study period. 2nd assessment for both groups was performed 8–10 weeks from baseline with a CPET and SF36v2 repeated. Primary outcome measures were changes in functional capacity as defined by changes in peak VO_2 and anaerobic threshold (AT). Secondary outcome measures were changes in mental and physical component scores (MCS and PCS) of the SF36v2 and changes in other CPET parameters e.g. peak power output.

RESULTS.

Patient demographics

	Control (n = 36)	Treatment (n = 37)
Age	60.8	55
APACHE II	15.9	16.6
Days Ventilated	12.7	19.8
ICU LOS	22.2	29.1
Hospital LOS	39.3	51

Results

	Control	Treatment	p
Physical Component Score	4.1	8.0	$p < 0.05$
Mental Component Score	4.0	10.6	$p < 0.01$
AT Improvement	16.2 %	13.9 %	$p = 0.74$)
Peak VO_2 improvement	15.3 %	17.7 %	$p = 0.68$
Peak power improvement	20.4 %	47.7 %	$p = 0.024$

Improvements in both peak VO_2 and AT were seen in botht the TG and CG from baseline levels, but no significant difference between groups was evident. PCS and MCS scores from baseline improved in both TG and CG with improvement significantly greater in the TG (PCS 4.1 vs 8.0 $p = 0.048$; MCS 4.0 vs 10.6, $p = 0.017$). Significan t improvements were also seen in terms of peak power output for those patients who had completed the rehabilitation programme.

CONCLUSIONS. A 7-week out patient based exercise and education programme for survivors of prolonged critical illness results in improved PCS and MCS scores of the SF36v2 and peak power output achieved during CPET. Although no significant improvements were seen in terms of CPET parameters, such programmes appear to provide a cost effective method of improving quality of life and perceived physical and psychological status in survivors.

REFERENCE(S). 1. Connolly et al. Exercise rehabilitation following hospital discharge in survivors of critical illness: an integrative review. 2012; 16:226 2. McWilliams et al. (2009) The impact and feasibility of a physiotherapy led, exercise based rehabilitation programme for intensive care survivors. Physiother Theory Pract. 2009.

0896

DELAYED DISCHARGE FROM THE INTENSIVE CARE UNIT IS ASSOCIATED WITH PROLONGED HOSPITAL STAY

S.L. Sanders[1], C. Bourdeaux[1], J. Brown[2], J. Parry-Jones[3]

[1]University Hospital Bristol, Bristol, UK, [2]North Bristol NHS Trust, Bristol, UK, [3]Aneurin Bevan Health Board, Intensive Care Unit, Newport, UK

INTRODUCTION. Delayed discharge from the intensive care unit (ICU) of patients deemed fit for the ward is common and often results from a lack of available ward bed. Obvious consequences of delayed discharge include: bed block to critically ill patients requiring admission, cancellation of elective surgery and increased costs. There is however paucity of data regarding the effects on the patients who have their discharge from ICU delayed.

OBJECTIVE. To determine effect of delayed ICU discharge on length of hospital stay (LOS).

METHODS. The study was carried out in 3 British ICU populations in Wales and Bristol covering mixed medical/surgical neurosurgical and tertiary referral centres. The study was approved as service evaluation by the Local Research Ethics Committee. Data was extracted and analysed retrospectively using the ward watcher software used to collect data for the Intensive Care National Audit and Research Centre Case Mix Program. All patients discharged alive to a ward within each hospital were analysed. Patients that did not have a medically ready for discharge time and date recorded were excluded from the analysis. Patients were analysed in 2 groups, those with no delay and those with delayed discharge, defined as discharge > 24 h post the time declared medically fit for discharge. Baseline data was collected including age, sex, APACHE II, and diagnosis.

RESULTS. Median Post ICU Hospital LOS (days) for prompt and delayed discharge and Median delay to ICU discharge (days) (inter-quartile range).
NBT 15 (N = 1,966) 17.5 (N = 344) 1.44 (1.21–2.31)
UHB 10 (N = 8,207) 12 (N = 1,698) 1.84 (1.25–3.23)
Wales 10(N = 1,902) 11 (N = 957) 2.13 (1.25–3.23)
Our results suggest that ICU patients who are medically fit for the ward experience an increased hospital length of stay post ICU discharge if their ICU discharge is delayed for greater than 24 h. Hospital LOS post ICU discharge is longer in patients in whom ICU discharge was delayed. These results are consistent across large ICUs with differing patient populations. This finding has implications when prioritising ward bed allocation and patient flow through the hospital.

CONCLUSIONS. Delayed discharge is associated with prolonged hospital stay and increased potential for patient harm. Further work should focus on identifying the risk factors for, and causes of delayed ICU discharge and the causes of increased hospital LOS post ICU discharge. This would enable modification of system processes and improved patient care.

REFERENCE(S). 1. Williams T, Leslie G. Delayed discharges from an adult intensive care unit. Aust Health Rev. 2004; 28(1): 87–96.

0897

IMPACT OF ICU-ACQUIRED WEAKNESS ON FUNCTIONAL OUTCOME—PRELIMINARY ANALYSIS OF A PROSPECTIVE OBSERVATIONAL STUDY

L. Wieske[1,2], D. Dettling-Ihnenfeldt[3], F. Nollet[3], I.N. van Schaik[2], M.J. Schultz[1], M. van der Schaaf[3], J. Horn[1]

[1]Academic Medical Center, University of Amsterdam, Intensive Care Medicine, Amsterdam, The Netherlands, [2]Academic Medical Center, University of Amsterdam, Neurology, Amsterdam, The Netherlands, [3]Academic Medical Center, University of Amsterdam, Rehabilitation, Amsterdam, The Netherlands

INTRODUCTION. Many survivors of critical illness have long-term functional limitations and reduced quality of life. This has been largely attributed to intensive care unit-acquired weakness (ICU-AW) [1]. Direct evidence of the impact of ICU-AW on long-term functional outcome is unavailable, because large prospective studies are lacking [2]. We hypothesized that patients with ICU-AW have poorer physical functioning and higher mortality rates at 6 months after ICU discharge compared to patients without ICU-AW.

OBJECTIVES. To investigate differences in physical functioning and mortality of patients with ICU-AW compared to patients without ICU-AW at 6 months after ICU discharge.

METHODS. We performed a prospective cohort study in a tertiary 30-bed mixed medical-surgical ICU. ICU-patients who needed mechanically ventilated for ≥ 48 h were included. Exclusion criteria included any central nervous system disorder, spinal cord disorder or neuromuscular disorder as reasons for admission. In addition, pre-existing poor functional status; language barrier and impossibility to assess muscle strength were reasons for exclusion. ICU-AW was defined as a mean Medical Research Council (MRC) score < 4, assessed in 6 muscle groups bilaterally [3]. At 6 months after final ICU discharge physical functioning and mortality were determined. Physical functioning was measured by telephone or mail using the physical functioning domain score of the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36).

RESULTS. In total 156 patients were included in the study; in this preliminary analysis, 121 patients for who the follow up period had passed were analyzed. Of those patients, 65 (54 %) had developed ICU-AW. Patient characteristics are displayed in table 1. At 6 months after ICU discharge, 29 patients with ICU-AW (45 %) had died compared to 9 patients without ICU-AW (16 %; $p < 0.01$). Of the 83 surviving patients, 13 patients (6 patients with ICU-AW) could not be reached or were unable to provide follow-up information. The median SF-36 physical functioning domain score of patients with ICU-AW was 45 (IQR: 30–70) compared to 75 (IQR: 50–90; p: 0.02) for patients without ICU-AW.

CONCLUSIONS. In this preliminary analysis, patients with ICU-AW had higher mortality rates and impaired physical functioning compared to patients without ICU-AW. Data collection of this study will be completed in September 2013.

REFERENCE(S). 1. Herridge MS, Tansey CM, Matté A et al. Functional disability 5 years after acute respiratory distress syndrome. N Engl J Med. 2011; 364;1293–1304 2. Connolly B, Denehy L, Brett S et al. Exercise rehabilitation following hospital discharge in survivors of critical illness: an integrative review. Crit Care 2012; 20:226 3. Stevens RD, Marshall SA, Cornblath DR et al. A framework for diagnosing and classifying intensive care unit-acquired weakness. Crit Care Med 2009; 37:S299–308

Patient characteristics

Interim analysis population (N: 121)	ICU-AW (N:65)	No ICU-AW (N:56)	p-value
Age, mean ± SD	65 ± 15	61 ± 15	0.14
Gender (male), n (%)	36 (55)	36 (64)	0.36
APACHE IV score, mean ± SD	88 ± 25	76 ± 26	0.02
Medical admission, n (%)	40 (62)	32 (57)	0.87 (for all admission types)
Emergency surgical admission, n (%)	12 (18)	11 (20)	
Planned surgical admission, n (%)	13 (20)	13 (23)	
Length of stay in the ICU (days), median (IQR)	16 (9–23)	7 (5–10)	<0.01
Mean MRC, median (IQR)	2.8 (1.1–3.3)	4.8 (4.4–5.0)	

Ventilator associated prenumonia: new insights: 0898–0902

0898

REDUCTION IN VAP INCIDENCE BY SUBGLOTTIC SECRETION DRAINAGE AND ANTIBIOTIC CONSUMPTION IN ICU PATIENTS

I. Van Cauwenberge[1], A. Ancion[2], B. Lambermont[2], D. Ledoux[1], M. Nys[1], N. Samalea[1], P. Damas[1]

[1]University Hospital Centre, Department of General Intensive Care, Liege, Belgium, [2]University Hospital Centre, Department of Medical Intensive Care, Liege, Belgium

INTRODUCTION. What is the impact of ventilatory associated pneumonia (VAP) reduction by prevention measures on antibiotic consumption (ABC)?

OBJECTIVES. A randomized controlled study on the efficacy of subglottic secretion drainage was performed in the 5 ICU of the Liege university hospital in Belgium.

METHODS. Three hundred and twelve patients, intubated with Teleflex ISIS endotracheal tube were prospectively and randomly assigned to subglottic suction (group 1, n = 154) or not (group 2, n = 158) if they were expected to be ventilated for more than 2 days between January 2012 and March 2013. VAP was defined by a clinical pulmonary severity score above 6, a new pulmonary infiltrate and a quantitative endotracheal aspiration culture of more than 10^5 CFU/ml of relevant pathogens. ABC was evaluated by the number of ventilatory days (VD) during which patients received antibiotics for any reasons.

RESULTS. The 312 patients were 67 % males, with a median age of 65 y (range 18–94), and their ICU admission were due to medical (75 %), surgical (20 %) or traumatic causes (4 %). Patients did no differ between groups. The median VD in group 1 was 8 days (range 3–37) and in group 2, 8 days (range 3–38) totalizing 1,559 VD in group 1 and 1,570 VD in group 2. VAP occurred in 15 patients of group 1 and in 30 of group 2 ($p = 0.024$), corresponding to a decrease in the rate of VAP caused by subglottic suctioning from 19.1

VAP/1,000 VD to 9.6 VAP/1,000 VD. The impact on ABC was less clear: Group 1 received antibiotics during 69 % of VD and group 2 during 75 % of VD. This was not statistically significant, $p = 0.075$. In group 1 and 2, 104 and 114 patients were respectively treated by antibiotics the day of intubation. In this subgroup of patients, VAP rate was 6/1,000 VD in the 104 patients from group 1 and 12/1,000 VD in patients from group 2. ABC was observed in 85 % of VD in both groups. Regarding patients with no treatment the day of intubation, VAP rate reached 19/1,000 VD in patients from group 1 and 39/1,000 VD in patients of group 2. Interestingly, it was in these subgroups that the decrease in ABC could be seen: patients from group 1 received antibiotic treatment during 32 % of VD and patients from group 2 during 52 % of VD ($p < 0.0001$).
CONCLUSIONS. Subglottic suctioning significantly decreased the rate of VAP. An impact on ABC was only observed in patients not treated by antibiotics the day of intubation. The ABC also had a great impact on the level of VAP incidence. This last parameter should be better known in all the prevention studies.

0899
SIMVASTATIN AND THE PROGNOSIS OF VENTILATOR-ASSOCIATED PNEUMONIA (STATIN-VAP): MULTICENTER RANDOMIZED CONTROLLED TRIAL

L. Papazian[1], A. Roch[1], P.-E. Charles[2], C. Penot-Ragon[3], G. Perrin[3], P. Roulier[4], P. Goutorbe[5], J.-Y. Lefrant[6], J. Textoris[7], B. Jung[8], J.-M. Constantin[9], L. Argaud[10], A. Nau[11], O. Baldesi[12], K. Baumstark[3], E. Jouve[3], M. Moussa[3], J.-M. Forel[1], For the STATIN-VAP Study Group

[1]Hopital Nord, Réanimation DRIS, Marseille, France, [2]CHU de Dijon, Dijon, France, [3]CHU de Marseille, Marseille, France, [4]CH de Perpignan, Perpignan, France, [5]HIA Sainte-Anne, Toulon, France, [6]CHU de Nimes, Nimes, France, [7]Hopital Nord, Marseille, France, [8]CHU de Montpellier, Montpellier, France, [9]CHU de Clermont-Ferrand, Clermont-Ferrand, France, [10]Hospices Civils de Lyon, Hôpital Edouard-Herriot, Lyon, France, [11]HIA Laveran, Marseille, France, [12]CH Aix-en-Provence, Aix-en-Provence, France
INTRODUCTION. Some epidemiological studies have suggested that the use of statins during the ICU stay could improve the outcome in patients presenting an infection. However, there was no convincing proof of the ability of statins to alter the outcome in specific ICU infections. We therefore designed this prospective multicenter double-blinded randomized controlled trial comparing simvastatine and placebo as adjunctive therapy in the treatment of patients presenting with ventilator-associated pneumonia (VAP).
OBJECTIVES. The main objective of the study was to show that simvastatin was able to decrease the 28-day mortality rate.
METHODS. Adults who had received mechanical ventilation in the ICU for at least 2 days were eligible if they had suspected pneumonia, defined by a simplified Clinical Pulmonary Infection Score (CPIS) score of at least 5 (1), and if a quantitative bacteriological culture of BAL, protected telescopic catheter (PTC) or endotracheal aspirate was done. Simvastatin 60 mg or placebo was given until ICU discharge or death and for a maximum of 28 days. Assuming a 28-day mortality rate of 30 % (2) and two planned interim analyses, we calculated that we needed to enroll 1,002 patients. The trial was monitored by an independent data and safety monitoring board (DSMB). The first interim analysis was done after the analysis of 251 completed inclusions. The DSMB proposed to stop the inclusions when the analysis was completed.
RESULTS. Three hundred patients were finally included. The intention-to-treat analysis was possible for 284 patients (16 patients unable to give their consent or who withdrew their consent). Finally 146 patients were included in the simvastatin group and 138 patients in the placebo group. The mean age of the 284 patients was 59 ± 17 years. The mean SAPS II score on admission was 47 ± 15. The simplified CPIS at enrollment was 7.0 ± 1.4 and the SOFA score at day 1 was 7.0 ± 3.3. Thirty-six percent of the patients were not receiving antibiotics during the 3-day period preceding the inclusion. The 28-day mortality rate for the entire group of 284 patients was 18.3 %. The overall hospital mortality was 28.5 %. There was no clinically relevant difference among the two groups regarding side-effects of the treatment.
CONCLUSIONS. This prospective randomized controlled trial was prematurely stopped by the steering committee after the first interim analysis report done by the DSMB.
REFERENCE(S). 1. Luna CM et al. Resolution of ventilator-associated pneumonia: prospective evaluation of the clinical pulmonary infection score as an early clinical predictor of outcome. Crit Care Med. 2003;31(3):676–82. 2. Fagon JY et al. Invasive and noninvasive strategies for management of suspected ventilator-associated pneumonia. A randomized trial. Ann Intern Med. 2000; 18;132(8):621–30.
GRANT OBTAINED. Projet Hospitalier de Recherche Clinique 2007

0900
A PATH TOWARDS ZERO VENTILATOR ASSOCIATED PNEUMONIA EVENTS; 5-YEAR EXPERIENCE FROM MAYO CLINIC FLORIDA

E. Festic[1], K. Thompson[1], W. Hellinger[1], D. Carey[1], G. Divertie[1]

[1]Mayo Clinic, Jacksonville, USA
INTRODUCTION. Ventilator-associated pneumonia (VAP) is a known complication of mechanical ventilation (MV), which increases patients' morbidity, mortality, length of stay and associated costs. A multidisciplinary VAP prevention team was reassembled in 2008 at Mayo Clinic Florida (MCF) in order to reduce the VAP rates.
OBJECTIVES. To decrease VAP rates by 50 % every year with a longer-term goal of zero annual events of VAP.
METHODS. The patient population included all patients requiring mechanical ventilation at MCF, an academic medical center with 54 critical care beds equally split between two, medical (MICU) and surgical (SICU), ICU wings from 2008 to 2012. In addition to the Institute for Healthcare Improvement VAP I and VAP II bundle protocols already in place, a multidisciplinary team with clinical and quality improvement expertise was reassembled and initiated a sequence of 5 novel interventions: 1. Early screening with chest radiographs or CT scans of patients at high risk for aspiration prior to the onset of MV; 2. Protocol for antiseptic oral care; 3. Protocol for daily antiseptic baths; 4. Early bronchoscopy; and 5. Protocol for endotracheal tube (ETT) cuff care. The data was continuously tracked and analyzed on monthly meetings.
RESULTS. The final objective of zero annual VAP events was achieved. The results are presented as summed events as well as separately for MICU and SICU wings. In 2008, there were 14 summed VAP events (3.33 events/1,000 ventilator days); in 2009, there were 7 (1.97/1,000); in 2010 there were 3 (0.72/1,000); in 2011 there was only 1 VAP (0.24/1,000); and in 2012 there were no summed VAP events (0). Summed ventilator days ranged from 3,495 to 4,206 per year in this 5-year period. In MICU and SICU, respectively, in 2008 there were 3 and 11 VAP events (1.9/1,000 and 4.19/1,000); in 2009, there were 0 and 7 (0 and 3.21/1,000); in 2010 there were 2 and 1 (1.39/1,000 and 0.37/1,000); in 2011 there were 0 and 1 (0 and 0.39/1,000); and in 2012 there were no VAP events in either MICU or SICU. Ventilator days in MICU and SICU ranged from 1,288 and 2,184 to 1,622 and 2,734, respectively, per year in this 5-year period. Majority but not all neurological and transplant patients, who in general tend to have higher VAP rates per literature, were treated in SICU wing.
CONCLUSIONS. The goal of zero VAP events at MCF has been achieved nearly 5 years after the implementation of a multidisciplinary VAP prevention team with not only a clinical but also an expertise in quality improvement strategies.

0901
VENTILATOR-ASSOCIATED COMPLICATION: INCIDENCE, OUTCOME AND RELATIONSHIP WITH VENTILATOR-ASSOCIATED PNEUMONIA

L. Bouadma[1], B. Mourvillier[1], M. Garrouste-Orgeas[2], S. Ruckly[3,4], C. Clec'h[5], B. Souweine[6], G. Voiriot[1], L. Potton[2], M. Darmon[7], B. Allaouchiche[8], L. Argaud[9], E. Azoulay[10], D. Goldgran-Toledano[11], H. Haouache[6], J.-F. Timsit[3,4], on behalf of the Outcomerea Study Group

[1]Hôpital Bichat Claude Bernard, Réanimation Médicale, Paris, France, [2]Groupe Hospitalier St Joseph, Polyvalent ICU, Paris, France, [3]Grenoble University Hospital, Polyvalent ICU, Grenoble, France, [4]Grenoble University Hospital, University of Grenoble 1 (Joseph Fourier) Integrated Research Center U 823, Albert Bonniot Institute, La Tronche, Grenoble, France, [5]Avicenne University Hospital, Medical-Surgical ICU, Bobigny, France, [6]Gabriel Montpied University Hospital, Medical ICU, Clermont-Ferrand, France, [7]Saint-Etienne University Hospital, Medical ICU, Saint-Priest-en-Jarez, France, [8]Edouard Herriot University Hospital, Surgical ICU, Lyon, France, [9]Edouard Herriot University Hospital, Medical ICU, Lyon, France, [10]Saint Louis University Hospital, Medical ICU, Paris, France, [11]Gonesse Hospital, Polyvalent ICU, Gonesse, France
INTRODUCTION. Ventilator-Associated Pneumonia (VAP) surveillance is needed to measure incidence and to gauge the success of prevention efforts [1]. However, VAP diagnosis is a complex issue for intensivists [2]. Therefore, the CDC developed a new approach to VAP surveillance [3]. The result is an algorithm for diagnosis of Ventilator-associated complications (VACs) based on objective criterion, i.e. an improvement of ventilator settings after a period of stable or decreasing ventilator support.
OBJECTIVES. We assessed
(1) the current incidence of VACs;
(2) events related to the first episode of VACs, i.e.; nosocomial infections (including VAPs), iatrogenic adverse events (IAEs) and interventions (transport and fluid resuscitation);
(3) the reality of a correlation between VACs and VAPs episodes,
(4) the impact of VAC on patient outcomes.
METHODS. Patients (n = 13,702) from the longitudinal prospective French multicenter Outcomerea database were included if they were under mechanical ventilation for ≥5 days and classified as to the presence of at least one VAC episode. VAC was defined as a respiratory alteration (≥2 days of stable or decreasing level of PEEP range (≥6, ≥10 and ≥16 mmHg) and a stable or improved PaO_2/FiO_2 ratio followed by a rise in level of PEEP ≥2 days or a decreasing PaO_2/FiO_2 ratio ≥2 days by more than 50 mmHg with the same level of PEEP or by more than 100 mmHg whatever the level of PEEP. VAP diagnosis used clinical suspicion and a quantitative proximal ($TA > 10^5$ CFU/ml) or distal samples (BAL culture $> 10^4$ CFU/ml or PTC/PSB $> 10^3$ CFU/ml.
RESULTS. A total of 3,028 patients were included in this study. Among them, 2,331 (77 %) patients experienced at least one episode of VAC. There was a good correlation between VACs and VAPs occurrences, but only 14.5 % of the first episode of VAC was related (2 calendar days before or after the onset of worsening oxygenation) to an episode of VAP. The median [interquartile range] of episodes per patient was 2 [1–3]. Overall, nosocomial infections accounted for 27.3 %, IAEs for 13.8 %, transport for 16.5 % and fluid resuscitation for 5.4 % of VAC first episodes. The number of days alive without antibiotics at day 28 was significantly lesser in patients with at least one episode of VAC (17 [4;23] vs. 24 [2;6], $p < 0.005$). Moreover using statistical models able to handle time-dependent covariates and competing risks and after adjustment for confounding factors we found that VAC was an independent factors for day-28 mortality (Hazard ratio = 1.29; Confidence interval 95 % [1.07;1.56], $p < 0.01$).
CONCLUSIONS. VACs may not be useful for VAP surveillance in ICUs, however, these features makes VAC a possible quality indicator candidate for quality improvement programs.
REFERENCE(S). 1. Zahar JR Crit Care Med. 2009;37:2545–51. 2. Klompas M JAMA 2007;297:1583–93. 3. Klompas M PLoS One 6:e18062.

0902
'VOLATILE METABOLITE FINGERPRINTS' OF TRACHEAL ASPIRATES DISCRIMINATES PATIENTS WITH VAP FROM CONTROLS

L.D.J. Bos[1,2], J. Kastelijn[1,2], I. Martin-Loeches[2], C. de Haro[2], G. Gilis[2], P. Povoa[3], A. Torres[4], A. Kolk[5], H.-G. Janssen[5], P.J. Sterk[1], A. Artigas[2], M.J. Schultz[1], BIOVAP Study Group

[1]Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands, [2]Corporació Sanitaria Parc Taulí Universitaria, Hospital de Sabadell, Autonomous University of Barcelona, Critical Care Centre, CIBER Enfermedades Respiratorias, Sabadell, Spain, [3]Sao Francisco Xavier Hospital, Lisbon, Portugal, [4]Hospital Clínic de Barcelona, Barcelona, Spain, [5]University of Amsterdam, Amsterdam, The Netherlands
INTRODUCTION. VAP may result in changes in the composition of volatile metabolites in the lung. An electronic nose (eNose) can rapidly fingerprint these changes. In a bench-study we determined changes in the composition of volatile metabolites in air from headspace of thawed tracheal aspirates (TA) of patients with or without VAP.
HYPOTHESES. We hypothesized that the volatile metabolite fingerprint of tracheal aspirates can discriminate between patients with and without VAP.
METHODS. Sub-study of an international multi-national cohort study of ventilated critically ill patients, using prospectively obtained TA. VAP was diagnosed using clinical criteria (chest X-ray infiltrate, fever, leucocytosis, purulent sputum) but always needed microbiological confirmation ('definitive VAP') ($10^3/10^6$ CFU for BAL/TA). Patients who met the clinical criteria for VAP but with negative TA culture were classified as 'suspected but unconfirmed VAP'. Patients who did not meet clinical criteria for VAP were further classified as having 'colonized' airways (positive TA culture), or 'non-colonized airways' (negative TA culture). TA obtained at the day closest to the day VAP was diagnosed

(median 7 [25 –75 %: 5–9] days after ICU admission) was compared to a randomly selected TA from a patient not developing VAP (4 [25–75 %: 2–8] days after ICU admission). A diagnostic model to discriminate definitive VAP from patients who did not develop VAP and had non-colonized airways was produced using sparse partial least square. This model was then applied to colonized patients and patients with suspected but unconfirmed VAP.
RESULTS. The analysis included 12 patients with definitive VAP, 7 patients with suspected but unconfirmed VAP, and 14 patients with and 17 patients without colonized and non-colonized airways. The eNose model discriminated patients with VAP from patients without VAP and non-colonized airways with an ROC-AUC of 0.80 [95 %-CI: 0.61–0.99]. VAP was discriminated from colonized patients with an ROC-AUC of 0.83 [95 %-CI: 0.67–1.0] and from patients with suspected but unconfirmed VAP with an ROC-AUC of 0.82 [95 %-CI: 0.63–1.0]. Colonized and non-colonized airways in patients without VAP were not discriminated (ROC-AUC: 0.56 [95 %-CI: 0.28–0.83].
CONCLUSIONS. eNose technologies can discriminate tracheal aspirates of patients with VAP from patients without VAP. These results require validation in larger, prospective clinical trials possibly focussing on *exhaled* volatile metabolites.
GRANT ACKNOWLEDGMENT. LDB is supported by the ESICM Young Investigator Award (2012).

Neurointensive care: outcome prediction: 0903–0907

0903

CSF AND PLASMA AMYLOID-B TEMPORAL PROFILES AND RELATIONSHIPS WITH NEUROLOGICAL STATUS AND MORTALITY AFTER SEVERE TRAUMATIC BRAIN INJURY: RESULTS OF A PILOT STUDY

S. Mondello[1], A. Buki[2], J. Randall[3], G. Provuncher[3], D. Hanlon[3], D. Wilson[3], D. Italiano[1], F. Tomasello[1], A. Jeromin[4]

[1]University of Messina, Messina, Italy, [2]University of Pecs, Pecs, Hungary, [3]Quanterix Corporation, Lexington, USA, [4]NextGen Science Dx, Gainesville, USA
INTRODUCTION. Recent experimental and human studies have shown that traumatic brain injury (TBI) results in significant changes in the concentration and dynamics of amyloid-β (Aβ) in the human brain (1, 2). This condition is believed to accelerate Aβ-related pathophysiologic processes and affect neuronal function in patients with severe TBI.
OBJECTIVES. To assess amyloid-β_{1-42} (Aβ42) concentrations and time-course in CSF and in plasma of patients with severe TBI and their relationship to injury characteristics, neurological status and clinical outcome.
METHODS. A total of 12 patients with severe TBI [Glasgow Coma Scale (GCS) $\leq$ 8] and 20 controls were included in this prospective study. We evaluated levels of Aβ42 in paired CSF and plasma samples taken from each TBI patient at admission and daily up to 7 days. Aβ42 concentrations were assessed by utilizing an ultrasensitive digital ELISA approach. This method is based on isolating single immunocomplexes labeled with an enzyme in arrays of femtoliter wells, sealing the arrays in the presence of the enzyme substrate, and fluorescently imaging the array. Isolation of single immunocomplexes in this way gives rise to a dramatic increase in sensitivity over bulk, ensemble detection methods. The limit of detection was 0.02 pg/mL in plasma. Data collected included demographic and clinical variables as well as survival 6 months post-injury.
RESULTS. CSF Aβ42 levels were significantly lower in TBI patients acutely after injury as compared to controls (median 105.9 vs. 537.6 pg/ml, $p < 0.0001$) with lower levels in patients who died 6 months post injury than in those who were alive. Conversely, plasma Aβ42 levels were significantly increased in TBI as compared to controls (median 17.0 vs.7.3 pg/ml, $p < 0.0001$) with higher levels in patients who survived. A trend analysis using the Jonckheere-Terpstra test showed that both CSF and plasma Aβ42 levels strongly correlated with mortality ($P < 0.0001$). CSF and plasma Aβ42 concentrations within the first 24 h after injury did not correlate with TBI characteristics. A positive correlation between changes in CSF Aβ42 concentrations and neurological status as assessed by GCS was identified. CSF Aβ42 levels tended to increase as neurological status improved and decrease when neurological status deteriorated. There was no correlation between CSF and plasma Aβ42 levels.
CONCLUSIONS. These results suggest that determination of Aβ42 may be valuable to obtain prognostic information in patients with severe TBI as well as in monitoring the response of the brain to injury.
REFERENCE(S). 1. Magnoni S, Brody DL. Arch Neurol. 2010;67(9):1068–73. 2. Tran HT, Sanchez L, Esparza TJ, Brody DL. PLoS One. 2011;6(9):e25475.
GRANT ACKNOWLEDGMENT. Supported by Department of Defense (DAMD17-03-1-0772 and DAMD17-03-1-0066).

0904

EVOLUTIONARY ANALYSIS OF SPONTANEOUS SUBARACHNOID HEMORRHAGE (SAH) IN A 17 YEARS PERIOD

F. Guerrero López[1], F.I. Pino Sánchez[1], M. Colomo González[1], M. Monsalve Álvarez de Cienfuegos[1], S. Nogueras Guijarro[1], J. de la Cruz Sabido[2]

[1]H.U. Virgen de las Nieves, Intensive Care Unit, Granada, Spain, [2]H.U. Virgen de las Nieves, Neurosurgery, Granada, Spain
INTRODUCTION. SAH remains a prevalent clinical entity, having emerged in last decades handling modifications affecting the results of these patients.
METHODS. It's a retrospective analysis of all patients admitted with a diagnosis of spontaneous SAH in a Neuro Intensive Care Unit. We included demographic variables, treatment schedule, specific severity criteria (Glasgow Coma Scale-GCS-, Hunt-Hess score -HH-, World Federation of Neurosurgeons -WFNS-, Fisher) and general of critical patient (APACHE III), aneurysm responsible for the bleeding and its treatment, patient′s overall treatment, neurological and extra-neurological complications, time from SAH to aneurysm treatment and time from admission in our service to aneurysm treatment, hospital mortality, hospital outcomes (GOS) and length of stay in ICU and hospital. To compare results in an evolutionary way, we have created three periods within these 17 years. We present basic descriptive statistics with means and standard deviation, median and interquartile range and absolute and relative frequencies. For comparison of qualitative variables we used the Chi square test and for quantitative variables ANOVA and Kruskal–Wallis test, as adjusted or not to a normal distribution. It was considered statistically significant at $p < 0.05$.
RESULTS. We included 925 cases, 58.6 % female, age 55.7 ± 14.7 years. In 714 cases (77.2 %) an aneurysm was found like responsible for the bleeding and anterior communicating artery was the most common location. Initially 30 % were in poor neurological condition (HH IV-V), 37.1 % according WFNS (IV-V), 21.7 % had a GCS score $\leq$ 8 and almost 80 % were Fisher III–IV. The APACHE III was 43.9 ± 31.5. A 39.4 % of patients required mechanical ventilation (not as a support for surgery or embolization). Of the patients with aneurysms, 194 were treated surgically, 380 by endovascular and in 15 cases both treatments were used in the acute phase. The median of time from bleeding until aneurysm treatment was 3 days [1, 7] and from hospitalization 1.9 [1, 5]. Hydrocephalus was present in 315 patients (34.1 %), vasospasm in 143 (15.5 %), rebleeding in 95 (10.3 %) and 160 patients developed a stroke (17.3 %). The most frequent extra-neurological complication was nosocomial pneumonia in 13.1 %. The hospital mortality was 24.4 % and overall poor outcomes (GOS I–III) of 43.7 %. The median ICU stay was 4 days [2, 9] and hospital stay 14 [5, 26]. In table 1 we can compare the results in the 3 time periods.

Evolutionary profile of SAH in three time periods

	1996–2002 (n = 257)	2003–2007 (n = 311)	2008–2013 (n = 357)	p
Hunt-Hess IV–V	41.7 %	29.6 %	21.8 %	0.001
Fisher III–IV	83 %	80.8 %	77.1 %	0.07
Endovascular treatment	31.7 %	38.9 %	52.7 %	0.001
Time admission-treatment	5 (2, 15.25)	1 (1, 5)	1 (1, 2)	0.001
ICU LOS*	5 (2, 10)	4 (2, 9)	3 (1, 8)	0.001
Vasospasm	24.5 %	10 %	13.7 %	0.001
Rebleeding	17.5 %	9.3 %	5.9 %	0.001
GOS I–III	54 %	45.9 %	33 %	0.0001
Hospital mortality	35.3 %	25.4 %	15 %	0.001

CONCLUSION. With course of time we have better outcomes (lower mortality and better functional outcome), partly because of lower severity of patients admitted (increase income criteria) but also by shortening treatment times, increased frequency of endovascular treatment and lower percentage of neurological complications.

0905

CLINICAL SPECTRUM AND OUTCOMES OF PATIENTS WITH ENCEPHALITIS REQUIRING ICU ADMISSION

R. Sonneville[1], N. Gault[2], I. Klein[3], E. De Montmollin[1], S. Chemam[1], E. Mariotte[1], B. Mourvillier[1], F. Tubach[2], M. Wolff[1], L. Bouadma[1]

[1]Bichat University Hospital, Intensive Care Medicine, Paris, France, [2]Bichat University Hospital, Epidemiology, Paris, France, [3]Bichat University Hospital, Radiology, Paris, France
INTRODUCTION. Acute encephalitis is a severe neurological condition which is associated with significant morbidity and mortality. Few epidemiological studies are available in Europe and determinants of outcome in patients admitted to the ICU are unknown.
OBJECTIVES. We aimed to describe the epidemiology, the clinical presentation and functional outcomes of patients with encephalitis requiring ICU admission.
METHODS. We performed a retrospective cohort study (1991–2012) on consecutive patients with encephalitis admitted to the ICU of a French University hospital. Cases were reviewed by two investigators and patients were classified into three categories according to the etiology: (1) infectious causes; (2) immune-mediated causes; (3) undetermined causes. Functional outcome was graded at hospital discharge using the modified Rankin score (mRs).
We compared patients' characteristics and causes of encephalitis between two 10-year periods (period 1: 1991–2001 and period 2: 2002–2012). We used multivariate logistic regression to analyze factors associated with a poor outcome, as defined by a $mRs > 2$ (severe disability or death). Data are expressed as median (interquartile range) or number (percentage).
RESULTS. We included 279 patients [Age: 39 (29–57) years, SAPS 2: 26 (16–41)] over the study period. Patients presented with impaired consciousness (GCS score of 12 (8–14)), seizures (35 %), focal signs (25 %) and fever [38.3 °C (37.5–39.0)]. Among them, 154 (55 %) were mechanically ventilated. The causes of encephalitis were: (1) infections in 149 (53 %) patients, including *Mycobacterium tuberculosis* (n = 65), herpes simplex virus (n = 40), and varicella zoster virus (n = 14); (2) immune-mediated causes in 41 (15 %) patients; (3) undetermined in 89 (32 %) patients. The distribution of causes differed significantly between the two periods (period 2 versus period 1, $p = 0.03$): (1) infections (61 (48 %) vs 88 (58 %) patients), (2) immune-mediated [26 (21 %) vs 15 (10 %) patients], (3) undetermined [39 (31 %) vs 50 (33 %) patients]. At hospital discharge, 208 (74.5 %) patients had a mRs = 0–2 (functional independence), 24 (8.5 %) had a mRs = 3–5 (severe disability), 47 (17.0 %) had a mRs = 6 (death). After adjusting for confounding factors (study period and functional status before ICU admission), our multivariate analysis identified 5 baseline characteristics associated with a poor outcome: a low GCS score, presence of focal signs, aspiration pneumonia, a low body temperature, and elevated cerebrospinal fluid protein levels (Table). Among identified causes, patients with tuberculous meningitis had the worst outcomes.

Independent predictors of poor outcome

Variable	OR	95 % CI	p
Study period (2002–2012)	1.78	0.92–3.50	0.09
Knaus score C or D	8.54	2.79–28.73	<0.001
GCS score (per 1-point increase)	0.76	0.69–0.84	<0.001
Focal sign (s)	2.72	1.32–5.64	0.007
Body temperature, °C (per 1-point increase)	0.73	0.55–0.95	0.02
Aspiration pneumonia	2.32	0.99–5.39	0.05
CSF protein levels, g/l (per 1-point increase)	1.11	1.02–1.26	0.03

CONCLUSIONS. The clinical profile of patients admitted to the ICU for encephalitis has changed over the past 20 years, with an increase in the proportion of immune-mediated causes. Overall, intensive care management yielded a good functional prognosis in 75 % of

cases. Our study identified early indicators of poor outcome, irrespective of the underlying etiology.

0906

SUBARACHNOID HAEMORRHAGE - WHICH GRADING SCALE BEST PREDICTS THE OUTCOME?

K. Suchdev[1], R. Damani[1], N.S. Bozorgzad[1], G. Norris[1]

[1]Wayne State University/DMC, Neurology, Detroit, USA

INTRODUCTION. Multiple grading scales have been developed to grade the severity of subarachonid haemorrhage (SAH). The most widely used scales,Hunt and Hess (H&H), Fischer, Glasgow Coma Scale (GCS) and World Federation of Neurological Societies (WFNS) scale were developed based on severity of symptoms,which has resulted in unclear correlation with the eventual outcome.

OBJECTIVES. To determine which scale best predicts the outcome of SAH among H&H, GCS and Fischer grade,independent of demographic risk factors such as age and other baseline comorbidities.

METHODS. A retrospective chart review of 141 consecutive patients who presented to two academic institutions between July 2009 to April 2012 and met criteria for spontaneous SAH was done. For each,demographics information (age, gender and race) and presence of comorbidities (diabetes, hypertension and hyperlipidemia) were recorded along with GCS, H&H and Fischer grade. Primary outcome was discharge modified Rankin Scale (mRS) which was further dichotomized into good outcome (mRS $\leq$ 2) and poor outcome (mRS $>$ 2). Results were analyzed using the SYSTAT software. Canonical correlation coefficients were calculated between each scale and mRS scores, controlling for age, hypertension, hyperlipidemia and diabetes. The performance of individual scale in predicting the dichotomized outcome measure (poor vs good) was assessed using binary logistic regression model, into which comorbidities of hypertension, hyperlipidemia, and diabetes as well as baseline demographics (age, gender and race) were incorporated.

RESULTS. All three scales correlated with discharge mRS score,even after controlling for the effect of age, hypertension, hyperlipidemia and diabetes. The GCS scale ($R^2 = 0.369$, $p < 0.001$) had the highest correlation coefficient, followed by H&H scale ($R^2 = 0.276$, $p < 0.001$) and Fischer scale ($R^2 = 0.054$, $p = 0.003$),which had the least correlation. In logistic regression model, the GCS score was again the best in predicting the dichotomous outcome measure, with receiver operating characteristic (ROC) AUC of 0.878 (OR = 1.440, [1.257–1.649], $p < 0.001$) followed by the H&H score with ROC area of 0.850 (H&H OR = 0.384 [0.258–0.574], $p < 0.001$). The Fischer scale did not reach statistical significance (Fischer scale OR: 0.617 [0.374–1.018], ($p = 0.059$).

CONCLUSIONS. Our study shows that admission GCS score is best predictor of outcomes in SAH patients when compared with other widely used scales (H&H and Fisher). Furthermore familiarity of admission GCS amongst all health care personnel makes it a better scale to follow compared to other grading scales which are only familiar to neurologists, neurosurgeons and intensivists and hence preclude their universality.

REFERENCE(S).

1. Rosen DS et al. Subarachnoid haemorrhage grading scales. Neurocrit. Care 2005. 2. Starke RM et al. Predicting long-term outcome in poor grade aneurysmal subarachnoid haemorrhage patients utilising the Glasgow Coma Scale. J Neurosci (2009).

0907

SPONTANEOUS CEREBRAL HAEMORRHAGE AND MORTALITY ACCORDING TO THE LEVEL OF CONSCIOUSNESS AND INTRAVENTRICULAR HAEMORRHAGE

M. Arias-Verdú[1], E. Castillo-Lorente[2], F. Guerrero-López[3], R. Gutierrez-Rodriguez[1], E. Banderas-Bravo[1], E. Aguilar-Alonso[4], G. Quesada-Garcia[1], R. Rivera-Fernández[1]

[1]Hospital Carlos Haya, Intensive Care Unit, Málaga, Spain, [2]Hospital Neurotraumatológico, Intensive Care Unit, Jaen, Spain, [3]Hospital Virgen de las Nieves, Intensive Care Unit, Granada, Spain, [4]Hospital Infanta Margarita, Intensive Care Unit, Córdoba, Spain

OBJECTIVE. To assess mortality of patients admitted to the ICU with spontaneous cerebral haemorrhage according to the level of consciousness and the presence of intraventricular haemorrhage.

METHODS. A multicentre, prospective cohort study of patients with spontaneous intracerebral haemorrhage and/or non-traumatic subarachnoid haemorrhage admitted to 3 hospitals (Carlos Haya in Malaga, Virgen de las Nieves in Granada, and the Trauma hospital in Jaén) between 2003–2008. We analyzed age, sex, type of haemorrhage, Glasgow on admission, APACHE-III, intraventricular haemorrhage, and ICU and hospital mortality. The statistical study was done with the Student, X^2 and logistic regression.

RESULTS. 203 patients. Age 55.65 $\pm$ 14.69 years, APACHE-III 51.48 $\pm$ 33.02, GCS on admission 9.66 $\pm$ 4.73. Hospital mortality 43.3 %. GCS on admission: 12.30 $\pm$ 3.80 in survivors versus 6.22 $\pm$ 3.43 in those who died ($p < 0.001$). In 30 patients the best GCS score was 4 points and their mortality was 90 %. The remaining 173 patients had a hospital mortality of 35.3 %.

Intraventricular haemorrhage (IVH) was present in 92 patients (mortality 66.3 %) and absent in 104 patients (mortality 21.2 %); $p < 0.001$. We analyzed mortality according to the level of consciousness on admission and the presence of IVH. The GCS on admission was: GCS $>$ 8 (N = 90) and GCS $<$ 8 (N = 108). Three of 73 patients without IVH and GCS $>$ 8 died (mortality 4.1 %), and 19 of 29 patients without IVH and GCS $\leq$ 8 died (mortality: 65.5 %), ($p < 0.001$). Fourteen of 33 patients with IVH and GCS $>$ 8 died (mortality: 42.4 %), and 45 of 56 patients with IVH and GCS $\leq$ 8 died (mortality: 80.4 %), ($p < 0.001$). Mortality was higher in the patients with IVH and a better level of consciousness on admission in comparison to those without IVH. This increased mortality associated with the presence of IVH was also seen in those who had a low level of consciousness, though much less markedly than in those with GCS $>$ 8.

The multivariate analysis detected a relation between hospital mortality and GCS on admission: OR 0.75 (0.68–0.82), type of haemorrhage: OR 2.4 (1.04–5.54), and the presence of IVH: OR 5.85 (2.58–13.28). Analysis of the interaction between level of consciousness on admission and the presence of IVH showed an interaction with IVH: OR for IVH plus GCS $\leq$ 8 of 2.72 (0.94–7.83) and for IVH plus GCS $>$ 8 of 16.55 (4.25–64.49).

CONCLUSIONS. The presence of IVH in patients admitted to the ICU with spontaneous cerebral haemorrhage is associated with an increased mortality, independently of the type of haemorrhage. This increase in mortality associated with IVH is much greater in patients with a better level of consciousness on admission to the ICU than in those with a low level of consciousness on admission.

Improving knowledge on sedation and delirium: 0908–0912

0908

RECALL OF ICU STAY IN MECHANICALLY VENTILATED PATIENTS MANAGED WITH A SEDATION PROTOCOL OR A SEDATION PROTOCOL WITH DAILY INTERRUPTION: RESULTS OF THE SLEAP MULTICENTER RANDOMIZED TRIAL

S. Mehta[1], D. Cook[2], M. Meade[3], R. Mallick[4], D. Fergusson[4], M. Herridge[5], M. Steinberg[1], J. Granton[5], N. Ferguson[5], J. Devlin[6], M. Tanios[7], P. Dodek[8], R. Fowler[9], K. Burns[10], M. Jacka[11], K. Olafson[12], S. Keenan[13], S. Reynolds[13], Y. Skrobik[14], L. Burry[1], the SLEAP Investigators and the Canadian Critical Care Trials Group

[1]Mount Sinai Hospital, Toronto, Canada, [2]Macmaster University, Medicine, Critical Care, Hamilton, Canada, [3]Macmaster University, Hamilton, Canada, [4]Ottawa Hospital Research Institute, Ottawa, Canada, [5]University Health Network, Toronto, Canada, [6]Northeastern University, Boston, USA, [7]Long Beach Memorial Medical Centre, Long Beach, USA, [8]St. Paul's Hospital, Vancouver, Canada, [9]Sunnybrook Health Sciences Centre, Toronto, Canada, [10]St. Michael's Hospital, Toronto, Canada, [11]University of Alberta, Edmonton, Canada, [12]University of Manitoba, Winnipeg, Canada, [13]Fraser Health Authority, New Westminster, Canada, [14]Hopital Maisonneuve Rosemont, Montreal, Canada

INTRODUCTION. Survivors of critical illness may have decreased recall of factual events yet report delusional memories, dreams, nightmares or hallucinations.

OBJECTIVES. To evaluate factual and delusional memories of the ICU stay in patients enrolled in a randomized trial comparing two sedation strategies.

METHODS. SLEAP was a prospective, randomized trial in 16 centres. 419 mechanically ventilated adults receiving opioid and/or benzodiazepine infusions were randomized to protocolized sedation (PS), or protocolized sedation plus daily sedation interruption (PS + DI). There was no difference in the primary outcome of duration of mechanical ventilation, and the PS + DI group received significantly higher sedative doses [JAMA 2012;308(19):1985]. Following ICU discharge, patients were interviewed on Days 3, 28 and 90 by research personnel, in person or by telephone, using the ICU Memory Tool. Patients were asked about factual memories (e.g. family presence, suctioning, lights, breathing tube, ICU admission and discharge), emotional memories (e.g. panic, pain, feeling down), and delusional memories (nightmares, hallucinations, someone trying to harm the patient).

RESULTS. 368 interviews were conducted in 289 of 297 survivors (97.3 %); from 146 patients in the PS group, and 143 in PS + DI group. 58 % of interviews were conducted in person and 42 % by telephone. The mean age was 56.6 years (SD 16.6), 132 were female (45.7 %), mean APACHE II score 23.1 (SD 7.4), and SOFA 6.3 (SD 3.2). On days 3, 28 and 90, 28 %, 26 %, and 36 % ($p = 0.748$) respectively had no recall of being in the ICU. There were no differences between PS and PS + DI groups in recall of hospital or ICU admission, sleep adequacy, panic, or intrusive memories (Table 1). On day 3, 97.2 % of patients had at least one factual memory from the ICU admission, and 72.2 % had at least one delusional memory; these frequencies remained stable on days 28 and 90 (Table 2 & 3). Specific factual memories remained stable over time, other than recollection of faces and the endotracheal tube, which declined significantly over time. The percentage of patients having at least one memory of feelings (e.g. pain, discomfort, anxiety) while in the ICU declined significantly over the 3 time points; specific memories of pain, confusion, and panic also individually declined significantly. There was a trend towards a decline in delusional memories over time ($P = 0.057$). Between the PS and PS + DI groups, the proportion of patients having at least one factual memory, memory of feelings, and delusional memory, was similar.

Recall on Day 28 after ICU discharge

	PS + DI (N = 62) n (%)	PS (N = 59) n (%)
Remember admission to hospital - clearly	25 (41.7)	31 (52.5)
Remember time before ICU - all of it	6 (10)	7 (12.1)
Remember being in the ICU	48 (78.7)	40 (69.0)
Remember all of the ICU stay	6 (10)	4 (6.9)
Enough sleep	39 (65.0)	36 (67.9)
Remember transfer from ICU - clearly	37 (61.7)	28 (49.1)
Panic or apprehension	12 (21.0)	14 (25.0)
Intrusive memories	9 (15.5)	12 (21.4)
$P > 0.05$ for all comparisons		

Factual memories in all patients

	Day 3 N = 144 n (%)	Day 28 N = 113 n (%)	Day 90 N = 92 n (%)	P value
Any factual memory	140 (97.2)	107 (94.7)	87 (94.6)	0.055
Faces	80 (55.6)	55 (48.7)	42 (45.6)	0.049
Voices	88 (61.1)	61 (54.0)	55 (59.8)	0.064
Alarms	71 (49.3)	49 (43.4)	41 (44.6)	0.149
Lights	64 (44.4)	50 (44.2)	38 (41.3)	0.492
Breathing tube	88 (61.1)	60 (53.1)	47 (51.1)	0.012
Suctioning	59 (41.0)	41 (36.3)	28 (30.4)	0.079
Tube in nose	62 (43.1)	49 (43.4)	36 (39.1)	0.452
Ward rounds	54 (37.5)	38 (33.6)	35 (38.0)	0.248

Emotional and delusional memories all patients

	Day 3 N = 144 n (%)	Day 28 N = 113 n (%)	Day 90 N = 92 n (%)	P value
At least one memory of feeling	129 (89.6)	91 (80.5)	72 (78.3)	0.006
Pain	51 (35.4)	33 (29.2)	20 (21.7)	0.041
Feeling confused	82 (57.0)	53 (46.9)	49 (53.3)	0.016
Panic	60 (41.7)	36 (31.9)	29 (31.5)	0.013
At least one delusional memory	104 (72.2)	79 (69.9)	57 (62.0)	0.057
Hallucinations	60 (41.7)	45 (39.8)	34 (37.0)	0.293
Dreams	80 (55.6)	57 (50.4)	46 (50.0)	0.051
Nightmares	46 (31.9)	38 (33.6)	26 (28.3)	0.585
Feeling people were trying to hurt you	23 (16.0)	18 (15.9)	21 (22.8)	0.415

CONCLUSIONS. Approximately 1/3 of patients in the SLEAP Trial had no recall of ICU admission; however, the majority had at least one factual memory and more than 60 % had

at least one delusional memory. Over time, factual and delusional memories remained stable, while memories of pain, discomfort, anxiety or other feelings declined significantly up to 3 months post discharge.

GRANT ACKNOWLEDGMENT. Canadian Institutes of Health Research

0909

A RANDOMIZED, DOUBLE-BLIND, PLACEBO CONTROLLED, DOSE ESCALATION STUDY OF DEXMEDETOMIDINE AS ADJUNCTIVE THERAPY FOR ALCOHOL WITHDRAWAL

S.W. Mueller[1], C.R. Preslaski[2], T.H. Kiser[1], J.C. Lavelle[3], D.N. Fish[4], S.P. Malkoski[3], R. MacLaren[1]

[1]University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Clinical Pharmacy, Aurora, USA, [2]Denver Health Medical Center, Department of Pharmacy, Denver, USA, [3]University of Colorado School of Medicine, Division of Pulmonary and Critical Care Medicine, Aurora, USA, [4]University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, USA

INTRODUCTION. Dexmedetomidine (DEX) has been used as adjunctive therapy for severe alcohol withdrawal. No prospective trials have assessed DEX for this indication.

OBJECTIVE. To evaluate the effect of DEX as adjunctive therapy to a lorazepam (LOR)-based, symptom-triggered alcohol withdrawal protocol (clinical trials identifier NCT00936377).

METHODS. This double-blind trial randomized 24 patients to DEX 1.2mcg/kg/hr (HD), 0.4mcg/kg/hr (LD), or placebo (P) as adjunctive therapy for up to 5 days or resolution of withdrawal symptoms. ICU patients requiring $\geq$ 16 mg of LOR within a 4-h period for clinical institute withdrawal assessment (CIWA) scores $>$ 15 were eligible. The primary outcomes were the 7-day cumulative and 12- and 24-h pre- vs. post doses of LOR in the combined DEX treatment groups (T) vs. P. Secondary outcomes included a dose response assessment and symptom control as measured by CIWA or RIKER sedation scale. Safety outcomes included blood pressure, heart rate, and seizure.

RESULTS. Baseline characteristics and LOR requirements prior to study drug initiation were similar between the three groups except more LD subjects were intubated prior to enrollment and their median APACHE III was higher. Median cumulative LOR requirement over the first 7 days of hospitalization was insignificantly lower in the T group vs. P group (159 mg vs. 181 mg) and was similar between HD and LD groups. Cumulative post-randomization LOR exposure was insignificantly lower in the T group vs. P group (59 mg vs. 109 mg, $p = 0.24$) and similar between HD and LD groups. Median differences in LOR requirements of pre- vs. post study drug administration were higher in the T group compared to the P group over both 12-h (-36.5 vs. -17.5 mg, $p = 0.027$) and 24-h (-56 mg vs. -8 mg, $p = 0.037$). Differences in 12 and 24-hpre-post LOR requirement trended towards significance between P and HD or LD but were similar between HD and LD. CIWA or Riker scores representing severe agitation (7 vs. 25 %) or moderate agitation (19 vs.18 %) in the first 24-h were similar in the T group vs. P group. Bradycardia occurred insignificantly more frequently in the T group vs. P group (25 vs. 0 %), most frequently in the HD group (37.5 %, $p = 0.042$ vs. P). Hypotension occurred insignificantly more frequently in the T group vs. the P group (18.8 vs. 0 %). More T group subjects than P group subjects required adjustments to the rate of infusion (50 vs. 0 %, $p = 0.02$). Neither endotracheal intubation or seizure occurred in any group while in the study.

CONCLUSION. Adjunctive DEX for severe alcohol withdrawal results in significantly less LOR exposure when using a symptom-triggered protocol and while maintaining symptom control. Monitoring for bradycardia and hypotension are needed when using DEX but the occurrence may be lessened with LD. Further study is needed evaluate the use of adjunctive DEX for alcohol withdrawal and its impact on clinical outcomes such as intubation and hospital length of stay.

0910

DELIRIUM IN ICU PATIENTS IS ASSOCIATED WITH INCREASED TEMPERATURE VARIABILITY

A.W. van der Kooi[1], T.H. Kappen[2], R.J. Raijmakers[1], I.J. Zaal[1], A.J. Slooter[1]

[1]University Medical Centre Utrecht, Department of Intensive Care Medicine, Utrecht, The Netherlands, [2]University Medical Centre Utrecht, Department of Anesthesiology, Utrecht, The Netherlands

INTRODUCTION. Delirium is an acute disturbance of consciousness and cognition. It is a common disorder in the intensive care unit (ICU) and associated with impaired long-term outcome.[1,2] Despite its frequency and impact, delirium is poorly recognized by ICU-physicians and -nurses using delirium screening tools.[3] A completely new approach to detect delirium is to use monitoring of physiological alterations. Temperature variability, a measure for temperature regulation, could be an interesting component to monitor delirium, but whether temperature regulation is different between delirious and non-delirious patients has not yet been investigated.

OBJECTIVES. The main objective was to investigate whether ICU delirium is related to temperature variability.

METHODS. We included 24 patients in whom days with delirium could be compared with days without delirium, based on the Confusion Assessment Method for the ICU as conducted by a research- physician or -nurse, in combination with the inspection of medical records. We excluded patients with conditions affecting thermal regulation or therapies affecting body temperature. Daily temperature variability was determined by computing the mean absolute second derivative of the temperature signal. Temperature variability (primary outcome) and body temperature (secondary outcome) were compared between delirium- and non-delirium days with a linear mixed model and adjusted for daily mean Richmond Agitation and Sedation Scale scores and daily maximum Sequential Organ Failure Assessment scores.

RESULTS. Temperature variability was increased during delirium-days compared to days without delirium ($\beta_{unadjusted} = 0.007$, 95 % Confidence Interval (CI) = 0.004–0.011, $p < 0.001$). Adjustment for confounders did not alter this result ($\beta_{adjusted} = 0.005$, 95 % CI = 0.002–0.008, $p < 0.001$). Delirium was not associated with body temperature ($\beta_{unadjusted} = -0.03$, 95 % CI = -0.17 to 0.10, $p = 0.61$). Adjusting for confounders did not change this ($\beta_{adjusted} = -0.03$, 95 % CI = -0.17 to 0.10, $p = 0.63$).

CONCLUSIONS. Our study suggests that temperature variability is increased during ICU delirium. Increased temperature variability may be used in conjunction with other objective components such as electroencephalography with automated processing, to develop a monitoring tool for ICU delirium.

REFERENCE(S). 1. Pisani MA et al. Am J Respir Crit Care Med 2009; 180:1092–7. 2. Ely EW et al. JAMA 2004; 291:1753–62. 3. van Eijk MM et al. Am J Respir Crit Care Med. 2011; 184:340–4.

GRANT ACKNOWLEDGMENT. None of the author's received funding for this study. Of the 3 studies from which patient data was used, only the Rivastigmine was funded by ZonMw (Grant 80-82305-98-08109), the Netherlands Brain Foundation (Grant 2008(1)0.30) and Novartis, Basel, Switzerland (unrestricted grant). Funding agencies had no influence on the design, data collection, analysis, interpretation of data, writing of the manuscript, or the decision to submit the manuscript for publication.

0911

A RANDOMIZED, DOUBLE-BLIND STUDY OF DEXMEDETOMIDINE VERSUS MIDAZOLAM FOR ICU SEDATION: PATIENT RECALL OF THEIR EXPERIENCES AND SHORT-TERM PSYCHOLOGICAL OUTCOMES

R. MacLaren[1], C. Preslaski[2], S. Mueller[1], T. Kiser[1], D. Fish[1], J. Lavelle[3], S. Malkoski[3]

[1]UCD School of Pharmacy, Aurora, USA, [2]Denver Health Medical Center, Denver, USA, [3]UCD School of Medicine, Aurora, USA

INTRODUCTION. Dexmedetomidine may be an ideal bridging sedative for short-term use when extubation is approaching because patients may be assessed neurologically while maintaining comfort without compromising their respiratory function.

OBJECTIVES. To evaluate converting continuous benzodiazepine sedation to dexmedetomidine in critically ill patients when they are eligible for daily awakenings. Specific outcomes assessed were ventilator liberation, patient recall of their intensive care unit (ICU) experiences, and the occurrence of anxiety/depression and post-traumatic stress disorder (PTSD).

METHODS. Randomized, double-blind, single center study. Existing continuous benzodiazepine sedation was converted to dexmedetomidine or midazolam when patients qualified for daily awakenings and titrated to achieve Riker sedation-agitation scores of 3–4. Spontaneous breathing trials were conducted as per an existing protocol and time to tracheal extubation determined. The ICU Stressful Experiences Questionnaire, hospital anxiety and depression scale, and the impact of event scale—revised were administered before hospital discharge to assess recall, anxiety/depression, and PTSD, respectively.

RESULTS. Baseline characteristics were similar between the 11 dexmedetomidine subjects and 12 midazolam subjects. The median dosage regimens were 0.61 μg/kg/h and 3.7 mg/h for 3.5 and 3 days for dexmedetomidine and midazolam, respectively. Attainment of goal sedation and analgesia were similar but more assessments in the dexmedetomidine group reflected agitation (27.1 vs. 6.6 %, respectively) and pain (21.4 vs. 13.3 %). Total benzodiazepine administration was reduced with dexmedetomidine. The median duration of mechanical ventilation from study drug initiation was 3.4 days in seven dexmedetomidine subjects and 2.9 days in eight midazolam subjects. One dexmedetomidine subject and five midazolam subjects developed new onset delirium ($p = 0.07$). Dexmedetomidine subjects remembered 18.5 experiences compared with 8.5 by midazolam subjects ($p = 0.015$). The occurrence rates of anxiety and depression were similar. Five (62.5 %) dexmedetomidine subjects and 1 (12.5 %) midazolam subject developed PTSD ($p = 0.063$). Hypotension occurred in 10 (90.9 %) dexmedetomidine subjects and six (50 %) midazolam subjects ($p = 0.069$).

CONCLUSIONS. Transitioning benzodiazepine sedation to dexmedetomidine when patients qualify for daily awakenings did not expedite ventilator liberation but did reduce the development of delirium, facilitated remembrances of ICU experiences, and led to PTSD in the short-term. Vigilant monitoring for hypotension is needed for both sedatives. Additional comparative studies of therapies focusing on the long-term impact of ICU recall and psychological outcomes are needed.

REFERENCE(S). None

GRANT ACKNOWLEDGMENT. Investigator-initiated research grant from Hospira. Trial registration: clinicaltrials.gov identifier NCT00744380.

0912

DELIRIUM IN INTENSIVE CARE UNIT: DEVELOPMENT AND INTERNAL VALIDATION OF A PREDICTIVE MODEL

F.M. Ballestero[1], S.P. Chapela[1], F. Grassi[1], E.J. Descotte[1], A.X. Boedo[1], M. Ferreyra[1], A. Gonzalez[1], F. Lascar[1], P. Lucero[1], D. Molina[1], S. Sac[1], R.O. Villagomez[1], E.D. Soloaga[1], M. Khoury[1], M.A. Blasco[1], F.J. Chertcoff[1]

[1]Hospital Britanico de Buenos Aires, Intensive Care Unit, Capital Federal, Argentina

INTRODUCTION. Delirium in the intensive care unit (ICU) has an incidence between 20–80 %, increase the length of stay, prolonged mechanical ventilation and it is an independent predictor of mortality. It has been calculate a 10 % of mortality increase for every day that the patient has delirium. A predictive model to identify the risk factor associated with these patients would be very useful.

OBJECTIVES. The purpose of this study is to evaluate a predictive model for identifying delirium in ICU patients.

METHODS. We conducted a prospective observational study included all patients admitted to the ICU over 18 year old, excluding those with a stay less than 24 h, RASS < -4, language is not Spanish and patients with drug intoxication. We evaluated daily for the presence of delirium using the CAMICU test.

The study was conducted in two steps: the first was from September 2011 to February 2012 we made a predictive model and the second phase August 2012 to January 2013 performed and internal validation. In both phases were analysed demographics, history, APACHE II, and predisposing factors associated with ICU admission.

RESULTS. The first phase included 476 patients, of which 19.9 % (95 patients) showed delirium. Univariate analysis was performed for all variables and then multivariate analysis from which we built a predictive model using multiple logistic regressions to identify the best predictors of delirium (Table 1). ROC area under the curve: 0.8326.

Table 1 Multivariate analysis, Multiple logistic

	OR (95 % CI)	Coefficient	p
Mechanical ventilation	12.30 (5.92–24.44)	2.48	<0.001
Hypernatremia	4.17 (1.43–12.10)	1.42	0.009
Use of beta blockers	2.34 (1.43–4.57)	0.85	0.012
Neurocritical patient	2.24 (1.22–4.11)	0.80	0.009
Age $\geq$ 65 years	2.23 (1.23–3.70)	0.80	0.008
Hypokalemia	2.11 (1.20–3.70)	0.74	0.009

We assigned 3 points score for MV and 1 point to other variables. The likelihood of delirium with 1 point was 7.97 %, with 2 points of 16.27 %, with 3 points of 32.43 %, with 4 points from 53.4 % with 5 points of 70.59 %, with 6 points of 86.54 %, and more or 7 points equal to 93.9 %. In the second internal validate phase including a total of 449 patients, with an incidence of delirium of 24.07 % (104 patients)we found that the likelihood of delirium with 1 point was

1.98 %, with 2 points of 12.24 %, with 3 points of 23.16 %, with 4 points of 58.82 %, with 5 points of 74.29 % and with more than 6 points 100 %. There was an ROC area under the curve of the predictive model score 0.86 and 0.84, with a sensitivity and specificity of 60 % and 92 % with more than 3 points.
CONCLUSIONS. Our score predicts the incidence of delirium in a cohort of patients admitted in critical care unit. An external and with more large validation is needed before generalization of these results.

Wednesday 9 October 2013

Poster Sessions

Technology in ICU: 0913–0926

0913

LEARNING TEMPORAL RULES TO FORECAST INSTABILITY IN INTENSIVE CARE PATIENTS

M. Guillame-Bert[1], A. Dubrawski[1], L. Chen[1], M. Hravnak[2], M. Pinsky[3], G. Clermont[3]

[1]Carnegie Mellon University, Auton Lab, Pittsburgh, USA, [2]School of Medicine, School of Nursing, Pittsburgh, USA, [3]School of Medicine, Department Critical Care Medicine, Pittsburgh, USA

INTRODUCTION. We study the utility of time series features and exceedences detected in a set of vital signs (VS: heart rate [HR], respiratory rate [RR], systolic blood pressure [SysBP], diastolic blood pressure [DiaBP] and peripheral oxygen saturation [SpO_2]) of Step Down Unit (SDU) patients in forecasting their instability.
For each vital sign, a range of acceptable values is defined. A patient is considered unstable if one of their VSs exceeds its acceptable range (Table 1) for at least 4 min. We aim at predicting onset of any such instability ahead of time.

Tab.1

Vital sign	Acceptable range
HR	[40, 140] beats/mn
RR	[6, 36] breaths/mn
SysBP	[80, 200] mmHg
DiaBP	[0, 110] mmHg
SpO_2	[85, 100] %

In the experiments, we consider 305 stays at one SDU. VSs of each patient are sampled every 20 s, and decision rules from Table 1 are used to flag potential instability. Each event of exceedence is evaluated by expert clinicians and labeled either as true instability or a likely artifact due to caveats of the measurement procedures.
OBJECTIVES. Our primary objective is to understand how accurately, how confidently, and how far in advance we can forecast onset of episodes of true instability.
METHODS. We use temporal rule learning methodology to build forecast models for instability1. The training data consists of the clinician-confirmed actual episodes of instability (separately flagged due to specific vitals: HR, RR, SysBP, DiaBP, SpO_2) to be predicted, and the preprocessed raw VS data as candidate predictors. Preprocessing involves computing basic statistics of VS waveforms such as moving averages, moving trends, and cross-correlations. Scalar values of thusly featurized vitals are used as state variables, and their abrupt changes as discrete events, to jointly form the input space for the rule learning algorithm. It then searches for human readable, statistically confident temporal association rules with sufficient support in data and high temporal predictive accuracy (see Fig. 1 for examples). We evaluate the utility of inferred rules using cross validation: data is split into multiple disjoint folds so that no single SDU stay could be used both in training and testing phases of evaluation.

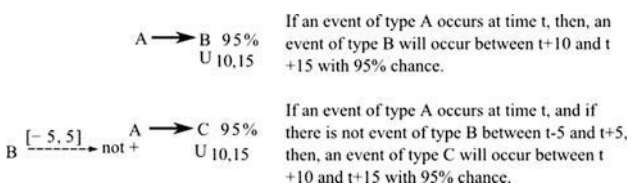


Fig. 2

RESULTS. Several temporal association rules of significant utility have been derived from data. A subset of complementary rules with the highest confidence, support, and precision was then assembled and evaluated jointly as a forecasting expert system. Fixing the false discovery rate to one per day per patient we observe recall rates of instability episodes of 83 %/49 %/42 % respectively for HR/RR/SpO_2 alerts, when the forecast horizon is 4–30 min ahead.
CONCLUSIONS. Learning temporal rules from multivariate VS waveforms allows forecasting instability in SDU patients. Presented approach can enable pre-emptive treatment of emerging instability.
REFERENCES. Guillame-Bert M, Crowley JL. New approach on temporal data mining for symbolic time sequences: Temporal tree associate rules. Tools with Artificial Intelligence (ICTAI), 2011.
GRANT ACKNOWLEDGMENT. NSF IIS 0911032, NIH NINR 1 R01 NR013912-01.

0914

AUTOMATIC IDENTIFICATION OF ARTIFACTS IN MONITORING CRITICALLY ILL PATIENTS

M. Fiterau[1], A. Dubrawski[1], L. Chen[1], M. Hravnak[2], G. Clermont[3], M. Pinsky[3]

[1]Carnegie Mellon University, Auton Lab, Pittsburgh, USA, [2]University of Pittsburgh, School of Nursing, Pittsburgh, USA, [3]University of Pittsburgh, Department of Critical Care Medicine, Pittsburgh, USA

INTRODUCTION. We present an analytic system that differentiates true alerts from artifacts in multivariate non-invasive vital signs (VS) measured in critically ill patients, and allows design of reliable decision rules to identify and dismiss false alerts in real time.
OBJECTIVES. To support adjudication of alerts from monitoring critically ill patients and reduce false alert rates while maintaining sensitivity of detection.
METHODS. Our noninvasive VS waveform data includes ECG-derived heart rate (HR) and respiratory rate (RR), oscillometric systolic and diastolic blood pressure (BP), and peripheral arterial oxygen saturation by finger plethysmography (SpO_2). Each violation of local stability criteria (HR $<$ 40 or $>$ 140, RR $<$ 8 or $>$ 36, systolic BP $<$ 80 or $>$ 200, diastolic BP $>$ 110, $SpO_2 <$ 85 %) is assigned a type consistent with the first VS to exceed control limits. Raw data is processed to extract features independently from each VS during the alert and a short window (4 min) preceding its onset. The features include common statistics such as mean, standard deviation, minimum, and maximum, and features inspired by domain expertise: data duty cycle (% of non-missing measurements during the alert period), the minimum/maximum of the first order differences and slope of a linear fit to data. We model alert-artifact classification separately for RR, BP and SpO_2 alerts using RECIP algorithm[1]. It relies on point estimators for conditional entropy and recovers a desirably small set of simple projections which accurately classify test alerts. New alerts can be detected using one of the projections from the retrieved set.
RESULTS. Models for RR, BP and SpO_2 alerts show leave one out cross validation accuracy, precision, and recall of 97.8 %/97.9 %/99.1 %, 88.6 %/89.6 %/95.8 % and 91.2 %/91.8 %/99.6 % respectively. The learned models, are generally consistent with clinical intuition. They also provide novel insight, e.g. some highly explanatory projections of data that isolate artifacts due to one particular VS often use only features derived from other VS. This suggests existence of informative correlations between VS that could be leveraged to inform false alert mitigation in existing monitoring systems. It enables new and effective decision rules to filter out artifacts using simple multivariate metrics such as ratios of features extracted from different VS.
CONCLUSIONS. Identification of artifacts in real time high frequency VS data can be handled automatically and data-driven rules for the adjudication presented to clinicians visually in an intuitive and easy to interpret fashion. Our approach reduces false alert rates without deteriorating the ability to detect true alarms. New decision rules can be developed for reliable real time filtration of artifacts in waveform vital sign measurements.
REFERENCES. Fiterau M, Dubrawski A. Projection Retrieval for Classification, NIPS 2012.
GRANT ACKNOWLEDGMENT. NSF IIS 0911032, NIH NINR 1 R01 NR013912.

0915

USE OF THE ELECTROMAGNETIC NG CORTRAK DEVICE IN ITU - A SURVEY

N. Sharma[1], P. Nair[2]

[1]Whiston Hospital, Anaesthesia, Liverpool, UK, [2]Walton Centre, Horsley Intensive Care Unit, Liverpool, UK

INTRODUCTION. The cortrak enteral access system (EAS) allows real time tracking of a NG tube tip, supposedly abolishing the need for X-ray confirmation of nasogastric tube (NGT) position. With the use of an electromagnetic transmitting stylet inserted within the NG tube and a receiver unit placed over the patient's xiphisternum, a real time graph is produced on a monitor and can be printed and used as evidence of correct placement.
Horsley ITU is in the unique position of not having an onsite radiographer overnight to confirm NG placement, this was hoped to be a solution. A 'Field Safety Notice' issued in 2010 described two inadvertent lung NGT placements confirmed by the cortrak device. This led to a possible mistrust of the device and increased use of CXR led confirmation.
The cost of the cortrak NGT is £90; a standard NGT £7.50; an X-ray overnight £65 and radiographer overnight £70. The clinical importance of this survey, is one of patient safety and cost effectiveness.
OBJECTIVES. To establish: the type of NGT being inserted; the frequency of correct use of the cortrak device and CXR used to confirm placement; the reasons for confirmatory CXR and to provide recommendations on future use of cortrak device based on patient safety and cost saving.
METHODS. Over a 4 week period, patient's notes and bedsides were surveyed as were their PACS and CXR records to establish the above aims.
RESULTS. 48 NGT insertions were identified. 85 % of all NGT inserted were cortrak (41/48). 76 % of these used electromagnetic device for insertion (31/41). 28/31 cortrak graphs were stuck in patients notes. 53 % (22/41) of cortrak NGT insertions had confirmatory CXR and 77 % (17/22) had evidence of magnetic device use and CXR. The commonest reason for this after 'no reason' was 'no aspirate' then 'inexperience reading graph.' No reported harm in 100 % of NGT insertions.
The cortrak EAS does not feature on NPSA decision tree and is not currently recommended and therefore inadvertent misplacement when using cortrak would not be supported. 77 % of cortrak NGT also had confirmatory CXRs. This shows incorrect use of an expensive piece of equipment. If these x-rays were done overnight, this also shows an overspend of £82.50 per patient. With a projected 492 NGT insertions a year at Horsley, £44.280 is currently being spent on cortrak NGT insertion compared with £3,690 with a standard NGT, not including price of CXR confirmation.
CONCLUSIONS. The cortrak device is not being used as intended and 77 % of patients are also having CXRs.
RECOMMENDATIONS.
1) Re - training of staff on cortrak device use and graph interpretation.
2)Creation of local protocol, especially overnight with cortrak use.
3) Return to use of standard NGT and confirm placement using aspirate or CXR in daylight hours.
OUTCOMES. The cortrak device is no longer used in HITU, with an estimated departmental saving of £50,000 a year.

0916

TELEMEDICINE IN THE DUTCH INTENSIVE CARE SETTING: FIRST RESULTS

R.J. Bosman[1], R. Obster[2], J.P. Wester[1], H. Feijen[1], J. de Metz[1], I. van Stijn[1], P.H.J. van der Voort[1]

[1]Onze Lieve Vrouwe Gasthuis, Intensive Care, Amsterdam, The Netherlands, [2]MC Zuiderzee, Lelystad, The Netherlands

INTRODUCTION. Telemedicine is a well known concept of providing intensive care in the USA where 10 % of intensive care patients are being treated with the use of telemedicine (tele-IC). Tele-IC has a remote intensivist with or without a remote intensive care nurse. Locally, at the bedside, a medical doctor with or without intensive care expertise can be present. Tele-IC can be executed with more or less responsibilities for the intensivist at

the remote site. In 2011 tele-IC was introduced in the Netherlands between a rural hospital and a high level ICU in Amsterdam.
OBJECTIVES. To describe, in an observational study, the organisation and effects of the first Dutch Tele-IC.
METHODS. Individual patient data were collected from the PDMS (Metavision, iMDsoft, Tel Aviv) over 2012. Data are presented as mean and SD, except Standardized Mortality Ratio (SMR) which is presented with 95 % confidence interval. The SMR of the transferred patients was calculated by using the hospital mortality from the receiving hospital. Results for patients transferred from the local ICU to other hospitals are reported separately (transfer). For all transferred patients the outcome in the next hospital could be established.
RESULTS. The rural hospital has ± 300 beds for general surgery and medicine. A 24/7 emergency care is present. The 3 bedded ICU has daytime staffing with local intensivists, nighttime care is delivered by the Tele-IC. Each bed has a two-way high definition audio-visual connection. A PDMS with physician order entry and clinical decision support is present and is simultaneously used at the bedside and in the telemedicine unit. Interventions like intubation and lines are performed by local anaesthesiologists. Patients who cannot be treated at the rural hospital because of the level of care this hospital can provide, are transferred to a higher level ICU at the discretion of the attending intensivist. The tele-IC is located at a nearby (55 km) high level ICU and is run by their intensivists. In 2012 260 patients were admitted to the rural ICU, 65.4 % outside "office hours". The mean APACHE IV predicted mortality was 19.66 % (32 % for transferred patients, 16.7 % for others). All transports were uneventful. SOFA on day of transfer was 6.8.

Data Tele-IC

	No Transfer	Transfer
No of admissions	209	51
Planned admission	23 (8.9 %)	0
Medical/surgical	142/67	42/9
Died	21 (10 %)	13 (25.5 %)
SOFA day of admission	4.1 (SD 3.1)	7.6 (SD 3.3)
SMR	0.51 (0.29–0.83)	0.78 (0.39–1.4)

CONCLUSIONS. Tele-IC was successful implemented in the Netherlands. Severity of illness was significantly greater in transferred patients. Mortality rates in both the transferred and non-transferred patientgroups were lower than predicted and in line with national data.
GRANT ACKNOWLEDGMENT. Achmea health care insurancy.

0917

THE RELATIONSHIP BETWEEN POTASSIUM DERANGEMENTS AND IN-HOSPITAL MORTALITY AND THE INFLUENCE OF IMPLEMENTING A COMPUTER-ASSISTED POTASSIUM REGULATION ALGORITHM

L. Hessels[1], M. Hoekstra[1,2], E.J. Mijzen[1,3], M. Vogelzang[1], A. Oude Lansink[1], M.W. Nijsten[1]

[1]University Medical Center Groningen, University of Groningen, Department of Critical Care, Groningen, The Netherlands, [2]University Medical Center Groningen, University of Groningen, Department of Anesthesiology, Groningen, The Netherlands, [3]Laurentius Hospital, Department of Critical Care, Roermond, The Netherlands

INTRODUCTION. Recent studies demonstrate a relationship between serum potassium levels and mortality in various patient groups[1]. If stricter potassium control can have an effect on outcome is unknown.
OBJECTIVES. To determine the relationship between in-hospital mortality and abnormal serum potassium levels which developed during ICU admission in a cohort of critically ill patients. Secondary objective was to evaluate this relationship after implementation of a computer-assisted potassium regulation protocol (GRIP-II) [2].
METHODS. We performed a retrospective before-after study including all patients admitted to our ICU of a university teaching hospital between 2002 en 2011. All potassium measurements of ICU admission days 2 through 7 were collected. The reference range for potassium in our institution was 3.5–5.0 mmol/L. The authenticity of all severe hypokalemia's and hyperkalemia's were separately verified by examination of patient files. The implementation of GRIP-II at our ICU was started in 2006. In-hospital mortality was the primary outcome measure.
RESULTS. A total of 139,773 potassium measurements in 10,451 patients (including 4,664 patients with computer-assisted potassium regulation) were analyzed. In-hospital mortality was 22 %. There was a U-shaped relationship between the mean serum potassium level as well as the most extreme potassium level and the in-hospital mortality ($P < 0.001$). Analogous to glucose levels, both mildly abnormal and even levels within, but at the extremes, of the reference range were associated with increased mortality. After the implementation of computer-assisted potassium control the incidence of hypokalemia (<3.5 mmol/l) decreased from 5.2 to 1.2 % ($P < 0.001$) and the incidence of hyperkalemia (>5.0 mmol/l) from 4.3 to 3.5 % ($P < 0.001$). Across the whole range from hypokalemia through hyperkalemia in-hospital mortality decreased ($P < 0.001$) after the introduction of GRIP-II.
CONCLUSIONS. In this retrospective study in a large cohort of ICU patients there was a U-shaped relationship between in-hospital mortality and abnormal potassium levels in the ICU. Implementation of computer assistance resulted in improved potassium control.
This retrospective before-after analysis suggests that more stringent control of potassium can influence outcome.
Thus future research, including a large prospective trial on potassium control is warranted.
REFERENCES. 1. Goyal A, Spertus JA, Gosch K. Serum potassium levels and mortality in acute myocardial infarction. JAMA 2012;307:157–64
2. Hoekstra M, Vogelzang M, Drost JT et al. Implementation and evaluation of a nurse centered computerized potassium regulation protocol in the intensive care unit—a before and after analysis. BMC Med Inform Decis Mak. 2010;10:5.

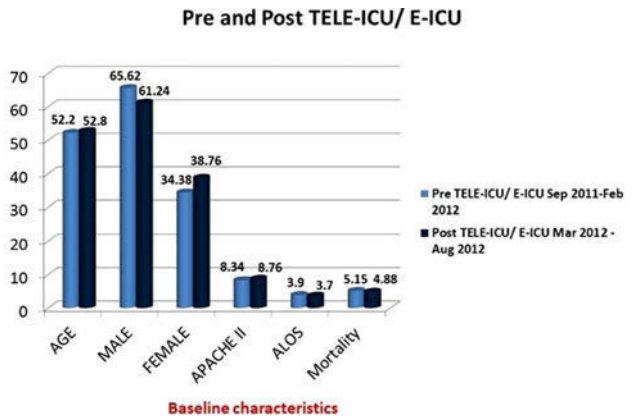
0918

EXTENDING TELE-ICU/E-ICU TO RATIONALIZE ANTIBIOTIC USAGE IN CORONARY CARE UNIT IN INDIAN SCENARIO

S. Gupta[1], P. Bag[1], S. Dewan[1], A. Kaushal[1], A. Varma[1]

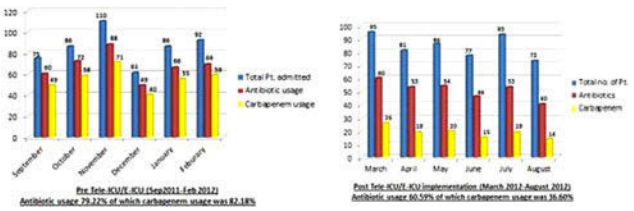
[1]Fortis Escorts Heart Institute, Critical Care Medicine, New Delhi, India

INTRODUCTION. Major changes in healthcare will significantly impact the modes of delivery, quality and landscape of critical care medicine. Remote intervention and monitoring through E-ICU has become a major part of this change continuum[1, 2]. Unfortunately because of worldwide overuse and misuse of antibiotics, common bacteria are becoming resistant to treatment with these ABX, and also leading to cost escalation for hospitals and patient's alike.[3, 4].
OBJECTIVES. To assess the usefulness of E-ICU in appropriate ABX usage and de-escalation in remote Indian coronary care unit (CCU).
METHODS. Retrospective observational study from Sep 2011 to Aug 2012 in a peripheral 10 bed CCU. All patients admitted to CCU were tracked and vitals maintained. Baseline characteristics included chief complaints, physical examination, investigations, X-ray, diagnosis, ABX, cultures, and outcome. All parameters were statistically analysed with pre and post E-ICU implementation in which rational use of ABX was suggested wherever deemed necessary. Chi square test was applied for comparison of patient on ABX and "Student t test" was applied for average dose comparison.
RESULTS. In our analysis baseline characteristics of patients were similar.



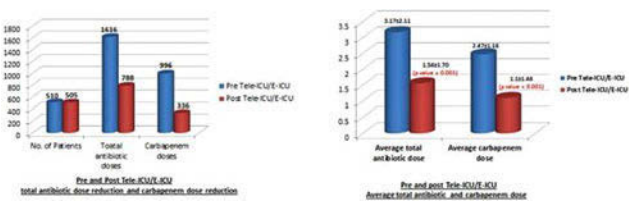
Baseline characteristics pre and post E ICU

From Sep'11 to Feb'12 pre E-ICU total 510 patients were admitted (mean APACHE II score 8.34 ± 3.45, 2SD) of whom 404 (79.22 %) received ABX with carbapenem usage in 332(82.18 %) patient. From Mar'12 to Aug'12 post E-ICU total 505 patients were admitted (mean APACHE II score 8.76 ± 3.48, 2SD) of whom 306 (60.59 %) received ABX with carbapenem usage in 112 (36.60 %). After E-ICU with smart oversight ABX usage decreased from 79.22 to 60.59 % ($P < 0.001$). Among all ABX usage carbapenem decreased from 82.18 to 36.60 % ($P < 0.001$).



ABX usage reduction pre and post E-ICU

Total ABX dose reduction was 828 doses (pre and post E-ICU 1,616 vs 788 respectively) of various ABX combined. Average dose reduced from 3.17 ± 2.11 to 1.56 ± 1.70 ($p < 0.001$) for 510 and 505 patients respectively, of which carbapenem dose reduction was 660 doses (996 vs 336 respectively). Average carbapenem dose reduction from 2.47 ± 1.16 to 1.10 ± 1.46: $p < 0.001$ pre and post E-ICU for 404 and 306 patients respectively.



Average ABX dose reduction pre and post E ICU

CONCLUSIONS. While there is no debate that "TELE INTERVENTION" plays an enormous role in providing optimal care to remote areas in developing world we believe that this benefit could be extended to improve quality parameters including antibiotic usage.
REFERENCES. 1. Willmitch B et al. Clinical outcomes after telemedicine intensive care unit implementation. Crit Care Med. 2012; 40(2):450–4. 2. Sadaka F et al. Telemedicine intervention improves ICU outcomes. Crit Care Res Pract. 2013; Article ID 456389.
3. Spellberg C et al. The epidemic of antibiotic-resistant infections: a call to action for the medical community from the Infectious Diseases Society of America. Infect Dis. 2008; 46 (2) 155–164 4. Todi S. Sepsis: new horizons. Indian J Crit Care Med. 2010; 14:1–2
GRANT ACKNOWLEDGMENT. Not taken any grant.

0919
MORBIDITY AND OUTCOME OF PATIENTS WITH PROLONGED STAY IN PEDIATRIC INTENSIVE CARE UNIT (PICU)

L. Vogiatzi[1], E. Volakli[1], S. Kalamitsou[1], K. Skoumis[1], S. Stabouli[1], A. Violaki[1], M. Sdougka[1]

[1]Ippokration Hospital, PICU, Thessaloniki, Greece

OBJECTIVES. To evaluate morbidity and outcome of patients with prolonged PICU stay and the impact on resource utilization.

METHODS. Cross-sectional retrospective study in PICU of Hippokration Hospital of Thessaloniki including all patients admitted during 2010–2012. Demographic and clinical data were recorded by review of the medical and nursing notes. Statistical analysis was performed with SPSS 19. Fisher's exact test and Mann–Whitney test were used where appropriate.

RESULTS. 228 admissions concerning 205 patients were recorded. The median age on admission was 3 years (range 0.1–19), median PICU length of stay (LOS) was 7 days (range 1–548) and median PRISM score on admission was 7 (range 0–43). In 207 cases mechanical ventilation (MV) was required. LOS was > 14 days in 72 cases, representing 31.5 % of the cases admitted but requiring 82 % of the total days of MV and 79.5 % of the total ICU days. The median PICU stay, in this group of patients, was 21.5 (range 14–548) days. Respiratory insufficiency was the most common admission reason (23/72). LOS > 14 days did not correlate with age, PRISM score or presence of developmental delay (DD), although there was a tendency towards longer stay in children with DD (12.7 vs 31.7 days, $p = 0.13$). These patients were at greater risk of hospital acquired infection (RR: 5.83, 95 % CI 0.08–0.25). Mortality was 9.7 % while the overall mortality was 16.6 % ($p = 0.05$).

CONCLUSIONS. Long stay PICU patients form a small group of PICU patients yet they consume a significant share of PICU resources. Hospital-acquired infections are significant factor of morbidity although mortality is not affected.

REFERENCES.

1. Williams TA, Ho KM, Dobb GJ, Finn JC, Knuiman M, Webb SAR. Effect of length of stay in intensive care unit on hospital and long-term mortality of critically ill adult patients. British J Anaesth. 2010; 104(4):459–464. 2. Marcin JP, Slonim AD, Pollack MM, Ruttimann UE. Long-stay patients in the pediatric intensive care unit. Crit Care Med. 2001;29(3):652–7.

0920
INTENSIVE-CARE UNIT ACQUIRED WEAKNESS (ICUAW): SPECTRUM OF DISABILITY IN SURVIVORS OF PROLONGED MECHANICAL VENTILATION AT 7 DAYS AND 6 MONTHS POST ICU DISCHARGE

J. Batt[1], M.S. Herridge[2], W. Gage[3], S. Mathur[4], J. Cameron[3], C. dos Santos[4]

[1]University of Toronto, Respirology, Toronto, Canada, [2]University of Toronto, Respirology and Critical Care, Toronto, Canada, [3]Toronto Rehabilitation Institute, Department of Occupational Science and Occupational Therapy, Toronto, Canada, [4]University of Toronto, Toronto, Canada

INTRODUCTION. ICU acquired weakness (ICUAW), attributed to Critical Illness myopathy (CIM) and Critical Illness Polyneuropathy (CIP), is a major cause of morbidity for the long term ventilated (>1 week) patient that influences their functional status, disposition, quality of life and health care utilization.

OBJECTIVES. To define the nature of the neuromuscular dysfunction in critically ill patients after an episode of prolonged mechanical ventilation.

METHODS. Nested prospective pilot study aimed at delineating functional capacity, muscle mass and muscle power at 7 days and 6 months post-ICU discharge in a cohort of patients with sustained CIM recruited from Towards RECOVER (Multi-Centre Prospective Cohort Study Evaluating 2-Year Outcomes in Survivors of Prolonged Mechanical Ventilation and their Family Caregivers). Skeletal muscle weakness and functional impairment was assessed by: 6 MW, SF-36, MRC bedside assessment of muscle power, measures of quiet postural standing, gait control, isokinetic strength testing, CT mid-thigh quadriceps femoris cross-sectional area (CSA), nerve conduction studies, and electromyography.

RESULTS. We have recruited 17 patients (13 from St Michaels Hospital over 2 years and 4 from the Toronto General Hospital over 1 year). 22 patients were consented at SMH from a total of 80 individuals in Towards RECOVER. 36 patients were excluded and consent was refused by 23 patients or their substitute decision makers. Of the consented patients 10 died, were transferred to another institution or developed a complication precluding biopsy. A total of 13 individuals have completed both the 7 day and 6 month post discharge clinical measures and biopsies to date. Healthy age and gender matched controls were retrospectively selected from the SMH Healthy Lung Research Registry.

CONCLUSIONS. Patients with sustained ICUAW fall into two phenotypic groups, those that show clinical functional and structural improvement at 6 months and those that have persistent and protracted functional disability and structural abnormalities. Future studies to determine the molecular basis of protracted ICUAW will be determine by molecular analysis of muscle samples from percutaneous biopsy of the vastus lateralis.

REFERENCES.

1. Batt J et al. Am J Respir Crit Care Med. 2013;187(3):238–46. 2. Dos Santos CC, Batt J. Curr Opin Crit Care. 2012;18(5):509–17.

GRANT ACKNOWLEDGMENT. This work is supported by the Canadian Institutes of Health Sciences, The Physicians Services Incorporate and the Ministry of Research and Innovation of Ontario, Canada.

0921
RECOLLECTION OF ICU MEMORIES ONE YEAR POST ICU ADMISSION FOR MULTI-ORGAN FAILURE PATIENTS

S. Rodriguez Villar[1], M. Sánchez Casado[2], C. Carlo Marco Schulke[3], V.A.A. Hortigüela Martín[4], H. Fletcher[5]

[1]Queen Elizabeth Hospital, Critical Care Medicine, London, UK, [2]Hospital 12 de Octubre Virgen de la Salud, Critical Care Medicine, Toledo, Spain, [3]Hospital Virgen de la Salud, Toledo, UK, [4]Hospital Virgen de la Salud, Critical Care Medicine, Toledo, Spain, [5]Queen Elizabeth Hospital, London, UK

INTRODUCTION. The ICU environment is often experienced as adverse and hostile. This has an impact on patients' psychological health and may influence their quality of life, both during their ICU stay and after discharge. Multi organ failure syndrome is the most common cause for a long stay in ICU and requires extensive therapeutic management resulting in significant physiological stress.

AIMS AND OBJECTIVES. To determine whether patients recall experiences of their stay in ICU following admission for multi-organ failure syndrome and to identify the associated factors impacting on the inability to recall.

DESIGN. Medical and surgical patients presenting with multiple organ dysfunction on the first day of admission were included in the study.

METHODS. One year following discharge from ICU, a telephone survey was conducted concerning the ex-patients' memories of their stay in ICU. Data also collected: Personal information, medical history, baseline data, source of admission, reason for admission, specialty (medical or surgical), severity scores and patient data: demographics, length of ICU stay, readmissions, and transfer/discharge destination.

RESULTS. 283 patients were contacted. 62.2 % male; age 59.7 ± 17.5; 67.8 % medical patients; 36.1 % did not have any recollection of their ICU stay, 39.7 % had a positive recollection, 23.3 % negative memories and 0.9 % very unpleasant memories.

CONCLUSIONS. Two-thirds of patients were able to recall their experience. The factors associated with the lack of recollection are: extensive co-morbidity, a high APACHE score, cardiac arrest within the first 12 h of ICU admission, endotracheal intubation, prolonged mechanical ventilation, an increased ICU length of stay and low GCS on admission.

REFERENCES.

1. Badia-Castelló M, Trujillano-Cabello J, Serviá-Goixart L, March-Llanes J y Rodríguez-Pozo A. Recuerdos y memoria del paciente crítico a largo plazo. Desarrollo de estrés postraumático. Med Clin (Barc). 2006; 126(15):561. 2. Besendorfer A. Experience of patients in the intensive care unit. A qualitative study. Pflege. 2002; 15(6):301–8. 3. Burchardi H. Aims of sedation/analgesia. Minerva Anestesiol. 2004; 70(4):137–43. 4. Capuzzo M, Valpondi V, Cingolani E, De Luca S, Gianstefani G, Grassi L, et al. Application of the Italian version of the Intensive Care Unit Memory tool in the clinical setting. Crit Care. 2004;8(1):R48–55. 5. Capuzzo M, Valpondi V, Cingolani E, Gianstefani G, De Luca S, Grassi L, et al. Post-traumatic stress disorder-related symptoms after intensive care. Minerva Anestesiol. 2005;71(4):167–79. 6. Ciesla DJ, Moore FA, Moore EE. Multiple organ failure. In: Feliciano DV, MatoxKL, Moore EE editors. Trauma. 6th edn. New York: Mc Graw-Hill; 2008.

FUNDING. Financial support, including any institutional departmental funds, was not sought for the study.

0922
SETTING UP TELEMEDICINE CRITICAL CARE SERVICE AT A CRITICAL ACCESS HOSPITAL IN THE UNITED STATES

S.V. Chhangani[1,2]

[1]Massachusetts General Hospital, Anesthesia Critical Care and Pain Medicine, Boston, USA, [2]Martha's Vineyard Hospital, Anesthesia, Oak Bluffs, USA

INTRODUCTION. With the aging population and continued healthcare reform, the delivery of critical care is likely to face significant workforce issues, especially in the United States (US). Martha's Vineyard Hospital (MVH) is one of 1,328 critical access hospitals (CAH) in the US with 3 ICU beds without critical care service. CAH is typically located in a rural healthcare environment and has 25 or less total beds. We report the results of initial step in establishing telemedicine critical care service (TM-CCS) at MVH.

OBJECTIVES. The goal of this project was to establish TM-CCS between MVH and a tertiary care hospital within the same healthcare system. The phase 1 of the project began with critical care education and analysis of transfer data.

METHODS. Total number of transfers out of MVH between 2009 and 2012 were analyzed. Based on needs assessment of MVH providers the Fundamental Critical Care Support Course (FCCS) was administered during the phase 1 of the TM-CCS project.

RESULTS. 333 patients were transferred from MVH between 2009 and 2012. Of these 22 % were admitted to a non-ICU bed at the tertiary care hospital. Majority of ICU transfers occurred between May and December. Average hospital LOS was 8 days (range 0–28 days). The common reasons for transfer were cardiac (acute coronary event, arrhythmia or heart failure), respiratory (aspiration, intoxication, pneumonia, allergic reaction), GI hemorrhage, and sepsis. Fifteen MVH providers (12 nurses, 2 respiratory therapists and 1 physician) took the FCCS Course. Majority of the participants highly rated the importance of recognition and management of acute life-threatening conditions, prioritizing assessment needs of critically ill patients, and sepsis. Because of FCCS course the participants reported improved focus on patient monitoring and interpretation of critical lab data and became comfortable with ventilator and sepsis management. Phase 2 of the project would establish 24/7 TM-CCS oversight to MVH.

CONCLUSIONS. Transfer of patients frequently occurs between CAH and tertiary care hospital. Although many transfers are unavoidable, patients with potentially short-stay and rapidly reversible critical conditions may be safely cared for at CAH. TM-CCS represents potential solution to limited critical care workforce issues. Providing TM-CCS oversight and FCCS education can be the keys to paradigm shift in providing critical care at CAH and improve its bottom-line. More physician buy-in is needed with FCCS education at CAH.

REFERENCES.

1. Chest 2004. 2. J Rural Health 2012.

GRANT ACKNOWLEDGMENT. The FCCS Course was supported by MVH and Massachusetts General Hospital.

0923
TRIANGULATING PERCEIVED NEEDS, PEER ASSESSMENT AND CLINICAL AUDIT TO DESIGN EDUCATIONAL PROCESSES FOR ICU HEALTH CARE PROFESSIONALS: INITIAL REPORT ON THE DEVELOPMENT OF THE 'TELEPROMETHEUS' E-LEARNING PLATFORM

S. Kokkoris[1,2], M. Foka[1,3], N. Stylianides[3,4], E. Demetriadou[1,3], A. Ioannides[2], A. Samara[1], E. Kondili[5], M. Epiphaniou[6], G. Christodoulou[6], P. Papapavlou[6], A. Pavlakis[6], D. Georgopoulos[5], S. Nanas[7], T.C. Kyprianou[1,2,3]

[1]Nicosia General Hospital, Dept of Intensive Care Medicine, Nicosia, Cyprus, [2]St Georges University of London Medical School at University of Nicosia, Nicosia, Cyprus, [3]Intensive Care Forum NGO, R&D Division, Nicosia, Cyprus, [4]University of Cyprus, Dept of Electrical Engineering, Nicosia, Cyprus, [5]University Hospital of Heraklion, Dept of Intensive Care Medicine, Heraklion, Greece, [6]Open University of Cyprus, Nicosia, Cyprus, [7]Evangelismos General Hospital, First Critical Care Dept, Athens, Greece

INTRODUCTION. Training in demanding professional environments, such as that of an ICU, combines theoretical knowledge, practical skills, integration of information technology (IT) into clinical practice and attitude formation tailored to extreme conditions. It is also a challenge for Health Education and IT, given the high standards (zero tolerance for errors), high cost, time constraints and the proven inefficiency of conventional educational methodology. 'Teleprometheus' is a novel e-learning platform for ICU professionals and patients' relatives, comprising four distinct components:

a) An e-learning platform (Moodle),

b) virtual classrooms (Blackboard Collaborate),
c) Interactive Infokiosks, installed inside the ICU (guidelines, protocols, checklists and educational videos for health professionals) and outside the ICU (information for relatives).
OBJECTIVES. To propose a novel approach to the design of an integrated educational program tailored to state-of-the-art IT services.
METHODS. To determine the educational needs (thus the content and priorities), we considered the following parameters: (a) Perceived needs of each professional team determined by questionnaires, (b) Clinical audit, based on real data from the European 'PROSAFE' quality assessment consortium and (c) Peer assessment by senior ICU staff. Relevant educational processes have pre-defined learning objectives and expected outcomes. Clinical competency is perceived as: (a) theoretical knowledge adequacy, (b) practical skills mastery and (c) proposed attitude adoption (Fig. 1).
RESULTS. Physicians rated procedures on a priority scale (1: low to 5:utmost) as follows : difficult airway management (mean (SE)) 4.1 (0.9), mechanical ventilation 4.0 (1.7) and ultrasound use 3.7 (1.1). ICU nurses self-rated skills on a competency scale (1: incompetent to 5: excellent) as follows: HFO 2.4 (1.3), CRRT devices 3.6 (1.4) and cardiac output measurement devices 3.7 (1.1). Regarding nurses' educational needs, however, both PROSAFE metrics and senior staff's opinion identified catheter-related bloodstream infections as a top-priority issue. Therefore, priority was given to the development of relevant training modules by means of lectures and seminars on Moodle, professional educational videos and the use of interactive screens and mute displays for easy retrieval/projection of educational material in the working environment. Similar approach will be followed for other educational needs.
CONCLUSION. Triangulating perceived clinical needs, outcome metrics and expert peer review feedback, can tailor continuous professional education to the local ICU needs. Future perspectives include individualization of training programs, 'injection' of educational material into the actual clinical practice and integration of other novel solutions, such as m-Educator and virtual patients.
Grant: EU cross-border co-operation program 2007–2013: C(2008) 1131/28-03-2008 Call ID: K1, Protocol ID: 9115, Contract No:K1_3_01

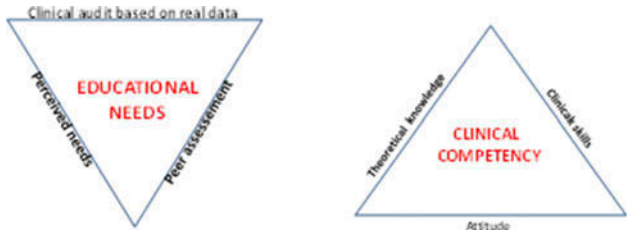


Fig. 1

0924
CORRELATION BETWEEN NURSING STUFF AND MONITORING GENERATED RECORDS OF CORE TEMPERATURE IN ICU PATIENTS

A. Vakalos[1], M. Gabra[1]

[1]Xanthi General Hospital, ICU, Xanthi, Greece
INTRODUCTION. Nursing stuff generated records may be compromised by effort to favor certain outcome, may be planned and may be affected by individual flow. The according error is called systemic bias. On the other hand, monitoring generated records may be compromised by characteristics of the system, like imperfect calibration of measurement instruments, leading to systematic error called systematic bias.
OBJECTIVES. The aim of our study was to compare nursing stuff generated core temperature records to monitoring generated core temperature records and to find out the kind of bias according to the nursing shift, in ICU patients.
METHODS. During February 2013, we looked for hourly core temperature records (rectal, ^{o} C) to ten daily nursing stuff sheets as well as to corresponding monitoring generated core temperature records, after accurate time synchrony was obtained. We looked retrospectively for 240 couple records (N) divided per 80 to morning (1st), afternoon (2nd) and night (3rd) nursing shift. Normality test was obtained using Kolmogorow - Smirnov method. Using linear correlation method, we looked for linear slope, correlation coefficient (r), and coefficient of determination (r^2), and by linear regression method using ANOVA test we looked for p value. We operated runs test to measure the points above, below and on to the line.
RESULTS. We found out 156 couple of records. In 84 cases there was either no nursing stuff or monitoring generated records.

Results

	N	Slope	r	r^2	p	above	below	on to
1st	53	0.79	0.77	0.60	<0.0001	17	36	11
2nd	55	0.77	0.82	0.68	<0.0001	20	35	10
3rd	48	0.60	0.62	0.39	<0.0001	17	31	7

CONCLUSIONS. According to our data, there was a lot of missing records, but most was marked during the night nursing stuff shift, while the correlation of the parameters was less strong during the 3rd shift. Nevertheless, the smaller number of points above the line suggests that the individual error, systemic bias, was greater during all shifts. Although the calculated p value was extremely low in all cases, our data suggest that monitoring generated core temperature records are more reliable during all shifts.

0925
USING INFORMATION TECHNOLOGY TO IMPROVE PROCESS COMPLIANCE TO CENTRAL LINE INSERTION AND MAINTENANCE BUNDLES: 7 YEAR EXPERIENCE

A. Hermon[1], P. Lawrence[2], T. Szakmany[1]

[1]Royal Glamorgan Hospital, Anaesthesia, Critical Care and Theatres, Llantrisant, UK, [2]Royal Glamorgan Hospital, IT Department, Llantrisant, UK
INTRODUCTION. Catheter related bloodstream infection (CRBSI) is still a common problem on the UK ICUs. The surveillance of central venous catheter (CVC) related infections became mandatory in Wales in 2007. Process compliance with all the elements of the care bundle has been shown to be the major factor in reduction of CRBSI rate (1).
OBJECTIVES. We investigated if records generated in the clinical information system (CIS) can be used for contemporary monitoring of process compliance and outcome.
METHODS. Retrospective audit on the rate of CRBSI for a 3 months period before the implementation of the CVC bundle provided baseline data in 2006. Prospective rolling audit was carried out after the bundle was introduced in 2007. The CVC bundle consisted hand hygiene, barrier precautions on insertion, 2 % chlorhexidine skin preparation, using femoral site as last resort, daily review of necessity of central access, daily inspection of insertion site, use of TPN on a dedicated port and maintaining asepsis when accessing the line. Compliance data was collected based on the information recorded in our CIS (Carevue, Philips). Weekly compliance data was presented at the audit meetings and also posted on the noticeboard. CRBSI diagnosis was made according to the HELICS criteria. We collected data on CRBSI rate and if the patient left the unit with a CVC line in situ. For statistical analysis Chi square and Wilcoxon tests were used.
RESULTS. We have seen a significant increase in the compliance with the bundle (55 % to 100 %) and it resulted a significant and sustained reduction in CRBSI rate (15.9, 6.4, 4.1, 3.5, 0.0, 0.0, 0.1/1,000 catheter days in 2006, '07, '08', '09, '10, '11, '12; respectively) and number of patients transferred to the ward with CVC lines (all $p < 0.05$ compared to baseline). Compliance data was accessible from the electronic care records, with reports generated on a monthly basis.
CONCLUSIONS. 100 % compliance with the bundle over a sustained period was necessary to eliminate CRBSI. The use of the CIS enables us to display real-time compliance data, which reinforces this message, even with high medical and nursing staff turnover. Automated weekly reports on CVCs help to identify any outliers.
REFERENCES. 1. Berhe M, Edmond MB, Bearman G. Measurement and feedback of infection control process measures in the intensive care unit: impact on compliance. Am J Infect Control. 2006;34(8):537–9.

0926
FINGER VEIN PATTERN TECHNOLOGY: A NEW PROMISING MEANS OF SECURE PATIENT IDENTIFICATION IN HOSPITALS

S. Solangasenathirajan[1], J. Khera[1], M. Jones[1], D. Hett[2], M. Jonas[2]

[1]University of Southampton, Southampton, UK, [2]University Hospital Southampton Foundation Trust, Southampton, UK
INTRODUCTION. Patient identification is a major challenge within any medical organisation. The prevention of the catastrophic sequence leading to a **'Never Event'**, i.e. the wrong patient, wrong diagnosis and wrong treatment relies only on loosely clipped plastic wristbands. These bands have several potential lethal flaws including loss, removal and application to incorrect patients.[1] In a UK national survey (NPSA 2003–2005), 236 'never events' were identified related to wristbands.[2]
Biometric vein pattern technology (Hitachi Ltd/CSS FastVein) has been shown to be a high fidelity means of personal identification.[3] Scanning the fingertip produces an image of the venous pattern which is unique and remains so throughout life. It is also resistant to skin surface changes, thus making it ideal for identification.[3] This technology has never been used for patient identification but its simplicity, ease of use and similar false positive rate to iris scanners used in airports suggests that it could provide a robust solution to patient misidentification.[3]
OBJECTIVES. 1. To investigate the utility of a finger vein scanner as a means of correctly identifying patients within hospitals.
2. Explore any confounding medical factors using this technique.
METHODS. The study was carried out following ethical approval on the Surgical Day Unit. Patients were recruited prior to surgery and enrolled onto the system by scanning the right and left index fingers with the finger vein scanner. They were later re-scanned with the device to assess whether they could be correctly re-identified. Wristband usage on the unit was also noted.
RESULTS. Findings show the device had a 100 % enrolment rate and following re-scanning the correct recognition rate was found to be 97 % (95 % C.I. 0.915–0.990). The false rejection rate (FRR) was found to be 2 % (95 % C.I. 0.006–0.070). In these cases the system was unable to identify the patient due to poor patient compliance and incorrect finger positioning.
9 patients that were recruited onto the study did not have wristbands prior to theatre with obvious implications.
CONCLUSIONS. Scanning the digital venous plexus has been shown to be a highly reliable method to identify people. The system never mismatched an individual suggesting this concept could be a major component to future patient identification. With such a system in place, never events involving patient misidentification could be significantly attenuated.
REFERENCES. 1. Ranger CA, Bothwell S. Making sure the right patient gets the right care. Quality Safety Health Care. 2004;13:329. doi:1136/qshc.2004.012005. 2. Ranger C, Bothwell S. Safer Patient Identification. National Patient Safety Authority. Report number:0236, 2005. 3. Jain A, Ross A, Prabhakar S. An introduction to biometric recognition. Trans Inf Technol Biomed. 2004;14(1):4–20. doi:10.1109/TCSVT.2003.818349
GRANT ACKNOWLEDGMENT. The Research and Development Department of the University Hospital Southampton NHS Foundation Trust.

Out-of-hospital cardiac arrest: ICU management: 0927–0940

0927

BRAIN DEATH OCCURRENCE AFTER OUT-OF-HOSPITAL CARDIAC ARREST: ANALYSIS OF THE PARISIAN REGISTRY OF COCHIN HOSPITAL

G. Geri[1,2,3], N. Mongardon[1,2], G. Franchineau[1], J. Charpentier[1], J.-D. Chiche[1,2], J.-P. Mira[1,2], J.-P. Empana[3], F. Dumas[2,3,4], A. Cariou[1,2,3]

[1]Cochin Hospital, Medical Intensive Care Unit, Paris, France, [2]Paris Descartes University, Paris, France, [3]Sudden Death Expertise Center, INSERM U 970, Paris Cardiovascular Research, Paris, France, [4]Cochin Hospital, Emergency Department, Paris, France

INTRODUCTION. Neurological outcome is the major concern of physicians taking in charge comatose survivors of out-of-hospital (OHCA) patients. In the most severe cases, some of these patients develop further brain damages leading to brain death (BD) and become candidate for organ donation. At that time, it is difficult to identify these patients at the early phase.

OBJECTIVES. To describe main characteristics of OHCA patients according to BD occurrence (according to French law) and to identify predictive factors associated with BD occurrence.

METHODS. Retrospective single centre study between 2006 and 2012 of 1,609 consecutive OHCA patients. We performed a univariate then a multivariate analysis to pick up predictive factors of BD occurrence in OHCA patients.

RESULTS. After initial resuscitation, 1,609 OHCA patients (median age 59.6 years 71.5 % of male) were admitted alive in ICU (all comatose) and were included in the study. BD occurred in 117 patients (7.3 %). OHCA followed by BD occurred most frequently at home, was witnessed in 44.6 % of cases, and related to a cardiac aetiology in 53.8 % whereas neurological related OHCA were evidenced in 66 (4.1 %) cases. The initial rhythm was shockable in 39 % of cases. Median no flow and low flow durations were 4 (Interquartile Range [IQR] 0;9) and 15 (IQR 9;25) minutes, respectively. Post resuscitation shock was observed in 59.6 % of cases. BD occurred more frequently in women (41 vs. 27.5 %, $p < 0.01$), in younger patients (53.6 vs. 60y, $p < 0.01$), in unwitnessed OHCA (68.4 vs. 54.4 %, $p < 0.01$), and in unshockable patients (86.3 vs. 59 %, $p < 0.01$). BD was more frequently observed in neurologic related OHCA compared to non-neurologic related OHCA (12.8 vs. 3.4 %, $p < 0.01$). Median no flow was longer in patients developing BD compared to those not developing BD (7 vs 4 min, $p < 0.01$). Therapeutic hypothermia had been performed in similar proportions in the two groups (70.2 and 73.5 %, $p = 0.45$).

In multivariate analysis, neurological cause of OHCA (OR 2.36, 95 %CI 1.25; 4.47), female gender (OR 1.55, 95 %CI 1.03; 2.33), age lower than 60 years (OR 2.30, 95 %CI 1.52; 3.49) and an initial unshockable rhythm (OR 3.65, 95 %CI 2.09; 6.37) were independently associated with BD occurrence.

CONCLUSIONS. BD occurred in 7.3 % of OHCA patients, and was typically observed in young women admitted after a neurological-related OHCA. Long term follow-up of transplanted organs from these donors is actually in process and will give further informations.

0928

RANDOMISED COMPARISON OF THE EFFECTIVENESS OF THE LARYNGEAL MASK AIRWAY SUPREME, I-GEL AND CURRENT PRACTICE IN THE INITIAL AIRWAY MANAGEMENT OF OUT-OF-HOSPITAL CARDIAC ARREST (REVIVE-AIRWAYS): FEASIBILITY RESULTS

J. Benger[1], D. Coates[2], S.E. Davies[3], R. Greenwood[4], J. Nolan[5], M. Rhys[2], M. Thomas[4], S. Voss[1]

[1]University of the West of England, Academic Department of Emergency Care, Bristol, UK, [2]South Western Ambulance Service NHS Foundation Trust, Exeter, UK, [3]University of Bristol, Bristol, UK, [4]University Hospitals Bristol NHS Foundation Trust, Bristol, UK, [5]Royal United Hospital, Bath, UK

INTRODUCTION. Traditionally, tracheal intubation has been accepted as the optimal form of airway management during out of hospital cardiac arrest (OHCA), but recent recommendations have suggested that supraglottic airway devices (SADs) are safe and effective alternatives. However, retrospective analyses of large OHCA databases have questioned the value of both tracheal intubation and SADs, and there is an acknowledged need for a prospective, randomised trial.

OBJECTIVES. To assess the feasibility of a prospective cluster randomised trial to compare the ventilation success of two newer SADs: the i-gel and the laryngeal mask airway supreme (LMAS) to usual practice (principally tracheal intubation) during the initial airway management of OHCA.

METHODS. We used a cluster-randomised design, in which participating paramedics were randomised to use either the i-gel or the LMAS or usual practice for all cases of non-traumatic adult OHCA that they attended over a 12 month period from March 2012.

The study tested the hypothesis that this trial design is feasible, and capable of establishing whether ventilation success can be achieved, as well as measuring a range of other outcomes, including regurgitation, further airway interventions, return of spontaneous circulation (ROSC), survival to hospital discharge and neurological status at 3 months.

RESULTS. We set out to recruit 150 paramedics from the South Western Ambulance Service. 535 paramedics were approached of whom 184 consented and 171 attended study training. 9 paramedics withdrew during data collection. The number of OHCA patients attended by each paramedic varied between 0 and 11, and followed a Poisson distribution. 10 % of paramedics attended no eligible patients.

610 patients were enrolled, and this was consistent throughout the 12 months and across study arms. Overall, 83 % of patients were adherent to the study protocol, increasing to an adherence of >90 % when legitimate reasons for non-compliance (such as early ROSC) were accounted for. 86 % of patients discharged from hospital consented to follow up at 3 months.

CONCLUSIONS. We have shown that a prospective trial of alternative airway management strategies in OHCA, cluster randomised at the level of individual paramedics, is feasible. Recruitment of both paramedics and patients exceeded our pre-determined targets, and there was consistent recruitment with good protocol compliance, data completeness and follow-up rates. We now plan to proceed to a full-scale trial powered to detect a difference in mortality between the groups.

GRANT ACKNOWLEDGMENT. This is independent research funded by the National Institute for Health Research (NIHR) under its Research for Patient Benefit (RfPB) Programme. The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health.

0929

PROGNOSTIC VALUE OF CELL-FREE DNA IN PLASMA OF OUT-OF-HOSPITAL CARDIAC ARREST SURVIVORS QUANTIFIED AT ICU ADMISSION AND 24 HOURS FOLLOWING ADMISSION

I. Gornik[1,2], V. Gasparovic[1,2], D. Milicic[1,3], V. Degoricija[1,4], B. Skoric[1,3], E. Fortner[1], J. Wagner[5], O. Gornik[6], G. Lauc[6,7]

[1]University of Zagreb School of Medicine, Zagreb, Croatia, [2]University Hospital Centre Zagreb, Department of Medicine, Medical ICU, Zagreb, Croatia, [3]University Hospital Centre Zagreb, Department of Cardiology, Zagreb, Croatia, [4]Sisters of Mercy University Hospital Center, Department of Medicine, Medical ICU, Zagreb, Croatia, [5]Universtiy J.J. Strossmayer, School of Medicine, Department of Medical Biology, Osijek, Croatia, [6]University of Zagreb, Faculty of Pharmacy and Biochemistry, Department of Biochemistry and Molecular Biology, Zagreb, Croatia, [7]Genos LTD, Molecular Genetics Laboratory, Zagreb, Croatia

INTRODUCTION. Cell-free DNA has been associated with outcome in several acute conditions including two reports concerning the outcomes after cardiac arrest that found association of circulating DNA quantities at admission with mortality. The origins of cell-free DNA are primarily necrosis and apoptosis, which in cardiac arrest occur during ischemia ("no-flow" and "low-flow" period), during reperfusion injury and as a consequence of post-arrest inflammatory response.

OBJECTIVES. Respecting the facts that significant cellular damage may occur during the post-arrest period, and that that damage might be reduced by mild therapeutic hypothermia, we investigated the prognostic value of cell free DNA at ICU admission and 24 h after admission.

METHODS. A prospective study was conducted in three intensive care units in university affiliated hospitals and included patients admitted after a non-traumatic out-of-hospital cardiac arrest and successful resuscitation. Patient data were collected in accordance with the Utstein protocol. Therapeutic hypothermia was performed according to ICU policies. Blood for cell-free DNA quantification was sampled at admission and at 24 ± 1 h after admission. Outcome measures were hospital morality and cerebral performance expressed with CPC scale at discharge.

RESULTS. Inclusion criteria were met in 67 patitenst; 24-h mortality was 37.3 % and hospital mortality 71.6 %. The following variables were associated with 24-h mortality in univariate analysis: asystole as the presenting rhythm, "no-flow" time, "low-flow" time and cell-free DNA at admission (median 0.081 in survivors vs. 0.160 ng/μl in non-survivors; $P = 0.038$). Multivariate analysis that included the above variables showed that no-flow time and low-flow time were independently associated with 24-h mortality.

Hospital mortality was associated with following factors: "low flow" time, coronary intervention, cell-free DNA at ICU admission and at 24 h after admission (median 0.042 vs. 0.188 ng/μl; $P = 0.048$). ROC curve for cell-free DNA 24 h after admission showed sensitivity of 81.0 % and specificity of 78.3 % for the cut-off value of 0.115 ng/μl.

Multivariate analysis showed that "low-flow" time and cell-free DNA at 24 h after ICU admission were independently associated with hospital mortality.

Cell free DNA showed different dynamics in patients who were and who were not treated with mild therapeutic hypothermia: it decreased in treated patients and slightly increased in non-treated patients.

CONCLUSIONS. Cell-free DNA quantity at ICU admission and 24 h after admission is associated with hospital mortality. Further studies will need to additionally investigate possible practical use of this new laboratory marker in patients resuscitated from cardiac arrest.

0930

COAGULOFIBRINOLYTIC CHANGES IN PATIENTS WITH DISSEMINATED INTRAVASCULAR COAGULATION ASSOCIATED WITH POST-CARDIAC ARREST SYNDROME—FIBRINOLYTIC SHUTDOWN AND INSUFFICIENT ACTIVATION OF FIBRINOLYSIS LEAD TO ORGAN DYSFUNCTION

T. Wada[1], S. Gando[1], A. Mizugaki[1], Y. Yanagida[1], H. Yamamoto[1], Y. Ono[1], D. Miyamoto[1], M. Sugano[1], M. Hayakawa[1], A. Sawamura[1], M. Ieko[2]

[1]Division of Acute and Critical Care Medicine, Department of Anesthesiology and Critical Care Medicine, Department of Emergency and Critical Care Medicine, Sapporo, Japan, [2]School of Density, Health Sciences University of Hokkaido, Department of Internal Medicine, Tobetsu, Japan

INTRODUCTION. Post-cardiac arrest syndrome (PCAS) is often associated with disseminated intravascular coagulation (DIC), thus leading to the development of multiple organ dysfunction syndrome (MODS) (1). The pathophysiology of MODS in patients with DIC is thought to involve an imbalance between coagulation and fibrinolysis due to activation of coagulation, inhibition of fibrinolysis (fibrinolytic shutdown) and insufficient activation of fibrinolysis (2).

OBJECTIVES. The aim of this study was to examine the pathophysiological relationships among coagulation, fibrinolysis and fibrinolytic shutdown by evaluating the levels of coagulofibrinolytic markers, including soluble fibrin, thrombin-activatable fibrinolysis inhibitor (TAFI), tissue plasminogen activator-plasminogen activator inhibitor-1 complex (tPAIC), plasmin-alpha2 plasmin inhibitor complex (PPIC), D-dimer, neutrophil elastase and fibrin degradation product by neutrophil elastase (EXDP).

METHODS. A total of 52 resuscitated patients were divided into two subgroups: 22 DIC patients and 30 non-DIC patients. DIC was diagnosed based on the Japanese Association for Acute Medicine (JAAM) criteria. This study compared the levels of these markers between the groups with and without DIC and evaluated the relationship of each marker to organ dysfunction.

RESULTS. The levels of soluble fibrin, D-dimer, PPIC, tPAIC, EXDP and neutrophil elastase in the DIC patients with PCAS were significantly higher than those in the non-DIC patients. The values of tPAIC and JAAM DIC scores were found to be independent predictors of increased SOFA scores in the DIC patients. The MODS patients demonstrated significantly higher levels of soluble fibrin and tPAIC; however, the levels of TAFI, D-dimer and EXDP were identical between the patients with and without MODS. In addition, positive correlations were observed between the levels of tPAIC and EXDP in the patients with non-MODS; however, no correlations were observed between these markers in the MODS patients.

CONCLUSIONS. Thrombin activation and fibrinolytic shutdown play important roles in the development of organ dysfunction in PCAS patients. Neutrophil elastase-mediated fibrinolysis cannot overcome fibrinolytic shutdown in DIC patients with PCAS, thus resulting in the development of MODS.
REFERENCES. 1. Gando S, et al. Tissue factor and tissue factor pathway inhibitor levels during and after cardiopulmonary resuscitation. Thromb Res. 1999;96:107–13. 2. Asakura H, Ontachi Y, Mizutani T, Kato M, Saito M, Kumabashiri I, et al. An enhanced fibrinolysis prevents the development of multiple organ failure in disseminated intravascular coagulation in spite of much activation of blood coagulation. Crit Care Med. 2001;29:1164–8.
GRANT ACKNOWLEDGMENT. This study was supported in part by a Grant-in-Aid for Scientific Research (2009-21249086) and a Grant-in-Aid for Young Scientists (B) (2011-23792091) from the Ministry of Education, Science, Sports and Culture of Japan.

0931
EFFICACY OF CEREBRAL REGIONAL SATURATION OF OXYGEN AS A PROGNOSTIC INDICATOR IN OUT-OF-HOSPITAL CARDIOPULMONARY ARREST PATIENTS

T. Fukuda[1], T. Matsubara[1], N. Ohashi[1], M. Gunshin[1], K. Doi[1], T. Ishii[1], Y. Kitsuta[1], S. Nakajima[1], N. Yahagi[1]

[1]The University of Tokyo, Department of Emergency and Critical Care Medicine, Tokyo, Japan
INTRODUCTION. The prognosis of out-of-hospital cardiopulmonary arrest (OHCA) patients is poor, and medical care may be often futile for them [1,2]. In the Guidelines for Cardiopulmonary Resuscitation 2010, the criteria to consider termination of resuscitation (TOR) was proposed [3,4]. However, these criteria cannot always accurately predict the patient's prognosis [5]. Currently, no prognostic value has been established as a reliable and immediate technique to predict the prognosis of OHCA patients. However, recently, it is expected that measurement of the cerebral regional saturation of oxygen (rSO_2) by using near-infrared spectroscopy could predict the prognosis of OHCA patients [6].
OBJECTIVES. This study aimed to examine the usefulness of the rSO_2 value as a prognostic indicator for OHCA patients on arrival.
METHODS. This was a single-center prospective cohort study of patients who suffered OHCA and were transported to our hospital between October 2012 and January 2013. The subjects were assigned to either the $rSO_2 \leq 25$ % group or the $rSO_2 > 25$ % group. We investigated the patients' characteristics, rSO_2 value, pH, and lactate level, rate of return of spontaneous circulation (ROSC), survival rate, and whether they met the TOR criteria or not.
RESULTS. Among the 30 subjects (male 56.7 %; mean age 67.6 ± 13.1 years), 23 (76.7 %) showed $rSO_2 \leq 25$ % and 7 (23.3 %) showed $rSO_2 > 25$ %. There was a significant difference in the rSO_2 value between the 2 groups (15.8 vs. 38.0; $p < 0.005$). However, no significant difference was observed in the age, sex, initial cardiac rhythm, pH, lactate level, conformity rate of TOR, rate of ROSC, and survival rate.
CONCLUSIONS. In this study, no significant difference in the prognosis of OHCA patients was observed based on the difference in the rSO_2 value. However, the rate of ROSC and survival rate tended to be higher in the $rSO_2 > 25$ % group than in the $rSO_2 \leq 25$ % group. Furthermore, there were no survivors in the $rSO_2 \leq 25$ % group. Although further large-scale studies that consider even neurologic prognosis are required, at least the measurement of the rSO_2 value in OHCA may be effective for selecting patients for whom treatment would be futile.
Measurement of the rSO_2 value may not always be effective for predicting the prognosis of OHCA patients but might be effective to select patients that can be excluded from treatment.
REFERENCES.1.Fukuda T et al. Resuscitation 2013 (in press) doi: 10.1016/j.resuscitation.2013.02.019. 2. Fukuda T. J Jpn Assoc Acute Med. 2010; 23:101–8. 3. Morrison LJ et al. Circulation 2010; 122:S665–75. 4. Lippert FK et al. Resuscitation 2010; 81:1445–51. 5. Fukuda T et al. Crit Care 2013; 17(Suppl 2):P303 6. Ito N et al. Resuscitation 2012; 83:46–50.
GRANT ACKNOWLEDGMENT. This research was supported by no Grants.

0932
NON-INVASIVE ASSESSMENT OF CARDIAC INDEX USING NEAR-INFRARED SPECTROSCOPY IN CARDIAC ARREST SURVIVORS WITH CARDIOGENIC SHOCK

P. Ostadal[1], A. Kruger[1], D. Vondrakova[1], M. Janotka[1], P. Neuzil[1]

[1]Cardiovascular Center, Na Homolce Hospital, Prague, Czech Republic
INTRODUCTION. Cerebral and peripheral oximetry (based on near-infrared spectroscopy - NIRS) is an established non-invasive method for measurement of tissue oxygen saturation in critically ill patients. The relationship between cerebral/peripheral oximetry and hemodynamic parameters is, however, not fully understood.
OBJECTIVES. We analyzed the relationship between cerebral/peripheral oximetry and cardiac index, systemic vascular resistance, and mean arterial pressure in cardiac arrest survivors with cardiogenic shock.
METHODS. Eighteen cardiac arrest survivors with cardiogenic shock hospitalized at coronary care unit were included in the analysis. All patients were treated with inotropic agents, vasopressors, and endovascular therapeutic hypothermia. Central venous and arterial pressures were monitored invasively, cardiac index and systemic vascular resistance index were measured using pulmonary artery catheter. Cerebral oximetry with two forehead sensors and peripheral oximetry with two sensors placed at calves were monitored with NIRS. Up to four hemodynamic measurements were performed in each patient with at least 6-h interval between measurements.
RESULTS. We observed significant correlation between peripheral oximetry values and cardiac index (Spearman r = 0.81, 95 % Confidence Interval [95 %CI] 0.71–0.87, $p < 0.0001$), systemic vascular resistance index (Spearman r = −0.45, 95 %CI −0.62 to −0.23, $p < 0.0001$), and mean arterial pressure (Spearman r = 0.58, 95 %CI 0.38–0.71, $p < 0.0001$). We found also significant correlation of cerebral oximetry with cardiac index (Spearman r = 0.55, 95 %CI 0.37–0.70, $p < 0.0001$) and systemic vascular resistance index (Spearman r = −0.47, 95 %CI −0.63 to −0.27, $p < 0.0001$). On the other hand, cerebral oximetry did not correlate with mean arterial pressure. Linear regression analysis revealed that cardiac index could be calculated from equation: cardiac index = somatic oximetry/24.0 ($p < 0.0001$).
CONCLUSIONS. Our results indicate that cerebral and especially peripheral oximetry values correlate with major hemodynamic parameters in cardiac arrest survivors with cardiogenic shock. We suggest that non-invasive peripheral NIRS oximetry could be used for estimation of cardiac index estimation in these patients.
GRANT ACKNOWLEDGMENT. This study was supported by a grant from the Czech Ministry of Health, Nr. NT12153.

0933
ACUTE KIDNEY INJURY AFTER CARDIAC ARREST

O. Tujjar[1], G. Mineo[1], B. Poyatos[1], K. Donadello[1], S. Scolletta[1], J.-L. Vincent[1], F.S. Taccone[1]

[1]Hopital Erasme, Bruxelles, Belgium
INTRODUCTION. Acute kidney injury (AKI) is a frequent complication in critically ill patients and may result in increased morbidity and poor outcome. Few data exist on the risk factors and time course of AKI development after cardiac arrest (CA).
OBJECTIVES. The aim of this study was to evaluate the occurrence and time course of AKI in a single-center cohort of CA patients.
METHODS. We reviewed all patients consecutively admitted for CA to our ICU from January 2008 to October 2012 who stayed in our Dept. of Intensive Care for at least 48 h. Demographics, comorbidities, development of sepsis, type, location and duration of arrest, use of vasopressors, mechanical ventilation, renal replacement therapy (RRT) and of potential nephrotoxic agents were recorded. AKI was defined as a daily UO < 0.5 ml/kg/h and/or an increase in serum creatinine of ≥ 0.3 mg/dL from baseline levels. Creatinine clearance (CrCl) was calculated on urinary excretion over the first day of ICU stay. Neurological outcome was assessed using the Cerebral Performance Category (CPC, 1 = good recovery; 5 = dead) scale at hospital discharge.
RESULTS. Of a total of 253 patients admitted for CA over the study period, 199 patients met the inclusion criteria (median age 62 years; 134 male gender). A total of 88 (44 %) patients developed AKI during the ICU stay, with a median time to AKI of 2 [2–3] days since admission. Patients with AKI had higher proportion of witnessed CA (73/88 vs. 77/114, $p = 0.01$) and in-hospital CA (42/88 vs. 34/114, $p < 0.001$) than those without AKI. They also had a lower CrCl on day 1 since admission (23 [8–45] vs. 66 [27–120] ml/min, $p < 0.001$). Patients with AKI were more commonly treated with vasopressors (63/88 vs. 43/114, $p < 0.001$), dobutamine (73/88 vs. 40/114, $p < 0.001$) or a mechanical cardiac support device (i.e. IABP or ECMO, 24/88 vs. 15/114, $p = 0.01$) and had a greater fluid balance over the first 48 h of ICU stay (4.6 [3.1–8.5] L vs. 3.3 [1.9–5.2] L, $p < 0.001$). These patients had a trend towards a higher ICU mortality (54/88 vs. 55/114, $p = 0.06$) and CPC score (5 [2–5] vs. 4.5 [1–5], $p = 0.07$).
CONCLUSIONS. AKI is very common after CA, occurring in more than 40 % of patients. These patients had a more severe hemodynamic impairment and needed a more aggressive ICU therapy, which resulted in a poorer brain recovery.

0934
OUTCOME OF PATIENTS WITH ACUTE CORONARY SYNDROME REQUIRING INTENSIVE CARE UNIT ADMISSION

A.A. Jain[1], R. Giri[1], H. Luckraz[1]

[1]New Cross Hospital, Cardiothoracic Anaesthesia, Wolverhampton, UK
INTRODUCTION. Small number of patients with acute coronary syndrome (ACS) treated with percutaneous coronary intervention (PCI) require Intensive Care Unit (ICU) admission following cardiogenic shock or out of hospital cardiac arrest (OOHCA). Data on outcome of these groups is sparse.
OBJECTIVES. To assess and compare outcome after PCI between ACS with cardiogenic shock (Group A) and ACS with OOHCA (Group B).
METHODS. Patient demographics and ICU data of patients with ACS admitted to ICU between April 2010 and August 2012 was retrospectively collected and statistically analysed.
RESULTS. During the study period, 2,478 patients were admitted to our Hospital with ACS. Only 61 patients (2.5 %) required ICU admission following PCI. Patient demographics were comparable between the two groups. The results are summarised in the following table. Ventilation, renal replacement therapy and balloon pump requirements were significantly higher in group A ($p < 0.05$). Inotrope requirement was comparable. ICU stay was significantly longer in group B ($p < 0.05$), however the overall hospital stay was comparable ($p = 0.23$). The incidence of neurological complications was significantly higher in group B (10.34 % vs 40.62 %,$p < 0.05$). In-hospital mortality was significantly lower in group B (62.07 % vs 43.75 %,$p < 0.05$). One year survival, however, was similar in both groups.

Results

	Cardiogenic shock, n = 29, group A	OOHCA, n = 32, group B	p value
Ventilation (%)	96.8	82.8	$p < 0.05$
Inotropes (%)	79.3	65.6	0.18
IABP (%)	96.5	68.7	$p < 0.05$
CRRT (%)	24.1	6.2	$p < 0.05$
ICU stay (median/range)	2(0–12)	4(0–38)	$p < 0.05$
Hospital stay (median/range)	5(0–68)	8(0–39)	0.23
Neurological complications (%)	10.3	40.6	$p < 0.05$
Mortality in hospital (%)	62.1	43.7	$p < 0.05$
1 year survival (%)	41.1	61.2	0.13

CONCLUSIONS. Following PCI for ACS, only 2.5 % patients required ICU admission. OOHCA group had better survival rate but significantly poor neurological outcome as compared to cardiogenic shock.
REFERENCES. 1. Out of Hospital cardiac arrest in patients with primary PCI for STEMI. Long term follow up data from EUROTRANSFER registry. Resuscitation 2012; 83(3): 303–6 2. Long term prognosis after out of hospital cardiac arrest and PCI. Resuscitation 2004; (1): 49–53.

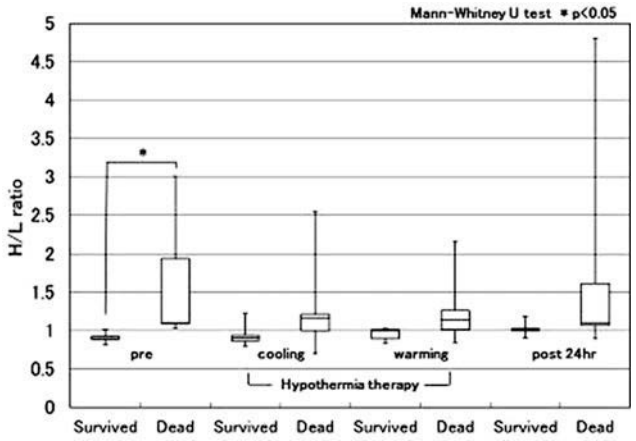
0935

THE RATIO OF HEAD-REGIONAL SATURATION OF OXYGEN AND LIVER-REGIONAL SATURATION OF OXYGEN INDICATED THE OUTCOME AFTER POST-CARDIAC ARREST SYNDROME

T. Kobayashi[1], E. Isotani[1], M. Takahashi[1], T. Sato[1], J. Shinohara[1], H. Takahashi[1], K. Yoshikawa[1], T. Masuda[1]

[1]Tokyo Woman's Medical University Medical Center East, Emergency Medicine Critical Care Medicine, Nishiogu, Japan

INTRODUCTION. As a medical treatment for Post-Cardiac Arrest Syndrome advocated by International Liaison Committee on Resuscitation (ILCOR) in 2008[1], such as hypothermia therapy for relieving neurological aftereffects is commonly accepted. However, quite a lot of cases are led to unintentional outcomes in spite of combined modality therapy during the period. Brain resuscitation examination suggested that patients with brain regional saturation of oxygen (rSO_2) > 40 % has a good brain resuscitation rate[2]. However, even if rSO_2 > 40 %, more than half of patients resulted in poor outcome. It is strongly desired to establish an indicator regarding neurological outcome prediction before introducing medical treatments such as hypothermia therapy which is one of expensive therapies.
OBJECTIVES. The present study aimed to compare cerebral oxygenation and systemic oxygenation more precisely using rSO_2.
METHODS. For patients who admitted into our emergency center due to cardiopulmonary arrest, rSO_2 of the brain (H-rSO_2) and liver (L-rSO_2) were measured during their intensive care unit stay. We analyzed the relationship between the outcome and H/L ratio, which was obtained as a ratio of H-rSO_2 to L-rSO_2.
RESULTS. In all cases that got the return of spontaneous circulation (ROSC), both H-rSO_2 and L-rSO_2 tended to go up according to the improvement of systemic circulation. The low H/L ratio group, which presented less dissociation between H-rSO_2 and L-rSO_2, presumably showed good outcome. The high H/L ratio group, which showed greater dissociation between H-rSO_2 and L-rSO_2, presumably showed poor outcome. Even if the patients showed high values in H-rSO_2 at arrival to our emergency center, the continuation of higher values of H/L ratio with dissociation between H-rSO_2 and L-rSO_2 resulted in poor outcomes.



Transition of H/L ratio

CONCLUSIONS. It has been suggested that H/L ratio, which reflects local blood flow indirectly and indicates blood flow imbalance in organs, can be a predictive marker for neurological outcomes in Post-Cardiac Arrest Syndrome cases.
REFERENCES. 1. Neumar RW, Nolan JP, Adrie C et al. Circulation. 2008; 118:2452–83. 2. Ito N, Nanto S, Nagano K et al. Regional cerebral oxygen saturation on hospital arrival is a potential novel predictor of neurological outcomes at hospital discharge in patients with out-of-hospital cardiac arrest. Resuscitation. 2011;83:46–50.

0936

ACUTE CORONARY SYNDROME IN THE ELDERLY PATIENT (EP). MANAGEMENT IN A INTENTIVE CARE UNIT (ICU) OF A RURAL HOSPITAL WITHOUT PERCUTANEOUS CORONARY INTERVENTION (PCI) UNIT

I. Romero Barroso[1], E. Pino Moya[1], P. Ortega Zarza[1], A. Álvarez Saiz[1], O. Barakat Shrem[1], M.A. Castaño López[2]

[1]Riotinto Hospital (SAS), Intensive Care Unit, Minas de Riotinto, Spain, [2]Juan Ramón Jiménez Hospital (SAS), CMU Analytical Laboratories, Huelva, Spain

INTRODUCTION. It is well known that age is a factor of outcomes for patients with acute coronary syndromes (ACS). There is also a minor use of cardiovascular drugs and invasive treatment in
EP (≥ 75 years old), in part due to the difficulty to assess risks and benefits specially for the fibrinolytic therapy (FT) and iv antiplatelet drugs prior to a PCI.
OBJECTIVES. To present the experience on treatment of EP with ACS at the ICU of a rural hospital without PCI Unit, and assess health outcome.
METHODS. Retrospective, descriptive study to evaluate the treatment received by EP with ST-segment elevation myocardial infarction (STEMI) or unstable angina/non-ST-segment elevation myocardial infarction (UA/NSTEMI) admitted between Mar 2006-Dec 2012 and compare with the treatment received by the younger patients (YP) (< 75 years old) admitted during that time.
RESULTS. GROUP STEMI:
a) 44 cases in EP (34♂, 10♀) (mean 79 years), 30 patients (68 %) received active treatment, 28 (63 %) FT (whitout complications) with TNK (with 2 rescue PCI for failed FT) and 2 (5 %) primary percutaneous coronary intervention (PPCI). The mean door-to-needle (DTN) time was 34.4 min (68 % in ≤ 30 min). Another 18 (41 %) patients received PCI before discharge from the ICU. The mean length of stay (LOS) in ICU was 2.26 days. 3 patients died (7 %) from cardiogenic shock (CS).
b) 119 cases in YP (105♂, 14♀) (mean 56 years), 90 patients (76 %) received active treatment, 84 (70 %) FT (only one complication: minor bleeding) with TNK (with 13 rescue PCI for failed FT) and 6 (5 %) PPCI. The mean DTN time was 34.5 min (73 % in 30 ≤ min). Another 63 (73 %) patients received PCI before discharge from the ICU. The mean LOS in ICU was 2.42 days. 2 patients died (1.7 %): 1 CS and 1 arrhythmia.
GROUP UA/NSTEMI:
a) 49 cases in EP (32♂, 12♀) (mean 79 years), 41 patients (84 %) received platelet GP IIb/IIIa blocking Tirofiban®, and 37(76 %) PCI: 3(9 %) in < 24 h, 9(26 %) in < 72 h, 2(4 %) in > 72 h and 23(62 %) before discharge from the ICU or Hospital. The mean LOS in ICU was 2.98 days. 4 patients died (8 %) from CS.
b) 143 cases in YP (114♂, 29♀) (mean 60 years),113 patients (79 %) received Tirofiban®, and 116(81 %) PCI: 5(4 %) in < 24 h, 39(34 %) in <72 h, 6(5 %) in > 72 h and 66(57 %) before discharge from the ICU or Hospital. The mean LOS in ICU was 3.05 days. 2 patients died (1.4 %) from CS.
CONCLUSIONS. We found no significant difference between the management of EP or YP in our ICU in either group of STEMI: active treatment (p = 0.448),FT with TNK (p = 0.509), DTN time ≤ 30 min (p = 0.651), PPCI (p = 0.78), PCI before discharge from the ICU (p = 0.235), death (p = 0.631); or group of UA/NSTEMI: treatment with Tirofiban® (p = 0.617), global PCI (p = 0.524), separately PCI (p = 0.722),death (p = 0.061; perhaps with an increase in sample a significant difference in the number of deaths in EP could appears, which does not appear with our sample). LOS were also similar.
REFERENCES. 1. Alexander KP et al. Acute Coronary Care in the Elderly. Circulation. 2007;115:2549–69.

0937

POST CARDIAC ARREST HYPOXIA NOT HYPEROXIA IS ASSOCIATED WITH AN INCREASE IN MORTALITY

A. Revill[1], R. Hunt[1], P. MacNaughton[1]

[1]Derriford Hospital, Anaesthetics and Critical Care, Plymouth, UK

INTRODUCTION. During the immediate post cardiac arrest period it has recently been suggested that hyperoxia may be detrimental. This has mixed support from animal data[1], but was also suggested clinically following an analysis of a large American registry of ICU patients, published in the Journal of the American Medical Association in 2010 by Kilgannon et al[2].
OBJECTIVES. To establish whether hyperoxia in the immediate post resuscitation period is associated with an increase in mortality in a large mixed-use 24 bed ICU, in the UK.
METHODS. We performed a retrospective observational study of all patients admitted to our ICU over a 3-year period. We employed the same inclusion criteria of, age older than 17 years, non-traumatic cardiac arrest, cardiopulmonary resuscitation within 24 h prior to ICU arrival, as Kilgannon et al. However, we excluded patients if they did not have a valid ABG result within the first hour of admission as opposed to the first 24 h.
Patients were divided into 3 groups based on PaO_2 from the first ABG values obtained in the ICU. Hyperoxia was defined as PaO_2 of 300 mmHg or greater; hypoxia, PaO_2 of less than 60 mmHg (or ratio of PaO_2 to fraction of inspired oxygen < 300); and normoxia, not classified as hyperoxia or hypoxia.
RESULTS. A total of 265 patients fulfilled the inclusion criteria, 10 were excluded for not having a valid ABG recorded, therefore 96 % of patients had a valid ABG result on admission post arrest. This compares to only 72 % in Kilgannon et al.
The proportions in the hypoxic group are identical at 63 %, our study has less patients in the hyperoxic group, 7.4 vs 18.2 %.
The mortality is highest in the hypoxia group. This difference is statistically significant when compared to the normoxia group and is associated with higher standardised mortality ratio, calculated using each groups APACHE II probabilities.

Results

	Hypoxia	Normoxia	Hyperoxia
Total	163	72	20
Deaths (%)	83 (50.9)	19 (26.3)	6 (30)
P value vs Normoxia	0.0005		1.0
APACHE II	17.8	17.3	18.7
APACHE II probability	0.28	0.25	0.33
Standardised Mortality Ratio	1.8	1.06	0.91

CONCLUSIONS. There is no evidence to suggest that hyperoxia is associated with increased mortality on our unit. However, hypoxia is associated with statistically significant higher mortality.
This opposes the findings of Kilgannon et al. This may be because our database allows us to relate the patients admission FiO_2 to their first recorded arterial blood gas PaO_2, also this ABG is done within the first hour of admission in 96 % of our patients, compared to any point within the first 24 h in Kilgannon et al.
A higher majority of patients with a timely ABGs result may reflect earlier more intensive management in general, allowing for early titration of oxygen therapy. This may also be reflected by the lower overall mortality in our cohort, 42 %, compared with 56 % in Kilgannon et al.
REFERENCES. 1. Pilcher J et al. The effect of hyperoxia following cardiac arrest—A systematic review of animal trials. Resuscitation 2012; V83:417–422. 2. Kilgannon JH et al. Association between arterial hyperoxia following resuscitation from cardiac arrest and in-hospital mortality. JAMA. 2010;303(21):2165–71.

0938

IS IT USEFUL TO EUROSCORE IN OUR MIDST?

M.R. Diaz[1], J.P. Valencia[1], S. Nogueras[1], M. Garcia[1], A. Reina[1], E. Aguayo[1]

[1]H.U. Virgen de las Nieves, Granada, Spain

INTRODUCTION. The European surgical cardiac risk assessment is a validated model for predicting hospital mortality following cardiac surgery (European System for Cardiac Operative Risk Evaluation (EuroSCORE)),. This validation was performed also in the European environment and therefore in our country.
OBJECTIVES. Our objective was to determine the effectiveness of the EuroSCORE model in our setting, when estimating mortality. Analyzing whether low values (< 4 points) correspond to low mortality and high (> 3 points) with high mortality.

METHODS. Retrospective study of patients undergoing cardiac surgery at our institution (H.U.Virgen de las Nieves in Granada) for a period of 4 years (January 2008–December 2011). We use the registry database of cardiac surgery within the panel care to heart disease in Andalucia (Spain).
RESULTS. A total of 1,527 patients, whose mean age was 62.8 ± 12.9, with 60.3 % male, with an ICU stay of 6.5 ± 10.8 days. The mean score was 5.7 ± 3.2 Euroscore points. The predicted mortality by EuroSCORE was 1.6 %, whereas the observed mortality was 12.1 %. Those who had a EuroSCORE < 4 had a mortality of 3.9 % and a EuroSCORE > 3 the mortality was 15.1 %, with $p < 0.05$. The analysis of mortality by subgroups of surgery found a 5.6 % CABG, 11.6 % in valve surgery and 23.4 % in mixed surgery.
CONCLUSIONS. The EuroSCORE underestimates the observed mortality in our environment. The low values obtained with this scale score if they correspond to lower mortality and higher values with higher mortality.
REFERENCES. 1. Álvarez M, González-Molina M, Colmenero M, Martína P, Prades I, Moreno E, Moreno y José Azpitarte T. Does the EuroSCORE identify patients at minimum risk of mortality from heart surgery? Rev Esp Cardiol. 2003;56(7):682–6. 2. Roques F, Nashef SAM, Michel P, Pinna Pintor P, David M, Baudet E, et al. Does EuroSCORE work in individual European countries? Eur J Cardiothorac Surg. 2000;18:27–30. 3. Nashef SAM, Roques F, Michel P, Gauducheau E, Lemeshow S,Salamon R, et al. European system for cardiac operative risk evaluation (EuroSCORE). Eur J Cardiothorac Surg. 1999;16:9–13.

0939
PROGNOSTIC FACTORS IN THE IN-HOSPITAL CARDIOPULMONARY ARREST

M. Colomo Gonzalez[1], R. de la Chica Ruiz-Ruano[1], L.I. Rodriguez Peralta[1], A. Sanchez Gonzalez[1]

[1]Hospital Universitario Virgen de las Nieves, Critical Care Unit, Granada, Spain
OBJECTIVES. To identify factors related with the survival of patients suffering an in-hospital cardiopulmonary arrest (CPA).
METHODS. It was performed a prospective and observational register, according to Utstein style, of every in-hospital CPA for a period of 3 years (August 2009–July 2012) in the Medical-Surgical Center in Hospital Universitario Virgen de las Nieves. CPAs ocurring in operating room, recovery areas and those in which extra-hospital life support manoeuvres were initiated or those whose patients had recovered espontaneous circulation signs at Emergency Unit arrival were excluded.
Multiple variables were registered following Utstein style and grouped into the following categories: related to the patient, with CPA episode, with resuscitation and with its late evolution. From this variables those more relevant in relation with prognosis were gender, age, CPA etiology (cardiologic vs. others), electric rhythm (defibrillable rhythm vs others) and resuscitation manoeuvres length. Hospital discharge survival was the dependent variable. We performed a logistic regression analysing model in which were included the clinically and statistically significant variables, considered as such a $p < 0.05$ in the previous univariate analysis. Results were expressed as percentages, averages and medians ± standard deviation and odds ratio.
RESULTS. 316 patients suffering at least one CPA episode were registered. Treated patients were mostly males (60.8 %) and the median age was 69 years. The first three CPA etiology were cardiac (40.8 %), respiratory (25.6 %) and unknown (13.3 %). Regarding the location were CPA occurred, it highlights the Critical Care Unit (44.3 %) and the Emergency Unit (18 %), the remainder (37.7 %) corresponding to hospitalization wards and other areas. It was only detected a defribillable initial rhythm in 22.5 % of all cases. The global hospital survival during the measured period was 22.2 %. The average of the total time arrest range obtained was 22.2 ± 29 min (median 15 min) and the average of the interval cardiac arrest-resuscitation team manoeuvres start was 4.87 ± 22 min (median 2 min). In Cox′s regression model prognostic factors were age (OR: 0.95; $p = 0.03$), total resuscitation manoeuvres lenght (OR: 0.88; $p < 0.001$) and the fact that the first electrical rhythm detected were a defribillable one (OR: 5.7; $p = 0.016$).
CONCLUSIONS. In our study, the prognostic factors related with hospital survival after suffering an in-hospital CPA are initial defibrillable electric rhythm, patient′s age and the lenght of resuscitation manoeuvres.

0940
DELIVERY OF EFFECTIVE VENTILATION DURING CARDIAC ARREST

S. Young[1], N.J.W. Bolton[1], K.J. Sim[1]

[1]St Helens and Knowsley NHS Trust, Intensive Care Unit, Merseyside, UK
INTRODUCTION. Despite ALS training, management of the airway during in-hospital cardiac arrests often appears poorly performed by the non-anaesthetist.
OBJECTIVES. To assess the competency of junior doctors airway skills in the cardiac arrest scenario.
METHODS. We conducted an assessment of foundation year 1 (FY1) doctors′ management of the airway in a simulated cardiac arrest scenario using a standard 'Resus Annie' mannequin. Over an 8 week period we assessed 26 of the 35 (74 %) available FY1 doctors working at a district general hospital. We reviewed their ability to set up an ambu-bag, connect it to oxygen within one cycle of CPR and thereafter deliver effective ventilation as per ALS guidelines.
RESULTS. 27 % set up a self-inflating bag within one cycle of CPR but of the total, only 15 % attached the ambu-bag to the wall or cylinder oxygen supply. 65 % managed to deliver the minimum of 2 effective breaths in 5 s (new guidelines) or deliver 2 effective ventilations of 5 attempts (old guidelines). All FY1 doctors audited were aware of appropriate airway adjuncts.
CONCLUSIONS. The results indicate that there is a substantial gap in practical knowledge of how to manage the airway of a patient in emergency situations Another cause for concern was only 65 % were able to deliver effective breaths in the time allowed. It is well known that in any review of a patient the airway is priority. It is therefore the first clinician on scene who will need to be able to manage the airway of a patient. Currently, most FY1 doctors are ALS providers, however they will not have had dedicated airway skills teaching.
This study demonstrates a lack of competence in the management of the airway by junior doctors who are often first on the scene. We suggest, at induction, all junior doctors should undergo a basic airway management course.
REFERENCES. 1. http://www.resus.org.uk.

Haemodynamic management of sepsis: 0941–0954

0941
MICROCIRCULATION MONITORING IN CRITICALLY ILL PATIENTS

Z. Mastora[1], E. Jahaj[1], A. Marvaki[1], V. Michail[1], P. Almpani[1], N. Beretas[1], V. Paparengas[1], N.A. Maniatis[2], S. Nanas[1], S.E. Orfanos[2], A. Kotanidou[1]

[1]1st Department of Critical Care Medicine & Pulmonary Services, Medical School of Athens University, Evangelismos Hospital, Athens, Greece, [2]2nd Department of Critical Care Medicine & Pulmonary Services, Medical School of Athens University, Attiko Hospital, Athens, Greece
INTRODUCTION. Sepsis is a life-threatening condition with high mortality and morbidity globally. Sepsis syndrome is characterized by significant alterations of the microcirculation, leading to tissue hypoperfusion and multiple organ failure. Near infrared spectroscopy (NIRS) is a non- invasive method to evaluate microcirculation alterations. Tissue oxygenation index (TOI) is a NIRS parameter and indicates the dynamic balance between O_2 supply and O_2 consumption in tissue capillaries, arterioles and venules.
OBJECTIVES. The aim of this study was to investigate changes of the microcirculation using the technology of NIRS in combination with vascular occlusion test (VOT) in critically ill patients. Specifically, a VOT with a pressure cuff can be used to provide a dynamic assessment of the tissue oxygenation response to ischemia.
METHODS. Data collection included NIRS measurements on admission to the Intensive Care Unit (ICU), on the day sepsis was diagnosed, 24 h and 48 h later. At each time point of NIRS measurement we applied VOT. We assessed the main parameters of NIRS: Tissue oxygen saturation (StO_2), occlusion slope, and hyperemia recovery area and hyperemia recovery time. All patients were ventilated.
RESULTS. We recruited 122 consecutive critically ill patients. Seventy-one (mean age 45 ± 19years) of them developed sepsis during the ICU stay. Hyperemia recovery time was significantly lower on the sepsis day compared to baseline (137 ± 50 s, vs 169 ± 30 s, $p = 0.0001$). Hyperemia recovery time continued to decrease during subsequent time points, at 24 h. Hyperemia recovery area showed significant differences between baseline and sepsis day (19.3 ± 10.6, vs 12.4 ± 8.6, $p < 0.001$), 24 h (10.7 ± 7.5, $p = 0.0001$) and 48 h (10 ± 4.7, $p = 0.0001$).
CONCLUSIONS. NIRS measurements are associated with microcirculatory alterations in critically ill patients in the early sepsis stage. Postischemic hyperemia is decreased in septic patients compared with their baseline. Critically ill patients with sepsis have a reduced rate of oxygen recovery as measured using NIRS in response to VOT. Further studies are needed.
REFERENCES. 1. Lima A, van Bommel J, Sikorska K, van Genderen M, Klijn E, Lesaffre E, Ince C, Bakker J. The relation of near-infrared spectroscopy with changes in peripheral circulation in critically ill patients. Crit Care Med. 2011,39:1649–54. 2. Shapiro NI, Arnold R, Sherwin R, O'Connor J, Najarro G, Singh S, et al. The association of near-infrared spectroscopy-derived tissue oxygenation measurements with sepsis syndromes, organ dysfunction and mortality in emergency department patients with sepsis. Critical Care 2011;15(5):R223.

0942
TRANSCRANIAL DOPPLER TO ASSESS COGNITIVE DECLINE IN CRITICALLY ILL SEPTIC PATIENTS

C. Pierrakos[1], R. Attou[1], L. Decorte[2], A. Kolyviras[1], S. Malinverni[1], P. Gottignies[1], J. Devriendt[1], D. De Bels[1]

[1]Brugmann University Hospital, Intensive Care, Brussels, Belgium, [2]Brugmann University Hospital, Geriatric, Brussels, Belgium
INTRODUCTION. Sepsis associated encephalopathy (SAE) is a common sepsis complication, suspected to contribute in short and long term cognitive impairment. Transcranial Doppler (TCD) is easily applied, non-invasive examination by which we can detect alterations of cerebral perfusion in septic patients.
OBJECTIVES. The aim of this study is to correlate TCD findings with clinical signs of SAE.
METHODS. We assessed 37 septic patients without any known neurological deficit, who were treated in our 33-bed Critical Care Unit. Sepsis was characterized as its definition by the standard international criteria. Using TCD we measured the mean velocity in the middle cerebral artery (mVMCA, cm/s) and we calculated pulsatility index (PI), resistance index (RI) and cerebral blood flow index (CBFi). Measurements were made at the first day of their admission or at the first day of sepsis development. Patients underwent an everyday cognitive assessment using the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU test).
RESULTS. Twenty-one patients (57 %) were found to present confusion. Patients with confusion had a higher mean age, mean APACHE II score (72 ± 11 vs 58 ± 16 $p = 0.02$, 24 ± 5 vs 18 ± 5 $p < 0.01$, respectively) and a lower mean arterial pressure (MAP) in (74 ± 11 mmHg vs 85 ± 13 $p < 0.01$). No differences of the pCO_2 values was found (36 ± 8 mmHg vs 42 ± 12 mmHg $p = 0.17$). Higher values of PI and RI was found in patients with confusion compared to non confused septic patients (2.15 ± 0.7 vs 1.2 ± 0.7 $p < 0.01$, 0.83 ± 0.08 vs 0.63 ± 0.11 $p < 0.01$ respectively). To the contrary lower values of CBFi and VMCA were found in patients with confusion (38 ± 14 vs 80 ± 29 $p < 0.01$, 37 ± 22 cm/s vs 62 ± 28 cm/s $p < 0.05$ respectively). PI, RI and CBFi could predict confusion in septic patients (PI cut-off: 1.26 AUC: 0.905 $p < 0.01$ Sensitivity: 95 % Specificity: 87 %, RI cut -off : 0.72 AUC:0.914 $p < 0.01$ Sensitivity 90 % Specificity 87 %, CBFi cut-off: 48 AUC:0.905 $p < 0.01$ Sensitivity:86 % Specificity 93 %).
CONCLUSIONS. Cerebral perfusion disturbances observed with TCD can explain clinical symptoms of SAE.

0943
INFLUENCE OF VENOVENOUS RENAL REPLACEMENT THERAPY ON THE ACCURACY OF TRANSPULMONAL THERMODILUTION MEASUREMENTS IN SEPTIC PATIENTS - A PROSPECTIVE STUDY

M. Habicher[1], C. Spies[1], C. von Heymann[1], M. Sander[1]

[1]Charité-University Medicine Berlin, Department for Anaesthesiology and Intensive Care Medicine, Berlin, Germany
INTRODUCTION. In critical ill patients with septic shock transpulmonal thermodilution derived parameters like extravascular lung water, global endiastolic volume index and cardiac index is used for guidance of hemodynamic therapy and volume therapy. However,

many of these patients also require renal replacement therapy (RRT). The influence of RRT on the accuracy of these transpulmonal thermodilution paramters is not clear[1,2].
OBJECTIVES. The aim of this study was to evaluate the influence of the dialysis catheter location during RRT on the accuracy of the results of CI, GEDVI and EVLWI.
METHODS. After approval by the local ethics committee we analyzed 112 transpulmonal thermodilution measurements from 9 septic patients. In Group 1, 28 measurements during RRT were performed in patients where the dialysis catheter and the central venous line (thermodilution bolus) were in the same venous vessel. In Group 2, 84 measurements were performed in patients where the dialysis catheter and the central venous line were in different vessels. In all patients the first two thermodilution measurements were performed during active renal replacement therapy, the next two measurements were performed with paused RRT after the RRT was on hold for 30 s. The data is presented as bias and limits of agreement (LOA), as well as percentage error comparing measurements with RRT and RRT on hold in the two groups.
RESULTS. In Group 1 bias (LOA) between measurement with active RRT and with RRT on hold was for CI −0.01 (−0.77 to 0.75) l/min/m^2, for EVLWI 0.73 (−2.03 to +3.49) ml/kg and for GEDVI −12.43 (−319.09 to +294.23) ml/m^2. Percentage error in this group was 26.4 % for CI, 26.8 % for EVLWI and 33.9 % for GEDVI. In Group 2 bias (LOA) between measurement with active RRT and with RRT on hold was for CI −0.21 (−0.87 to +0.45) l/min/m^2, for EVLWI 0.29 (−1.89 to +2.47) ml/kg and for GEDVI −59.38 (−324.96 to +206.2)ml/m^2. Percentage error in this group was 19.6 % for CI, 24.1 % for EVLWI and 27.5 % for GEDVI.
CONCLUSIONS. Our data suggest that measurements with on-going RRT compared to measurements with paused RRT are comparable for CI, EVLWI and GEDVI if dialysis catheter and central venous line that is used for thermodilution bolus injection are in different vessels. In contrast to this we report increasing error if the catheters are in the same vessel. In this situation it might be indicated to pause RRT during the measurement of CI, EVLWI and GEDVI to minimize error in the measurement.
REFERENCES. 1. Pathil A. et al. Eur J Anaesthesiol. 2013. 2. Sakka et al. Anesth Analg. 2007.

0944
EFFECT OF GLUTAMINE TREATMENT ON CYTOKINE AND HSP70 EXPRESSION IN MURINE PERITONEAL MACROPHAGES FOLLOWING LPS STIMULATION

I. Plati[1], E. Karagianni[1], O. Rassouli[1], T. Tavladaki[1], G. Briassoulis[2], M. Venihaki[1]

[1]University of Crete, Faculty of Medicine, Heraklion, Greece, [2]University of Crete/ University Hospital, Heraklion, Greece
INTRODUCTION. Glutamine (Gln) has been shown to protect against inflammatory injury and illness in experimental and clinical settings. The mechanism of this protection is unknown; however, laboratory and clinical trial data have indicated a relationship between Gln-mediated protection and enhanced heat shock protein 70 (HSP70) expression, as well as Gln-mediated inhibition of nuclear factor kB (NF-kB). Heat Shock protein (HSP) expression is vital to cellular and tissue protection following stress or injury. Especially, the 70-kDa HSP70 family is a group of proteins that are critical for protein assembly, folding, and transport.
OBJECTIVES. To clarify the mechanisms Gln utilizes to exert the beneficial effects on the inflammatory response. We also aim to determine the interaction between Gln and HSP70 during inflammation.
METHODS. Macrophages are the major source of producing and releasing proinflammatory cytokines, which in turn induce inflammation and recruit other immune cells. Gln metabolism is initiated by glutaminase, which catalyzes the conversion of Gln to glutamate and ammonia. Macrophages have very high glutaminase activity and can utilize Gln at a much faster rate than any other amino acid. Therefore, we used in our study primary macrophages collected from wild type mice (*Hsp70+/+)* as well as from mice with specific deletion of the *Hsp70.1* and *Hsp70.3* genes (*Hsp70*$^{-/-}$*)*. Macrophages from both genotypes were collected 4 days after intraperitoneal (ip) injection of 4 % thioglycolate. Cells were treated with 100 ng/ml LPS for 2, 4 and 24 h in the presence or absence of 10 mM Gln (which was administered either 1 h prior or 1 h after LPS stimulation). Cytokines and HSP70 were measured with ELISA. NF-kB protein expression was evaluated by Western blot.
RESULTS. Cytokine levels (TNF-α, IL-6 and IL-8) were significantly higher in *Hsp70−/−* compared to *Hsp70 +/+* macrophages, (5-fold difference, $P < 0.05$). Similarly, NF-kB protein levels were also higher in *Hsp70−/−* compared to *Hsp70+/+* macrophages. To our surprise, administration of Gln prior to LPS does not affect either cytokine release or NF-kB protein levels in macrophages isolated from either genotype. In line with these results, no difference was observed in HSP70 expression in *Hsp70 +/+* primary macrophages when cells treated with Gln and LPS for 2 h.
CONCLUSIONS. Our preliminary results indicate that HSP70 likely exerts a protective anti-inflammatory effect in macrophages. The mechanism of this effect is under further investigation.
REFERENCES. 1. Wischmeyer, Singleton. Crit Care Med 2003.2. Weiss et al. Shock 2000. 3. Singleton et al. Shock 2005 4. Hunt et al. Mol Cell Biol. 2004.
GRANT ACKNOWLEDGMENT. This research has been co financed by the European Union (European Social Fund (ESF)) and Greek national funds through the Operational Program "Education and Lifelong Learning" of the National Strategic Reference Framework (NSRF)-Research Funding Program: THALES.

0945
PERFUSION PARAMETERS EXHIBIT MARKEDLY DIFFERENT RECOVERY TIME COURSES THROUGHOUT RESUSCITATION IN A COHORT OF SEPTIC SHOCK SURVIVORS

G. Hernandez[1], C. Luengo[2], A. Bruhn[1], E. Kattan[1], A. Fuentealba[1], G. Friedman[3], G. Ospina-Tascon[4], T. Regueira[1], J. Florez[1], M. Rovegno[1], C. Romero[2], C. Ince[5], J. Bakker[5]

[1]Pontificia Universidad Católica de Chile, Departamento de Medicina Intensiva, Santiago, Chile, [2]Hospital Clínico Universidad de Chile, Unidad de Pacientes Críticos, Santiago, Chile, [3]Hospital de Clínicas de Porto Alegre, Department of Critical Care Medicine, Porto Alegre, Brazil, [4]Fundación Valle del Lili, Intensive Care Unit, Cali, Colombia, [5]Erasmus MC University Medical Centre, Department of Intensive Care Adults, Rotterdam, The Netherlands
INTRODUCTION. Several parameters have been used to monitor perfusion status or as potential resuscitation goals in septic shock under the assumption that they are flow-responsive. However, little is known about the specific recovery time course of individual parameters a fact that appears as relevant to select the most appropriate target at different time-points.
OBJECTIVES. We assessed the recovery time course for hemodynamic, peripheral, metabolic and microcirculatory parameters during early intensive care unit based resuscitation.
METHODS. A prospective observational clinical study in 35 septic shock patients with hyperlactatemia, mechanical ventilation and less than 2 h of evolution were originally included but final analysis was performed only in the 31 hospital-survivors. Patients were evaluated with a multimodal perfusion monitoring protocol.
RESULTS. Macrohemodynamic, metabolic, peripheral, and sublingual microcirculatory perfusion parameters were evaluated at baseline, 2, 6 and 24 after starting intensive care unit-based resuscitation. Some variables such as central venous oxygen saturation, central venous-arterial pCO_2 gradient, capillary refill time, thenar tissue oxygen saturation were already normal in more than 70 % of survivors after 6 h of resuscitation. Lactate presented a much slower recovery trend, decreasing significantly at 6 h compared to baseline ((2.7 [2.2–3.9] vs. 4.0 [3.0–4.9] mmol/l $p < 0.01$), but with only 48 % of patients achieving normality at 24 h. Sublingual microcirculatory parameters exhibited the slowest recovery rate with persistent moderate derangements still present in almost 80 % of patients at 24 h (proportion of perfused vessels 77 % [68–84], and microvascular flow index 2.2 [2.0–2.5]).
CONCLUSIONS. Perfusion parameters exhibit markedly different recovery rates in response to early resuscitation in septic shock surviving patients. The recovery time course of microcirculatory abnormalities in survivors seems to be the slowest among all perfusion parameters.

0946
MICROVASCULAR AND VASCULAR REACTIVITY EVALUATION AFTER A VASCULAR OCCLUSION TEST (VOT) IN THE BRACHIORADIALIS MUSCLE IN SEPTIC SHOCK PATIENTS

J. Marin-Corral[1], L. Claverias[1], I. Oliva[1], C. Solé[1], V. Blazquez[1], I. Leache[1], M. Bodí[1,2], S. Pascual[3], J. Gea[2,3], A. Rodriguez[1,2]

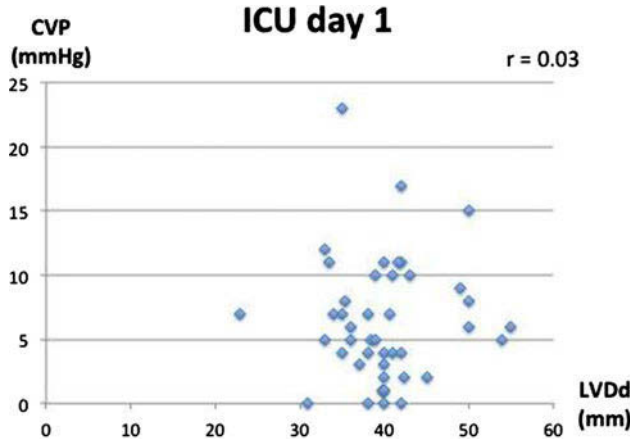
[1]Joan XXIII Hospital, Intensive Care Unit, Tarragona, Spain, [2]CIBERes de Enfermedades Respiratorias (Instituto de Salud Carlos III), Bunyola, Spain, [3]Hospital del Mar-IMIM, Pneumologic Department, Barcelona, Spain
INTRODUCTION. Septic shock patients have a microvascular dysfunction that can be early detected by the evaluation of tissue oxygen saturation index (rSO_2). Near Infrared Spectroscopy (NIRS) is a non-invasive technology easy to use and it provides instant information on rSO_2 which might have prognostic implications.
OBJECTIVES. (1) To determine, using NIRS, the microvascular dysfunction/vascular reactivity of septic shock patients during the first 24 h of admission to Intensive Care Unit (ICU) and compare it to healthy control subjects after a vascular occlusion test (VOT) in the brachioradialis muscle, and (2) To determine its association with mortality.
METHODS. rSO_2 was measured by NIRS (INVOS 5100®) in the brachioradialis muscle during a VOT of the brachial artery using a cuff inflated to 200 mmHg for a period of min or until the 50 % decrease of baseline rSO_2. We determined in both groups baseline, minimum and maximum rSO_2 values, as well as slope of increase (re-oxygenation) and the difference between the maximum and baseline rSO_2 (delta). In the septic shock group the association between these variables with mortality was also evaluated. Differences between groups were assessed using Student's t- test. We considered $p < 0.05$ to be significant.
RESULTS. A total of 15 septic shock patients (age 69.0 ± 12.2, APACHE II 20.3 ± 8.8) and 40 healthy control subjects (age 37.2 ± 12.4) were included. Septic shock patients had lower baseline rSO_2 (62.3 % ± 9.4 vs. 67.7 % ± 7.6, $p = 0.035$), slower re-oxygenation (1.94 %/seg ± 0.45 vs. 10.83 %/seg ± 0.72, $p = 0.000$) and lower delta (2.64 % ± 1.60 vs. 18.0 % ± 1.13, $p = 0.000$) when compared to healthy subjects. Among septic shock patients, non-survivors showed lower baseline rSO_2 (57.0 % ± 6.6 vs. 68.6 % ± 9.8 $p = 0.041$) and lower maximum post-re-perfussion rSO_2 values (58.0 % ± 7.79 and 73.3 ± 12.0 $p = 0.029$) than survivors respectively.
CONCLUSIONS. Septic shock patients show an altered recovery of muscle tissue oxygenation after a vascular occlusion test. The monitoring of microvascular reactivity by rSO_2 in the brachioradialis muscle after a VOT could represent a useful tool for the early evaluation of septic shock patients with prognostic implications.
REFERENCES. 1. Rodriguez A et al. Mortality and regional oxygen saturation index in septic shock patients: a pilot study. J Trauma 2011; 70:1145–52.
GRANT ACKNOWLEDGMENT. Partially funded by FIS PI10/01538.

0947
RELIABILITY OF CVP TO ASSESS LEFT VENTRICULAR PRELOAD FOR FLUID RESUSCITATION IN SEPTIC SHOCK PATIENTS

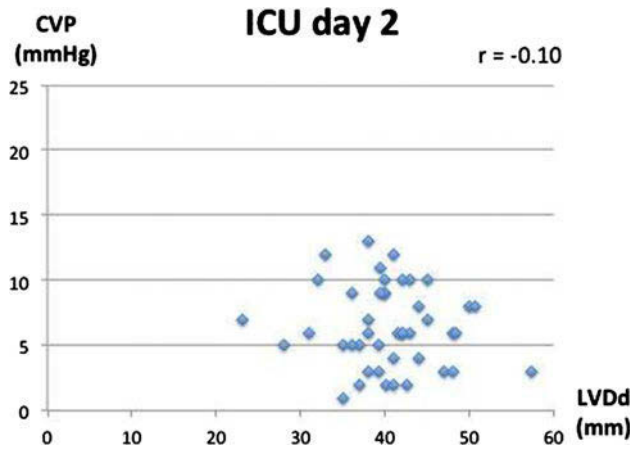
T. Sasai[1], H. Tokioka[1], E. Iwasaki[1], N. Kawanoue[1], T. Fukushima[1], T. Mikane[1], S. Oku[1], H. Kobayashi[1], M. Ishii[1], Y. Oishi[1]

[1]Okayama Red Cross Hospital, Department of Anesthesiology, Okayama, Japan
INTRODUCTION. Initial fluid resuscitation is an important hemodynamic therapy in septic shock patients. The Surviving Sepsis Campaign guidelines recommend hemodynamic resuscitation with volume loading according to the CVP (1). Septic shock patients have been reported to develop a transient decrease in cardiac function, and, thus, it might be inappropriate to use CVP as a parameter for fluid management. We measured the left ventricular end-diastolic diameter (LVEDD), left atrial diameter (LAD), and pressure gradient of tricuspid regurgitation (TRΔP) using transthoracic echocardiography for volume loading in fluid therapy. We investigated whether CVP could be used to predict the left ventricular preload accurately in comparison with LVEDD in septic shock patients.
METHODS. Forty-four adult patients with a mean age of 75.5 years were enrolled. They had septic shock secondary to intra-abdominal infection, with mean APACHE II score of 24.5. The shock state was treated with the continuous infusion of the vasopressors of dopamine (less than 10 μg/kg/min), norepinephrine (less than 0.5 μg/kg/min), and vasopressin (less than 1 U/h), and volume loading according to assessment by cardiac echocardiography. The target mean blood pressure was set at greater than 80 mmHg. For fluid resuscitation, we attempted to maintain the left ventricular preload with LVEDD of 40–50 mm, LAD of 25–35 mm, and TRΔP of less than 25–35 mmHg.

RESULTS. Fractional shortening (FS), an index of left ventricular contraction, decreased to less than 30 % in 41 and 27 % of septic shock patients on the first and second ICU day, respectively. Severe left ventricular dysfunction with FS of less than 25 % developed in 20 and 23 % of patients on the first and second ICU day, respectively, in spite of the use of catecholamine. Mild pulmonary hypertension with TR△P greater than 30 mmHg was present in 27 and 30 % of patients on the first and second ICU day, respectively. CVP was not significantly correlated with LVEDD. The correlation coefficients were 0.03 and −0.10 on the first and second ICU day, respectively. The hospital mortality rate in this study was 9 %, although the predicted mortality based on the APACHE II score was 59 %.



ICU day 1



ICU day 2

CONCLUSIONS. Patients with septic shock often develop left ventricular dysfunction or right ventricular overload. CVP is not a reliable parameter of left ventricular preload for fluid management during the initial phase of septic shock. Assessment by echocardiography while measuring LVEDD is more useful for initial fluid resuscitation than CVP.

REFERENCES. 1. Dellinger RP. Crit Care Med. 2013; 41:580–637.

0948

CONTINUOUS NON-INVASIVE ASSESSMENT OF CARDIAC OUTPUT DURING FLUID THERAPY IN SEPTIC PATIENTS IN THE EMERGENCY DEPARTMENT

G.M. van der Wouden[1], M.P. Harms[1,2], J. Ligtenberg[1,2], J.C. ter Maaten[1,2], CAPE Study Group

[1]University Medical Center Groningen, University of Groningen, Emergency Medicine, Groningen, The Netherlands, [2]University Medical Center Groningen, University of Groningen, Internal Medicine, Groningen, The Netherlands

INTRODUCTION. Fluid therapy is important in the resuscitation of septic patients in the emergency department (ED). However it is difficult to determine which patients need fluid therapy and how much fluid they need. Physicians make correct estimations of the underlying hemodynamic profile of acutely ill patients in a minority of cases. In addition, only 50 % of hemodynamically unstable patients respond positively to fluid resuscitation with a rise in cardiac output (CO). Heart rate (HR), blood pressure (BP), and invasive measurement of central venous pressure are probably not as accurate as CO. Therefore a noninvasive beat-to-beat CO monitoring may be a very useful tool in predicting and monitoring the effects of fluid therapy in the ED.

OBJECTIVES. Can Nexfin be used to monitor CO during fluid therapy, and can CO changes measured with Nexfin during passive leg raising (PLR) be used to predict response to fluid therapy in the ED?

METHODS. Nexfin (BMEYE B.V., Amsterdam, NL) provides continuous non-invasive BP measurement and, from the resulting pulse pressure waveform, calculates beat-to-beat CO. Thirty-one septic patients (18 men and 13 woman, mean age 55 years) were studied during fluid therapy. Before fluid therapy, PLR was performed by raising the legs from the supine position to a 45° angle. A patient with a 10 % or more increase in CO was defined as a fluid responder.

RESULTS. During PLR, mean arterial pressure (MAP) increased (from 88.4 ± 17.7 to 91.7 ± 18.4 mmHg), HR increased (from 101.6 ± 14.7 to 103.1 ± 15.4 bpm) and CO increased (from 7.6 ± 2.3 to 7.9 ± 2.2 l/min). There was no change in stroke volume (SV). After fluid therapy HR decreased (from 101.6 ± 14.7 to 95.9 ± 14.1 bpm) with an increase in SV (from 75.8 ± 21.6 to 84.1 ± 19.5 ml). This resulted in a non-significant increase in CO (from 7.6 ± 2.3 to 8.0 ± 2.0 l/min; p = 0.09). MAP did not change. There were 8 PLR responders and 12 fluid therapy responders. The sensitivity of PLR to predict fluid responsiveness was 50 %, the specificity 89 %.

CONCLUSIONS. Nexfin can monitor the response of fluid therapy in septic patients in the ED. SV and CO are useful parameters of fluid response. PLR and NexFin are promising tools to guide fluid resuscitation in the ED.

0949

CENTRAL VENOUS OXYGEN SATURATION DOES NOT PREDICT FLUID RESPONSIVENESS IN CRITICALLY ILL SEPTIC PATIENTS

G. Gavriilidis[1], E. Kostakou[1], D. Nakopoulou[1], N. Koulouris[1], A. Koutsoukou[1]

[1]University of Athens/'Sotiria' Chest Hospital, ICU 1st Dept of Respiratory Medicine, Athens, Greece

INTRODUCTION. Limited research has been done about the value of central venous oxygen saturation ($ScVO_2$) as a predictive marker for fluid responsiveness in critically ill patients.

OBJECTIVES. The aim of this study is to test the hypothesis that low $ScVO_2$ is related to the degree of volume responsiveness in patients with severe sepsis/septic shock.

METHODS. This is a prospective clinical study that is taking place in a university medical Intensive Care Unit. We have included so far 44 patients with severe sepsis and/or septic shock, who received a fluid challenge. After a cardiac echo for the assessment of the systolic performance of the heart, we measured $ScVO_2$, blood gases from arterial and central venous lines, Central Venous Pressure (CVP), systolic, diastolic, mean and arterial pulse pressure, before and after volume challenge.

RESULTS. We calculated changes in pulse pressure after volume challenge and an increase of 9 % was used as criterion to define volume responsiveness (1). Among 44 patients included in this study, 26 (59 %) were responders (R).$ScVO_2$ was not different between the two groups, responders (R) and non-responders (NR) (64.8 ± 11.4 vs 67.3 ± 10.9, p = 0.45) (mean ± SD). Moreover 38 % of R had $ScVO_2 > 70$ % and 66 % of NR had $ScVO_2 < 70$ %.

CONCLUSIONS. $ScVO_2$ cannot predict volume responsiveness in critically ill septic patients. Low $ScVO_2$ value does not indicate need for fluid administration.

REFERENCES. 1.Preau S, Saulnier F, Dewavrin F, Durocher A, Chagnon J-L (2010) Passive leg raising is predictive of fluid responsiveness in spontaneously breathing patients with severe sepsis or acute pancreatitis. Crit Care Med. 38:819–25.

0950

DIASTOLIC DYSFUNCTION IN PATIENTS WITH SEPTIC SHOCK

J. Sánchez Ruiz[1], Á. Estella García[1], R.Á. Bohollo de Austria[1], F. Valenzuela Sánchez[1]

[1]Associate University Hospital SAS of Jerez, Critical Care Medicine Unit, Jerez de la Frontera, Spain

OBJECTIVE. Patients with septic shock often present diastolic dysfunction and are associated with a worse prognosis. The main objective was to analyze mechanically ventilated patients with septic shock evaluated with tissue Doppler and to describe incidence, severity, clinical characteristics and prognostic value.

METHOD. Prospective study of 15 patients admitted to the intensive critical unit for septic shock in mechanical ventilation. Patients were excluded with a history of ischemic heart disease, hypertensive, valvular, dilated, hypertrofic and restrictive. Epidemiological, analytical and echocardiographics variables were collected after admission. They were monitored continuously with system that analyses the arterial waveform. The diastolic dysfunction was defined according to the guidelines of the American Society of Echocardiography using E, A, E/A, É, E/e′ y TDE. The left ventricular systolic dysfunction was defined as EF < 45 % and the right ventricle as S′ < 15 cm/sg. Statistical analyses were performed using SPSS Ò 14.0 software.

RESULTS. 15 patients were included. Mean age was 47 ± 16 years (66 % men) with APACHE II of 21 ± 9 points and SOFA 10 ± 4. In the echocardiographics study, 5 patients (33 %) had diastolic dysfunction, 2 patients (13 %) severe and 3 patients (20 %) moderate. 9 patients (60 %) submitted systolic dysfunction and 4 of them (26 %) was severe (EF < 35 %). We observed a decrease in EF associated with the need for vasoactive. Comparing survivors and died, fluid balance was 2,375 ± 840 ml vs 2,913 ± 1,346 ml (p = 0.31) in the first 6 h, heart rate 86.7 ± 5.5 vs 100.6 ± 14.5 b.p.m (p = 0.055), lactic 1.83 ± 0.5 vs 4.67 ± 1.8 mMol/l (p = 0.001), urine output 0.39 ± 0.06 vs 0.32 ± 0.04 ml/kg/h (p = 0.055), vasoactive medications 0.33 ± 0.125 vs 0.6 ± 0.18 μg/kg/min (p = 0.19), NT-proBNP 732.8 ± 854.8 vs 19,402 ± 14,992 pg/ml (p = 0.001), high-sensitivity troponin 51 ± 59 vs 357 ± 508 ng/ml (p = 0.028), E wave 72.7 ± 11.5 vs 84.8 ± 3.9 cm/sg (p = 0.019), E wave deceleration time 262 ± 40 vs 171 ± 41 ms (p = 0.003), E/é ratio 6.64 ± 1.9 vs 13.15 ± 3.2 (p = 0.005) and PCWP estimated 9.41 ± 2,7 vs 17.59 ± 4 mmHg. (p = 0.005) respectively. ICU length of stay was 7 ± 5 days and mechanical ventilation time was 5.3 ± 4.1 days. Finally, 6 patients (40 %) died.

CONCLUSIONS. Diastolic dysfunction is common in patients with septic shock. Tissue Doppler allows us diagnose it.

Diastolic dysfunction is associated with increased E/e′, PCWP, lactic, cardiac markers and poor outcome.

0951

COST OF MANAGING SEVERE SEPSIS PATIENTS TREATED WITH TORAYMYXIN IN SPAIN

A. Navas[1], D. Suarez[1], G. Gomà[1], G. Gili[1], R. Ferrer[2], A. Artigas[1]

[1]Critical Care Center, Corporació Sanitária i Universitária Parc Taulì-UAB, Sabadell, Spain, [2]Intensive Care Medicine, Hospital Mútua de Terrassa, Universitat de Barcelona, Terrassa, Spain

INTRODUCTION. Hemoperfusion with Toraymyxin is an innovative option for the treatment of severe sepsis. However, there is no evidence on the costs associated with this treatment in Spain.

OBJECTIVE. To quantify the overall treatment cost of patients with severe sepsis treated with Toraymyxin.
METHODS. We examined the overall treatment costs of nine patients treated with Toraymyxin and eight controls in a public hospital in Sabadell (Barcelona, Spain). For the cost calculation the hospital perspective was adopted. The following variables were taken into account for deriving the total costs: ICU days, ward days, days of treatment with vasoactive drugs, days of renal replacement therapy, days of mechanical ventilation and Toraymyxin use. Additionally, the above costs were compared with those reported in a cost-effectiveness study of Toraymyxin in Italy. That study showed that the treatment is cost-effective in that country. The costs are shown in 2010 Euros.
RESULTS. The table shows the average costs in Euros for the treatment of severe sepsis in Spain and Italy.

	Spain	Italy	Italy with Spanish Euros*
Toraymixin treated patients	41,119	59,922	66,458
Control patients	25,057	42,712	47,371
Difference (Incremental cost)	16,062	17,210	19,087

The previous data shows that the incremental cost per patient due to treatment with Toraymyxin in Spain is around 16,000 Euros, a figure that is lower than the one obtained in the Italian study that had the same goal. Furthermore, assuming a cost of treating Toraymyxin in 2010 of 8,357 euros per patient the weight cost of such treatment on the total cost of treatment is just over 20 %. The additional incremental increase in overall cost was mainly drove by a longer UCI stay for the patients treated with Toraymyxin.
CONCLUSIONS. The average incremental cost per patient due to treatment with Toraymyxin in Spain was lower than the reported in a cost-effectiveness study conducted in Italy that showed that Toraymyxin is a cost-effective treatment to treat severe sepsis, specifically the additional cost per life year gained was of 3,864 Euros. Therefore, if we assume that the effectiveness of Toraymyxin in Spain should be similar to that observed in the Italian study it seems plausible that Toraymyxin is also a cost-effective treatment in Spain. Thus, under this assumption the additional cost per year of life saved would be only 3,606 euros.
REFERENCES. 1.Berto P, Ronco C, Cruz D, Melotti RM, Antonelli M. Cost-effectiveness analysis of polymyxin-B immobilized fiber column and conventional medical therapy in the management of abdominal septic shock in Italy. Blood Purif. 2011; 32(4):331–40.

0952
BUNDLE-BASED MANAGEMENT OF SEPTIC SHOCK IN NAGOYA UNIVERSITY EMERGENCY AND MEDICAL ICU

N. Matsuda[1], S. Matsushima[1], S. Hashimoto[1], M. Ejima[1], Y. Takatani[1], M. Higashi[1], M. Inaba[1], M. Ohbayashi[1], K. Asada[1], J. Umino[1], T. Hinoshita[1], A. Numaguchi[1], M. Kado[1], Y. Adachi[1], H. Takahashi[1]

[1]Nagoya University Graduate School of Medicine, Department of Emergency & Critical Care Medicine, Nagoya, Japan
INTRODUCTION. Nagoya University Hospital opened the emergency and medical ICU of the closed system by the attending physician in our department on the 1st May 2011. We set up a main bundle of 11 underlying medical policy for the management of septic shock.
OBJECTIVES. This study is intended to analyze the outcome of septic shock by using this bundle.
METHODS. As the basis for management of septic shock, 11 elements were set as management bundle of septic shock. This included bacterial culture test and antibiotics against Gram-negative bacteria and Gram-positive bacteria, standard precaution, infusion therapy using cardiovascular echocardiogram and early goal-directed therapy, lactate clearance, open lung strategy, analgesia and sedation, urine volume management, non-β-receptor stimulation, continuous renal replacement therapy, early enteral nutrition within 48 h, and early rehabilitation within 3 day. We analyzed the management and outcome of septic shock from the 1st May 2011 to 31 March 2013 in accordance with this management policy.
RESULTS. Out of the total 733 cases that were managed by the ICU in the period, 42 cases were septic shock with lactate elevated. There were 23 male and 19 female patients. The mean age was 63.0 ± 21.2 years, in-ICU day was 13.6 ± 16.1 days, APACHE II score was 23.2 ± 8.0, and SOFA score was 11.2 ± 3.9. The predicted mortality by APACHE II score was 62 %. However, shock withdrawal rate was 100 %, and the 28 day mortality and in-ICU mortality rate was 2.4 and 7.1 %, respectively. The coarse of death were intestinal perforation, vertebral body infection and endocarditis, which were treated as DNR and end-of life care. On the other side, in the other 39 cases, anti-thrombin administration was found in 35 cases (89.7 %), recombinant thrombomodulin in 19 cases (48.7 %), and IVIG in 29 cases (74.4 %), respectively, as a replacement therapy. What had been 100 % compliance of the bundle were bacterial culture test and antibiotics,standard precaution, infusion therapy, lactate clearance, open lung strategy, daily interruption of analgesia and sedation, urine volume management, and early enteral nutrition.
CONCLUSIONS. Septic shock was almost 100 % reversal in our ICU. A high survival rate was obtained compared to the predicted mortality and results in sepsis registry in the Japanese Society of Intensive Care Medicine. We concluded that bundle management could improve outcome in septic shock.

0953
COLLOIDS VERSUS CRYSTALLOIDS IN SEVERE SEPSIS AND SEPTIC SHOCK

E. Torrents[1], C. de Haro[1], C. Teixidó[1], C. Espinal[1], A. Rodriguez[1], A. Artigas[1]

[1]Hospital de Sabadell, Corporació Sanitària i Universitària Parc Taulí, Critical Center, Sabadell, Spain
INTRODUCTION. Fluid administration is essential in the management of septic patients. However, the type of fluids used remains under debate. The two main groups of fluids, crystalloids and colloids, have advantages and limitations.
OBJECTIVES. To compare the effect of the administration of colloids and crystalloids in the resolution of shock, the evolution of organ failures and the fulfillment of the initial resuscitation goals proposed by the Surviving Sepsis Campaign (SSC).
METHODS. Observational retrospective study (November2010–November2011) in a polyvalent ICU. We included all the admitted patients with severe sepsis or septic shock. We identified two groups according they received colloids (6 % HES and gelatins solutions) and crystalloids (group A) or only crystalloids (group B). Clinical, analytical and fluid therapy variables were analyzed during the first 4 days of sepsis evolution. Data were analyzed with Chi square and t-student. Results were presented as mean ± standard deviation and percentage.
RESULTS. 99 patients were included (74 group A and 25 group B). Both groups were comparable at baseline (table 1), except for the incidence of septic shock and the SOFA score (both of them higher in the colloids group). There were no differences between groups regarding the resolution of shock (evaluated as time to discontinue vasoactive agents), time of vasopressors and the fulfillment of initial goals of SSC. Patients treated with colloids presented a worse stage in RIFLE scale only in the second day, without differences in the requirement of renal-replacement therapies between groups (16.2 vs 8 %;p = 0.30). There were no differences in the transfusion needs between groups (41.9 vs 28 %;p = 0.21). Fluid balance was more positive in the colloids group than in the crystalloids (5,711.3 ± 5,300.1 ml vs 2,500.1 ± 4,576.2 ml; p = 0.008). Despite the group of colloids had a daily higher SOFA than crystalloids, there were no differences between groups in delta SOFA from day 4 to day 1(table 2). There were no differences in ICU stay (14.2 ± 14.4 vs 15.6 ± 14.5; p = 0.69), in-hospital stay (28.9 ± 23.1 vs 34.6 ± 31.4; p = 0.35), days of mechanical ventilation (7.8 ± 10.2 vs 7.6 ± 9.2; p = 0.93) and 28 days mortality (28.2 vs 26.1 %;p = 0.84).
CONCLUSIONS. In our patients, the administration of colloids does not improve the initial resuscitation of sepsis. We did not find any association between the use of colloids and organ failures. Patients receiving colloids had a higher positive fluid balance. There are no differences in ICU stay, in-hospital stay, days of mechanical ventilation and mortality.

Table 1

	Colloids (group A)	Crystalloids (group B)	p
Age (years)	66.0 ± 14.9	69.2 ± 10.7	0.329
Sex (male)	58.1 %	60 %	0.868
Weight (kg)	79.4 ± 18.0	74.1 ± 18.8	0.210
APACHE II score	19.1 ± 6.9	16.6 ± 7.2	0.125
Mean arterial pressure (mmHg)	62.7 ± 10.2	67.7 ± 15.4	0.070
Central venous pressure (mmHg)	10.6 ± 4.8	8.7 ± 5.1	0.117
$SvcO_2$ (%)	69.2 ± 8.0	69.7 ± 8.4	0.802

Table 2

SOFA score	Colloids	Crystalloids	p
Day 1	7.7 ± 3.1	6.2 ± 2.7	0.040
Day 2	7.7 ± 3.4	5.5 ± 2.5	0.004
Day 3	6.8 ± 3.7	4.7 ± 2.7	0.011
Day 4	6.0 ± 4.0	3.6 ± 2.3	0.009

REFERENCES. 1. Guidet B et al. The CRYSTMAS study. Crit Care. 2012;16:R94. 2. Myburgh J et al. The crystalloid versus HES trial (CHEST). ICM 2011;37:816. 3. Bayer O et al. Effects of fluid resuscitation with synthetic colloids or crystalloids alone on shock reversal, fluid balance, and patient outcomes in patients with severe sepsis: a prospective sequential analysis. CCM 2012;40(9).

0954
ARE THE LOW SERUM LEVELS OF VASOPRESSIN IN SEPTIC SHOCK PATIENTS REFRACTORY TO CATECHOLAMINES?

F. Molina[1,2], D. Cuesta[2], N. Fonseca[2], A. Lemos[2]

[1]Clinica Universitaria Bolivariana, Intensive Care Unit, Medellin, Colombia, [2]Universidad Pontificia Bolivariana, Ciencias de la Salud, Medellin, Colombia
INTRODUCTION. A relative deficiency of vasopressin may contribute to shock in sepsis. The levels are increased at the initial phase of septic shock and a deficiency occurs after 36 h from shock onset.
OBJECTIVE. To assess the frequency of the relative vasopressin deficiency in patients with refractory septic shock.
METHODS. This is a study derived from a blinded, randomized, controlled trial performed in the Intensive Care Unit of healthcare-high complexity institution Medellín-Colombia. Patients with norepinephrine higher 0.3 mcg/kg/min, were assigned to increasing doses of norepinephrine or norepinephrine plus vasopressin (0.03U/min). During the first 24 h of shock, serum samples were taken before the randomization and after patients have achieved central venous oxygen saturation ≥70 % and received steroids. A relative vasopressin deficiency was defined by vasopressin levels <3.6 pg/mL. Data are expressed as median with interquartile range (IQR) and compared by Mann–Whitney test, $p < 0.05$ was considered statistically significant. Written informed consent was obtained.
RESULTS. 16 patients received norepinephrine and 14 norepinephrine/vasopressin. Four patients (13.3 %) had vasopressin levels <3.6 pg/mL, and eight had vasopressin levels >100 pg/mL. The levels among groups were: median = 19.5 pg/mL; IQR 6.3–89 for norepinephrine group, and median = 29.6 pg/mL; IQR 3.9–298.2 for norepinephrine/vasopressin group, p-value 0.32.
CONCLUSIONS. In the first 24 h of refractory septic shock, 13.3 % of patients had relative vasopressin deficiency at baseline. Shock may be the result of a peripheral receptor hyposensitivity and a reduced response to vasopressin.
REFERENCES. 1. Sharshar T, Blanchard A, Paillard M, Raphael JC, Gajdos P, Annane D. Circulating vasopressin levels in septic shock. Crit Care Med. 2003; 31:1752–58 2. Russell JA, Walley KR, Singer J, Gordon AC, Hébert PC, Cooper DJ, Holmes CL, Mehta S, Granton JT, Storms MM, Cook DJ, Presneill JJ, Ayers D; VASST Investigators. Vasopressin versus norepinephrine infusion in patients with septic shock. N Engl J Med. 2008;358(9):877–87.

Perfusion and the microcirculation: 0955–0968

0955
EFFICACY OF TETRATHIOMOLYBDATE, A SULPHIDE DONOR, IN A RAT MODEL OF SEVERE HAEMORRHAGE/REPERFUSION INJURY

A. Dyson[1], M. Singer[1]

[1]University College London, Bloomsbury Institute of Intensive Care Medicine, London, UK

INTRODUCTION. Hydrogen sulphide (H_2S) inhibits mitochondrial respiration and offers therapeutic potential by induction of a 'suspended animation'-like state. We recently discovered that the copper chelating agent, tetrathiomolybdate (TTM) acts as a slow-release sulphide donor and is more metabolically active than the standard sulphide donor, NaHS in both healthy and shocked rats.

OBJECTIVES. To assess the therapeutic potential of TTM in a rat model of severe haemorrhage/reperfusion injury.

METHODS. Anaesthetized male Wistar rats underwent insertion of carotid arterial and jugular venous lines for blood removal and fluid/drug administration, respectively. After 30 min stabilization, 50 % estimated circulating blood volume was removed from the arterial line over 15 min. Animals were monitored for a further 90 min prior to resuscitation, then randomized (n = 16/group) to receive either TTM (10 mg/kg; i.v. bolus) or vehicle (n-saline). This was immediately followed by administration of shed blood over 15 min. In TTM-treated animals, the shed blood was supplemented with a further 2.5 mg/kg TTM. Vehicle-treated animals received equivalent volumes of fluid and administration of shed blood. Following resuscitation, both groups of animals received 10 ml/kg/h n-saline. Core temperature and cardiac function (echocardiography) were assessed following each haemorrhage/reperfusion step and hourly thereafter. At 2 h post-resuscitation, blood (1 ml) was removed for measurement of plasma IL-6 and protein carbonyls (marker of oxidative damage). Survival was assessed up to 6 h post-resuscitation.

RESULTS. At 6 h post-reperfusion, 10/16 TTM-treated animals survived vs 5/16 controls ($p < 0.05$) (Fig 1). The rise in core temperature and heart rate on reperfusion was prevented in TTM-treated animals, indicative of decreased global metabolism. Respiration rate also fell ($p < 0.05$) in TTM-treated animals while cardiac output was similar in both groups (data not shown). IL-6 and protein carbonyls at 2 h post-resuscitation were lower in TTM-treated animals, albeit not significantly.

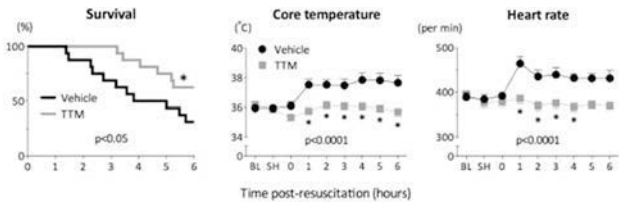


Fig. 1 Effects of TTM following severe haemorrhage/reperfusion injury. Post-resuscitation survival shown as a Kaplan–Meier curve ($p < 0.05$, Log-rank test). Core temperature and heart rate shown as mean ± SEM (statistics: 2-way RM ANOVA + Bonferroni test). BL, baseline; SH, post-shock

CONCLUSIONS. TTM administration significantly improves survival following severe haemorrhage/reperfusion injury. This beneficial effect is likely mediated by modulation of metabolism.

GRANT ACKNOWLEDGMENT. Partial support from Magnus Invention.

0956
EARLY IMPACTS OF INTRA-ABDOMINAL HYPERTENSION ON MICROVASCULAR FLUID- AND PROTEIN-EXCHANGE AND HEMODYNAMICS—STUDIES IN A PORCINE MODEL

B. Elvevoll[1], O. Haugen[1], K. Øvrebø[2], P. Husby[1]

[1]Haukeland University Hospital, Department of Anesthesia and Intensive Care, Bergen, Norway, [2]Haukeland University Hospital, Section for Gastrointestinal Surgery, Bergen, Norway

INTRODUCTION. Intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) contributes significantly to increased morbidity and mortality in critically ill patients. The condition frequently follows intra-abdominal or systemic inflammation causing abundant edema formation. However IAH could itself be a factor promoting edema formation.

OBJECTIVES. The purpose of this study was to explore the acute effects of elevated intra-abdominal pressure on microvascular fluid- and protein shifts and vascular capacity in order to better understand the mechanisms responsible for secondary organ dysfunction or failure.

METHODS. 16 pigs were randomized to either the control-group (C-group, n = 8) or the interventional group (P-group, n = 8). After surgery and 60 min stabilization intra-abdominal pressure (IAP) of the P-group animals was elevated by insufflation of helium into the intra-abdominal cavity. IAP was maintained at 15 mmHg (grade 1–2 of IAH) for 120 min and then at 30 mmHg (grade 4 of IAH) for 120 min. The C-group animals underwent the same surgical procedure but no further intervention. Laboratory and hemodynamic parameters, plasma volume and total tissue water content were measured and net fluid balance and fluid extravasation rates calculated. Statistical analysis was performed by SPSS (Version 20) and results presented as mean ± SD. All P-values refers to between-group differences.

RESULTS. Hematocrit (Hct), Plasma volume (PV), and fluid extravasation rate (FER) of the C-group animals remained unchanged throughout the experiments. In the P-group Hct increased from 27.7 ± 1.6 % at baseline to 29.6 ± 1.3 % (IAH grade 1–2) and 32.4 ± 1.9 % (IAH grade 4) ($P < 0.001$). PV of the P-group decreased from 60.9 ± 7.5 ml/kg at baseline to 54.4 ± 7.1 ml/kg (IAH grade 1–2) and to 47.2 ± 6.3 ml/kg (IAH grade 4)($P < 0.001$). FER of the P-group animals increased from 0.18 ± 0.05 ml/kg/min at baseline to 0.24 ± 0.01 ml/kg/min during IAH grade 1–2 and to 0.27 ± 0.03 ml/kg/min during IAH grade 4 ($P < 0.001$). Venous pressure of the P-group were significantly higher in the P-group as compared with the C-group during IAH grade 1–2, both when measured in the femoral vein ($P < 0.001$) as well as in the right atrium ($P < 0.05$). The differences were even more pronounced during IAP grade 4.

CONCLUSIONS. IAH contributes to increased fluid filtration from circulation to the interstitial space resulting in plasma volume contraction. The elevated central venous pressure of the P-group may contribute to the increase in FER since venous pressure is an important determinant of capillary hydrostatic pressure.

0957
PTP1B GENETIC DELETION LIMITS CARDIOVASCULAR DYSFUNCTION AND MORTALITY DURING ENDOTOXINIC SHOCK

D. Coquerel[1], E. Gomez[2], X. Marechal[3], D. Montaigne[4], I. Remi-Jouet[2], S. Renet[2], P. Mulder[2], R. Neviere[3], V. Richard[2], F. Tamion[2]

[1]INSERM 1096, Recherche, Rouen, France, [2]INSERM 1096, Rouen, France, [3]EA 4484, Physiologie, Lille, France, [4]EA 4484, Lille, France

INTRODUCTION. Sepsis-associated cardiovascular dysfunction is one of the main causes of mortality in critically ill patients. PTP1B was describing as a negative regulator of insulin signaling and endothelial Nitric Oxide (NO) production, two mechanisms likely involved in the pathogenesis of sepsis. We recently showed that PTP1B gene deletion or pharmacological inhibition afford myocardial and endothelial protection in experimental heart failure. However, whether PTP1B inactivation opposes LPS-induced cardiovascular dysfunction is unknown.

OBJECTIVES. Assess the impact of PTP1B genetic deletion in the cardiovascular dysfunction and inflammation during experimental endotoxinic shock.

METHODS. $PTP1B^{-/-}$ or wild-type mice received lipopolysaccharide (15 mg/kg) or vehicle followed by subcutaneous fluid resuscitation (saline 30 ml/kg). Vascular function was assessed in mesenteric arteries resistance on arteriographe system and left ventricular (LV) function by echocardiography, pressure–volume curves and ex vivo in Langendorff isolated-perfused hearts. Inflammatory and oxidative stress markers were assessed by Western blot and RT-PCR.

RESULTS. We found that LPS enhances significantly cardiovascular PTP1B mRNA expression. Compared with wild type, $PTP1B^{-/-}$ mice displayed markedly reduced lipopolysaccharide-induced mortality associated with a higher locomotor activity during endotoxemia. Concerning vascular function, $PTP1B^{-/-}$ LPS mice display a significant improvement of contractile response to phenylephrine and flow mediated-dilatation in association with a significant phosphorylation of Akt and eNOS. Moreover we find that PTP1B genetic deletion significantly reduced vascular mRNA expression level of VCAM-1, ICAM-1, COX-2, iNOS and Gp91phox.

Cardiac dysfunction was also significantly reduced in $PTP1B^{-/-}$ mice as shown by the LV End Diastolic and End Systolic Pressure–Volume Relation improvement (LVESPVR WT H8 16.1 ± 1.62 *vs.* $PTP1B^{-/-}$ H8 19.96 ± 1.95 mmHg/RVU, $p < 0.05$) but also by the higher LV Developed Pressure (LVDP WT H8 25 ± 5 vs. $PTP1B^{-/-}$ H8 50 ± 5 mmHg) observed ex vivo in Langendorff. These results were associated with a significant decrease of myocardial inflammatory state as shown by the lower mRNA expression level of VCAM-1, ICAM-1, CD45, IL-1b, TNF-a and Gp91phox in $PTP1B^{-/-}$ mice. PTP1B deficiency also reduced P38 and ERK1/2 phosphorylation and increased phospholamban phosphorylation. These beneficial effects were observed despite increased plasma concentrations of TNF-a and IL-1b and no effects on LV mitochondrial fonction.

CONCLUSIONS. We demonstrate for the first time that PTP1B gene deletion protects against lipopolysaccharide-induced cardiovascular dysfunction and mortality. These results suggest that PTP1B is an attractive target for the treatment of sepsis.

0958
HEMODYNAMIC EFFECTS OF POSITIVE END EXPIRATORY PRESSURE IN A PORCINE MODEL OF PNEUMOPERITONEUM

B. Fyntanidou[1], K. Kotzampassi[1], E. Amaniti[1], C. Nouris[1], E. Oloktsidou[1], V. Ourailoglou[1], V. Grosomanidis[1]

[1]Aristotle Medical School, Thessaloniki, Greece

INTRODUCTION. The salutary respiratory effects of Positive End Expiratory Pressure (PEEP) in mechanically ventilated patients are well known. However, PEEP is associated with some unfavorable hemodynamic effects. Furthermore, iIncreased intra-abdominal pressure (IAP) has been also recorded to have a negative impact on the cardiovascular system.

OBJECTIVES. The aim of our study was to investigate the hemodynamic effects of different PEEP levels in a porcine model with and without pneumoperitoneum (PP).

METHODS. The hemodynamic effects of different PEEP levels were evaluated in 12 female pigs (mean age: 3 months and mean weight: 25 kg) during 2 different Time Periods, TP-A and TP-B, with and without PP. All of the animals received general anesthesia and were mechanically ventilated. During TP-A, IAP was raised to 12 mmHg and remained at that level by CO_2 inflation via a Veress needle using a gas insufflation device, whereas during TP-B, which followed P-A, the peritoneal cavity was opened. Standard monitoring applied consisted of ECG, invasive blood pressure, cardiac output (CO) and stroke volume (SV) using a pulmonary artery catheter and finally $etCO_2$ and airway pressures. Parameters recorded included: Heart rate (HR), mean arterial pressure (BPm), CO, SV and Peak Inspiratory Pressure (PIP). Measurements were obtained at 5 different phases (P): P0: PEEP = 0, P1: PEEP = 5, P2: PEEP = 10, P3: PEEP = 15 and P4: during disconnection of the ventilator. Every phase lasted for 15 min and during P4 apneic oxygenation was initiated to preserve adequate oxygenation. ANOVA was utilized for repeated measurements and paired t-test for comparison between the two time periods.

RESULTS. The results of our study are depicted on Tables 1

	TP-A	TP-B	TP-A vs TP-B
	CO		
P0	3.8±0.7	3.9±0.7	NS
P1	4.1± 0.6**	3.4 ± 0.8*	NS
P2	4.5 ± 0.6**	2.8 ± 0.8**	p<0.001
P3	4.7±0.5**	2.3±0.8**	P<0.001
P4	3.7 ± 1	4.5 ± 0.9*	NS
	SV		
P0	36.3±10.7	39.7±13	NS
P1	38.1 ± 10.5*	32.7 ± 13**	NS
P2	39.9 ± 8.1**	26.5 ± 12,6**	p<0.01
P3	41.4±6.6**	21.7±10.9**	P<0.001
P4	30.7 ± 7**	47.6 ± 15.3**	p<0.001
*:p<0.05, **:p<0.001 compared to P0			

Table 1

	TP-A	TP-B	TP-A vs TP-B
	HR		
P0	108.5 ± 19.8	108.6 ± 29.9	NS
P1	112.6 ± 24.6	116.1 ± 32.1	NS
P2	115 ± 24.3	121.1± 36	NS
P3	116.6±23.9	123 ± 39*	NS
P4	121.2±19.5*	99.2 ± 16.6	p<0.01
	BPmean		
P0	112.2± 13.6	108.4± 17.3	NS
P1	115.3±16.2	102.7±14.4	p<0.05
P2	106.9 ± 12	92.7±19.9*	p<0.05
P3	101.2± 17	67.9±19.5**	p<0.001
P4	111.6±13.2	108±9.8	NS
*:p<0.05, **:p<0.001 compared to P0			

Table 2

CONCLUSIONS. The unfavorable hemodynamic effects of PEEP and of increased IAP are well defined in the literature[1,2]. According to our results, PEEP application in a setting of increased IAP, not only does not promote the deterioration of the cardiovascular system but on the opposite it has positive hemodynamic effects.

REFERENCES. 1. Barnes G et al. Cardiovascular responses to elevation of intra-abdominal hydrostatic pressure. Am J Physiol Regul Integr Comp Physiol. 1985; 248: 208–213 2. Scharf S. Cardiovascular effect of positive pressure ventilation. J Crit Care 1992; 7:268–279

0959

HETEROGENOUS PHYSIOLOGICAL RESPONSES TO AN IDENTICAL SEVERE HYPOXAEMIC INSULT

N.J. Ekbal[1], A. Mayevsky[2], M. Singer[1]

[1]Bloomsbury Institute of Intensive Care Medicine, Division of Medicine, London, UK, [2]Bar-Ilan University, The Mina & Everad Goodman Faculty of Life Sciences, Ramat Gan, Israel

INTRODUCTION. The current fixation with management bundles and protocols homogenizes patients into single populations and does not consider individual differences related to age, sex, co-morbidities (e.g. COPD, hypertension), etc., nor an individual's ability (or not) to compensate for an acute deterioration. We have noted heterogeneous responses to cardiorespiratory insults in our rat models even though they are of similar age, gender and upbringing, and often from the same litter. We studied this further in a severe hypoxaemia model as part of an ongoing assessment of monitoring skeletal muscle NADH redox state. This non-invasive approach utilizes the biological property of reduced NADH (but not oxidized NAD +) autofluorescence in response to light excitation. Decreases in mitochondrial oxygenation increase NADH:NAD + redox state and thus the NADH fluorescence intensity.

OBJECTIVES. To examine the individual response of healthy rats to severe hypoxaemia, assessing changes in skeletal muscle NADH fluorescence, global haemodynamics and tissue perfusion.

METHODS. Anaesthetised, spontaneously breathing, male Wistar rats underwent left common carotid (for BP monitoring and blood sampling) and right jugular venous cannulation (for fluid administration), and tracheostomy. Changes in mitochondrial NADH on the surface of the exposed right gracilis muscle were determined following light excitation (MitoViewer, Prizmatix, Israel). Tissue PO_2 and laser Doppler microvascular blood flow were monitored using a combined sensor (Oxylite, Oxford Optronix, UK) placed into the left gracilis muscle. After a 60-min stabilization period, the F_iO_2 given via tracheostomy was reduced from 0.21 to 0.06. Echo and arterial blood gas analysis were performed at 15-min intervals until death or 180 min.

RESULTS. Ten animals were studied. Fig 1 demonstrates marked variability in response to 6 % inspired O_2. Five died within 30 min whereas four survived for 180 min. The tenth rat initially compensated but then deteriorated after 30 min. The rise in NADH redox state paralleled the severity of the insult. Animals dying within 30 min had much greater rises in NADH that failed to recover, whereas the one delayed death showed a lesser initial rise that failed to normalize but then increased markedly over the 30 min prior to demise. All surviving rats showed a smaller rise in NADH fluorescence that normalized by 60–90 min. Similar patterns were seen in the other markers measured.

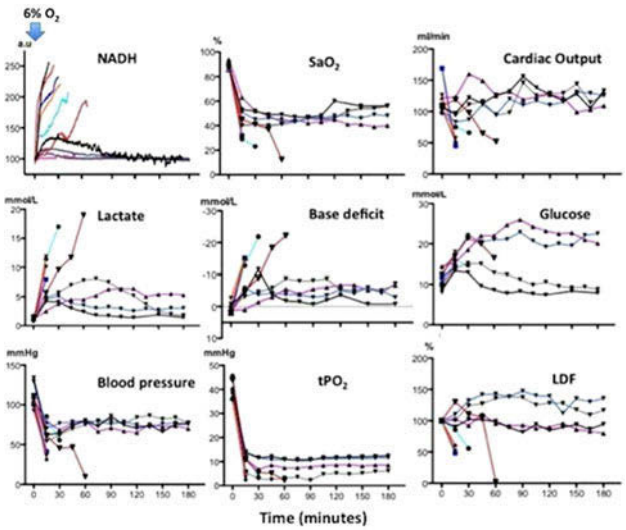


Fig. NADH, Acid–base & physiological variables

CONCLUSIONS. An identical severe hypoxaemic insult produced a highly variable individual response in a seemingly homogenous population. NADH fluorescence and other makers of tissue oxygenation and perfusion reflected the ability of the individual animal to compensate.

REFERENCES. 1. MacIntyre N. Resp Care 2013; 58:142–150.

GRANT ACKNOWLEDGMENT. NE is funded by the Medical Research Council (UK).

0960

INTER-RATER RELIABILITY OF SUBJECTIVE ASSESSMENT OF SUBLINGUAL MICROCIRCULATION IMAGES AND ITS DIAGNOSTIC PERFORMANCE AMONGST PHYSICIANS AND NURSES FROM DIFFERENT COUNTRIES

A.A. Pinto Lima[1], A. Lopez[2], M.E. van Genderen[1], A. Shono[2], F.J. Hurtado[2], J. van Bommel[1]

[1]Erasmus MC University Medical Centre Rotterdam, Rotterdam, The Netherlands, [2]Hospital de Clínicas, Department of Pathophysiology, Montevideo, Uruguay

INTRODUCTION. Sidestream dark field (SDF) imaging technique allows the direct visualization of the sublingual microcirculation and its use has had an important clinical impact on prognosis during resuscitation of circulatory shock. Several obstacles, however, exist to assess microcirculation at the bedside, such as the requirement of offline processing and scoring, which can delay results to the clinician. Therefore, a real-time subjective evaluation of microcirculatory disturbances would provide quicker screening at the bedside and allow for immediate clinical management decisions to be made.

OBJECTIVES. This study aimed to investigate the ability of subjective assessment of sublingual microcirculation images by multiple observers amongst physicians and nurses from three different countries to discriminate normal from abnormal sublingual microcirculation based on flow and density abnormalities.

METHODS. We selected 106 examiners (mean age: 36 ± 10 years; 45 physicians, 61 nurses) from three different centers in the Netherlands (N = 61), Uruguay (N = 12) and Japan (N = 33) to examine 15 videos of sublingual microcirculation randomly gathered of pigs from an experimental model of endotoxic shock. All videos were first analyzed offline with designed software (A.V.A. 3.0, A.M.C. the Netherlands) by an independent experienced investigator, and categorized in *good*, *bad* or *very bad* microcirculation based on microcirculatory flow index (MFI), perfused capillary density (PCD) and proportion of perfused capillaries (PPC) cutoff values (1,2). Thereafter, the videos were randomly assigned to the examiners, who were instructed to categorize subjectively each image in *good*, *bad* or *very bad*. An inter-rater analysis was performed using the average Kappa across all raters pairs (Light's Kappa) then used the mean of these estimates to provide an overall index of agreement amongst the raters. The sensitivity and specificity were calculated to test the proportion of A.V.A. score abnormalities correctly identified by the examiners.

RESULTS. The resulting Kappa indicated moderate agreement in rating microcirculation abnormalities and did not differ between physicians and nurses, nor differed amongst the different countries (TABLE 1). TABLE 2 shows the sensitivity and specificity of examiners evaluation for A.V.A. score abnormalities. Figure 1 shows the percent of agreement between AVA analysis and subjective analysis by the examiners.

	K All	K Nurses	K Physicians	K the Netherlands	K Uruguay	K Japan
Light's Kappa (K)	0.48	0.52	0.48*	0.48	0.35	0.50**

[*P = 0.16 vs. nurses. **P = 0.26 amongst the countries]

	Mean	95 % CI
Sensitivity	84 %	81–86 %
Specificity	87 %	84–90 %
Positive predictive value	92 %	90–94 %
Negative predictive value	75 %	72–79 %
Likelihood ratio positive test	6.5	5.2–8.1
Likelihood ratio negative test	0.2	0.16–0.22

Diagnostic accuracy among the 106 examiners

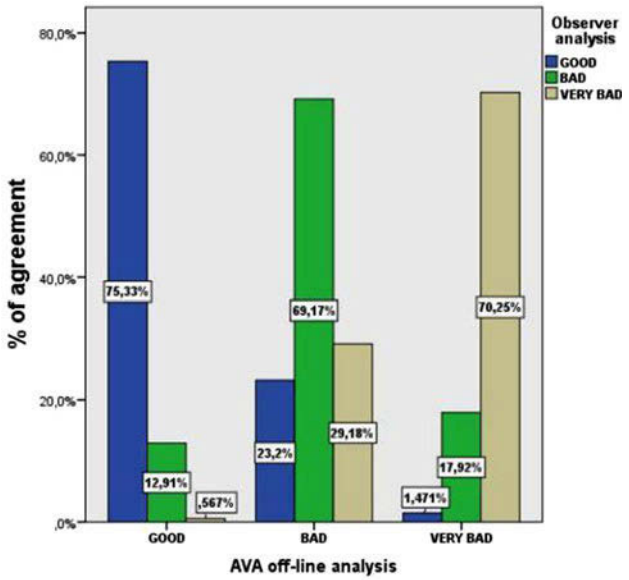


Figure 1

CONCLUSIONS. Subjective assessment of sublingual microcirculation by physicians and nurses had good agreement with conventional off-line analysis, and was highly sensitive and specific to identify sublingual microcirculatory abnormalities.

REFERENCES. 1. Quantitative assessment of the microcirculation in healthy volunteers and in patients with septic shock. Crit Care Med. 2012; PMID: 22430243. 2. Persistent microcirculatory alterations are associated with organ failure and death in patients with septic shock. Crit Care Med. 2004; PMID: 15343008.

0961

CENTRAL VENOUS OXYGEN SATURATION ($SCVO_2$) AS A PROGNOSTIC INDICATOR FOR OPTIMIZED THERAPY AND OUTCOME IN PATIENTS WITH SEVERE HEART FAILURE/CARDIOGENIC SHOCK

A. Helal[1,2], T. Fahmy[2], A. Yehia[2], M. Hamdi[2], S. Mokhtar[2]

[1]Ahmed Maher Teaching Hospital, Critical Care Department, Cairo, Egypt, [2]Cairo University, Critical Care Department, Cairo, Egypt

INTRODUCTION. Central venous oxygen saturation ($ScvO_2$) provides an estimate of body oxygen consumption/delivery ratio.(1) It has been widely used for optimization of therapy in septic patients (3); however its value in acute decompensated heart failure (ADHF)/cardiogenic shock has not yet been established. (2).

OBJECTIVES. To assess the value of $ScvO_2$ as a prognostic indicator for optimized therapy and outcome in patients with ADHF/cardiogenic shock.

METHODS. $ScvO_2$ was prospectively measured in 30 consecutive patients admitted with ADHF/cardiogenic shock requiring inotropic support ± vasopressor,(mean age 56 ± 10 years; 18 females; left ventricular ejection fraction 34 ± 8 %). $ScvO_2$, lactate and oxygen extraction were compared in survivors and non-survivors on admission, after 24 h of therapy and before weaning off inotropes.

RESULTS. Out of 30 included patients, mortality occurred in 12 (40 %) patients. Admission $ScvO_2$ did not differ between survivors and non-survivors (51.1 ± 7.1 vs. 49.6 ± 4.6 respectively), but admission lactate was significantly lower in survivors (2.6 ± 0.3 vs. 4.61 ± 3.03; $p = 0.01$). After 24 h of therapy, $ScvO_2$ increased and was significantly higher than non survivors (74.3 ± 2.9 % vs. 59.5 ± 3.2 %; $p < 0.0001$). Finally before weaning off inotropes, $ScvO_2$ was significantly higher in survivors than non-survivors (70.3 ± 2.5 % vs. 52.1 ± 6.1 %; $p < 0.0001$). There was a significant positive correlation between $ScvO_2$ and cardiac ejection fraction (R:0.5, p value0.03). Multivariate analysis showed that $ScvO_2$ at 24 h was an independent predictor of mortality as well as lactate and oxygen extraction at 24 h. Using ROC, a cut-off value of 70 % for $ScvO_2$ after 24 h was predictive of mortality with a sensitivity 88 % and specificity 100 % (P value 0.0001).

CONCLUSIONS. In patients admitted with ADHF/cardiogenic shock requiring inotropic support, $ScvO_2$ is a good prognostic indicator for optimal therapy and mortality. A cut off level ≤ 70 % after 24 h of therapy, is an indicator for poor outcome and may warrant more aggressive therapy.

REFERENCES. 1. Christian T, Christian AS, Sarah W et al. Hemodynamic variables and mortality in cardiogenic shock: a retrospective cohort study. Critical Care 2009; 13:R157. 2. Dickstein K, Cohen-Solal A, Filippatos G, et al. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2008: Developed in collaboration with the Heart Failure Association of the ESC (HFA) and endorsed by ESICM. Eur Heart J 2008;29:2388–442. 3. Jones AE, Shapiro NI, Trzeciak S, Arnold RC, Claremont HA, Kline JA. Lactate clearance vs. central venous oxygen saturation as goals of early sepsis therapy: a randomized clinical trial. JAMA. 2010;303(8):739–46.

0962

THE ANION STUDY: EFFECTS OF LARGE VOLUME RESUSCITATION ON ACID–BASE BALANCE, PHYSIOLOGY AND SURVIVAL

N.J. Ekbal[1], P. Hennis[2], A. Dyson[1], M. Mythen[2], M. James[3], M. Singer[1]

[1]Bloomsbury Institute of Intensive Care Medicine, Division of Medicine, London, UK, [2]UCL Centre for Anaesthesia, Critical Care & Pain Medicine, London, UK, [3]University of Cape Town, Department of Anaesthesia, Cape Town, South Africa

INTRODUCTION. Crystalloid solutions are increasingly used for intravascular volume replacement, e.g. NaCl 0.9 %, Hartmann's solution or less commonly, Ringer's acetate. None are perfect: many contain an excess of sodium and chloride, solutions are either hypertonic or hypotonic compared to plasma, and none contain a balance of electrolytes comparable to plasma. Large volumes may thus lead to disturbances of electrolyte balance with potentially harmful consequences.

OBJECTIVES. To ascertain the effects that three distinct crystalloid solutions exert on the balance of plasma electrolytes and acid–base physiology during resuscitation from simulated haemorrhage.

METHODS. Constituents of each study solution (mmol/L) are shown in Table (1) below:

Table

Fluid	Na^+	K^+	Cl^-	Mg	Lactate	Acetate	Osmolarity
Chloride solution	140		140	1			282
Lactate buffer	140	4	112	1	34		291
Acetate buffer	137	4	110	1.5		34	286.5

Anaesthetized, spontaneously breathing, male Wistar rats underwent left common carotid (for BP monitoring and blood removal) and right jugular venous cannulation (for fluid administration), and tracheostomy. Post-stabilization, baseline echo was performed. Ten percent estimated blood volume was removed and replaced with 2× volume of (blinded) test solution. Echo was repeated 3 min after each fluid bolus and filling volume estimated by left ventricular internal diameter in diastole (LVIDD). If LVIDD was below baseline at 5 min post-fluid bolus, half of the initial fluid dose was given. This was repeated at 3 min intervals until either LVIDD ≥ baseline or a maximum of 5x volume of the blood withdrawn was given. This cycle was repeated at 15 min intervals until death. Removed blood was sampled at 15 min intervals for plasma ions, acid–base status, haemoglobin and glucose. The primary endpoint was change in plasma bicarbonate within each fluid group. Secondary endpoints included time to death and cardiac performance.

RESULTS. 15 animals per group were studied. All 45 rats survived until cycle 5, therefore data were compared using RM-ANOVA until this point (Figure 1).

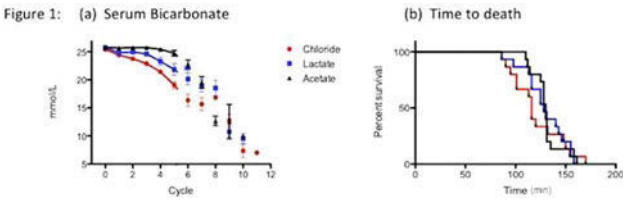


Figure 1 (a) Plasma bicarbonate (b) Time to death

Bicarbonate was significantly higher in acetate-treated versus chloride-treated rats from cycle 3 onwards, and from cycle 5 for the lactate group. Time to death (mean ± SE) was however similar: chloride solution 121 ± 6.5 min, lactate 129 ± 5.5 min ($p = 0.6$), acetate 130 ± 3.6 min ($p = 0.6$). No difference was seen between groups for cardiac performance relative to haemoglobin concentration (data not shown). Glucose did not significantly differ between groups, suggesting that the organic anions do not result in increased gluconeogenesis in this model.

CONCLUSIONS. In this blinded study, acetate solution showed early maintenance of serum bicarbonate compared to chloride solution however, there was no difference in overall survival or cardiac performance between groups.

REFERENCES. 1. Scheingraber S et al. Anesthesiology 1999; 90:1265–70

GRANT ACKNOWLEDGMENT. NE is funded by the Medical Research Council (UK). Fresenius provided unrestricted grant support.

0963

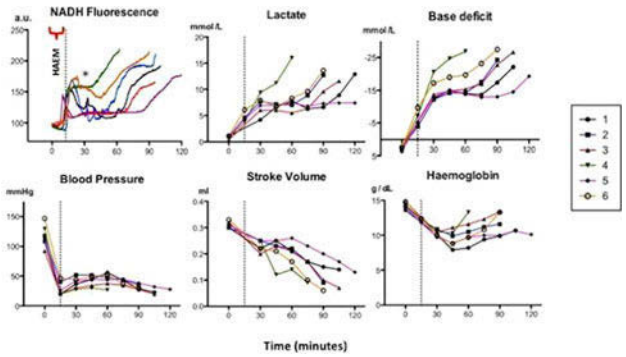
SUSTAINED CHANGES IN SKELETAL MUSCLE NADH REDOX STATE ARE AN EARLY PREDICTOR OF MORTALITY FROM HAEMORRHAGIC SHOCK

N.J. Ekbal[1], A. Mayevsky[2], M. Singer[1]

[1]Bloomsbury Institute of Intensive Care Medicine, Division of Medicine, London, UK, [2]Bar-Ilan University, The Mina & Everad Goodman Faculty of Life Sciences, Ramat Gan, Israel

INTRODUCTION. Tissue hypoperfusion relates to the inadequate supply of oxygen, which is predominantly (>90 %) utilized by mitochondria for production of ATP. Monitoring the adequacy of mitochondrial oxygenation is thus the 'holy grail' in (impending) shock states. Within mitochondria, NADH transfers electrons from the Krebs' cycle to Complex I of the electron transport chain and becomes oxidised to NAD+. A rise in NADH:NAD+ redox state occurs with a downstream block of the chain, e.g. due to lack of oxygen. NADH (but not NAD+) fluoresces in response to excitation light at 340 nm, and at an intensity proportional to its concentration. As most of the tissue NADH fluorescence

signal represents changes in mitochondrial NADH, this can be utilized for non-invasive monitoring of tissue perfusion.
OBJECTIVES. To examine the relationship between changes in skeletal muscle NADH fluorescence intensity with concurrent measures of global haemodynamics (BP, HR, cardiac output) and tissue perfusion (lactate, base deficit) following severe haemorrhage.
METHODS. Six anaesthetised male Wistar rats underwent instrumentation and, after 60 min stabilization, underwent controlled removal of 40 % of circulating blood volume. Animals were followed until death with monitoring of mitochondrial NADH (MitoViewer, Prizmatix, Israel) on the surface of the exposed right gracilis muscle, tissue PO_2 and laser Doppler microvascular blood flow (Oxylite, Oxford Optronix, UK) in the left gracilis muscle, continuous BP and intermittent (15 min) echocardiography & arterial blood gas analysis.
RESULTS. Due to individual response to haemorrhage, results are shown for each animal (Fig 1). At 15 min post-haemorrhage, muscle NADH, heart rate, lactate and base deficit rose with concurrent falls in blood pressure, stroke volume and haemoglobin. Variable improvement was seen by 30 min due to attempted physiological compensation. The rats (4,6) showing the largest initial rise in NADH that failed to shown any clear improvement (asterisk) subsequently deteriorated further and died within 90 min. Rats whose NADH signal initially recovered then subsequently deteriorated died within 30–45 min of the secondary rise. This deterioration occurred more consistently, and generally in advance, than any other marker of circulation/perfusion being concurrently measured.



NADH, Acid–base & physiological variables

CONCLUSIONS. In this study of a severe circulatory insult, NADH fluorescence was a sensitive and specific marker of 'tissue unhappiness' and subsequent death. Changes generally occurred before deterioration was noted in physiological and biochemical variables routinely used in the critically ill to denote tissue hypoperfusion. Skeletal muscle NADH fluorescence monitoring thus represents a potentially useful approach for assessing tissue bioenergetic status and the adequacy of perfusion.
REFERENCES.1. Mayevsky A. J Clin Monit Comput. (2013) 27:1–34.
GRANT ACKNOWLEDGMENT. NE is funded by the Medical Research Council (UK)

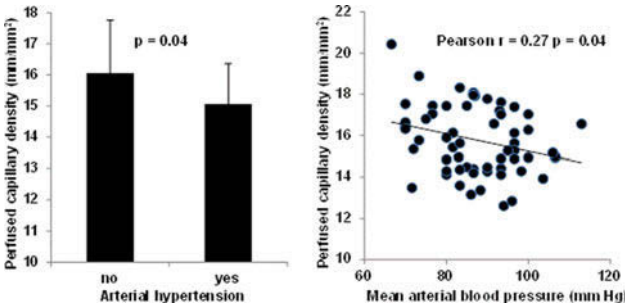
0964
CHARACTERIZATION OF SUBLINGUAL MICROCIRCULATION IN HEALTHY VOLUNTEERS AND SUBJECTS WITH CARDIOVASCULAR RISK FACTORS

V.S. Kanoore Edul[1,2], C. Ince[2], G. Ferrara[1], Y. Arzani[3], C. Salvatori[3], A. Dubin[1,3]

[1]Cátedra de Farmacología Aplicada, Facultad de Ciencias Médicas, Universidad Nacional de La Plata, La Plata, Argentina, [2]Academic Medical Center, University of Amsterdam, Translational Physiology, Amsterdam, The Netherlands, [3]Sanatorio Otamendi y Miroli, Servicio de Terapia Intensiva, Buenos Aires, Argentina
INTRODUCTION. There is an increasing number of studies focused on sublingual microcirculation in critically ill patients. The normal ranges of microvascular parameters in the general population, however, are poorly defined. Moreover, the effect of age, physical conditioning and comorbid stable states on the microcirculation is unknown.
OBJECTIVES. To quantitatively characterize the microcirculatory parameters in healthy individuals and to evaluate the influence of age, physical conditioning and comorbid states on the sublingual microcirculation.
METHODS. We studied 61 volunteers (19–94 years old) who had either no significant health problems or stable chronic conditions with cardiovascular risk factors (arterial hypertension, dislipidemia, smoking, diabetes). The sublingual microcirculation was evaluated by the use of SDF imaging. Red blood cell velocity (RBCV), capillary microvascular flow index (MFI), total capillary density (TCD), and perfused capillary density (PCD) were measured by means of AVA 3.0 software.
RESULTS. Forty-seven percent of the volunteers had at least one cardiovascular risk factor and 27 % had more than one condition. Microcirculatory parameters were not different between healthy individuals and subjects with cardiovascular risk factors. The hours of exercise per week were negatively correlated with RBCV ($r = -0.473$, $p = 0.0001$) and positively correlated with TCD ($r = 0.246$, $p = 0.05$).

	All	Healthy	Co-morbid states	p-value
N	61	32	29	
TVD (mm/mm^2)	15.80 (1.65)	16.03 (1.78)	15.50 (1.50)	0.51
MFI (0–3)	2.96 (0.03)	2.96 (0.03)	2.97 (0.03)	0.27
RBCV (μm/s) mean (SD)	1,298 (145)	1,309 (156)	1,286 (133)	0.16
PVD (mm/mm^2) mean (SD)	15.77 (1.65)	16.00 (1.77)	15.51 (1.50)	0.50

[Microcirculatory parameters whole group]
Nevertheless, Participants with chronic arterial hypertension showed lower TCD and PCD compared with volunteers without this comorbidity. In addition, PCD was correlated with mean arterial pressure (MAP) in the whole group of volunteers.



Blood pressure

Regression analyses evaluating the association between microcirculatory parameters with age and cardiovascular risk factors showed a significant association between MAP and PCD that was independent from age (coefficient −0.44, p-value = 0.039 (95 %CI −0.80;−0.02)).
CONCLUSIONS. TCD and PCD could be affected by the presence of arterial hypertension as co-morbidity and by the actual value of MAP. Physical conditioning could also modify the capillary density. This study may be useful as a reference for microcirculatory studies performed in critically ill patients with cardiovascular risk factors.
GRANT ACKNOWLEDGMENT. Supported by the grant PICT-2010-0495, Agencia Nacional de Promoción Científica y Tecnológica, Argentina.

0965
OPTIMISATION OF BOTH MACRO AND MICROCIRCULATION WITH LOW DOSE NORADRENALINE CONFIRMED BY MICROVISION IMAGING

A.A. Jain[1], M. Lombrano[1], L. Polesello[1], M. Bossolasco[1], L. D'agrosa[1], G. Martinelli[1], H. Luckraz[1]

[1]New Cross Hospital, Cardiothoracic Anaesthesia, Wolverhampton, UK
INTRODUCTION. Microvision is a side stream dark field (SDF) imaging tool allowing accurate analysis of sub lingual micro vessel perfusion which reflects splanchnic microcirculation. This may offer the ability to identify early hallmarks of organ microcirculation in Cardiac Intensive Care Unit.
OBJECTIVES.
Primary objective: To correlate the clinical picture (Mean Arterial Pressure, pH, Base excess, lactate, urine output, Urea & Electrolytes, inotrope usage when available) to MicroVision results and seek validation in terms of sensitivity and specificity in predicting microvessel malperfusion.
Secondary objective: To assess the effect of vasoconstrictors (noradrenaline) and vasodilators (GTN and enoxamone/milrinone) on sub-lingual microcirculation.
METHODS. We conducted a prospective pilot study in 60 patients undergoing Cardiac surgery using SDF imaging to assess sublingual micro circulation at pre cardio pulmonary bypass CPB (T0), on CPB (T1), after rewarming on CPB (T2), on arrival in ICU (T3) and 6 h post arrival in ICU (T4). Microvascular flow was estimated with total vessel density (TVD), proportion of perfused vessels (PPV), microvascular flow index (MFI) and heterogeneity index (HI). Cardiac index was not analysed. Continuous data was analysed using Mann–Whitney U test. Kendall Tau rank correlation coefficient was used to measure association between variables.
RESULTS. Early analysis of 26 patients is reported (Group A, 14 patients on low dose Noradrenaline - NA and Group B, 12 patients on no inotropes). NA was used to achieve Mean arterial pressure MAP $\geq$ 65 mmHg. Log Euroscore was significantly higher in Group A ($p = 0.031$). Lactate and MAP were also higher in Group A at all intervals but significant only at T2 ($p = 0.042$). Deranged TVD, PPV, MFI and HI in Group A at T0 were normalised at T3 and T4, however this was not statistically significant. Lactate correlated significantly with TVD and PVD at T1, T2 ($p = 0.027$, $p = 0.021$) and with MFI at T4 ($p = 0.028$) in both groups.
CONCLUSIONS. Preliminary results show adequate correlation between clinical data and microvision results. Use of low dose Noradrenaline in optimization of macrocirculation seems to have a positive effect on microcirculation normalization as well. Completion of total data analysis will be necessary to confirm our finding.
REFERENCES. 1. De Backer D. How to evaluate the microcirculation: report of a round table conference. Critical Care 2007;11:sR101.

0966
CAN WE DETECT A VARIATION OF ANAEROBIC METABOLISM FASTER WITH THE RATIO ($PVCO_2$–$PACO_2$)/(CAO_2–CVO_2) THAN WITH ARTERIAL BLOOD LACTATE, AFTER A CHANGE IN HEMODYNAMIC STATUS OF A PATIENT IN SHOCK

J.F. Georger[1], M. Tchir[1], S. Chettab [1], E. Barsam[1], R. Gondret[1], P. Lehericey[1], A. Montefiore[1]

[1]Centre Hospitalier Intercommunal de Villeneuve Saint Georges, Reanimation, Villeneuve Saint Georges, France
INTRODUCTION. Patient in circulatory failure, it is difficult to assess the anaerobic metabolism of the patient and the effectiveness of our therapeutic. Arterial blood lactate is the parameter most often used to evaluate the metabolism of lactate but is modified by many other factors that make it difficult to interpret. It has been described in the literature that the ratio ($PvCO_2$–$PaCO_2$)/(CaO_2–CvO_2) (coefficient of anaerobic work (CAW)) can be an endpoint of overall anaerobic metabolism. CAW is found to be over 1.4 in patients in anaerobic status (1).
OBJECTIVES. Determine if a rapid change in the hemodynamic status of a patient causes a variation of CAW and whether this variation is more or less informative than arterial blood lactate.
METHODS. We included patients in shock, intubated and sedated, hemodynamically stable with norepinephrine infusion and with a central catheter introduced in Superior Vena Cava. When patient stabilized with a mean arterial pressure (MAP) greater than 80 mmHg, we decreased norepinephrine infusion to obtain a MAP at 65 mmHg. We performed

measurement of cardiac output by transthoracic echocardiography, central venous blood gases, arterial blood gases and arterial hemoglobin before and after changes in norepinephrine infusion.
RESULTS. We included 28 patients in shock in an average of 2.7 mg/h [1.4–4] of norepinephrine. Twenty-two were septic shock (15 pneumonia, 3 peritonitis, 2 pyelonephritis, one cellulitis, one knee arthritis), 2 hemorrhagic shock and 2 cardiogenic shock, one pancreatitis and one fat embolism, 81 % of patients were men. The average age is 58.5 years [18–84]. The time difference between the two measurements is on average 53 min [24–71]. The mean arterial blood lactate at inclusion was 1.9 mmol/l [0.5 to 7.0] there is no significant variation with lower MAP. Nineteen patients had a CAW found to be over 1.4 at baseline. The decrease in MAP causes increases in 15 CAW (6–170 %) and 13 decrease of the CAW (−53 to −5 %). There is decrease or increase CAW is not observed significant changes in cardiac output. There is a decrease in $ScvO_2$ in both groups. There was no correlation found between the change in CAW and cardiac output variation and CAW variation and arterial blood lactate variation.
CONCLUSIONS. A change in the hemodynamic status of a patient as modification of the norepinephrine infusion may cause a change in the patient's anaerobic work, decreased or increased, which is detected in less than an hour by CAW while will not be by variation of arterial blood lactate. There is no correlation with a variation of cardiac output in a patient having more than 65 mmHg of MAP. This variation of CAW can give additional information to that obtained with only $ScvO_2$.
REFERENCES. Metkontso-Dessap A et al. Intensive Care Med. 2002;28(3):272–7.

0967
QUANTITATIVE CAPILLARY REFILL TIME (Q-CRT): A NOVEL TECHNIQUE OF THE CRT MEASUREMENT BY APPLYING THE PRINCIPLE OF PULSE OXIMETER

N. Morimura[1], K. Takahashi[1], T. Doi[1], K. Nakamura[1], T. Uchikura[1], A. Yumori[1], Y. Kawamura[1], N. Suzuki[1], J. Ishikawa[1], J. Matsumoto[1], N. Harunari[1]

[1]Yokohama City University Graduate School of Medicine, Department of Emergency Medicine, Yokohama, Japan
INTRODUCTION. Capillary refill time (CRT) has been used as one of simple methods to grade shock status. As the confirmation of timing of the skin blanched and the return of color to baseline depended on the examiner's eye measurement, the conventional procedure by compression of nail bed had a limit to measure CRT with objectivity and reproducibility. Recently we developed a novel equipment to quantify CRT by applying the principle of pulse oximeter, and reported the correlation between quantitative CRT (Q-CRT) and hypoperfusion status represented by blood lactate levels in critically ill patients[1,2,3].
OBJECTIVES. We designed an interventional study to evaluate the reproducibility of the value of Q-CRT of healthy subjects by several examiners.
METHODS. This study was conducted to 10 adult healthy subjects by 3 examiners. Q-CRT was measured by the modified pulse oximeter (OLV-3100, Nihon Kohden Corp., Japan) with attachment of the SpO_2 sensor at the nail bed of middle finger. Transmitted light intensity of red light (660 nm) and infra-red light (940 nm) by manual compression of the nail bed over the sensor during 5 s were measured with personal computer. Q-CRT was defined the time from the release of nail compression to the estimated time of 90 % recovery of pre-compression transmitted light intensity. Q-CRT of each subject was examined basically three times by an examiner. Kendall's Coefficient of Concordance was calculated to evaluate the reproducibility of Q-CRT measurement by the examiners.
RESULTS. Of the 93 measurements of 88 data of Q-CRT in the 10 subjects was recorded. In this population Q-CRT was 1.6 ± 0.9 s (average $\pm$ SD). Kendall's Coefficient of Concordance was 0.525 ($p = 0.001$) which demonstrated significantly high reproducibility among the examiners.
CONCLUSIONS. A novel modified pulse oximeter can provide a high reproducibility to measure Q-CRT. Further study for patients will confirm the availability of Q-CRT at ER, ICU, OR, and out-of hospital setting.
REFERENCES. 1. Morimura N, Sakamoto T, Takahashi K, et al. Diagnostic accuracy of capillary refill time for victims of trauma and gastrointestinal bleeding. Prehosp Disaster Med. 2007;22:s70. 2. Morimura N, Takahashi K, Doi T, et al. Quantitative capillary refill time (Q-CRT): A novel technique for the measurement of CRT with its excellent diagnostic accuracy of the status of high blood lactate level in critically ill. In: 18th World Congress for Disaster and Emergency Medicine, 2013, Manchester, UK. 3. Aoyagi T. Pulse oximetry: its invention, theory, and future. J Anesth 2003; 17:259–66.
GRANT ACKNOWLEDGMENT. We inquired by the grant of the Ministry of Education, Culture, Sports, Science and Technology.

0968
FEMORAL VENOUS OXYGEN SATURATION AS A SUBSTITUTE OF CENTRAL VENOUS OXYGEN SATURATION IN CRITICALLY ILL PATIENTS

Y.N. Marti[1], L.B. Milena[1], R.P. de Azevedo[1], F.R. Machado[1]

[1]Federal University of Sao Paulo, Anesthesiology and Critical Care Department, São Paulo, Brazil
INTRODUCTION. Central venous access is not always feasible in critically ill patients and the use of femoral access is sometimes necessary. The use of femoral venous oxygen saturation ($SfvO_2$) is not well studied but previous studies suggested it is not a substitute for central venous oxygen saturation ($ScvO_2$) [(1–3)].
OBJECTIVE. To determine if there is agreement and correlation between $SfvO_2$ and $ScvO_2$ values in critically ill patients. We also aimed to evaluate the agreement and correlation between lactate levels in arterial blood with those from femoral venous blood in this population.
METHODS. In this prospective and observational study, we included critically ill adult patients with both a central venous catheter and a femoral vein catheter in place. We collected samples from both sites as well as from an arterial line. We determined the correlation and agreement of $SfvO_2$ and $ScvO_2$ using Spearman correlation and Bland–Altman tests. The same analysis was done for lactate values from the arterial and femoral venous blood.
RESULTS. We analyzed 107 paired samples in 26 patients. There was a significant correlation between $ScvO_2$ and $SfvO_2$ ($r = 0.67$, $p < 0.001$). However, their limits of agreement were wide (bias 8.24, 95 % limits of agreement −12.23 to 28.70). Arterial lactate values were highly correlated with those from femoral vein (0.99, $p < 0.001$), but also had large limits of agreement (bias –2.71, 95 % limits of agreement –22.03 to 16.61).
CONCLUSIONS. Both $SfvO_2$ and lactate from femoral vein are different from $SvcO_2$ and arterial lactate and their use should not be recommended.
REFERENCES. 1. van Beest PA et al. Crit Care Med. 2012; 40(12):3196–3201. 2. Davison DL et al. Chest. 2010;138(1):76–83 3. Groombridge CJ et al. Crit Care Resusc. 2011; 13(3): 151–55.

Nursing education & management: 0969–0982

0969
SIMULATION-BASED TRAINING FOR CRITICAL CARE NURSES IN A CARDIAC INTENSIVE CARE UNIT: THE DEVELOPMENT OF NON-TECHNICAL SKILLS IN CRITICAL CARE

L.S. Malanjum[1], C. Hebbes[1], R. Annamaneni[1]

[1]Glenfield Hospital, UHL, Anaesthesia and Critical Care, Leicester, UK
INTRODUCTION. Medical errors in intensive care are not usually a result of failure in medical knowledge. Investigations into critical incidents often show that failure in communication amongst nurses and the medical team as well the lack of situation awareness may have contributed to the resulting error. These skills are now recognised as part of the four core non-technical skills that is essential in anaesthesia but is now also used in critical care training. The four core non-technical skills are task management, team working, situation awareness and decision making. To develop these non-technical skills, the use of medical simulators have been shown to be useful.
OBJECTIVES. To re-create emergency clinical scenarios that may be seen in a cardiac ICU and assess the performance of a group of critical care nurses with emphasis on non-technical skills.
METHODS. 3 clinical scenarios were designed and simulated using a medical simulator (Sim-Man). The training day was conducted within the cardiac ICU area in order to mimic as closely to a real situation. The 3 clinical scenarios were:
1. Fast atrial fibrillation (arrhythmia)
2. Displaced tracheostomy
3. Post-operative cardiac tamponade

The team involved in each scenario involved 3 nurses and an Intensivist. Following each scenario, candidates were debriefed and asked to complete a questionnaire.
RESULTS. Overall, the candidates found the simulation improved their confidence level in managing the emergency scenarios that was set out. There were 15 nurses involved in the training day. 4 nurses found that their confidence level did not improve with the simulation but in the questionnaire, they had listed very specific technical skills such as applying cricoid pressure and preparing for cardioversion that may have influenced their answers in the questionnaire. However, they all found that the simulation training was helpful in developing their teamwork skills, communication and clinical handover, leadership in a crisis and prioritising tasks in an emergency.
CONCLUSIONS. As non-technical skills in gradually being recognised as essential in improving patient safety and outcome, there is a growing need to change the way nurses and doctors are trained in critical care. Although observation within real-life environment could be used to assess these non-technical skills, the use of high fidelity medical simulators is a safer alternative. However, there is still a need to develop a system in which these non-technical skills can be both subjectively and objectively assessed.
REFERENCES. 1. Reader T. Flin R. Lauche K. Cuthbertson BH. Non-technical skills in the intensive care unit. BJA 2006; 96:551–9. 2. Reader T. Flin R. Cuthbertson BH. Communication skills and error in the intensive unit. Curr Opin Crit Care 2007; 13:732–36.
3. White N. Understanding the role of non-technical skiils in patient safety. Nursing Standard 2012, 26:43–8.

0970
ICU NURSING LEARNING STATION, LEARNING IN AN AUTHENTIC INTENSIVE CARE ENVIRONMENT

G. van Tricht[1], H.G. van de Glind[1], T. van Galen[1]

[1]VU University Medical Center, Intensive Care, Amsterdam, The Netherlands
INTRODUCTION. In the Netherlands the extra curriculum ICU training for qualified nurses lasts for 18 months and has a national accreditation. Traditionally each student will learn ICU knowledge and skills in a in-service.
Of 'tutor - student' system alternating with study periods at a nursing school.
The student has two tutors during the 18 month training period. The ICU Learning Station (ICULS) is new at our ICU and is organized in a different way.
OBJECTIVES. Our aim was to create a different kind of 'learning on the job' where a student doesn't copy what his tutor advises but makes his professional nursing choices for himself and in cooperation with his fellow students.
METHODS. The ICULS program was introduced and implemented with support from the medical and nursing staff management. Students set goals together and collect and use their knowledge and skills by using other staff members (colleagues and doctors)or textbooks, internet or local protocols. This process is being coached by a selected number of experienced ICU nurses. Our aim: Facilitate our students to reach their goals by using a variety of learning strategies and learning from each other (peer assessment). We did not expect to use the ICULS as a money or time saving method. We are focussed on creating an improved learning environment. In our ICULS we assign two patients to two students who vary in learning period and level. We instructed our selected coaches and were physically present during the start of each shift in which the ICULS was opened. In order to coach the students and coaches in setting their learning goals and creating the new learning environment.
RESULTS. After one operational year we would like to conclude that the ICULS program has proven to be a place where our students can learn and work according to our profession based goals. Results can be showed from evaluation forms (0 months/12 months) and coach meetings. We have no comparison to other IC Units in the Netherlands because we are the first. No evidence regarding ICU e.g. best practice can be found. It appears to be an efficient system; you can control more students in your ICU without losing quality of learning and in a 'student safe' environment.
CONCLUSIONS. With ICULS learning and development is very visible within our ICU, other disciplines can be consulted, and are stimulated to help and give bedside teaching. Pure 'instruction' is replaced by 'coaching' The ICULS system has a positive influence on patient safety; the coach is completely assigned to the ICULS and has no distractions coming from other responsibilities.

REFERENCES. 1. De Leerwerkplaats, samen leren in de praktijk. Ria Havekes (2005). 2. Werk begeleiden in zorg en welzijn, Nieuwe rollen van de werkbegeleider in competentiegericht onderwijs. Nicolien van Halem (2008). 3. Kolb; http://www.thesis.nl. 4. De verpleegkundige werkplaats in het LUMC; http://link.springer.com/content/pdf/10.1007/BF03071307#page-1.

0971
INTRODUCTION OF A MULTI-DISCIPLINARY INTENSIVE CARE SIMULATION COURSE

N. Pathmanathan[1], J. Pettit[1], D. Muir[1], K. Conway[2], N. Beaumont[2], V. Kirkby[1], D. Wright[1]

[1]Hull and East Yorkshire Hospitals, Intensive Care Unit, Hull, UK, [2]Hull and East Yorkshire Hospitals, Department of Physiotherapy, Hull, UK

INTRODUCTION. Intensive Care Units (ICU) manage patients in a complex environment, where a multi-disciplinary team (MDT) should work efficiently towards a common goal. To achieve a high standard of care and patient safety, regular and relevant training for the MDT is required.

There are numerous courses for single disciplines; however there are few that include medical staff, nursing staff and physiotherapists together. Importantly, confidence, leadership and team working can be developed in addition to clinical knowledge and skills.

OBJECTIVES. • Develop a sustainable course for MDT training

• Improve clinical, communication, team-working and leadership skills

METHODS. A simulation training day was set up for 15 candidates from critical care (5 nursing, 4 physiotherapy, 6 medical). Faculty comprised of education leads from critical care medicine, nursing and physiotherapy. A detailed evidence-based pre-course learning manual was distributed to all candidates.

6 critical care scenarios were selected to cover a wide cross-section including; trauma, neuro-intensive care, paediatric and medical intensive care. 5 out of the 6 scenarios involved all three facets of the MDT (i.e. physiotherapy, nursing and medical). There was an extensive debrief following each scenario with feedback from education leads from each discipline.

Candidates completed a pre and post course questionnaire, with ratings on a visual analogue scale (0–100 mm). This assessed the candidates' perception of their knowledge, communication, technical, leadership and team working skills and also their confidence in managing critical incidents. Means were analysed using a paired, 2-tailed t-test.

RESULTS.

Table 1 Candidate's previous exposure to simulati

	< 6 months	6–12 months	> 12 months
Nursing	0	0	2
Physiotherapy	0	0	0
Medical	5	2	5

Table 2 Pre and post course scores (all candidate)

	Mean Score			
	Pre	Post	Difference between means (p value)	95 % confidence interval
Knowledge	42.4	63.1	+ 20.7 (0.001)	9.5–31.5
Technical Skills	44.7	60.3	+ 15.5 (0.003)	6.5–24.6
Team Working	51.2	66.4	+ 14.7 (0.015)	3.3–26.2
Communication	47.6	63.3	+ 18.6 (0.003)	7.6–26.2
Leadership	38.0	58.9	+ 20.9 (0.004)	7.9–34.0
Confidence	39.7	64.1	+ 24.3 (0.002)	10.2–38.4

Table 3 Total pre and post course scores (by spec)

	Mean score			
	Pre	Post	Difference between means (p value)	95 % confidence interval
Nursing	40.2	52.9	+ 12.7 (0.0001)	7.8–17.7
Physiotherapy	41.4	66.9	+ 25.5 (0.0001)	14.4–36.6
Medical	49.0	68.0	+ 18.0 (0.0001)	11.7–26.3
All groups	44.0	62.7	+ 18.7 (0.0001)	14.2–23.1

100 % of candidates would recommend the course to colleagues and most felt simulation training should be compulsory (60 % definitely, 40 % probably).

CONCLUSIONS. Course participation generated self-reported improvements in all areas of technical and non-technical skills. Physiotherapists showed the greatest improvement, followed by medical and nursing staff.

All candidates felt simulation training should probably/definitely be made compulsory. There is increasing recognition of the role of simulation training in intensive care. However there is no formalised simulation training for nursing or physiotherapy practitioners.

This course demonstrates promising results as a training method for all members of the MDT and we plan to incorporate this into on-going professional education of all MDT members.

0972
IMPLEMENTING NICE CG 83

L.F. Jenions[1], S. Dyson[1], L. Murray[1], P. Turner[1]

[1]Royal Liverpool University Hospital, Therapies Department, Liverpool, UK

INTRODUCTION. Approximately 110,000 people (estimated from the UK Intensive Care National Audit and Research Centre) spend time in critical care units in England and Wales each year, many surviving to discharge home. However, discharge home following critical illness can be only the beginning of a journey that can include profound weakness, anxiety, depression, fatigue and post traumatic stress disorder. The time taken to recover can be considerably longer than the period of critical illness leading to financial difficulties as well as strained relationships with family and friends.

OBJECTIVES. To implement NICE CG83 by means of a multidisciplinary (MD) rehabilitation pathway to encourage a short clinical assessment of all patients admitted to critical care. This would direct referrals to the MD team including physiotherapist (PT), occupational therapist (OT), speech and language therapist (SALT) and dietician at appropriate times for a comprehensive clinical assessment.

METHODS. A rehabilitation stakeholders group was set up under the leadership of one of the critical care consultants. Membership included PT, OT, SALT, dieticians, nursing staff and the critical care outreach team.Trigger questions were devised for each discipline to encourage early identification of appropriate patients and referral to the correct therapy team.

Physiotherapy	Occupational therapy	Speech and language therapy	Dietician
Does the patient have any of the following:	Does the patient have any of the following:	Does the patient have any of the following:	Does the patient have any of the following:
Neurological conditions	Requires splinting to maintain functional position of joints	Neurological conditions	Artificial nutrition
Multiple trauma	Neurological conditions	ET intubation for > 48 h	High risk on trust nutritional screening tool
Sepsis	Anxiety problems	Tracheostomised patient with weak or wet voice with cuff deflated and PMV	Obviously wasted or BMI < 18.5
Multi-organ failure	Seating problems	Tracheostomised patient with evidence of fluid/food/oral secretions on suctioning	Unintentional weight loss (> 5 %) over 3-6 months
Tracheostomy or ETT	Reduced independence and self care	Desaturation or coughing on oral intake	NBM or poor oral intake for >5 days
Amputation	Impaired movement of limbs	Difficulty speaking or finding words or understanding what is being said	Requires modified texture diet
Multiple co-morbidities		Change in voice quality	
If yes, refer for physiotherapy	If yes, refer to OT	If yes, refer to SALT	If yes, refer to dieticians

Trigger questions

It was envisaged that those patients admitted to critical care for longer than 48 h would have a pathway commenced. Within the pathway was an assessment of previous functional ability to direct rehabilitation, and a section for discipline specific therapy goals.

It was also decided to commence multidisciplinary board rounds within critical care. These were attended by the consultant, nurse in charge and the MD team. Patients were discussed and rehabilitation plans, progression and goals updated.

RESULTS. A rehabilitation pathway was devised to ensure timely referrals to therapists with the aim of preventing physical and non-physical morbidity for patients admitted to critical care. This was supplemented by the introduction of MD board rounds and face-to-face discussion regarding rehabilitation goals between therapists, nursing staff and medical staff.

CONCLUSION. A multidisciplinary approach helped to devise a pathway to ensure those patients admitted to critical care for more than 48 h received a short clinical assessment to assess risk of developing physical and non-physical morbidity. It also ensured patients were referred to the appropriate therapy disciplines at the correct time for a more comprehensive clinical assessment as dictated in NICE CG83.

REFERENCES. 1. UK Intensive Care National Audit and Research Centre Case Mix Programme Summary Statistics. 2. NICE Clinical Guideline 83 (2009) Rehabilitation following critical illness.

0973
UTILIZATION OF A NURSING "JOURNAL CLUB" TO DISSEMINATE EVIDENCE-BASED PRACTICE

L. Destefano[1]

[1]Memorial Healthcare, Intensive Care Unit, Newport, USA

INTRODUCTION. • Nursing practice based on evidence improves patient outcomes

• Research is needed to develop a scientific basis for critical care nursing practice

• Understanding of research is needed for application of evidence-based practice

• Education is fundamental to professional growth and to excellence in clinical practice and optimal patient outcomes

OBJECTIVES. To disseminate evidence-based practice and to create a predictable monthly forum for this collaborative in a motivational and professional environment.

METHODS. • The monthly Journal Club was initiated in 2002 to engage acute and critical care nurses from local and regional hospitals in discussion of current, relevant, recently published research findings

• Monthly topics were selected based on clinical relevance, educational needs assessment, and requests by members

• Schedule of topics were modified by emerging innovative approaches to patient care issues, including workplace environment issues, and other "hot topics"

• The gatherings were scheduled consistently on the same day of each month for predictability and convenience

• The topics were announced in advance and the selected article citations forwarded to the members via e-mail 1–2 weeks prior to meeting

• Efforts were made to create a non-threatening, inspiring and inviting environment promoting open discussion following presentations

• Introduction and analysis of the journal article provided by a leader with emphasis on clinical significance and potential for adaptation into real clinical practice ***based on unit culture***

RESULTS. • Attendance increased from 4–6 members each month to 50–90 monthly attendees

• Several members now travel over 100 km to attend every month vCommunity subgroups of interest have formed to further review sedation protocols, glycemic control and other hot topics prompted by an initial Journal Club discussion

• Many hospitals are willing to "share" their order sets, policies, guidelines, and other tools they have created with other institutions to facilitate implementation and avoid "reinventing the wheel
• The confidential, non-threatening, respectful, and supportive environment promotes open, frank discussion and diminishes intimidation
CONCLUSIONS. The AACN Chapter "Journal Club" attendance has expanded exponentially over the past 11 years and provides an encouraging forum for new and experienced nurses to collaborate on a regular basis on important topics related to current practice. Other chapters have adopted this model to develop a collaborative for their region.
REFERENCES. 1. Pravikoff DS, Tanner AB, Pierce ST. Readiness of U.S. nurses for evidence-based practice. AJN 2005; 105(9):40–51. 2. Ulrich BT, Lavandero R, Hart KA, Woods D, Legett J, Taylor D. Critical care nurses′ work environments: a baseline status report. Crit Care Nurse 2006; 26(5):46–56.

0974
TASK ANALYSIS OF ICU NURSE ABOUT CPR ON DACUM METHOD

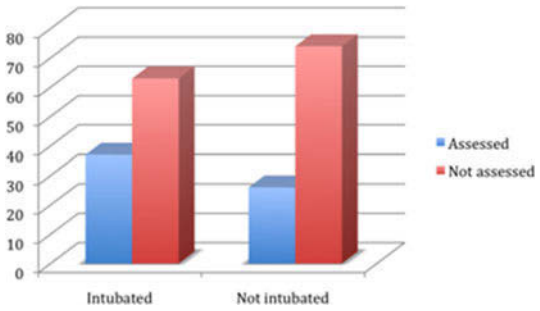
Y.O. Kwon[1], Y.H. Park[2]

[1]Seoul National University Hospital, Medical Intensive Care Unit, Seoul, Republic of Korea, [2]Seoul National University, Seoul, Republic of Korea
INTRODUCTION. Above half of in-hospital cardiac arrest occur in an intensive care unit (ICU). Since nurses are frequently the first to witness a cardiac arrest in ICU, they may play a central role in the effective management of cardiac arrest. Regularly training is very important for retention of CPR skills. A "job task analysis" is widely recognized as the foundation of successful training. Therefore, it is necessary that task analysis before training.
OBJECTIVES. The purpose of this study was to develop and analyze CPR-related job for ICU nurses in KOREA.
METHODS. The definition of ICU nurse′s CPR job and task analysis was developed based on developing a curriculum (DACUM) by 6 panels who experienced in DACUM analysis or ICU nursing with CPR certification.
One hundred twenty-five nurses who were working at an adult ICU of a university hospital in Seoul were participated. The questionnaire included frequency, importance, and difficulty of duties, tasks, and task elements. The data were collected in October 2011, analyzed by descriptive statistics.
RESULTS. The job description of ICU nurse′s CPR revealed 10 duties, 17 tasks, and 44 task elements. On the all 10 duties, the one with the highest frequency was "pre-arrest decision making" the one with the highest level of importance was "intra-CPR intervention" and "intra-CPR decision making" and the one with the highest level of difficulty was "intra-CPR coordination". On the all 17 tasks, the one with the highest frequency was pre-arrest "Observe the patient continuously", intra-CPR "Check and analyze blood test, X-ray", post-CPR "Record about patient′s status after CPR"; the one with the most importance was pre-arrest "Observe the patient continuously", intra-CPR "Use a defibrillator", "Administer drugs", post-CPR "Identify ROSC" and the one with the highest difficulty was pre-arrest "Take a medical history", intra-CPR "Participate in CPR team", post-CPR "Identify complication after CPR".
CONCLUSIONS. In this study, ICU nurse′s CPR job was identified and analyzed.
ICU nurses were less confident about collecting pre-arrest status information, or about physical assessment to check out for post-CPR complications. Thus they need to receive training for physical assessment skills. Also, since performing CPR after checking cardiac arrest rhythms, preparing a defibrillator, or administering emergency medications are the core parts of CPR, such training should be performed on a regular basis in order to improve the nurse's confidence level. As a multi-member work in ICUs, CPR should be based on education aimed at enhancing team work, such as accurate communication and effective assignment of roles. Information about latest CPR guidelines also need be shared.
The results of this study are helpful for identifying the high value of ICU nurses' job and expanding their roles in this area. Furthermore, they can be used as primary material for developing educational programs.

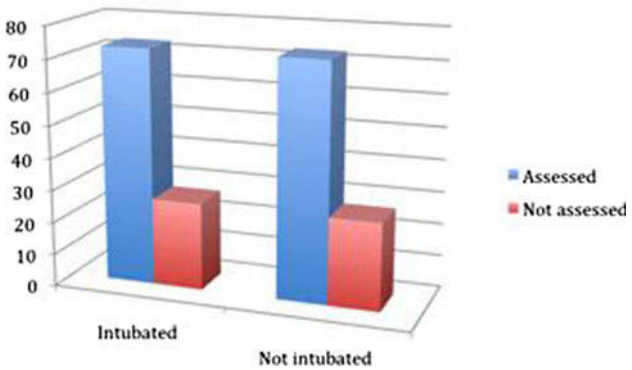
0975
THE EFFECT OF EDUCATION ON COMPLIANCY TO CAM-ICU SCREENING IN INTENSIVE CARE UNIT

A.S.K. Poon[1], M. Hearn[1]

[1]Lister Hospital, East and North Hertfordshire NHS Trust, Anaesthestic, Stevenage, UK
INTRODUCTION. Delirium is an acute medical condition and one of the commonest complications in intensive care unit (ICU). In a European epidemiology study, 32 % of patients experienced delirium at some point during their stay in ICU.[1] Multi-centre trials have shown increased mortality and morbidity in patients with delirium compared to those without, and a recent study has revealed it to be an independent factor in mortality even one year after an ICU stay.[2] According to National Institute for Health and Clinical Excellence (NICE) guidelines, ICU patients should be assessed using the Confusion Assessment Method for the ICU (CAM-ICU) screening tool for delirium.[3]
OBJECTIVES. Audit the compliance of conducting the CAM-ICU screening tool on ICU patients pre and post introduction of an education programme.
METHODS. Initially, four random days were taken at the end of August 2012 to assess all patients on the ICU. The only exclusion criterion was patients who had been admitted for fewer than 24 h onto the unit. Nursing staffs were blinded to the audit. The Gold Standard was that patients should be assessed twice a day for signs of delirium. An educational programme was implemented and a re-audit was performed after 6 months.
RESULTS. A total of 42 patients were included in the first round of the study and 39 in the second round. Overall compliance in the first round of the audit was 33 % (graph 1) and this improved to 73 % (graph 2) post implementation of the education programme. Incidence of delirium as recorded on the observation chart was 0 vs 10 %.



Graph showing first audit results



Graph showing second audit results

CONCLUSIONS. The initial audit highlighted poor compliance in conducting CAM-ICU testing. After introduction of an education programme the compliance improved by 40 %. There is also a marked difference in incidence of delirium on the unit, 0 % compare to 10 %. This could be a true reflection of incidence but perhaps more likely to represents under-diagnosis of the conditions. This completed audit has highlighted the importance of having a dedicated education programme to improve staff awareness to delirium. The increased use of the screening tool, led to improved pick up of delirium and ultimately improved patient care on the ICU. The authors recommend that all ICU units should have a dedicated programme raising delirium awareness to nursing staff and clinicians.
REFERENCES. 1. Salluh JI, Soares M, Teles JM, et al.; Delirium Epidemiology in Critical Care Study Group. Delirium epidemiology in critical care (DECCA): an international study. Crit Care. 2010;14(6):R210. 2. Pisani MA, Kong SYJ, Kasi SV et al. Days of delirium are associated with 1-year mortality in an older intensive care unit population. Am J Respir Crit Care Med 2009; 180:1092–1097. 3. National Institute for Health and Clinical Excellence guideline 103- Delirium July 2010.
GRANT ACKNOWLEDGMENT. No grants has been received for this audit.

0976
MEASURING NURSING ACTIVITY SCORE (NAS) IN SEVERELY ILL PATIENTS

S.J. Keizer[1], T.W. Kamphuis[1], R.H. Driessen[1], E.A. Armstrong[1], J.J. Spijkstra[1], A.R.J. Girbes[1], M.C. de Waard[1]

[1]VU University Medical Centre, ICaR-VU, Department of Intensive Care, Amsterdam, The Netherlands
INTRODUCTION. Patient safety, quality of care and high costs of intensive care require measurement of nursing workload. Nursing activity score (NAS) is the best tool currently available to measure nursing workload per individual patient and per shift on an Intensive Care Unit (ICU). Identifying the risk factors for high nursing workload opens the possibility to meet nursing staff requirements to actual care demands within particular patient groups. At our academic ICU NAS is incorporated in the patient data management system (Metavision®, Tel Aviv, Israel), which answers seventeen out of the twenty-three NAS questions automatically. As a result, the time spent by the nurses answering the remaining six NAS questions at the end of each shift is limited.
OBJECTIVES. Identify the nurse workload in severely ill patients by the Nursing Activity Score (NAS).
METHODS. NAS was registered per patient at the end of every 8 h shift, during the first week of admission, in the period September 2012 till March 2013. The NAS scores were automatically collected from Metavision together with patient characteristics. Only severely ill patients, in need for high intensive nursing care especially during the first shift, were included in the analysis.
RESULTS. A total of 112 severely ill patients were divided in three groups according to reason of admission, namely cardiac arrest (CA), sepsis and traumatic brain injury (TBI). 52 % of the patients were admitted after CA, 13 % due to sepsis and 35 % after TBI (table). Body mass index and length of stay were not different between the groups. Patients in the TBI group had a significantly lower apache-II score compared to the CA patients and were significantly younger compared to patients in both the CA and sepsis group. Nurses experience the post-CA patients treated with therapeutic hypothermia as a patient group with the highest nurse workload. Despite the most intensive blood sampling in those patients, NAS during the first day, of the first, second and third shift was not different between patient suffering CA, sepsis or TBI.
Overall the mean NAS during the 1st shift was 70 ± 25 %. ICU admittance during weekend hours, reason of admittance, length of stay, age and BMI did not correlated with the 1st NAS. Apache-II score significantly correlates with the 1st measured NAS. During night hours a significantly lower NAS score was measured compared to NAS measured during evening shifts (day shift 70 ± 20 %, evening shift 78 ± 25 %, night shift 59 ± 26 %;

$P < 0.05$). Furthermore, patients who did not survive to ICU discharge had a higher NAS score during the first shift (survivors 66 ± 22 % versus non-survivors 77 ± 27 %; $P < 0.05$).
Regression analysis was performed per patient of the mean NAS per day for seven days. Only apache-II score was significantly related to the slope of the regression line.
CONCLUSIONS. High apache-II scores and not reason of admission are associated with high NAS scores of the first shift.

Table 1 Patient characteristics and data

	CA	Sepsis	TBI
Apache-II score	30.8 ± 8.3	25.6 ± 8.5	21.7 ± 6.5*
Length of stay (days)	9.0 ± 10.2	9.5 ± 8.9	10.7 ± 11.9
Age (years)	59 ± 16	67 ± 12	46 ± 21*†
BMI	26 ± 5	24 ± 7	25 ± 4
NAS 1st shift (%)	73 ± 23	64 ± 26	68 ± 26
NAS 2nd shift (%)	50 ± 19	57 ± 21	58 ± 23
NAS 3rd shift (%)	48 ± 16	48 ± 18	49 ± 20
Blood samples during 1st 24 h, n	12.1 ± 3.8	9.8 ± 2.8*	7.2 ± 3.5*†

Data are mean ± SD
CA, cardiac arrest; TBI, traumatic brain injury
*$P < 0.05$ vs CA group, †$P < 0.05$ vs Sepsis group.

0977
NURSING WORKLOAD AND INTRAVENOUS DRUGS′ ADMINISTRATION: A TIME AND MOTION STUDY

I. Comisso[1], E. Manganaro[2]

[1]Azienda Ospedaliero-Universitaria Santa Maria della Misericordia, Udine, Italy, [2]Corso di Laurea in Infermieristica, Udine, Italy

INTRODUCTION. Nursing workload measurement in Intensive Care Unit (ICU) is necessary to properly assign human and material resources and therefore contain related costs. Only a few studies determine specifically time needed to administer intravenous (IV) drugs.
OBJECTIVES. Primary aim of the study was to determine time spent by ICU nurses to manage IV drugs administration. Secondary aim was to identify clinical-organizational variables related to an increase in such time.
METHODS. Prospective observational-correlational study. Observed nurses belonged to three general ICUs in an Italian hospital. Observations were conducted during morning shifts, for 1 month, during weekdays and weekends. Time dedicated to prepare, administer and manage desired and adverse effects were recorded and central and dispersion indexes (mean ± SD, median, range) were calculated. By univariate analysis, Relative Risk between risk variables and increased time (>70 s) was searched. Risk variables included: • drugs′ form and dose, device used for the administration;
• SOFA and NAS score for each patient;
• nurse to patient ratio, nurses′ seniority in ICU.
Statistical significance was accepted when $p < 0.05$
RESULTS. 513 preparation procedures and 656 administration procedures were observed. Hub′s disinfection requested 32.55 ± 10.75 s, whilst drugs′ preparation 95.53 ± 70.05. Globally, 6.24 % of nursing time was employed to prepare, administer and manage effects of IV drugs. Lyophilized form ($p < 0.0001$), fractioned dose ($p = 0.0295$), syringe pump use ($p < 0.0001$) and NAS score ($p = 0.0133$) were associated to a significative increase in drugs′ preparation. Time dedicated to monitoring procedures increased only when glycaemic control was requested ($p < 0.0001$).
CONCLUSIONS. Time dedicated to drugs′ administration is considerable during morning shifts in ICU. When dilution and dose′s calculation are requested and technologies are employed to administer drugs such time increases.
REFERENCES. 1. Abbey M, Chaboyer W, Mitchell M. Understanding the work of intensive care nurses: a time and motion study. Aust Crit Care 2012; 25:13–22. 2. Van Zanten A, Engelfriet PM, van Dillen K, van Veen M, Nuijten MJC, Polderman KH. Importance of nondrug costs of intravenous antibiotic therapy. Crit care, 2003; 7(6):184–190.

0978
ANALYSIS OF THE NURSING WORKLOAD AND OUTCOME OF HOSPITALIZATION IN THE INTENSIVE CARE UNIT IN AMAZONAS, BRAZIL

D.C. Oliveira[1], S.L. Osis[1], A.B. Martins[1], S.P. Osis[2]

[1]Universidade do Estado do Amazonas, Enfermagem, Manaus, Brazil, [2]Unimed Fesp, São Paulo, Brazil

INTRODUCTION. The *Nursing Activities Score* (NAS) is a instrument developed with the goal of to predict the workload of nursing without the aim to correlate with the severity of patients[1], but it is observed that the sickest patients require greater load work[2]. The instrument allows nurses to identify the degree of care needs of patients by assessing, seeking improvements in care, because the efficiency and quality of care can affect the costs of hospitalization and treatment[1, 2].
OBJECTIVES. To analyze the *Nursing Activies Score* (NAS) of the patients admitted in a Critical Care Unit of the city of Manaus, Amazonas.
METHODS. This was a descriptive, exploratory, quantitative, prospective. The study was approved by the Ethics and Research of the State University of Amazonas. Data analysis was conducted using Epi Info version 7 and the significance level was 5 %.
RESULTS. The sample consisted of 143 patients with 1,351 measures/patient/day NAS. The overall average NAS was 53.1 % (± 8.79), being identified in patients hospitalized for neurological cause NAS average of 56.0 % (± 7.3/n = 101), 51.7 % clinical cause (± 13.5/ n = 22) and causes surgical 57.6 % (± 7.6/n = 20). Evolved into discharged 73.4 %(n = 105) and 23.1 % died (n = 33). The average NAS of patients who were discharged was 54.3 % and of patients who died of 61.5 % ($p < 0.001$). In the analysis between type of admission, the average NAS and outcome, was identified among clinical patients discharged NAS average of 47.3 % (±9.9) and death 64.5 % (±14) ($p = 0.006$); neurological patients discharged NAS average of 55.0 % (±7) and death 60.4 % (±3.6) ($p = 0.001$). We identified a median of 7 days of hospitalization time and $r = 0.26$ in the correlation between the NAS and length of stay.
CONCLUSIONS. The specialty Neurological presented the higher demand and higher average NAS. Identified as being significant in the average of NAS of patients who were discharged than those who died ($p < 0.001$). There was a correlation between type of admission, the mean NAS and outcome, identified among clinical patients who were discharged and death ($p = 0.006$) and for neurological patients they were discharged and death ($p = 0.001$). The value of the NAS identified in the study was lower than that reported in the international literature, it is noteworthy that the NAS evaluates only the care that was provided to the patient within the therapeutic and technological possibilities offered by unity.
REFERENCES. 1. Ducci AJ, Padilha KG. *Nursing Activities Score*: estudo comparativo da aplicação retrospectiva e prospectiva em unidade de terapia intensiva. Acta Paul Enferm. 2008; 21(4):581–7. 2. Nogueira LS, et al. Nursing Activities Score: Comparação com o índice APACHE II e a mortalidade em pacientes admitidos em Unidade de Terapia Intensiva. Rev Bras de Ter Int. 2007;19(3):327–30.
GRANT ACKNOWLEDGMENT. The Government of the State of Amazonas.

0980
NEW ROLES ON ICU: THE COST EFFECTIVENESS OF EMPLOYING THERAPY TECHNICIANS ON INTENSIVE CARE TO REDUCE LENGTH OF STAY AND IMPROVE FUNCTIONAL OUTCOMES

Z. van Willigen[1], L. Gallagher[1], R. Cusack[2], D. Richardson[2], Critical Care Medical Patients

[1]University Hospital Southampton Foundation Trust, Physiotherapy, Southampton, UK, [2]University Hospital Southampton Foundation Trust, General Intensive Care Unit, Southampton, UK

Survival following critical illness is improving but is often associated with a poor functional outcome which may persist for years [1]. Immobilisation due to sedation may exacerbate muscle wasting and deconditioning. Schweickert et al. recently demonstrated the combined effects of reduced sedation and physical activity was safe, well tolerated and resulted in less delirium, more ventilator free days with better functional outcomes at hospital discharge[2].
Few UK NHS trusts employ therapy technicians on the Intensive Care Unit. We introduced a Band 2 and a Band 4 therapy technician as part of an early mobilisation multidisciplinary team.The programme commenced in April of 2012.
An initial training period was required to familiarise staff with equipment - a Motomed bicycle for use in bed bound patients for both upper limb and lower limb exercise, therabands, weights, stretcher chairs and a stand-aid hoist. The technicians are also trained in sedation and delirium assessment using Richmond Agitation-Sedation Scale (RASS) and Confusion Assessment Method for the ICU (CAM-ICU).
The technicians deliver two 30 min sessions of rehabilitation/mobilisation therapy daily in addition to standard physiotherapy sessions. This is in conjunction with a strict sedation and analgesia protocol ensuring minimal sedation at all times. The technicians play an important educational role of the nursing staff and junior doctors in ensuring the sedation protocol is adhered to.
Therapy is started for medical patients only, within 72 h of being intubated and ventilated, and is continued until discharge from the intensive care unit.
Functional outcomes are measured using number of ADLs patients are achieving at hospital discharge. Of the cohort we sampled 13 out of 13 patients returned to baseline (including independent walking) at hospital discharge, compared with only 4 out of 8 patients sampled in the previous year over the same time period, prior to implementation of the project. Patient feedback is also very positive.
Financial results show a saving of two bed days per ICU patient. This translates to a saving of between £155,000–271,000 (depending on ICU bed day cost estimates of £800–£1400) over the first year (97 patients). This demonstrates at least a 3:1 return for the investment required to fund the project annually. The project is continuing on our ICU and we are hoping to start including surgical patients too.
GRANT ACKNOWLEDGMENT. The cost of the project was funded by University Hospitals Southampton Foundation NHS Trust Innovation Fund.
REFERENCES. 1. Herridge MS, Tansey CM, Matte A et al. Functional disability 5 years after acute respiratory distress syndrome. N Engl J Med 2011;364:1293–3042. 2. Schweickert WD, Pohlman MC, Pohlman AS et al. Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial. Lancet 2009;373:1874–82.

0981
THE INTENSIVE CARE NURSES OF THE FUTURE

K. Paalanen[1], O. Mäkinen[2], M. Veijanen[3]

[1]JAMK University of Applied Sciences, The School of Health and Social Studies, Jyvaskyla, Finland, [2]Central Finland Central Hospital, Jyväskylä, Finland, [3]Lives Ambulance, Ylöjärvi, Finland

INTRODUCTION. Critically ill people are today more ill than earlier when transferred to Intensive Care Units. This means the nursing care is changing. Nurses do need more knowledge and develop their skills? (AACCN 2013.)
OBJECTIVES. The objective of this thesis was to examine the perceptions of nurses working in a particular critical care unit about the future competencies in critical care nursing. The results of this thesis can be used in developing the ICU, for example, in developing the orientation of new employees, education and recruitment.
METHODS. This thesis was carried out as qualitative research. The material was collected by using a focus group discussion. The eight participants for the discussion were chosen randomly from the ICU's staff and both genders were represented. Two years of ICU work experience was required from the participants. The focus group discussion was executed in January 2012. The material was analyzed by using qualitative content analysis.
RESULTS. As a result of the focus group discussion nine different perspectives arose. The perspectives were nurses' job description, control of technology, the changing patients, team work, job rotation, occupational well-being, the changing organization, evidence-based nursing and the education and orientation of nurses.
CONCLUSIONS. As a result of the focus group discussion nine different perspectives arose. The perspectives were nurses' job description, control of technology, the changing patients, team work, job rotation, occupational well-being, the changing organization, evidence-based nursing and the education and orientation of nurses.
REFERENCES. 1. AACCN. About critical care nursing. American Association of Critical Care Nursing. n.d. Accessed on 22 April 2013. http://www.aacn.org/wd/pressroom/content/aboutcriticalcarenursing.pcms?menu.

0982
PAIN MANAGEMENT APPROACHES DURING CHEST TUBE REMOVAL

O. Aslan[1]

[1]Gülhane Military Medical Academy, School of Nursing, Department of Fundamentals of Nursing, Etlik/Ankara, Turkey

INTRODUCTION. Pain management is an important issue in nursing care. Removal of chest tubes causes pain. Therefore, many pain reducing techniques are used.

OBJECTIVES. The objective of this literature review was to explain pain management approaches (PMA) during chest tube removal (CTR).

METHODS. Scientific literature was searched by using key words entitled "chest tube/chest drains removal and pain and nursing" through Pub-Med, Medline databases between 2002–2013.

RESULTS. Review contained 6 research and 4 review papers. Experiments in the research papers were 1 controlled experimental design with repeated measures, 3 randomised controlled design, 1 semi-experimental design, and 1 randomised double-blinded design. According to the search results, PMA were use of cold application before, during and after CTR, use of fast-acting and short-acting analgesics, use of cold application with standardized analgesics, performing relaxation exercises with opiods, use of local anestethics and inhalation agents, use of analgesics with procedural and sensory information. It was stated that the level of pain during CTR was from moderate to excessive degree and clinical protocols were scarce. There was a research need containing multi modal approaches. Age, gender, the duration of chest tube insertion, indication of chest tube placement variables were not associated with the pain during CTR.

CONCLUSIONS. Pain continues to be a problem during CTR. The newest and the most effective approach should be selected by clinicians according to hospital policies. Updated guidelines for nursing care should be prepared for nurses.

REFERENCES. 1. Ertug N, Ulker S. The effect of cold application on pain to chest tube removal, J Clin Nurs 2012; 21(5–6):784–790. 2. Given J. Management of procedural pain in adult patients, Nurs Stand 2010, 25(149):35–40. 3. Demir Y, Khorshid L. The effect of cold application in combination with Standard analgesic administration on pain and enxiety during chest tube removal: a single-blinded, randomized, double-controlled study, Pain Manage Nurs 2010, 11(3):186–196. 4. Sullivan B. Nursing management of patients with a chest drain, Br J Nurs 2008, 17(6):388–393.

ALI & ARDS: mechanistic insights: 0983–0995

0983
ASSOCIATION OF LOW SERUM 25-HYDROXYVITAMIN D LEVELS AND NON-CARDIOGENIC ACUTE RESPIRATORY FAILURE

D.R. Thickett[1], T. Moromizato[2], A.A. Litonjua[3], K. Amrein[4], S.A. Quraishi[5], K.A. Lee-Sarwar[6], F.K. Gibbons[7], C.A. Camargo Jr.[8], E. Giovannucci[9], K.B. Christopher[2]

[1]College of Medical and Dental Sciences, University of Birmingham, School of Clinical and Experimental Medicine, Birmingham, UK, [2]Brigham and Women's Hospital, Renal Division, Boston, USA, [3]Brigham and Women's Hospital, Pulmonary and Critical Care Division, Boston, USA, [4]Medical University of Graz, Division of Endocrinology and Metabolism, Graz, Austria, [5]Massachusetts General Hospital, Department of Anesthesia, Critical Care and Pain Medicine, Boston, USA, [6]Brigham and Women's Hospital, Department of Medicine, Boston, USA, [7]Massachusetts General Hospital, Pulmonary and Critical Care Medicine, Boston, USA, [8]Massachusetts General Hospital, Department of Emergency Medicine, Boston, USA, [9]Harvard School of Public Health, Departments of Nutrition and Epidemiology, Boston, USA

INTRODUCTION. Vitamin D deficiency has been associated with impaired pulmonary function, increased incidence of viral and bacterial infections and inflammatory disease including asthma and COPD. Vitamin D appears to affect a variety of inflammatory and structural cells within the lung including macrophages, lymphocytes and epithelial cells.

OBJECTIVES. We hypothesized that low vitamin D prior to hospitalization would be associated with increased risk of non-cardiogenic acute respiratory failure in critically ill patients.

METHODS. We performed a two-center observational study of patients treated in medical and surgical intensive care units in Boston, USA. We studied 1,985 patients, age $\geq$ 18 - years, who received critical care between 1993 and 2011. The exposure of interest was pre-admission 25(OH)D, which we used to categorize vitamin D status as severe deficiency ($\leq$ 10 ng/mL), deficiency (10–19.9 ng/mL), insufficiency (20–29.9 ng/mL) and sufficiency ($\geq$ 30 ng/mL). The primary outcome was non-cardiogenic acute respiratory failure defined by the presence of ICD-9 codes for respiratory failure or pulmonary edema (518.4, 518.5, 518.81, or 518.82) and for mechanical ventilation (96.7 ×). We excluded patients with ICD-9 codes for congestive heart failure (428.0–428.9). The ICD-9 definition of acute respiratory failure was validated against the Berlin Definition of ARDS. Associations between vitamin D groups and acute respiratory failure were estimated by bivariable and multivariable logistic regression models. Adjustment included age, race, sex, Deyo-Charlson Index, and patient type (medical versus surgical).

RESULTS. Of the cohort, 8 % had severe vitamin D deficiency, 24 % were deficient, 24 % were insufficient and 44 % were sufficient. The mean (SD) age was 63.2 (16.2) years. 18 % of cohort patients were diagnosed with non-cardiogenic acute respiratory failure, 45 % were male and 80 % were white.

Pre-admission 25(OH)D deficiency was predictive for non-cardiogenic acute respiratory failure. Compared to patients with vitamin D sufficiency, patients with lower 25(OH)D levels had higher odds of acute respiratory failure:

severe deficiency OR = 2.11 (95 %CI, 1.41–3.15;P < 0.001);
deficiency OR = 1.72 (95 %CI, 1.28–2.30; P < 0.001);
insufficiency OR = 1.46 (95 %CI, 1.08–1.98; P = 0.01);
all relative to patients with vitamin D sufficiency.

25(OH)D remained a significant predictor of acute respiratory failure following multivariable adjustment:

severe deficiency OR = 1.84 (95 %CI, 1.22–2.77; P = 0.004);
deficiency OR = 1.60 (95 %CI, 1.19–2.15;P = 0.002);
insufficiency OR = 1.37 (95 %CI, 1.01–1.86;P = 0.04);
all relative to patients with vitamin D sufficiency.

Validation of ICD-9 defined non-cardiogenic acute respiratory failure assignment for the Berlin Definition of ARDS showed a positive predictive value of 84 % and a negative predictive value of 57 %.

CONCLUSIONS. Pre-hospital 25(OH)D is a robust predictor of non-cardiogenic acute respiratory failure in the critically ill.

0984
PULMONARY VASCULAR EFFICIENCY IS AFFECTED BY LUNG CONDITION AND PEEP SETTINGS IN AN EXPERIMENTAL MODEL OF ARDS

A. Santos[1], L. Lucchetta[2], J.B. Borges[1], G. Tusman[3], M.I. Monge García[4], A. Larsson[5], G. Hedenstierna[6], F. Suarez-Sipmann[5,7]

[1]Uppsala University, Hedenstierna Laboratory, Surgical Science Department, Uppsala, Sweden, [2]Milano Bicocca University, Dipartimento di Scienze della Salute, Monza, Italy, [3]Hospital Privado de Comunidad, Anesthesiology, Mar del Plata, Argentina, [4]Hospital SAS de Jerez de la Frontera, Servicio de Cuidados Críticos y Urgencias, Jerez de la Frontera, Spain, [5]Uppsala University Hospital, Surgical Sciences, Section of Anesthesiology and Intensive Care, Hedenstierna Laboaratory, Uppsala University, Uppsala, Sweden, [6]Uppsala University, Hedenstierna Laboratory, Department of Medical Sciences, Uppsala, Sweden, [7]CIBERES, Madrid, Spain

INTRODUCTION. Right ventricular dysfunction affects outcome in acute respiratory distress syndrome (ARDS). The severity and pattern of lung pathology as well as the ventilatory settings can modify the characteristics of the pulmonary vascular system (PVS) affecting right ventricle afterload.

OBJECTIVES. To describe the effects of different lung conditions and PEEP settings on pulmonary vascular efficiency in a porcine model of ARDS.

METHODS. We studied 6 anesthetized and muscle relaxed pigs (33 $\pm$ 4 kg) submitted to a two-hit lung injury model combining repeated lung lavages with injurious mechanical ventilation. Animals were ventilated in volume control, with a tidal volume = 7 ml/kg, PEEP = 8cmH_2O, FIO_2 = 1 and respiratory rate adjusted to maintain an end-tidal CO_2 = 45–60 mmHg. We studied the following situations: Baseline (BL): healthy animal after instrumentation; ARDS: after inducing lung injury; and then in a random order: Open Lung PEEP (OLP): same ventilator setting but PEEP adjusted 2 cmH_2O above best dynamic compliance obtained from a decremental PEEP trial after lung recruitment; Overdistension (OD): PEEP = OLP + 4cmH_2O; Collapse (COL): PEEP = OLP-8cmH_2O (never higher than 10 cmH_2O). During OD, PEEP was decreased when neccessary to maintain Plateau pressure $\leq$ 35 cmH_2O. After 40 min stabilization at each protocol condition respiratory and hemodynamic data were collected including pulmonary artery (PA) flow and pressure waveforms (200 Hz sampling rate) acquired by a high-fidelity microtip manometer and an instantaneous transonic pulmonary flow probe placed in the main PA by a small lateral thoracotomy. Analytic methods in time and frequency domain were used to describe efficiency of the PVS in terms of resistance, effective arterial elastance (Eaz) and wave reflection[1] phenomena.

RESULTS. Lung function variables of the different studied lung conditions are presented in Table 1. Hemodynamic parameters and vascular efficiency indexes are presented in Table 2. Compared to baseline, ARDS presented an increase in Eaz, resistance, and wave-reflection phenomena with a decoupling between forward and backward pressure waveforms (i.e. shorter time to peak and foot and increased pressure produced by backward pressure wave). Either too high (OD) or too low (COL) PEEP levels worsened PA resistance, Eaz and coupling between backward and forward pressure waveforms when compared with an optimized (OLP) level.

CONCLUSIONS. Efficiency of the PVS deteriorated with worsening of lung function. PEEP settings modulated these effects resulting in improved PA indexes when adjusted to minimize overdistension or lung collapse.

REFERENCES. 1. Maggiorini M et al. Effects of pulmonary embolism on pulmonary vascular impedance in dogs and minipigs. J Appl Physiol. 1998; 84:815–21.

GRANT ACKNOWLEDGMENT. This study is part of a project awarded by the ECCRN of the ESICM.

	BL	ARDS	OD	OLP	COL
PEEP	8 ± 0	9 ± 1	22 ± 1	19 ± 1	10 ± 1
PaO2 (mmHg)	541 ± 48	108 ± 67	494 ± 82	446 ± 127	189 ± 127
PaCO2 (mmHg)	49 ± 4	67 ± 9	61 ± 3	55 ± 4	72 ± 16
pH	7.39 ± 0.04	7.24 ± 0.04	7.23 ± 0.05	7.24 ± 0.09	7.18 ± 0.12
shunt	6 ± 2	32 ± 12	7 ± 4	11 ± 7	26 ± 11
Vd/Vt Bohr	0.47 ± 0.05	0.44 ± 0.22	0.64 ± 0.04	0.58 ± 0.04	0.56 ± 0.05
Cdyn	39 ± 8	13 ± 3	21 ± 4	28 ± 3	16 ± 3

Table 1. Respiratory variables durign the experiment steps. Vd/Vt Bohr Bohr's dead space; Cdyn dynamic compliance.

Table 1

	BL	ARDS	OD	OLP	COL
PAPm (mmHg)	27 ± 2	40 ± 8	32 ± 3	29 ± 4	35 ± 6
Q (L·min·m^2)	3 ± 0	4 ± 1	3 ± 1	3 ± 1	4 ± 1
PVR (dyn.s.cm^5)	228 ± 111	500 ± 58	346 ± 54	247 ± 49	423* ± 99
Amp Pbw (mmHg)	8 ± 3	13 ± 2	8 ± 3	7 ± 2	11 ± 1
Time to peak Pbw (s)	1 ± 0	0 ± 0	1 ± 0	1 ± 0	0 ± 0
Time to foot Pbw (s)	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
ETR (%)	97 ± 1	95 ± 2	98 ± 1	98 ± 1	96* ± 2
DPP (mmHg)	-2 ± 6	6 ± 6	0 ± 3	-2 ± 2	3 ± 5
SV:PP (ml/mmHg)	3 ± 1	1 ± 0	2 ± 0	2 ± 0	2 ± 1
Eaz (mmHg·ml)	0.30 ± 0.17	0.69 ± 0.25	0.47* ± 0.18	0.31 ± 0.06	0.57* ± 0.17

Table 2. Hemodynamic variables and vascular efficiency indexes. PAPm mean pulmonary artery pressure; Q mean flow per m^2; PVR pulmonary vascular resistance; Amp Pbw backward pressure wave amplitud; ETR energy transmission ratio (hydarulic power in the measured wave hydraulic power in the forward wave); DPP difference between measured and forward pulse pressure; SV:PP ratio stroke volume to pulse pressure. Eaz Effective arterial elastance (PAPm-Pulmonary wedge pressure) SV. * P<0.05 comparing to OLP

0985
EFFICACY OF MESENCHYMAL STEM CELLS DEPENDS ON ADMINISTRATION ROUTE IN A MURINE MODEL OF ACID INHALATION ARDS

V. Zambelli[1], T. Mauri[1], R. Borsa[1], F. Pozzi[1], G. Bellani[1], C. Cappuzzello[2], E. Dander[2], C. Garlanda[3], G. D'Amico[2], A. Pesenti[1]

[1]University of Milan-Bicocca, Department of Health Science, Monza, Italy, [2]Ospedale San Gerardo, Centro Ricerca 'M Tettamanti', Monza, Italy, [3]Humanitas Clinical Institute, Rozzano, Italy

INTRODUCTION. Acute respiratory distress syndrome (ARDS) is still associated with high mortality, as only few effective therapies are available. Mesenchymal stem cells (MSCs) showed beneficial effects in various experimental ARDS model, by fine balancing inflammation with increased ability of eliminating the noxa without additional injury. Data on the effects of MSCs in acid inhalation-induced ARDS still lack.

OBJECTIVES. Aim of this study was to test the therapeutic effects of MSCs, administered by intravenous (iv) and intraperitoneal (ip) route, in a murine model of ARDS induced by acid inhalation.

METHODS. Intubated and ventilated mice received 1.5 mL/kg HCl (0.1 M) into the right bronchus and were immediately extubated. One hour after acid instillation, MSCs were injected ip or iv (10^6 cells in 200 μl solution for both routes). Mice treated by iv or ip PBS (200 μl) served as controls. Twenty-four hours after MSCs administration mice were sacrificed and arterial blood gases ($FiO_2 = 0.21$) and bronchoalveolar lavage (BAL) were analyzed to assess lung injury.

RESULTS. Survival at 24 h was 95 % for MSCs ip and 85 % for iv; no mice died in the PBS groups. Mice treated with MSCs ip showed significantly ($p = 0.013$) higher partial pressure of oxygen in arterial blood (Figure 1) associated with reduction in number of neutrophils recovered in BAL ($p = 0.055$), compared to PBS ip group (Figure 2). In contrast, mice that received MSCs intravenously did not show any beneficial effects in terms of oxygenation and neutrophils recruitment in the alveolar space, if compared to PBS iv group.

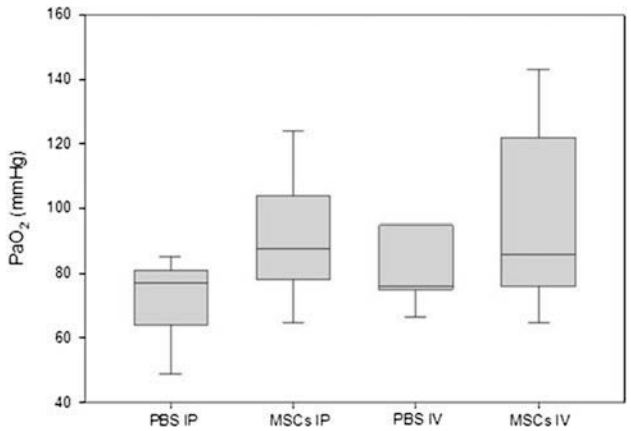


Figure 1

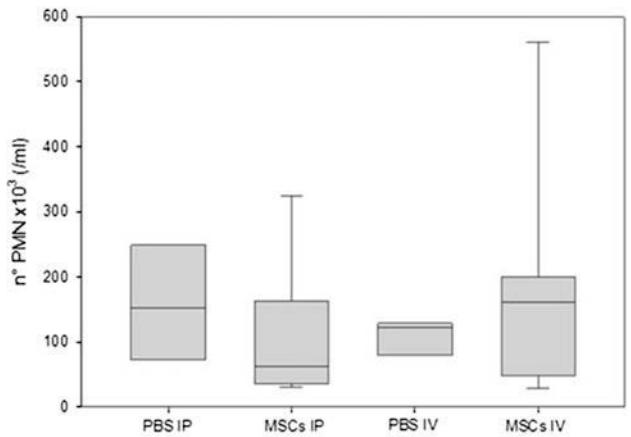


Figure 2

CONCLUSIONS. MSCs injected intraperitoneally 1 h after onset of acid-induced experimental ARDS determine a significant improvement in oxygenation at 24 h, possibly by dampening recruitment of activated neutrophils in the alveolar space. On the other hand, MSCs iv do not seem to attenuate acid-induced ARDS, maybe because acid environment in lung parenchyma destroy a significant amount of MSCs as they pass through lung vascular tree.

0986
SAMPLING AND ANALYSIS OF ALVEOLAR EXHALED BREATH CONDENSATE IN MECHANICALLY VENTILATED PATIENTS: A FEASIBILITY STUDY

R. Vaschetto[1], M. Goldoni[2], L. Cancelliere[1], S. Pulvirenti[1], U. Fazzini[1], R. Costagliola[3], F. Capuzzi[1], F. Longhini[3], G. Cammarota[1], F. Della Corte[1,3], A. Mutti[2], M. Corradi[2], P. Navalesi[3,4,5]

[1]Azienda Ospedaliero-Universitaria "Maggiore della Carità", Novara, Italy, [2]Università degli Studi di Parma, Dipartimento di Medicina Clinica e Sperimentale, Parma, Italy, [3]Università del Piemonte Orientale "A. Avogadro", Dipartimento di Medicina Traslazionale, Novara, Italy, [4]Ospedale Sant'Andrea, Dipartimento di Anestesia e Rianimazione, Vercelli, Italy, [5]CRRF Mons. L Novarese, Centro per il recupero e la rieducazione funzionale, Moncrivello, Vercelli, Italy

INTRODUCTION. Exhaled breath condensate (EBC) diffuses as gas from the lining fluid covering airspaces, airways, and the mouth. EBC sampling is totally noninvasive. As EBC composition is influenced by the origin of air, a new two-way valve (Medivac, Italy) has been developed to collect only the alveolar fraction of EBC (1). An infrared sensor, measuring the concentration of exhaled CO_2, makes the exhaled air passes into the commercially available condenser TURBO-DECCS system (Medivac, Italy) when CO_2 concentration exceeds the 50 % increase of CO_2 concentration, which is traditionally used to distinguish the anatomical dead-space air from the rest, while when it is below, air is discharged in the expiration limb.

OBJECTIVES. The aim of our study was to verify the feasibility of sampling alveolar-EBC in mechanically ventilated patients with different ventilators. Both the switch of the valve and the size of the connectors linking the valve, the condenser, and the expiration limb of the ventilator could have had an effect on respiratory dynamic of patients, increasing respiratory resistance.

METHODS. In 16 patients with (L_I group, $n = 8$) and without (L_{NI} group $n = 8$) lung injury, alveolar-EBC has been collected for 30 min. Before connecting the valve and the condenser to the ventilator circuit (baseline setting), a blood gas was taken and the respiratory and hemodynamic parameters registered. During sampling peak and plateau pressures, flow, intrinsic positive end-expiratory pressure (PEEP), tidal volume (Vt), and respiratory rate (RR) have been measured. Blood gases have been sampled every 15 min. Blood pressure, heart rate and oxygen saturation have been continuous monitored. EBC samples have been used for oxidative stress molecules measurements.

RESULTS. Patients were ventilated with a mean Vt of 450 ml in L_I and 480 ml in L_{NI} with a RR of 20 and 13 breath/min, respectively. The ratio between arterial partial pressure of oxygen to fraction of inspired oxygen (PaO_2/FiO_2), was 180 mmHg in L_I and 290 mmHg in L_{NI} ($p = 0.01$) without any significant changes throughout EBC collection. Respiratory mechanical parameters and hemodynamic variables were stable without any significant differences between the baseline settings and the end of the EBC collection. The analysis of EBC samples led to a significant difference in hydrogen peroxide (0.122 vs. 0.031 microM in L_I and L_{NI}), while pH, 8-isoprostano, and malondialdeide were similar between the groups.

CONCLUSIONS. Alveolar EBC collection is feasible in mechanically ventilated patients through the application of a new two-way valve connected to a condenser at the expiration limb of diverse ventilators. Although promising, the advantage of collecting only the alveolar fraction of EBC in ICU mechanically ventilated patients has still to be clarified.

REFERENCES. 1. Goldoni M et al. J Breath Res. 2013;7(1).

GRANT ACKNOWLEDGMENT. Medivac kindly provided the two-way valve and the TURBO-DECCS system.

0987
PROTECTIVE EFFECTS OF NON-HEMATOPOIETIC HEME OXYGENASE - 1 IN LPS INDUCED PULMONARY INFLAMMATION

F.M. Konrad[1], U. Knausberg[1], R. Hoene[1], K.C. Ngamsri[1], J. Reutershan[1]

[1]University Hospital of Tuebingen, Tuebingen, Germany

INTRODUCTION. The stress response enzyme heme oxygenase 1 (HO-1) is expressed ubiquitous in the body tissue and mediates, besides its major biological function of heme degradation, a variety of anti-inflammatory effects including leukocyte trafficking to inflamed tissue, e.g. to the lungs during acute pulmonary inflammation. It remains unclear whether HO-1 on leukocytes or on non-hematopoetic cells contributes to these effects.

OBJECTIVES. We investigated the role of HO-1 in a murine model of pulmonary inflammation with a particular focus on the role of non-hematopoetic HO-1. HO-1 was induced by hemin given both as aerosol and as intraperitoneal injection.

METHODS. We used HO-1 floxed (flox/flox) mice that express reduced HO-1 on leukocytes (by 82 %). Wildtype- and HO-1 flox/flox mice inhaled LPS for 30 min. After 24 h, PMNs were detected in lung compartments (intravascular–interstitial–alveolar), using a flow cytometry-based technique. HO-1 was pharmacologically induced by hemin and inhibited by TinProtophorphyrin-IX (SnPP). Chemokines were measured in the BAL (ELISA), microvascular leakage was determined using the Evans blue extravasation technique. HO-1 activity was measured colorimetric by its enzymatic reaction.

RESULTS. Activation of HO-1 in wildtype mice reduced migrated PMNs into the lung interstitium and into the alveolar space. Hemin effect was pronounced when applied as aerosol.. Experiments with HO-1 flox/flox mice revealed non-hematopoietic HO-1 to be crucial for the anti-inflammatory effect in terms of PMN migration. Microvascular permeability was also reduced by hemin and inhibited by SnPP. This effect remained in HO-1 flox/flox mice, highlighting the pivotal role of HO-1 on non-hematopoietic cells. HO-1 activation decreased release of CXCL1, CXCL2/3, TNFα, and IL6 in the BAL of wildtyp and HO-1 flox/flox mice, whereas latter had significantly higher levels of TNFα but decreased CXCL1 levels compared to wildyp controls. Corresponding to our findings, HO-1 activity measurements of lungs of wildtype and floxed mice did not show any differences. Activation of HO-1 showed a protective effect even when given after the inflammatory stimulus, highlighting its clinical potential.

CONCLUSIONS. Our results identified the anti-inflammatory effects of stimulating HO-1 in LPS-induced migration of PMNs and alveolo-capillary leakage. Particularly, HO-1 on non-hematopoietic cells appears pivotal in our model. Local administration of hemin reduced the required doses and might represent a potentially therapeutic approach.

GRANT ACKNOWLEDGMENT. This work was supported by German Research Foundation Grant RE 1683/4-1 (to Jörg Reutershan).

0988

EARLY CD56+ PERCENTAGE, IGM AND FERRITIN LEVELS ACTING AS PROGNOSTIC FACTORS IN PATIENTS WITH SEPSIS CAUSED BY INFLUENZA A VIRUS (N1H1)

F. Valenzuela Sanchez[1], B. Valenzuela Méndez[2], R. Bohollo de Austria[1], J.F. Rodríguez Gutierrez[3], M. Recuerda Nuñez[1], A. Estella García[1], J. Sánchez Ruiz[1], V. Pérez Madueño[1], P. Guijo González[1], S. Garzón López[3], A. Jareño Chaumel[1]

[1]Associate University Hospital SAS of Jerez, Critical Care Medicine Unit, Jerez de la Frontera, Spain, [2]University of Sevilla, Sevilla, Spain, [3]Associate University Hospital SAS of Jerez, UGC Hematology, Jerez de la Frontera, Spain

INTRODUCTION. The immunity is an important factor in the evolution of the systemic response in septic patients and should respond differently depending on the offending agent.
OBJECTIVES. We study aspects of innate and acquired immunity in patients with severe sepsis from pulmonary origin due to influenza A virus (N1H1v) pneumonia.
METHODS. Prospective observational study. We recruited patients admitted consecutively to the ICU with a diagnosis of severe sepsis during a period of 25 months. We studied the subgroup of pulmonary sepsis caused by influenza A pneumonia. Epidemiological data, number of leukocytes, neutrophils, lymphocytes and monocytes, as well as lymphocyte subpopulations, HLA-DR expression on CD14 + cells, immunoglobulin levels and iron metabolism parameters were collected at admission, at 48 h, on the 5th day and at discharge.
RESULTS. After implementation of the protocol, 243 patients were included as septic, of whom 55 patients suffered bacterial pneumonia (BPN) and 7 caused by influenza A virus N1H1. In the influenza group the mortality was 42.85 (3/7), the leukocyte count at admission was 14,460 ± 6,970; lymphocytes were 20,070 ± 2,780. The CD4+ represented 50.5 % of the lymphocytes, the CD4/CD8 ratio was 2.5 ± 1. The percentage of CD56+ was 7, 57 ± 4.5 %, statistically lower than in the BPN group (17.66 ± 10; $p < 0.05$). Tthis ratio remained low throughout evolution and was enhanced in non-survivors (4,33 ± 1.15 %). CD19+ lymphocytes were 17.7 % at admission. The number of monocytes at admission was 760 ± 570 and represented the 6.3 ± 5 % of the lymphocytes; the expression of HLA-DR at admission was 513.6 ± 224 MFI, higher than that found in the BPN ($p < 0.05$). IgM levels were significantly higher compared to the total group of septic patients and BPN group: 111 ± 85/63 ± 32 mg/dl, $p < 0.05$. Moreover, this level of IgM was higher in non-survivors (76 ± 49/157 ± 111 mg/dl, ns) (table 1). Iron levels at admission was 58.7 mcg/dl and they descended significantly at 48 h to 19.66. Ferritin at admission was 2,530 ± 2,089 ng/ml, with significant difference between survivors and non-survivors respectively (1,414 ± 1,144/4,019 ± 2,306 ng/ml).

Table 1

At admission	CD4 %	CD56 %	CD19 %	CD4/CD8	HLA-DR (MFI)	IgM (mg/dl)	Ferritin (ng/ml)
Sepsis group	40.37 ± 13	13.6 ± 8	18.8 ± 12	2.53 ± 1.8	263 ± 286	75.6 ± 45	992.7 ± 1,390
BPN	38 ± 14	17.6 ± 10	18 ± 12	1.95 ± 1.6	181.5 ± 102	63 ± 32	1333.8 ± 2,044
A/H1N1 PN	50.42 ± 9	7.57 ± 4.5	17.7 ± 13	2.5 ± 1	513.6 ± 224	111 ± 85	2,530 ± 2,089
A/H1N1 PN survivors	47 ± 5	10 ± 4.7	13.25 ± 7.5	2 ± 0.7	678 ± 774	76 ± 49	1,414 ± 1,144
A/H1N1 PN non survivors	54 ± 12	4.33 ± 1.15	23 ± 11	3.1 ± 1.36	292 ± 180	157 ± 111	4,019 ± 2,306

CONCLUSIONS. In patients with influenza A/N1H1 severe sepsis there are an increase in the IgM and ferritin levels and a sustained drop in the percentage of CD56 + . These findings are more marked in non-survival patients.

0989

IMPACT OF BIOMARKERS TO PREDICT SHORT-TERM MORTALITY IN PATIENTS PRESENTING SEVERE ACUTE DYSPNEA WITH LOWER RESPIRATORY TRACT INFECTION

C. Ara Somohano[1,2], L. Potton[1,3], J.C. Cartier[1,4], M. Lugosi[1,4], A. Vesin[4], C. Minet[1], A. Bonadona[1], R. Hamidfar[1], P. Pavese[5], C. Schwebel[1], J.F. Timsit[1], BIOIRA

[1]CHU A. Michallon, Medical Intensive Care Unit, Grenoble, France, [2]CHU A. Michallon, Emergency Department, Grenoble, France, [3]HP2 Laboratory, INSERM U 1042, UJF-Grenoble 1, Grenoble, France, [4]U 823 Institut A Bonniot team 11 UJF Grenoble 1, Grenoble, France, [5]CHU A. Michallon, Infectious Diseases, Grenoble, France

INTRODUCTION. Lower respiratory tract infection is associated with a considerable mortality. Early evaluation of disease severity is essential for optimized treatment strategy and allocation of health care. Biomarkers may help the clinician in prognostic assessment in this specific clinical setting.
OBJECTIVES. To assess predictive value for 28 days mortality and adverse outcome of :NT B type Natriuretic peptide (NTProBNP), cardiac troponin I (Tn), C-reactive protein (CRP), procalcitonin (PCT), Mid-regional Pro-Atrial natriuretic peptide (ProANP), Mid-regional Pro Adrenomedulin (ProADM), Pro Endothelin (ProET) and Copeptin (CP) in patients with severe dyspnea and pneumonia.
METHODS. Post hoc analysis of BIOIRA study 384 patients admitted in Emergency Department (ED) and Medical Intensive Care Unit (ICU) in a University Hospital with severe dyspnea defined by $SpO_2 \leq 92$ % and/or respiratory rate ≥ 25 b/min. Final diagnosis adjudicated by an independent expert panel. Severe acute pneumonia (SAP) defined by death or mechanical ventilation or use of vasopressor within the first 3 days. Univariate and multivariate analysis of risk factors of SAP and D-28 mortality using logistic regression. Impact of biomarkers assessed individually (ROC analysis) and taking into account other prognostic clinical and biological covariates.
RESULTS. 114 patients (77 male, med[Q1–Q3] age: 69 [58–81]y) had diagnosis of pulmonary sepsis. D-28 mortality was 26.1 %. 43 patients (37.7 %) developed SAP. Except for PCT and CRP, median values of biomarkers were higher in 28D deceased and biomarkers were significantly associated with 28-days mortality AUC-ROC (p value): Pro ADM 0.815($<10.^4$), Pro-ANP 0.796($<10.^4$), CP 0.791($<10.^4$), NTpro BNP 0.787($<10.^4$), Tn 0.713(0.001), Pro ET 0.668(0.013). Best threshold of biomarkers were: Pro ADM 2.2 nmol/l, Pro-ANP 305 pmol/l, CP 75 pmol/l, NTpro BNP 8,991 ng/l, Tn 0.04 μg/l, Pro ET 224.1 pmol/l. After adjustment on clinical and biological factors, 4 biomarkers add prognostic information AUC-ROC (p value): Pro ADM 0.865(0.037), Pro-ANP 0.873(0.024), CP 0.893(0.0.01), Tn 0.896(0.03). Median value for troponin was significantly higher in patient with SAP, but after adjustment on clinical and biological pronostic factors, Tn didn't add prognostic information. We didn't find significant difference for the others biomarkers between patient with or without SAP.
CONCLUSIONS. In this specific population of patient with pneumonia and severe dyspnea defined by two simple clinical criteria, Pro ADM, Copeptin, Pro ANP and Tn are predictive of early mortality independently of clinical and biological covariates. In contrast, no biomarkers are able to predict adverse outcomes in the first 3 days of hospitalisation. Further analysis are ongoing to assess wether biomarkers could improve the performance of established predictive score in this cohort.
REFERENCES. 1. Renaud B. Chest 2012;142(6):1447–54.
GRANT ACKNOWLEDGMENT. Grenoble University hospital/Brahms Diagnostic.

0990

DIAPHRAGMATIC MITOCHONDRIAL RESPIRATION IN CHRONICALLY CIGARETTE SMOKE EXPOSED MICE AFTER BLUNT CHEST TRAUMA AND MECHANICAL VENTILATION

J. Matallo[1], M. Groeger[1], M. Wepler[1], S. Hafner[1], P. Radermacher[1], F. Wagner[1], K. Wagner[1], E. Calzia[1]

[1]Ulm University, Anesthesia, Sect. APV, Ulm, Germany

INTRODUCTION. Previous studies clearly indicate that diaphragm disuse during mechanical ventilation (MV) rapidly leads to atrophy of this muscle[1]. On the biochemical level, this MV related diaphragmatic weakness is linked to an increased production of reactive oxygen species (ROS) and impaired mitochondrial respiration[2,3]. However, no data are available yet on the effects of MV on diaphragmatic function in subjects with chronic pulmonary diseases associated with airway obstruction resembling human COPD.
OBJECTIVES. To measure mitochondrial respiratory activity in diaphragm and heart in chronically cigarette smoke exposed (CSE) mice, i.e. in a accepted COPD-model, after a standardized blunt chest trauma[4] and 5 h of mechanical ventilation.
METHODS. Maximum mitochondrial respiration in small, homogenized biopsies of heart and diaphragm was measured according to previously published protocols[5] under combined stimulation of the respiratory chain with complex I (Pyruvate 10 mM, Malate 5 mM, and Glutamate 10 mM) and complex II (Succinate 10 mM) substrates after uncoupling by 0.5 μM Carbonylcyanide-*p*-trifluoromethoxyphenylhydrazone (FCCP) using an O2K®-Oxygraph (Oroboros Instruments, Austria). All measurements were performed at 37 °C. We studied 4 groups of animals (controls vs. CSE with or without trauma and MV, n = 5–8).
RESULTS. Only in the diaphragm of CSE mice mitochondrial respiration already decreased after the short period of MV. In contrast, in the heart muscle as well as in the diaphragm of healthy animals mitochondrial respiratory activity was unaffected by the MV (Fig. 1 and 2).

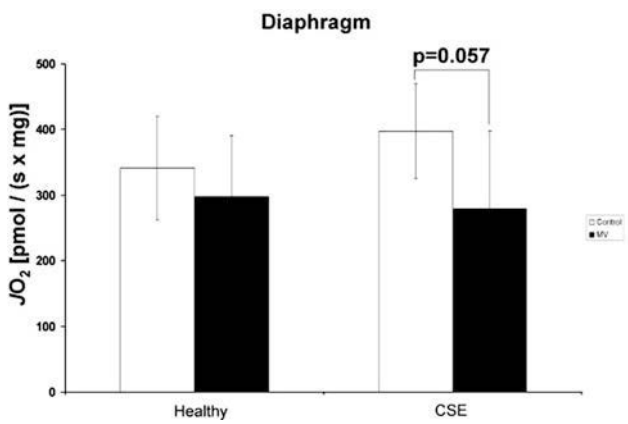


Fig. 1

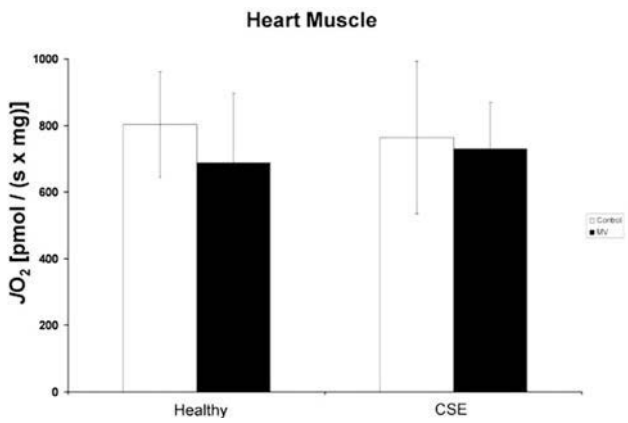


Fig. 2

CONCLUSIONS. Compared to healthy individuals, in subjects suffering from a condition of chronic pulmonary disease with airway obstruction similar to human COPD, diaphragmatic mitochondrial dysfunction already results from shorter periods of MV and inactivity of the respiratory muscles.
REFERENCES. 1. Levine S et al. N Engl J Med. 2008; 358:1327–35 2. Kavazis AN et al. Free Radic Biol Med. 2009; 46:842–50 3. Picard M et al. Am J Respir Crit Care Med. 2012;

186:1140–9 4. Wagner F et al. J Trauma. 2011; 71:1659–67 5. Baumgart K et al. Crit Care Med. 2008; 36:640–2
GRANT ACKNOWLEDGMENT. Perspektivförderung Boehringer Ingelheim Ulm University (BIU) and Innovationsfond Medizin Land Baden-Wuerttemberg.

0991
FRACTALKINE (CX3CL1) MEDIATES NEUTROPHIL TRAFFICKING IN LPS-INDUCED PULMONARY INFLAMMATION

K.-C. Ngamsri[1], F. Konrad[1], J. Reutershan[1]

[1]University Hospital Tübingen, Anesthesiology and Intensive Care Medicine, Tübingen, Germany

INTRODUCTION. Chemokines play a pivotal role in migration of neutrophils (PMNs) into the inflamed lung. Fractalkine is the only member of the CX3CL chemokine group. Fractalkine is expressed as a transmembrane protein on the surface of cells and in soluble form. The soluble form acts as a chemoattractant that may be involved in the extravasation of leukocytes into inflamed tissues, the membrane form of the protein may also play a role in cell adhesion. Contribution of fractalkine in acute lung injury remains elusive.
OBJECTIVES. In this study, we sought to characterize the role of fractalkine in LPS-induced pulmonary inflammation.
METHODS. In our murine model of acute lung injury, C57/Bl6-mice were exposed to aerosolized LPS. We used a flow cytometry-based method to quantify the PMN recruitment into the different compartments of the lung (intravascular, interstitium, alveolar airspace). The effects of fractalkine in pulmonary inflammation was investigated with a pharmacological CX3CL1-Inhibitor in vivo. Moreover, we studied the impact of fractalkine on microvascular permeability, release of inflammatory cytokines and immunohistochemistry.
RESULTS. Endotoxin inhalation resulted in significant release of fractalkine and pulmonary PMN migration into all three compartments of the lung. Pharmacological inhibition of fractalkine resulted in significant lower migration of PMNs into the BAL. To quantify LPS-induced pulmonary microvascular permeability, we used the Evans Blue dye extravasation technique and we measured the extravasation of protein into the BAL. LPS inhalation caused a significant increase of Evans Blue leakage in the lungs. Inhibition of fractalkine resulted in significant decrease of Evans blue leakage and extravasation of protein. Pretreatment with the fractalkine inhibitor decreased the release of inflammatory cytokines. Also we visualized the effects of fractalkine inhibitor on the migration of PMNs into inflamed lung by immunohistochemistry.
CONCLUSIONS. Fractalkine plays a critical role in LPS-induced PMN transmigration in pulmonary inflammation and induces microvascular permeability. Further studies are required to characterize underlying mechanisms and possible therapeutic potential.
REFERENCES. 1. Olson TS, Ley K. Chemokines and chemokine receptors in leukocyte trafficking. Am J Physiol Regul Integr Comp Physiol. 2002;283(1):R7–28

0992
A NEW EXPERIMENTAL MODEL OF SUSTAINED ACUTE LUNG INJURY

F. Puig[1,2], R. Herrero[1,3], R. Guillamat[4], L. Chimenti[2], N. Gómez[2], J. Tijero[2], M.E. Quílez[1,2], J. López-Aguilar[1,2], L. Blanch[1,2], A. Serrano-Mollar[1,4], A. Artigas[1,2]

[1]CIBERes (Instituto de Salud Carlos III), Enfermedades Respiratorias, Bunyola, Spain, [2]Corporació Sanitària i Universitària Parc Taulí, Critical Care Center, Sabadell, Spain, [3]Hospital Universitario de Getafe, Critical Care Center, Getafe, Spain, [4]Instituto de Investigaciones Biomédicas de Barcelona, CSIC, Barcelona, Spain

INTRODUCTION. Several animal models have been developed to study acute lung injury (ALI), but the majority of them focus on the acute phase of ALI. These models do not allow studying operative mechanisms in the later phases or testing long-term treatment effects.
OBJECTIVES. To develop an experimental ALI model simulating bronchial aspiration of gastric contents with bacterial superinfection that induces diffuse alveolar damage persisting at least 72 h.
METHODS. Adult male Sprague–Dawley rats (200–250 g) were anesthetized with isofluorane. ALI was induced by intratracheal instillation of HCl (1 μl/g, 0.1 mol/L pH = 1.4) followed by instillation of LPS from Escherichia coli O55:B5 (0, 10, 20, 30 or 40 μg/g b.w.) 2 h later. Control rats were treated with intratracheal instillations of saline. The rats were sacrificed at 48 h and 72 h after the last instillation. Mortality, changes in total body weight and white blood cell count in bronchoalveolar lavage (BAL) fluid were assessed.
RESULTS. Only HCl associated with the highest dose of LPS (40 μg/g b.w.) caused mortality in rats ($\sim$ 50 %) in the first 48 h. Compared to baseline (before instillation), rats showed a significant reduction of total body weight at 48 h (8.2 % with LPS: 10 μg/g b.w, 11.1 % with LPS: 20 μg/g b.w, 16.3 % with LPS: 30 μg/g b.w and 12.6 % with LPS: 40 μg/g b.w). Even though, the body weights of the rats started to increase after 48 h, they were still decreased compared to the baseline values at 72 h (5.6 % with LPS: 10 μg/g b.w, 9.8 % with LPS: 20 μg/g b.w, 9.3 % with LPS: 30 μg/g b.w and 14.5 % with LPS: 40 μg/g b.w). Control rats gained weight at 48 h and at 72 h. Compared to control rats, instillation of HCl + LPS significantly increased total neutrophil counts in BAL fluid at 48 h ($2.2 \pm 1.4 \times 10^4$ cells vs. $1.3 \pm 0.3 \times 10^7$cells with LPS: 10 μg/g b.w, $2.6 \pm 1.0 \times 10^7$cells with LPS: 20 μg/g b.w, $2.7 \pm 0.4 \times 10^7$cells with LPS: 30 μg/g b.w, and $1.4 \pm 0.3 \times 10^7$cells with LPS: 40 μg/g b.w). At 72 h, the neutrophil counts in BAL fluid started to decline but remained higher than in control animals.
CONCLUSIONS. Intratracheal instillation of HCl followed by LPS at the dose of 30 μg/g b.w induces severe lung alveolar damage that lasts at least 72 h, without causing mortality in the rats. This sustained ALI model would be useful for testing new therapeutic strategies in this disease.
GRANT ACKNOWLEDGMENT. FIS-PI12/02548 and Fundació Parc Taulí.

0993
ELEVATION OF PROCALCITONIN AFTER IMPLANTATION OF AN INTERVENTIONAL LUNG ASSIST DEVICE IN CRITICALLY ILL PATIENTS: WAIT AND WATCH OR HIT 'EM HARD?

M. Kott[1], B. Bewig[2], D. Schaedler[1], T. Becher[1], I. Frerichs[1], N. Weiler[1]

[1]University Medical Center Schleswig–Holstein, Campus Kiel, Department of Anesthesiology and Intensive Care Medicine, Kiel, Germany, [2]University Medical Center Schleswig–Holstein, Campus Kiel, Department of General Internal Medicine, Kiel, Germany

INTRODUCTION. In patients with acute respiratory distress syndrome (ARDS), need for mechanical ventilation and refractory hypercapnia, pumpless veno-arterial interventional lung assist (iLA) devices are used as part of a lung-protective ventilation strategy [1]. Delayed antimicrobial therapy increases the mortality in this group of high-risk patients in case of bacterial infection [2]. Besides clinical signs and symptoms, treatment is based on the kinetics of biomarkers, like Procalcitonin (PCT) [3]. We hereby report PCT elevations in patients after iLA implantation in the absence of documented infection.
OBJECTIVES. To evaluate peri-interventional kinetics of PCT concentrations before and after iLA implantation.
METHODS. Retrospective study in a small series of patients with ARDS of non-infectious cause.
RESULTS. An up to ten-fold increase in PCT concentrations was observed in critically ill patients after iLA implantation. In the absence of clinical signs of infection it is likely to relate this phenomenon to the release of pro-inflammatory cytokines following contact of the blood with the artificial surfaces of the iLA membrane, with subsequent PCT release. Hence, the start of administration of antibiotics should be carefully considered in the context of other clinical findings, and repeated PCT measurements in short time intervals should be performed.
REFERENCES. 1. Liebold A, Reng CM, Philipp A, Pfeifer M, Birnbaum DE: Pumpless extracorporeal lung assist - experience with the first 20 cases. Eur J Cardiothorac Surg. 2000; 17:608–13. 2. Kumar A, Roberts D, Wood KE, Light B, Parrillo JE, Sharma S, Suppes R, Feinstein D, Zanotti S, Taiberg L et al. Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. Critical Care Med. 2006; 34:1589–96. 3. Uzzan B, Cohen R, Nicolas P, Cucherat M, Perret GY. Procalcitonin as a diagnostic test for sepsis in critically ill adults and after surgery or trauma: a systematic review and meta-analysis. Crit Care Med. 2006, 34:1996–2003.

0994
EFFECT OF NEBULIZATIONS WITH MESNA, N ACETYL CYSTEINE AND NORMAL SALINE ON AIRWAY DYNAMICS IN MECHANICALLY VENTILATED PATIENTS

Y. Mehta[1], C. Mehta[1], N. Vyas[1], T.M. Ali[1]

[1]Medanta The Medicity, Institute of Critical Care and Anesthesiology, Gurgaon, India

INTRODUCTION. In intubated patients, the normal respiratory physiology is disturbed in terms of altered humidification system and depressed ciliary mucus clearance induced by the endotracheal tube. In addition, there is an increased mucus production due to mechanical irritation of the airway caused by the endotracheal tube. Thirdly, there is an ineffective cough by virtue of these patients receiving sedatives during mechanical ventilation. All these together lead to mucus retention predisposing to increased airway resistance and atelectasis causing bacterial colonization and increased risk of developing ventilator associated pneumonia (VAP). Thus in mechanically ventilated patients there are enhanced needs for bronchial hygiene practices, and physiotherapy for timely and adequate clearance of tracheal secretions. All these form the rationale behind the use of mucoactive agents in mechanically ventilated patients.
OBJECTIVES. To study the effect of nebulized Normal saline, Mesna (2 mercaptoethane sulphonate) and N acetyl cysteine on airway dynamics in terms of oxygenation, clearance of secretions and radiological improvement.
METHODS. A prospective observational study was conducted in a medical-surgical ICU of a tertiary care hospital in Northern India. Sixty ICU patients under sedation, and ventilated through endotracheal tube, for more than 72 h were enrolled. Patients were nebulized with either normal saline, mesna or n acetyl cysteine. Nebulizations with the studied drug were given thrice over 24 h at 8 h interval. All patients were nebulized with levosalbutamon 10 min before instituting the studied drug. Data were recorded in four steps:
(1) basal,
(2) 10 min after each nebulization
(3) 2 h after each nebulization, and then at the end of study duration i.e. 24 h after first nebulization.
RESULTS. All the three studied drugs resulted in thinning of secretions but none of them resulted in any improvement in oxygenation, clearance of infiltrates on chest roentgenogram. No adverse effect was observed with any of the drugs in terms of increased resistance or hemodynamic changes.
CONCLUSIONS. No significant difference in airway dynamics or oxygenation was observed in groups nebulised with either Normal saline, Mesna or N acetylcysteine.
REFERENCES. 1. Fernandez R, Sole J, Blanch L, Artigas A. The effect of short term instillation of a mucolytic agent (mesna) on airway résistance in mechanically ventilated patients. Chest 1995; 107:1101–6. 2. Balsamo R Lanata C, Egan G. Mucoactive drugs. Eur Respir Rev. 2010; 19(116):127–133. 3. Nash EF, Stephenson A, Ratjin F, Tullis E. Nebulized and oral thiol derivatives for pulmonary disease in cystic fibrosis. Cochrane database Syst Rev. 2009; CD007168. 4. Zandstra DF, Shoutenbeck CP, Mirande DR. Effect of mucolytic and bronchodilator aerosol therapy on airway resistance in mechanically ventilated patients. Intensive Care Med. 1985; 11:316–18.

0995
INTRATIDAL GAS DISTRIBUTION IS ABLE TO POINT OUT THE BEST PEEP IN MECHANICALLY VENTILATED PATIENTS

P. Blankman[1], D. Hasan[1,2], D. Gommers[1]

[1]Erasmus MC University Medical Centre Rotterdam, Intensive Care Adults, Rotterdam, The Netherlands, [2]Maasstad Hospital, Intensive Care, Rotterdam, The Netherlands

INTRODUCTION. Electrical Impedance Tomography (EIT) is a non-invasive and non-radiating imaging technique, which can be used to visualize ventilation at the dependent and non-dependent regions.
OBJECTIVES. To define the optimal PEEP level based on EIT measurements.
METHODS. We submitted ten post-cardiac surgery patients, ventilated with Pressure Controlled Ventilation mode, to a PEEP trial with steps of 5 cm H_2O and a recruitment maneuver. We performed EIT registration around the 5th and 6th intercostal space and calculated five different parameters from the acquired data: Ventilation Surface Area (VSA), Center of Gravity (COG), regional compliance or pixel compliance, Regional Ventilation Delay (RVD) index and the intratidal gas distribution.
RESULTS. The maximum value for VSA, regional compliance and RVD index was different between the dependent and the non-dependent region for almost all patients. The dorsal-to-ventral impedance distribution, expressed according to the center of gravity index, decreased at lower PEEP levels. The intratidal gas distribution showed a unique PEEP level in each individual patient, in which the gas distribution is taken over by the opposite lung region, indicating the point of overdistention of the non-dependent region.

CONCLUSIONS. Intratidal gas distribution is the ideal EIT-parameter to detect the exact PEEP level where overdistention of the non-dependent lung region starts.

Imaging to understand lung disease & guide therapy: 0996–1009

0996

COMPARISON BETWEEN LUNG CT SCAN ANALYSIS AND END EXPIRATORY LUNG VOLUME—STATIC COMPLIANCE METHOD IN THE ASSESSMENT OF LUNG RECRUITMENT

D. Chiumello[1], A. Marino[2], M. Brioni[2], I. Cigada[2], F. Menga[2], L. Gattinoni[1,2]

[1]Fondazione IRCCS Ca' Granda - Ospedale Maggiore Policlinico, Dipartimento di Anestesia, Rianimazione (Intensiva e Subintensiva) e Terapia del Dolore, Milano, Italy, [2]Università degli Studi di Milano, Dipartimento di Fisiopatologia Medico-Chirurgica e dei Trapianti, Milano, Italy

INTRODUCTION. In ARDS patients the estimation of lung recruitability is fundamental to set an optimal level of PEEP, in order to limit ventilator-induced lung injury. Lung CT scan analysis (1), although being a source of radiation exposure and requiring a dedicated software, remains the reference method for computing the PEEP induced lung recruitment. Recently, a new method to estimate lung recruitability, based on end-expiratory lung volume (EELV) and static compliance of respiratory system (Crs) has been proposed (2).

OBJECTIVES. To compare EELV/Crs method with lung CT scan analysis in assessing lung recruitability.

METHODS. Sedated and paralyzed patients underwent a whole lung CT scan at end expiration at PEEP 5 and 15 cmH_2O. The EELVs were measured at the same levels of PEEP during an end expiratory pause with a simplified closed circuit helium dilution method. CT scan images were manually delineated and analyzed with a dedicated software; lung recruitment was computed as the fraction of not aerated tissue which regained aeration passing from 5 to 15 cmH_2O of PEEP, expressed in percentage of total lung tissue. For the EELV/Crs method, lung recruitment was computed subtracting the amount of minimum predicted increase in lung volume (computed multiplying Crs measured at PEEP 5 cmH_2O for 10 cmH_2O, i.e. the variation of pressure between the two PEEP levels considered), to the difference in EELV between PEEP 15 cmH_2O and 5 cmH_2O; lung recruitment estimated with this method was expressed as percentage of EELV at 5 cmH_2O.

RESULTS. 22 patients (15 males), with age 67.5 ± 11.7 years, BMI 27.4 ± 7.1 kg/m^2, and PaO_2/FiO_2 195 ± 37, were enrolled in this study. As shown in figure 1, lung recruitment computed by the EELV/Crs method was not correlated with that obtained with lung CT scan analysis (linear regression: $R^2 = 0.07$, $P = 0.24$, upper panel), and the Bland–Altman analysis (lower panel) showed bias and limits of agreement of 37.9 % and −9.5 to 85.4 %.

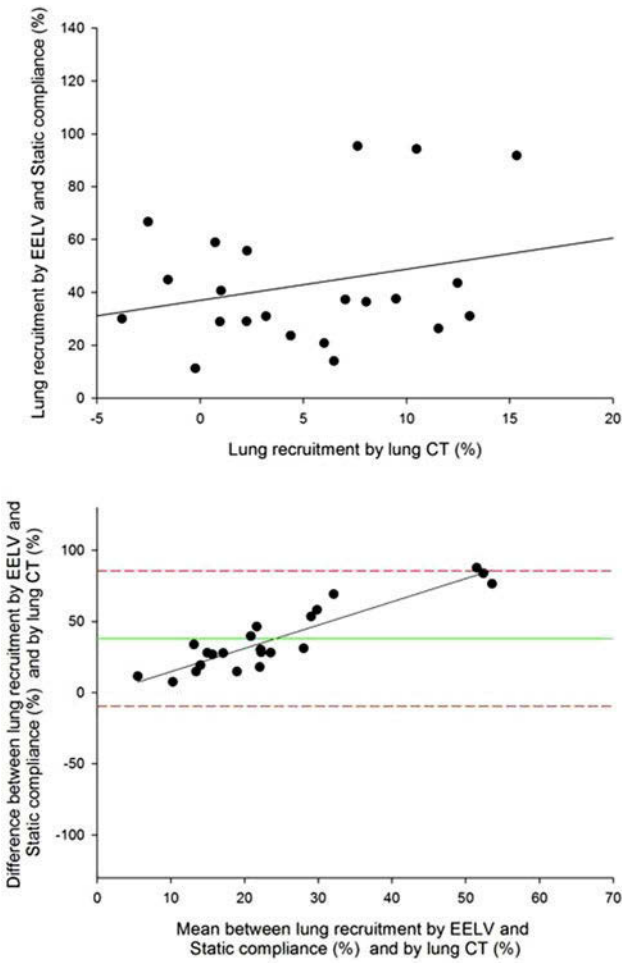


Figure 1

CONCLUSIONS. EELV/Crs, method is not sufficiently accurate in estimating lung recruitability, compared to the reference method.

REFERENCES. 1. Gattinoni L et al. N Engl J Med. 2006;354(17):1775–86. 2. Dellamonica J et al. Intensive Care Med. 2011;7(10):1595–604.

0997

RESPIRATORY SYSTEM COMPLIANCE DURING PRESSURE SUPPORT VENTILATION ASSESSED WITH ELECTRICAL IMPEDANCE TOMOGRAPHY DURING A WAVELIKE CHANGE IN POSITIVE END-EXPIRATORY PRESSURE

T. Becher[1], S. Bui[2], D. Schädler[1], D. Bläser[1], I. Frerichs[1], N. Weiler[1]

[1]University Medical Center Schleswig–Holstein, Campus Kiel, Anesthesiology and Intensive Care Medicine, Kiel, Germany, [2]University of Kiel, Kiel, Germany

INTRODUCTION. Electrical impedance tomography (EIT) is suitable for assessing regional changes in respiratory system compliance (C_{rs})[1] during controlled mechanical ventilation (CMV). This might offer a new way for guiding lung protective ventilation[2]. However, during pressure support ventilation (PSV) as well as in other forms of assisted spontaneous breathing, calculation of C_{rs} may become inaccurate due to the variability of the patient's inspiratory muscle effort (P_{mus})[3]. In these cases, precise calculation of C_{rs} requires measurement of esophageal pressure (P_{es}) for determination of P^4_{mus}.

OBJECTIVES. To develop a method for determination of global and regional C_{rs} during assisted spontaneous breathing with EIT that obviates the need for P_{es}-measurements.

METHODS. After approval of the local ethics committee and obtaining the written informed consent from the patients or their legal representatives, we examined 12 mechanically ventilated ICU patients (8 men, 4 women, age 58 ± 16.6 yr (mean ± SD)) during PSV. Esophageal pressure (P_{es}) was recorded with a Bicore 2 measurement apparatus. EIT examinations were performed with the Goe-MF II device (both CareFusion, Yorba Linda, USA). 16 electrodes were placed on the chest circumference in one transverse plane. Global impedance change per ml of tidal volume (V_T) was recorded during undisturbed tidal breathing. We then performed a wavelike change in positive end-expiratory pressure (PEEP) as follows: After every fifth breath, PEEP was increased by 1 mbar until a level of 5 mbar above the original PEEP was reached, immediately followed by 5 stepwise decreases in the same way. The mean change in global impedance minima per mbar during the wavelike PEEP change was calculated using the least-squares approximation and was then divided by the impedance change per ml of V_T to calculate C_{rs}. Regional ventral and dorsal C_{rs} was calculated from the EIT tracings acquired in the ventral and dorsal regions within the chest cross-section using the same approach.

To obtain a reference value, lung compliance (C_{lung}) was then calculated using the least-squares approximation with the recorded P_{es}. All patients were also sedated and submitted to a period of CMV for determination of chest wall compliance (C_{cw}). The reference value for global compliance (C_{ref}) was then calculated as $C_{ref} = (C_{lung}^{-1} + C_{cw}^{-1})^{-1}$.

RESULTS. We found a highly significant correlation between the global C_{rs} obtained with EIT during the wavelike PEEP change and C_{ref} ($r^2 = 0.78$; $p = 0.0002$). Ventral C_{rs} was significantly higher than dorsal C_{rs} (45.9 ± 4.6 vs 14.9 ± 2.6; $p < 0.0001$).

CONCLUSIONS. Global and regional C_{rs} can be assessed with EIT during assisted spontaneous breathing by performing a wavelike PEEP change.

REFERENCES. 1. Lindgren et al. Intensive Care Med. 2007;1:172–80 2. Wolf et al. Crit Care Med. 2013; 41:1296–304 3. Iotti et al. Intensive Care Med. 1995; 21:406–13 4. Mead et al. J Appl Physiol. 1953; 12:779–96.

0998

VALIDATION OF ALVEOLAR RECRUITMENT ASSESSED BY THE NITROGEN WASHOUT/WASHIN TECHNIQUE USING COMPUTED TOMOGRAPHY AS GOLD STANDARD

J.-C. Richard[1,2], C. Pouzot[2], A. Morales[2], J.S. Torres[2], D. Ortega Munoz[2], M. Orkisz[2], B. Neyran[2], F. Lavenne[3], C. Guérin[1,2]

[1]Hôpital de la Croix Rousse, Lyon, France, [2]CREATIS UMR CNRS 5220 - INSERM U 630, Lyon, France, [3]CERMEP-Imagerie du Vivant, Lyon, France

INTRODUCTION. Estimating alveolar recruitment by PEEP at the bedside is critical to rationalize PEEP setting in ARDS patients. The minimum predicted increase in lung volume (MPILV) technique [1] was recently described to compute alveolar recruitment from end-expiratory lung volume assessed by the nitrogen washout/washin technique.

OBJECTIVES. The aim of the study is to validate this new technique using computed tomography (CT) as gold standard in experimental acute respiratory distress syndrome (ARDS).

METHODS. Lung injury was induced by saline lavage in 14 piglets (28 ± 2 kg). The animals were mechanically ventilated under FiO_2 1, with tidal volume (VT) 10 ml/kg and respiratory rate 35/min at PEEP 0 cm H_2O (baseline), using an Engström ICU ventilator. A decremental PEEP trial was performed from 20 to 2 cm H2O by 2 cm H2O steps, with VT 6 ml/kg. End-expiratory lung volume (EELV) was assessed by the nitrogen washout/washin technique ($EELV_{wowi}$) using pediatric sensors, and by CT ($EELV_{CT}$). The recruited alveolar volume by PEEP from baseline was computed using the MPILV technique ($Vrec_{wowi}$). Alveolar recruitment was also computed using CT ($Vrec_{CT}$), as the difference in lung weight of non-aerated regions between a given PEEP level and baseline [2]. The bias and limits of agreement (LA) of the relationship between $Vrec_{wowi}$ and $Vrec_{CT}$ were assessed by 1-the Bland and Altman analysis for repeated measurements 2- a mixed model analysis [3]. Finally, the ability of the nitrogen washout-washin technique to detect a 150 mL increase in recruited volume was assessed by ROC curve analysis.

RESULTS. $Vrec_{CT}$ amounted to 366 ± 180 mL (range −199 to 780 mL), and was greater than 150 ml in 88 % of the measurements. $Vrec_{wowi}$ and $Vrec_{CT}$ were significantly correlated ($r = 0.61$, $p < 0.001$). Using Bland and Altman analysis for repeated measurements, bias amounted to −75 mL, with limits of agreement ranging from −404 to 254 mL (Figure 1). Adjusting for potential confounding variables (VT, PEEP level, $EELV_{CT}$ at baseline, compliance of the respiratory system at baseline), the limits of agreements were narrowed to −173 to 23 ml, and percentage error ($2SD_{Bias}/mean_{Vrec}$) amounted to 30 %. The area under the ROC curve for predicting a 150 mL increase in recruited volume amounted to 0.94 (95 % confidence interval: 0.89–1). A $Vrec_{wowi}$ of 143 ml was the best cut-off for discriminating a 150 mL increase in $Vrec_{CT}$ induced by PEEP with sensitivity 89 % (95 % confidence interval: 83–94 %) and specificity 81 % (95 % confidence interval: 63–83 %).

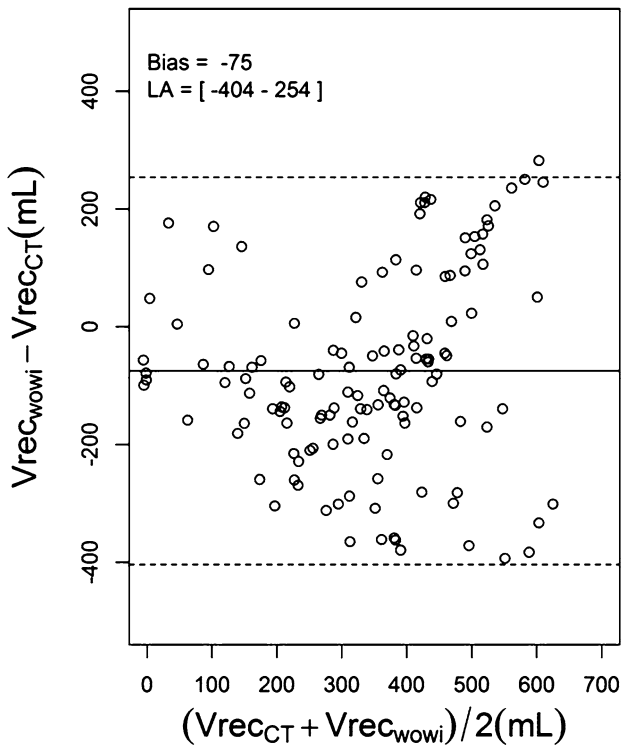


Figure 1

CONCLUSIONS. Alveolar recruitment induced by PEEP is reliably assessed by the nitrogen washout/washin technique.

REFERENCES. 1. Dellamonica J, et al. Intensive Care Med 2011;37(10):1595–604. 2. Gattinoni L, et al. Am J Respir Crit Care Med 1995;151(6):1807–14. 3. Myles PS, Cui J. I. Using the Bland–Altman method to measure agreement with repeated measures. Br J Anaesth 2007;99(3):309–11.

0999
GRAVITATIONAL DISTRIBUTION OF LUNG ELASTICITY: COMPUTED TOMOGRAPHY STUDY OF COMPLIANCE MAPS

G. Perchiazzi[1], M. Pellegrini[1], C. Rylander[2], S. Derosa[1], A. Tannoia[1], A. Sindaco[1], T. Fiore[1], G. Hedenstierna[3]

[1]University of Bari, Emergency and Organ Transplant, Bari, Italy, [2]Sahlgrenska University Hospital, Anaesthesia and Intensive Care Medicine, Göteborg, Sweden, [3]University of Uppsala, Medical Sciences, Uppsala, Sweden

INTRODUCTION. Knowledge of the elastic properties of the lung is used to titrate mechanical ventilation (MV). Lung compliance (CL) is usually estimated by plotting volume against pressure (V/P) at airway opening. V/P curves represent the overall behavior of respiratory system and do not take into account the heterogeneous regional properties of the lung. Gravity is one of the possible determinants of lung inhomogeneity. Computed Tomography (CT) can provide quantitative information about gas distribution inside lung parenchyma; image analysis technologies allow to compare CT images obtained at different inflation volumes and to provide compliance maps (Cmap) of the lung, when combined with airways respiratory mechanics (1).

OBJECTIVES. To assess the role of gravitational forces on the distribution of lung compliance in healthy (HL) and injured (ALI) lungs, at different PEEPs (5 and 10 cmH_2O) and inflation volumes.

METHODS. Four anesthetized and mechanically ventilated pigs underwent twelve inspiratory hold maneuvers (IHM) at increasing volumes covering the whole inspiratory capacity (IC). Flow, volume and pressure were sampled at airway opening, together with esophageal pressure. CT-scans were executed at each volume, at PEEP 5 and 10, in HL and ALI conditions. ALI was induced by i.v. administration of oleic acid. By using image registration technology and transpulmonary pressure, we obtained the Cmap of the lungs which were divided into eleven isogravitational stripes. Cmaps were divided into three IHM volume groups: low [between (IC/12)*1 and (IC/12)*4], medium [between (IC/12)*5 and (IC/12)*8] and high [between (IC/12)*9 and (IC/12)*12]. The median values of compliance were plotted versus their distance from the most dependent plane and their exponential regression computed. The compliance vs gravity courses at different lung volumes, applied PEEP and lung status (HL and ALI) were compared by using the F-test.

RESULTS. Exponential regressions described all the relations between compliance and gravity except for low volume in ALI animals. In HL the three regressions at low, medium and high volume were statistically different at both PEEP levels. In ALI, curves subtending different inspiratory volumes were not different.

CONCLUSIONS. Compliance distribution is, as expected, influenced by gravitational forces, but to different degree in healthy and sick lungs. In healthy conditions, compliance is higher in dependent areas and at lower inspiratory volumes. During ALI the effect of gravity is more limited than in healthy conditions. Increasing the severity of disease lowers the effects of gravity on lung compliance distribution.

REFERENCES. 1. Perchiazzi G. et al. Topographic distribution of lung compliance assessed by computer tomography in mechanically ventilated patients. Intensive Care Med. 2012; 38(1):S41.

GRANT ACKNOWLEDGMENT. The Italian Ministry of University and Scientific Research, The Swedish Medical Research Council (5315).

1000
THE SIGNIFICANCE OF VISCOELASTIC PARAMETERS IN EXPERIMENTAL ACUTE RESPIRATORY DISTRESS SYNDROME. A LUNG CT STUDY

J.-C. Richard[1,2], C. Pouzot[3], A. Morales[4], J. Torres[5], J. Ortega-Munoz[6], M. Orkisz[5], B. Neyran[5], F. Lavenne[7], C. Guérin[8,9]

[1]Hôpital de la Croix Rousse, Lyon, France, [2]INSERM 1044, Créatis, Lyon, France, [3]Ecole Vétérinaire, SIAMU, Marcy L'Étoile, France, [4]Université de Lyon, Crétis, Lyon, France, [5]Université de Lyon, Créatis, Lyon, France, [6]Université de Lyon, Lyon, France, [7]CERMEP, Bron, France, [8]Hôpital de la Croix Rousse, Réanimation Médicale, Lyon, France, [9]INSERM 1044, Lyon, France

INTRODUCTION. In Acute Respiratory Distress Syndrome (ARDS), the respiratory system can be represented by a 2-parameter lumped viscoelastic model[1] with viscoelastic elastance (E_2rs) and resistance (R_2rs). This model takes into account viscoelastic properties of thoracic tissues and time constant inequalities within the lungs.

OBJECTIVES. To test the hypothesis that viscoelastic parameters correlate with the volume of lung tissue rather than that of lung air in non- or poorly aerated rather than aerated lung compartment.

METHODS. ARDS was achieved in15 tracheotomized, anesthetized and paralyzed female pigs by saline lavage. Then, recruitment manoeuver (sustained inflation to 40 cmH_2O for 40 s) was performed followed by decremental PEEP trial from 20 to 2 cm H2O by 2 cmH_2O steps of 10 min each. At each step, 15-s end-inspiratory occlusion was performed at the end of which whole lung CT scan was taken and airflow and airway pressure (Pao) recorded. Viscoelastic parameters were obtained by fitting an exponential equation to the decayed Pao over time during occlusion[2]. Volume of air and tissue over whole lung in non-aerated, poorly-aerated, normally-aerated and over-aerated compartments were assessed at end-inspiration by the CT scan. The relationships between viscoelastic parameters and volume of air and tissue in each compartment were analyzed by using linear mixed model taking into account each animal.

RESULTS. The viscoelastic model fitted the Pao-time relationship in every instance. The values of slopes for each relationship between viscoelastic parameters and volume of air and tissue in each compartment resulting from the regression analysis over all pigs are shown in the table (mean ± SD). No convergence means that the regression analysis cannot fit the relationships between viscoelastic parameters and lung volume.

Table 1
*P < 0.001

	E2rs slope (cmH_2O/L/ml)		R2rs slope (cmH_2O/L/s/ml)	
Lung compartments	Air	Tissue	Air	Tissue
Non-aerated	−2.02 ± 0.53*	0.02 (0.005)*	−2.38 ± 0.78*	0.03 ± 0.009*
Poorly-aerated	−0.04 ± 0.01*	−0.02 ± 0.01*	No convergence	No convergence
Normally-aerated	−0.0008 ± 0.001	No convergence	No convergence	No convergence
Over-aerated	No convergence	No convergence	No convergence	No convergence

Per 1 ml increase of lung tissue in non-aerated compartment, E_2rs significantly increased by 0.02 cmH_2O/L and R_2rs by 0.03 cmH_2O/L/s, on average.

CONCLUSIONS. In saline lavage-induced experimental ARDS, the viscoelastic parameters reflect and, hence may help assessing the volume of lung tissue in non aerated compartment during a decremental PEEP trial.

REFERENCES. 1. Eissa et al. J Appl Physiol 1990. 2. Antonaglia Eur Respir J 1998

1001
EFFECT OF UNILATERAL EMPYEMA ON THE ASSESSMENT OF REGIONAL LUNG VENTILATION BY ELECTRICAL IMPEDANCE TOMOGRAPHY

D. Bläser[1], S. Pulletz[2], T. Becher[1], N. Weiler[1], I. Frerichs[1]

[1]University Medical Center Schleswig–Holstein, Campus Kiel, Department of Anesthesiology and Intensive Care Medicine, Kiel, Germany, [2]Osnabrück Hospital, Department of Anesthesiology and Intensive Care Medicine, Osnabrück, Germany

INTRODUCTION. Electrical impedance tomography (EIT) is able to assess regional lung ventilation distribution. Fluid accumulation in the pleural space may affect the distribution of ventilation in the lungs and the corresponding EIT findings. This was qualitatively described in a small animal experimental study showing acute regional decrease in electrical impedance at the site of fluid accumulation after instillation of Ringer solution into the pleural space with reduced ventilation in the adjacent lung region (1). However, this phenomenon has never been studied quantitatively and clinical data are lacking.

OBJECTIVES. To determine the impact of unilateral pleural pathology on the assessment of regional lung ventilation by EIT.

METHODS. Six patients (5 men, 1 woman, age 56 ± 7 years (mean ± SD)) suffering from unilateral empyema were studied prior to thoracic surgery. The study was approved by the local ethics committee and written informed consent was obtained from the patients. The patients were intubated with a double-lumen endotracheal tube and examined by EIT (Goe-MF II, CareFusion, Höchberg, Germany) during volume-controlled ventilation with bilateral and unilateral ventilation of the right and left lungs. Tidal volume (V_T) was set to 800 ml and 400 ml, respectively, positive end-expiratory pressure was 5 cm H_2O. EIT data were acquired during 60 s in each of the three settings. Mean tidal amplitudes of the EIT signal were calculated in all image pixels within the studied chest cross-section. The sums of these values, expressed as relative impedance change (rel. ΔZ) in arbitrary units, were then determined. The sums of rel. ΔZ determined during the two cases of ventilation of one lung either on the affected or the unaffected chest side (i.e. with or without empyema) with V_T of 400 ml were then related to the sum of rel. ΔZ obtained during bilateral ventilation with V_T of 800 ml and expressed as %.

RESULTS. The sums of rel. ΔZ determined during each one lung ventilation with V_T of 400 ml were significantly smaller than during bilateral ventilation with 800 ml, as expected ($p < 0.001$, ANOVA for repeated measures). However, in contrast to previous findings obtained in patients with healthy lungs with no pleural pathology under comparable conditions (2), low values of rel. ΔZ were found when the lung on the affected side of the chest was ventilated. Consequently, the fractions of rel. ΔZ were 19.4 % and 53.1 % when the two ventilations of one lung on the affected and unaffected sides were compared with bilateral ventilation. These values differed significantly from each other ($p < 0.01$, paired t test).

CONCLUSIONS. Our results indicate that quantitative evaluation of EIT-derived ventilation may be affected by the presence of empyema. Other factors, like accompanying lung pathology may exert an additional effect.

REFERENCES. 1. Hahn et al. Physiol Meas 2006; 27:187–98 2. Pulletz et al. Acta Anaesthesiol Scand 2008; 52:1131–9.

1002

ASSESSMENT OF TRENDING ABILITY OF THE NITROGEN WASHOUT-WASHIN TECHNIQUE TO DETECT CHANGE IN END-EXPIRATORY LUNG VOLUME

J.-C. Richard[1,2], C. Pouzot[2], A. Morales[2], J.S. Torres[2], D. Ortega Munoz[2], M. Orkisz[2], B. Neyran[2], F. Lavenne[3], C. Guérin[1,2]

[1]Hôpital de la Croix Rousse, Lyon, France, [2]CREATIS UMR CNRS 5220 - INSERM U 630, Lyon, France, [3]CERMEP-Imagerie du Vivant, Lyon, France

INTRODUCTION. The nitrogen washout-washin technique [1] (wowi) is now implemented in one ICU ventilator (Engström ventilator, General Electrics, Madison, WI, USA) to monitor end-expiratory lung volume measurement (EELV) automatically. This technique is particularly suitable for trending, but has never been validated in this setting.

OBJECTIVES. The aim of this study is to evaluate trending ability of the nitrogen wowi technique to detect change in EELV associated with positive-end expiratory pressure (PEEP) and tidal volume (VT) variations, using computed tomography (CT) as a reference.

METHODS. Lung injury was performed in 14 piglets (28 ± 2 kg) by saline lavage. The animals were mechanically ventilated under FiO_2 1, VT 10 ml/kg and respiratory breathing rate 35/min on PEEP 0, using an Engström ventilator. A decremental PEEP trial was then performed from 20 to 2 cm H_2O by 2 cm H_2O steps with VT 6 ml/kg, and the animals were randomized into 3 experimental PEEP groups (optimal PEEP based on either best dynostatic compliance or best EELV during PEEP trial, or PEEP-FiO_2 table). Finally, 7 levels of VT were applied at the selected PEEP (4, 5, 7, 8, 10, 15 and 20 ml/kg), ranging from 100 to 625 mL. $EELV_{wowi}$ was compared to EELV measured from CT during end-expiratory pause ($EELV_{CT}$), in the following experimental conditions: immediately after lung injury onset at PEEP 0, during the PEEP trial, 1 h after setting optimal PEEP, and during the variable VT trial. Variations in $EELV_{wowi}$ ($\Delta EELV_{wowi}$) between experimental steps were computed and plotted against variations in $EELV_{CT}$ ($\Delta EELV_{CT}$), on a log–log scale. The ability of wowi technique to detect an absolute change in EELV in the range 120–500 ml was tested by multiple computations of area under ROC curve.

RESULTS. $\Delta EELV_{wowi}$ values adequately tracked $\Delta EELV_{CT}$ change (Figure 1). Concordance rate over all measurements amounted to 78 %, and slightly increased to 82 % after exclusion of small variations in EELV (≤ 10 %) which do not reflect trending ability. AUC of $EELV_{wowi}$ was 90 % and 95 % to detect $EELV_{CT}$ volume change greater than 200 ml and 360 ml, respectively (Figure 2). Using polar plot analysis, after exclusion of small EELV changes (≤ 100 mL), angular bias amounted to 20 ± 15°, and radial limits of agreement to ± 52°, suggesting an offset in $EELV_{wowi}$.

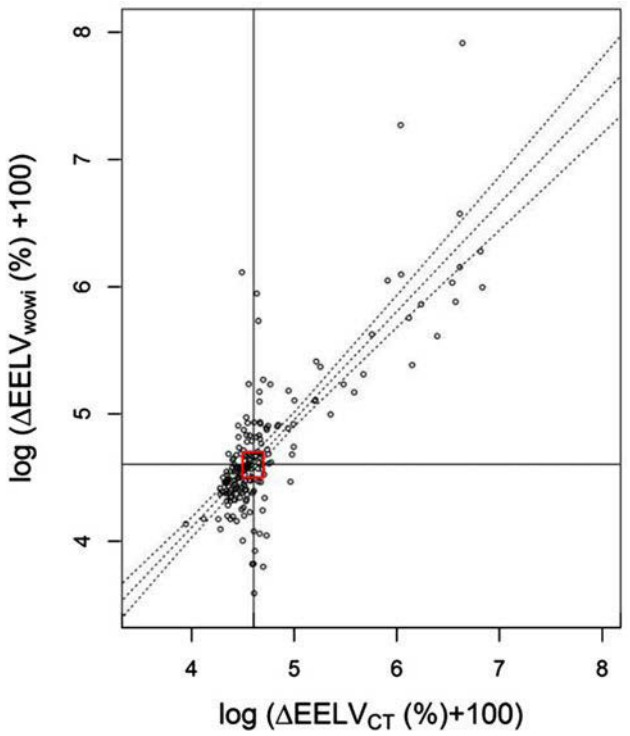


Figure 1

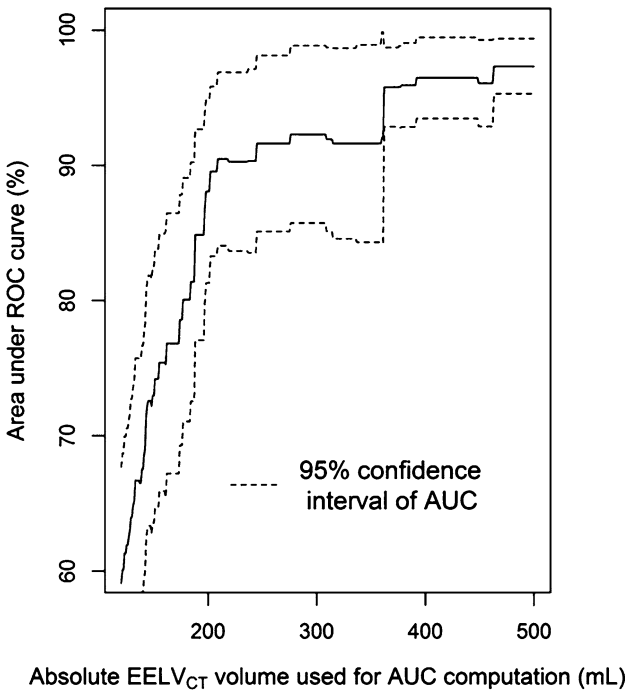


Figure 2

CONCLUSIONS. The nitrogen washout-washin technique is reliable to detect EELV change over time greater than 200 ml, but may be less accurate for smaller volume changes.

REFERENCES. 1. Olegard C, Sondergaard S, Houltz E, Lundin S, Stenqvist O. Estimation of functional residual capacity at the bedside using standard monitoring equipment: a modified nitrogen washout/washin technique requiring a small change of the inspired oxygen fraction. Anesth Analg 2005;101(1):206–12.

1003

VISCOELASTIC PARAMETERS OF THE RESPIRATORY SYSTEM AND TIDAL RECRUITMENT. A LUNG CT INVESTIGATION IN EXPERIMENTAL ACUTE RESPIRATORY DISTRESS SYNDROME

J.-C. Richard[1,2], C. Pouzot[2], A. Morales[2], J.S. Torres[2], D. Ortega Munoz[2], M. Orkisz[2], B. Neyran[2], F. Lavenne[3], C. Guérin[1,2]

[1]Hôpital de la Croix Rousse, Lyon, France, [2]CREATIS UMR CNRS 5220 - INSERM U 630, Lyon, France, [3]CERMEP-Imagerie du Vivant, Lyon, France

INTRODUCTION. The respiratory system can be represented by a 2-parameter lumped viscoelastic model[1] with viscoelastic elastance (E_2rs) and resistance (R_2rs). This model takes into account viscoelastic properties of thoracic tissues and time constant inequalities within the lungs. In present study we further explored whether these parameters may correlate with tidal recruitment during experimental Acute Respiratory Distress Syndrome (ARDS).

METHODS. Saline lavage ARDS was achieved in15 tracheotomized, anesthetized and paralyzed female pigs followed by recruitment manoeuver (sustained inflation 40 cm H_2O for 40 s). PEEP was then decreased from 20 to 2 cm H_2O by 2 cmH_2O steps. At each step, 15-s occlusion was performed at end-expiration then at end of next end-inspiration. At the end of each occlusion whole lung CT scan was taken and airflow and airway pressure (Pao) were recorded. Viscoelastic parameters were obtained by fitting an exponential equation to the decayed Pao over time during occlusion[2]. Tidal recruitment was defined as the difference in volume of non-aerated lung compartment between end-expiration and end-insxpiration. The relationships between viscoelastic constants and tidal recruitment were analysed by using linear mixed model taking into account each animal.

RESULTS. The viscoelastic model fitted the Pao-time relationships in every instance. There was a significant positive relationship between E_2rs and R_2rs and tidal recruitment: $E_2rs = 10.17\ cmH_2O/L + 0.12\ cmH_2O/L/ml$ tidal recruitment ($R^2 = 0.30$, $p < 0.001$, slope $P = 0.00004$, figure 1) and $R_2rs = 12.93\ cmH_2O/L/s + 0.22\ cmH_2O/L/s/ml$ tidal recruitment ($R^2 = 0.67$, $p < 0.001$, slope $P = 0.0001$, figure 2).

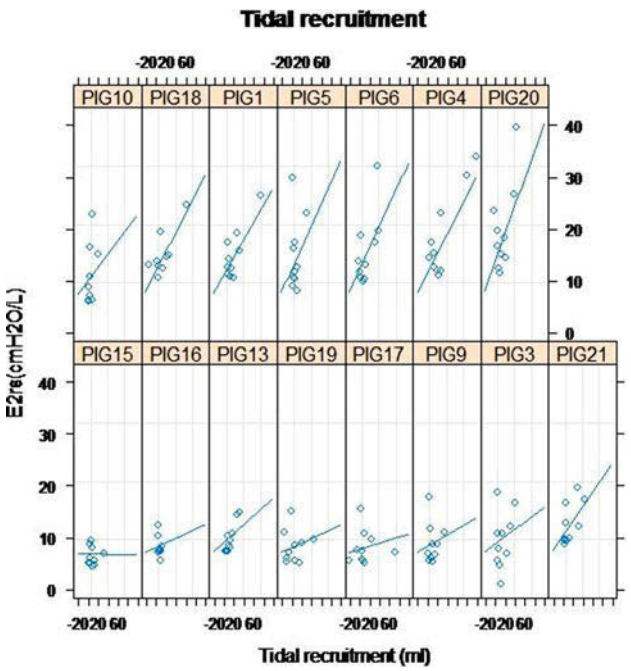


Figure 1

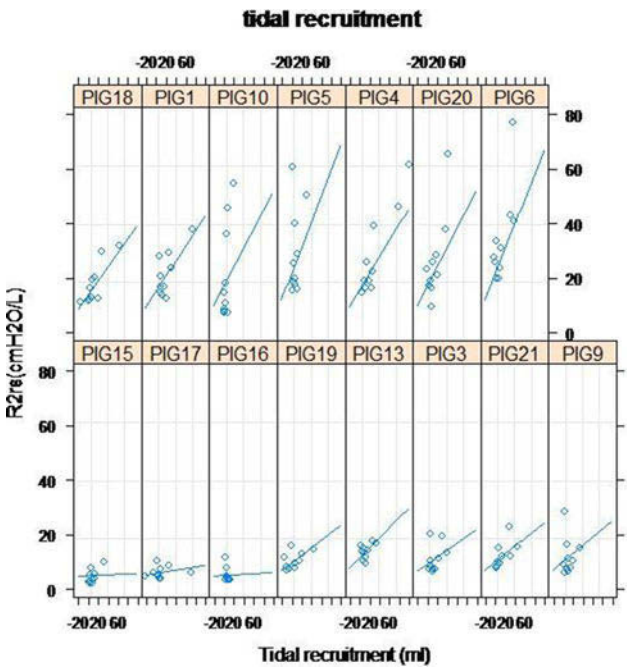


Figure 2

CONCLUSIONS. Viscoelastic parameters, and particularly R2rs, significantly correlated to tidal recruitment in saline-induced experimental ARDS during a decremental PEEP trial. They may be used to minimize stretching due to repeated opening and closing of terminal respiratory units.

REFERENCES. 1. Eissa et al. J Appl Physiol 1990. 2. Antonaglia Eur Respir J 1998.

1004

ASSESSMENT OF EXTRAVASCULAR LUNG WATER BY ELECTRICAL IMPEDANCE TOMOGRAPHY IN ACUTE LUNG INJURY

C.J.C. Trepte[1], C. Phillips[2], J. Solà i Caros[3], A. Adler[4], M. Rapin[4], S.H. Bohm[5], D.A. Reuter[1]

[1]University Medical Center Hamburg-Eppendorf, Anesthesiology and Intensive Care Medicine, Hamburg, Germany, [2]Oregon Health and Science University, Pulmonary and Critical Care, Portland, USA, [3]Centre Suisse d'Electronique et de Microtechnique (CSEM), Neuchâtel, Switzerland, [4]Carleton University, Department of Systems and Computer Engineering, Ottawa, Canada, [5]Swisstom AG, Landquart, Switzerland

INTRODUCTION. Assessment of pulmonary oedema is a key factor in monitoring and guidance of therapy in critically-ill patients. Bedside quantification of pulmonary oedema using chest X-ray was proven not to be a reliable measure. The physiologic correlate of pulmonary oedema, that is extravascular lung water (EVLW), can be determined reliably by transcardiopulmonary thermodilution, which however requires invasive catheterization and therefore is among other complications is associated with bloodstream infections.

OBJECTIVES. Therefore the aim of the present study was to develop a novel approach to reliably assess extravascular lung making use of the functional imaging capabilities of electrical impedance tomography (EIT) in combination with a defined positioning protocol.

METHODS. In an experimental model 30 domestic pigs were anesthetized and randomized to three different groups. In Group 1 no injury was induced. In group 2 acute lung injury was induced by bronchoalveolar lavage using sodium chloride. In group 3 a vascular lung injury was induced by intravenous injection of oleic acid. We introduce here a novel diagnostic to assess EVLW by quantifying the impedance change ratios determinded by EIT at defined lateral body rotations. From a series of such measurements we then calculated a Lungwater $Ratio_{EIT}$. Animals were turned 45° to the left, 45° to the right and left in prone postion for 20 min. Impedance change ratios were calculated as the quotient of impedance changes within the dependent, divided by those in the non-dependent lung areas. From three valid ratios a characteristic slope, the Lungwater $Ratio_{EIT}$ was derived which was assumed to represent EVLW. This EIT-based slope was then compared to the experimental goldstandard for quantifying pulmonary oedema, that is the post-mortem lung gravimetry. Correlation analysis using Pearson product moment was carried out. $p < 0.05$ was considered for statistical significance.

RESULTS. Correlation analysis revealed a significant correlation between the estimation of extravascular lung-water by post-mortem gravimetry and the quantification by electrical impedance tomography ($r = 0.78$; $p < 0.05$). Moreover, $LungWaterRatio_{EIT}$ differentiated clearly between injured and non-injured lungs. Neither gravimetry nor EIT could separate the two types of injury.

CONCLUSION. Extravascular lung water could be determined non-invasively determining characteristic changes in electrical impedance tomograms at angles of lateral rotation. The novel Lungwater $Ratio_{EIT}$ holds promise to become a reliable non-invasive bedside measure of pulmonary oedema.

GRANT ACKNOWLEDGMENT. Else Kröner-Fresenius Stiftung.

1005

DIFFERENCES BETWEEN PEEP FOR DEPENDENT VERSUS NON-DEPENDENT LUNG RECRUITMENT FOLLOWED WITH ULTRASOUND

B. Rode[1], J. Kovač[1], M. Širanović[1], M. Vučić[1], A. Horvat[1], H. Krolo[1]

[1]University Hospital Center 'Sisters of Mercy', Zagreb, Croatia

INTRODUCTION. Positive end-expiratory pressure (PEEP) required to maintain recruited alveoli in ALI/ARDS (acute lung injury/acute respiratory distress syndrome) on mechanical ventilation is higher for the dependent lung than for the non-dependent, contributing to suboptimal PEEP or to the overdistention. PEEP recruitment of subpleural crater-like consolidations (SCLC) typical for ALI/ARDS can easily be followed with ultrasound and measured on the ventilator.

OBJECTIVES. Bedside determination of the difference between PEEP for recruitment of dependent versus non-dependent SCLC.

METHODS. Observational study between October 2009 and May 2012 in surgical/neurosurgical intensive care. 16 sedated patients with early ALI/ARDS, 10 with extrapulmonary and 6 with pulmonary aetiology, in semirecumbent position on pressure support ventilation with empiric PEEP and with visible SCLC in the entire respiratory cycle were included. Preload optimization was assessed by absence of respiratory variations in doppler measured maximal aortic velocities. Non-dependent intercostal spaces were signed as those above mamilla and anterior to the middle axillary line, as opposed to dependent spaces. Linear ultrasound transducer 5–10 MHz at a depth of 3,3–6 cm was used. Lower border of the SCLC was followed in expiratory elevating caused by raising PEEP towards surrounding pleural line. Levelling between the lower border of SCLC and surrounding pleural line was considered as full PEEP recruitment. 22 cmH_2O was the upper ventilator PEEP limit. Ventilation was continued with empiric PEEP.

RESULTS. Mean PEEP difference between dependent and non-dependent SCLC recruitment was 3,5 cm H_2O (range 0–6 cm H_2O), with significant Spearman correlation ($r = 0.862$; $p < 0.0001$).

CONCLUSIONS. PEEP required for recruitment of SCLC in dependent intercostal spaces is mostly higher, uppermost for 6 cm H_2O, compared with non-dependent spaces which are at possible risk of added overdistention in inspiration. Unevenness of differences between dependent and non-dependent spaces is caused by different ultrasound positions for measurements according to visible SCLC, together with tissue reasons. Comparing results to the ARDS sponge model (1), differences are smaller. Ultrasound of SCLC could be a useful tool for checking PEEP.

REFERENCES. 1. Gattinoni L, Caironi P, Pelosi P, Goodman LR. What has computed tomography taught us about the acute respiratory distress syndrome? Am J Respir Crit Care Med. 2001;164(9):1701–11.

1006

IN-BREATH MONITORING OF LUNG RECRUITMENT AND DISTENSION USING PULMONARY MECHANICS IN AN EXPERIMENTAL ARDS ANIMAL MODEL

Y.S. Chiew[1], E.J. van Drunen[1], B. Lambermont[2], P. Morimont[2], N. Janssen[3], C. Pretty[4], T. Desaive[4], G.M. Shaw[5], J.G. Chase[1]

[1]University of Canterbury, Mechanical Engineering, Christchurch, New Zealand, [2]University Hospital of Liege, Medical Intensive Care Unit, Liege, Belgium, [3]University Hospital of Liege, Emergency Department, Liege, Belgium, [4]University of Liege, GIGA-Cardiovascular Sciences, Liege, Belgium, [5]Christchurch Hospital, Department of Intensive Care, Christchurch, New Zealand

INTRODUCTION. Positive end expiratory pressure (PEEP) during mechanical ventilation (MV) supports breathing and gas exchange. However, the best level of PEEP can be patient-specific and is thus subject to great debate.

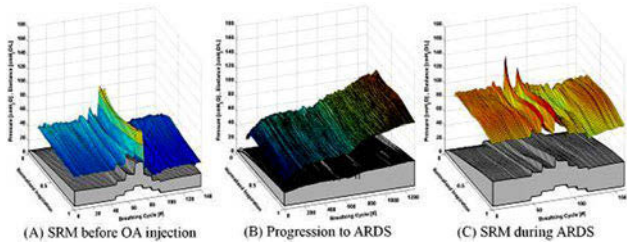
OBJECTIVE. This study presents a non-invasive, model-based method to monitor breath-to-breath recruitment and distension during MV.

METHODS. Retrospective analysis of airway pressure and flow from 3 experimental ARDS piglets was performed. After intubation via tracheotomy, the piglets were ventilated using Engström CareStation ventilators (Datex, GE Healthcare, Finland) with a fixed tidal volume of 8–10 ml/kg, FiO_2 of 0.5 and a breathing rate of 20 breaths/min. Each piglet underwent a staircase recruitment manoeuvre (SRM; PEEP: 5-10-15-20-15-10-5 cmH_2O). After SRM, the piglets were injected with oleic acid (OA) to induce ARDS, and then given a second SRM. Equation (1) was used to calculate time-varying respiratory elastance E_{drs} *(t)*.

$$P_{aw}(t) = R_{rs} \times Q(t) + E_{drs}(t) \times V(t) + P_0 \quad (1)$$

Where, P_{aw} is the airway pressure, t is time, R_{rs} is the resistance of the conducting airway, Q is the air flow, V is the lung volume and P_0 is the offset pressure. Mapping E_{drs} *(t)* across every breathing cycle during MV assesses the pressure input and recruited volume response, where increasing E_{drs} *(t)* indicates greater distension for each unit of volume recruited. The corresponding PEEP at minimum E_{drs} *(t)* may be the optimal PEEP to maximise recruitment while avoiding lung overdistension[1].

RESULTS. The figure shows E_{drs} *(t)* at 3 experimental phases (A), (B) and (C) with the airway pressure from PEEP to peak inspiratory pressure (PIP) in grey for each subject. E_{drs} *(t)* decreases within a breathing cycle when recruitment outweighs alveoli distension, and vice versa. All 3 pigs had similar results. Mean and peak E_{drs} *(t)* in (A) was lower than (C) ($p < 0.05$) as expected from an increasing lung stiffness due to ARDS. (B) clearly shows the effect of oleic acid on respiratory mechanics as ARDS developed.



Experimental Phases

CONCLUSION. This novel method provides clinically useful information on breath-to-breath recruitment, response to PEEP, and risk of over distension, providing an opportunity to diagnose patient-specific condition and response to MV. The clinical impact of this monitoring method warrants further investigation.

REFERENCES. 1. Carvalho A et al. Intensive Care Med. 2011, 37:263–71.

1007

ELECTRICAL IMPEDANCE TOMOGRAPHY CHANGES IN REGIONAL TIDAL AMPLITUDE DO NOT REFLECT CHANGES IN REGIONAL TIDAL VOLUME

B. Grychtol[1], S.H. Böhm[2], A. Santos[3], A. Adler[4], J.B. Borges[3], F. Suarez-Sipmann[3,5]

[1]German Cancer Research Center, Medical Physics in Radiology, Heidelberg, Germany, [2]Swisstom AG, Lanquart, Switzerland, [3]Uppsala University, Department of Surgical Sciences, Uppsala, Sweden, [4]Carleton University, Systems and Computer Engineering, Ottawa, Canada, [5]Uppsala University Hospital, Section of Anesthesiology and Critical Care, Uppsala, Sweden

INTRODUCTION. Electrical Impedance Tomography (EIT) holds promise as a tool for monitoring regional ventilation in the lungs. Based on previous validation studies, it is commonly assumed that local amplitudes in EIT images are directly proportional to volume changes in a given lung region of interest [1]. However, experimental studies [2] and simulations suggest that the relationship between change in regional volume and resulting image amplitude depends on regional aeration, such that volume changes in less aerated lung regions cause greater change in the EIT image than equal changes in more aerated regions.

OBJECTIVE. To validate the predictions from simulations by selectively manipulating aeration in the two lungs while maintaining constant tidal volumes in each lung.

METHODS. The experiment was performed at the *Hedenstierna laboratory* at the University of Uppsala, Sweden after local ethical approval. A 27 kg healthy pig was anesthetized, paralyzed and hemodynamic stability ensured. The animal was tracheostomized and intubated under bronchoscopic supervison with a double-lumen tube such that each lung could be independently ventilated via two synchronized Servo 900C ventilators (Siemens-Elema, Solna, Sweden). Initially, positive inspiratory pressure (PIP) for both lungs was adjusted to achieve a total tidal volume of 6 ml/kg at 20 breaths per minute and positive end-expiratory pressure (PEEP) of 10 cm H_2O resulting in a PIP of 17 cm H_2O and tidal volumes of 63 and 107 ml for the left and the right lung, respectively. Keeping all other settings unchanged, PEEP in the left lung was increased to 20 cm H_2O for 2 min. EIT (Swisstom AG, Lanquart, Switzerland), dynamic CT (SOMATOM flash, Siemens, Erlangen, Germany) and air flow (NICO, Phillips, Wallingford, CT, USA) data were acquired simultaneously.

RESULTS. When both lungs were ventilated with the same PEEP tidal amplitudes in the EIT images were 56 in the left and 101 (arbitrary units) in the right lung. After PEEP increase in the left lung, EIT amplitude in this lung dropped to 39 (−29 %) while that of the other remained unchanged (101). Tidal volumes as recorded by the flow sensor and the ventilator spirometer remained constant. Preliminary analysis of the CT data confirmed the increase in aeration in the left lung and showed no difference in tidal density changes.

CONCLUSIONS. Regional tidal amplitudes of EIT images may not accurately reflect regional tidal volumes in states of uneven or variable lung aeration.

REFERENCE(S). 1. Victorino et al. Imbalances in regional lung ventilation: a validation study on electrical impedance tomography. Am J Respir Crit Care Med 2004; 169:791–800. 2. Markhorst et al. Assessing effects of PEEP and global expiratory lung volume on regional electrical impedance tomography. J Med Eng Technol. 2009; 33:281–7.

GRANT ACKNOWLEDGMENT. BG: Fellowship of the Alexander von Humboldt Foundation. Experiment sponsored by Swisstom AG, Landquart, Switzerland.

1008

DIAPHRAGMATIC DYSFUNCTION EVALUATION USING ULTRASONOGRAPHY AS A PREDICTOR OF WEANING OF PATIENTS WITH ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE FROM MECHANICAL VENTILATION

A.M. Fayed[1], M.S. Barakat[2], E.M. Zakaria[1]

[1]Alexandria Faculty of Medicine, Critical Care Medicine, Alexandria, Egypt, [2]Alexandria Faculty of Medicine, Alexandria, Egypt

INTRODUCTION. Acute Exacerbation of COPD (AECOPD) is defined as increased breathlessness, often accompanied by cough, sputum production, wheezes, chest tightness or other symptoms and signs of acutely worsened respiratory status. (1) Weaning from mechanical ventilation is defined as the process of abruptly or gradually withdrawing ventilatory support. (2) The diaphragm is susceptible to various insults which are common in critically ill patients. Mechanical ventilation can induce diaphragmatic dysfunction (DD). (3) Ultrasonography (U/S) is a bedside diagnostic tool, devoid of radiation hazards. The M-mode U/S examination of the diaphragm gives functional information about the muscle and can be repeated. (4).

OBJECTIVE. determining the correlation between DD and outcome of patients with AECOPD.

METHODS. The study was carried out on 60 mechanically ventilated patients with AECOPD, admitted to the department of Critical Care Medicine in the Alexandria Main University Hospital. They were classified ultrasonographically into two groups; Group I: those with DD (< 1 cm excursion), Group II: those without DD (> 1 cm excursion). All patients were subjected to: History taking, complete physical examination, laboratory evaluation, M-mode U/S evaluation of the diaphragm was performed at the start of spontaneous breath trial on T-piece. Outcomes: Duration of weaning, mechanical ventilation, weaning failure either primary or secondary, length of ICU and hospital stay, hospital mortality, sensitivity, specificity, positive and negative predictive values.

RESULTS. There were ten patients with primary weaning failure in the DD group and two in the non-DD group. There were six patients with secondary weaning failure in the DD group. There were 6.7 days reduction in the mean days of ICU stay, 8.42 days reduction in the mean days of hospital stay in favour of non-DD group ($p < 0.001$). A single case of mortality was found in the DD group. M-mode U/S evaluation of the diaphragm, in predicting total weaning failure, showed 88.89 % sensitivity, 97.62 % specificity, 94.12 % positive predictive value and 95.35 % negative predictive value.

CONCLUSIONS. DD, detected by M-mode U/S, was associated with prolonged duration of mechanical ventilation, ICU, hospital stay, and weaning failure in AECOPD patients.

REFERENCE(S). 1. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Available from http://www.goldcopd.org. (Updated February 2013). 2. Boles JM, Bion J, Connors A, Herridge M, et al. Weaning from mechanical ventilation. Eur Respir J. 2007; 29(5):1033–56. 3. Schild K, Neusch C, Schonhofer B. Ventilator-induced diaphragmatic dysfunction (VIDD). Pneumologie 2008; 62:33–9. 4. Kim WY, Suh HJ, Hong SB, Koh Y, et al. Diaphragm dysfunction assessed by ultrasonography: influence on weaning from mechanical ventilation. Crit Care Med. 39(12):2627–30.

1009

IMPACT OF ABDOMINAL MASS LOADING ON LUNG COLLAPSE DETECTED BY EIT DURING PEEP TITRATION ON A PORCINE MODEL OF ACUTE LUNG INJURY

V. Torsani[1], S. Hukrauf[2], A. Rau[2], S. Hammermüller[2], S. Gomes[1], R.R.D.S. Santiago[1], E.L.V. Costa[3], A.W. Reske[2], M.B.P. Amato[1]

[1]Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Heart Institute (InCor), São Paulo, Brazil, [2]University Hospital Leipzig, Department of Anesthesiology and Intensive Care Medicine, Leipzig, Germany, [3]Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Dept Pneumology - Heart Institute (InCor), São Paulo, Brazil

INTRODUCTION. Increased intraaabdominal pressure is common in critically-ill patients. Such increase raises the closing pressures by causing an offset change in the chest wall component of the respiratory system pressure–volume relationship[1].Electrical impedance tomography (EIT) is a radiation-free bedside monitoring device that can be used to quantify the amount of recruitable collapse during a decremental PEEP titration maneuver.

OBJECTIVES. Assess the influence of the abdominal pressure on the amount of collapse during a PEEP titration in a porcine model of acute lung injury.

METHODS. A total of five Landrace pigs (31 ± 2 kg) were anesthetized, paralyzed and mechanically ventilated in the supine position. Tracheostomy, cistostomy, and central venous lines were prepared. Femoral and pulmonary arteries were catheterized for blood gas and shunt measurements. EIT belts were placed around the thorax in the transversal plane at the level of the axilla. Consecutive lung lavages with 30 ml/kg warm saline (until the PaO_2/FiO_2 fell below 100 mmHg) were followed by 2 h of injurious ventilation with low PEEP, high tidal volumes, and plateau pressures according to a protocolized table. A recruitment maneuver with plateau of 50 cmH_2O was performed and PEEP titration started at a PEEP of 25 cmH_2O and was decreased in 2 cmH_2O steps every 4 min until a PEEP of 7 cmH_2O was reached. Ventilator parameters during titration were VCV = 6 ml/kg, RR = 20–30 bpm, inspiratory pause = 0.3 s and I:E = 1:2. EIT data were continuously recorded. Arterial and mixed venous blood gases were measured at each PEEP step, and shunt was quantified by the Berggren equation. Increased abdominal pressure (abdominal loading) was achieved using three 1L standard saline bags (total 3 kg) placed 10 cm below the xiphoid process after the recruitment and before the titration. The order of loaded or unloaded titration was randomized.

RESULTS. The addition of a 3 kg-weight on the abdomen caused a significant increase in both EIT lung collapse (P = 0.007) and true shunt (P = 0.011). The magnitude of the increase was dependent on the level of PEEP (P = 0.038 for the interaction between PEEP and abdominal weight in EIT).

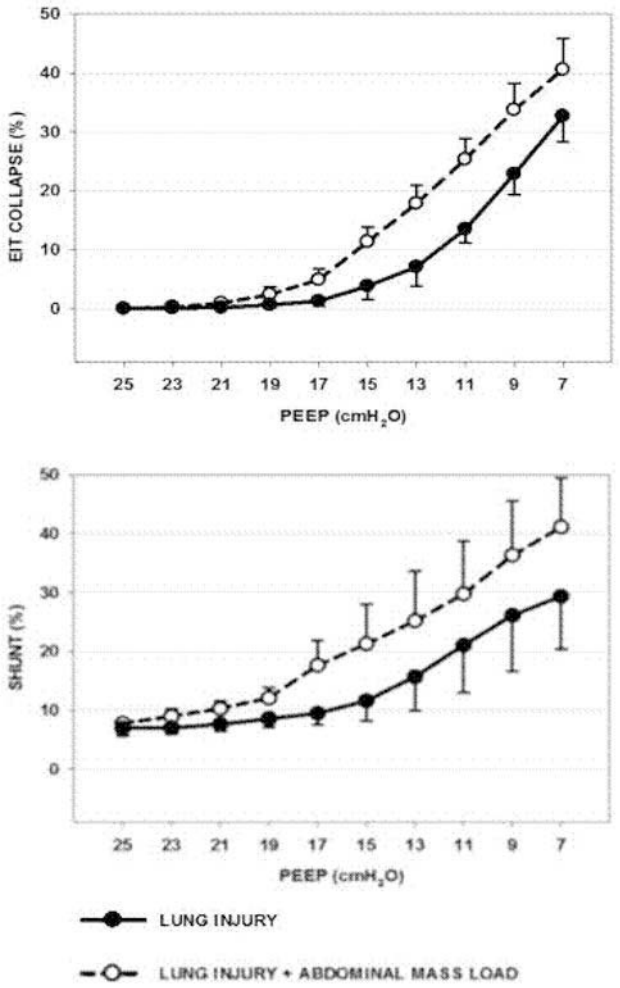


Fig. 1: Amount of recruitable collapse and shunt measured by EIT and blood gas, respectively, during PEEP titration.

Graph 1

CONCLUSIONS. Increased abdominal pressure leads to more lung collapse and shunt during the PEEP titration maneuver. This finding highlights the importance of an individualized setting of PEEP, especially in situations of increased abdominal pressure.

REFERENCES. 1. Sharp JT et al. Effects of mass loading the respiratory system in man. J Appl Physiol. 1964;19:959–66

GRANT ACKNOWLEDGMENT. CAPES, FINEP, LIM-09.

Sepsis: experimental models: 1010–1021

1010

EARLY DEXAMETHASONE TREATMENT IMPROVES SURVIVAL IN A MOUSE LPS MODEL OF SEPSIS

M. Bergquist[1,2], M. Nurkkala[2], C. Rylander[3], G. Hedenstierna[1], C. Lindholm[2]

[1]Uppsala University, Medical Sciences, Uppsala, Sweden, [2]Sahlgrenska Academy, University of Gothenburg, Göteborg, Sweden, [3]Sahlgrenska University Hospital, Department of Anaesthesia & Intensive Care, Göteborg, Sweden

INTRODUCTION. Severe sepsis is associated with high mortality in the ICU. The role of glucocorticoid treatment in patients with severe sepsis and septic shock remains controversial, with contradictory clinical outcomes from recent large multicentre clinical trials. In our mouse model of *S. aureus* (Gram positive) sepsis we have previously shown that the expression and function of the glucocorticoid receptors (GR) is progressively decreased and that dexamethasone treatment is only beneficial when administered early (Bergquist et al. 2013). In the present study, we investigated the expression and function of GR and whether the timing of steroid treatment is of similar importance in endotoxin-induced sepsis in mice.

OBJECTIVES. To investigate if the timing of dexamethasone treatment effects the expression and function of the GR and the mortality in a Gram negative model of sepsis.

METHODS. Male C57BL/6 J mice were administered LPS intraperitoneally (i.p.) and blood and spleen cells were collected after 12 and 24 h for flow cytometry and ImageStream. GR expression in different leukocyte subsets; T cells (CD4+ and CD8+), B cells, monocytes and neutrophils, were quantified and GR function was assessed by the cells' ability to bind FITC-labelled dexamethasone in vitro. Translocation of the GR into the cell nucleus was quantified using ImageStream. In a steroid treatment experiment, groups of septic mice received dexamethasone treatment starting 2 h before, 2 h after, and at 12 and 24 h after LPS. Healthy, uninfected mice were used as controls.

RESULTS. B cells and neutrophils increased GR expression in blood and spleen, whereas CD4 T lymphocytes and monocytes decreased the expression ($p < 0.05$). The dexamethasone binding capacity was increased in B cells in blood and spleen, as expected ($p \leq 0.02$). Interestingly, neutrophils from spleen bound less dexamethasone ($p = 0.01$) in spite of higher GR expression. On day 1 after LPS administration, the translocation ability was increased compared to healthy controls but reduced on day 2 compared to day 1 in all cells ($p < 0.0001$). Dexamethasone administered 2 h after LPS administration resulted in reduced mortality compared to when dexamethasone treatment was started at 12 h ($p = 0.02$) and when no dexamethasone treatment was given ($p = 0.02$). There was no significant difference between the healthy control group and the group who received dexamethasone at 2 h after LPS ($p = 0.08$). Healthy controls had significantly higher survival than all other groups ($p \leq 0.01$).

CONCLUSIONS. Steroid treatment has effect on mortality in this mouse model of Gram negative sepsis only when administered early after (2 h), but not before LPS. Neutrophils are in spite of a higher GR expression able to bind less dexamethasone during sepsis. This, in combination with the result that the neutrophils are progressively increasing in number, may explain why steroid treatment is only beneficial when administered early.

1011

TREATMENT WITH ADENOCAINE/MG^{2+} DURING ENDOTOXEMIA INDUCES REVERSIBLE HYPOTENSION, AND IMPROVES HEMODYNAMICS, PULMONARY FUNCTION AND REDUCES NEUTROPHIL ACTIVATION

A. Granfeldt[1], H.L. Letson[2], G.P. Dobson[2], W. Shi[3], J. Vinten-Johansen[3], E. Tønnesen[1]

[1]Aarhus University Hospital, Department of Anaesthesiology, Aarhus, Denmark, [2]James Cook University, Heart and Trauma Research Laboratory, Department of Physiology and Pharmacology, Townsville, Australia, [3]Emory University School of Medicine, The Cardiothoracic Research Laboratory, Carlyle Fraser Heart Center, Atlanta, USA

INTRODUCTION. Death from sepsis arises from the development of systemic inflammation, hemodynamic deterioration and organ dysfunction. The combination of adenosine + lidocaine (Adenocaine) and Mg^{2+} (ALM) has in models of cardiac arrest and hemorrhagic shock demonstrated protective hemodynamic, metabolic and anti-inflammatory properties.

OBJECTIVES. To evaluate the protective effects of ALM infusion in an endotoxemic porcine model.

METHODS. Pigs (37–42 kg) received lipopolysaccharide (LPS) at 1 μg/kg/h for 5 h. Pigs were randomly assigned to: 1) LPS alone (control) ($n = 8$) or 2) LPS + ALM ($n = 8$). At start of LPS infusion the pigs were treated with a three-tiered strategy of ALM consisting of 1) a high dose bolus, 2) a continuous infusion for 1 h and 3) a continuous infusion for an additional 3 h at a lower dose; controls received comparable volumes of saline. Pulmonary function was evaluated by PaO_2/FiO_2 and wet-dry ratio, while leukocyte superoxide anion (O_2^-) generation was quantified in whole blood using lucigenin-enhanced chemiluminescence.

RESULTS. Infusion of ALM caused an immediate decrease in mean arterial pressure (MAP) that was maintained during the 4 h infusion period (ALM: 47 ± 1.6 mmHg vs. control: 80 ± 2.9 mmHg, $p < 0.0001$). After discontinuation of ALM, MAP immediately returned to control group values (ALM: 89 ± 5 mmHg vs. control: 86 ± 3 mmHg, $p = 0.63$) The lower MAP in the ALM group was due to a lower systemic vascular resistance (ALM: 695 ± 29 dyn·s/cm^5 vs. control: 1,620 ± 135 dyn·s/cm^5, $p < 0.0001$) despite a significantly higher cardiac index (ALM: 4.7 ± 0.2 l/min vs. control: 3.9 ± 0.2 l/min, $p < 0.02$). Oxygen delivery was significantly higher in the ALM group (ALM: 653 ± 30 ml O_2/min vs. control: 445 ± 26 ml O_2 m/min, $p = 0.0001$) while whole body oxygen consumption was significantly lower (ALM: 205 ± 7 ml O_2 m/min vs. control: 231 ± 7 ml O_2 m/min, $p = 0.02$) during infusion. Oxygen consumption increased immediately to control group values (ALM: 217 ± 5 ml O_2/min vs. control: 212 ± 7 ml O_2/min, $p = 0.03$) after cessation of ALM treatment. Lactate was significantly lower in the ALM group at the end of the study (ALM: 0.8 ± 0.05 mmol vs. control: 1.1 ± 0.06 mmol, $p = 0.0068$), supporting a more balanced oxygen supply/demand relationship. In addition, ALM treatment significantly reduced mean pulmonary arterial pressure (ALM: 25 ± 1 mmHg vs. control: 34 ± 1 mmHg, $p = 0.0001$), pulmonary wet/dry ratio (ALM: 6.17 ± 0.05 vs. control: 6.87 ± 0.06, $p < 0.001$) and increased PaO_2/FiO_2 ratio (ALM: 388 ± 13 % vs. control: 260 ± 26 %, $p = 0.0005$). While neutrophil superoxide anion release increased by 19 ± 27 % in the control group, it decreased by 74 ± 8 % in the ALM group ($p = 0.0006$).

CONCLUSIONS. In this porcine model of endotoxemia treatment with ALM induced a permissive hypotensive, hypometabolic state compared to controls which was associated with superior restorative metabolic and pulmonary functions and exerted potent anti-oxidant effects.

1012

EFFECTS OF SEPSIS ON THE WORK OF BREATHING IN A PORCINE MODEL OF ABDOMINAL COMPARTMENT SYNDROME

V. Grosomanidis[1], B. Fyntanidou[1], K. Kotzampassi[1], C. Nouris[1], D. Chlorou[1], E. Oloktsidou[1], V. Ourailoglou[1]

[1]Aristotle Medical School, Thessaloniki, Greece

INTRODUCTION. Abdominal compartment syndrome (ACS) has been well recognized in the literature as a considerable cause of morbidity and mortality in the Intensive Care Unit.

OBJECTIVES. The aim of our study was to investigate the effects of sepsis on the work of breathing (WOB) in a porcine model of ACS.

METHODS. A total of 12 female pigs were divided into 2 groups of 6, G-A and G-B. All of the animals received general anesthesia and were mechanically ventilated. After baseline measurements (phase 0), intra-abdominal pressure (IAP) was raised in both groups to 25 mmHg and remained at that level by helium inflation via a Veress needle using a gas insufflation device. In G-B, sepsis was induced by intravenous injection of Escherichia Coli endotoxin (LPS, 111:B, 100 μg/kg) 60 min after the increase of IAP. WOB of the respiratory system (WOB_{RS}), of the lungs (WOB_L) and of the chest wall (WOB_{CW}) were measured using planimetry of pressure–volume loops (Cambell methodology)[1]. Parameters recorded included:

1) inspiratory resistive WOB of the RS (WOB insp $_{RS}$ Resistive) and CW (WOB insp $_{CW}$ Resistive),

2) inspiratory elastic WOB of the RS (WOB insp $_{RS}$ elastic), of the CW (WOB insp $_{CW}$ elastic) and of the L (WOB insp $_{L}$ elastic),

3) expiratory resistive WOB of the RS (WOB exp $_{RS}$ Resistive) and of the CW (WOB exp $_{CW}$ Resistive).

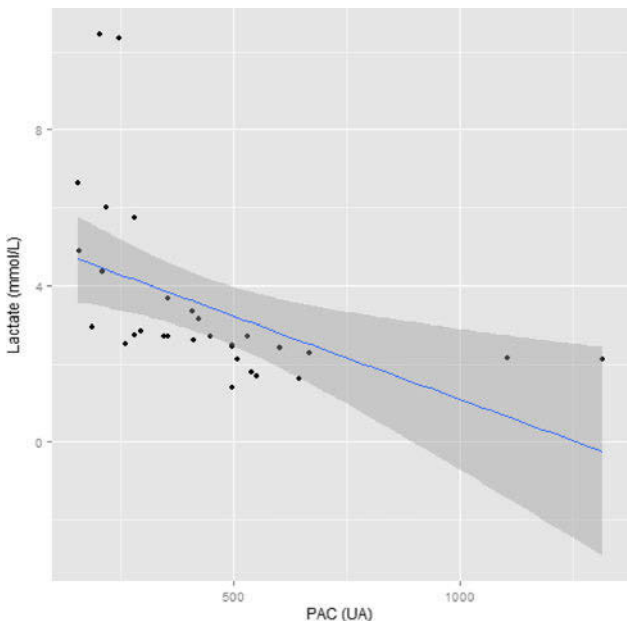
After the baseline measurement (Phase 0), data were recorded every 20 min for 3 h (phases 1–8) and after PP was disengaged (phase 9).

RESULTS. WOB insp $_{RS}$ and WOB insp $_{CW}$ Resistive and Elastic increased statistically significantly after ACS and decreased after deinsufflation. There was a statistically significant difference between the 2 groups concerning WOB insp $_{RS}$ Resistive at phases 7 and 8. WOB insp $_{L}$ elastic increased statistically significantly in both groups after ACS and declined in G-A after deinsufflation but remained elevated in G-B for the whole study period. G-A and G-B differed statistically significantly from phase 4 and throughout the study. Moreover, ACS caused a statistically significant increase in WOB exp $_{RS}$ Resistive in both study groups, which decreased in G-A and reached the baseline values after deinsufflation, whereas it remained elevated in G-B. G-A and G-B differed statistically significantly from phase 6 through phase 9. Finally, WOB exp $_{CW}$ Resistive increased statistically significantly in both groups after ACS and decreased after deinsufflation in a similar way.
CONCLUSIONS. According to the results of our study, it has been showed that ACS results in a significant increase in the WOB both with and without sepsis. However, sepsis causes an additional increase in the WOB, which is irreversible and does not decline after deinsufflation.
REFERENCES. 1.Banner M et al. Components of work of breathing and implications for monitoring ventilator-dependent patients, Crit Care Med. 1994; 22:515–23

1013
A NEW DEVICE FOR CONTINUOUS ASSESSMENT OF GUT MICROCIRCULATION. PROOF OF CONCEPT ON A PORCINE MODEL OF SEPTIC SHOCK

M. Jacquet-Lagrèze[1], B. Allaouchiche[1,2], O. Vassal[1], J.-M. Bonnet-Garin[3], C. Paquet[3], J.-Y. Ayoub[3], S. Junot[3]

[1]Hospices Civils de Lyon, Hôpital Edouard-Herriot, Service d'Anesthésie-Réanimation, Lyon, France, [2]Université Claude-Bernard, Lyon, France, [3]Vetagro Sup - Campus Vétérinaire de Lyon, EA 4174 Sepsis Inflammation Hémostase, Marcy-l'Étoile, France
INTRODUCTION. Impairment of gut microcirculation during sepsis is a triggering factor for multi organ dysfunction syndrome [1] and subsequent death [2]. Despite its therapeutic importance, assessment of microcirculation remains difficult. It is currently carried out with sublingual videomicroscopy, which gives non-continuous and deferred measurements. We propose to evaluate an innovating device consisting of a plethysmography sensor fixed on a balloon at the tip of an enteral feeding tube. This non-invasive device allows a contact between the probe and the duodenal mucosa and gives real-time and continuous measurements.
OBJECTIVES. This study aims to determine if the area under the curve of the plethysmographic signal (PAC) is a reliable method to assess microcirculatory impairment in a porcine model of septic shock.
METHODS. Ten piglets were anesthetized and mechanically ventilated. They were randomly assigned in two groups: animals of the control group (n = 4) received a infusion of Ringer's lactate solution (RL) alone, those of sepsis group received in addition a suspension of *Pseudomonas aeruginosa*. Heart rate (HR), pulse oxymetry (SpO_2) mean arterial pressure (MAP), cardiac output (CO) by thermodilution and serum lactate were collected. Following a median laparotomy, the plethysmographic probe was inserted after a gastrotomy in the duodenum. The value of PAC was compared with regional arterial blood flow (RABF) and gut microcirculation (GM) measured respectively by an ultrasonic probe surrounding a branch of the gastro-duodenal artery and a laser Doppler probe applied on the duodenal serosa.
The data were collected for 150 min. A decrease of 50 percent of the basal cardiac output or MAP was the trigger of resuscitation, which was based on fluid load, norepinephrine and dobutamine administered following a defined algorithm.
RESULTS. The sepsis group received significantly greater amount of fluid, norepinephrine or/and dobutamine, (Fisher's exact test, p = 0.047) Spearman correlation between serum lactate and PAC was strong in sepsis group (r = −0.861 p < 0.001).



Correlation between serum lactate and PAC

When comparing before and after the onset of sepsis - 4 min before bacterial administration and 4 min before the onset of shock (MAP < 50 mmHg) - we observed that the PAC was able to detect a microcirculatory failure more accurately than MAP, CO or HR.

	t0	t1	p value*
PAC (UA)	483.8	349.9	0.032**
GM (UA)	314.4	280.7	0.562
RABF (ml min^{-1})	10.7	8.08	0.094
MAP (mmHg)	61.22	54.99	0.14
CO (L min^{-1})	1.62	1.38	0.078
HR (min^{-1})	82.0	79.66	0.140

[*Comparison t0 to t1, Wilcoxon test, **p < 0.05]
CONCLUSIONS. The PAC reflects the microcirculatory state and is able to detect splanchnic perfusion disorders earlier than macrocirculatory parameters in a model of septic shock. Correlation with serum lactate is noteworthy because goal directed therapy based on lactate clearance is able to reduce mortality in septic shock [3]. This new device could become the cornerstone of goal directed therapy during septic shock.
REFERENCES. 1. Am J Gastroenterol. 1996; 91:1697–1710 2. Crit Care Med 2004; 32: 1825–31. 3. Am J Respir Crit Care Med. 2010; 182: 752–61

1014
HYDROXYETHYLSTARCH AUGMENTS BASAL ENDOTHELIAL AND EPITHELIAL PERMEABILITY IN THE ISOLATED PERFUSED MOUSE SMALL INTESTINE

I. Lautenschläger[1], Y.L. Wong[1,2], H. Dombrowsky[1,2], J. Sarau[1,2], T. Goldmann[3], A. Frey[2], M. Albrecht[1], B. Bein[1], M. Steinfath[1], S. Uhlig[4], I. Frerichs[1], N. Weiler[1]

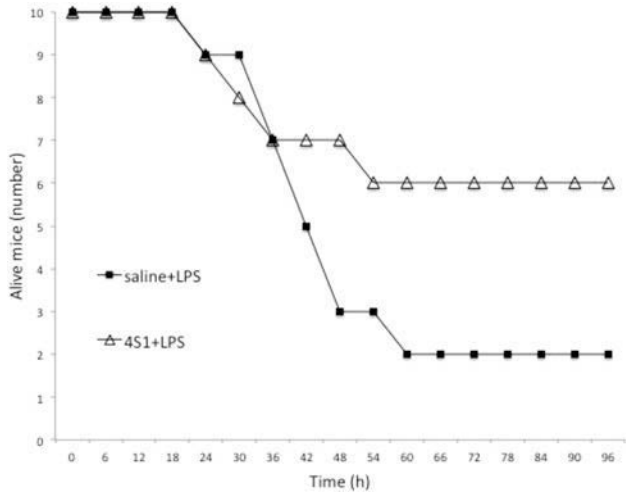
[1]University Medical Center Schleswig–Holstein, Campus Kiel, Anaesthesiology and Intensive Care Medicine, Kiel, Germany, [2]Leibniz Centre for Medicine and Biosciences, Priority Area Asthma and Allergies, Borstel, Germany, [3]Leibniz Centre for Medicine and Biosciences, Clinical and Experimental Pathology, Borstel, Germany, [4]RWTH University Hospital Aachen, Pharmacology and Toxicology, Aachen, Germany
INTRODUCTION AND OBJECTIVES. The suitability of colloids for resuscitation of septic patients remains controversial. There is some evidence that hydroxyethylated starches (HES) harm the kidney leading to renal failure (1) but, to our knowledge, the HES-related intestinal dysfunction has not been intensively studied so far. In this study we aim to analyse the functional and morphologic effects of vascular perfusion with HES in a newly developed model of the isolated perfused mouse small intestine.
METHODS. Small intestines were taken from 7 to 9 weeks old C57/BL6 mice. The isolated intestines were perfused vascularly and luminally in a warmed humidified chamber as described before in a rat model with small species-specific modifications (2). After 60 min of equilibration, the vascular perfusion media were, either changed from Krebs-Henseleit buffer (KHB) containing 3 % of bovine albumin (BSA) to KHB with 3 % HES (130/0.4) (HES; N = 5), or perfusion media remained unchanged (BSA; N = 6), both for further 75 min. The fluid shifts within the vascular, luminal and lymphatic compartments of the organ were measured continuously. The transfer of vascular dextran, the resorption of galactose derived from luminal lactose and the lactate-to-pyruvate ratio (LPR) were recorded every 15 min. Finally, wet-to-dry weight ratio (WDR) was measured and microscopic analyses were performed. Data are presented as mean ± SD. Statistical analysis was performed using the t-test.
RESULTS. WDR (BSA: 5.43 ± 0.18; HES: 5.67 ± 0.24) and LPR (BSA: 9.11 ± 2.46; HES 7.98 ± 1.92) did not exhibit significant differences between the groups but HES perfusion impaired galactose resorption (p < 0.01), led to fluid accumulation in the intestinal lumen (p < 0.05) and caused translocation of dextran from the vascular to the lymphatic and the luminal compartments (p < 0.05). In the HES group, the electronmicroscopic analysis showed intracellular vacuoles and paracellular fluid accumulation in the intestinal epithelium.
CONCLUSIONS. Administration of HES to the vascular compartment of isolated perfused mouse small intestines harms the endothelial and epithelial barriers and leads to vascular fluid loss. It impairs the resorptive function and induces morphological changes in the epithelium. Further studies are needed to show the relevance of the present findings under in vivo conditions and during inflammation.
REFERENCES. 1. Perner et al. N Engl J Med. 2012;367:124–34. 2. Lautenschläger et al. Am J Physiol Gastrointest Liver Physiol. 2010;298:G304–313.

1015
SULFATED OLIGOGLUCURONAN REDUCES MORTALITY INDUCED BY ENDOTOXIN SHOCK IN MICE

A. Salomon[1,2], L. Louvet[1], E. Trecherel[1], S. Malaquin[1,2], J. Ausseil[1], A. Wadouachi[3], J. Kovensky[3], H. Dupont[1,2], E. Lorne[1,2]

[1]INSERM U 1088, Amiens, France, [2]Amiens University Hospital, Department of Anesthesiology-Critical Care and Emergency Medicine, Amiens, France, [3]Laboratoire des Glucides FRE 3517, Amiens, France
INTRODUCTION. Heparin has been shown to be associated with reduced mortality in murin models of septic shock. In this work we studied the effect of a sulfated oligoglucuronan composed from 4 unit of monosulfated glucuronic acid (4S1) which structuraly close to heparin without heparanase inhibition and anticoagulant activity.
OBJECTIVES. To test the ability of 4S1 to regulate NF-κB dependent cytokines and decrease mice mortality in an endotoxinic shock model.
METHODS.
Cell model: We exposed RAW 264.7 cells to the 4S1. We then stimulated the pathway TLR4-NF-kappa B by the addition of LPS in cell cultures. We measured the levels of pro-inflammatory cytokines IL-6, IL-1β and TNF-α in the supernatant by ELISA method as well as the translocation of NFκB by performing ELISA Transam on nuclear extracts.
In vivo model:
We induced endotoxinic shock by intraperitoneal injection of LPS on C57BL6 mice. These mice have received, 1 h before LPS, an intravenous injection of either isotonic saline serum (saline) or sulfated oligosaccharide 4S1. Survival was studied up to H96 and deaths dated precisely using a continuous infra-red video recording.

Statistical analysis was performed by Tukey–Kramer test for analysis of variance, comparisons of survival by Kaplan–Meier test (* = $p < 0.05$ considered significant).
RESULTS. The oligoglucuronan 4S1 decreases the production of TNF-α without affecting the production of IL-6 and IL-1β. The oligoglucuronan 4S1 does not diminish the translocation of NF-kB showing that TLR4-NF-kB was regulated by an epigenetic mechanism.



Effect of 4S1 on mice survival

The injection of sulfated oligosaccharide 4S1 prevents mortality in a mouse model of endotoxinic shock induced by LPS (Figure 1).
CONCLUSIONS. The oligoglucuronan 4S1 regulates TLR4-NF-kB activities and decrease specifically TNF-α production. The effect of heparin might be due to saccharides structures independent of anticoagulations activities.

1016
EFFECT OF CONTINUOUS REGIONAL ARTERIAL INFUSION OF LOW MOLECULAR WEIGHT HEPARIN IN A PORCINE MODEL OF SEVER ACUTE PANCREATITIS

L. Ke[1], H. Ni[1], Z. Tong[1], W. Li[1]

[1]Jinling Hospital, Nanjing University, Nanjing, China
INTRODUCTION. There is accumulating evidence in both human and animal studies that disturbances in pancreatic microcirculation have a significant impact in the progression of acute pancreatitis. Anticoagulant therapy using heparin or it derivatives has been proved to be beneficial in the early phase of acute pancreatitis[1, 2]. However, due to high risk of peripheral bleeding, anticoagulant therapy is not widely applied, continuous regional arterial infusion (CRAI) may be a potential solution to this dilemma.
OBJECTIVES. The aim of this study was to evaluate the effects of CRAI of low molecular weight heparin (LMWH) in the treatment of severs acute pancreatitis (SAP).
METHODS. Following baseline measurements, 24 animals were divided into 3 groups (6 animals each group): CRAI group (LMWH infused through placed arterial catheter), Venous group (LMWH infused through central venous catheter) and SAP group (control). SAP was induced with retrograde intra-ductal infusion of sodium taurocholate. General hemodynamic profiles, systemic oxygenation and serum biochemical parameters of the animals were measured. Histological examination of pancreas, intestine and lung was performed at the end of observation.
RESULTS. All animals survived at the end of the experiment and the CRAI group present no bleeding complication, while gastrointestinal hemorrhage was observed in two animals in the Venous group. During the investigation, the CRAI group showed significantly improved systemic hemodynamics, peripheral perfusion and inflammation intensity evidenced by higher cardiac output (4.0 ± 0.2, 3.4 ± 0.5, 3.2 ± 0.6, respectively, $P < 0.05$), higher urine output (23 ± 5, 16 ± 5 and 13 ± 3, respectively, $P < 0.05$) and lower level of cytokines (TNF-α 6.3 ± 3.0, 26.3 ± 4.1 and 23.3 ± 10.3, respectively, $P < 0.05$) at the end of the study. Moreover, no difference could be detected in respect to activated partial thromboplastin time (APTT) among the three groups. The pathology results also showed significantly alleviated pancreatic necrosis in the CRAI group.
CONCLUSIONS. CRAI of LMWH exhibits strong therapeutic effect in the management of severe acute pancreatitis with great safety. Our data suggest its potential value in the routine clinical clinical treatment of this disease.
REFERENCES. 1. Ceranowicz P, Dembinski A, Warzecha Z, et al. Protective and therapeutic effect of heparin in acute pancreatitis. J Physiol Pharmacol. 2008; 59(Suppl 4):103–25. 2. Lu XS, Qiu F, Li JQ, et al. Low molecular weight heparin in the treatment of severe acute pancreatitis: a multiple centre prospective clinical study. Asian J Surg. 2009; 32(2):89–94.

1017
INTENSIVE CARE UNIT-ACQUIRED WEAKNESS: GRIP STRENGTH DOES NOT DECLINE IN AN E. COLI PERITONITIS MOUSE MODEL

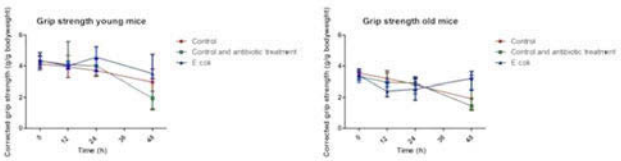
E. Witteveen[1], I.C.M. Hoogland[1], L. Wieske[1], C. Verhamme[1], I.N. van Schaik[1], M.J. Schultz[1], J. Horn[1]

[1]Academic Medical Center, Amsterdam, The Netherlands
INTRODUCTION. Intensive care unit-acquired weakness (ICU-AW) is a frequent complication of critical illness and is associated with long term morbidity and mortality.[1] Sepsis is the main risk factor.[1] The most prominent characteristic of ICU-AW is generalised weakness. However, in currently used animal models of ICU-AW, strength measurements have not been reported. We hypothesize that strength declines in a frequently used and well-established model of sepsis and that the decrease is more evident in old compared to young mice.
OBJECTIVES. To investigate whether strength, assessed by grip strength measurements, is reduced in a septic peritonitis model and whether this is more evident in old compared to young mice.
METHODS. A total of 64 male C57BL/6 J mice, aged 8 weeks or 13 months, were assigned to the following groups; 'E. coli and antibiotic treatment' group, 'control and antibiotic treatment' group and 'control' group (table 1). At baseline, '*E. coli* and antibiotic treatment' groups were intraperitoneally injected with 1.16 x 10^4 colony forming units of *Escherichia coli*.
Forelimb grip strength was measured, using a grip strength meter, at baseline (t = 0), t = 12, t = 24 h and, in case mice were sacrificed at t = 72 h, at t = 48 h. The average result of three sequential grip strength measurements from each time point was used for analysis. Grip strength was corrected for concomitant body weight, since loss of body weight decreases grip strength.[2] Mice were sacrificed at 48 or 72 h. Blood, spleen, and liver were harvested for determination of bacterial outgrowth.

Grouping of mice

Age	Group	t = 0 h	t = 12 h	t = 24 h	t = 48 h	t = 72 h
8 weeks old	Control n = 6	Saline	Saline	Saline	Sacrificed n = 3	Sacrificed n = 3
8 weeks old	Control and antibiotic treatment n = 6	Saline	Ceftriaxone	Ceftriaxone	Sacrificed n = 3	Sacrificed n = 3
8 weeks old	*E. coli* and antibiotic treatment n = 20	*E. coli*	Ceftriaxone	Ceftriaxone	Sacrificed	
n = 10	Sacrificed n = 10					
13 months old	Control n = 6	Saline	Saline	Saline	Sacrificed n = 3	Sacrificed n = 3
13 months old	Control and antibiotic treatment n = 6	Saline	Ceftriaxone	Ceftriaxone	Sacrificed n = 3	Sacrificed n = 3
13 months old	*E. coli* and antibiotic treatment n = 20	E. coli	Ceftriaxone	Ceftriaxone	Sacrificed	
n = 10	Sacrificed n = 10					

RESULTS. Severe weight loss up to 10 % of baseline body weight was observed and in 91 % of mice bacterial outgrowth in at least one organ was found. Baseline grip strength was higher in young mice (median 4.30 g/g, versus 3.40 g/g in old mice). Neither young nor old mice in the 'E. coli and antibiotic treatment' groups showed a decline in grip strength compared to controls (figure 1, median and interquartile range).



Grip strength

CONCLUSIONS. Despite severe weight loss and bacterial outgrowth, indicating a severe illness, this septic peritonitis model did not induce the characteristic decrease in strength as seen in ICU-AW, neither in young nor in old mice. Possible reasons are an early antibiotic treatment and an observation period too short to induce weakness. In patients, ICU-AW is mainly seen with severe illness and ongoing inflammation. We conclude that this model is not suitable to study ICU-AW within an observation period of 3 days and with the currently used ceftriaxone regimen. A prolonged model with ongoing inflammation may be more successful to induce ICU-AW in mice.
REFERENCES. 1. Stevens RD et al. Neuromuscular dysfunction acquired in critical illness: a systematic review. Intensive Care Med. 2007; 33:1876–91. 2. Maurissen JPJ, Marable BR, Andrus AK, Stebbins KE. Factors affecting grip strength testing. Neurotoxicol. Teratol. 2003; 25:543–53.

1018
THERAPEUTIC MODULATION OF THE ANGIOPOIETIN/TIE2 SYSTEM IN MURINE EXPERIMENTAL SEPSIS

T. Stiehl[1], K. Thamm[1], U. Schaeper[2], J. Kaufmann[2], A. Santel[2], H. Haller[1], S. David[1]

[1]Hannover Medical School, Hannover, Germany, [2]Silence Therapeutics, Berlin, Germany
INTRODUCTION. In sepsis, quiescent blood vessels become leaky and inflamed by mechanisms that are incompletely understood. We recently demonstrated that angiopoietin-2 (Angpt-2), a partial antagonist of the endothelium-stabilizing receptor Tie-2 secreted by endothelium, contributes to adverse outcomes in this disease.
OBJECTIVES. Here we analyzed a completely novel therapeutic strategy using a specific Angpt-2 siRNA approach to improve vascular function and thereby outcome in murine experimental sepsis.
METHODS. We used a novel lipophilic in vivo siRNA approach to specifically target Angpt-2 transcription in the pulmonary vasculature. siRNA against Angpt-2 or a luciferase control was injected i.v. and polymicrobial sepsis was induced 48 h later via the cecal ligation and puncture model (CLP). Laparotomy without further manipulation served as disease control. 24 h after CLP, tissue was harvested to analyse the expression of endothelial adhesion molecules (e.g. ICAM-1, VCAM-1) and the local inflammatory response (Gr-1) via fluorescent immunohistochemistry. An Evans-Blue Permeability Assay was used to quantify in vivo vascular permeability. We also assessed organ function and mortality.
RESULTS. First, the efficacy of the Angpt-2 siRNA was validated via qPCR showing a 45.5 ± 5.4 % reduction in pulmonary endothelial Angpt-2 ($p = 0.01$). This resulted in significantly less expression of ICAM-1, VCAM-1 and E-selectin during sepsis in verum-treated animals. Consequently, the local infiltration of inflammatory cells was clearly affected (*Gr*-1 positive cells/HPF: verum 19.3 ± 7.6 vs. vehicle: 36.5 ± 12.7 $p < 0.0001$). At the same time we found a trend towards less vascular (fluid)permeability in terms of lung edema. On the functional level Angpt-2 siRNA ameliorated acute kidney injury (creatinin: verum 47.8 ± 8.4 vs. vehicle 66.2 ± 15.7 umol/l; urea: verum 20.6 ± 13.4 vs. 41.2 ± 7.7 μmol/l, $p = 0.008$) and improved the overall survival in an otherwise 100 % lethal sepsis model by an impressive 50 % ($p = 0.0002$).

CONCLUSIONS. The Tie2 antagonist Angpt-2 contributes to sepsis morbidity and mortality and could therefore represent a promising candidate against adverse outcomes. A lipophilic in vivo siRNA strategy might hold promise as a potential therapeutic against pathological Angpt-2 elevation.
GRANT ACKNOWLEDGMENT. This work was funded by an intramural grant to SD (HiLF).

1019
CASPASE-8 TYROSINE PHOSPHORYLATION IS A POTENTIAL MECHANISM OF INCREASED NEUTROPHIL SURVIVAL IN SEPTIC PATIENTS

J.L.Y. Tsang[1,2,3], S. Jia[3], J. Parodo[3], M. Lodyga[2], E. Charbonney[4], A. Kapus[3], J.C. Marshall[3]

[1]McMaster University, Hamilton, Canada, [2]University of Toronto, Toronto, Canada, [3]Li Ka Shing Knowledge Institute, Toronto, Canada, [4]University of Montreal, Montreal, Canada
INTRODUCTION. Sepsis carries a mortality rate of up to 40–50 % & there is no effective biological therapy available. Neutrophils (PMN) in septic patients survive longer & contribute to organ dysfunction. However, the mechanism of increased PMN survival is unclear. Caspase-8 (C8), an apical **c**ysteine-dependent **asp**artate-directed prote**ase** involved in apoptosis, has been shown to be tyrosine phosphorylated in septic PMN & it can interact with a pro-survival molecule, Src kinase.
OBJECTIVES. We studied whether caspase-8 serves as a molecular switch to regulate apoptosis & survival. Specifically, we studied whether caspase-8 activity can inhibit Src activity & whether tyrosine phosphorylation (TP) of C8 would inhibit its own activity, prevent apoptosis, & promote Src & Erk1/2 activity. We further studied which tyrosine (Y) residue is crucial in the inhibition of C8 activity & promotion of Src & Erk1/2 activity.
METHODS. GFP-tagged Wild Type (WT), non-cleavable (C377S), phosphomimetic (Y- > E) or non-phosphorylatable (Y - > F) mutants of C8 including Y397F, Y397E, Y465F, Y465E, Y397E/465E, Y397F/Y465E were generated & transfected along with constitutively active (Y527F) Src into human embryonic kidney cells. Z-IETD-FMK was used to inhibit C8 activity. Western blot of whole cell lysates was done to study C8 cleavage, Src & Erk1/2 activation. Immunofluorescence microscopy (IF) was used to quantitate GFP-C8 and active caspase-3 (C3) positive cells. Mass spectrometry of Y465E was used to determine other sites of TP.
RESULTS. WT transfection results in suppression of Y416 phosphorylation & global protein TP. When Z-IETD-FMK was used with WT or when C377S was transfected, the suppression of Src activity was abrogated. Y465E but not WT, Y397F, Y397E & Y465F was non-cleavable & failed to activate C3 or cause cell rounding. This suggests that Y465 but not Y397 is the key residue in determining the activity of C8. Moreover, Y465E but not WT, Y397F, Y397E & Y465F activated Src & Erk1/2 & increased global protein TP. This suggests that phosphorylation (P) at Y465 promotes cell survival. With mass spectrometry, we identified that Y397 was phosphorylated by Y527FSrc in Y465E mutants. We further showed that Y397F/Y465E did not activate Src & Erk1/2 pathway as efficiently as Y397E/Y465E. This suggests that Y397 P is required for activation of survival pathway in the presence of Y465 P.
CONCLUSIONS. Our data suggest that TP at Y465 is crucial in preventing cleavage & activation of C8, thus preventing apoptosis. Src activity cannot be inhibited by TP at Y465 since it prevents activation of C8. Therefore Src can then phosphorylate C8 at Y397, allowing it to further activate Src activity in a positive feedback loop & activate Erk1/2 pathway. Together, these data suggest that C8 can act as a molecular switch to regulate cell death versus survival by TP & it serves as a potential mechanism of prolonged septic PMN survival.
GRANT ACKNOWLEDGMENT. CIHR.

1020
THE PROGNOSTIC SIGNIFICANCE OF BCL-3 EXPRESSION IN PERIPHERAL BLOOD MONONUCLEAR CELLS IN SEVERE SEPSIS OR SEPTIC SHOCK

H.-T. Chang[1], K.-P. Chung[2], C.-J. Yu[3]

[1]Far Eastern Memorial Hospital, Department of Critical Care Medicine, New Taipei City, Taiwan, Republic of China, [2]National Taiwan University Hospital, Department of Laboratory Medicine, Taipei, Taiwan, Republic of China, [3]National Taiwan University Hospital, Department of Internal Medicine, Taipei, Taiwan, Republic of China
INTRODUCTION. *Bcl3* gene is one of the anti-inflammatory genes activated in peripheral blood mononuclear cells (PBMC) in human endotoxinemic models [1]. Bcl3 is related to NF-kB activation in activated T lymphocytes[2]. In rodent macrophage, the expression of Bcl3 protein attenuates TNF-a and IL-1b expression after LPS stimulation [3]. Furthermore, Bcl3 in activated T lymphocytes can prevent activation-induced cell death, in part through Bim inhibition [4, 5]. *Bcl3* knock-out mice will have worse survival during systematic infection [6]. Therefore, it is assumed that increased *Bcl3* expression in PBMC could be protective for septic patients.
OBJECTIVE. we investigated the outcome significance of *Bcl3* expression in PBMCs from septic patients.
METHODS. This study was prospectively conducted in medical intensive care units (ICU). All adult patients admitted for severe sepsis or septic shock were screened for eligibility from Oct 2010 through Jan 2012. After written informed consent, 10 mL blood would be collected at the time of ICU admission (day 0), and also at 24 h (day 1) and 72 h (day 3) after admission. Blood specimens collected from healthy laboratory staffs (n = 12) were used as control. The *Bcl3* and *Bim* mRNA expression in PBMCs were measured by quantitative PCR. The plasma levels of TNF-a, IL-6, IL-8, and IL-10 were measured by the commercial multiplex cytokine kits.
RESULTS. A total of 92 patients were enrolled in this study. According to median of *Bcl3* expression in PBMCs, the study population was divided into two groups: high (n = 46) and low (n = 46) *Bcl3* groups. The high *Bcl3* group had higher APACHE II (22.0 vs. 26.8, $P = 0.002$), higher SOFA scores (8.6 vs. 10.8, $P = 0.005$) and higher 28-day mortality (78.3 % vs. 60.9 %, $P = 0.042$), compared to the low *Bcl3* group. Higher plasma levels of TNF-a, IL-6 and IL-10 were also found in high *Bcl3* groups. In high *Bcl3* group, the amounts of *Bcl3* expression in PBMCs decreased with time in the course of sepsis ($P < 0.001$), whereas no serial change of *Bcl3* expression was noted in low *Bcl3* group ($P = 0.441$). Compared to patients in low Bcl3 group, those in high *Bcl3* group had significantly higher *Bim* expression in PBMCs on day 0 (P = 0.017).
CONCLUSIONSWe found that septic patients with high *Bcl3* expression in PBMCs had worse survival. The pros-survival effect of *Bcl3* in PBMC might be offset by increased *Bim* expression during sepsis. The potential mechanism for worse survival in high *Bcl3* group could be lymphocytic hyper-activation, resulting in increased inflammatory cytokines and more organ damage.

REFERENCES. 1. Calvano SE et al. Nature 2005. 2. Ge B et al. J Immunol. 2005. 3. Wessells J et al. J Biol Chem. 2004. 4. Mitchell TC et al. Nature Immunol. 2001. 5. Bauer A et al. PNAS 2006. 6. Riemann M et al. J Immunol. 2005.
GRANT ACKNOWLEDGEMENT: This work was supported by the Far Eastern Memorial Hospital National Taiwan University Hospital Joint Research Program (grants 100-FTN-01).

1021
CHANGES IN EXERCISE CAPACITY AND MUSCLE FUNCTION IN A RECOVERY MODEL OF SEPSIS

S. Saeed[1], M. Singer[1]

[1]University College London, Bloomsbury Institute of Intensive Care Medicine, London, UK
INTRODUCTION. Critically ill ICU patients commonly experience severe muscle wasting with impaired function. This delays recovery and impacts upon morbidity and healthcare resources. A long-term laboratory model replicating this human scenario would be very useful for assessing both temporal changes and putative interventions.
OBJECTIVES. To determine changes in exercise capacity and muscle functionality in a 14-day rat model of sepsis and recovery.
METHODS. Male Wistar rats (28 in total), 300–350 g body weight, underwent training on both an exercise treadmill and a forelimb grip strength meter. Baseline measurements were performed of exercise capacity, grip strength, and the force of plantar flexion and fatiguability (measured under brief general anaesthesia by a force transducer using electrical stimuli administered to the hind limb via percutaneous needle electrodes). Intraperitoneal zymosan was used to induce long-term peritonitis and recovery. Sham animals had no intervention but underwent all measurements. Rats were followed for 14 days and daily weight, food intake and clinical score recorded. Exercise capacity, forelimb grip strength and muscle force and fatigue measurements were repeated on days 2, 4, 7 and 14.
RESULTS. By the peak of their illness on day 2, septic animals had higher illness severity scores, percentage weight change (mean −6.7 vs +2.9 %; $p < 0.0001$) and a lower food intake (mean 6.9 vs 58.6 g; $p < 0.0001$) compared with sham controls. Exercise capacity, muscle force generation and maximum tetanic force were significantly reduced ($p < 0.05$) up to day 7 (Fig 1) while mean absolute forelimb grip strength remained lower until day 14.

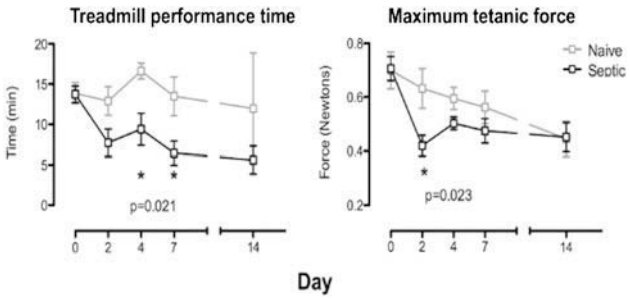


Figure 1 Changes in treadmill performance time and maximum tetanic force during recovery following sepsis induction on Day 0. Time and force measures shown as mean ± SEM (2 way ANOVA + Bonferroni test)

CONCLUSIONS. This study characterizes exercise capacity and muscle function throughout a long-term episode of critical illness from the acute phase through to recovery. This model will enable assessment of future therapeutic interventions designed to protect muscle function or augment recovery.
GRANT ACKNOWLEDGMENT. Supported by Clinical Research Training Fellowship awarded to SS by the Medical Research Council, UK

Predicting long-term outcome: 1022–1035

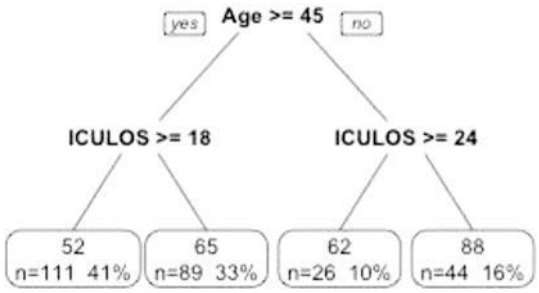
1022
LONG-TERM PATIENT OUTCOMES AFTER PROLONGED MECHANICAL VENTILATION: THE TOWARDS RECOVER STUDY

M. Herridge[1,2], L.M. Chu[3], A.L. Matte[3], L. Chan[2], G. Tomlinson[2,3], N.D. Ferguson[2,3], S. Mehta[2,4], J. Friedrich[2,5], N. Adhikari[2,6], R. Fowler[2,6], F. Lamontagne[7], J.C. Rudkowski[8], H. Meggison[9], N. Ayas[10], Y. Skrobik[11], C. Thomas[3], J. Batt[2,5], C. dos Santos[2,5], J. Flannery[2,12], S. Abbey[2,3], G.D. Rubenfeld[2,6], D. Scales[2,6], T. Sinuff[2,6], B. Cuthbertson[2,6], E. Fan[2,3], A.S. Slutsky[2], G. Leung[6], A. Moody[6], M. Levasseur[13], M. Bayley[12], C.M. Lee[2,4], V. Lo[3], S. Mathur[2], A. Tan[3], M.E. Wilcox[2,3], J.C. Marshall[2,5], D.J. Cook[8], J.I. Cameron[2], Canadian Critical Care Trials Group & The RECOVER Investigators

[1]University Health Network, Medicine/Critical Care, Toronto, Canada, [2]University of Toronto, Toronto, Canada, [3]University Health Network, Toronto, Canada, [4]Mt. Sinai Hospital, Toronto, Canada, [5]St. Michael's Hospital, Toronto, Canada, [6]Sunnybrook Health Sciences Centre, Toronto, Canada, [7]Universite de Sherbrooke, Sherbrooke, Canada, [8]McMaster University, Hamilton, Canada, [9]The Ottawa Hospital, Ottawa, Canada, [10]St. Paul's Hospital, Vancouver, Canada, [11]University of Montreal Maisonneuve Rosemont Hospital, Montreal, Canada, [12]Toronto Rehab Institute, Toronto, Canada, [13]Institut Universitaire de Geriatrie de Sherbrooke, Sherbrooke, Canada
INTRODUCTION. There are no detailed in-person multi-centre 2-year follow-up data on patients requiring prolonged mechanical ventilation and no data on how to risk stratify for early rehabilitation intervention.
OBJECTIVES. To characterize the functional, psychological, and HRQOL outcomes in survivors of prolonged mechanical ventilation and their caregivers. We hypothesize that older age, greater burden of comorbid illness at ICU admission and ICU LOS are associated with poor functional, neuropsychological, QOL outcomes and increased cost and healthcare utilization at 1 and 2 years after ICU discharge.
METHODS. Towards RECOVER is a multi-centre prospective Canadian cohort study designed to evaluate detailed outcomes to 2 years after ICU to inform risk stratification for

an early and ongoing rehabilitation intervention for patients mechanically ventilated for 7 or more days and their family caregivers.

RESULTS. To date, 614 patients are enrolled and we report descriptive statistics on 311. Patient characteristics are: median age 57, 61 % M, median APACHE II 23, median vent days 16, median ICU LOS 19 d and hospital LOS 45 d. Motor Subscale of Functional Independence Measure (FIM- range 18–126) at 7d and 12 months: was 25 and 89 respectively; 6MWD at 7d and 12 months was 0 m and 450 m respectively. Physical component score of SF-36 was 34 and 39 at 3 and 12 months respectively. BDI-II measure was 9.5 at 3 months and 8 at 12 months and the IES-R was 12 at both 3 and 12 months. In multivariable modelling, older age, greater Elixhauser comorbidity score and longer ICU LOS were significantly associated with 7 d FIM Motor subscale score (all $p < 0.05$). A recursive partitioning model shows bifurcation at age 45 then according to ICULOS, resulting in 4 groups with mean FIM of 52, 65, 62 and 88) by ICU LOS x days.[a >=45,ICULOS >=18: FIM = 52; a >=45,ICULOS < 18: FIM = 65, a < 45,ICULOS >=24: FIM = 62; a < 45,ICULOS >=24: FIM = 88].



Recursive Partitioning Model

CONCLUSIONS. Emerging data from this multi-centre study sample suggest important early functional disability captured best by FIM with improvement but persistent impairment to 12 months after ICU discharge. Modeling results suggest that patients may be risk stratified for early inpatient rehabilitation at 7 days after ICU discharge based on 7d FIM, age and ICU LOS.

REFERENCES. 1. Herridge MS et al. N Engl J Med 2011;364:1293–1304. 2. Jones C et al. Crit Care Med 2003;31(10)2456–5461. 3. Carson SS et al. Curr Opin Crit Care 2006;12(5):405–411.

GRANT ACKNOWLEDGMENT. Canadian Institute of Health Research (CIHR) Operating Grant and the Ontario Ministry of Health Alternate Funding Plan - Innovation Fund.

1023

CHARACTERISTICS, SHORT AND LONG-TERM OUTCOME OF PATIENTS WHO STAYED MORE THAN 90 DAYS IN THE ICU: AN OBSERVATIONAL STUDY OF 50 CASES

C. Vannucci[1], F. Belafia[1], A. De Jong[1], G. Chanques[1], B. Jung[1], S. Jaber[1]

[1]Saint Eloi University Hospital, Montpellier, France

INTRODUCTION. Advances in resuscitation over the past 20 years have improved care for the most severe patients leading to a drastic extension of the length of hospital stays. Literature (reviews and studies) describes patients outcome after a "long stay" in intensive care unit (ICU) after more than 30 days (1, 2). But none has focused on longer stays in terms of morbidity and mortality with a 90 days threshold.

OBJECTIVES. The aim of this study was to assess the short (3 months) and long (12 months) term outcome of patients who stayed more than 90 consecutive days in ICU.

METHODS. This is a descriptive, retrospective study which took place during a 14 year period. All consecutive patients who stayed more than 90 days in our surgical-medical ICU (between 1997 and 2011) were included and screened. No polytrauma patients were included. Demographic data, comorbidity factors, primary diagnosis, side effects and complications were recorded. We then obtained the ICU mortality ratio at 6, 9 and 12 months after ICU admission. We performed a Kaplan–Meier survival curve to describe the mortality kinetic.

RESULTS. The median [interquartile] duration of the ICU stay was 116 days [105, 153] coming both from surgical (44 %) and medical wards (52 %). The overall ICU mortality was 36 %. Mortality at 6, 9 and 12 months after ICU admission was respectively 60 %, 64 % and 66 %. Only 40 % of patients were discharged alive from the hospital. Table 1 shows the comparisons between one year survivors and dead patients.

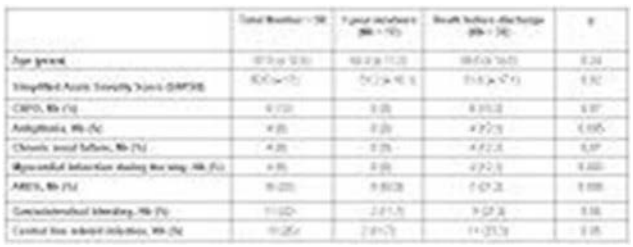
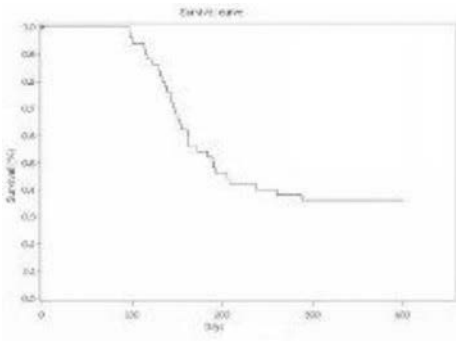


Table 1

CONCLUSIONS. One-third of patients who stayed more than 90 days died in ICU. One-third died in the hospital (after ICU discharge) and 40 % were alive at the hospital discharge. The one year survival rate reached 34 %. COPD and heart disease were significantly associated with a shorter survival time unlike age or SAPSII score. Our descriptive retrospective monocentric study provides data and outcome insight on patients with very prolonged stay in the ICU. Prospective studies are needed to target long-stay patients who would benefit from a better use of ICU resources, in a more cost-effective management. The quality of life after a prolonged ICU stay should also be evaluated in further prospective studies.



Survival Curve

REFERENCES. 1. Friedrich JO. Crit Care 2006; 10:R29. 2. Venker J. Anaesthesia 2005; 60:541–46.

1024

CHARACTERISTICS AND OUTCOMES OF ICU PATIENTS WITH LUNG CANCER

K. Hulse[1], K. Puxty[1], J. Kinsella[1], T. Quasim[1], D. Morrison[2]

[1]University of Glasgow, Department of Anaesthesia, Glasgow Royal Infirmary, Glasgow, UK, [2]University of Glasgow, West of Scotland Cancer Surveillance Unit, Glasgow, UK

INTRODUCTION. 10–15 % of patients admitted to ICU have a diagnosis of cancer.[1] Cancer patients have been excluded from ICU in the past due to their high mortality from critical illness however features of the malignancy do not dictate short-term survival.[2] For cancer patients to benefit from ICU they must survive with a good quality of life after discharge; the concern is that their life expectancy may be restricted due to the malignancy.[3]Lung cancer is the most common cause of cancer mortality in Scotland and 1-year survival is 19.6 %.[4].

OBJECTIVES. Our aims were to define the characteristics of ICU lung cancer patients, determine the rates of short and long-term mortality compared to matched non-ICU patients and identify predictors of mortality.

METHODS. We linked clinical data from four ICUs between 1/1/2000–31/12/2009 and the West of Scotland Cancer registry. We identified 1,717 patients who had an ICU admission plus a solid tumour diagnosis 5 years prior to, or during admission. From the ICU cancer population we selected patients with a diagnosis of lung cancer based on ICD-10 coding and matched them to a group of non-ICU lung cancer patients using predetermined characteristics. Statistical analyses were performed using StataCorp. 2011. *Stata Statistical Software: Release 12.*

RESULTS. 144 (8.4 %) of the ICU cancer patients had lung cancer of which 99 (68.8 %) had non-small cell lung cancer. Mechanical ventilation was required for 86.8 % of patients admitted. ICU mortality was 49.3 % with a hospital mortality of 61.1 %. Longer-term mortality was 76.4 % at 6 months and 86.8 % at 1 year compared to a 1 year mortality of 57.4 % in the matched non-ICU group Fig 1. ($P = < 0.001$).

On multivariate analysis factors associated with ICU mortality were APACHEII $\geq$ 25 (HR 2.05 $p = 0.012$) and level of organ support $\geq$ 2 (HR 2.97 $p = 0.001$). APACHEII $\geq$ 25 was still associated with higher mortality at 6 months (HR 1.69 $p = 0.022$) but patients who had prior tumour resective surgery had significantly lower mortality (HR 0.53 ($p = 0.016$). Age, metastatic disease or tumour type were not associated with short or long-term mortality.

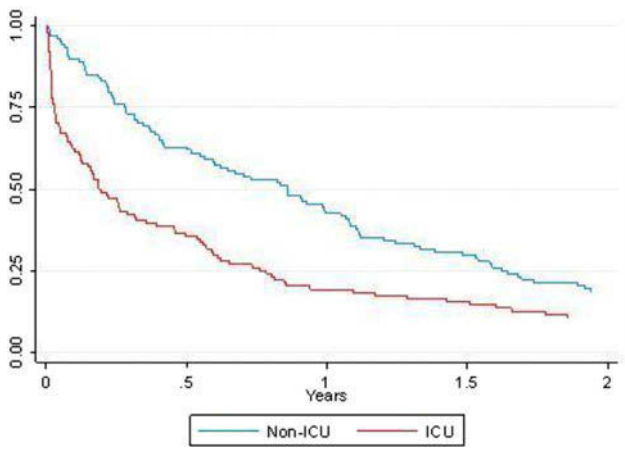


Figure 1

CONCLUSION. Our results suggest that severity of illness is the main indicator of short-term mortality in critically ill lung cancer patients and this continues to have an impact on 6 month mortality. However, at 6 months features relating to cancer management (i.e. tumour resective surgery) also influence survival. The benefit of ICU for lung cancer patients with severe critical illness should be further assessed as unit mortality is high and survival time after discharge is limited.

REFERENCES. 1. Taccone. Characteristics and outcomes of cancer patients in European ICUs; Critical Care 2009. 2. Soares. Characteristics and outcomes of patients with cancer requiring admission to intensive care units; Critical Care Medicine; 2010. 3. Cuthbertson. Quality of life in the five years after intensive care; Critical Care; 2010. 4. Cancer in Scotland (2011); ISD.

1025
HEALTH-RELATED QUALITY OF LIFE AFTER INTENSIVE CARE: A LONG-TERM FOLLOW-UP STUDY

M. Colomo Gonzales[1], F. Manzano Manzano[1], M.D.M. Jiménez Quintana[1], J.P. Valencia Quintero[1], S. Martínez Ruiz[1], O. Irigaray[1], A.M. Pérez Pérez[1], M. Sevilla Martínez[1], J. Castaño Pérez[1], M. Colmenero Ruíz[1]

[1]Hospital Virgen de las Nieves, ICU, Granada, Spain

OBJECTIVES. Health-related quality of life (HRQOL) is an important issue both for patients and their families. Our aim is to evaluate mortality and quality of life at least 12 months after discharge from the intensive care unit (ICU) of adult ventilated patients.

METHODS. Between July 2010 and December 2011, all patients admitted for mechanical ventilation (VM) $\geq$ 24 h to surgical-medical ICU of a university-affiliated hospital in Spain were enrolled in this observational and prospective study. HRQOL before ICU admission, at discharge from the ICU and hospital, at 6 and 12 months following discharge from the hospital was assessed using the EQ-5D questionnaire. Other variables were APACHE II score, gender, age, surgery, duration of MV, length of stay (LOS) in ICU and hospital; also mortality (ICU, in-hospital, 6 and 12 months). Statistical analysis included descriptive analysis, McNemar test, and multivariate analysis with logistic regression.

RESULTS. 596 patients were studied. ICU mortality, in-hospital and at 6 months was respectively 36 %, 41 % and 43 %. One-year mortality was 44.5 %. The 118 survivors of the ICU patients included in the study showed age 63 $\pm$ 14 years, APACHE II score 23.7 $\pm$ 8 points, MV duration of 9.2 $\pm$ 12 days, LOS of ICU and hospital was 16 $\pm$ 18 and 25 $\pm$ 23 days. The degree of impairment in each EQ-5D dimension in the survivors before ICU admission and after 12 months following discharge from the hospital were: mobility (no/some/severe: 74.2 % vs 73.4 %/18.5 % vs 21.8 %/7.3 % vs 4.8 %; $p = 0.56$); Self-care (76.6 vs 73.4; 17.7 vs 21.8 %, 5.6 vs 4.8 %; $p = 0.27$), usual activities (57.3 vs 76.6; 25.8 vs 17.7; 16.9 % vs 5.6 %; $p < 0.001$); pain/discomfort (53.2 % vs 57.3 %; 35.5 vs 39.5 %; 11.3 % vs 3.2 %; $p = 0.03$) and anxiety/depression (69.4 % vs 73.4 %; 22.6 % vs 22.6; 1.6 % vs 4 %; $p = 0.46$). Prognostic factors associated with worsening self-care dimension were male gender (OR 2.58 95 % CI, 1.12–5.96, $p = 0.026$), age (OR 1.04 95 % CI, 1.12–5.96, $p = 0.009$), duration of MV (OR 1.03 95 % CI, 1.001–1.072, $p = 0.042$) and APACHE II score (OR 1.02 95 % CI, 0.95 to 1.09, $p = 0.46$).

CONCLUSIONS. Although year mortality of patients who require mechanical ventilation remains high, the HRQOL per year is equal to or better than pre-ICU admission.

1026
ICU SURVIVORS QUALITY OF LIFE 6 TO 10 MONTHS AFTER HOSPITAL DISCHARGE

P.R. Ferreira[1], S. Ventura[2], A. Marques[3], T. Lapa[1], P. Coutinho[3]

[1]Centro Hospitalar e Universitário de Coimbra, Anaesthesiology - HG, Coimbra, Portugal, [2]Centro Hospitalar e Universitário de Coimbra, Internal Medicine - HG, Coimbra, Portugal, [3]Centro Hospitalar e Universitário de Coimbra, Intensive Care - HG, Coimbra, Portugal

OBJECTIVE. To find if the experiences felt by patients during ICU stay and their previous status were correlated with health-related quality of life (HR-QOL).

METHODS. A prospective study was conducted in a Portuguese mixed intensive care unit (ICU). All records of ICU survivors were evaluated 6 to 10 months after hospital discharge. Those who died after hospital discharge, the very old (> 82 years), those who lived very far away from the hospital and those who were too ill at the time of hospital discharge were excluded. All the other were called for an appointment with an intensivist. A questionnaire of patient recollections from the ICU, health status prior to admission, data from the ICU stay and HR-QOL (EQ-5D) was applied.

From August 2010 to April 2012, 548 patients were admitted in ICU. Hospital mortality was 27,2 %. 75 % of the 399 survivors were called for the appointment. 132 patients (45 % of those who were called) were included in the study.

RESULTS. The median age was 52 years, 59,8 % males, mean length of stay was 9 $\pm$ 11 days. Complications were seen on 9,2 % of the patients. Prior to admission 59,8 % said that were healthy, and 59,1 % were fully independent. The type of admission was medical in 29,5 %; surgical in 50.7 % and trauma in 19.7 %.

Twenty-two percent of the patients stated they did not remember any moment of their ICU stay, 74 % had good memories and 58 % had bad memories. Those who remembered both the proportion between good and bad experiences was 8:1.

Sleep was described as being good by 46 %, 6 % had nightmares and 2 % had good dreams. Hygiene procedures were considered good by 60 % (39 % did not remember [NR]), being questionned was good for 53 % (46 % NR), environment was remembered by 67 %, and 45 % remembered the procedures. Extubation was remembered by 17 %.

The dimensions of EQ-5D showed: normal mobility in 79 %, normal personal care in 80 % and normal activities in 64 %, 67 % didn't have any pain and 54 % had no anxiety problems. 47 % of the patients had a HR-QOL > 80 %.

Multiple regression analysis showed that lower HR-QOL was related to previous autonomy and previous disabling diseases. When each dimension of the EQ-5D is analyzed separately higher age, SOFA and APACHE scores, female sex and lesser procedure recall are related with worse outcome.

CONCLUSION. Although isolated dimensions of life can be compromised by events occurred during the stay in the ICU, this study suggests that the most important factors determining HR-QOL after discharge is previous autonomy and disabling diseases.

REFERENCES. 1. Critical Care 2005; 9:R96-109. 2. Intensive Care Med 2001; 27:1005–11. 3. Critical Care Clin 2009; 25:615–28.

GRANT ACKNOWLEDGMENT. To Cristina Monteiro for her help retrieving information from ICU databases.

1027
LIFE BEYOND DEATH, 6 MONTH LATER

M.J. García-Monje[1], I. Astola[1], A. Ceniceros[1], L. Pita[1], V. Rodriguez[1], J.M. López[1], J.M. Gulias[1], D. Freire[1]

[1]A Coruña University Hospital, Intensive Care Medicine, A Coruña, Spain

OBJECTIVES. To evaluate the real quality of life of patients after suffering a cardiac arrest and treated with therapeutic hypothermia.

METHODS. Prospective study, realized in the Coronary Unit of A Coruña University Hospital. All patients admitted after a cardiac arrest and treated with therapeutic hypothermia from December 2009 to October 2012 were studied. Demographic data, past medical history, cardiac arrest data (initial rhythm, CPR time, place…), ICU and hospital evolution and complications was recorded. 6 months after the event, patients or their relatives were contact and 3 neurological scales used to determine the real quality of life. The scales used were Barthel Index modified (BIm), Cerebral Performance Categories (CPC) Scale and IQ-5D scale. We defined good outcome when the patient had a BIm > 90, CPC 1 or 2 and IQ-5D > 0, 7. Database was analyzed with SPSS statistic program.

RESULTS. 58 patients were treated during this period, 44 males. Median age was 64, 1 year old (SD 14, 36). 46, 6 % has two or more cardiovascular risk factors as past medical history. 75, 9 % were out-of-hospital cardiac arrest, and ventricular fibrillation (VF) as initial rhythm was present in 74, 1 %. CPR time to return to spontaneous circulation (ROSC) was 15 min (SD 10, 2). Emergency coronariography was done in 55, 2 % of the patients and 12, 1 % of those patients did not present any significant coronary obstruction. 77, 6 % (45 patients) were ICU discharge, 4 patients died in hospital, with a total hospital discharge of 70. 7 %. 6 months after cardiac arrest 37 patients were alive, and 31 (83, 8 %) presented a good quality of life being neurologically intact or with minimal cerebral disability, being independent for a normal life.

When risk factors were analyzed we observed a statistic significance relationship between good prognosis and a shorter time of CPR ($p = 0.005$) and a shorter ICU length of stay ($p = 0.013$). Time of CPR was 15, 8 vs. 22, 2 and ICU LOS was 14, 5 vs. 22,5. Age, initial rhythm, and OHCA were not statically significant.

CONCLUSIONS.

-Less than 20 % of patients alive 6 months after a cardiac arrest present important cerebral disabilities.

-Time of PCR and ICU LOS seems to be associated to a better prognosis.

-Age was not found as a prognosis factor.

1028
ICU MORTALITY IN PATIENTS WITH FUNCTIONAL STATUS DISABILITY PREVIOUS TO ADMISSION

C. López-Caler[1], R. Gutierrez-Rodriguez[1], R. Rivera-López[2], J. Barrueco-Franccioni[1], M. Garcia-Delgado[2], E. Castillo-Lorente[3], E. Aguilar-Alonso[4], G. Quesada-Garcia[1]

[1]Carlos Haya Regional University Hospital, Malaga, Spain, [2]Hospital Virgen de las Nieves, Granada, Spain, [3]Hospital Neurotraumatológico, Jaen, Spain, [4]Hospital Infanta Margarita, Cabra, Spain

OBJECTIVES. To analyze hospital mortality in patients with functional affecttation before ICU admission, evaluated as Glasgow Outcome Scale does.

METHODS. Data were collected since 2006 to 2012 in several of our geographical area hospitals. Carlos Haya hospital in Málaga, Virgen de las Nieves in Granada, Neurotraumatological in Jaén and Infanta Margarita in Cabra. Data were collected to developed SAPS 3 prognosis system, patients functional was classified into five categories: dead, vegetative state, severe disability (not self-sufficient), moderate disability (self-sufficient) and good recovery. ANOVA test has been used in statistical study, multiple logistic regression and area under ROC curve have been used to assess discrimination.

RESULTS. 1757 patients have been studied, with a age 61.29 $\pm$ 15.37 years, SAPS 3 score was 44.07 + 13.08 points, SAPS 3 predicted mortality was 14.79 % by general equation and 15.41 % by our geographical area equation. ICU mortality was 9 % and hospital mortality was 13,72 %0.60.7 % of patients had normal prior functional status, with hospital mortality 8,26 % and SAPS 3 predicted mortality by general equation was 11.65 %. In self-sufficient group, mortality was 20.6 % and predicted by SAPS-3 was 19.18 %. In 8,4 % of the patients ($N = 147$) showed limitation and they were no self sufficients with mortality in 28,57 % and SAPS 3 predicted mortality 21.18 %. Only 0.6 % of the patients ($N = 10$) were in vegetative state, with mortality in 10 % and SAPS 3 predicted mortality was 21.25 %. There were statistical differences according to ANOVA ($p < 0.001$) both in the hospital mortality and predicted mortality according to SAPS 3. Multivariate statistical analysis using logistical multiple regression showed than for similar severity of illness evaluated with SAPS3 (OR = 1.072; IC:1.063–1.082), mortality of patients with functional disability but self sufficient was higher than normal patients (reference categorie), OR 1.968 (1.38–2.81), and for patients not self-sufficient or vegetative the OR was 2.84(1.75–4.61)). This model discrimination assessed with area under ROC curve was 0.849 (0.821–0.879) and SAPS3 discrimination isolated was 0.839 (0.81–0.869).

CONCLUSIONS. Our study shows that mortality in patients with functional status disabilities previously to be admitted at ICU is higher to those without any affectation, by similar severity of illness evaluated with SAPS3.

1029
BEYOND INTENSIVE CARE UNIT: PROGNOSIS AND QUALITY OF LIFE OF HOME CARE PATIENTS

S. Izdes[1], N.D. Altintas[2], E. Solmaz[3], C. Soykut[3], M. Aksoy[1]

[1]Yildirim Beyazit University, Medical Faculty, Ataturk Training and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey, [2]Ankara University, Faculty of Medicine, Department of Intensive Care (Internal Medicine), Ankara, Turkey, [3]Ataturk Training and Research Hospital, Department of Anaesthesiology and Intensive Care, Ankara, Turkey

INTRODUCTION. Number of home care patients is progressively increasing with advancement of critically ill patient management, development of home care devices and increasing cost of hospital stay. However, there are few studies on the prognosis and quality of life of these patients[1].

OBJECTIVES. We planned to analyze outcomes and patient/family satisfaction rates of our patients discharged on home care with the aim of improving our discharge protocols.

METHODS. Families of 44 home-care patients who were discharged between 03.01.2011 and 03.01.2013 from a level III ICU were contacted and interviewed on the phone.

RESULTS. Of these patients 30(%68) were men, mean age was 62.4 years. Admission Glasgow coma score (GKS) was 7.2. Mean ICU length of stay was 64 days (ranging between 17 to 156 days). Primary admission diagnosis was a traffic accident in 8(18 %), cardiac arrest in 7(16 %), falls in 5(11 %), electrocution in 1(2 %). They were discharged after an average of 21 days past the decision to discharge. Of these patients, 12(27 %) were discharged to step down units or normal wards, 28(64 %) patients were cared at home by relatives and only 4(9 %) were placed to hospice care. On discharge 34(77 %) patients had a tracheotomy and 33(75 %) had a percutaneously placed gastrostomy (PEG). The average GKS was 10.1 on discharge. Relatives were given an average of 8 h hands-on training for the care of the patient. After discharge 3(7 %) patients reported to have a problem with the tracheotomy, and 4(9 %) reported to have problems with PEG. Public home care services followed 22(50 %) of the patients but could not provide a standard of care. A total of 41 hospital admissions for 22(50 %) patients occurred (10 admissions of 1 patient is included). On the date of interview 16(36 %) patients had passed away, mainly due to respiratory problems. The average time of survival after ICU discharge of the deceased was 116 days (ranging between 0 and 442 days). When the families were questioned, night time suctioning and home-bound position of the care-giver was the main problems faced during the care of a patient. When asked to score the satisfaction of having the patient out of the ICU, an average score of 3.65 out of 5 was given.
CONCLUSIONS. Patients who are in need of continued care after ICU admission pose a big problem to the community. Insufficient hospices, inadequate training of family doctors for the care of these patients requires substantial participation by relatives on care of these patients. Although families are bonded to their beloved ones, they felt this became too demanding at times and they feared they could not meet their patients' needs. We believe organization of professional home care teams who are familiar to needs of these patients will improve quality of care and patient/family satisfaction.
REFERENCES. 1. Conti M, et al. Prognosis and quality of life of elderly patients after intensive care. Swiss Med Wkly 2012;142:w13671.

1030
OUTCOME INDICATORS FOR ONCOLOGICAL CRITICALLY ILL PATIENTS. EXPERT OPINION AND EVIDENCE BASED IN THE UK

C. Gore[1], T. Wigmore[2]
[1]The Royal Marsden NHS Foundation Trust, Critical Care Medicine, London, UK, [2]Royal Marsden Hospital, Critical Care Medicine, London, UK
INTRODUCTION. Dismally low survival rates in critically ill cancer patients requiring life sustaining treatment from the 80 [s] are now significantly improved. There is evidence that classic predictors of outcome lost their importance and the characteristics of the malignancy are not associated with mortality. Physiological scores do not perform well in critically ill cancer patients, the survival outcome depending on the nature and number of organ failures (Ref 1).
OBJECTIVES. In this survey, we sought to assess the overall perspective of intensive care unit (ICU) lead clinicians regarding the management of critically ill patients with cancer in the UK.
METHODS. A survey was sent to ICU lead clinicians in the UK, structured in 4 parts:
1. Hospital and ICU demographics
2. Estimated overall mortality in critically ill cancer patients
3. Mortality outcome indicators in two subgroups of cancer candidates for ICU admission
4. The local management of acutely deteriorating oncological patients potentially requiring ICU care.
RESULTS.
1. The survey is representative for the UK ICUs, the response rate being 36 %. 76 % of responders had more than 10 years ICU experience. 42 % worked in university hospitals. 33 % hospitals had medical and 32 % had surgical oncology service. The percentage of participants with specialty in intensive care medicine (ICM) alone (3 %), ICM and anaesthetics (88 %), ICM and internal medicine (5 %), ICM and emergency medicine (1 %), ICM and surgery (1 %) and anaesthetics alone (1 %).
46 % of ICUs had less than 10 % of admitted patients with a cancer diagnosis and 37 % had more than 20 % of ICU admissions with malignant disease.
2. The ICU mortality rates estimated by survey respondents differed from those reported in the literature (Fig 1). ST is solid tumor, ST with mets is solid tumor with metastasis, HO Haemato-oncological cancer, AUTO is autograft bone marrow transplant, ALLO is allograft bone marrow transplant.
3. Fig. 2 show those outcome indicators thought to be important by responders in forecasting ICU prognosis. Only the checked bars have been shown to be indicators of outcome in the literature.
4. Table 1 shows the main issues raised by the ICU consultants regarding critically ill oncological patients management.

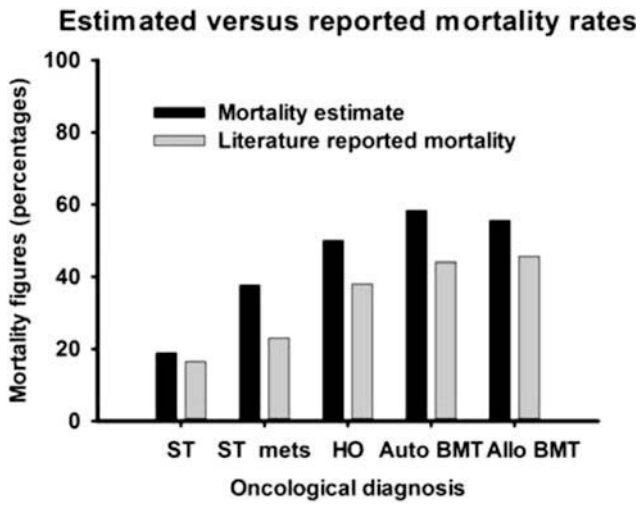


Fig. 1

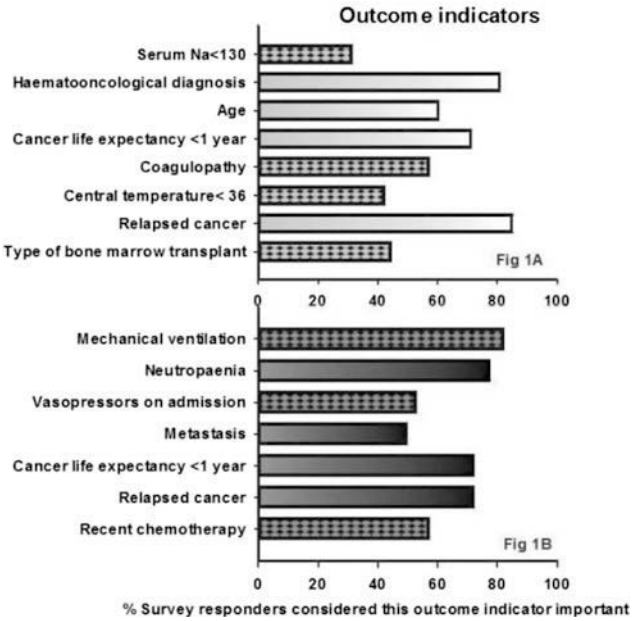


Fig. 2

	% reported by survey responders	% reported by survey responders	% reported by survey responders	% reported by survey responders
	Never	Rarely	Occasionally	Commonly
Conflict between teams	0 %	44 %	56 %	0.2 %
Plans made prior to deterioration	11 %	38 %	41 %	9 %
Predetermined triage policy	95 %			5 %

Table 1

CONCLUSIONS. Survey responders estimated ICU mortality differed from the literature reported figures. There was a large difference between the current evidence on prognostic indicators and perceived indicators among ICU clinicians regarding critically ill cancer patients.
Few units had established triage policies for the acutely ill cancer patient. It was not common that plans were made prior to the patient's deterioration.
There is a need to design comprehensive management plans for critically ill cancer patients prior to deterioration and broaden ICU admission criteria for cancer patients.
REFERENCES. 1. Lecuyer et al. CCM 2007; 35:3.

1031
FUNCTIONAL STATUS SIX MONTHS AFTER DECOMPRESSIVE CRANIECTOMY. PROGNOSTIC FACTORS

M. Arias-Verdú[1], R. Rivera-Fenández[1], J. Muñoz-Bono[1], A. Muñoz-López[1], S. Fernández-Jimenez[1], L. Romero-Moreno[2], A. Martin-Gallego[2], A. Pérez-Rielo[1]
[1]Hospital Carlos Haya, Intensive Care Unit, Málaga, Spain, [2]Hospital Carlos Haya, Department of Neurosurgery, Málaga, Spain
OBJECTIVE. To analyze in patients admitted to the ICU by structural brain lesion who undergo decompressive craniectomy (DC) the relation between the functional and the clinical status 6 months after admission.
METHODS. The prospective study included all those patients with structural brain damage (spontaneous subarachnoid haemorrhage secondary to aneurysmatic rupture (SAH), spontaneous haemorrhagic stroke (SHS), ischaemic stroke and traumatic brain injury (TBI)) requiring decompressive craniectomy at some time during their ICU stay, between 2006–2012. The analyses were done with Student t test, Chi squared test and logistic regression.
RESULTS. The sample included 62 patients, 19 with SAH of nontraumatic origin, 5 with SHS, 6 with ischaemic stroke and 32 with TBI. Their age was 73 ± 48.22 years and the depth of coma on admission, assessed with GCS, was 9.35 ± 3.68 points. Prior to surgery 28 patients (45.2 %) had isochoric pupils, 32 (51.6 %) had anisocoria and 2 (3.2 %) had bilateral mydriasis. Hospital mortality was 40.3 %. The functional status at 6 months was known in 56 patients (6 missing): 27 died (48.2 %), 5 vegetative (8.9 %), 10 limited not self-sufficient (17.9 %), 10 limited self-sufficient (17.92 %) and 4 normal (7.1 %); 14 patients (25 %) had a good functional status (normal or self-sufficient). These 14 patients with a good status at six months presented no significant differences concerning age and all had a similar Glasgow coma scale score on admission.
According to the diagnosis, a good evolution was seen in 10 of the 30 patients (33.3 %) with TBI, 3 of the 6 (50 %) with ischaemic stroke, 6.7 % of the 15 with SAH, and none of the 5 with SHS ($p = 0.058$). Grouping the patients according to whether or not the damage was haemorrhagic showed that only 1 of 20 (5 %) with haemorrhagic disorders (SAH and SHS) had a good evolution and 13 of the 36 (36.1 %) with non-haemorrhagic disorders (ischaemic stroke and TBI) had a good evolution ($p = 0.01$). Four of 31 (12.9 %) patients with pupillary abnormalities prior to surgery and 10 of 25 (40 %) with normal pupils had a good evolution at 6 months ($p = 0.02$).
Multivariate analysis showed that a poor evolution at 6 months was related to the pupillary abnormalities prior to surgery: OR 4.19 (1.04–16.86), and type of diagnosis (haemorrhagic vs. non-haemorrhagic): OR 10.05 (1.16–87.21).

CONCLUSION. In our area, 25 % of patients admitted to the ICU with structural brain damage who undergo decompressive craniectomy have a good functional status at six months. Patients fare better if they have non-haemorrhagic disorders or if the procedure is performed before the onset of pupillary abnormalities.

1032
USE OF THE SABADELL SCORE TO PREDICT HOSPITAL AND 6-MONTH OUTCOME FOLLOWING CRITICAL CARE ADMISSION IN A UK CENTRE

G. Dempsey[1], T. Astles[1]

[1]University Hospital Aintree, Department of Intensive Care Medicine, Liverpool, UK

INTRODUCTION. The Sabadell score is a modified McCabe score used to stratify patients after discharge from the Critical Care Unit.[1] It was shown to correlate well with hospital survival and has since been validated in a prospective multicentre study.[2] However, it is yet to be validated in a UK hospital population and survival following hospital discharge has not been studied.

OBJECTIVES. We aimed to both validate the Sabadell scoring system for stratification of patients according to hospital outcome and also study post-hospital survival.

METHODS. At the point of discharge from Critical Care, patients were allocated a Sabadell score by the duty Consultant Intensivist indicating the subjective predicted prognosis. The scores were based on the following groups:

0: Good long-term prognosis,
1: Poor long term prognosis. Survival beyond 6 months expected,
2: Poor short term prognosis. Less than 6 month survival expected,
3: Death within current hospital admission highly likely.

Details of patients' hospital outcome as well as survival beyond discharge were collected and compared to the Sabadell score.

RESULTS. A total of 1,568 patients were discharged from the Critical Care Unit at University Hospital Aintree between September 2011 and March 2013 and had died or reached hospital discharge at the time of data analysis. Of these, 1,160 were discharged between September 2011 and September 2012 and hence have 6-month survival outcome available. Table 1 shows age, APACHE 2 scores, length of Critical Care stay and in-hospital mortality for all patients as well as 6-month mortality for the subgroup. Table 2 shows the mean survivals in days and confidence intervals for post-hospital survival.

Table 1

Sabadell score	Number of patients	Age (Mean ± SD)	APACHE 2 (Mean ± SD)	Length of Stay (Mean ± SD)	In-hospital mortality	6-month mortality (n = 1,160)
0	619	53.4 ± 17.3	13.3 ± 5.4	3.3 ± 4.5	1.3 %	5.2 %
1	715	64.7 ± 13.5	15.6 ± 5.4	4.6 ± 6.4	3.2 %	12.1 %
2	191	66.3 ± 13.5	17.4 ± 5.6	6.0 ± 8.4	16.2 %	29.8 %
3	43	69.1 ± 14.1	20.9 ± 6.3	7.2 ± 7.8	48.8 %	60.6 %
Total	**1,568**	**60.6 ± 16.2**	**15.0 ± 5.7**	**4.3 ± 6.2**	**5.3 %**	**13.0 %**

Table 2

Sabadell	Mean			
	Estimate	Std. Error	95 % Confidence Interval	
			Lower Bound	Upper Bound
0	534.6	6.0	522.8	546.4
1	491.4	7.8	476.0	506.8
2	382.5	20.0	343.4	421.6
3	224.6	44.7	137.0	312.2
Overall	**487.3**	**5.5**	**476.4**	**498.1**

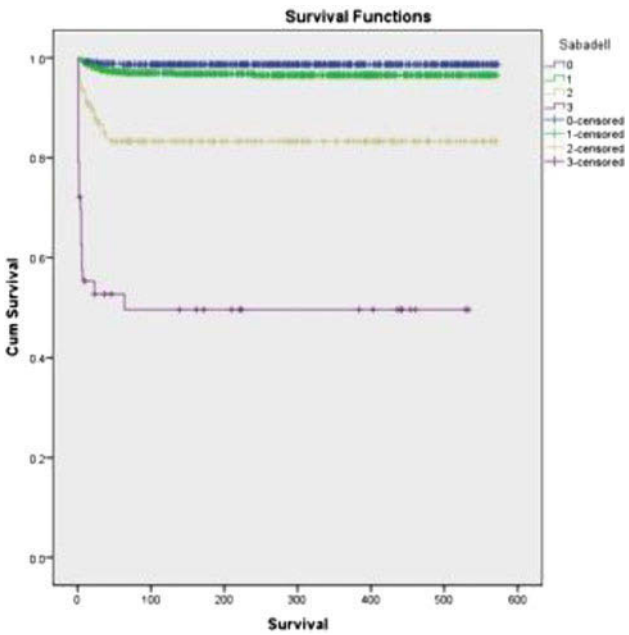


Figure 1 shows the Kaplan–Meier plot for hospital survival according to Sabadell score

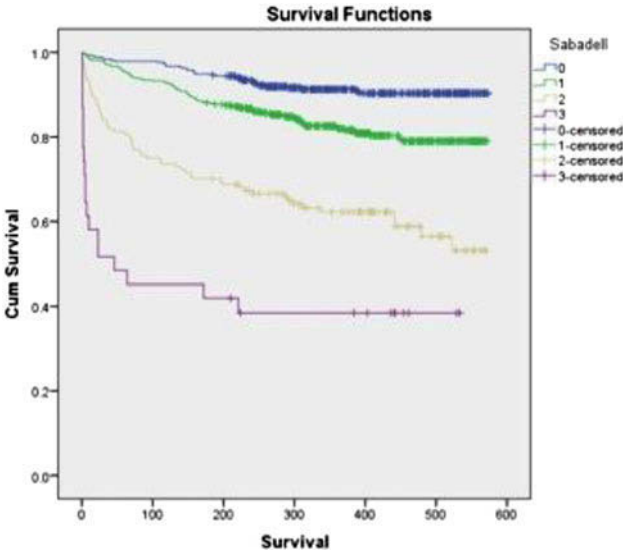


Figure 2 shows the Kaplan–Meier plot for post-hospital survival in days according to Sabadell score

CONCLUSIONS. Although a simple and subjective tool the Sabadell score seems to effectively stratify patients according to hospital outcome in the UK patient population. Critical Care Physicians seem to predict well those patients with a high likelihood of inpatient mortality. The score also seems to accurately stratify survival following hospital discharge at six months and beyond. It is hoped that this information could be used to help guide decision-making about appropriateness of readmitting patients to the Critical Care Unit following their initial discharge.

REFERENCES. 1. Fernandez R, Baigorri F, Navarro G, Artigas A. A modified McCabe score for stratification of patients after intensive care unit discharge: the Sabadell score. Crit Care 2006; 10:R179. 2. Fernandez R, Serrano JM, Umaran I et al. Ward mortality after ICU discharge: a multicenter validation of the Sabadell score. Intensive Care Med. 2010; 36:1196–1201.

1033
QUALITY OF LIFE RELATED FACTORS AFTER INTERMEDIATE CARE UNIT DISCHARGE

P. Oliveira[1], M. Bastos[1], L. Magalhães[1], M. Sousa[1], J. Valente[1], V. Dias[1]

[1]Centro Hospitalar Vila Nova de Gaia/Espinho, Internal Medicine Department - Intermediate Care Unit, Vila Nova de Gaia, Portugal

INTRODUCTION. Quality of life (QoL) after Intensive Care (ICU) admission has been studied and well characterized[1,2]. Patients admitted to Intermediate Care Units (ImCU) are critically ill and submitted to invasive procedures as well, but studies about influence of ImCU admission in patients QoL are lacking.

OBJECTIVES. To assess the impact of ImCU stay in patients QoL and to identify QoL related factors 6 months after ImCU discharge.

METHODS. Prospective, 4 years, observational study for QoL evaluation at 6 months of patients discharged from ImCU with more than 48 h of length of stay (LOS) capable of answer the queries. Eq5D and Visual analogue scale (VAS) were applied and a question to compare present health status with that 6 months before ImCU admission was added. Qui-square, Likelihood ratio and Independent Sample median tests were used.

RESULTS. Eq5D was administered to 189 patients at 6 weeks follow-up and from those to 142 at 6 months. 52 % were male, mean age 50 *[sd 17]* yoa, 97 % previously autonomous for daily activities (ADA), 47 % with co-morbidities and 24 % had a previous hospital admission. Patients were admitted mainly because of Pulmonary embolism (30 %), Pneumonia (12 %), Septic shock (9 %), Heart failure (6 %), Myxedema coma (6 %), Intoxication (5 %) and Neuromuscular disease (5 %). Median ImCU and in hospital LOS was 6 and 11 days, respectively. 14 % came from ICU and 18 % had complications in ImCU. At 6 months, 70 % had no mobility problems, 84 % had no problems in their self-care, 64 % had no problems in their usual activities, 54 % had no pain (37 % had moderate pain) and 57 % were feeling no anxiety (38 % had moderate anxiety). Only 14 % felt worse than 6 months before. EQ-VAS was 80. Co-morbidities were the most important determinant of low levels of QoL ($p < 0.001$). Previous hospital admission ($p = 0.021$) was associated with severe problems in mobility and self-care. Older age influenced mobility and pain ($p = 0.041$). ICU stay was related with less anxiety ($p = 0.005$). There was no difference concerning ImUCI or hospital LOS or in-hospital complications. Health status at 6 months before admission was worse in female gender ($p = 0.038$) and in patients with disabilities ($p = 0.006$). VAS score at 6 months was associated with co-morbidities ($p = 0.02$), age ($p < 0.001$) and hospital and intermediate care unit ($p < 0.001$) LOS.

CONCLUSIONS. More than 60 % of patients reported good recovery of their health 6 months after ImCU admission. Patients reported worse QoL in pain and anxiety domains than in physical ones. QoL is mainly related to previous co-morbidities and previous hospital admission. Although ImCU LOS and acute diagnosis were not related to worse QoL, levels were below those expected for general population, but better than those observed after ICU admission[2].

REFERENCES.1. Capuzzo M et al. Predictors of early recovery of health status after intensive care. ICM 2006. 2. Granja C et al. Quality of life after intensive care-evaluation with EQ-5D questionnaire. ICM 2002.

1034
PREDICTED AND OBSERVED OUTCOME OF CANCER PATIENTS IN INTENSIVE CARE UNIT AND HOSPITAL

C. Quintaneiro[1,2], I. Sanches[2,3], V. Domingues[2,4], I. Aragão[2], A. Bastos[2]

[1]Hospital Distrital da Figueira da Foz, Internal Medicine, Figueira da Foz, Portugal, [2]Hospital de Santo António-Centro Hospitalar do Porto, Unidade de Cuidados Intensivos Polivalentes, Porto, Portugal, [3]Centro Hospitalar e Universitário de Coimbra, Pneumology, Coimbra, Portugal, [4]Hospital de Santo António-Centro Hospitalar do Porto, Internal Medicine, Porto, Portugal

INTRODUCTION. Cancer is a prevalent and growing condition in western population leading to higher demands on ICU admissions to the intensive for this group of patients; howeverdata concerning the characteristics and outcome of this specific population are not well known.

OBJECTIVES. To characterize the population with any cancer admitted in a mixed Portuguese ICU and analyze short term outcome, exploring the relevance of cancer and comorbidities in mortality.

METHODS. Retrospective cohort of all cancer patients admitted to ICU between January 2010 and October 2012. Description of both solid and liquid tumors by gender, age, primary location, diagnosis and specific cancer therapy at admission, relation of cancer with admission, SAPS II, number of physiological dysfunctions at admission, ward and UCIP length of stay and mortality.

RESULTS. During the study period a total of 86 patients were included with a mean age of 66 ± 13,8 years old, 72 % were male (n = 62). Among this group of patients 62 had solid tumors mainly located in the abdomen and pelvis 60 % (n = 37), being 53 % (33) diagnosed in the previous year. From these 41 % (n = 26) were not under any specific therapy and they were admitted mainly due to the acute illness 75 % (n = 46). The liquid tumors were 24 mainly involving the bone marrow 79 % (n = 19) being 46 % (11) diagnosed in the previous year. From these 41 % (n = 10) were not under any specific therapy and they were also admitted mainly due to the acute critical illness 83 % (n = 20). SAPSII was 55 ± 21 with a predicted hospital mortality of 56 %; the observed hospital mortality was 45 %. The mean ICU stay was 12 and 10 days for solid and liquid cancer, respectively; the mean hospital length of stay was 22 and 30 days (idem). Mortality in the ICU was 40 % in solid and 58 % liquid cancer and the hospital mortality was 50 % and 63 % when the predicted was 41 and 77 % for solid and liquid.

CONCLUSIONS. Cancer patients admitted in this mixed ICU had mainly solid tumors. Both solid and liquid tumors were admitted at an initial stage of disease and were due to non-cancer related acute illness. Mortality relates with the number of dysfunctions at admission and SAPS II predicting with good accuracy the outcome .

REFERENCES.

1. Taccone FS, Artigas AA, Sprung CL, Moreno R, Sakr Y, Vincent J-L. Characteristics and outcomes of cancer patients in European ICUs. Critical care (London, England). 2009; 13(1):R15. 2. Bird GT, Farquhar-Smith P, Wigmore T, Potter M, Gruber PC. Outcomes and prognostic factors in patients with haematological malignancy admitted to a specialist cancer intensive care unit: a 5 yr study. British J Anaesth. 2012; 108(3):452–9. 3. de Jonge E, Bos MM. Patients with cancer on the ICU: the times they are changing. Critical care (London, England) 2009; 13(2):122.

1035
FUNCTIONAL STATUS AND RESIDUAL SYMPTOMS 6 AND 12 MONTHS FOLLOWING DISCHARGE FROM INTENSIVE CARE IN PATIENTS SURVIVING MULTIPLE ORGAN FAILURE

S. Rodriguez Villar[1], M. Sánchez Casado[2], P.M. Kilgour[3], V.A. Hortigüela Martín[4], C. Marco Schulke[4]

[1]Queen Elizabeth Hospital, Critical Care Medicine, London, UK, [2]Hospital Virgen de la Salud, Critical Care, Toledo, Spain, [3]School of Medicine, University of St Andrews, North Haugh, Anatomy, St Andrews, UK, [4]Hospital Virgen de la Salud, Critical Care Medicine, Toledo, Spain

INTRODUCTION. For intensive care patients, a critical condition should be seen as a journey which begins with acute deterioration and ends when the patient regains an acceptable state of health and functional status [(1-4)].

OBJECTIVES. The purpose of this study was to evaluate the functional status and residual symptoms exhibited by multi-organ failure (MOF) [5] patients following discharge from an intensive care unit (ICU) and to investigate their relation to the patients' baseline functional status, prior to ICU admission.

METHODS. 545 consecutively admitted adult patients with MOF according to the Sepsis-related Organ Failure Assessment criteria (SOFA) during the first 24 h of admission were included in the study. The residual symptomatology and functional status were assessed according to The Glasgow Outcome Scale Extended (GOS-E) and The Modified Rankin Scale (MRS) by means of a structured interview. Functional status and residual symptomatology were prospectively compared at 6 and 12 months post-discharge.

RESULTS. General characteristics during admission to ICU: 63 % male; age 60 ± 17 years; SOFA 7 ± 2 Acute Physiology and Chronic Health Evaluation (APACHE II) 17 ± 6; length of stay in ICU: 5.1 ± 28.4 days; Of the 228 patients who survived the first 6 months post-hospitalization, 5 % died during the subsequent months of follow-up, 24 % were able to go back to work 6 months post-discharge, though in some cases with limitations, and 70 % continued to suffer moderate-to-severe disability.

CONCLUSIONS. Follow-up interviews revealed that severely ill patients frequently present with "residual" symptomatology following discharge, most notably with arthromyalgia and asthenia. Many of these symptoms persist for months. Functional status improves over time especially between 6 and 12 months post-discharge and is related to the patient's prior functional status.

GRANT ACKNOWLEDGMENT. Financial support, including any institutional departmental funds, was not sought for the study.

REFERENCES.

1. Dowdy DW, Eid MP, Sedrakyan A, et al. Quality of life in adult survivors of critical illness: a systematic review of the literature. Intensive Care Med. 2005; 31:611–620.3. 2. Hofhuis JG, Spronk PE, van Stel HF, et al. The impact of critical illness on perceived health-related quality of life during ICU treatment, hospital stay, and after hospital discharge: a long-term follow-up study. Chest 2008; 133:377–385.4. 3. Kaarlola A, Pettila V, Kekki P. Quality of life six years after intensive care. Intensive Care Med 2003; 29:1294–1299. 4. Cheung AM, Tansey CM, Tomlinson G, et al. Two-year outcomes, health care use, and costs of survivors of acute respiratory distress syndrome. Am J Respir Crit Care Med 2006; 174:538–544. 5. Beal AL, Cerra FB. Multiple organ failure syndrome in the 1990's. Systemic inflammatory response and organ dysfunction. JAMA 1994; 271:226–233.2.

Salt, water and acidosis: 1036–1049

1036
INTRACELLULAR VOLUME AS A FUNCTION OF SODIUM LEVELS IN ICU PATIENTS. TESTING THE CURRENT DOCTRINE IN ERYTHROCYTES

A. Oude Lansink[1], E.J. Hoorn[2], M.H. Renes[1], M. Nijsten[1]

[1]University Medical Center Groningen, University of Groningen, Department of Critical Care, Groningen, The Netherlands, [2]Erasmus Medical Center, Department of Internal Medicine, Rotterdam, The Netherlands

INTRODUCTION. Conventional doctrine on intracellular (ICV) and extracellular volume (ECV) rests on two assumptions:

1) ECV and ICV follow changes in total sodium and potassium.

2) ECV and ICV are iso-osmotic implying that ECV and ICV also change proportionally to changes in total body water.

Although elegant, these principles are neither compatible with anecdotal clinical observations nor with experimental studies on the intrinsic stability of the ICV in vertebrates[1]. More exact knowledge on the effect of changes in water, sodium and potassium on ICV and ECV may have direct clinical relevance. The only directly measurable intracellular volume, is the erythrocyte volume. Since hemoglobin (Hb) and hematocrit (Ht) are often jointly measured we used Hb and Ht to asses changes in erytrocyte volume.

OBJECTIVES. Classical assumptions predict a negative relation between sodium and erythrocyte volume, and consequently a positive relation between sodium and mean corpuscular hemoglobin concentration (MCHC), as derived from Hb and Ht. Thus we assessed the relation between serum sodium and MCHC in a large group of ICU patients.

METHODS. A retrospective study performed in a cohort of anonymized ICU patients admitted between 2000 and 2011 to our adult 45-bed tertiary ICU. Since the hemoglobin content is virtually constant during the lifespan of erythrocytes, dynamic volume changes are inversely proportional to MCHC, which equals Hb Ht^{-1} (reference range 19.6–22.0 mmol L^{-1}). Serum sodium levels were compared with MCHC with linear regression analysis.

RESULTS. In 35,159 patients 197,736 triple measurements of sodium, Hb and Ht were available. Mean ± SD sodium was 138.7 ± 5.3 mmol L^{-1}, Hb was 6.5 ± 1.4 mmol L^{-1}, Ht was 0.313 ± 0.064 and MCHC was 20.6 ± 0.9 mmol L^{-1}. The corresponding coefficients of variation were 4, 21, 20 and 4 % respectively. Sodium levels showed a significant negative correlation with MCHC. MCHC = 25.51–0.04 sodium mmol L^{-1} ($P < 0.0001$). Thus erythrocyte volume had positive correlation with sodium.

CONCLUSIONS. In a large dataset we found positive relation between in vitro measured serum sodium and erythrocyte volume. This finding contradict shrinking of the erythrocyte under hypernatremia but support in vivo stabilization of erythrocyte volume in response to hyperosmolar stress, probably by generation of osmolytes. Because it is plausible that other intracellular compartments are osmolyte-stabilized as well[1], long-standing clinical assumptions regarding the distribution of infused fluid over ECV and ICV may not be valid.

REFERENCES.

Hoffmann EK, et al. Physiology of cell volume regulation in vertebrates. Physiol Rev. 2009;89:193.

1037
RAISING EXTRACELLULAR PH INHIBITS THE BIOLOGICAL AND RESISTANT ACTIVITY OF EXTENSIVELY DRUG-RESISTANT ACINETOBACTER BAUMANNII

L. Song[1], J. Wang[1], L. Liu[1], J. Chen[1], X. Xu[2]

[1]Forth Military Medical University/Xijing Hospital, Department of Pulmonary and Critical Care Medicine, Xi'an, China, [2]Forth Military Medical University/Xijing Hospital, Department of Clinical Laboratory, Xi'an, China

INTRODUCTION. Airways acidification can be observed in inflammation including the infection with Acinetobacter baumannii. Changing the circumastance pH would be a potential method to palliate the infection of multidrug resistant pathogen and promote the antibacterial activity of antimicrobialagents.

OBJECTIVES. The effect of raising extracellular pH would be investigated on the activity of extensively drug-resistant Acinetobacter baumannii (XDRAB) in vitro, and on the antibacterial activity of Cefoperazone/sulbactam (2:1,CSF) combined with Minocycline (MNO).

METHODS. 42 strains of XDRAB were isolated from sputum and were cultured in the Mueller–Hinton medium. With $NaHCO_3$ solution the extracellular pH were adjusted to 6.9, 7.4 and 7.8, respectively. The OD value of all strains in different pH would be examinated after 24 h. Based the pH diffirence change the minimum inhibitory concentration (MIC) of CSF, MNO and the combined intervene were determined. The fractional inhibitory concentration (FIC) indexes were calculated for the combination.

RESULTS. Compared with pH 6.9, in which OD value is 0.555 ± 0.200, the OD in pH 7.4 and pH 7.8 reduced significantly to 0.523 ± 0.187 and 0.512 ± 0.174 ($P < 0.01$), respectively. But there was no different between the latter two. With the pH increasing the MIC_G of CSF decreased gradually while MNO were converse. And the MIC_G were significantly different between pH 6.9 and pH 7.8 in both CSF and MNO groups ($P < 0.01$). In the combination intervene, the MIC_G of CSF decreased gradually following the rise of pH. The MIC_G in pH 7.8 (46.19 μg/mL) was lower than those in pH 6.9 (58.38 μg/mL) ($P < 0.01$) and in pH 7.4(55.14 μg/mL) ($P < 0.05$). All MIC_G of combination intervene were obviously lower than those of CSF alone with same concentration ($P < 0.01$). Under the combination intervene the MIC_G of MNO among different pH groups showed no difference, but were lower than those of MNO intervene alone. When the pH values were 6.9, 7.4 and 7.8, the percentage of $1 < FIC \leq 2$ were 73.81 %, 88.10 % and 71.43 %, respectively.

CONCLUSIONS. Compared with acidic environment, neutral or alkaline environment inhibited the XDRAB activity in vitro. Raising extracellular pH could promote the antibacterial activity of CSF or the combination of CSF and MNO on XDRAB.

REFERENCES. 1. Karaiskos I, Galani L, Baziaka F, Giamarellou H. Intraventricular and intrathecal colistin as the last therapeutic resort for the treatment of multidrug-resistant and extensively drug-resistant Acinetobacter baumannii ventriculitis and meningitis: a literature review. Int J Antimicrob Agents. 2013; pii: S0924–8579 [Epub ahead of print]. 3. Davis MD, Walsh BK, Dwyer ST, Combs C, Vehse N, Paget-Brown A, Pajewski T, Hunt JF. Safety of an alkalinizing buffer designed for inhaled medications in humans. Respir Care. 2012; [Epub ahead of print].

1038

ASSOCIATION BETWEEN HYPOPHOSPHATEMIA AND CARDIAC ARRHYTHMIAS: COULD PHOSPHATE REPLACEMENT THERAPY REDUCE THE INCIDENCE OF ARRHYTHMIAS

A. Schwartz[1], L. Koifman[1], E. Brotfein[1], A. Zlotnic[1]

[1]Soroka Medical Center, Beer-Sheba, Israel

INTRODUCTION. Critically ill patients have a high prevalence of hypophosphatemia. In a previous study (1) we showed that patients with sepsis and hypophosphatemia are at a greater risk of developing cardiac arrhythmias. To prevent this negative effect, it is vital to immediately identify patients with sepsis who are at risk of developing cardiac arrhythmias.

OBJECTIVES. The purpose of this study was to evaluate whether phosphate replacement therapy in the early stage of sepsis reduces the incidence of arrhythmias.

METHODS. We conducted a prospective controlled study in a general intensive care unit. 34 patients with sepsis but without any previous cardiac disease were studied during their first 24 h in the ICU. Patients were connected to a continous ECG recording device. Blood samples for serum phosphorus were drawn during the first 6 h after admission. The 34 patients received IV phosphate replacement therapy early after detection of hypophosphatemia until the serum level normalized. For the control group, we used the patients from our previous study, which included 16 patients in the early stage of sepsis with hypophosphatemia without IV phosphate supplementation.

RESULTS. In the phosphate-treated group, 14 patients (41.2 %) suffered from supraventricular and ventricular arrhythmias and 7 of these (50 %) needed antiarrhythmic medication. The mean phosphorus level was significantly lower in patients with arrhythmias (1.87 ± 0.4 mg/dl) than in patients without arrhythmias (3.5 ± 0.8 mg/dl; $p < 0.02$). Similarly, in the control group, patients with arrhythmias had significantly lower serum phosphorus levels (2.3 ± 0.5 mg/dl versus 3.2 ± 1 mg/dl; $p < 0.03$). The arrhythmia rate in the phosphate-treated group was 41.2 % (14/34) compared to 68 % (10/16) in the control group ($p < 0.001$).

CONCLUSIONS. Our results indicate that phosphate replacement therapy in early sepsis in patients with hypophosphatemia significantly reduces the incidence of arrhythmias.

REFERENCES. 1. Schwartz A, Gurman G, Cohen G, Gilutz H, Shenfeld Y. Association between hypophosphatemia and cardiac arrhythmias in the early stage of sepsis. Eur J Int Med. 2002;13:434–38.

1039

STRONG ION DIFFERENCE (UNMEASURED ANIONS) ANALYSIS BY STEWART SIMPLIFIED METHOD AS A MORTALITY PREDICTOR IN PATIENTS WITH SEPTIC SHOCK IN CRITICAL ILL PATIENTS

J.S. Sanchez[1], C. Meneses[1], A. Palacios[1], E. Monares[1], M. Poblano[1], J. Franco[2]

[1]ABC Medical Center, Critical Care, Mexico, Mexico, [2]ABC Medical Center, Critical Care/ Chief Department, Mexico, Mexico

INTRODUCTION. A new interest has led to renewal in the evaluation of acid–base balance, with the increasing use of the Stewart Model (theory of strong ion difference), to calculate the acid–base balance in critically ill patients. This is one of several methods that can be used in the intensive care unit for a quantitative assessment. In this study, the SIG was calculated by the following formulas: (Base Deficit Related to Albumin Levels) BDalb = [42 - albumin (g/L)] × 0.25, (Base Deficit Related to Na–Cl Levels) BDNa–Cl = Na–Cl - 32, (Base Deficit Related to Unmeasured Anions) BDUMA = BDtot - BDalb - BDNa-Cl, finally (Unmeasured Ions) UMA = 2.39 - (0.871 × BDUMA).

OBJECTIVES. Analyze Stewart Simplified Method for predicting mortality at day-28 of stay in the ICU in patients with septic shock.

METHODS. This was a retrospective observational study, conducted in an intensive care unit of a tertiary care hospital. We included all patients with septic shock admitted to the ICU from January 2005 to December 2012. The next measures were collected: Sequential Organ Failure Assessment (SOFA), Central Venous O_2 Saturation ($ScvO_2$), Shock Index (SI), pH, Base (B), Strong Ion Gap (SIG), Cardiac Index (CI), Anions Not Measured (UMA) were measured at time of admission and 24 h later. The SIG was calculated in a simplified manner through the following formulas: BDalb = [42 - albumin (g/L)] × 0.25, BDNa-Cl = Na - Cl - 32, BDUMA = BDtot - BDalb - BDNa-Cl, finally UMA = 2.39 - (0.871 × BDUMA).). Normally-distributed variables were compared with an Independent T-Test; Threshold UMA predictive value to predict mortality were obtained to maximize the ROC. Table 1.

Table 1. Baseline Characteristics of the Population at Admission N=41		
Age	62.5	DS ± 15.5
SOFA (points)	10	DS ± 4
SvcO2 (%)	63	DS ± 14
Shock Index lpm/mmHg	1.0	DS ± 0.3
pH	7.31	DS ± 0.10
Base	-5.5	DS ± 7
SIG	-2.5	DS ± 7.5
CI	3.6	DS ± 1.5
UMA	4.0	DS ± 6.8

Baseline characteristics

RESULTS. N = 41, M/F n = 24(58 %)/17(42 %); Surviving 21(51 %), Non survivors: n = 20 (49 %). The difference between non-survivors and survivors at time of admission and 24 h later can be seen in Table 2. Assuming a pre-test mortality probability of 49 %, an UMA > -2 predicts a 10 % post-test mortality rate.

Difference Between Survivors and Non-Survivors at Admission			
	Survivors n= 21	Non-Survivors n= 20	p
Age	61.5 ± 17	63.5 ± 14	0.6
SOFA	9.9 ± 4	10.5 ± 3.4	0.6
SvcO2	60.7 ± 15	65 ± 12	0.24
SI	0.9 ± 0.3	1.0 ± 0.3	0.001
pH	7.32 ± .11	7.3 ± .10	0.87
B	-4.5 ± 7	-6.3 ± 6.0	0.042
SIG	-1.3 ± 7.3	-3.8 ± 7.6	0.2
CI	3.7 ± 1.0	3.8 ± 1.8	0.21
UMA	1.9 ± 7.4	6.2 ± 5.5	0.04
Difference Between Survivors and Non-Survivors at 24 hours			
	Survivors n= 21	Non-Survivors n= 20	p
SOFA	10.0 ± 3.8	11.4 ± 3.2	0.23
SvcO2	70.8 ± 9.4	71 ± 9.7	0.9
SI	0.7 ± 0.18	1.0 ± 0.3	0.001
pH	7.39 ± 0.6	7.38 ± 0.09	0.21
B	-1.2 ± 4.5	-3.0 ± 6.1	0.27
SIG	4.2 ± 10.5	-3.8 ± 12	0.28
CI	3.7 ± 1.0	3.8 ± 1.8	0.7
UMA	-1.9 ± 7.1	-0.34 ± 10	0.5

Analysis of ROC for Baseline Values as Predictors of Mortality in Septic Shock							
	AUC	CI 95%	p	Sen%	Sp%	Cut-off	LR+	LR-
UMA	0.674	0.503-0.854	0.05	90	40	-2mmHg	1.5	0.25

Difference between survivors and non-survivors

CONCLUSIONS. The SIG simplified formula is not statistically significant. The correction to determine UMA is slightly useful in identifying patients at lower risk of death from septic shock. Within 24 h the formula loses its predictive value, maybe for the alterations in acid base status conditioned by administration of hyperchloremic solutions.

1040

PROGNOSTIC IMPACT OF SERUM SODIUM CONCENTRATION CHANGES IN CRITICALLY-ILL PATIENTS WITH DYSNATREMIA

M. Darmon[1], M. Pichon[1], C. Schwebel[2], S. Ruckly[3], C. Adrie[4], H. Haouache[5], E. Azoulay[6], L. Bouadma[7], C. Clec'h[8], L. Argaud[9], B. Allouchiche[10], M. Garrouste-Orgeas[11], B. Souweine[12], A.-S. Dumenil[13], D. Goldgran-Toledano[14], S. Jamali[15], H. Khallel[16], F. Zeni[1], J.-F. Timsit[2], Outcomeréa Study Group

[1]Saint-Etienne University Hospital, Medical-Surgical ICU, Saint-Etienne, France, [2]Grenoble University Hospital, Medical ICU, Grenoble, France, [3]University of Grenoble 1, Integrated Research Center U 823, Grenoble, France, [4]Cochin University Hospital, Department of Physiology, Paris, France, [5]Henri Mondor University Hospital, Surgical ICU, Créteil, France, [6]Saint-Louis University Hospital, Medical ICU, Paris, France, [7]Bichat University Hospital, Medical ICU, Paris, France, [8]Avicenne University Hospital, Medical-Surgical ICU, Bobigny, France, [9]Edouard Herriot University Hospital, Medical ICU, Lyon, France, [10]Edouard Herriot University Hospital, Surgical ICU, Lyon, France, [11]Saint-Joseph Hospital, Medical ICU, Paris, France, [12]Gabirel Montpied University Hospital, Medical ICU, Clermont-Ferrand, France, [13]Antoine Beclére University Hospital, Surgical ICU, Clamart, France, [14]Gonesse Hospital, Medical-Surgical ICU, Gonesse, France, [15]Dourdan Hospital, Medical-Surgical ICU, Dourdan, France, [16]Cayenne Hospital, Medical-Surgical ICU, Cayenne, French Guiana

INTRODUCTION. Abnormal serum sodium concentrations adversely affect physiologic function and may be associated with adverse outcome [1, 2]. Little informations are however available regarding influence of dysnatremia correction on outcome.

OBJECTIVES. Main objective of this study was to assess prognostic impact of serum sodium concentration changes in patients with dysnatremia at ICU admission.

METHODS. Prospective observational multicenter cohort study performed in thirteen intensive care units. Patients admitted between 2005 and November 2012 in the participating ICUs and with an ICU stay longer than 72 h were included in this study. Hypernatremia was defined as a serum sodium concentration > 145 mmol/L and hyponatremia as a serum sodium concentration < 135 mol/L. ICU-acquired hypernatremia was defined as a hypernatremia occurring after 24 h of ICU stay. Persistent dysnatremia was defined as a dysnatremia at ICU admission persisting at day 3.

Results are reported as n (%) or median (IQR). Influence of dysnatremia and changes in serum sodium concentration were assessed using a logistic regression model where day 28 survival was the variable of interest.

RESULTS. 7,067 patients were included in this study. At admission (Day 1), 1,830 patients (25.9 %) had hyponatremia and 634 patients (9.0 %) had hypernatremia. Correction of hyponatremia at day 3 was observed in 1,019 patients (55.7 %). Correction of hypernatremia was observed in 393 patients (62.0 %). Last, 263 patients without dysnatremia (5.7 %) developed a hyponatremia and 449 (9.8 %) a hypernatremia.

After adjustment for confounders, persistent hyponatremia at day 3 and persistent hypernatremia at day 3 (OR 1.30, 95 %CI 1.06–1.60 and OR 1.91, 95 %CI 1.40–2.60 respectively) were independently associated with day-28 mortality. Similarly, ICU-acquired hypernatremia at day 3 (OR 1.58, 95 %CI 1.17–2.15) was independently associated with mortality.

Neither hyponatremia with correction at day 3, hypernatremia with correction at day 3 nor ICU-acquired hyponatremia were associated with outcome (OR 0.88, 95 %CI 0.72–1.07; OR 0.98, 95 %CI 0.74–1.31 and OR 1.07; 95 %CI 0.80–1.44 respectively).

In patients with dysnatremia at admission, median correction rate between day 1 and day 3 was 2.6 mmol/day (IQR 0.67–4.55). Higher serum sodium concentration correction rate was associated with lower adjusted mortality (OR per mmol/day 0.93, 95 %CI 0.90–0.97).

CONCLUSIONS. Our results confirm the prognostic association between dysnatremia and outcome. However, early correction of dysnatremia may reverse the association between dysnatremia and day 28 mortality. These results suggest that the prognostic association between dysnatremia and outcome may reflect either a direct prognostic impact of dysnatremia or that dysnatremia is a surrogate for quality of care.

REFERENCES. 1. Funk et al. Intensive Care Med 2010. 2. Darmon et al. Crit Care 2013.

1041
PREVALENCE AND TIME COURSE OF METABOLIC ACIDOSIS IN ELECTIVE MAJOR SURGERY, AND ASSOCIATED FACTORS - THE BADASS STUDY

T. Lawton[1], S. Fletcher[1], A. Quinn[1], B. Booth[1]

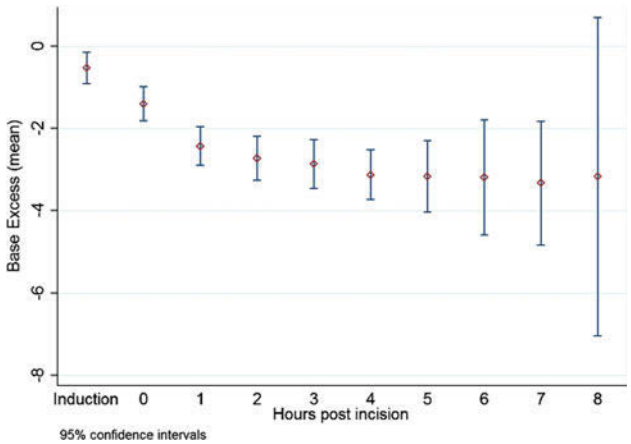
[1]Bradford Teaching Hospitals NHS Foundation Trust, Bradford, UK

INTRODUCTION. Metabolic acidosis (MA) is felt to be a deleterious state; we have noticed many surgical patients admitted to ICU are acidotic. Existing data on the topic are limited.

OBJECTIVES. We aimed to estimate the prevalence and time course of MA in major surgery, and to generate hypotheses about causes using multiple regression models.

METHODS. We recruited 92 patients undergoing elective major surgery requiring ICU and intra-arterial monitoring. Arterial blood was sampled awake, at incision, and every hour subsequently. We also recorded drug and fluid use.

RESULTS.



Base excess by hour

Metabolic acidosis timing

Time	pH (mean ± SEM)	BXS (mean ± SEM)	Lactate (mean ± SEM)	BXS ≤−2 (proportion)
Awake	7.42 ± 0.003	−0.5 ± 0.2	1.2 ± 0.05	18 %
Incision	7.39 ± 0.005	−1.4 ± 0.2	1.3 ± 0.06	37 %
1 h post	7.36 ± 0.006	−2.5 ± 0.2	1.4 ± 0.07	59 %
End of	surgery	7.35 ± 0.006	−3.4 ± 0.2	2.1 ± 0.14
79 %				

MA began prior to incision and most of it had occurred by the first hour post incision. By the end of surgery (mean 3.8 h) 79 % of patients had a significant MA (base excess < −2). The late acidosis accompanied a rising lactate, unlike the early acidosis.

The regression model of early acidosis was unsuccessful; no measured factor was a significant predictor (adjusted R^2 0.02). The late acidosis model was better (adjusted R^2 0.51) and showed a significant effect of early fluids in preventing acidosis.

Post incision acidosis: predictors

Predictor	Predicted Change in BXS	95 %CI	p
Hartmanns pre-incision	+1 per 780 ml	430 ml to 4,330 ml	0.02
Saline pre-incision	+1 per 430 ml	260 ml to 1,320 ml	0.004
Volulyte pre-incision	+1 per 260 ml	190 ml to 430 ml	<0.001
Surgery Type (vs open)	+1.1	0.2 to 2.1	0.02
- Lap/Thoracoscopic	+1.4	0.3 to 2.5	0.01
- Body surface			
Blood rate post-incision	−1 per 130 ml/hr	90 ml/h to 210 ml/h	<0.001
Gelofusine rate post-incision	−1 per 480 ml/hr	260 ml/h to 3,500 ml/h	0.02
CO_2 change post-incision	+0.27 per 1 kPa rise	−0.02 to +0.57 per 1 kPa	0.07

There was a trend towards increased ICU stay (by 1.4 days) and hospital stay (by 2.6 days) where significant MA was present at the end of surgery, after controlling for surgery type and length, but this did not reach statistical significance.

CONCLUSIONS. The magnitude of MA at the end of surgery was in line with previous studies.[1,2] This is the first large study to evaluate the evolution of MA, and shows that acidosis starts prior to incision and most of it occurs by the first hour post incision. The failure of the regression model to predict early acidosis may relate to homogeneity in anaesthetic technique, unmeasured variables, or it being an unavoidable consequence of anaesthesia. Desflurane was the main maintenance agent used in this study, and has been associated with acidosis.[3]

The model for late acidosis fits very well and gives the expected result that more invasive surgery was associated with a greater acidosis, although operation length did not predict acidosis. Fluids given pre-incision appeared to protect against acidosis roughly in line with their volume retention at 6 h,[4] suggesting volume expansion as a mechanism. Intra-operative colloids predicted acidosis; this is probably correlation rather than causation.

Future research in this area should try to confirm whether MA is harmful, and if so evaluate strategies for its reduction. Our regression model suggests that early fluid administration may be preventative.

REFERENCES. 1. Waters JH et al. Cause of metabolic acidosis in prolonged surgery. Crit Care Med. 1999;27:2142–6 2. Park C-M et al. Factors related to post-operative metabolic acidosis following major abdominal surgery. ANZ J Surg. 2012 (online). 3. Weiskopf RB et al. Cardiovascular Actions of Desflurane in Normocarbic Volunteers. Anesth Analg. 1991;73:143–56. 4. Reid F et al. Hartmann's solution: a randomized double-blind crossover study. Clin Sci. 2003;104:17–24.

1042
QUANTITATIVE ANALYSIS OF IATROGENIC HYPERCHLORIDAEMIA CAUSED BY GUIDELINE-DRIVEN RESUSCITATION OF DIABETIC KETOACIDOSIS

M. O'Meara[1], J. Offer[1], G. McNeill[1], F. Duska[1]

[1]Nottingham University Hospitals NHS Trust, Adult Intensive Care Unit, Nottingham, UK

INTRODUCTION. Guidelines worldwide [1,2,3] recommend the use of 0.9 % NaCl solution (normal saline, NS) as the initial choice of fluid for the volume repletion in patients presenting with diabetic ketacidosis (DKA).

OBJECTIVES. To analyse the degree of hyperchloridaemic component of metabolic acidosis during the treatment of DKA using Stuart's quantitative approach.

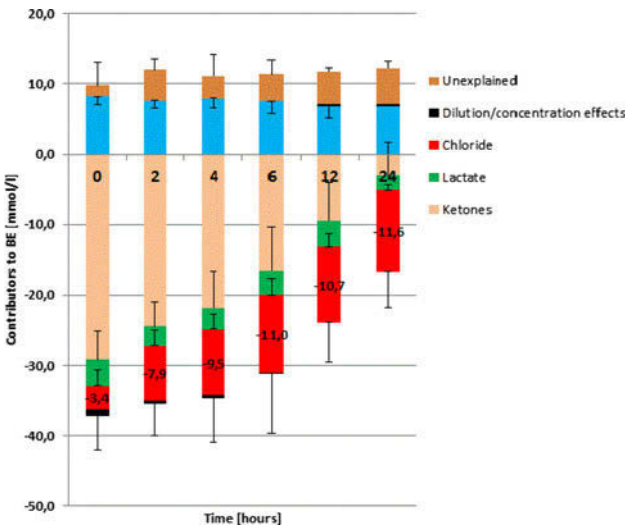
METHODS. A retrospective case series of all adult patients treated for DKA in ICU of Nottingham University Hospitals in 2012. We analysed serial acid–base parameters during 24 h after admission and calculated (as described in [4] and by Lloyds [5]) the quantitative contribution of following components of acid–base disorder: L-lactate, net-unmeasured acids (mostly reflecting ketones), change of SID due to water shifts (dilutional acidosis), hyperchloridaemic component as well as changes attributable to shifts in the concentration of weak acids (mostly hypoalbuminaemic alkalosis). Lastly, we compared the results with BE value calculated by ABL90 FLEX blood gas analyser (Radiometer, Denmark).

RESULTS. Out of 168 patient presenting with DKA in 2012, 5 were admitted to ICU (3 M + 2F, age 44-69 years, all already known type 1 diabetics), none of them required echanical ventilation or renal replacement therapy. All patient were initially resuscitated with 0.9 % NaCl together with fixed insulin rate at 0.1 IU/kg,h according to local guidelines [1].

Acid–base during treatment of DKA (mean ± SD)

Time [hours]	0 (Baseline)	2	4	6	12	24
BE [mM]	−27.4 ± 5.4	−23.6 ± 1.9	−23.6 ± 4.7	−19.9 ± 6.6	−12.1 ± 8.2	−4.4 ± 7.8
pH	6.910 ± 0.130	7.020 ± 0.044	7.016 ± 0.131	7.112 ± 0.127	7.258 ± 0.128	7.396 ± 0.129
Na + [mM]	125 ± 8	134 ± 9	134 ± 10	138 ± 8	138 ± 8	142 ± 10
Cl (act., [mM])	94 ± 9	106 ± 11	107 ± 10	111 ± 3	111 ± 2	115 ± 4
Cl (corrected, [mM])	105 ± 6	110 ± 6	112 ± 7	113 ± 9	113 ± 7	114 ± 5

As demonstrated in Table and Figure, unmeasured acids (ketones) and L-lactate cleared quickly. After 24 h, the main factor responsible for remaining base deficit was iatrogenic hyperchloridaemia, partially outweighed by hypoalbuminaemic alkalosis. The effects of concentration/dilution were negligible and our model failed to explain 2-5 mM of base excess.



Components of base deficit (means, SD)

An extensive audit of all 118 subjects including the fluids infused will follow.

CONCLUSIONS. Iatrogenic hyperchloridaemia during the treatment of DKA is a significant contributor to non-resolving acidosis, adding ~ 12 mM to the base deficit after 24 h of treatment of DKA in our case series. Our data are supportive to the use of balanced solutions for volume replacement during the management of DKA and stress the importance of appropriate acid–base analysis when dealing with non-resolving base deficit in DKA.

REFERENCES. 1. Diabetic Ketoacidosis in Adults. NUH Guideline, May 2012, ver. 2. Online https://www.nuh.nhs.uk/healthcare-professionals/clinical-guidelines/ 2. Savage MW et al. Joint British Diabetes Societies guideline for the management of diabetic ketoacidosis. Diabetc Med 2011;28:508–15. 3. http://www.diabetessociety.com.au/downloads/Type1guidelines(7Feb11).pdf 4. Kellum JA, Elbers PWG. Stewart's Textbook of Acid–Base. 2nd Edn, Amsterdam 2009;. ISBN 978-1-4092-5470-6 5. Acid–Base Calculator V10.8. available at http://www.acidbase.org/phpscripts6/downloads.php

1043
ELECTROLYTE DISTURBANCES FOLLOWING INTRODUCTION OF NUTRITIONAL SUPPORT IN CRITICALLY ILL PATIENTS: PRELIMINARY DATA FROM A PROSPECTIVE STUDY

A. Drolz[1], M. Wewalka[1], T. Horvatits[1], M. Schmid[1], V. Fuhrmann[1], C. Zauner[1]

[1]Medical University of Vienna, Internal Medicine III, Gastroenterology and Hepatology, Vienna, Austria

INTRODUCTION. Electrolyte disturbances are a known complication associated with introduction of artificial nutrition. Hyposphosphatemia is the laboratory hallmark of nutrition-associated complications during re-feeding in undernourished patients at the hospital. Incidence and features electrolyte-shifts, especially of phosphate, associated with nutritional support in critically ill patients have not been evaluated.

OBJECTIVES. To assess incidence and features of electrolyte-shifts associated with nutritional support at the intensive care unit.

METHODS. For this prospective cohort study, one hundred critically ill patients consecutively admitted to the ICU and requiring artificial nutrition were studied. Type and amount of nutritional support as well as laboratory analyses were documented for 1 week following the start of artificial nutrition. Serum phosphate was considered the primary indicator for electrolyte disturbances associated with nutritional support.

RESULTS. Of 100 patients, 30 were female. Median age was 60 years (IQR 50–70) and median SOFA score on admission was 10 (IQR 8–12).

The vast majority of patients received nutritional support via the enteral route only (79 %), whereas 3 % received parenteral nutrition only. 18 % received both types of nutritional support.

Twelve percent of all patients included showed decreased phosphate-levels (< 0.8 mmol/l) prior to introduction of nutritional support. Of the remaining patients, 23 (26 %) showed a drop in phosphate-levels to < 0.6 mmol/l following the start of nutritional support. In 4 patients this phosphate drop was associated with a decrease in serum magnesium levels to < 0.66 mmol/l (lower reference level), 5 patients showed a drop in serum potassium levels to < 3.5 mmol/l (lower reference level), and 2 patients presented a decrease in phosphate, magnesium and potassium. Nadir levels of phosphate were observed on day 3 (IQR 2–5) of nutritional support.

CONCLUSIONS. Hypophosphatemia following introduction of nutritional support is frequently observed in critically ill patients. Serum-electrolytes should be closely monitored during the first week of nutritional support. Future studies should evaluate the impact of nutrition-associated electrolyte disturbances on complications and outcome in critically ill patients.

1044
PHOSPHATE LEVELS IN ICU PATIENTS. A RETROSPECTIVE, OBSERVATIONAL STUDY LOOKING AT PHOSPHATE LEVELS AND MORTALITY IN ICU PATIENTS

S. Bengeri[1], M. Balasa[1]

[1]Darlington Memorial Hospital, Anaesthesia and Intensive Care, Darlington, UK

INTRODUCTION. Hypophosphatemia is one of those frequently encountered electrolyte disorders, for which many causative factors are present in critically ill patients. It is uncertain when and how to correct hypophosphatemia, did phosphate levels on the day of admission to ICU and whether its correction affects outcome in critically ill patients. Phosphate is essential in many activities like ATP production, cell wall integrity and it affects contraction of muscle. Hypoposphataemia is believed to make critically ill patients weak and delay the respiratory weaning. All our patients with hypoposphataemia are treated with IV phosphate repletion.

OBJECTIVES. To search for answers to the following questions:

(a) Whether pre-admission phosphate levels made any difference to mortality.

(b) Whether correction of hypophosphatemia is associated with improved outcome.

Our hypothesis, H0, was there was no difference in discharge and death rates from our ICU in patients who had PO4-levels less than 0.81 mmol/Liter on day Zero.

METHODS. All patients admitted to adult ICU between1 January and 31December 2011 were included in the study. The data was gathered from hospital admission data. The following data was collected; hospital number, date of admission, date of discharge or death, sex, mortality data. Phosphate levels were collected using iSoft. The data was collated using MS Excel data sheet. Phosphate levels on the day of admission to hospital, lowest & highest-level phosphate during their ICU stay were collected. Patients who did not have their phosphate levels measured on the day of admission and during their ICU stay were excluded from the study. Phosphate levels on the day of admission to hospital (Day Zero), the highest-levels and the lowest-levels during their ICU and hospital stay until discharge or day of death were grouped under three groups; hypo-, normo-, and hyper-phosphataemia according to the levels < or = 0.81, between 0.81–1.45 and > or = 1.45. Discharge rates and mortality rates from hospital were calculated according to the phosphate levels on the day zero, highest and lowest-levels of phosphate using MS Excel spreadsheet.

RESULTS. A total of 309 patients were included in the study.184 patients left the hospital and 125 patients died. The incidence of hypoposphataemia on day zero was 61/309 (19.74 %). 40/184(22 %) patients who left the hospital alive and 21/125(17 %) patients who died had hypo-phosphataemia on day zero. 69 % of patients who died had hypoposphataemia during ICU stay despite treatment compared to 50 % of patients in discharge group.

CONCLUSIONS. Day Zero phosphate levels had no correlation with outcome. The incidence of hypoposphataemia on day zero was 19.74 %. Our data (Grade 2C) shows the 69 % of patients in fatal group had hypoposphataemia despite treatment as per our hospital policy.

REFERENCES. 1. Westerblad H et al. Physiology 2002;17:17–21 2. Uptodate

1045
VALIDATION OF A NINE PARAMETER STANDARD BASE EXCESS MODEL IN A COHORT OF CARDIAC SURGICAL PATIENTS

M. Agrafiotis[1], F. Ampatzidou[1], K. Diplaris[2], O. Ananiadou[2], M. Sileli[1], G. Drosos[2]

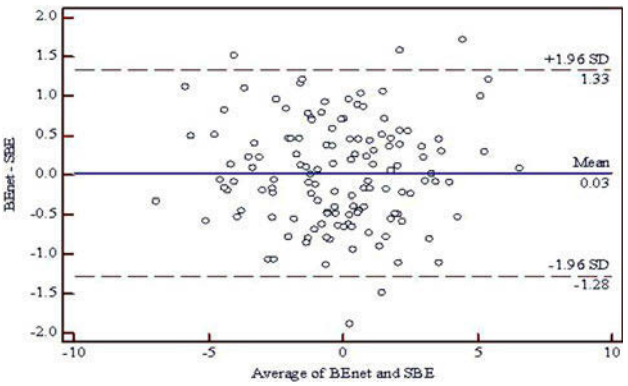
[1,]'G. Papanikolaou' General Hospital, ICU Department, Exohi Thessaloniki, Greece, [2,]'G. Papanikolaou' General Hospital, Cardiothoracic Surgery Department, Exohi Thessaloniki, Greece

INTRODUCTION. Standard base excess (SBE) is a marker of the metabolic acid base status and can be easily calculated from the Van Slyke equation[1]. Recently, Wolf and DeLand proposed a new method for calculating SBE[2]. This method considers the ionic and osmotic interactions of the erythrocytes, plasma and interistium and models SBE as the sum (BEnet) of the contributions of the nine parameters, namely the deviations of Na, K Cl, lactate, Ca + Mg, albumin, phosphate and unmeasured ions from their reference values, as well as the effect of the dilution.

OBJECTIVES. To validate this new model by comparing BEnet and SBE.

METHODS. We evaluated data obtained from 135 postoperative cardiac surgical patients (age 64.5 ± 10.9 years, 94 males). Demographic (sex, weight, height), acid base (pH, PCO_2) and blood chemistry (Hb, K, Na, Cl, Ca, Mg, Lac, albumin, phosphate) data were entered into the VisSim Viewer simulation software to calculate the individual BE partitions and BEnet. SBE and BEnet were compared by Bland–Altman and concordant correlation analysis. A mean bias of 1 meq/l with limits of agreement 1 meq/l and a concordant correlation coefficient (rc) > 0.9 were considered to indicate strong agreement.

RESULTS. Mean bias was +0.03 with upper limit of agreement +1.33 (95 % CI 1.13, 1.53) and lower limit of agreement −1.28 (95 % CI −1.47, −1.08), (figure) while rc was 0.97 (95 % CI 0.95, 0.98).



Results

CONCLUSIONS. BEnet as estimated per the Wolf and Deland model seems to be a reliable approximation of SBE. This model could provide insights into the mechanisms of acid base disturbances.

REFERENCES. 1. Siggaard-Andersen O, Fogh-Andersen N. Acta Anaesthesiol Scand Suppl. 1995. 2. Wolf MB, DeLand EC. J Clin Monit Comput 2011.

1046
RENAL TUBULAR ACIDOSIS CONTRIBUTES TO HYPERCHLOREMIC ACIDOSIS IN CRITICALLY ILL PATIENTS

R. Brunner[1], A. Drolz[1], T.-M. Scherzer[1], K. Stauffer[1], V. Fuhrmann[1], C. Zauner[1], U. Holzinger[1], B. Schneeweiß[2]

[1]Medical University of Vienna, Dept. of Medicine III, Vienna, Austria, [2]Landeskrankenhaus Kirchdorf, Medical Department, Kirchdorf, Austria

INTRODUCTION. Hyperchloremic acidosis is frequent in critically ill patients. Renal tubular acidosis (RTA) may contribute to acidemia in the state of hyperchloremic acidosis

OBJECTIVES. We aimed to investigate the prevalence, type, and possible risk factors of RTA in critically ill patients using a physical–chemical approach.

METHODS. In this prospective observational trial conducted in an eight-bed medical ICU we included 100 consecutive critically ill patients at the age ≥ 18, the expectancy to stay in the ICU for ≥ 24 h, the clinical necessity for a urinary catheter, and the absence of anuria. Base excess subset calculation on the first 7 days after ICU admission was used to compare the effects of free water, chloride, albumin, and unmeasured anions on the standard base excess according to the approach of Gilfix et al. Calculation of the urine anion gap (UAG) − as an approximate measure of the unmeasured urine cation NH^{4+} − served as determinate between renal and extra-renal bicarbonate loss in the state of hyperchloremic acidosis.

RESULTS. During the first week of ICU stay 43 % of the patients presented with hyperchloremic acidosis on one or more days represented as pronounced negative Base $Excess_{Chloride}$. However, this was neutralized in two-thirds of the patients mainly by simultaneously decreased serum albumin leading to a neutral arterial pH. Hyperchloremic acidosis in the state of acidemia was found in 16 % of the patients. In 88 % of these patients bicarbonate loss was associated with RTA characterized by a negative UAG. The most frequent type of RTA was Type II (79 %), followed by Type I (14 %), and Type IV (7 %).

CONCLUSIONS. Hyperchloremic acidosis is ubiquitous in critically ill patients, whereas it is often neutralized by the simultaneous occurrence of other acid–base disturbances. RTA frequently contributes to acidemia in the state of hyperchloremic acidosis.

1047
TIME COURSE OF HYPONATRAEMIA IN CRITICAL CARE

A.E. Nee[1], I. Welters[2,3], R. Kolammunage-Dona[4], T. Steele[1]

[1]Liverpool University, Institute of Ageing and Chronic Disease, Liverpool, UK, [2]University of Liverpool, Institute of Ageing and Chronic Disease, Liverpool, UK, [3]Royal Liverpool University Hospital, Intensive Care Unit, Liverpool, UK, [4]University of Liverpool, Department of Biostatistics, Institute of Translational Medicine, Liverpool, UK

INTRODUCTION. Dysnatraemia, (serum sodium < 135 mmol/L or > 145 mmol/L) is common in critically ill patients, impacting on both morbidity and mortality.[1] Causes are multifactorial and may elude diagnosis.[2] Sodium levels frequently change over the course of a patients stay in Critical Care Units as a result of myriad factors; all of which need to be identified to allow appropriate management.[3]

OBJECTIVES. This study aims to explore the time course and the factors associated with hyponatraemia, in critically ill patients.

METHODS. We retrospectively collected data from all patients admitted to the Intensive Care Unit (ICU), of a university teaching hospital. Patient demographics, admission diagnosis, serial sodium levels and associated electrolyte concentrations during the first 4 days

following admission were analysed for their effect on outcome measures. Repeated measures analysis of variance (ANOVA) was used to assess the influence of time post admission on sodium concentration. Logistic regression was carried out to compare normonatraemic patients with hyponatraemic based on a matched case–control analysis. Cumulative survival was assessed using Kaplan–Meier curves and log rank tests.
RESULTS. Data on 1,034 patients (56.9 % male, mean age 59, mean APACHE II score 19) were analysed. The median ICU length of stay was 8 days and the overall 28-day mortality was 18 %. The incidence of hyponatraemia was 30.3 %; with 21 % being mild (130–134 mmol/L), 4.5 % moderate (125–129 mmol/L) and 2.2 % severe (< 125 mmol/L). Just over 2 % of patients were hypernatraemic (> 145 mmol/L) at admission. Hyponatraemia was associated with a history of alcohol excess, chronic kidney disease and a high APACHE 2 score ($p < 0.01$, $p = 0.04$ and $p < 0.01$, respectively). Abnormalities of blood levels of potassium, chloride and lactate were shown to be strong predictors of sodium derangement (all $p < 0.01$). Sodium on admission significantly affected change in sodium level over time ($p < 0.01$), however there was no impact on mortality ($p = 0.545$). Those with moderate and severe hyponatraemia failed to fully normalise their sodium concentration by the fourth day of ICU admission.
CONCLUSION. Our results indicate that hyponatraemia remains a significant problem within critical care and affects nearly one-third of patients. Despite fluid replacement, sodium concentrations do not normalise over the first 4 days post admission. Further studies are warranted to identify factors contributing to dysnatraemia, but also to investigate the most successful treatment strategies.
REFERENCES. 1. Funk G-C et al. Incidence and prognosis of dysnatremias present on ICU admission. Intensive Care Med. 2010; 36:304–11. 2. Fenske W et al. Utility and limitations of the traditional diagnostic approach to hyponatremia: a diagnostic study. Am J Med 2010; 123:652–7. 3. Pokaharela M, Block CA. Dysnatremia in the ICU. Curr Opin Crit Care. 2011;17:581–93.

1048
DAILY VARIATION OF PREDOMINANT INTRACELLULAR IONS IN ENTERALLY AND PARENTERALLY FED PATIENTS IN A UK TERTIARY ICU

R. Gokhale[1], A. Paterson[1], D. Lukk[1], R. Thomson[1], R. Mahroof[1]

[1]Addenbrooke's Hospital, John Farman ICU, Department of Critical Care and Anaesthesia, Cambridge, UK
INTRODUCTION. Artificial feeding in ICU patients, be it enteral (EN) or parenteral (PN) nutrition is associated with fluctuations of the predominantly intracellular ions such as potassium (K), magnesium (Mg) and phosphate (PO) 1,2. Re-feeding syndrome is a potentially lethal condition. Inadequate electrolyte supplementation in EN/PN patients may be a surrogate indicator of sub-clinical enzyme dysfunction across a wide range of organ systems 2.
OBJECTIVES. A pilot body of work to
(1) assess the degree of fluctuation of predominant intracellular ions in EN/PN patients in our ICU and
(2) review adequacy of their biochemical surveillance and intravenous supplementation.
METHODS. LREN approval was granted. All patients admitted to the ICU receiving EN/PN within the month of February 2013 with a length of stay (LoS) $\geq$ 3 days were included. The K, Mg and PO levels were checked daily, and our standard protocol allowed for daily supplementation up to 40, 10 and 10 mmol, with an aim to keep serum levels above, 4.5, 0.8 and 0.7 mmol/L, respectively. The demographic data, degree of organ dysfunction and APACHE II/ICNARC scores were collected. Descriptive statistics and linear mixed effect regression analysis were used for statistical analysis.
RESULTS. 89 patients (see Table for demographic and organ support data) were admitted and 52 patients had a LoS $\geq$ 3 days. Of the latter 25, 11 and 4 patients received EN only, PN only and both EN and PN respectively. The APACHE II and ICNARC median (range) scores of these patients were 20 (11–37) and 25 (10–43) respectively. The remaining 12 patients were self-feeding. 1,059 readings were assessed in total. Overall, 94, 79 and 60 % of patients were under-supplemented on at least 1 occasion for K, Mg and PO respectively. The daily electrolyte flux showed a mean (SD) of; K 0.44 (0.24), Mg 0.15 (0.10) and PO 0.34 (0.21), with a coefficient of variation of the overall percentage of the mean of 10, 17 and 32 % respectively. The p-values from regression analysis for K, Mg and PO were 0.23, 0.94 and 0.0001 respectively.

Demographics and organ support

	Number
Male	25
Mechanical ventilation	33
Renal replacement therapy	15
Enteral nutrition	25
Parenteral nutrition	11

CONCLUSIONS. There was a considerable variation of K, Mg and PO serum levels on a daily basis in our EN and/or PN fed patients. The degree of daily flux of PO was statistically significant. This pilot has provided an impetus for us to assess the electrolyte changes in subgroups of patients such as those with chronic renal, liver and/or intestinal failure. We will also be reviewing the frequency of testing as well as dosages and frequency of replacement.
REFERENCES. 1. Zeki S, Culkin A, Gabe AM et al. Refeeding hypophosphataemia is more common in enteral than parenteral feeding in adult in patients. Clin Nutr. 2011;30(3):365–8. 2. Solomon SM, Kirby DF. The refeeding syndrome: a review. J Parenter Enteral Nutr 1990; 14(1):90–7.

1049
INFLUENCE OF A STANDARD SODIUM PROTOCOL ON INCIDENCE AND OUTCOME OF DYSNATREMIAS IN NEUROCRITICAL CARE

V. Spatenkova[1], O. Bradac[2], P. Skrabalek[3]

[1]Regional Hospital, Neurocenter, Neurologic-Neurosurgical Intensive Care Unit, Liberec, Czech Republic, [2]Central Military Hospital and Charles University, Department of Neurosurgery, Prague, Czech Republic, [3]Regional Hospital, Department of Clinical Biochemistry, Liberec, Czech Republic
INTRODUCTION. Sodium disturbances are common and prognostically serious in neurocritically care.
OBJECTIVE. To analyse whether the implementation of a standard sodium protocol enables the timely detection and diagnosis of dysnatremias, thereby influencing the incidence and outcome in the neurological-neurosurgical intensive care unit (NNICU).
METHODS. Over the same 5-year period we compared a retrospective analysis in 1,440 patients (pts) with a prospective study with sodium protocol in 1,560 pts with acute brain diseases. The sodium protocol involved measuring SNa^+, serum and urine osmolality, measured and calculated renal function parameters from urine collected within 24 h daily, complete fluid balance every 6 h, fluid intake 40 ml/kg weight/day without the use of hypotonic saline, thiazide and desmopressin for all NNICU pts. Hyponatremia was defined as serum sodium (SNa^+) < 135 mmol/l, hypernatremia SNa^+ > 150 mmol/l.
RESULTS. In the retrospective period hyponatremia occurred in 16.3 % (234) of pts, in the prospective in 15,7 % (245) of pts ($p = 0.684$), hypoosmolal hyponatremia 3.5 % (50 pts) to 3,5 % (54 pts), ($p = 0.987$), hypernatremia 5,2 % (58 pts) to 8.5 % (133 pts), ($p < 0.001$), hypo/hypernatremia in 1.2 % (17 pts) to 1.5 % (23 pts), ($p = 0.483$). There were no differences in incidence of cerebral salt wasting syndrome (25 to 26 pts, $p = 0.883$), syndrome of inappropriate secretion of antidiuretic hormone (4 to 1 pts, $p = 0.152$) and central diabetes insipidus (8 to16 pts, $p = 0.149$). In hyponatremia there were no differences in NNICU mortality (6 to 15 pts, $p = 0.074$) and bad outcome upon discharge from NNICU (94 to 80 pts, $p = 0.101$), but in hypernatremia both mortality (14 to 43 pts, $p < 0.001$) and bad outcome from NNICU (39 to 105 pts, $p < 0.001$) were higher.
CONCLUSIONS. In our neurocritical care the implementation of a sodium protocol did not influence the incidence and outcome of hyponatremia, and hypernatremia occurred more often and had higher mortality and bad outcome. The study showed that CSWS, SIADH and cDI were not common causes of dysnatremia in patients with acute brain diseases.

Special patients + special places = special problems: 1050–1061

1050
PROFILE OF SUICIDE ATTEMPTS ADMITTED IN ICU: IS IT RELEVANT FOR FURTHER MANAGEMENT? AND WHICH ARE THE DIFFERENCES WITH OTHER HOSPITAL SERVICES?

I. Astola-Hidalgo[1], M. Mourelo-Fariña[1], A.V. Aller-Fernandez[1], M. Pérez-García[2], A. Mozos[1], P. Vidal-Cortes[3], D. Freire-Moar[1]

[1]Complexo Hospitalario Universitario de A Coruña, A Coruña, Spain, [2]Complexo Hospitalario de Santiago de Compostela, Santiago de Compostela, Spain, [3]Complexo Hospitalario Universitario Ourense, Ourense, Spain
INTRODUCTION. Patients with mental illness can suffer self-inflicted injuries requiring admission to an Intensive Care Unit (ICU).
OBJECTIVES. The aim of this study is to define the characteristics of patients admitted to ICU after suicide attempt and the prognosis.
METHODS. A prospective analysis of patients with suicide attempt admitted to the ICU of a tertiary hospital of Spain from January to October 2012. Demographic data, ICU length of stay, hospital length of stay, APACHE II, organ failure and mortality were recorded. Univariate analysis was used, t-student and Chi square tests.
RESULTS. 22 patients. The mean age was 49.23 years (SD 16.54) and 81.8 % women. APACHE II were 21.23 (SD 9.02) and admission GCS 7.9 (4.24 SD). Demographic variables: 40.9 % were unmarried, 36.4 % have a partner and 13.6 % widowed. 72.7 % had primary education level and only 22.7 % had a job. 45.5 % had not any systemic diseases and 77.3 % had psychiatric history. The main psychiatric diagnosis were affective disorders (33 %), followed by personality disorders (10 % had no pathology). 55.5 % were toxic consumers. 50 % had history of previous suicide attempts and two or more attempts in 82 %. The suicide attempts are more frequent on weekends (72.7 %) and second half of the month (72.8 %). The most common methods of suicide attempts were binge of benzodiazepines (50 %). 95.2 % occur in the place of residence. 31.8 % of the cases had prior planning. In 54.5 % there was no chance of rescue. The 6.7 % were admitted to the psychiatric unit. Complications in the ICU: 77.3 % had respiratory failure, 14.3 % altered level of consciousness, 18.2 % renal failure and 45.5 % vasopressor support. At discharge 93 % of the cases had a similar previous functional level. The mean ICU length of stay was 11.36 $\pm$ 26.44 days and hospital length of stay 21.09 $\pm$ 27.94 days. Overall mortality was 2 %. In the univariate analysis we found that the profile by gender is similar except planning ($p < 0.02$), severity ($p < 0.02$), and functional level at discharge/three months (p 0.008 and p 0.002), were higher in women. The possibility of rescue was higher in men (p 0.003). 9.1 % have psychiatric hospitalizations. At 4.5 % was not subsequent psychiatric review.
CONCLUSIONS. The profile was female, 49 years old; single, with primary education who lives alone and with a psychiatric history. Presents an affective disorder, regular alcohol intake with previous suicide attempts. Most attempts were performed with drugs, at home, with no planning but with the possibility of rescue. At discharge did not require psychiatric admission. As in other studies, man made suicide attempts more aggressive but with more chance of rescue.
REFERENCES. 1. Choung Ah Lee et al. J Korean Med Sci. 2012; 27(3):307–312. 2. Baca-García E et al. Psychiatr Serv. 2004; 55(7):792–7.

1051
RED CELL DISTRIBUTION WIDTH, DEPRIVATION AND OUTCOMES IN SCOTTISH BURNS PATIENTS

M. Bruce[1], A. Vassalos[2], D. Young[3], J. Kinsella[2]

[1]University of Glasgow, Glasgow, UK, [2]Glasgow Royal Infirmary, University Department of Anaesthesia, Glasgow, UK, [3]University of Strathclyde, Department of Mathematics and Statistics, Glasgow, UK
Despite advances in critical care, mortality in severe burns patients remains high compared to that of general intensive care (ICU) admissions. Red cell distribution width (RDW) is a biomarker of inflammation and risk factor for all-cause mortality in ICU (1). The Scottish Index of Multiple Deprivation (SIMD) was introduced by the government to identify small area concentrations of multiple deprivation across Scotland. Deprivation has been linked to a chronic inflammatory state (2).
We investigated the link between severe burns, RDW, social deprivation and ICU mortality. A retrospective cohort analysis of ICU admissions to a tertiary burns referral unit with a diagnosis of severe burns from December 2002 to November 2012 was conducted. Patient demographic and outcome data were collected from the Scottish intensive care society audit database (WardWatcher). Burns characteristics, RDW and routine laboratory results were accessed from medical records and patient database (Clinical Portal). Overall SIMD and

domain ranks were determined for each patient by postcode from data collected in the 2011 census by the Scottish Executive.
In total, 96 patients with severe burns were admitted to ICU (43(17)yrs; 2.1 M:F) during this period. No significant association between median RDW on admission to ICU and mortality was found [14.40(13.3, 16.6) % vs. 13.85(13.1, 15.4) %, $p = 0.14$]. Significantly more patients belonging to the most deprived SIMD quintile were admitted to ICU with severe burns during this time [41(42.7 %), $p < 0.001$] but deprivation did not influence mortality ($p = 0.95$). Patients from the most deprived areas had a lower RDW on admission [13.8(13.0,14.8) % vs. 15.3(13.7,16.8) %, $p = 0.04$, figure 1]. RDW was significantly higher in patients with a greater percentage total body surface area burned [13.3(12.1, 14.4) % vs. 14.2(13.5, 15.3) %, $p = 0.05$].
Living in a deprived area in Scotland increases the likelihood of being admitted to ICU with a severe burn but this importantly does not impact on mortality. Elevations in RDW on admission to ICU are associated with greater percentage area burns and decreasing deprivation implicating an inflammatory mechanism. 1. Bazick H et al. Red cell distribution width and all-cause mortality in critically ill patients. Crit Care Med. 2011;39:1913–21. 2. Welsh P et al. Associations of plasma pro-inflammatory cytokines, fibrinogen, viscosity and C-reactive protein with cardiovascular risk factors and social deprivation: the fourth Glasgow MONICA study. Br J Haematol 2008;141:852–61.

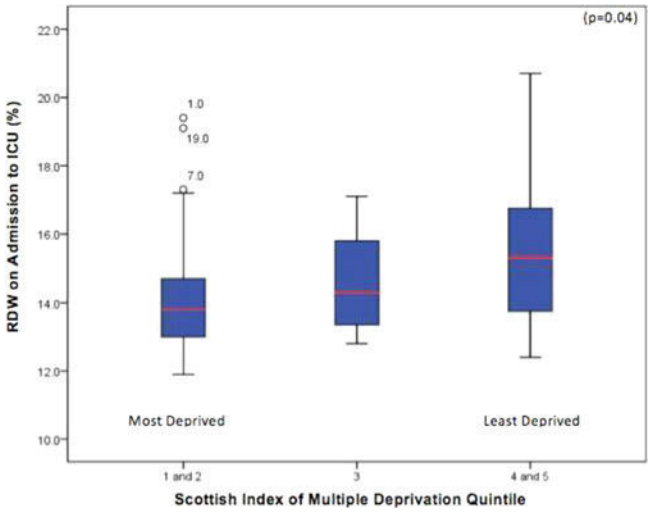


Figure 1

Association between red cell distribution width (RDW) and deprivation in severe burns patients admitted to intensive care (ICU)

1052
SUBJECTIVE EVALUATION OF THE BURN-OUT SYNDROME IN ICU DURING THE ECONOMIC CRISIS IN GREECE (PART I)

N. Karachalios[1], E.C. Katsilaki[1], D. Sfyras[1]

[1]General Hospital of Lamia, ICU, Lamia, Greece

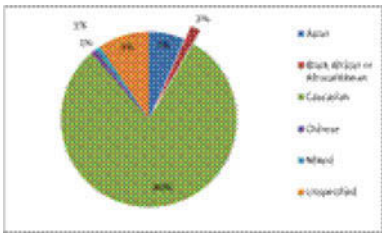
The purpose of the project is the subjective evaluation of the appearance of the BurnOut Syndrome in an ICU of a public hospital during the economic recession in Greece.
For this purpose a protocol has been created for the subjective study of the working satisfaction of the people working in ICU. A substantiated anonymous questionnaire with both close and open ended questions was distributed during the second year of the economic crisis in Greece. At the same time the general results of a previous study with the staff of the same ICU (conducted two years before the beginning of the economic crisis) were used.
According to the descriptive statistic analysis of the N = **48**/54 answered questionnaires, it was found out that 87,5 % of the staff said that their desire to work has been influenced by the economic crisis. 75 % stated that they don't have the proper support when there is uncertainty about the future of their job. As far as the BurnOut Syndrome is concerned, a high level of emotional exhaustion has been detected among the staff working from 6–9 years (MS = 33 SD ± 11.83). We have the same results with the group with > 10 - years of service (MS = 33 SD ± 9.53). The median score in all the groups under study was a low feeling of personal accomplishment (first came the group with up to 3 years of service in ICU), (MS = 34 SD ± 7.54). As far as it concerns the level of depersonalization, the groups of study from 3–6 years of service and from 6–9 years of service in ICU have a very high score (MS = 11 SD ± 4.2)&(MS = 14 SD ± 5.26) respectively. The group working for > 10 years has a medium level of depersonalization (MS = 7 SD ± 4.81).
From the processing of the recent questionnaires and the study carried out prior to the financial crisis we come to the following conclusions:
1) The financial crisis has influenced the staff's desire for work.
2) The working people feel vulnerable due to the results of the financial crisis in their workplace and to the oncoming changes in their working conditions.
3) The people mention that there is a low level of cooperation among them as well as usual conflicts and lack of cohesion.
4) Many of the staff report that there is lack of support from their directors and their colleagues.
5) The group with the highest scores in this syndrome is the one with 6–9 years of service in the ICU.
6) The medical and nursing staff of ICU seem to have the BurnOut Syndrome.
REFERENCES. 1. European Agency for Safety and Health at Work "Stress at work-facts and figures" OOP of the European Communities, 2009. 2. Ministry of Labour Greece&SLIC Psychosocial risks at work 2012. 3. Maslach C, Jackson SE (1984) Burnout in organizational settings. Appl Social Psychol Annu. 1984; 5:133–153. 4. Karachalios N, et al. Research into the working conditions…of people working in ICU. In: 23rd ESICM Congress Spain 2010.
APPRECIATIONS TO: D.Sfyras Director of ICU All the staff of ICU who voluntarily participated in our study Professors Ch. Koutis, F. Babatsikou and Th. Konstantinidis.

1053
ETHNICITY AND ADMISSION TO OBSTETRIC CRITICAL CARE

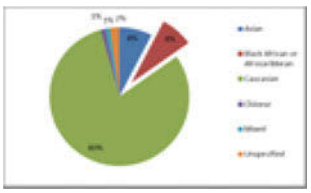
C. Kalluri[1], R. Gauntlett[1], I. Clement[1]

[1]Newcastle Upon Tyne Hospitals NHS Trust, Department of Peri-Operative and Critical Care, Newcastle Upon Tyne, UK

INTRODUCTION. There are widely recognised inequalities in health and illness outcomes between different ethnic groups. In the UK, successive reports of the confidential enquiry into maternal deaths have highlighted shocking variations in mortality rates, particularly amongst black African and Afro-Caribbean women (1). Reports on the epidemiology of obstetric critical care have not focused on ethnicity and it is not known if the over-representation of black and minority ethnic women in mortality figures extends to severe obstetric morbidity. The rate of pre-eclampsia is known to vary between different ethnic groups (2) and this may provide some explanation for any inequality observed in admission rates.
OBJECTIVES. To compare the ethnicity of the total obstetric population served by our obstetric unit in the north-east of England with the ethnic mix of the population of women admitted to critical care. To determine if any over-representation of black and minority ethnic women in the obstetric critical care population is explained by known inter-ethnic variation in the prevalence of hypertensive disease of pregnancy.
METHODS. We extracted ethnicity data from two pre-existing patient databases over a 42 month period ending in June 2012. We then compared the data on ethnic origin from our obstetric admission database (Euroking) with our critical care admission database (ICNARC Case-Mix Programme). In a secondary analysis we reviewed the reasons for admission to critical care and excluded patients with conditions known to vary in prevalence between ethnic groups.
RESULTS. A total of 24,789 births were recorded in our unit during the study period. 1.84 % of women in our obstetric population identified as African or Afro-Caribbean, the same ethnic groups constituted 7.61 % of admissions to critical care. This inequality remained after excluding conditions known to have a higher prevalence in African and Afro-Caribbean women.



Ethnicity of all obstetric patients



Ethnicity of all obstetric critical care patients

CONCLUSIONS. This study shows that the over-representation of African and Afro-Caribbean women in maternal mortality data in the UK is also present amongst women with severe maternal morbidity who did not die. Further work is required to explain this inequality.
REFERENCES. 1. Centre for Maternal and Child Enquiries (CMACE). Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer: 2006–08. The Eighth Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. BJOG 2011; 118 (Suppl. 1):1–203. 2. Urquia ML, Ying I, Glazier RH, Berger H, De Souza LR, Ray JG. Serious preeclampsia among different immigrant groups. J Obstet Gynaecol Can. 2012; 34(4):348–52.

1054
DESCRIPTIVE ANALYSIS OF ADULT INTENSIVE CARE UNITS IN TURKEY: PUBLIC, PRIVATE, AND UNIVERSITY HOSPITALS

H. Yagmurdur[1], I. Sencan[2], C. Kaymak[3], A. Sari[4], S. Izdes[5], D. Gokmen[6]

[1]The Ministry of Health Ankara Numune Training and Research Hospital, Intensive Care Clinic, Ankara, Turkey, [2]The Ministry of Health General Directory of Health Services, Clinical Microbiology and Infectious Diseases, Ankara, Turkey, [3]The Ministry of Health Ankara Training and Research Hospital, Anesthesiology and Reanimation, Ankara, Turkey, [4]The Ministry of Health General Directory of Health Services, Ankara, Turkey, [5]The Ministry of Health Ankara Ataturk Training and Research Hospital, Anesthesiology and Reanimation, Ankara, Turkey, [6]Ankara University Faculty of Medicine, Biostatistics, Ankara, Turkey

INTRODUCTION. Intensive care medicine is one of the most propagating component of Turkish healthcare system, very little information exists about the state of intensive care medicine in the nation's public, private, and university hospitals.
OBJECTIVES. To analyse and report on the distribution and attributes of adult Intensive Care Units (ICU) in public, private, and university hospitals in Turkey.
METHODS. This was a prospective observational study to evaluate ICUs of public, private, and university hospitals in Turkey with respect to their patient outcome, structure and demographic data. The survey of a total of 466 hospital (public:200, private:215, and university:51) in Turkey was conducted between June 7–30, 2012. The census instrument was designed to capture information for a single nonweekend day. The census questionnaire was mailed to the controllers and filled out by these controllers. Descriptive statistics was used for data analysis.

RESULTS. Data were obtained regarding 6,124 beds, with 4,188 patients (private: 1,078, public: 2,258, and university:852 patients) from 690 seperate ICUs in 466 hospitals in Turkey. In university and private hospitals, the majority of units were level 3 (76.3 % and 63.2 %); whereas in public the majority were level 2 (54.4 %). The controllers reported a mean occupancy rate of 90 %, 68 %, and 74 % of total bed capacity in public, private, and university hospitals, respectively. Most patients were admitted to the units from the emergency room in public (41.2 %) and university (34.7 %) hospitals and from other hospitals in private (54.2 %) centers ($p < 0.001$). Primary admitting diagnoses were cerebrovascular accidents, respiratory insufficiency/failure, and ischemic heart disease, consequently, in all type of hospitals. The percentage of patients more than 60 years old was 71.9, 73.8, and 55.5 in public, private, and university hospitals, respectively ($p < 0.001$). The mean APACHE II score at the time of ICU admission was 19.8 ± 8.4, 22.1 ± 9.3, and 18 ± 8.4 in public, private, and university hospitals, respectively ($p < 0.001$). The mean SOFA score at the control day was 5.95 ± 3.6, 6.66 ± 3.9, and 6.03 ± 4 in public, private, and university hospitals, respectively ($p < 0.001$). The ICU length of stay (LOS) was longer for the private and university compared to the public (23.4 ± 70.3 and 23.39 ± 46.9 versus 19.75 ± 37.8 days, $p < 0.05$). The overall mortality was lower for the university hospital compared to both private and public hospitals (41.5 % versus 48.3 % and 46.9 %, $p = 0.01$).

CONCLUSIONS. This is the first survey to comprehensively describe the attributes and distribution of intensive care in Turkey. Our survey findings provide an introduction into the everyday workings of critical care units throughout the Turkey. Patients in the private hospital had a higher APACHE II and SOFA score, ICU LOS, and mortality rate than those in the public and university hospitals.

1055
CRITICAL ILLNESS IN HOMELESS PERSONS: A SYSTEMATIC REVIEW OF THE LITERATURE

C. Chant[1], O. Smith[1], A. Wang[1], K. Burns[1], C.C. dos Santos[1], J.O. Friedrich[1], S. Hwang[1], on behalf of the St. Michael's Hospital and Li Ka Shing Knowledge Institute Critical Care and Inner City Health Working Group

[1]St. Michael's Hospital, Toronto, Canada

INTRODUCTION. Homelessness is a serious problem across North America. Compared to the general population, people who are homeless have higher rates of acute and chronic health conditions and are at increased risk for all-cause mortality. Despite their increased need for health services, homeless people are a marginalized population who frequently encounter barriers to accessing primary health care and little is known about the impact of homelessness on critical care.

OBJECTIVE. The objective of this study was to systematically review the literature on critical illness in homeless persons.

METHODS. Medline, HealthStar, EMBASE, and CINAHL databases were reviewed from inception to July 2012 without language restriction. Bibliographies of studies that met inclusion criteria were also reviewed. Studies were included if they focused on critical illness and any participants were homeless adults. Two authors independently reviewed each study and extracted data on study methods and results using a standardized form.

RESULTS. A total of 2,563 studies were identified as potentially relevant and were reviewed. There were no studies of patients with critical illness in which more than 50 % of the participants were homeless. We found only 5 studies addressing critical illness in which any participants were homeless adults, with the number of homeless participants in these studies ranging from 3 to 326,073. Three of the five studies used a retrospective design. Study topics included consent and recruitment in research, types of traumatic injuries, preferences for life support in patients with chronic obstructive pulmonary disease, and pneumococcal bacteremia. Explicit reporting of data for the subset of homeless patients with critical illness occurred in only 1 study.

CONCLUSION. This systematic review of the literature identified very few studies on critical illness in homeless persons. Further research on this topic should delineate the needs, health conditions, and resource utilization of this patient population.

GRANT ACKNOWLEDGMENT. No funding was associated with the study. JF, KB are supported by a Clinician Scientist Award from the Canadian Institutes of Health Research. CCDS is supported by the New Investigator Award of Canadian Institutes of Health Research. OS is supported by SMH.

1056
THE ASSESSMENT OF ADULT INTENSIVE CARE UNITS IN TURKEY

S. Izdes[1], I. Sencan[2], Y. Hatice[3], A. Sari[4], C. Kaymak[5], D. Gökmen[6]

[1]University of Yildirim Beyazit Ataturk Education and Research Hospital, Anesthesiology and Intensive Care, Ankara, Turkey, [2]Ministry of Health, Infectious Diseases, Ankara, Turkey, [3]Ankara Numune Training and Research Hospital, Anesthesiology and Intensive Care, Ankara, Turkey, [4]Ministry of Health, Ankara, Turkey, [5]Ankara Training and Research Hospital, Anesthesiology and Intensive Care, Ankara, Turkey, [6]Ankara University Faculty of Medicine, Department of Statistics, Ankara, Turkey

INTRODUCTION. In Turkey, elderly population is on an increase, which leads to a rise in the number of patients in need of intensive care. It is important to determine the intensive care bed occupancy rates and whether the intensive care beds are used effectively in order to plan the number of intensive care unit (ICU) beds (1).

OBJECTIVES. The present study is aimed to estimate the current situation all levels of adult ICUs in Turkey and to establish intensive care bed occupancy rates and whether the patients stay in ICUs at appropriate levels.

METHODS. The institutional review board of the Ministry of Health approved the study. Data from adult ICUs all over Turkey (except Coronary and Cardiothoracic Care Unit) were collected in 1-day point prevalence study by external study physicians. All ICU patients treated on the study day were included and the demographic and severity of illness and whether the patients stayed in ICUs at appropriate levels were recorded. All enrolled patients were followed up until discharge or death. The ICU data also analyzed the included information about nurse/patient ratio, the type and number of ICU beds.

RESULTS. Of the total of 6,929 ICU beds in Turkey that are in use as secondary and tertiary, 6,124 were evaluated. Of these 6,124 ICU beds, 2,422 were secondary (1,773 in patients occupancy rate of 73 %) and 3,702were tertiary (2,744 in patients occupancy rate of 74 %) ICU beds. Average age of patients staying in the secondary care was 65 ± 20 (median 71), and the average age of patients staying in tertiary care was 62 ± 20.5 (median 68). On the day of evaluation at ICUs, it was revealed that 575 patients (32 %) in secondary ICUs and 1,042 patients (38 %) in tertiary ICUs were not occupying the beds at appropriate levels. Two hundred and 12 patients (12 %) staying in ICUs were supposed to be treated in tertiary ICUs, and 101 patients (6 %) should have been in clinics. Of the patients that were staying in tertiary ICUs, 78 were home care patients, 239 (9 %) were clinic patients, and 719 (26 %) were secondary intensive care patients. On admission, mean APACHE II score was 18.05 ± 8.58 and 20.8 ± 8.67, mean SOFA score was 5.79 ± 3.62 and 6.4 ± 4 in secondary and tertiary ICUs, respectively. Mortality rate at the second ICUs was 40.3 %, and it was 47 % at the tertiary ICUs. The mean ICU length of stay was 19.2 ± 63.9 (median 6) days in secondary ICUs and in tertiary ICUs, mean ICU length of stay was 24 ± 70.3 (median 9) days. In secondary ICUs, median nurse/patient ratio was 3 (range 0.5–9), and in tertiary ICUs, median nurse/patient ratio was 3 (range 0.5–8).

CONCLUSIONS. It was established that the number of intensive care beds in Turkey were sufficient, however, intensive care beds were not used effectively.

REFERENCES. Hill AD, Fan E, Stewart TE, et. al. Critical care services in Ontario: a survey-based assessment of current and future resource needs. Can J Anaesth. 2009; 56:291–7.

1057
CRITICAL CARE IN SOUTHWEST UGANDA

H. Buckley[1], K. Webster[2], S. Ttendo[3]

[1]Salford Royal Hospital, Critical Care, Manchester, UK, [2]North Manchester General Hospital, Anaesthesia and Critical Care, Manchester, UK, [3]Mbarara Regional Referral Hospital, Anaesthesia and Critical Care, Mbarara, Uganda

INTRODUCTION. Uganda sits amongst the 26 poorest countries in the world. 30 % of the population live on less than $1 per day. The median age is 15 with average life expectancy being 54 years compared with 80 years in the UK.

Whilst primary care remains the priority of many health initiatives, hospital outcomes can be vastly improved with an increase of critical care facilities. In Uganda it is recognised that 15 % of hospital beds should be equipped for critical care. There is 1 critical care bed per million people[3] compared with approximately 60 per million in the UK.

Mbarara Regional Referral Hospital is a major tertiary referral hospital in the southwest of Uganda serving over 3 million people. Transport networks from Tanzania, Kenya, Rwanda and the Democratic Republic of Congo intersect in Mbarara. This immensely busy and pivotal hospital serves its population with two critical care beds.

OBJECTIVES. Analyse the critical care patient demographics of a major tertiary referral centre in a resource poor country. Ascertain sources of referrals and admitting diagnoses. Collect and calculate outcomes.

METHODS. After local ethics and research approval we interrogated the critical care database of all admissions and deaths over a 22-month period. The data was then categorised into information regarding age, diagnosis, referring speciality and length of stay.

RESULTS. 209 patients were admitted over 22 months. The average age was 23 years with a 37 % mortality. 53 % were female. The average length of stay was 4 days. Patients received interventions from mechanical ventilation to cardiovascular support and close nursing care. 33 % of referrals were from emergency medicine (EM), 22 % obstetrics and gynaecology, 20 % medicine and 20 % paediatrics. 74 % of the patients were under 40 years of age with over half of them being under 30 years. Obstetrics and medicine had mortality rates of 45 % and 40 % respectively with only 11 % of surgical patients surviving to discharge. Leading mortality diagnoses were sepsis of all origin (25 %), head injuries (19 %), and obstetric causes (10 %).

Top 5 Mortality Diagnosis

Diagnosis	Number of deaths	Percentage
Sepsis	21	27
Head Injury	15	19
Obstetric	8	10
Poisoning	6	8
Cardiogenic Shock	5	6

CONCLUSIONS. The unit has two beds that are under enormous demand from the population. 10 % of all patients were paediatric with a 30 % mortality rate reflecting the need for an increase in paediatric facilities. On reflection the admission diagnosis and causes of death are not dissimilar to a general intensive care unit in the UK, with vastly differing demographics and outcomes. The high head injury and trauma rate reflects Mbarara's unique position as a literal cross roads of major trading routes between 5 nations. Plans are in place to expand to an 8-bedded unit with a repeat analysis of data.

REFERENCES. 1. World Health Organization (WHO): http://www.who.int/countries/uga/en/ 2. WHO: http://www.who.int/countries/gbr/en/. 3. Intensive Care Society of Uganda http://www.intensivecareuganda.com/index.html.

1058
ACQUISITION OF RESISTANT MICROORGANISMS AND INFECTIONS IN HIV-INFECTED PATIENTS ADMITTED TO THE ICU

M. Rinaudo[1], N. Cobos Trigueros[2], P. Castro[1], M. Solé[3], S. Fernández[1], C. Hernández[1], J. Pumarol[1], J. Mallolas[2], J. Vila[3], L. Morata[2], J.M. Gatell[2], A. Soriano[2], J. Mensa[2], J.M. Nicolás[1], J.A. Martínez[2]

[1]Hospital Clínic, Medical Intensive Care Unit, Barcelona, Spain, [2]Hospital Clínic, Department of Infectious Diseases, Barcelona, Spain, [3]Hospital Clínic, Department of Microbiology, Barcelona, Spain

INTRODUCTION. The immunosuppression is often considered to be a risk factor of acquiring infections by resistant organisms. The extent to which HIV-infected patients in comparison to other critically ill medical patients behave regarding the acquisition of nosocomial infections and resistant or potentially resistant microorganisms (RPRMs) remains to be clarified.

OBJECTIVES. To compare critically ill HIV-infected and non-infected patients in terms of acquisition of resistant microorganisms, infections and prognosis.

METHODS. Observational, retrospective study of patients admitted to a medical intensive care unit (ICU) during 35 months. Swabbing of nares, pharynx and rectum, and culture of respiratory secretions were obtained thrice weekly. Samples were processed by microbiological techniques aimed at the detection of RPRMs. Logistic regression analysis was used to evaluate predictors of ICU mortality.

RESULTS. Out of 969 included patients 64 (6.6 %) were HIV-infected. Compared with non-HIV-infected patients, they had a higher APACHE II on admission (19.5 ± 6.6 vs. 21.1 ± 5.4, $p = 0.02$) and were more frequently admitted due to an infection (48 % vs.

77 %, $p < 0.0001$). HIV-infected patients stayed longer in the unit and were more exposed to several invasive devices and antibiotics. There were no differences in the rate of acquisition of RPRMs and the only difference in ICU-acquired infections was a significantly higher incidence of catheter-related bacteraemia (3 % vs. 9 %, $p = 0.03$). ICU-related mortality were similar in both groups (14 % vs. 16 %, $p = 0.70$), and in HIV-infected patients it was independent from CD4 cell count.

CONCLUSIONS. Despite a longer ICU stay, critically ill HIV-infected patients did not show a higher rate of RPRMs acquisition regardless of their CD4 cell count. The rate of ICU-acquired infection was similar between HIV-infected and non-infected patients, except for catheter-related bacteraemia, which was higher in the HIV-infected population. Mortality was similar in both groups.

GRANT ACKNOWLEDGMENT. This work was supported by a grant from the "Fondo de Investigaciones Sanitarias, Subdirección General de Evaluación y Fomento de la Investigación, Ministerio de Ciencia e Innovación, Gobierno de España, (PI050167)".

1059

CLINICAL FEATURES AND OUTCOMES PATIENTS WITH DISSEMINATED TOXOPLASMOSIS ADMITTED TO THE ICU: A MULTICENTER STUDY

M. Schmidt[1], R. Sonneville[2], S. David[3], N. Bigé[4], R. Hamifadar[5], N. Mongardon[6], V. Castelain[7], K. Razazi[8], A. Marty[9], F. Vincent[10], M. Dres[11], S. Gaudry[12], C.E. Luyt[13], V. Das[14], J.B. Micol[15], A. Duguet[1], A. Demoule[1], J. Mayaux[1]

[1]La Pitié Salpêtrière - Charles Foix, Service de Pneumologie et Réanimation Médicale, Paris, France, [2]Bichat University Hospital, Réanimation Médicale, Paris, France, [3]Saint-Louis University Hospital, Réanimation Médicale, Paris, France, [4]Saint Antoine Hospital, Réanimation Médicale, Paris, France, [5]Albert Michalon Hospital, Réanimation Médicale, Grenoble, France, [6]Cochin University Hospital, Réanimation Médicale, Paris, France, [7]Haute Pierre Hospital, Réanimation Médicale, Strasbourg, France, [8]Henri Mondor University Hospital, Réanimation Médicale, Creteil, France, [9]Institut Gustave Roussy, Réanimation Médicale, Paris, France, [10]Avicenne University Hospital, Réanimation Médicale, Paris, France, [11]Bicêtre University Hospital, Réanimation Médicale, Paris, France, [12]Louis Mourier Hospital, Réanimation, Colombes, France, [13]La Pitié Salpêtrière - Charles Foix, Réanimation Médicale, Paris, France, [14]Andre Gregoire Hospital, Montreuil, France, [15]Institut Gustave Roussy, Paris, France

BACKGROUND. Characteristics and outcomes of adult disseminated toxoplasmosis patients admitted in intensive care unit (ICU) have rarely been described.

METHODS. We performed a retrospective study on consecutive cases of adult patients with disseminated toxoplasmosis who were admitted to the ICU from January 2002 through December 2012 in the ICU of 14 University-affiliated hospitals. Disseminated toxoplasmosis was defined as microbiological, or histological evidence of disease affecting > 1 organ in immunosuppressed patients. Isolated cerebral toxoplasmosis were not included in this study. Initial clinical presentation, risk factors and impact on 60-day mortality of disseminated toxoplasmosis were analyzed.

RESULTS. Among the 38 patients who were identified during the study period, 22 (58 %) had received an allogeneic hematopoietic stem cell transplantation (61 [43–175] days before ICU admission), 4 (10 %) were solid organ transplantation recipients and 10 (27 %) were HIV-positive (CD4-cell count, 14 [6–33] cells/μL). Main reasons for ICU admission were acute respiratory failure (89 %) and/or shock (53 %), leading to 82 % of 60-day mortality rate. Allogeneic hematopoietic stem cell transplantation recipient.
(HR = 2.28, 95 % CI, 1.05–5.35, P = 0.04), systolic cardiac dysfunction (HR = 3.54, 95 % CI, 1.60–8.10,
$P < 0.01$), SAPS II and SOFA at day 1 were associated with 60-day mortality.

CONCLUSIONS. Severe disseminated toxoplasmosis leading to intensive care admission has a poor prognosis. Allogeneic hematopoietic stem cell transplantation recipients seem to be particularly exposed to this fatal issue. Strategies aimed at preventing this fatal opportunistic infection may improve outcomes.

1060

OUTCOME OF 86 PATIENTS WITH SYSTEMIC AUTO-IMMUNE DISEASES ADMITTED TO AN INTENSIVE CARE UNIT: A RETROSPECTIVE CASE SERIES

T. Heijnen[1], D. Blockmans[2], M. Van de Velde[1], L. Henckaerts[2]

[1]UZ Leuven, Anesthesiology, Leuven, Belgium, [2]UZ Leuven, Internal Medicine, Leuven, Belgium

INTRODUCTION. Systemic autoimmune diseases form a rare and heterogeneous group of diseases, with an important morbidity caused by disease evolution and/or treatment. Admission to an intensive care unit (ICU) is necessary in 10 % of patients, with a mortality of up to 50 %, according to previous studies.

OBJECTIVES. Description of patient characteristics, clinical features and outcome of patients with systemic autoimmune diseases admitted to a referral hospital intensive care unit in Belgium.

METHODS. We performed a single center retrospective case series review of all patients with a systemic autoimmune disease (n = 86) admitted to the medical intensive care unit of Leuven University Hospital between May 2007 and September 2012. Patients with rheumatoid arthritis were not included in this study.

RESULTS. The most frequent diagnoses in the studied group included vasculitis (n = 31), sarcoidosis (n = 15), systemic sclerosis (n = 9) and systemic lupus erythematosus (n = 7). In the vasculitis group, granulomatosis with polyangiitis (n = 10) was the most frequent disease. In 10 patients (12 %), the diagnosis was made during their ICU admission; 6 other patients (7 %) had a recent diagnosis within a month previous to their admission. Fifty percent of the patients were female. Mean age on ICU admission was 60 years (± 16). Median time from disease diagnosis to ICU admission was 3,7 years (IQR 0.25–14 years, min 0–max 36). Fifty-seven percent of the patients were treated with immunosuppressive drugs at least in de 3 months before their admission. Comorbidities included diabetes (21 %), chronic renal failure (41 %) and history of cancer (15 %). Thirteen percent of patients (n = 11) had been transplanted before. Main reason for admission was infection (60 %) followed by disease related organ failure (47 %). The respiratory system was the most common organ failure (60 %). Mean APACHE II score was 28 (± 10). Mortality during ICU-admission was 19 %, during hospital stay 39 % and at the end of follow-up 58 %. Hospital mortality was high in systemic sclerosis (50 %), sarcoidosis (47 %) and vasculitis (41 %). Mean age at death was 65 years (± 13). Hospital death (n = 34) was caused by an infection in the majority of cases (56 %), and by evolution of the underlying disease in 32 %. Only age and APACHE II score were associated with mortality in this study.

CONCLUSIONS. Mortality of patients with systemic autoimmune diseases admitted to the intensive care unit is high, both in ICU and afterwards. Comparison of studies is difficult because of the different case-mix. Systemic autoimmune diseases are rare, with broad heterogeneity both within and between the groups. Only a large prospective and multicenter study will therefore be able to identify all variables associated with mortality in this population.

REFERENCES. 1. Quintero OL, Rojas-Villarraga A, Mantilla RD, Anaya JM. Autoimmune diseases in the intensive care unit, an update. Autoimmun Rev. 2013;12(3):380–95.

GRANT ACKNOWLEDGMENT. None.

1061

"AUTOIMMUNE DISEASES IN THE INTENSIVE CARE UNIT": A RETROSPECTIVE STUDY IN A PORTUGUESE HOSPITAL

S.P. Nunes[1], S.V. Silva[1], I. Aragão[2], F. Farinha[3], C. Vasconcelos[3], G. Campello[2]

[1]Hospital de Santo António-Centro Hospitalar do Porto, Department of Internal Medicine, Oporto, Portugal, [2]Hospital de Santo António-Centro Hospitalar do Porto, Intensive Care Unit, Oporto, Portugal, [3]Hospital de Santo António-Centro Hospitalar do Porto, Clinical Immunology Unit, Oporto, Portugal

INTRODUCTION. Patients with systemic autoimmune diseases constitute a small percentage of the admissions on the medical intensive care units (ICU). Their management remains a challenge in this context. New and more aggressive diagnostic and therapeutic approaches have improved the care provided to these patients. The authors provide a clinical characterization of the patients with autoimmune diseases admitted in ICU, including outcome comparison with general ICU patients.

METHODS. Retrospective cohort study of all patients with systemic autoimmune disease admitted in a mixed ICU between 2007 and 2012. Data was collected on demographics, clinical data and outcomes.

RESULTS. During the study period, 2,326 patients were admitted in the ICU, 22 patients (1 %) had autoimmune disease. The study population had a mean age of 57 ± 16 years, 77 % female (n = 17). The mean previous autoimmune disease evolution was 9 years, in 2 the diagnosis was made in ICU. Eight patients had systemic lupus erythematous (SLE), 4 primary biliary cirrhosis, 3 reumathoid arthritis, 3 systemic vasculitis, 2 dermato/polimyositis, 1 primary antiphospholipid syndrome and 1 had psoriatic arthritis. Fourteen patients were on imunossupressive therapy at ICU admission, mainly steroids. The main diagnosis leading to hospitalization was infection (n = 11) with or without associated flare. The main reason for ICU admission was respiratory failure (n = 6), regardless of the autoimmune disease. Mean SOFA was 9 and more than half of the patients had three or more organ dysfunction (n = 12). Eight patients needed specific immunotherapy in ICU context. Mean ICU length of stay was 9 days compared with the 8 days in general ICU population. The general ICU population in the same period of time had mean SAPS II of 44 and ICU mortality rate of 29 %. The value of the SAPS II in the study population (47) predicted a hospital mortality of 37 %, but the mortality rate verified was 32 %. Seventeen patients were discharged from the ICU, but only nine were alive 12 months after ICU discharge (mortality rate at 1 year = 59 %).

CONCLUSIONS. Systemic autoimmune disease admissions to the ICU are rare and usually associated with a significant high mortality, mainly longtime mortality. In our population, the ICU length of stay and mortality was similar to general ICU population.

Fighting multidrug resistant pathogens: 1062–1075

1062

SCREENING FOR RESISTANT ORGANISMS IN THE ICU

P.D. Levin[1], E. Orenbuch-Harroch[1], S. Benenson[2], A.E. Moses[2], C.L. Sprung[1], M.J. Cohen[2]

[1]Hadassah Hebrew University Medical Center, Anesthesia and Critical Care, Jerusalem, Israel, [2]Hadassah Hebrew University Medical Center, Clinical Microbiology and Infectious Diseases, Jerusalem, Israel

INTRODUCTION. Methicillin-resistant *Staphylococcus aureus* (MRSA) and carbepenem-resistant *enterobacteriaceae* (CRE) are common causes of healthcare-associated infections. Screening allows for earlier detection of carriage, prevention of spread and optimization of antibiotic coverage when needed. Our patients have
(1) surveillance cultures (nasal and peri-anal cultures on admission and weekly thereafter for MRSA and CRE),
(2) routine cultures (sputum and urine cultures 3 times per week cultured for all bacteria) and
(3) clinical cultures (sent according to clinical indications).
Overlap might exist in the information provided by these three groups of cultures providing an opportunity for cost savings.

OBJECTIVES. To measure detection rates of MRSA and CRE by surveillance, routine and clinical cultures in order to determine if culturing policy could be safely reduced.

METHODS. A retrospective analysis of surveillance, routine and clinical cultures. Proportion of MRSA and CRE affected patients identified by each culture group was measured.

RESULTS. From 2009 to 2012, 1,834 patients were admitted to ICU. MRSA was detected in 86 (4.7 %) patients and CRE in 112 (6.1 %). Overall 24,088 cultures were taken, including 4,430 (18 %) surveillance, 11,343 (47 %) routine and 8,315 (35 %) clinical cultures. These were positive for MRSA on 93 (2.1 %), 124 (1.1 %) and 45 (0.5 %) occasions and for CRE on 212 (4.8 %), 67 (0.6 %) and 86 (1 %) occasions respectively.
Among 86 MRSA positive patients, 42 (48.8 %) were identified from surveillance cultures, 30 (34.9 %) from routine cultures and 14 (16.3 %) from clinical cultures. MRSA bacteremia represented the MRSA defining event for 3/86 (3.5 %) patients. A further 3 patients developed bacteremia after MRSA detection from another source.
Among 112 CRE cases, 92 (82.1 %) were identified from surveillance cultures ($p < 0.001$ vs MRSA surveillance), 8 (7.1 %) from routine cultures ($P < 0.001$ vs MRSA) and 12 (10.7 %) from clinical cultures ($p = 0.25$ vs MRSA). Bacteremia was the CRE defining event for 8/112 (7 %) patients. Bacteremia occurred in 13 other known CRE patients.
Repeating the analysis with surveillance cultures excluded from the database, MRSA detection decreased to 58 patients (67.4 % of the 84 patients identified using all culture results) and CRE to 42 (37.5 % of 112) patients. Median time from admission to detection increased from 8.5 (IQR 3-25) to 10 (IQR 3–24, $p = 0.70$) days for MRSA patients and from 17 (IQR 8–33.5) to 17.5 (IQR 8–35, $p = 0.84$) days for CRE patients.

CONCLUSIONS. Effective detection of MRSA carriage requires both surveillance and routine cultures. The majority of CRE carriage is detected by surveillance cultures alone. Bacteremia may be the defining event for the presence of MRSA or CRE. Omission of surveillance cultures may decrease detection of MRSA and CRE patients, but not change time to detection for those detected.

1063
PERSISTANCE AND EMERGENCE OF BACTERIA IN THE COURSE OF PERSISTENT INTRAABDOMINAL SEPSIS

P. Montravers[1], G. Dufour[1], H. Houissa[1], P. Augustin[1], N. Allou[1], M. Desmard[1]

[1]Paris VII University-APHP, DAR-CHU Bichat, Paris, France

INTRODUCTION. During persistent intraabdominal sepsis (PAS), multiple reoperations combined to adequate antibiotic therapy (AB) are performed to control the source of infection. The cultured microorganisms (MO) can be identical on repeated operations (persistence P) or different (emergence E) from the previous samples.

OBJECTIVES. The analysis of the microbiologic features of PAS offers an opportunity to assess the reasons of antibiotic (AB) failures rarely reported in other types of infections and never assessed in PAS.

METHODS. Between 01/99 and 12/07, 387 patients (pts) were admitted in ICU following a secondary peritonitis (called S0). In 98 of them, PAS occured which led to one or more reoperations. Microbiologic data collected at S0 were compared with the cultures obtained on the first (R1), second (R2) and third (R3) reoperations. A P was observed when the same organism(s) was recovered on two repeated surgical samples whilst an E was defined as the culture of a new MO (or the same with a different susceptibility profile). The same analyses were repeated on R1, R2 and R3. The risk of E of multidrug resistant (MDR) strains was analysed. Results are presented in numbers and proportions and compared by Chi2 or Fisher exact tests.

RESULTS. Overall 173 reoperations were made (98 R1, 54 R2, 21 R3). 670 MO were cultured (S0 = 286, R1 = 222, R2 = 118, R3 = 44). A P was reported in 65 (66 %) pts at R1, 32 (59 %) at R2 and 14 (67 %) at R3 involving 181 strains (37, 43 and 52 % of the isolates at R1, R2 and R3, respectively). The most frequent P strains were enterococci (21, 18 and 13 %), E coli (18, 16, 9 %) and fungi (27, 41, 43 %) whilst MDR strains were noticed in 22, 22 and 48 % of the isolates (at R1, R2 and R3, respectively, $p < 0.05$ between R1 and R3 and R2–R3). 18 MO were repeatidly cultured in 11 pts from R1 to R3. An E was observed in 65 (66 %) pts at R1, 37 (69 %) at R2 and 13 (69 %) at R3 involving 201 strains (52, 57 and 48 % of the isolates). The most frequent E strains were enterococci (14, 13, 5 %), staphylococci (14, 16, 10 %), E coli (14, 15, 10 %) and fungi (24, 9, 0 %), whilst MDR strains were reported in 35, 48 and 62 % of the isolates ($p < 0.05$ between R1 and R3). Combined P and E were noted in 39 (40 %) pts at R1, 20 (61 %) at R2 and 8 (38 %) at R3. A prolonged AB therapy >3 days between S0 and R1 was associated with the E of MDR strains (67 % of MDR versus 32 % in case of AB <3 days, $p < 0.01$) but not at R2 or R3. The use of glycopeptides between S0 and R1 decreased the E of MDR strains at R1 (10 % vs 29 % without glycopeptides, $p < 0.05$). An adequate AB between S0 and R1 did not modify the E of MDR strains at R1, R2 or R3.

CONCLUSIONS. The frequencies of P and E seem to be balanced and stable during PAS. An inadequate AB concentration at the site of infection might explain the P of the MO. The mechanisms leading to the E of new strains, especially MDR strains, seem variable and depend of the types of AB previously used.

1064
IMPACT OF MULTIDRUG RESISTANT *PSEUDOMONAS AERUGINOSA* COLONIZATION AND INFECTION IN CRITICALLY ILL PATIENTS

B. Borgatta[1], A.T. Imbiscuso[2], M. Pérez[1], M.N. Larrosa[3], J. Gavalda[4], J. Rello[1,5]

[1]Vall d'Hebron University Hospital, Critical Care Unit, Barcelona, Spain, [2]Hospital General de Segovia, Critical Care Unit, Segovia, Spain, [3]Vall d'Hebron University Hospital, Microbiology, Barcelona, Spain, [4]Vall d'Hebron University Hospital, Infectious Diseases, Barcelona, Spain, [5]Vall d'Hebron Research Institute, Barcelona, Spain

INTRODUCTION. *Pseudomonas aeruginosa* (PSA) is one of the main pathogens of hospital-acquired infections, with an impressive ability to develop antibiotic resistance, it represents a serious challenge in the management of infections in the ICU. In the last decade, a rise of multidrug resistant strains (MDR-PSA), particularly in the ICU, have been reported; however, the clinical impact is unknown.

OBJECTIVES. To assess the clinical impact of MDR-PSA infection and colonisation in critically ill patients. Primary outcome was the ICU mortality. Secondary objectives were the identification of risk factors and epidemiology of MDR-PSA.

METHODS. Retrospective cohort study (January 2010–July 2012), in clinical samples from a general ICU in a tertiary university hospital. Epidemiological, clinical and microbiological data were recorded for patients with isolation of MDR-PSA strains.

RESULTS. Antibiotic susceptibility was performed in 496 isolates of *P. aeruginosa* belonging to 193 patients, of which 33.1 % carried MDR-PSA strains. 84.8 % of MDR-PSA isolates were only susceptible to amikacin and colistin. Most patients were young (mean 55 ± 14.6 yr) characterized by elevated severity-of-illness at the ICU admission: APACHE II score 18.3 ± 4.1 (mean ± SD), SOFA score 4 (3–6) (median, IQR). 54.5 % admitted by medical causes, 32.5 % by solid organ/haematological transplant, and 28.4 % after surgery. At time of sample collection, patients had prolonged ICU stay 23 (8.8–43.3) days, 75.8 % underwent tracheotomy and presented worsen clinical condition: median SOFA score 6. Most (97 %) patients received one or more antibiotics within 30 days prior to the isolation. Overall, 80.3 % had anti-pseudomonal activity. 40 (62.5 %) patients presented infection (67.5 % respiratory). MDR-PSA was isolated in tracheal aspirates (63.6 %) followed by urinary samples (28.8 %); with similar distribution within the infection and colonisation groups. Overall ICU mortality rate was 33.3 %. Patients with respiratory infection presented mortality rates of 45.5 % (compared with 62.5 % in colonized), being mortality rates in non-respiratory infection of 13.6 %; (37.5 % in colonized). End-stage renal disease (RR = 7.91), immunocompromise (RR = 4.22), vasopressor use (RR = 2.57), leukopenia/leucocytosis (RR = 1.73) and need for renal replacement therapies (RR = 4.0) were significantly associated with ICU mortality, whereas local inflammatory response was significantly associated with survival (RR of death = 0.27).

CONCLUSIONS. MDR-PSA was frequently isolated in respiratory or urinary samples, both as colonization or infection, being a late event. Infection by MDR-PSA was not associated with increased mortality compared with colonized patients.

REFERENCES. 1. Rello et al. ICM 1994;20:193–98. 2. Rello et al. CID 1996;23:973–78. 3. Aloush et al. AAC 2006;50:43–8. 4. Tumbarello et al. ICM 2013. 5. Martin-Loeches et al. ICM 2013; 39:672–81.

GRANT ACKNOWLEDMENT. Supported in part by FIS PI 11/01122, SEPAR 913/2010 and FIS PI 12/02 903.

1065
MULTIDRUG RESISTANT GRAM-BACTERIA CAUSING PNEUMONIA IN ICU PATIENTS WITH SEVERE THORACIC TRAUMA

M. Eforakopoulou[1], H. Papandreou[1], M. Skopelitis[1], B. Kaldis[1], P. Botsis[1], H. Pavlou[1]

[1]General Hospital KAT, Athens, Greece

INTRODUCTION. Mechanically ventilated patients with thoracic trauma and lung contusion are at high risk for pneumonia. The presence of multi-resistant pathogens has increased in ICU. This increase can be an important risk factor for worsening morbidity and mortality rates of patients with thoracic trauma.

OBJECTIVES. To investigate the impact of multiple resistant Gram-bacteria causing pneumonia on the clinical features of ICU patients with severe thoracic trauma.

METHODS. We studied retrospectively all patients with thoracic trauma who were admitted to ICU for more than 5 days between January 2011 and December 2012. Patients with pneumonia were divided into two groups according to the presence of multiple resistant bacteria in bronchial secretions cultures. Group A included patients with multidrug-resistant bacteria and group B included those with sensitive bacteria. Age, sex, number of mechanical ventilation days, ICU length of stay and outcome of the patients were recorded. Data were analyzed using t student test and x^2 test.

RESULTS. Twenty-eight multiple injured patients (25 men and 3 women) with severe thoracic trauma (rib fractures, fractured sternum, lung contusions, pneumothorax treated with chest tube drainage) were admitted to ICU. They were all mechanically ventilated and treated with standard therapy according to our clinic protocol. Ten to fifteen days after admission pneumonia was diagnosed and was treated with antibiotics according to the sensitivity test. In fourteen patients (group A) multi-resistant bacteria were cultured in bronchial secretions (acinetobacter baumannii 5, klebsiella pneumoniae 6 and Pseudomonas aeroginosa 3). In three patients pneumonia was complicated by lung abscess which was treated with surgical drainage. The effect of resistant bacteria on the status of patients' clinical characteristics is shown in the following table.

Clinical characteristics in group A and group B

	Age (mean ± SD)	Mech. Vent. Days (mean ± SD)	Length of stay (mean ± SD)	Survival No of patients
Group A	47,21 ± 23,2	25,00 ± 13,43	29,21 ± 13,8	7
Group B	44,21 ± 19,769	14,36 ± 12,7	18,00 ± 13,29	14
Significance	NS	$p < 0.05$	$p < 0.05$	$P = 0.001$

CONCLUSIONS. Lung infection caused by multi-resistant bacteria greatly increases the ventilation time, the length of ICU stay and reduces survival of patients with severe thoracic trauma.

REFERENCES. 1. Dey A, Bairy I. Incidence of multidrug-resistant organisms causing ventilator-associated pneumonia in a tertiary care hospital: a nine months′ prospective study. Ann Thorac Med. 2007;2(2):52–7. 2. Resende MM, et al. Epidemiology and outcomes of ventilator-associated pneumonia in northern Brazil: an analytical descriptive prospective cohort study. BMC Infect Dis. 2013; 5:13:119

1066
CARBAPENEMASE PRODUCING *KLEBSIELLA PNEUMONIAE* INFECTIONS IN A GREEK INTENSIVE CARE UNIT: A 2-YEAR EPIDEMIOLOGICAL AND MOLECULAR STUDY

M. Katsiari[1], Z. Roussou[2], P. Giakkoupi[3], A.C. Vatopoulos[3], E.D. Platsouka[2], A. Maguina[1]

[1]Konstantopouleio General Hospital, Intensive Care Unit, Athens, Greece, [2]Konstantopouleio General Hospital, Microbiology Department, Athens, Greece, [3]National School of Public Health, Microbiology Department, Athens, Greece

INTRODUCTION. *Klebsiella pneumoniae* strains carbapenemases producing as KPC or VIM are emerging pathogens which frequently are responsible for high morbidity and mortality in Intensive Care Unit (ICU) patients.

OBJECTIVES. To determine epidemiology and outcome of infections caused by KPC and VIM *Klebsiella pneumoniae*.

METHODS. Prospective observational study conducted in a multidisciplinary 9-bed ICU. Between April 2010 and March 2012, 61 patients (42 males) were infected or colonized with *Klebsiella pneumoniae* (KPC or VIM). Data collected for each patient included demographics, day of infection/colonization after ICU admission, type of infection, microbiological data, management and outcome. Molecular typing was performed by Pulsed Field Gel Electrophoresis (PFGE) of *Xba*I fragments of chromosomal DNA. Only the first episode of infection/colonization per patient was included in the analysis.

RESULTS. Mean age and APACHE II score on admission of patients included were 64 ± 16 years and 21.1 ± 6.73 respectively. Cause of admission was surgical in 18 patients. Median day of *Klebsiella pneumoniae* isolation was day 12 after ICU admission. A total of 64 strains were isolated (50 KPC, 14 VIM), half of them related with infection. Type of infection included: Eight (25 %) hospital-acquired pneumonias (7 ventilator-associated pneumonia, VAP), 16 (50 %) bacteremias (6 catheter-related bloodstream infections, CRBSIs), 4 (12.5 %) skin and soft tissue infections and 4 (12.5 %) complicated intra-abdominal infection. Tigecycline with colistin was the most common combination antimicrobial scheme. ICU crude mortality in infected patients was 71 %, significantly higher compared to colonized patients (40 %, $p = 0.015$). Median ICU length of stay of infected patients was 25 days. Molecular analysis revealed sporadic isolates producing KPC β-lactamase till September 2010. After September 2010 ICU disinfection, a previously existing type was spreading in ICU from December 2010 till May 2011 (9 patients). A second disinfection took place in June 2011. A KPC producing type, closely related to the previously existing, was identified in five patients from November 2011 to February 2012. At the same time, a larger dissemination of a VIM producing type took place, including 9 patients.

CONCLUSIONS. Carbapenemases producing *Klebsiella pneumoniae* are an emerging problem in Greece. KPC producing *Klebsiella pneumoniae* was the predominant strain in our study population. Ventilator-associated pneumonias and bacteremias were the most frequent infections. Infected patients revealed high ICU mortality (71 %). Molecular analysis revealed three strain clusters during the study period. ICU disinfection may have contributed to restriction of strains' dissemination and outbreaks' elimination. However, strict infection control measures are of significant importance in order to diminish horizontal transmission of *Klebsiella pneumoniae*.

1067
PREVALENCE AND RISK FACTORS FOR COLONIZATION WITH MULTIDRUG RESISTANT BACTERIA AMONG PATIENTS ADMITTED TO THE INTENSIVE CARE UNIT RETURNING FROM ABROAD

M. Angue[1], D. Vandroux[1], Y. Lefort[1], M. Orabona[1], O. Belmonte[2], N. Lugagne[3], J. Allyn[1]

[1]CHU F Guyon, La Réunion, Réanimation Polyvalente, Saint Denis de La Réunion, France, [2]CHU F Guyon, La Réunion, Bactériologie, Saint Denis de La Réunion, France, [3]CHU F Guyon, La Réunion, CLIN, Saint Denis de La Réunion, France

INTRODUCTION. The management of ICU patients returning from abroad poses environmental and treatment problems. French recommendations are preventive contact isolation only for patients who have been hospitalized abroad; there is no mention of patients returning from abroad in general. No study has been carried out on this topic in ICU.

OBJECTIVES. Describe the characteristics of patients having been abroad during the past 6 months and identify factors associated with colonization with MRB.

METHODS. Retrospective study of 15 months (2012–2013) in the ICU of the University Hospital North of Reunion. Inclusion of all patients admitted to the ICU during this period and identification of patients who have been abroad at any time within 6 months prior to the admission. Statistical analysis of the data (including sampling hygiene research MRB systematically performed on admission to the unit) consisted of uni and multivariate analysis to identify factors related to the carriage of MRB. Results are presented as median (Q1–Q3) and percentage.

RESULTS. Of 1,157 patients admitted to the ICU, 79 (6.8 %) had been abroad in the previous 6 months (50 % Madagascar, Mayotte/Comoros 30 %, India/Mauritius 13 %). Of the 79 patients, 49 (62 %) resided abroad, 44 (56 %) had been repatriated by a foreign hospital, 24 (30 %) had received antibiotics on site. The median age was 59 (38–64) years, SAPS II at admission was 49 (29–62), and an infection was the reason for admission in 47 %0.29 (37 %) of these 79 patients had a positive screening MRB at admission (71 % among the subpopulation of patients who received antibiotics, 50 % of repatriated patients, 49 % of foreign residents, and 17 % of tourists), against 7.2 % among other patients admitted to the ICU ($p < 0.01$). MRB (44 Enterobacteriaceae ESBL and 1 carbapenemase, 5 acinetobacter baumanii resistant to carbapenems, 1 Pseudomonas aeruginosa resistant to ceftazidime, 3 Stenotrophomonas maltophilia, 0 MRSA, glycopeptide-resistant enterococci 0) was pathogenic in 7 of 29 cases (24 %) from admission. Probabilistic antibiotherapy was prescribed before the 4th day in 84 % of cases; it contained a carbapenem in 36 % of cases, and covered MRSA in 26 % of cases. 11 (28 %) patients experienced an MRB infection during their stay. The univariate and multivariate identified one factor associated with colonization with MRB admission in these patients, taking antibiotics: OR (95 % CI): 5.2 (1.2 to 21.4), $p = 0.02$.

CONCLUSIONS. We report, in this large cohort, a carriage of MRB very common, even among tourists, justifying isolation and MRB carriage screening for any patient having been abroad during the past 6 months, beyond recommendations. The rate of infection on admission to the MRB and related factors identified can challenge a systematic probabilistic very broad spectrum antibiotherapy.

1068
IMPACT OF INFECTION PREVENTION PROGRAMS IN ANTIBIOTIC USE IN CRITICALLY ILL PATIENTS

M. Palomar[1], F. Alvarez lerma[2], X. Nuvials[1], P. Olaechea[3], J.J. Otal[4], R. Gimeno[5], I. Seijas[6], M. Catalan[7], M. Arenillas[2], ENVIN-HELICS Group

[1]IRBLleida, Lleida, Spain, [2]Hospital Mar, Barcelona, Spain, [3]Hospital Galdakao, Galdakao, Spain, [4]Hospital Galdakao Vall Hebron, Barcelona, Spain, [5]Hospital La Fe, Valencia, Spain, [6]Hospital Cruces, Bilbo, Spain, [7]Hospital Doce de Octubre, Madrid, Spain

INTRODUCTION. According to the literature, rates of associated device's infections are decreasing but the consumption of antibiotics (ATB) in the ICUs remains high.

OBJECTIVES. To asses whether prevention programs for bacteriemia (BZ) and VAP (NZ), initiated in 2009 and 2011,have had some impact on the use of ATB in Spanish ICUs.

METHODS. ENVIN-HELICS, prospective, multicenter, observational study, including all patients admitted to the ICU from April to July from 2008 to 2012. Patients with ATB, indications as community-acquired infection (CAI), extra-ICU (NI) and ICU (ICU-AI) nosocomial infections, and days of treatment (ATB-days) were documented. Statistical analysis: Chi square test, significance * = $p < 0.05$.

RESULTS. We documented 84,107 patients and 637,647 patient-days. A total of 116,432 ATB and 753,628 ATB-days were prescribed.

The percentage of patients with ICU-NI drecreased from 13.5 % in 2008 to 10.24 % in 2012*, while Pts with CAI increased from 13.4 to 14.3 %.

The percentage of patients with ATB ranged from 60 % in 2009 to 63 % in 2012. However, the percentage of ATB free-days in ICU increased from 33 to 37 % *and the total ATB-days in relation to the patient days fell from 116.8 to 113.4 *as well.

ATB for ICU-NI, declined both in number of indications* (27.2 % 2008 to 20.7 % in 2012*) and ATB-days (35.1 to 26.8 %) of total use, while ATB, (number and days) for CAI increased (25.8 and 26.3 % to 29.3 and 32.7 %).

ATB for NI increased in a lower degree (20.1 and 21.9 % to 20.7 and 23.4 %*) .

CONCLUSIONS. The decrease of ICU-NI as a result of implementation of safety patient programs (BZ and NZ) has been reflected in a significant lower use of ATB for these indications and overall.

REFERENCES. 1. http://hws.vhebron.net/envin-helics/

GRANT ACKNOWLEDGMENT. Pfizer

1069
DOXYCYCLINE AND CO-TRIMETHOXAZOLE: A NEW COMBINATION FOR TREATMENT OF MDR ACINETOBACTER BAUMANNII. DOES IT WORK?

S. Farid[1], A. Abouelela[2], M. Eliwa[2]

[1]Alexandria University, Microbiology & Immunology, Alexandria, Egypt, [2]Alexandria University, Critical Care Medicine, Alexandria, Egypt

INTRODUCTION. Acinetobacter baumannii has proven to be an increasingly important and demanding species in health care-associated infections. The drug-resistant nature of the pathogen and its unusual and unpredictable susceptibility patterns make empirical and therapeutic decisions even more difficult. Most of the published and running studies for treatment of multidrug-resistant Acinetobacter baumannii (MDR-AB) depends on the usage of older class of antibiotic (Colistin) either alone as a single therapy or in combination with another antibacterial agents. the fact that new strains of Acinetobacter baumannii started to show resistance to colistin obliged the investigators to search for other alternatives for treatment.

OBJECTIVE. The aim of this study was to assess the effect of combination of Doxycycline and co-trimethoxazole in the cure of nosocomial MDR-AB infection in critically ill patients and its effect on the patients outcome.

METHODS. The study was done on 50 adult critically ill patients who developed nosocomial isolated MDR-AB in the Critical Care Medicine Department of Alexandria University in Egypt and received combination of Doxycycline 100 mg twice daily With trimethoprime-sulphamethoxazole (co-trimethoxazole) in a dose of 80 mg Trimethoprime/ 400 mg Sulphamethoxazole twice daily for 1 week. patients who are allergic to the antibiotics used or those who did not continue 7 days treatment were excluded from the study. Approval of local ethical committee as well as consent from patients relatives were obtained. culture and sensitivity was repeated after 1 week treatment.

RESULTS. The microbiological cure rate was 60 % as 30/50 patients were cured. The best cure rate was in surgical site infection with 88.9 % (8/9) while the cure in pneumonia was 56.7 % (17/30). Two cases with blood steam infection were not cured while (5/9) patients from those who had more than one site infection were cured. The total 30 days mortality was 20 % (10/50) while the mortality related infection was 12 %.

CONCLUSIONS. We concluded that combination of Doxycycline and co-trimethoxazole can be used in the treatment of nosocomial MDR-AB infection resistant to colistin or in cases with contraindications or unavailability of colistin especially in surgical site infection and to less extent in pneumonia.. However, further larger studies are needed to validate the results of this study.

REFERENCES. 1. Maragakis LL, Perl TM. *Acinetobacter baumannii*: epidemiology, antimicrobial resistance, and treatment options. Clin Infect Dis 2008; 46(8):1254–63. 2. Popescu GA. Antimicrobial resistance of Acinetobacter baumannii strains isolated in „MATEI BAL national institute of infectious diseases. Therapeutics, Pharmacology and Clinical Toxicology 2011; 15(3): 225–9. 3. Eberle BM. The impact of Acinetobacter baumannii infections on outcome in trauma patients: a matched cohort study. Crit Care Med. 2010;38(11):2133–8.

1070
WE ARE ALL NECESSARY AGAINST THE OUTBREAK

V. Olea Jiménez[1], J.M. Mora Ordoñez[1], E. Curiel Balsera[1]

[1]Hospital Regional Carlos Haya, Medicina Intensiva, Málaga, Spain

INTRODUCTION. Strains resistant ESBL and carbapenem are increasing. The first was in 1993 carbapenemase in Enterobacter cloacae coded in NmcA. We have identified a variety of carbapenem in enterobacteria, (A, B and D). Class D are mostly OXA-48 and OXA-181 are endemic to the Mediterranean basin. The Hodge test can be used as a first step in the detection of carbapenemases. The time required is 24–48 h and is better for the detection of carbapenemase KPC and OXA-48. The main mechanism of spread is patient–patient. The Control strategies are surveillance cultures, cleaning up the environment, contact precautions and prudent use of antibiotics antimicrobianos. These strains are sensitive to colistina, some aminoglycoside and tigeciclina.

OBJECTIVES. Describe the measures to control the outbreak.

METHODS. Descriptive observational study of the measures taken during the outbreak K. pneumoniae bla-OXA48 from October 2011 to 2012.

RESULTS. Collected 135 ESBL. 104K. pneumoniae ESBL with carbapenemase OXA suspect phenotype 48. Interventions are by a multidisciplinary group. When It confirms the existence of the outbreak, were provides guidelines to follow. Monitoring is performed Klebsiella isolates from culture and antibiogram of samples as well as molecular typing. Described 82 patients OXA 48 confirmed. The 98.7 % were CTX-M15. Although the study showed polyclonality clone 5 was predominant with 90 %. The Samples which was first isolated from rectal swab 41.5 %, 22 % respiratory secretions, urine culture, blood culture, 17.1 % and 8.5 %. Were transferred infected and colonized patients in single rooms. The Patient cohorts with this organism were in a particular area. Measures contact isolation were implemented, until we had 3 negative cultures. The cultures were monitoring through rectal swabs of all patients who may have been in contact and those with more than 48 h of ICU. Repeat once a week. Priority was given to the cleaning. Equipment non-critical was devoted for individual use. It is increased the points of hand hygiene. Informative talks were conducted. After six month at the persistence of the outbreak are increased measures. A commission was created to improve multidisciplinary, were assigned specific areas of insulation out of ICU, dedicated staff exclusive, were cleanings terminals, was introduced Selective Digestive Decontamination and the establishment of specific PCR molecular technique to detect OXA-48. It was controlled the outbreak in October 2012.

CONCLUSIONS. The emergence of multidrug-resistant germ outbreak increases both morbidity and mortality. It is essential to the performance of a multidisciplinary team with the support of management. The high suspicion or early detection with PCR technique allows early action. Insulation measures, exclusive personal hygiene, proper treatment and the use of SDD controlled the outbreak difficult.

REFERENCES. 1. CMI 18:439–448. 2. CMI 18:413–431.

1071
MULTIDRUG RESISTANT ACINETOBACTER INFECTION IN A SECOND LEVEL INTENSIVE CARE UNIT

C. Trujillano-Fernandez[1], M.-V. de la Torre-Prados[1], N. Zamboschi[1], J. Perez-Vacas[1], A. Puerto-Morlan[1], E. Camara-Sola[1], P. Martinez-Lopez[1,2], A. Garcia-Alcantara[1,2]

[1]Hospital Universitario Virgen de la Victoria, Intensive Care Unit, Malaga, Spain, [2]IBIMA Institute, Malaga, Spain

INTRODUCTION. Multidrug resistant (MDR) Acinetobacter has emerged as a cause of infection in critically ill patients. Broad spectrum antibiotics, mechanical ventilation, central venous catheter and tracheostomy are well-known risk factors for developing this infection. The development of Intensive Care Unit (ICU) acquired infections is strongly related to prolonged ICU stay and worse outcomes including increased morbidity and mortality.

OBJECTIVES. To describe demographic, clinical characteristics and the associated outcomes of patients who develop MDR Acinetobacter infections in ICU.

METHODS. A retrospective study of 22 cases admitted to a second level ICU with this kind of infection was made during the period November 2010 to January 2013, with a review of medical records, laboratory tests and microbiological isolates during the admission period. Descriptive and comparative statistical analysis was performed using the statistical software packages SPSS version 15.0 (SPSS Inc., Chicago, IL, USA).

RESULTS. During the study period we had an outbreak of 13 cases, from november 2010 to march 2011, and unrelated 9 cases in the post period. Mean age was 58.18 ± 16.6 years (IC95 % 50.82–65.54); 73 % were males (n = 16) and 68 % (n = 15) came from emergency area. Mean APACHE II score was 20 ± 7 (IC95 % 16.7–23.5) and predicted mortality related to APACHE II Score in deceased subgroup was 43 ± 18 % (IC95 % 31.6–55). The most frequent reason for admission in ICU was cardiorespiratory failure n = 10 (45.4 %), followed by gastrointestinal tract n = 4 (18.2 %) and trauma n = 4 (18.2 %). The source of infection was bronchial aspirate isolates in 95 % of patients (n = 21) and these patients needed mechanical ventilation >7 days. The 63.6 % of patients underwent tracheostomy. All patients have received vasoactives drugs and antibiotherapy: cephalosporin, quinolones or carbapenem. The period between admission in ICU and MDR infection was 6.45 ± 5.6 days. Average stay in ICU was 28.53 ± 15.2 days (IC95 % 21–36). Most patients received colistin (95.5 %, n = 21), alone or associated to another one. A total of 12 patients died (54.5 %). A bivariate mortality analysis showed in the died subgroup higher age (51.7 vs 63.6 years), more organ failure with statistical significance 2.5 ± 0.7 (IC95 % 1.9–3) vs 3.33 ± 0.77 (IC95 % 2.84–3.83) and a shorter period between admission in ICU and first nosocomial infection 9.4 ± 6.8 vs 4 ± 2.9.
CONCLUSIONS. Most patients with MDR Acinetobacter infections have received broad spectrum antibiotics and have developed septic shock in a medical pathology. A colonization study in risk patients, isolation measures and a strict hygiene policy is essential to avoid the persistence of MDR Acinetobacter outbreak in the ICUs.
REFERENCES. 1. Pérez MJ, Sánchez M and Rodríguez J. Utilización de la colistina nebulizada en la colonización e infección respiratoria por Acinetobacter baumannii en pacientes críticos. Med Intensiva. 2011; 5:226–31.

1072
NOSOCOMIAL OUTBREAK OF MULTIDRUG-RESISTANT *ACINETOBACTER BAUMANNII* (MDRAB) IN A CRITICAL CARE CENTRE, 2012 - FIRST REPORT FROM JAPAN

H. Ushizawa[1], Y. Yahata[2], K. Nakashima[2], K. Shibayama[3], K. Oishi[2], Y. Otomo[1]

[1]Tokyo Medical and Dental University, Acute Critical Care and Disaster Medicine, Tokyo, Japan, [2]National Institute of Infectious Diseases, Infectious Diseases Surveillance Centre, Tokyo, Japan, [3]National Institute of Infectious Diseases, Bacteriology II, Tokyo, Japan
INTRODUCTION. MDRAB is known as one of emerging opportunistic pathogens, which has been spreading in globally both in hospital and community. As of 2012, however, there have never been any reports on MDRAB outbreaks from Japan. This outbreak was recognized when clinical laboratory technologist noticed MDRAB positive strain from 38 year-old male at a critical care centre on 1 March 2012.
OBJECTIVES. To control the ongoing nosocomial outbreak, to identify risk factors for colonization of MDRAB, and to elucidate the bacterial and molecular epidemiology of the outbreak.
METHODS. We evaluated some infection control measures such as temporal closing of emergency room and intensive care unit, isolating or cohorting MDRAB positive cases, infection control after new case occurrence, environmental cleaning, continuous risk assessment, periodical screening of hospitalised patients, infection control-compliance assessment, environmental sample collection and test, re-education for all health care workers, and external evaluation committee as before-and-after interventional study. We also conducted a matched case–control study to examine the risk factors for MDRAB colonization. We examined the identity of outbreak strains by pulse-field gel electrophoresis (PFGE), elucidated the mechanism of drug resistance, and compared the outbreak strains with strains in other countries by multilocus sequence test (MLST).
RESULTS. Interventions above led to the cessation of the outbreak. We identified fifteen patients as cases, who were admitted to the critical care center from 1 June 2011 to 31 March 2012 and then infected or colonized with MDRAB 48 h after admission. Thirty-one controls were defined as patients with *Acinetobacter baumannii spp.* negative for specimen. After adjusting by usage of carbapenem, matched multivariate logistic regression analysis clarified that hypoalbuminemia (adjusted odds ratio [aOR], 20.5; 95 % confidence interval [CI], 1.9–227.8, intubation (aOR, 10.2; 95 % CI, 1.2–85.6), and arterial catheterization (aOR, 5.6; 95 % CI, 1.1–28.3) were significant. In PFGE, all strains submitted were identical. The strain did not produce metallo-ß-lactamase. OXA-23-like carbapenemase gene functioned. MLST showed the sequence type as 74 and allele profile as 1-3-33-2-2-75-3.
CONCLUSIONS. Early detection and intervention were effective to stop horizontal transmission. Medical practice in the light of risk factors is indispensable. Risk factors serve as an alert to prevent the outbreak. PFGE suggested the outbreak to be induced from single strain. MLST suggested the strains belonged to the pandemic strains called clonal complex 92.
REFERENCES. 1. Munoz-Price LS et al. Acinetobacter infection. N Engl J Med. 2008.

1073
TIGECYCLINE FOR THE TREATMENT OF MULTIDRUG-RESISTANT GRAM-NEGATIVE ORGANISMS: EFFICACY AND ADVERSE EFFECTS

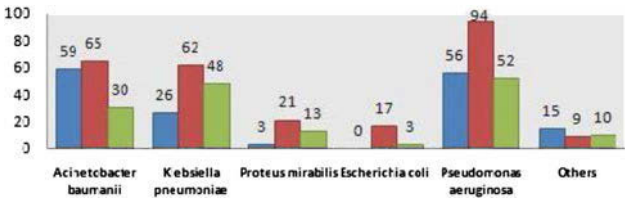
M. Katsiari[1], A. Xydaki[1], E. Tsamoukas[1], I. Strouvalis[1], E. Palla[2], Z. Roussou[2], E.D. Platsouka[2], A. Maguina[1]

[1]Konstantopouleio General Hospital, Intensive Care Unit, Athens, Greece, [2]Konstantopouleio General Hospital, Microbiology Department, Athens, Greece
INTRODUCTION. Nosocomial infections caused by multidrug-resistant (MDR) bacteria continue to challenge physicians and endanger their patients' outcome. Tigecycline is a novel antibiotic demonstrating activity against these microorganisms in vitro.
OBJECTIVES. To assess the efficacy of tigecycline use in serious hospital-acquired infections, and identify possible adverse clinical events.
METHODS. Prospective observational study conducted in a multidisciplinary 9-bed Intensive Care Unit (ICU). Over a 10-month period, 33 consecutive patients who were treated with tigecycline were enrolled in the study. Data collected for each patient included demographics, type of infection and causative microorganisms, treatment duration, clinical and microbiological outcome and adverse effects of tigecycline use. Identification and susceptibility testing of bacterial isolates were performed by standard techniques. MIC of tigecycline was determined by E-test. All patients received standard approved dosage of tigecycline in combination with colistin.
RESULTS. Mean age and APACHE II score of patients included were 66 ± 14 years and 20 ± 6.3 respectively. Tigecycline was prescribed in 33 patients, 12 (36.3 %) with hospital-acquired pneumonia (10 ventilator-associated pneumonia, VAP), 13 (39.4 %) with bacteremia (9 catheter-related bloodstream infections, CRBSIs), 2 (6.1 %) with skin and soft tissue infections and 6 (18.2 %) with complicated intra-abdominal infections. Bacterial isolates were as follows: 24 (68.6 %) *Acinetobacter baumannii* and 11 (31.4 %) *Klebsiella pneumonia*e. Median duration of tigecycline therapy was 9 days (range 4–24). Clinical outcome was positive in 21 (63.6 %) patients, while microbiological outcome was positive in 11 (33.3 %) patients. In one case, resistance to tigecycline was developed during therapy. In 3 (9 %) patients tigecycline was discontinued due to a decrease of fibrinogen levels (< 200 mg/dl), cholestasis or pancytopenia. Isolation of other Gram-negative bacterial strains during treatment with tigecycline was observed in 18 (54.5 %) patients, in 12 (36.4 %) representing superinfection and in 6 (18.1 %) colonization. *Pseudomonas aeruginosa* was the predominant agent (47.6 %), followed by *Proteus mirabilis*, *Providencia stuartii* and *Stenotrophomonas maltophilia.* Median time elapsed between tigecycline prescription and isolation of tigecycline-resistant bacteria was 6 days. Type of superinfections: 5 (41.2 %) patients with VAP, 6 (50 %) with bacteremia (5 CRBSIs) and 1 (8.3 %) with intra-abdominal infection.
CONCLUSIONS. Our preliminary results suggest that tigecycline revealed a good clinical response in the treatment of MDR Gram-negative bacteria, although microbiological response was less positive. However, a significant rate of superinfections from pathogens with inherent resistance to tigecycline was identified (36.4 %), underlining the need for tight surveillance in the follow-up of patients treated.

1074
EPIDEMIOLOGY AND ANTIMICROBIAL RESISTANCE AMONG COMMONLY ENCOUNTERED GRAM NEGATIVE BACTERIA IN ADULT ICU PATIENTS

T. Aslanidis[1], E. Geka[1], A. Kontos[1], A. Myrou[1], I. Oloktsidou[1], E. Chytas[1], E. Boultoukas[1], I. Soultati[1], E. Efthimiou[1], E. Anastasiou[1], M. Giannakou-Peftoulidou[1]

[1]'AHEPA' Univ. Hospital, ICU, Thessaloniki, Greece
INTRODUCTION. Local epidemiological data and antibiograms are useful for optimized empirical antibiotic therapy for severe ICUacquired infections.
OBJECTIVES. To explore the microbiology trends of positive cultures for Gram negative bacteria and their resistance patterns.
METHODS. Every positive culture for Gram negative microorganisms in our 10 bed polyvalent ICU of a 653 bed university hospital was recorded from 1/1/2010 till 31/12/2012. Positive cultures before ICU admission were excluded from the study.
RESULTS. The study period included a total of 888 admissions (average values for the following demographics were: APACHE II score 15 ± 2, age 57 yrs, LOS 9.96 d, mechanical ventilation 7.4, mortality 15.6 %) Out of 1,102 positive cultures (corresponding to 486 patients), 583 referring to combined CVC-blood and respiratory cultures, were included for further analysis. Stratification according to specimen type for the three most common bacteria revealed that combined blood and CVC culture accounted for 39 % (2010), 27 % (2011) and 44 % (2012) of strains while respiratory positive samples where 17 %, 10 % and 16 % respectively. Others species were rare (fig. 1). A raise in the number of isolates in 2011 was noticed.



Isolates in 2010 (blue), 2011 (red) and 2012 (green)

Resistance rates for carbapenems and aminoglycosides for
a) *A. baumanii* were 57.6 and 42.3 % (2010), 51.9 and 23.1 % (2011) and 36.7 and 30 % (2012)
b) *P. aeruginosa* were 39.2 and 37.6 % (2010), 46.8 and 27.6 % (2011) and 48 and 40.3 % (2012)
c) *K. pneumoniae* were 53.8 and 3.8 % (2010), 54.8 and 3.3 % (2011) and 66.7 and 39,5 % (2012)
CONCLUSIONS. In this study the most common Gram(−) strains were *P. aeruginosa* (34,6 %), *A. baumannii* (25,9 %) and *K. pneumoniae* (23,1 %). The 2012 results for *A. baumanii* might be attributed to increased colimycin use in 2011. Aminoglycosides displayed a variable pattern of resistance for *P. aeruginosa.* Susceptibility rates for carbapenems and aminoglycosides were similar for the first two years, but a clear tendency towards more resistant *Klebsiella spp.* strains was observed.
REFERENCES. 1. Ruoming T, J Micro Immun Inf. 2013.

1075
EXTENDED SPECTRUM B-LACTAMASE STRAINS INFECTION IN AN INTENSIVE CARE UNIT

C. Trujillano-Fernandez[1,2], N. Zamboschi[1,2], M.-V. de la Torre-Prados[1,2], J. Perez-Vacas[1,2], A. Puerto-Morlan[1,2], E. Camara-Sola[1,2], A. Garcia-Alcantara[1,2], C. Reina-Artacho[1,2]

[1]Hospital Universitario Virgen de la Victoria, Intensive Care Unit, Malaga, Spain, [2]IBIMA Institute, Malaga, Spain
INTRODUCTION. Extended spectrum b-lactamase (ESBL) producing enterobacteriaceae are rapidly emerging pathogen in intensive care units. The most common producing strains are *Escherichia coli* and *Klebsiella peumoniae*.
OBJECTIVES. To describe the epidemiological and clinical characteristics of patients who suffered these infections/colonizations admitted to our Intensive Care Unit.
METHODS. A retrospective study of cases admitted to ICU with this kind of infection/colonization. Study period ranges from November 2009 to January 2013. We made a review of medical records, laboratory tests and microbiological isolates. Descriptive and comparative statistical analysis was performed using the statistical software packages SPSS version 15.0 (SPSS Inc., Chicago, IL, USA).
RESULTS. We had analyzed 51 cases, 18 patients with *Klebsiella pneumoniae* isolation, 23 patients with *Escherichia coli* and 10 cases were colonization. The mean age was 61.82 ± 15.12 years. A total of 33 were male (64.7 %). The average stay was 28.98 ± 25.8 (8.75–42.5) days. The mean APACHE II score was 19.78 ± 7.47 and the predicted mortality related to this score was 33.19 ± 18.48. The main reason of admission in ICU was respiratory diseases n = 15 (29.4 %), followed by cardiovascular pathology n = 13

(25.5 %) and gastrointestinal diseases n = 10 (19.6 %), other causes of admission were renal failure or trauma. Most patients came from the emergency department n = 39 (76.5 %) with medical pathology, n = 39 (76.5 %). The first source of infection was bronchoaspirate isolates n = 18 (35.35 %), followed by urine isolates n = 8 (15.7 %) and blood cultures n = 6 (11.8 %). Most patients needed vasopresor drug n = 42 (82.4 %), mechanical ventilation n = 45 (88.2 %) and 29 patients underwent tracheostomy. All patients 100 % received previous antibiotics before the ESBL isolation and the drug chosen to treat the infection was a carbapenem in 41 patients (80.4 %), either alone or associated to another antibiotic. 16 patients died in the total group (31.4 %) and mortality was higher in the *Escherichia* subgroup than the *Klebsiella* subgroup 47.8 % vs. 22.2 %. A bivariate mortality analysis showed in the subgroup of deceased a higher age (67 vs. 59.43 years), more organ failures (3.56 vs. 2.55), longer duration in mechanical ventilation (20.81 vs. 18 days) and a shorter period of time between admission in ICU and first nosocomial infection (15.5 vs. 19.75 days).

CONCLUSIONS. ESBL producing enterobacteriaceae infection is an important cause of nosocomial infection with long stays and high intensive support. A program based on obtaining early samples, especially for patients from ward and other hospitals, and increased surveillance and strict infection control measures for these organism.

REFERENCES. 1. Prashant N et al. An observational study on bloodstream extended-spectrum beta-lactamase infection in critical care unit: incidence, risk factors and its impact on outcome. Eur J Internal Med. 2012; 23: 192–95.

Prognosis of sepsis: 1076–1089

1076

SEPTIC SHOCK HEMODYNAMIC MANAGEMENT: EVOLUTION IN A DECADE

G. Zani[1], F. Freddi[1], B. Gemelli[1], S. Vitali[1], E. Bergamini[1], S. Tisato[1], D. Morri[1], S. Spadaro[1], R. Ragazzi[1], C.A. Volta[1]

[1]University of Ferrara, Anesthesiology and Intensive Care, Department of Morphology, Surgery and Sperimental Medicine, Ferrara, Italy

INTRODUCTION. Septic shock patients are a very heterogeneous population and this reason make them so hard to investigate. The early treatment and the use of specific goals seem able to influence the outcome of these patients. Although recent guidelines of the Surviving Sepsis Campaign (SSC) on the hemodynamic management are most clear [1], there are still some controversies: does one fit all? And what about the treatment subsequent to the first 6 h [2, 3]?

OBJECTIVES. Primary aim of this study was to analyze the evolution in hemodynamic management in septic shock patients from 2003 to 2012 in our general ICU. Secondary objective was to discover if and how this strategy could influence the outcome.

METHODS. We analyzed vasopressor and fluid management in all patients admitted to our ICU with a diagnosis of septic shock in 2003, 2007 and 2012. Data were collected retrospectively for 2003 and 2007 and prospectively for 2012. We considered 2003 because there were still no guidelines and 2007 and 2012 as representative of the first and second edition of SSC guidelines. Patients' data were recorded by consulting medical records.

RESULTS. 63 patients were finally enrolled (18 in 2003, 20 in 2007 and 25 in 2012).

- Inhospital mortality fall from 72 % in 2003 to 55 % in 2007 and 44 % in 2012, with a total reduction in mortality of 28 %.
- No differences were found for median age, SAPS II score and cardiovascular dysfunction assessed by SOFA score.
- SSC hemodynamic targets were reached in 2007 and in 2012.
- Use of dopamine was prevalent in 2003; instead, norepinephrine was the first choice drug both for 2007 and 2012.
- We found a reduction of both dosage of vasoactive drugs from 2003 to 2012 ($p < 0.05$) and duration of infusion of dopamine ($p < 0.01$).
- The use of saline solutions seems to correlate with a worse outcome at the limit of statistical significance ($p = 0.06$).
- Lactate $\geq$ 4 mmol/l at ICU admission and after 6 h of treatment were predictive of mortality ($p < 0.05$).

CONCLUSIONS. Application of the SSC guidelines for septic shock patients improved the outcome. Norepinephrine has been identified as the first choice already in 2007, according to the most recent SSC guidelines, but the best strategy to improve the outcome seems the use of vasopressors in low doses, for a short time and in combination with an appropriate fluid therapy. Lactacidemia was a simple parameter able to predict mortality and it should be used as a guide for fluid therapy in addition to other hemodynamic parameters. The low number of patients enrolled is probably responsible of lack of significance about the use of normal saline in septic shock. However it is tempting to believe that the use of balanced solutions might be associated with a better outcome compared with normal saline.

REFERENCES. 1. The SSC Guidelines Committee. Intensive Care Med 2013;39:165 2. Perel A. Crit Care 2008;12:223 3. Marik PE. Ann Intensive Care 2011;1:17.

1077

STATISTICAL STUDY OF URINARY INFECTIONS RELATED TO URETHRAL CATHETER IN OUR INTENSIVE CARE UNIT (ICU)

R. Fernandez[1], J.C. Frías[1], M. Muñoz[1], M.E. Yuste[1], R. Ramírez[1]

[1]Granada University, Granada, Spain

INTRODUCTION. Urinary tract infection is the most common nosocomial infection, accounting for 23 to 30 % of all infections acquired during hospitalization. Increases hospital stay by an average of 4 days. Mortality is low and is particularly associated with secondary bacteremia, which occurs from 0.5 to 4 % of these patients. Bladder catheterization (CV) is the most influential factor for developing an urinary tract infection (UTI). Approximately 75 % of UTIs, affect patients that have required catheterization. Through the application of some of medical and sanitary steps,UTI may decrease about 30 %, infectious complications of bladder catheterization.

OBJECTIVES. We want to describe the incidence of UTI associated with urethral catheter, using data from the National Nosocomial Infections Surveillance (ENVIN) in a 18-bed ICU.

METHODS. The patients of our study, were admitted to our ICU from 01.04.11, until 01.01.13, dividing them in two periods: from 01.04.11 to 01.01.12 and 01.01.12 to 01.01.13.. We included only patients admitted for more than 24 h. All were followed until discharge from the ICU. As statistical parameters, we used the rate per 100 patients admitted (total of 1,821 patients) and the incidence density (ID) per 1,000 days of ICU stay (8,599 days) and ID per 1,000 urinary catheter days (6,122).

RESULTS. The profile of patients with catheter-associated urinary tract infection in our ICU is: mean age 61 years with standard desviation (SD) 24.65, 60 % women, 80 % artificial airway, central venous catheter (CVC) 80 %, SAPS II half 42, SD18.38. Half APACHE 21.20, SD 6.87 and half days of stay: 108 with SD 122.75 (maximum 242, minimum 4). According to ENVIN-ICU, national average rate is between 4.08 per 1,000 days of catheterization.

In the first period, we had a total of 7 UTIs with a rate of 0.99 UTIs per 100 patients admitted and 1.96 UTIs per 100 catheterized patients.

The ID was 1.86 UTIs per 1,000 days of ICU stay and 2.73 per 1,000 catheter days. The most frequently isolated microorganisms were E. coli and K. pneumoniae.

During the second period, we also present 7 urinary infections, with a rate of 0.63 per 100 patients admitted and 1.16 per 100 patients with urinary catheter. The DI was 1.30 UTIs per 1,000 days of stay and 20.1 per 1,000 urinary catheter days. During this year, shared first place E. coli,K. pneumoniaeplus P. Aeruginosa. In the two cuts, one was isolated fungus, being C. albicans.

In both periods, the most common inflammatory response was sepsis (71.43 %, 85.71 % respectively) with proper treatment in 85.71 % and 100 % of cases, respectively, it was then demonstrated with the culture and sensitivity.

CONCLUSIONS. We are below the rate and the national ID catheter-associated UTI. It is relationated to the exclusive probing to patients who require it, to the sterile conditions of the technical

REFERENCES. 1. Flores J, Bustinza A. Vesical catheterization guidelines. Grupo SECIP. 2012

GRANT ACKNOWLEDGMENT. Dra Yuste, Dra Ramírez

1078

OUTCOME PREDICTORS IN SEVERE DENGUE INFECTION WITH MULTIORGAN DYSFUNCTION SYNDROME—A PROSPECTIVE MULTICENTERED STUDY IN INDIA (IPRI-DIMODS STUDY)

S. Jog[1,2], S. Prayag[2,3], P. Joshi[2,4], S. Dixit[2,5], P. Rajhans[1,2], K. Zirpe[2,6], M. Penurkar[2,7], J. Shah[2,8], A. Kakrani[9], A. Yadav[2,10], K. Kadapatti[2,11], B. Pawar[1,2], S. Gurav[2,6], K. Borawake[2,9], D. Patel[1,2], ISCCM Pune Research Initiative (IPRI)

[1]Deenanath Mangeshkar Hospital, Intensive Care Medicine, Pune, India, [2]ISCCM Pune, Pune, India, [3]Shree Medical Foundation, Intensive Care Medicine, Pune, India, [4]Niramay Hospital, Pune, India, [5]Sanjeevan Hospital, Intensive Care Medicine, Pune, India, [6]Ruby Hall Clinic, Intensive Care Medicine, Pune, India, [7]Shashwat Hospital, Intensive Care Medicine, Pune, India, [8]Bharati Veedyapeeth Medical College, Intensive Care Medicine, Pune, India, [9]D Y Patil Medical College, Medicine, Pune, India, [10]Niramay Hospital, Intensive Care Medicine, Pune, India, [11]Jehangir Hospital, Intensive Care Medicine, Pune, India

INTRODUCTION. Outcome predictors of Severe Dengue Infection [(1)] in tertiary level Intensive Care Units (ICU) are not well studied and mortality rates reported in the published literature have significant variablility. [(2,3)]

OBJECTIVES. To study outcome predictors in patients with severe dengue infection with multiorgan dysfunction admitted in intensive care units.

METHODS-This prospective Multicentered study was conducted in 14 multidisciplinary tertiary level intensive care units in Pune,India during the period July 2012 to December 2012. The inclusion criteria were:

1) Age above 18 years,

2) Diagnosis of Dengue infection by either Dengue NS1 antigen or Dengue IgM antibody or Dengue PCR positivity.

3) Presence of at least 2 organ dysfunction by SOFA criteria. Exclusion criteria were:

1) Concomittent other tropical/bacterial infection

2) Presence of MODS more than 5 days before ICU admission. Contemporary standard ICU care including advanced hemodynamic monitoring & treatment, mechanical ventilation, renal replacement therapy,blood products transfusion were instituted as per respective ICU′s policy without having any resource limitations.

RESULTS. 410 patients with Dengue infection were screened of which 86 patients who met inclusion criteria were enrolled. Average age was 40.40 ± 17.86 years and average SOFA score on the first day of ICU admission was 3.36 ± 3.80. All cause 28 day mortality was 29.10 % (25/86). We studied various demographic, clinical, laboratory and therapeutic parameters as outcome predictors of mortality. On binomial logistic regression analysis need of vasopressor within 24 h of ICU admission (Cardiovascular SOFA score $\geq$ 2) ($p = 0.009$) along with acute kidney injury (Renal SOFA score $\geq$ 1) ($p = 0.002$) were statistically significantly related to mortality. Patient characteristics like duration of illness before ICU admission; respiratory, hepatic, hematological, neurological dysfunction as well as baseline hematocrit, serum albumin level, global systolic LV function on echocardiography had no co relation with mortality. Therapeutic interventions like positive fluid balance at 24 h of ICU admission,use of colloids, choice of vasipressor, modality of renal replacement therapy, use of systemic steroids, RBC transfusion, plasma replacement, platelet transfusion had no statistically significant co-relation with mortality.

Outcome predictors on logistic regression analysis

Variable	B value	Std error	p value	Odds ratio (C.I.)
CVS SOFA $\geq$ 2	−1.64	0.63	0.01	0.19(0.06–0.66)
Renal SOFA $\geq$ 1	−2.21	0.71	0.002	0.11(0.02–0.44)

CONCLUSIONS. Severe Dengue Infection with multiorgan dysfunction,despite treated in tertiary care ICU, without having any resource limitations, had high mortality. Cardiovascular and renal dysfunction during first 24 h of ICU admission were predictors of higher mortality.

REFERENCES. 1. Dengue guidelines for diagnosis, treatment, prevention and control. Geneva: World Health Organization, 2009. 2. J Critical Care 2011; 26:441–448 3. Am J Trop Med Hyg. 2011; 84(1):127–134.

GRANT ACKNOWLEDGMENT. Research grant from ISCCM, Pune Branch

1079

NEW STRATEGY IN PATIENTS WITH SEPTIC COMPLICATIONS AFTER SURGERY

Y. Miyerbekov[1], G. Svyatova[2], V. Mutagirov[1]

[1]National Scientific Cetre of Surgery, Anaesthesiology, Almaty, Kazakhstan, [2]National Scientific Cetre of Surgery, Clinical Laboratory, Almaty, Kazakhstan

INTRODUCTION. Mortality in patients with peritonitis and abdominal sepsis may be as high as 50–70 %0.[1, 2] Numerous mortality predicting scales are very useful to determine the rate of death probability in septic patients. [3, 4] But there are no predicting scales or signs for rate of sepsis occurrence in patients after urgent abdominal surgery.

OBJECTIVES. to study the role of the tumor necrosis factor (TNFα) gene polymorphism as prognostic factor of septic complications in patients after urgent abdominal surgery.

METHODS. After local ethic Committee approval and informed concern 152 pts underwent urgent abdominal surgery were studied. We studied frequency of septic complications after surgery. All patients underwent genotype examination to reveal abnormalities of TNFα gene.
RESULTS. 49 (32.2 %) pts had septic complications after surgery (group 1), 103 (37.8 %) pts had no complications (group 2). We have revealed pathological genotype AA of TNFα gene in group 1 in 68.6 ± 6.62 % of patients and 9.9 ± 3.36 % in patients of group 2 ($p < 0.05$). AG genotype was in 19.7 ± 9.45 % in group 1 and 38.5 ± 6.7 % in group 2 ($p < 0.05$). Genotype GG have 13.5 ± 9.05 % of patients in group 1 and 53.9 ± 6.93 % of patients in group 2 ($p < 0.05$).
CONCLUSIONS. Revealed prevalence of genotype AA of TNFα gene in patients with septic complications after surgery let us to suggest its role in development of septic complications after surgery. Genotype AA of TNFα gene can be settled as early prognostic criteria of high risk for development of septic complications in surgical patients and may substantiate early aggressive prevention of septic complications in surgical patients to decrease mortality.
REFERENCES. 1. Bartlett J. Intra-abdominal sepsis. Med Clin North Am.1995; 79(3):599–617. 2. Friedman G, Silva E, Vincent J. Has the mortality of septic shock changed with time. Crit. Care Med. 1998; 26(12):2078–86. 3. Bohnen J, Mustard R, Oxholm S, Schouten B. APACHE II score and abdominal sepsis. A prospective study. Arch. Surg. 1988; 123:225–229. 4. Ohmann C, Wittmann D, Wacha H. Prospective evaluation of prognostic scoring systems in peritonitis. Eur J Surg. 1993; 159:267–74.

1080

OUTCOMES OF SEPSIS IN PATIENTS ADMITTED TO A TERTIARY HOSPITAL IN INDIA AFTER IMPLEMENTATION OF A SEPSIS PATHWAY: A RETROSPECTIVE STUDY

S. Jakkinaboina[1], T. Patil Ashish[1], Z.A. Mohammed[1], A.L.V. Ramakrishna[1]

[1]Apollo Health City, Critical Care Medicine, Hyderabad, India

INTRODUCTION. The application in clinical practice of evidence-based guidelines for the management of patients with sepsis improves outcomes. The adherence to a sepsis management pathway is poor in many hospitals despite the introduction of such a pathway.
OBJECTIVES. The objectives of this study were to evaluate the effect of an in-hospital sepsis program on the adherence to evidence-based guidelines and outcome of patients with sepsis admitted to the hospital.
METHODS. A retrospective study was done for a period of 6 months from July 2012 to December 2012. The data was collected from patient records after ethics committee approval. The primary end point was mortality. The secondary outcomes were hospital and ICU length of stay. The following were the parameters monitored: age, sex, diagnosis, source of infection, APACHE II score, serum lactate at 1 and 6 h, time to antibiotic administration after the diagnosis of sepsis, comorbidities, organs failure, EGDT goals achieved in 6 h,use of vasopressors, type of fluids, capillary glucose at admission and glucose control in 48 h, hospital and ICU length of stay and use of steroids in septic shock.
RESULTS. The total number of patients were 150. The patients were divided into 4 groups 1) sepsis 2) severe sepsis 3) septic shock 4) over all group (comprises of sepsis + severe sepsis + septic shock patients). The baseline characteristics are represented in the table no 1. The average initial antibiotic time in sepsis, severe sepsis, septic shock and overall group were 30.97 min, 22.5 min, 83.25 min, 41.63 min respectively. The most common antibiotic used in all groups were beta lactum + beta lactamase inhibitor. The outcomes are represented in table no 2.
The early goal directed theraphy was acheived in 73.8 % of patients.
0.9 % saline was the most common fluid used for resusitation.
In septic shock 28.125 % patients received steroids.
The following were the results for the multivariate analysis for the increased hospital length of stay.
In Sepsis - uncontrolled blood sugars in 48 h, and increased APACHE 2 score.
In Severe sepsis - uncontrolled blood sugars in 48 h, and increased age.
In Septic shock - uncontrolled blood sugars in 48 h.
In Overall group - uncontrolled blood sugars in 48 h, and increased APACHE 2 score and use of vasopressors.
The following were the results for the multivariate analysis for the increased hospital mortality.
In sepsis and septic shock - increased APACHE 2 score.
In severe sepsis - increased hospital stay.
In overall group - Increased APACHE 2 score and use of vasopressors.

Baseline characteristics of the patients

Groups of patients	Apache ii	Age in years	Sex ratio M:F	Lactate in mmol/l	Blood sugar at admission mg/dl	Most common source of infection IN %	Most common comorbidities %	Organs failure in %
Sepsis	8.53	54.48	70:30	2.28	185.7	Lung-55 Urinary Tract Infection-16.8	Diabetes 21.5	
						Hypertension 13	Lung 38 Kidney 12	
Severe					sepsis	20.5	47.40	70:30
7.22	247				Cellulites 30 Urinary Tract Infection 20	Diabetes 40 Hypertension 30	Lung 40 Kidney 20	
Septic					shock	21.18	52.96	59:41
7.94	153.93	Lung		65	Acute	Gastroenteritis 9.38	Diabetes 25	
						Hypertension 5	Lung 34 Kidney 10	
Overall					group	17	53.68	32:68
2.75	183	Lung-			54.36 Urinary Tract Infection-14.77	Diabetes 23.49 Hypertension 16.78	Lung 33.36 Kidney 12	
Death					patients	21.29	50.92	66:34
2.74	146.8	Lung-			37.40 Urinary Tract Infection-14.81	Diabetes 25.93 Hypertension 11.11	Lung 22.22 Kidney 11.11	
Discharge					patients	16.19	53.18	68:32
2.75	191	Lung-		58	Urinary Tract Infection-18	Diabetes 22.90 Hypertension 17.21	Lung 36 Kidney 11.48	

Primary and Secondary outcomes

Groups of patients	Hospital length of stay in days	Intensive care unit (icu) length of stay in days	Mortality IN %
Sepsis	8.90	4.30	11.21
Severe sepsis	12	6	20
Septic shock	16.87	9.96	40.63
Overall outcome	10.84	5.74	18.12
Death patients	11.08	7.5	100
Discharge patients	10.45	4.88	0

CONCLUSIONS. The increased APACHE II and use of vasopressors increased the morbidity and mortality. Uncontrolled blood sugar in first 48 h increased hospital length of stay. The adherence to sepsis pathway is 73.8 % but needs further improvement.
REFERENCES. 1. Chest 2010;138:476–483.

1081

PREINFECTION SYSTEMIC INFLAMMATORY CONDITION, NOT THE ONE THAT OCCURS AFTER INFECTION, DETERMINES SEPSIS SURVIVAL

R. Manez[1], M. Perez-Cruz[2], C. Costa[2]

[1]Belvitge University Hospital, Intensive Care Medicine, Hospitalet de Llobregat, Spain, [2]Bellvitge Biomedical Research Institute (IDIBELL), Infections and Transplantation, Hospitalet de Llobregat, Spain

INTRODUCTION. Sepsis is considered a hyperinflammatory state that shifts towards an anti-inflammatory response that ends predominating. However, sepsis occurs mostly in patients with other medical, surgical or traumatic conditions that may influence the outcome.
OBJECTIVES. To ascertain the role of preinfection inflammatory condition on susceptibility to sepsis.
METHODS. Isogenic Lewis rats were submitted to a non-infectious insult (xenogenic immunization with three every-other-day intraperitoneal injections of 1 ml of hamster blood), which boosts natural T-independent (TI) antibodies cross-reactive with bacteria along with systemic inflammation. The day after the last injection cecal ligation and puncture (CLP) was performed with two severity levels: a moderate-severe (17G needle) and a low-grade (19G needle) sepsis. Rat serum was analyzed for the presence of 34 cytokines using a rat antibody cytokine array from RayBiotech (Norcross, GA, USA).
RESULTS. Xenoimmunization was associated with the boosting of mainly TI IgM antibodies at the time of CLP, along with hematological and biochemical signs of inflammation. It also led to a significant reduction in animal survival in moderate-severe sepsis ($p < 0.005$, as determined by log rank survival analysis), with all rats dying within 20 h of CLP. All control animals (C-TI) that had a final survival of 20 %, were still alive at this time point. Enhancement of TI xenoantibodies was also associated with decreased survival in low-grade sepsis, which was 88.2 % in C-TI and 52.9 % after hamster blood immunization ($p < 0.05$). Bacterial loads were observed in blood samples 12 h after CLP for moderate-severe sepsis in both C-TI and xenoimmunized rats. In contrast, no bacteria was detected 24 h after CLP in blood samples from rats with low-grade sepsis either after boosting TI xenoantibodies or not, despite the presence of abscesses in the abdomen. Within the xenoimmunized group, no differences were found in the level of TI IgM or IgG anti-hamster xenoantibodies at the time of CLP between animals that survived and those which died after the procedure. Cytokine analysis in low-grade sepsis 48 h after CLP showed a simultaneous decrease in proinflammatory and anti-inflammatory cytokines in C-TI animals or augmented in TI rats that survived the procedure. In the latter group, xenoimmunization was associated with a decrease of both proinflammatory and anti-inflammatory cytokines at the time of CLP, which contrasted with the augment observed in animals that died after the procedure. Furthermore, animals that died after low-grade sepsis showed a higher body weight at baseline along with an absence of weight gain after xenoimmunization compared to C-TI and TI animals that survived after CLP.
CONCLUSION. Xenoimmunization may lead to two different patterns of inflammatory responses in genetically identical rats, apparently influenced by animal weight, which determines animal survival after sepsis even with local infection.

1082

ANALYSIS OF THE EVOLUTION OF MORTALITY OF SEVERE SEPSIS IN SPANISH ICUS IN THE LAST 6 YEARS

B. Sánchez[1], D. Suárez[2], A. Artigas[3], R. Ferrer[1], Edusepsis Study Group

[1]Hospital Universitario Mutua Terrassa, Universidad de Barcelona, Intensive Care Department, Terrassa, Spain, [2]Fundació Parc Taulí, Sabadell, Spain, [3]Hospital de Sabadell, Corporación Sanitaria Parc Taulí, Universidad Autónoma de Barcelona, Critical Care Center, Sabadell, Spain

INTRODUCTION. In Spain, the incidence of septic shock is 31 cases per 100 000 adults/year, with a mortality rate of 45.7 % (1) Several treatments have shown improved survival resulting in the development of treatment guidelines of the Surviving Sepsis Campaign (SSC) (2) However initial compliance with these recommendations was low. For this reason, the SSC developed an international project of quality improvement based on these recommendations; in Spain it had a specific format and design through Edusepsis study: first education intervention was general (3) and the second intervention was focused on early antibiotics (ABISS-Edusepsis) and is still on going.
OBJECTIVES. Determine if since the introduction of SSC guidelines in Spain, the mortality of sepsis has been reduced and if this reduction is attributable to improved treatment.
METHODS. Prospective cohort study. We included all consecutive patients with severe sepsis or septic shock admitted to 41 Spanish ICUs during two time periods: first group (11/1/2005 to 12/31/2005) was the pre-intervention group of the Edusepsis study and second group (4/11/2011 to 10/07/2011) was the pre-intervention group of the study ABISS-Edusepsis. We compared the clinical characteristics, treatments administered and mortality between the two groups. Statistical analysis: Descriptive statistics including percentages, means, standard deviations, confidence intervals for categorical or continuous variables. To compare variables between the two periods was used student′s t test or Chi square as appropriate. We performed a multivariate analysis of factors associated with mortality.
RESULTS. 1,369 patients were included in the study, 646 in 2005 and 723 in 2011. Patients in 2011 were older (62.1 ± 16.7 vs 64.9 ± 14.9y, $p = 0.023$) and more severe (APACHE II score 20.7 ± 7.2 vs 22.4 ± 7.9, $p = 0.001$). In 2011 there has been a significant improvement in the treatments administered: Resuscitation Bundle (Table 1) and Bundle Treatment (Table 2). Absolute hospital mortality was lower in 2011 43.5 % vs 32.6 %, $p < 0.001$) and also the adjusted mortality (OR 0.638 (0.49 to 0.831), $p = 0.001$) (Table 3).

CONCLUSIONS. In the last 6 years the mortality of severe sepsis and septic shock in Spanish ICUs has been dramatically reduced, probably attributable to improved compliance with the treatment recommendations.

REFERENCES. 1. Esteban A, Frutos-Vivar F, Ferguson ND et al. Sepsis incidence and outcome: contrasting the intensive care unit with the hospital ward. Crit Care Med. 2007; 35(5):1284–89. 2. Dellinger RP et al. Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. Intensive Care Med. 2004;30(4):536–55.
3. Ferrer R et al. Edusepsis Study Group. Improvement in process of care and outcome after a multicenter severe sepsis educational program in Spain. JAMA. 2008;299(19):2294–303. doi: 10.1001/jama.299.19.2294.

GRANT ACKNOWLEDGMENT. Instituto Carlos III, PI 10/01497

Table 1

Sepsis resuscitation bundle (first 6 h after presentation)	First Group (n = 646)	Second Group (n = 723)	P value
Measure lactate	No. (%) [95 % CI] 268 (41.5) [41.12–41.78]	No. (%) [95 % CI] 537 (74.6) [74.22–24.87]	<0.001
Blood cultures before antibiotics	351 (54.3) [54.26–54.36]	385 (53.4) [53.36–53.46]	0.729
Broad-spectrum antibiotics	441 (68.3) [68.29–68.39]	464 (64.4) [65.39–64.49]	0.137
Fluids and vasopressors	264 (43.7) [43.25–43.05]	582 (80.9) [80.45–81.25]	<0.001
Central venous pressure ≥ 8 mmHg	136 (23.2) [22.89–23.41]	336 (46.7) [46.39–46.91]	<0.001
Central venous oxygen saturation O_2 ≥ 70 %	36 (6.2) [5.94–6.39]	203 (28.2) [27.94–28.39]	<0.001
All resuscitation measures	37 (5.7) [5.67–5.72]	47 (6.5) [6.47–6.52]	0.574

Table 2

Sepsis management bundle (first 24 h after presentation)	First Group (n = 646)	Second Gruop (n = 723)	P value
Consideration of low-dose steroids for septic shock according to ICU policy	No. (%) [95 % CI] 247 (45.9 [45.38–46.33]	No. (%) [95 % CI] 621 (86.4) [85.88–86.83]	<0.001
Consideration of drotrecogin alfa (activated) according to ICU policy	280 (43.3) [42.94–43.65]	540 (75.3) [74.94–75.56]	<0.001
Glucose control	290 (44.9) [44.77–44.92]	378 (52.6) [52.47–52.62]	0.005
Plateau-pressure control	332 (87.4) [86.99–87.72]	634 (88.1) [87.69–88.42]	0.771
All management measures	72 (11.1) [10.84–11.29]	242 (33.7) [33.43–33.88]	<0.001
Administration of medication Low-dose steroids	247 (38.2) [38.08–38.21]	323 (44.7) [44.59–44.71]	0.018
Drotrecogin alfa (activated)	37 (5.7) [5.46–5.87]	190 (26.5) [26.26–26.67]	<0.001

Table 3

Multivariate analysis of factors associated with mortality	Odd ratio (95 % CI)	P value
First Group 0.638 (0.49–0.831)	0.638 (0.49–0.831)	0.001
Age	1.016 (1.008–1.025)	<0.001
APACHE II	1.104 (1.084–1.124)	<0.001
Sepsis presentation and diagnosis Emergency department	1.796 (1.362–2.367)	<0.001
Medical-surgical ward	2.168 (1.4–3.357)	0.001
Origin of infection Acute abdominal infection	0.277 (0.172–0.445)	<0.001
Meningitis	0.4 (0.219–0.731)	0.003

1083

MORTALITY AND PROGNOSTIC FACTORS IN PATIENTS ADMITTED TO THE ICU FOR SEVERE SEPSIS. RESULTS OF A SPANISH MULTICENTER STUDY

R. Herrán Monge[1], M. García García[1], A. Muriel Bombín[1], P. Merino García[1], F. Gandía Martínez[2], M.P. Pérez Losada[3], F. Callejo Torre[4], S. Moradillo González[5], C. Tarancón[6], S. Macías[7], B. Álvarez Martínez[8], M.J. López Pueyo[4], D. Moreno Torres[9], J. Blanco-Varela[1], for the Grupo de Estudio y Análisis en Cuidados Intensivos (G.R.E.C.I.A.)

[1]Hospital Universitario Río Hortega, Intensive Care Department, Valladolid, Spain, [2]Hospital Clínico Universitario, Intensive Care Department, Valladolid, Spain, [3]Complejo Asistencial Universitario de Salamanca, Intensive Care Department, Salamanca, Spain, [4]Complejo Asistencial Universitario de Burgos, Intensive Care Department, Burgos, Spain, [5]Complejo Asistencial de Palencia/H. Río Carrión, Intensive Care Department, Palencia, Spain, [6]Hospital Virgen de la Concha, Intensive Care Department, Zamora, Spain, [7]Hospital General de Segovia, Intensive Care Department, Segovia, Spain, [8]Hospital del Bierzo, Intensive Care Department, Ponferrada, Spain, [9]Complejo Asistencial de Soria, Intensive Care Department, Soria, Spain

OBJECTIVES.
1. - To know the early (48 h), 28 days, ICU and hospital mortality in patients admitted to the ICU for severe sepsis.
2. - To determine independent risk factors associated with 28 days mortality.
3. - To build a mortality predictive model.

METHODS. Prospective observational multicenter cohort study, conducted in 11 ICUs of 10 hospitals during five months of 2011. A severe sepsis (1) screening was carried out daily, and all episodes of severe sepsis diagnosed upon ICU admission and all those developed during ICU stay were recorded. Cardiologic patients and patients under 18 were excluded. Epidemiological and clinical variables, source of acquisition (community, nosocomial and intraUCI) and infection location, APACHE II and LOD scores in the first 24 h of admission were collected. Organ dysfunction was defined as 3 and 4 points in SOFA score, and its evolution in survivor and non-survivos was followed by sequential mesurement of SOFA score on days 0–7, 14 and 28 (D0–7; D14; D28) and delta SOFA D0–D3 and D1–D3. Mortality at 48 h, 28 days, ICU and total hospital was collected. Bivariate and multivariate analysis to identify risk factors associated with mortality at 28 days were performed. A mortality predictive model was built using logistic regression (backwards stepwise).

RESULTS. 231 episodes in 229 patients were included. Incidence of severe sepsis was 14 % (95 % CI 12,5–15,17). Age (X ± SD) 66,87 ± 14,22 years; Sex (Male) 66,2 %. The most frequent comorbidity was immunosuppression (21.4 %). Scores at diagnosis (X ± SD) were: APACHE II 21.92 ± 6.67; LOD 5.6 ± 3.28; SOFA D0 8.62 ± 3.43. The most common source of infection acquisition was the community (59.13 %) and the main location was abdominal (32.47 %), followed by lung (29.87 %) and urinary tract (15.15 %). Early mortality at 48 h was 6,93 %; 28 days 28,14 %; ICU 27,2 % and Hospital 36,4 %. The factors independently associated with mortality in the multivariate analysis are shown in Table 1. The predictive model characteristics: sensitivity (S), specificity (Sp), positive predictive value (PPV), negative predictive value (NPV) and the value of the area under ROC curve (AUC), are reflected in Figure 1.

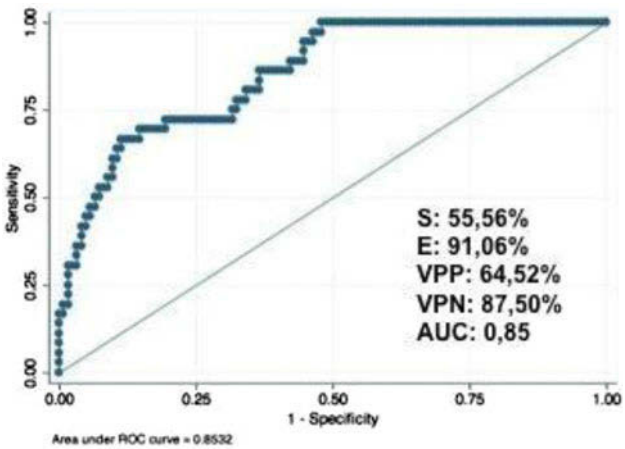
CONCLUSIONS.
1.- Overall mortality was high and almost 20 % of non-survivors died in the first 48 h.
2.- Nosocomial acquisition, respiratory infection and prior immunosuppression, are the most strongly independently factors associated with mortality at 28 days.
3.- The mortality predictive model built has good discriminative ability, good specificity and moderate sensitivity.

REFERENCES. 1. Levy MM. Crit Care Med 2003.

Table 1. Prognostic factors associated with 28 day mortality

	Odds Ratio	CI 95 %
Age	1.05	1.01–1.09
Prior immunosuppresion	3.10	1.11–8.69
Lung location of the infection(a)	2.94	1.18–7.37
Total LOD on D0	1.29	1.11–1.51
Nosocomial acquisition	5.43	2.05–14.39
Delta SOFA D1 - D3	1.20	0.99–1.45

(a) reference: urinary tract infection



Predictive model characteristics

1084

WHAT IS A ROLE OF IBUPROFEN IN THE DECREASING OF MORTALITY AND INCREASING SURVIVAL OF PATIENTS WITH SEVERE SEPSIS?

S. Satsuta[1,2]

[1]Government Institution "Lugansk State Medical University", Lugansk, Ukraine, [2]Lugansk State Medical University, Lugansk, Ukraine

INTRODUCTION. The high mortality in severe sepsis and scientific works that speak about the decline in mortality when using ibuprofen were the basis for this study.

OBJECTIVES. Check the hypothesis that in patients with severe sepsis, treatment with ibuprofen led to improve in survival.

METHODS. We conducted a randomized, double-blind, placebo-controlled trial of intravenous ibuprofen (10 mg per kilogram of body weight [maximal dose, 800 mg], given every 6 h for eight doses or placebo (glycine-buffer vehicle) administered in the same volume and at the same times in 100 patients who had sepsis, defined as fever, tachycardia, tachypnea, and acute failure of at least one organ system. Blood was obtained for culture from at least two sites. Both the patient and the care givers were unaware of the patient's treatment assignment. All patients haven't anything contraindications to be in this clinical research.

RESULTS. In the ibuprofen group, but not the placebo group, there were significant declines in urinary levels of prostacyclin and thromboxane, temperature, heart rate, oxygen

consumption, and lactic acidosis. With ibuprofen therapy there was no increased incidence of renal dysfunction, gastrointestinal bleeding, or other adverse events. However, treatment with ibuprofen did not reduce the incidence or duration of shock or the acute respiratory distress syndrome and did not significantly improve the rate of survival at 30 days (mortality, 38 percent with ibuprofen vs. 41 percent with placebo).
CONCLUSIONS. Treatment with ibuprofen has no effect on survival or the development of shock or acute respiratory distress syndrome. Treatment with ibuprofen does have clear physiologic effects on fever, tachycardia, oxygen consumption, and lactic acidosis in patients with severe sepsis.
REFERENCES. 1. Carey PD, Winsdor AC, Walsh CJ. Drug treatment of microcirculatory disorders caused by sepsis. Br J Surg. 1994; 81(12):1752–6.

1085
OUTCOME OF PATIENTS ADMITTED TO THE ICU WITH WEST NILE VIRUS NEUROINVASIVE DISEASE

K. Sakagianni[1], D. Evrenoglou[1], A. Kessaris[1], E. Stagaki[1], T. Bakogianni[1], S. Michelidou[1], V. Harizopoulou[1], K. Valakis[1]

[1]Sismanoglio General Hospital of Athens, Intensive Care Unit, Athens, Greece
INTRODUCTION. West Nile virus (WNV), a mosquito-borne flavivirus has been recently recognized as an emerging human neuropathogen, in several European and Mediterranean countries. Less than 1 % of infected cases present severe neuroinvasive disease with encephalitis, meningitis and/or acute flaccid paralysis.
OBJECTIVES. This is a retrospective study that focuses on patients with WNV neuroinvasive disease (WNND) admitted to our intensive care unit during the recent outbreaks of WNV infection in Greece, in the years 2011 and 2012.
METHODS. We reviewed the demographic and clinical characteristics, cerebrospinal fluid (CSF) findings, underlying chronic medical conditions, brain MRI findings and outcome of patients admitted with WNND (see Table). Serum and (CSF) specimens were tested for the presence of WNV-specific IgM and IgG antibodies, using commercial Elisa kits.
RESULTS. From August 2011 until August 2012 five patients were admitted to our ICU with confirmed WNV infection. The median age of the patients was 74 years (range 57–82). Four of them (80 %) were males. Median APACHE II score was 19 and at least two underlying chronic medical conditions were present; arterial hypertension (n = 5), cardiovascular disease (n = 3) and diabetes mellitus (n = 2). In all patients WNV-specific IgM antibodies were detected in CSF and blood specimens. CSF analysis revealed pleocytosis and elevated protein with normal glucose. All of them presented with high fever, symptoms of meningoencephalitis/meningitis and rapidly progressive acute flaccid paralysis, ranging from monoplegia of the upper extremity to asymmetrical quadriparesis and flaccid quadriplegia, after a viral prodromal syndrome. Significant hyponatremia was present in two patients with severe CNS disease. All the cases were intubated and mechanically ventilated. Length of ICU stay ranged from 28–150 days (median 90 d). Two patients had complete mental recovery, with residual weakness of the affected extremity. Three patients with severe meningoencephalitis and diffuse flaccid paralysis died after long-term ICU stay, as mental and motor functions never recovered. The patients who died were older with a median age of 78 (range 74–82), had more comorbidities, and severe neuroimaging abnormalities, in contrast with the patients who recovered that were younger and had mononeuropathies.
CONCLUSIONS. WNV infection should be included in the differential diagnosis of acute neurologic disease during seasonal outbreaks. Advanced age and existence of comorbidities are associated with severe disease and worse prognosis. Acute flaccid paralysis has a poor prognosis regarding recovery of physical function.

Demographic and clinical features of patients

Case	Age	Sex	Comorbidities	Clinical features	CSF WBC (cell/μl)	CSF protein (g/L)	Brain MRI findings	Outcome
1	57	M	Hypertension, alcoholism	Meningitis, flaccid paralysis LUE	60		(70 % lympho)	0.8
			Negative	Residual limb weakness				
2	61	M	Hypertension, diabetes mellitus, COPD	Meningitis,tremor, flaccid paralysis RUE, respiratory distress	130		(90 % lympho)	1.6
Left			basal ganglia signal intensity abnormalities	Residual limb weakness				
3	74	M	Hypertension, dyslipidemia, vascular disease	Drowsiness,coma,asymmetrical flaccid quadriparesis	108		(75 % neutro)	0.43
			Signal intensity abnormalities in basal ganglia and frontal horns of lateral ventricles	PVS, flaccid paralysis, death				
4	82	M	Hypertension, CAD, AF, dyslipidemia, vascular disease, stroke	Respiratory distress, drowsiness,myoclonus,coma, flaccid quadriplegia	110		(70 % lympho)	1.57
			Dural enhancement,increased signal intensity in the cerebral cortex and subcortical white matter of both hemispheres	PVS, flaccid paralysis, death				
5	78	F	Hypertension, AF, Diabetes mellitus	Aphasia, ataxia,seizures, coma, flaccid quadriplegia	535		(90 % neutro)	1.27
			Signal intensity abnormalities in the pons, and inferior cerebellar peduncles	PVS, Guillain-Barré, death				

PVS, persistent vegetative state; CAD, coronary artery disease; AF, atrial fibrillation; RUE, right upper extremity; LUE, left upper extremity; COPD, chronic obstructive pulmonary disease
REFERENCES. 1. Danis K, Papa A, Papanikolaou E, et al. Ongoing outbreak of West Nile virus infection in humans, Greece, July to August 2011. Euro Surveillance 2011; 25:16(34). 2. Leis A, Stokic D. Neuromuscular manifestations of West Nile virus infection. Front Neurol. 2012; 3:37. Epub 2012 Mar 21.

1086
THERAPEUTIC GOAL ACHIEVEMENTS AND THEIR ASSOCIATION WITH PATIENTS' OUTCOMES DURING SEPSIS AND SEPTIC SHOCK RESUSCITATION

C. Permpikul[1], S. Tongyoo[1]

[1]Siriraj Hospital, Mahidol University, Medicine, Bangkok, Thailand
INTRODUCTION. Severe sepsis and septic shock are serious conditions associated with high mortality. Resuscitation protocol aimed toward early stabilization of tissue perfusion proves to maximize treatment results.
OBJECTIVES. To examine the adherence to the protocol and the association with patients' outcomes.
METHODS. A prospective cohort included patients with sepsis and septic shock who were admitted from the emergency department during April 2011 to September 2012. All patients underwent sepsis resuscitation protocol aimed to achieve defined hemodynamic goals within 6 h. These goals included: a. a mean arterial pressure of > 65 mmHg (MAP goal), b. urine output of > 0.5 ml/kg/hr (organ perfusion or urine goal), and c. central venous saturation of > 70 % or lactate clearance > 10 % (tissue perfusion goal). Patients' baseline information, treatment received and outcomes were recorded.
RESULTS. A total of 175 patients were included. Nineteen (10.8 %) patients achieved all 3 goals while 79 (45.1 %) achieved 2 goals and 52 (29.8 %) achieved 1 goal. The survival in patients who achieved all 3 goals was 94.7 %, in those who achieved 2 goals 81 % and 1 goal (61.5 %). The patients who did not achieve any goal at 6 h had 56 % survival. During this period, $ScvO_2$ was measured in only 13 patients (7.4 %) and serum lactate in 51(29.1 %). When focusing on the patients who achieved MAP target, they had lower initial APACHE II score as compared with those who did not (20.6 ± 7.2 vs. 23.9 ± 8.2). Also they had higher blood pressures and lower initial lactate level (MAP 61.9 ± 18 vs. 58.5 ± 18.1, p = 0.024; lactate 3.9 ± 4.4 vs. 7.7 ± 6.3, p = 0.004). These patients received less total fluid replacement at 6 h, 24 h and at 72 h (6 h 2.33 ± 1.15vs.2.72 ± 1.01L, p = 0.03; 24 h 5.01 ± 1.9 vs. 5.8 ± 1.7L, p = 0.02; 72 h 9.92 ± 9.53 vs. 15.57 ± 14.3L, p = 0.023), with less uses of norepinephrine. They had more urine output (1.34 ± 1.28 vs. 0.63 ± 0.82, p = 0.001) and more of them achieved urine goal (75.8 % vs. 46.7 %, p < 0.001) and tissue perfusion goal (55.9 % vs. 46.7 %, p < 0.001). Their hospital mortality and 28 day mortality were lower (ICU mortality 19.4 % vs.34.9, p = 0.043; hospital mortality 22.5 % ± 39.1, p = 0.034).
CONCLUSIONS. During early sepsis resuscitation, blood pressure achievement resulted in better outcomes and the achievement of more goals improved survival. Low rate of central venous sampling was noted in this report.
REFERENCES. 1. Permpikul C, Tongyoo S, Ratanarat R, et al. Impact of septic shock hemodynamic resuscitation guidelines on rapid early volume replacement and reduced mortality. J Med Assoc Thai 2010;93(Suppl.1):S102–9. 2. Permpikul C, Noppakaorattanamanee K, Tongyoo S, et al. Dynamics of central venous oxygen saturation and serum lactate during septic shock resuscitation. J Med Assoc Thai 2013;96(Suppl.2):S232–7.
GRANT ACKNOWLEDGMENT. Siriraj Hospital, Mahidol University.

1087
THE INTENSIVE CARE OVER NATIONS (ICON) AUDIT: PATTERNS OF ORGAN FAILURE AND OUTCOME

J.L. Vincent[1], Y. Sakr[2], on behalf of the ICON investigators

[1]Erasme Hospital, Université libre de Bruxelles, Dept of Intensive Care, Brussels, Belgium, [2]Friedrich-Schiller-University Hospital, Dept of Anesthesiology and Intensive Care, Jena, Germany
INTRODUCTION. The ICON Audit was sponsored by the World Federation of Intensive and Critical Care Societies to gather data from ICUs around the world.
OBJECTIVES. To describe the patterns of organ failure in this international cohort of ICU patients.
METHODS. ICON was a multicenter, worldwide audit in which all adult patients (> 16 years) admitted to the 730 participating centers in 84 countries between May 8 and May 18, 2012 were included. Patients were followed up until death, hospital discharge, or for 60 days. Infection was defined according to the definitions of the International Sepsis Forum. Organ failure was defined as a SOFA score > 2 for the organ in question. Organ failure was judged not to be related to sepsis if it was already present 24 h before the onset of sepsis or more than 24 h after the disappearance of sepsis criteria.
RESULTS. Of the 10,069 patients included, 3,718 (36.9 %) had sepsis during the ICU stay. Organ failure was present in 2,967 (79.8 %) of these patients and in 4,266 (67.2 %) of the 6,351 patients who did not have sepsis during their ICU stay. In sepsis-associated organ failure, the number of failing organs was greater than the number in non-sepsis-associated organ failure. Renal (54.7 %), cardiovascular (54.1 %) and respiratory (51.1 %) failures were the most commonly reported organ failures in association with sepsis, whereas renal failure (41.2 %) was predominant in non-septic patients. ICU and hospital mortality rates increased steadily according to the number of organ failures and the degree of organ failure as assessed by the SOFAmax score, irrespective of the presence of sepsis. In-hospital mortality in patients with isolated single organ failure was higher for the renal (11.2 vs. 6.2 %, p < 0.005) and coagulation (30.8 vs. 6.7 %, p = 0.001) systems when associated with sepsis compared to patients without sepsis.
CONCLUSION. Renal failure is even more common than cardiovascular or respiratory failure in sepsis. The impact of sepsis-related isolated organ failure on hospital mortality is greatest with renal and coagulation failures.

1088
CHANGES OF OUTCOME IN SEPSIS FOR A PERIOD EXTENDING FROM 1980 THROUGH 2012 IN IWATE PREFECTURAL ADVANCED CRITICAL CARE AND EMERGENCY CENTER

G. Takahashi[1], C. Onodera[1], R. Akimaru[1], N. Matumoto[1], M. Kojika[1], Y. Yoshida[1], Y. Inoue[1], S. Endo[1]

[1]Iwate Medical University, Iwate, Japan
BACKGROUND. Sepsis has remained one of the primary causes of death over the last few decades. The Iwate Prefectural Advanced Critical Care and Emergency Center was established in November 1980 and has been in existence for over 32 years. Changes in the treatment results of sepsis over the past 32 years will be assessed.
Materials and methods. The total number of inpatients admitted between November 1, 1980 and December 31, 2012 is 40,651. A prospective (partly retrospective) study was conducted using the ACCP/SCCM diagnostic criteria for diagnosing sepsis and the APACHE II score for severity assessment. The assessment of sepsis and severity was made after consultation between the same physicians qualified for both ICDs and medical specialists in emergency medicine, and clinical research coordinators.
RESULTS. Three thousand, and eighty-nine (7.6 %) of 40,651 patients had sepsis (including severe sepsis and septic shock). The overall 28-day mortality rate for sepsis has been markedly reduced from 26.3 % (APACHE II score: 22.1) to 3.9 % (APACHE II score: 26.8) and the 90-day mortality rate from 37.4 % to 6.9 % in the last 32 years.
CONCLUSION. We shall set the goal for 28-day mortality from sepsis at 5 % or less of and for 90-day mortality from sepsis at 10 % or less in the sepsis group ranked 25th in the average APACHE II score, while treating sepsis. Also, we hope to demonstrate that these values are achievable.

1089
A COMPARISON OF PATIENTS OUTCOME IN SEPTIC SHOCK ICU ADMISSION DURING WEEKDAYS VS WEEKEND

A. Ortín[1], R. Jiménez[1], S. Rebollo[1], A. Ojados[1], L. Tárraga[1], S. Moreno[1], L. Herrera[1], M. Galindo[1], A. Fernández[1], J. Murcia[1], G. Escudero[1], J.M. Castillo[1], O.M. Téllez[1], M.J. Del Amor[2], M.D. Rodríguez[1], A. Melgarejo[1], J.M. Allegue[1]

[1]Hospital General Universitario Santa Lucía, Intensive Care Unit, Cartagena, Spain, [2]Hospital General Universitario Santa Lucía, Microbiology Department, Cartagena, Spain

INTRODUCTION. Patients admitted to Intensive Care Unit (ICU) often have multi organ failure and different abnomalities that require special care. The availability of appropriate diagnostic test and treatment is more imperative in the first hours after admission, when patients are more likely to be critically ill, unstable and require vigorous care. Several studies have reported increased hospital mortality for patients admitted on weekends.

The speed and appropriateness of therapy administered in the initial hours after septic shock development are likely to influence outcome. In spite of the fact that bundles of Surviving Sepsis Campaign (SCC) improve the care of septic patients in underresourced areas, some points of SCC recommendations are difficult to apply on weekends because of the particular resources of each hospital.

OBJECTIVES. To investigate the effect of the time of admission to ICU on mortality among patients admitted with septic shock.

METHODS. Retrospective and observational study performed to all patients admitted to our 18-bed polivalent ICU with diagnostic of septic shock, in a 2 years period.

We analyzed demographic data, time of admission (weekend Vs weekdays), ICU scoring, length of ICU stay, duration of mechanical ventilation, duration of vasoactive drugs support, microbiological results and hospital mortality.

In our Institute, microbiology laboratory, source of infection control techniques and invasive procedures to obtain cultures (CT guided drainage, bronchoscopy…) are available on weekdays, but not on weekend. Regardless of the day of the week, ICU admissions depends on two on call staff intensivists.

Statistics: percentages, means or median as appropriate; comparisons of groups using Chi square, t-Student or U-Mann–Whitney as appropriate.

RESULTS. 126 patients were admitted with diagnostic of septic shock. Of those 88 (69.8 %) were admitted on weekday and 38 (30.2 %) on weekend. Patients were slightly older in weekend group (69.8 years CI 95 % 64.2–75.3) than in weekdays group (66.7 years CI 95 % 64–69.4) (p 0.051).

Both groups had similar APACHE II (22 in weekend group (IQR 15.75–31.75) vs 22 in weekdays group (18.25–27.75); p 0.72) No differences was found in duration of mechanical ventilation (2 vs 3 days; p NS) and duration of vasoactive support (72 vs 76 h; p NS) Positivity rates of microbiological cultures was similar (68.4 vs 71.6 %; p 0.44).

There were statistical differences in length of ICU stay: 4 days (2.25–8.75) for weekend group and 6 days (4–15.25) for weekday (p 0.043).

Hospital mortality was significantly higher in weekend group: 55.5 % vs 35.5 % (p 0.029).

CONCLUSIONS. Weekend ICU admission was associated with poor outcome. According to this, an effort must be made to actively seek the factors associated with this issue and try to correct them.

REFERENCES. 1. Cavalazzi et al. Association between time of admission to the ICU and mortality: a systematic review and metaanalysis. Chest 2010;138(1):68–75.

1090
PERCEPTION GAP OF SLEEP IN CRITICALLY ILL PATIENTS IN INTENSIVE CARE UNIT

N. Rajagopalan[1], A.H. Mahadevaiah[1], T. Walker[2], M.S. Patil[3], C. Shivaprasad[4]

[1]Narayana Hrudayalaya, Critical Care and Pulmonology, Bangalore, India, [2]Narayana Hrudayalaya, Critical Care Nursing, Bangalore, India, [3]Narayana Hrudayalaya, Anesthesiology & Critical Care, Bangalore, India, [4]Narayana Hrudayalaya, Internal Medicine and Critical Care, Bangalore, India

INTRODUCTION. The importance of sleep in critically ill patients is often not well appreciated by both physicians and nurses. Hence recognition of sleep problems and necessary interventions are not undertaken routinely. We undertook this study to find out the magnitude of this perception gap between patients on the one hand and health care workers on the other hand.

OBJECTIVES. The purpose of this study was to assess the quality of sleep in critically ill patients, the factors affecting their sleep and the perception by healthcare workers about patient's sleep. This will greatly improve our understanding of sleep in the critically ill patient and enable us to take appropriate measures to improve the quality of sleep.

METHODS. The study has been undertaken in the Medical Intensive Care Unit, Narayana Hrudayalaya Multi-Speciality Hospital, Bangalore, India. Patients under 18 years of age, those with altered mental status and patients on heavy sedation were excluded from the study. A modified Richard Campbell sleep Questionnaire was used. Patients were helped in completing the questionnaire in the morning at about 8 A.M regarding their previous night's sleep. Nurses and physicians taking care of these patients were also asked to complete the questionnaire during the same time. A visual analogue scale of 0–10 using 5 parameters for nurses and 7 parameters for patients were used. Paired t test was used to analyse the results.

RESULTS. Thirty-six patients have been included in this study so far. The mean of the modified Richard Campbell sleep questionnaire score is higher for the nurses 5.37(10) in comparison with the patients score 3.68(10) with p-value of 0.003078 (paired T test). Awakening the patients for investigations in ICU is the leading cause for sleep disturbance followed by the pain, as admitted by both patient and the nurse. Only 9(25 %) patients were asked about their sleep by nurses and 7(19.4 %) by physicians.

CONCLUSIONS. This study showed that there is a wide perception gap regarding quality of sleep between patients and nurses. Disturbances in sleep result from awakening for investigations, pain and bathing. Majority of physicians fail to ask patients regarding their sleep. Awareness of the importance of sleep must be raised both among nurses and physicians, which would improve the quality of sleep in critically ill patients.

REFERENCES. 1. Eliassen KM, Hopstock LA. Sleep promotion in the intensive care unit—a survey of nurses′ interventions. Intensive Crit Care Nurs. 2011; 27(3):138–42, doi: 10.1016/j. iccn.2011.03.001. Epub 2011 Apr 15 2. Frisk U, Nordström G. Patients′ sleep in an intensive care unit–patients′ and nurses′ perception. Intensive Crit Care Nurs. 2003; 19(6):342–49. 3. Holley AB, Lettieri CJ. Sleep in the ICU. Medscape Crit Care 2010.

1091
RISK FACTORS FOR WORSENING QUALITY OF LIFE IN PATIENTS WITH MECHANICAL VENTILATION

M. Busico[1], D. Intile[2], N. Irastorza[2], A.L. Alvarez[3], S. Depaoli[1], A. Jarque[1], J. Quintana[1], A. Morena[1], J. Armelino[1], L. Barcena[1], A. Palmieri[1], L. Vasquez[3], G. Plotnikow[2], A. Leoz[2], P. Danunnzio[2], V. Rienzi[2], M. Heidenreich[2], V. Leiva[2], C. Quiroga[2], F. Palizas[3], F. Villarejo[1], P. Desmery[2]

[1]Clinica Olivos, Buenos Aires, Argentina, [2]Sanatorio Anchorena, Buenos Aires, Argentina, [3]Clinica Bazterrica, Buenos Aires, Argentina

INTRODUCTION. Health-related quality of life (QoL) seems to clearly state the significance of surviving to the intensive care unit (ICU). Previous studies have demonstrated how patients deteriorate their QoL after an episode of critical illness. However, not many have searched for the risk factors that contribute to this deterioration in patients with mechanical ventilation (MV).

OBJECTIVES. The objective of this multicentric observational study was to identify risk factors related to the deterioration of QoL and functional status at 3 months and 1 year after discharge of the ICU.

METHODS. Patients > 18 years admitted to the ICU between Apr 2011 to Jan 2012 that required more than 24 hs of MV were included on the study. Baseline QoL was evaluated with EQ-5D (Argentine version) 4 weeks previous to admission and compared with the same questionnaire at 3 months and 1 year after ICU discharge. Functional status was evaluated through Daily living activities (DLA, Barthel index) at baseline and follow up. Comorbilities (Charlson), Delirium (CAM-ICU), acquired weakness (MRC), drugs utilization and parameters of MV and weaning were evaluated daily during ICU stay. We′ve considered worsening of QoL whenever EQ-5D index at 3 months was lowest than inferior CI95 % of baseline index (from Argentine general population). Multivariable logistic regression analyses were performed to investigate risk factors. The significance level was $p < 0.05$.

RESULTS. 181 patients received more than 24 hs of MV and 84 were included. At 3 months 70 were alive and 55 at 1 year. Total of 28 % died and 4 % lost to follow up. Baseline, 3 months and 1 year QoL of the whole group (Graph1) was lower than that of general population in Argentina stated by age [0.831(0.527–0.931) vs 0.880(0.872–0.888)$p < 0.001$]. Same results were found for DLA (Graph2). When we compare baseline and 3 months QoL (Graph3), most patients worsened their index ($n = 47$) but some didn′t ($n = 23$). Variables associated with worsening QoL in univariate analysis were: age, days of delirium, length of hospital stay (LHS), days of MV, weakness (MRC), days with delirium and tracheostomy. In multivariate analysis only LHS longer than 20 days [$p < 0.001$ OR14.38(3.98–51.98)] and more than 50 year of age [p0.029 OR4.46(1.16–17.17)] were independently associated with worsening QoL at 3 months. LHS > 20 days [p 0.0003 OR22.78(4.19–123.75)], age > 50 years [p0.0026 OR 7.82(1.27–48.2)] and tracheostomy [p0.005OR30.23(2.71–337.43)] could explain worsening in DLA in multivariate analysis.

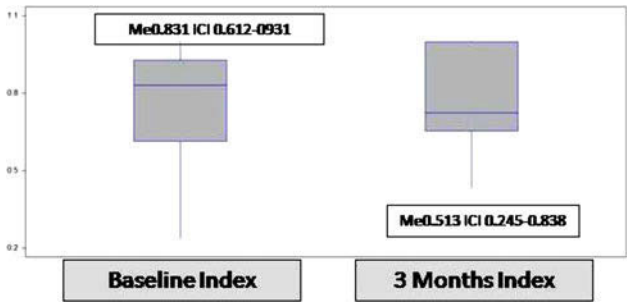
ICU policies and strategies: 1090–1102

EQ-5D		Baseline (N=71)	3 months (N=70)
Mobility	1	48 (68%)	37 (53%)
	2-3	23 (32%)	33 (47%)
Self-Care	1	63 (89%)	41 (59%)
	2-3	8 (11%)	29 (41%)
Usual Activities	1	57 (80%)	*19 (27%)*
	2-3	14 (20%)	*51 (73%)*
Pain / Discomfort	1	34 (48%)	40 (57%)
	2-3	37 (52%)	30 (43%)
Anxiety/ Depression	1	34 (48%)	36 (52%)
	2-3	37 (52%)	34 (48%)

Graph 1 EQ-5D

Barthel Index	Baseline	3 months
Dependence on DLA	16 (23%)	36 (51%)
Independence on DLA	55 (77%)	34 (49%)
Median (ICI)	100 (100-100)	97 (53.7-100) p<0.001

Graph 2 Comparison Barthel Index



Graph 3 Comparison EQ-5D Index

CONCLUSIONS. QoL is mostly impaired after an episode of critical illness with MV, however, when individual analysis is done, a low percentage of them were recovered at 3 months. LHS and age were independently associated with worsening QoL and DLA. It seems we have to focus our efforts on early discharge and rehabilitation of our ventilated patients.

REFERENCES. 1. Augustovski F, Irazola V, et al. Argentine Valuation of the EQ-5D Health States. Value in Health 2009;12:587–96.

1092

CLINICAL IMPLICATIONS OF MICROBIOLOGICAL ISOLATION IN SEVERE SEPSIS AND SEPTIC SHOCK

P. García Olivares[1], J.C. Sotillo[1], J. Peral[1], M. Sancho[1], E. Bermejo[1], J.M. Gómez[1], P. Santa Teresa[1], S. Arenal[1], A. Jaspe[1]

[1]H.G.U. Gregorio Marañón, Intensive Care Unit, Madrid, Spain

INTRODUCTION. While early appropriate antimicrobial therapy improves survival in severe sepsis and septic shock patients, the outcome according to the different bacterial infection remains debated.

OBJECTIVES. The purpose of this study was to evaluate the clinical implications of different bacterial infection in patients with severe sepsis and septic shock.

METHODS. Prospective study of septic patients admitted in ICU between March 2011–November 2012. All of patients were treated according Surviving Sepsis Campaign (SSC) recommendations.

Demographic data, comorbidities, focus and type of sepsis (severe sepsis and septic shock), severity scores, microbiological isolates (Gram-negative or Gram-positive bacteria), need of mechanical ventilation and vassopresor therapy, early recognition and antibiotic therapy of sepsis and SSC bundles implemented were collected. Continuous data were reported as mean ± SD or median (interquartile range) and categorical data as percentages. The analysis between both types of bacterial infection was performed using Student *t*-test for continuous variables and Chi squared test for categorical variables. Multivariable logistic regression was used to estimate the risk of death associated with different bacterial infection after adjustment for possible confounding factors.

RESULTS. Isolation of Gram-positive or Gram-negative bacteria was obtained in 78 (58.5 %) of the 133 patients admitted in ICU with severe sepsis and septic shock. 51 % of the isolates (43/78) were Gram-negatives bacterias, with positive blood culture in 65 % (28/43) of patients. Thirty-five patients had Gram-positive bacteria isolation, with positive blood culture in 20 patients (57 %). The isolation of Gram-positive predominated in respiratory sepsis and Gram-negative in abdominal and urinary sepsis.

Patients with Gram-negative bacterial infection had a higher severity score (SOFA 10.4 ± 3.9 vs 8.4 ± 4.4, p = 0.04), higher percentage of thrombocytopenia (34.9 % vs 14.3 %, p = 0.03), diagnosis of septic shock (88.4 % vs 57.1 %, p = 0.00), vassopresor therapy (88.4 % vs 62.9 %, p = 0.00), ICU mortality (37.2 % vs 14.3 %, p = 0.02) and hospital mortality (44.2 % vs 17.1 %, p = 0.01) than those with Gram-positive bacterial infections. Comparison between both bacterial infections is summarized in table 1.

Table 1

	Gram-negative bacterial infections	Gram-positive bacterial infections	Significance "p"
Age	61.2 ± 19.9	57.3 ± 13.9	0.25
Comorbidities	44.2 %	45.7 %	0.89
APACHE II	25.5 ± 7.6	23.1 ± 6.6	0.13
Respiratory focus	37.2 %	68.6 %	0.06
Abdominal-urinary focus	56.8 %	17.2 %	0.00
Mechanical ventilation	58 %	60 %	0.86
Early appropriated antibiotic therapy	54.5 %	53.5 %	0.92
SSC bundles completed (6 h)	3.6 ± 1.3	3.8 ± 1.3	0.43
ICU stay (days)	17.1 ± 29.7	19.1 ± 22.8	0.73

In multiple logistic regression analysis after adjusting for demographic data, comorbidities, severity scores, respiratory or abdominal focus, diagnosis of septic shock, number of SSC bundles completed, early administration of appropriate antibiotic therapy, need of mechanical ventilation and culture-positive blood sample, Gram-negative bacterial infection is associated with an increased risk of death (table 2).

Table 2

	Odds Ratio	95 % CI
Gram-negative bacterial infection	8.38	1.64–42.88
Comorbidity	5.32	1.10–26.40
SOFA	1.32	1.02–46.28
Mechanical ventilation	40.83	3.60–46.28

CONCLUSIONS. In our study, despite an appropriate management of sepsis, including early appropiated antibiotic therapy, Gram-negative bacterial infections had a higher mortality.

1093

INAPPROPRIATE CONTINUATION OF STRESS ULCER PROPHYLAXIS BEYOND THE ICU/HDU SETTING AND INTO THE COMMUNITY

R. Laurie[1], T. Molnar[1], T. Gould[1], D. Freshwater-Turner[1]

[1]Bristol Royal Infirmary, Intensive Care, Bristol, UK

INTRODUCTION. Gastric acid suppression with proton-pump inhibitors (PPIs) reduces the incidence of bleeding due to gastric and oesophageal erosions (stress ulcers). Evidence for the benefit of stress ulcer prophylaxis (SUP) is limited to high risk patients in intensive care settings. Other patients may have absolute indications for PPI prescription regardless of their stress ulcer risk.

PPIs raise gastric pH, resulting in oropharyngeal bacterial overgrowth and increased hospital-acquired pneumonia. PPIs are associated with increased *Clostridium difficile* infection and bony fractures in susceptible populations (1, 2). Furthermore, intravenous (IV) routes of administration are costlier than enteral routes and have higher risks of administration errors and infections.

Therefore, SUP should be given enterally when appropriate and stopped once patients are not at high stress ulcer risk. SUP should be discontinued on ICU/HDU discharge unless there is an absolute indication for PPI prescription, in order to minimise adverse health outcomes and prescription costs.

OBJECTIVES. To quantify how many patients are discharged from ICU on inappropriate PPI medications, and how many IV prescriptions could have been given enterally.

METHODS. Data was collected on patients discharged from ICU/HDU between 1st April–30th June 2012. Patients were excluded if they died before ICU/HDU discharge or if they were transferred to another ICU/HDU. Of 291 patients, 245 were eligible and had complete data sets.

RESULTS. Of 245 patients, 71 (29 %) had inappropriate PPI prescription at discharge from ITU/HDU: 3 (1.2 %) had their PPI inappropriately discontinued whilst 68 (27.8 %) had it inappropriately continued.

PPIs were prescribed enterally in 147 patients (84 %) and intravenously in 28 patients (16 %). There was no indication for IV administration in 21 (75 %) of those discharged on IV PPIs. Overall, 40/245 (16.3 %) patients discharged from ICU/HDU were discharged into the community on inappropriate PPIs.

CONCLUSIONS. We introduced a written guideline for the use of SUP on ICU/HDU at the beginning of April 2013. This emphasizes the importance of reviewing SUP regularly, particularly at discharge. We performed a targeted teaching intervention for our new cohort of junior medical staff during their unit induction program in April 2013. Following these changes we will re-audit from April to June 2013, to ascertain whether these interventions have been successful in reducing inappropriate PPI prescription.

REFERENCES. 1. Bourne C, Charpiat B, Charhon N, Bertin C, Gouraud A, Mouchoux C, Skalli S, Janoly-Dumenil A. Emergent adverse effects of proton pump inhibitors, Presse Medicale. 2013;42(2):e53–62. 2. Ament PW, Dicola DB, James ME. Reducing adverse effects of proton pump inhibitors. Am Family Phys. 2012;86(1):66–70.

GRANT ACKNOWLEDGMENT. No grant funding used.

1094

IMPLEMENTATION OF A BLOOD MANAGEMENT PROGRAM IN THE INTENSIVE CARE UNIT (ICU)

L.D. Umezawa Makikado[1], M. Chico Fernández[1], C. García Fuentes[1], Z. Molina Collado[1], E. Torres Sánchez[1], H. Marín Mateos[1], M. Catalán González[1], J.A. Sánchez-Izquierdo Riera[1], J.C. Montejo González[1]

[1]Hospital 12 de Octubre, Madrid, Spain

INTRODUCTION. Many studies have documented the widespread use of blood products transfusion in critically ill patients, surprisingly there are no specific guidelines in critically

ill patients. Transfusion criteria are largely extrapolated. More important there is a reluctance to adhere to these guidelines. We propose a blood management program (BMP) to attain the goal of decreasing inappropriate transfusions. **OBJECTIVE.** Measure the impact in transfusion practices after the implementation of a BMP.
METHODS. We conducted a prospective, single-center study at a university hospital. Consisted of two 90-days periods (P). P1 was a control period. P2 followed the implementation of a BMP that included individualized prescription of blood products, daily review of physiological trigger, reduce prescription and blood waste. To improve adherence, knowledge translation strategies were applied (education interventions and audits). Descriptive analysis of the results was performed using SPSS 18. Incidence of inadequate transfusion was estimated following Spanish Society of Intensive Medicine, Critical Care, and Coronary Units 2011 indicators.
RESULTS. P1 from January to March 2011, a total of 90 patients admitted to the ICU were included. APACHE II at admission was 20 ± 11. 45.6 % received at least 1 unit of blood components. 70.1 % were bleeding while 29.9 % were electively transfused at time of transfusion. None bleeding had a mean pretransfusion hemoglobine (PHB) of 7.0 ± 0.8 g/dl, mean threshold for platelet concentrate transfusion (PCT) of 44x103 ± 28 x10^3cell/ml and a mean activated partial thromboplastin time (aPTT) of 39.5 ± 13.3 %. The overall incidence of inadequate transfusion for red blood cells (RBC), PCT and fresh-frozen plasma (FFP) was 54,5 %, 24,3 % and 0 % respectively. P2 from January to March 2013, a total of 117 patients were included. APACHE II was 19.8 ± 10. 35.1 % received at least 1 transfusion. 69.6 % were bleeding while 34.4 % were electively transfused. In none bleeding we found a mean PHB of 6.6 ± 0.6 g/dl, mean threshold for PCT of 47x103 ± 48x10^3cell/ml and a mean aPTT of 53.6 ± 4.2 %. The overall incidence of inadequate transfusion for RBC, PCT and FPP was 23,7 %, 21 % and 0 % respectively. Due to small sample size, no statistical difference was found.
CONCLUSIONS. The introduction of a BMP had a positive impact on the appropriateness of blood component transfusions in critically ill patients. Knowledge translation strategies improve adherence to guidelines.
REFERENCES. 1. Napolitano et al. Clinical practice guideline: red blood cell transfusion in adult trauma and critical care. Care Med 2009;37(12):3124–57. 2. Wang JK et al. Red blood cell transfusion in the treatment and management of anaemia: the search for the elusive transfusion trigger. Vox Sanguinis 2010;98:2–11. 3. Leal-Noval SR et al. Impact of national transfusion indicators on appropriate blood usage in critically ill patients. Transfusion 2011;51:1957–65

1095
AUDITS IN REAL TIME FOR SAFETY IN CRITICAL CARE (ART-SACC): ARE THEY USEFUL?

M. Bodi[1,2], G. Sirgo[1,2], A. Pobo[1,2], F. Esteban[1,2], M. Olona[1,2]

[1]University Hospital Joan XXIII, Tarragona, Spain, [2]Institut d'Investigació Sanitària Pere Virgili, Tarragona, Spain

INTRODUCTION. Timely mistakes and omissions detection including feedback to clinical staff is a requirement for focused improvement in critical patient safety. Real time auditing, which efficacy has been repeatedly demonstrated in industry, has not been used previously to evaluate patient safety.
OBJECTIVES. To design a checklist of safety measures (SMs) based on scientific evidence, and to determine the utility and feasibility of this tool in a pilot study.
METHODS. A 37 item (distributed in ten blocks) patient safety checklist was developed via a modified Delphi method. The checklist focused on errors of commission or omission. Safety audits were performed using the checklist during routine work thrice weekly during the 3 month study period (October to December 2012). Each day, 50 % of patients and 50 % of SMs were randomized. Utility was determined by measuring the changes in clinical performance after ART-SACC:"Improvement Proportion Related to ART-SACC" (IPR-ART-SACC). The impact on mortality, length of stay and nosocomial infection rates were assessed. Feasibility was determined by the completion of auditing on each day that audits were attempted.
RESULTS. During the study period, 234 patients were evaluated, The mean of SOFA was 5.1 ± 3.5 and the length of stay was 14,8 days ± 13,9. The distribution of the patients was: 120 (51.3 %) medical, 64 (27.4 %) surgical, 27 (11.5 %) neurosurgical and 23 (9.8 %) trauma. Regarding utility, changes in clinical performance were performed after ART-SACC in 36 (97.3 %) of the 37 items on the checklist. IPR-ART-SACC was over 25 % in the following SMs: assessment of the alveolar pressure limit, checking of mechanical ventilation alarms, checking of monitor alarms, correct prescription of the daily treatment orders, daily evaluation of the need for catheters, artificial nutrition monitoring, assessment of semi-recumbent position, and checking patients' clinical information appropriately organized in their Clinical Record. The average APACHE II patients admitted during the study period was 18.2 ± 7.9 and mean age 60.8 ± 15.7, both higher than the same period of previous year (15.2 ± 9.4, $p = 0.17$; and 58.2 ± 17.8, $p = 0.11$, respectively). We observed a reduction in the average length of stay (10.6 ± 13.8 vs 14.6 ± 31.5; $p = 0.15$). Not reduction was observed in mortality and nosocomial infection rates. Feasibility: rounds were completed on all proposed days.
CONCLUSIONS. The ART-SACC helped to direct attention towards minimizing errors (action or omission) and improved clinical care. To assess the impact on morbidity and mortality in critically ill patients and other indicators of quality and safety requires a longer period of study and a larger number of assessments in different hospitals.
REFERENCES. 1. Ursprung R. Qual Saf Health Care 2005. 2. Simpson SQ. AACN 2007.
GRANT ACKNOWLEDGMENT Financed by ISCIII, FIS grants, project PI11/02311.

1096
EARLY MOBILISATION OF MEDICAL PATIENTS IN INTENSIVE CARE - THE FINANCIAL BENEFIT FROM THE INTRODUCTION OF A PHYSIOTHERAPY ASSISTANT LED SERVICE IN A UNIVERSITY HOSPITAL IN THE UK

L. Gallagher[1], Z. van Willigen[1], N. Collins[1], K. Golder[2], S. Herbert[2], D. Richardson[2], R. Cusack[2]

[1]University Hospitals Southampton NHS Foundation Trust, Physiotherapy Department, Southampton, UK, [2]University Hospitals Southampton NHS Foundation Trust, Intensive Care, Southampton, UK

INTRODUCTION. Intensive care acquired weakness is exacerbated by immobilisation secondary to sedation of critically ill patients. Early mobility with interruption of sedation and additional physical therapy has been demonstrated to be safe and well tolerated and results in reduced delirium, increased ventilator free days and reduced length of ICU stay [1,2].
OBJECTIVES. Few NHS trusts in the UK employ physiotherapy assistants in intensive care. By introducing 2 physiotherapy assistants (one band 2 and one band 4) into an early mobilisation multidisciplinary team we effected service improvements with associated financial savings.
METHODS. Medical patients entered this program if admitted with respiratory failure, mechanically ventilated for < 72 h and expected to be ventilated for at least a further 24 h. Patients with irreversible pathology excluded. Three months prior to the introduction of this program, data was collected prospectively on all patients who met the planned inclusion criteria. The program commenced April 2012. All patients were on a strict sedation protocol. RASS and CAM-ICU were assessed 3 times per day. Patients had 2 additional 30 min of rehabilitation/mobilisation therapy 5 days per week. This increased to 7 days per week after 6 months of the program starting.
Costs of implementation: 2 physiotherapy assistants (£24 K + £18 K) £42,000, Motomed Letto2 £11,000, 2 Stretcher Chairs £ 12,000. Total £65,000. Cost of increasing form 5 to 7 day service £ 6.857. Re-occurring costs £50,000 per year.
RESULTS.

Results

	Jan–Mar 2012	Jan–Mar 2013
Number of patients	23	28
Survivors to icu discharge	16	22
M:F	13:9	18:10
Age	62.5(11.2)	56.3 (15.9)
APACHEII	23.2 (5.2)	20.6 (6.6)
Days of respiratory support	12.7 (10.3)	10.9 (12.9)
Ventilator free days (days 1–28)	14 (9.4)	15.6 (9.4)
ICU LOS	16.9 (11.9)	14.2 (14.4)
Hospital LOS	39.6 (40.5)	25 (20)

Mean (± SD)
CONCLUSIONS. The benefits this program have been numerous and extend beyond the boundaries of the project. The additional members of staff has facilitated the introduction of a 7 day physiotherapy service in critical care, improved compliance with sedation protocols and improved awareness of medical staff on the importance of light sedation and physiotherapy. The improved duration of ventilation and LOS are likely due to a combination of these factors. During the first 12 months of this project 97 patients entered into the program. In 2000 cost costs per ICU bed day was estimated at £995 [3]. With adjustment for inflation in the UK inflation the equates to £1400 in 2012. This initial data indicating 1.8 bed days saved in 97 patients equates to savings of more than 4 times the implementation costs during the course of a year.
REFERENCES. 1. Schweickert WD, Pohlman MC, Pohlman AS, et al. Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial. Lancet 2009, 373:1874–82. 2. Alder J, Malone D Early Mobilisation in the Intensive Care Unit: a systematic review. Cardiopulmonary Phys Ther 2012, 23:5–13. 3. Jacobs P, Rapoport J, Edbrooke D. Economics of scale in British intensive care units combined intensive care/high dependency units. Intensive Care Med. 2004, 30:669–4.
GRANT ACKNOWLEDGMENT. Supported by University Hospitals of Southampton Innovation Fund.

1097
UNRESTRICTED HOURS VISITING POLICY AT ICU. DOES IT MATTER FOR FAMILIES?

R.R.L. Fumis[1], P.S. Martins[1], G.P.P. Schettino[1]

[1]Hospital Sirio Libanês, ICU, Sao Paulo, Brazil

INTRODUCTION. Family members visiting intensive care unit (ICU) patients have symptoms of anxiety, depression or posttraumatic stress (PTSD). Unrestricted visiting has been identified as a top-ten need by families of patients in the ICU but it is not clear the effects of an open visit hours on family members.
OBJECTIVES. Identify the influences of an unrestricted hour visiting ICU on family satisfaction, anxiety, depression and symptoms of PTSD.
METHODS. Prospective study conducted in a 22 beds adult general ICU. Critical Care Family Needs Inventory (CCFNI) and the Hospital Anxiety and Depression Scale (HADS) were completed by a family member when the patient′s ICU length stay (LOS) exceeded 48 h and they were also interviewed by phone at 30 and 90 days after ICU discharge or death with of the Impact of Event Scale (IES) and the HADS.
RESULTS. 401 families were interviewed between March 2011 to November 2012. Of them, 187 (46.6 %) were spouse and 178 (44.4 %) adult child and median age was 54 years. Median patients' age was 69 years, SAPS 3 56 points and LOS 5 days. ICU mortality was 13.7 %. The median CCFNI score was 13. 141(35.2 %) family members had symptoms of anxiety, 74 (18.5 %) depression, 58 (14.5 %) had both anxiety and depression during ICU stay. Symptoms of PTSD were found in 12.1 % and 12.5 % at 30 and 90 days respectively. The interviewed family member permanence time inside the ICU was 12 h per day. No correlation was found between permanence ≥ 12 h with family satisfaction ($p = 0.977$), symptoms of anxiety ($p = 0.605$), depression ($p = 0.690$), symptoms of PTSD at 30 days ($p = 0.380$) or PTSD at 90 days ($p = 0.060$). Symptoms of PTSD at 30 days were associated with ICU death $p < 0.0001$, OR1.27 (CI 1.13–1.41); SAPS3 > 50 $p = 0.031$, OR 1.12 (CI 1.05–1.20), family's anxiety and depression during ICU stay $p < 0.0001$, OR1.54 (CI 1.41–1.68). At 90 days these symptoms were associated with death in the ICU $p < 0.0001$, OR 1.13 (CI 1.01–1.27) and family's anxiety and depression at ICU $p < 0.0001$, OR 1.44 (CI 1.31–1.58).
CONCLUSIONS. Present findings show that staying longer time in ICU visiting patients do not help to decrease anxiety or depression neither increase the satisfaction. Moreover, the family members of patients with more severe disease (SAPS3 > 50 points) and family of patients who died in the ICU have more chance to develop symptoms of PTSD.
REFERENCES. 1. Fumis RR, Deheinzelin D. Family members of critically ill cancer patients: assessing the symptoms of anxiety and depression. Int Care Med 2009; 35:899–902. 2. Azoulay E et al. Risk of post-traumatic stress symptoms in family members of intensive care unit patients. Am J Respir Crit Care Med 2005; 171: 987–994.
3. Lee MD et al. Visiting hours policies in New England intensive care units: strategies for improvement. Crit Care Med 2007; 35:497–501.

1098
FAMILY PRESENCE OR PARTICIPATION TO ADULT PATIENTS' CARE IN INTENSIVE CARE UNITS: ACCEPTABILITY AMONG FRENCH ICU CAREGIVERS

M.C. Thirion[1,2], G. Plantefeve[1,2], O. Pajot[1,2], E. Rosset[1,2], E. Boitrou[1,2], M. Preau[1,2], H. Outin[2,3], H. Mentec[1,2]

[1]CH Victor Dupouy, Service de réanimation polyvalente, Argenteuil, France, [2]CREUF, Paris, France, [3]Centre Hospitalier Intercommunal Poissy Saint-Germain, Service de Réanimation Médico-Chirurgicale, Poissy, France

INTRODUCTION. Family participation to care in ICU is controversial. A French ICU team investigated the acceptability of sharing cares with family members of ICU patients[1]. Family presence during resuscitation is recommended by scientific societies and has been recently proved to be beneficial[2]. Whether these practices could be generalized in France is unknown.

OBJECTIVES. The aim of the survey was to investigate the acceptability of family presence (FPe) and/or participation (FPa) to some adult patients' care in French ICUs and the impact on the perceived quality of care (QoC).

METHODS. An anonymous internet survey was conducted using the extra-universitary college of French ICU caregivers (CREUF) mailing list.

RESULTS. 760 (33 %) persons answered the questionnaire: 51.6 % medical doctors, 32.8 % nurses, 8.3 % nursing aids consisting in 56.1 % women, 28.3 % practicing in ICU for more than 10 y. According to type of care, opinion concerning FPe and FPa during care is favorable for 31 to 77 % and 53 to 95 % of caregivers interviewed respectively.

When unfavorable to FPa to ICU care, the most common reasons evoked were that these were professional cares (62.7 %), there may be some intimacy (44.4 %) or hygiene issues (16.3 %) or that it modified the QoC delivered (34.1 %).

26 % of ICU caregivers (CG) stated that FPa did not interfere with QoC, but 45 % stated that it may increase and 29 % that it may decrease the QoC.

Factors that may decrease QoC during FPe or FPa were: "shocking" cares (79 %), family (fam) exciting the patient (68 %), severity of patient (50 %), frequent or numerous visits (45 %), lack of experience of CG (37 %), type of care (32 %), children visitors (22 %), age of patients (6 %). Those that may increase QoC were: better communication with patients (pts) (88 %), fam calming patients (84 %), better understanding of pts′ needs (75 %), the look of others making CG improve (33 %), visitors being CG themselves (12 %).

FPe during resuscitation raises large concerns as 75 % of answerers were unfavorable arguing risk of psychological trauma to fam (89 %), lack of space (67 %), anxiety generated on CG (55 %), trouble to give appropriate care (55 %), lack of personnel (44 %) and risk of litigation (14 %). Among favorable CG (15 %), the benefits mentioned are: giving the certainty that "everything has been done" (83 %), helping the bereavement process (71 %), enabling the fam to stay until "the last moment" (69 %), reassuring the fam and answering their needs (51 %), make them feel useful for the pt (24 %) and limiting litigation (15 %).

CONCLUSIONS. FPe or FPa to ICU care seems possible according French ICU caregivers. Interestingly, according to 45 % of them it may improve the QoC delivered.

Despite scientific societies' recommendations, FPe during resuscitation still raises large reject among French ICU caregivers.

REFERENCES. 1. Thirion M. ICM 2009; (35):S183. 2. Jabre P NEJM 2013; 368:1008–18.

1099
A 24-HS VISITATION POLICY IN AN ADULT ICU: IS IT GOOD FOR WHOM?

R.R.L. Fumis[1], F.J.D.S. Ramos[1], L. Azevedo[1], G.P.P. Schettino[1]

[1]Hospital Sirio Libanês, Intensive Care Unit, Sao Paulo, Brazil

INTRODUCTION. Despite the growing recognition of the importance of open visiting policy (OVP) in the ICU, unrestricting visitation policy may interfere in the ICU organization and can cause conflict and burden among healthcare workers.

OBJECTIVES. To evaluate the physicians, nurses and respiratory therapists' perceptions about a 24-hs visitation policy in an adult ICU after four years of its implementation.

OBJECTIVES. This study was performed in a medical-surgical 30 beds ICU with an OVP and families' facilities to encourage the visit (free entering time during the day or night, possibility of changing the visitor at any time, option to sleep with the patient in an individual box with sofa, TV and bathroom). All ICU healthcare staff (senior physicians and medical residents: 45; nurses: 39 and respiratory therapists: 27) were invited to answer a questionnaire about perceptions of an OVP based on models used by Marco and Garrouste-Orgeas. ICU staff working in the institution < 6 months was excluded. During 5 consecutive days we prospectively recorded the time that at least one patient′s visitor effectively stayed inside the patient′s box.

RESULTS. The median visiting time for each ICU patient per day was 11.7 h (IQR 25–75 % 6.3–17). According to the responders an OVP occasionally (60.4 %) or frequently/always (28.3 %) negatively interferes with bedside work; frequently/always (59.4 %) impairs the organization of the care and that the patient care occasionally (49.1 %) or frequently/always (23.6 %) suffer much more interruptions. However, the ICU staff pointed out that a OVP frequently/always (53.8 %) helps patient's recovery and frequently/always (56.6 %) decreases patients' anxiety and stress. Considering the family benefits, they think that it frequently/always (44.8 %) increases family satisfaction about patient′s care; never (2.9 %) or occasionally (52.4 %) increases family satisfaction about patients' care and never (9.4 %) or occasionally (40.6 %) helps to decreases families' anxiety and stress. However, 67.9 % of healthcare workers would like to be hospitalized in an ICU with a OVP.

CONCLUSIONS. The OVP within family facilities in an adult ICU lead the visitors to stay many hours together within the ICU patients. The healthcare workers pointed out that the presence of the family inside the ICU interferes in the ICU organization and in the patient care, however they have a positive perception regarding the importance of this police for patients and families and would like, if needed, to be admitted themselves in an ICU with an OVP.

REFERENCES. 1. Marco L et al. Intensive care nurses' beliefs and attitudes towards the effect of open visiting on patients, family and nurses. Nurs Crit Care 2006; 11:33–41. 2. Garrouste-Orgeas M, et al. Perceptions of a 24-hour visiting policy in the intensive care unit. Crit Care Med. 2008; 36(1):30–5.

1100
SHORT -TERM PSYCHOLOGICAL EFFECTS IN FAMILY MEMBERS OF ICU PATIENTS

M. Kourti[1,2], G. Fildisis[1], E. Christofilou[2], D. Bora[2], G. Kallergis[1]

[1]University of Athens, Faculty of Nursing, Athens, Greece, [2]General Hospital LAIKO, ICU, Athens, Greece

INTRODUCTION. It is generally accepted that hospitals are places where emotions of anxiety, depression and uncertainty can appear, either to the patients or to their family members.[1] However, ICU is probably the only place, where patients' relatives seem to suffer more, not only because of the critical ill's condition, but also because of the fact that relatives must represent the patient and, in some cases, may need to take a decision for him[2].

OBJECTIVES. Aim of this study was to examine the presence of anxiety and depression symptoms in relatives of ICU patients that admitted in the Intensive Care Unit of a General Public Hospital in Athens, Greece, and the degree such feelings are connected to the critical ill's condition.

METHODS. A total of 102 patients' relatives were enrolled in this study (62 females and 40 males). The symptoms of anxiety and depression were evaluated with the Hospital Anxiety and Depression Scale (HADS) [3], and a HADS score over 21 was considered as a "probable" case of these symptoms. Patient's condition was evaluated with A.P.A.CH.E II (Acute Physiology And Chronic Health Evaluation II) score. The higher the score was getting, the more the patient's condition was deteriorating. Two measurements took place, the first one after 7–10 days of patient's admission in the ICU and the second one after 7–10 days from the first measurement.

RESULTS. During the first measurement, 61.8 % relatives were probable [4] cases of anxiety and 49,1 % were probable cases of depression. During the second measurement, 61,5 % probable cases of anxiety and 53.8 % probable cases of depression were identified. No relation was found between symptoms of anxiety and depression to the relatives of patients' and patients' condition of health.

CONCLUSIONS. Symptoms of anxiety and depression were found to almost all patients' relatives that participated in the study, regardless of the seriousness of ill's condition. According to all these, the assessment of these patients is strongly recommended in order serious problems of anxiety and depressions prevented. [5]

REFERENCES. 1. Davidson JE. Family-centered care: meeting the needs of patients' families and helping families to adapt to critical illness. Crit Care Nurse 2009;29:28–34. 2. Harvey MA. Evolving toward-but not to-meeting family needs. Crit Care Med. 1998; 26:206–07 3. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psyciatr Scand. 1983;67:361–370 4. Maruiti MR, Galdenao LE, Dias Farah OG. Anxiety and depressions in relatives of patients admitted in intensive care units. Acta Paul Enferm 2008; 21(4):636–4 5. Leske JS. Interventions to decrease family anxiety. Crit Care Nurse. 2002;22(6):61–5

GRANT ACKNOWLEDGMENT. The authors are grateful to ICU personnel for their cooperation and to the ICU patients′ relatives for their willingness to help with the research.

1101
WHAT INTERFERES WITH THE COMPLETION OF THE SIMPLIFIED ACUTE PHYSIOLOGY SCORE FORM?

R.V. Gomes[1], W.A. Martins[1], A.R. Felipe[1], P.M.M. Nogueira[1], M.A.D. Mattos[1], M. Assad[1], M.L. Toscano[1], L.H.D.O. Fonseca[1], C.N.D. Barros[1], L.A.D.A. Campos[1], Hospital Unimed Rio

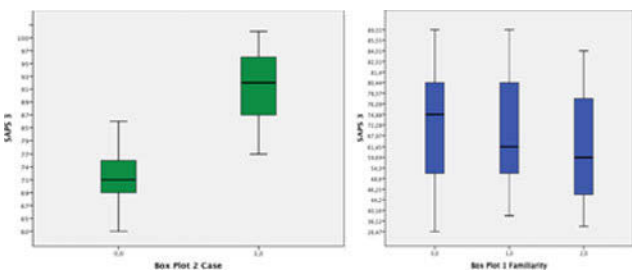
[1]Hospital Unimed Rio, Rio de Janeiro, Brazil

INTRODUCTION. The severity of patients admitted to coronary or non-specialized intensive care units demands the use of a prognostic score. The Simplified Acute Physiology Score (SAPS3) is the most widely used in Brazil; however, completing its form is not a simple task.

OBJECTIVE. To identify and assess the factors that affect the quality of the process of filling out the SAPS3 form before specific training.

METHODS. From December 2012 to January 2013, 36 physicians (all with medical residency and proven experience in their medical specialties) completed the form available at http://www.saps3.org. to calculate the first-hour SAPS3 of two test cases (pancreatitis and post-operative period of colectomy). The physicians were divided into groups according to their areas of expertise: cardio-intensive care; emergency; intensive care; and more than one specialty. Their familiarity with the SAPS3 was assessed according to how many times they had already completed a SAPS3 form as follows: never; up to 5 times; and more than 5 times. That form completion (29 variables) underwent descriptive analysis and was compared with a standard completion [based on the definitions of appendix C (http://www.saps3.org)] performed by three certified intensive care professionals. Variables with disparities were identified. The ANOVA test was used to assess the impact of case severity, of familiarity with form completion, and of the medical specialty on the difference between results.

RESULTS. After completing the score form, agreement was identified in 56 % of the 29 variables, while the remaining 44 % showed at least two disparities, with a consequent change in mortality prediction. ANOVA resulted as follows: the medical specialty had no influence on the result; familiarity (boxplot 1) related to better form completion, although the impact on mortality prediction was mild (3.3 %; $p = 0.013$); and the case severity (boxplot 2) related to poorer form completion, with a high impact of 17.16 % ($p = 0.03$) on mortality prediction.



SAPS 3 Case and Familiarity

CONCLUSION. The SAPS3 form completion improved with the user's familiarity to the form, as well as with his/her training, but was hindered by the case severity. Training in the use of electronic tools with clear definitions and easy access seems to be paramount.

1102

STILL PREPARING TO FAIL BY FAILING TO PREPARE? SURVEY OF TRAINEES' EXPERIENCE OF AND TRAINING IN INTERHOSPITAL TRANSFERS

L. Paton[1], J. Stenhouse[1], J. Ruddy[1], N. Howie[1]

[1]Monklands Hospital, Glasgow, UK

INTRODUCTION. Interhospital transfer of critically ill patients is a task frequently delegated to doctors in training[1]. However, these individuals must be appropriately trained if the risks of transfer are to be minimised and the safety of both patient and staff maintained[2,3].

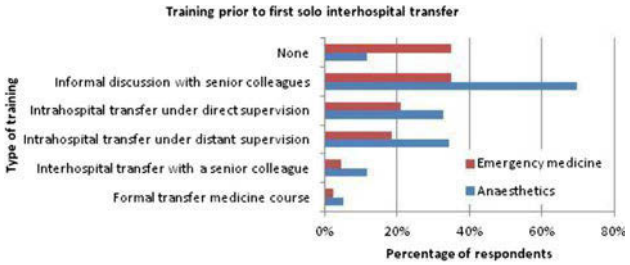
OBJECTIVES. We surveyed anaesthetic and emergency medicine trainees in the West of Scotland to gauge their experience of and training in interhospital transfers.

METHODS. Trainees were invited to complete a web-based questionnaire on three occasions in January and February 2013. Responses in the form of ticked boxes or free text were collated and analysed for trends.

RESULTS. One hundred and thirty-seven trainees replied, yielding a response rate of 55 %. Anaesthetic trainees had greater experience of solo interhospital transfers, with 41 % of respondents having performed more than ten. Conversely, 43 % of emergency medicine trainees had never performed an interhospital transfer and a further 18 % had undertaken fewer than three. This is particularly concerning as emergency medicine trainees more often transfer paediatric level 2 patients, whose physiology and behaviour may be less predictable than that of an intubated ventilated adult.

Most trainees (80 %) performed their first solo interhospital transfer before their third year of specialty training, which breaches the standards advocated by the anaesthetics curriculum in the UK[4]. Thirty per cent of trainees reported experiencing a critical incident during transfer.

Twenty-one per cent received no training prior to their first solo interhospital transfer and few had previously conducted an interhospital transfer with a senior colleague (9 %) or attended a transfer medicine course (4 %).



Training prior to first interhospital transfer

Almost a third (32 %) had felt uncomfortable transferring a patient because their experience in this area was inadequate and 60 % rated their transfer training as deficient or absent. The vast majority (94 %) felt there was a place for more formal tuition in transfer medicine.

CONCLUSIONS. These data suggest that we are failing to prepare trainees for the challenges of transfer. Redressing this deficit in training is imperative, particularly as centralisation of services will require transport of more critically ill patients by more trainees. Safe, cohesive transfers are fundamental to the premise of critical care as a concept rather than a location.

REFERENCES. 1. Jameson DP, Lawler AG. Transfer of critically ill patients in the Northern region. Anaesthesia 2000;55:489–518. 2. Edge WE, Kantar RK, Weigle CG, et al. Reduction of morbidity in interhospital transport by specialised paediatric staff. Crit Care Med 1994;22:186–91. 3. Intensive Care Society. Guidelines for the transport of the critically ill adult. ICS, 2011. 4. Royal College of Anaesthetists. Curriculum for a CCT in Anaesthetics. RCOA, 2010.

Author Index

Q

R