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Abstracts

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The abstracts appear in order of presentation from Monday 15 October to Wednesday 17 October 2012.
The same abstract numbering is used in the Congress Final Programme.

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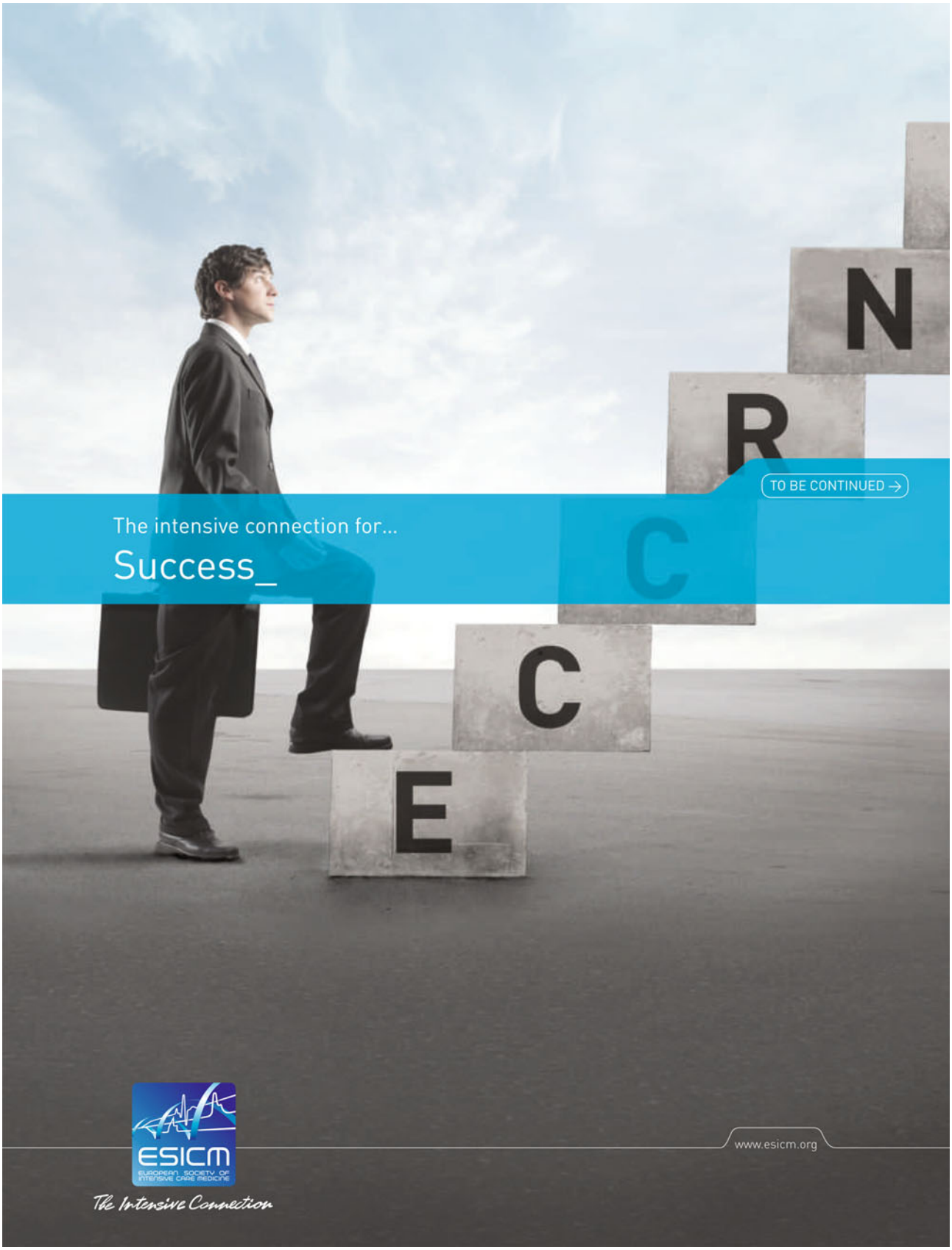
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Table of Contents

Monday 15 October 2012

Tuesday 16 October 2012

Oral Sessions

Wednesday 17 October 2012

Oral Sessions

Poster Corner Sessions

Author Index

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 15 October 2012

Oral Sessions
Genetic and molecular basis of ARDS and VILI: 0001–0005

0001
HUMAN MESENCHYMAL STEM CELLS ENHANCE REPAIR FOLLOWING VENTILATOR-INDUCED LUNG INJURY

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INTRODUCTION. Recent work by our group [1] and others [2, 3] has shown that mesenchymal stem cells (MSCs) aid lung repair and regeneration in pre-clinical models of acute lung injury/acute respiratory distress syndrome including ventilator-induced lung injury (VILI). Prior to advancement to clinical trials an improved understanding of the role of human MSCs in ALI is needed. Barriers to clinical translation of mesenchymal stem cells include concerns regarding inter-species mechanistic discrepancies in mesenchymal stem cell-mediated immunosuppression[4] and a lack of clarity regarding the optimal dosing regimen, including the lower effective MSC dose.
OBJECTIVES. We wished to examine the role of human MSCs in modulating inflammation and enhancing repair after rodent Ventilator Induced Lung Injury (VILI).
METHODS. An animal model of repair of VILI has been developed by our group [1]. Male CD rats were anaesthetized, oro-tracheally intubated and subjected to high stretch mechanical ventilation until a defined worsening of compliance occurred. Once awake and spontaneously ventilating animals received an intra-venous injection of either human MSCs (4 million), fibroblasts or saline control. The animals were then extubated and housed in individually ventilated cages for 24 h to facilitate the inception of repair processes. The level of ongoing injury/repair was characterised during harvest of the animals using blood gas analysis, compliance measurement, wet/dry ratio, BAL total protein, cytokines and cell count and histological analysis. In ongoing experiments to characterise the effects of human MSCs dosage in VILI, we performed a 5 group study, in which we administered vehicle and doses of 10, 5, 2 and 1 million/kg human MSCs to rats after VILI.
RESULTS. Treatment with human MSCs attenuated indices of lung injury including respiratory compliance and lung edema. Total lung water as assessed by wet:dry ratio, and bronchoalveolar lavage total inflammatory cell and neutrophil counts were reduced in the MSCs group. Oxygenation as assessed by arterial pO_2 and the alveolar-arterial oxygen gradient was improved in the MSC group (Fig. 1). MSCs also restored lung structure following lung injury as evidenced by reducedalveolar tissue volume fraction and increased air-space.

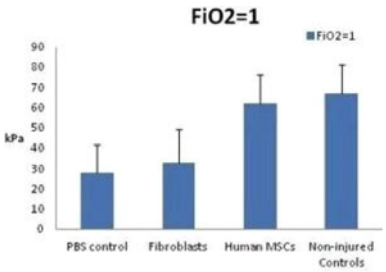

Figure 1

CONCLUSIONS. This animal model of repair following VILI confirms the potential of human MSCs to modulate inflammation and pulmonary odema in this setting. These experiments on human MSCs in VILI aim to help address barriers to their clinical translation. Further analysis of our work, including BAL cytokine assay and histological assessment of injury, will provide insight into the utility of human MSCs to enhance repair in the lung.
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0002
PATTERNS OF GENE EXPRESSION IN PATIENTS WITH SEPSIS AND ACUTE RESPIRATORY DISTRESS SYNDROME

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INTRODUCTION. The study of gene expression patterns may be useful to discover diagnostic and prognostic biomarkers of disease and define therapeutic targets.
OBJECTIVE. To analyze gene expression of patients with severe sepsis or septic shock (SEP) and acute respiratory distress syndrome (ARDS).
METHODS. We studied patients consecutively admitted to the intensive care unit (ICU) of an academic hospital with age ≥18 years, and the diagnosis of SEP on ICU admission. Exclusion criteria were second admission to the ICU and absence of informed consent. We also included as a control group 6 healthy volunteers with no significant past medical history. This study was approved by the local Ethics Committee. Severe sepsis, septic shock and ARDS were defined as per the ACCP-SCCM definitions and the AECC, respectively. Blood samples from patients and controls were withdrawn on the first day of ICU admission or on a random day, respectively, and stored in Tempus tubes and frozen at −80 °C for later RNA extraction. Single-stranded cDNA was synthesized using a High-Capacity cDNA Archive Kit (AB, Foster City, CA). Quantitative real-time RT-PCR was performed using an ABI Prism 7900HT Sequence Detection System with TaqMan® Low-Density Arrays. Sixty four genes were analyzed, selected based on their potential pathophysiological role in sepsis and ARDS. Genes were named according to the HUGO Gene Nomenclature Committee (http://www.genenames.org). We used the G protein coupled receptor (GPR) 144 gene as the housekeeping gene. A univariate gene expression analysis was performed (paired two-tailed Student's *t* test, with the Bonferroni correction), to compare (i) patients with SEP and without ARDS with controls; and (ii) patients with SEP and ARDS with patients with SEP without ARDS.
RESULTS. Forty five patients with SEP were sequentially recruited, 30 without and 15 with the diagnosis of ARDS. Patients with SEP and without ARDS showed, as compared to controls, upregulation of the genes CXCR4, DR1, KLF10, NAMPT, S100A12, STK17B, NFE2l2, TNFRSF1B, MIF and ILF3, and downregulation of DGKZ. Patients with SEP and ARDS showed, as compared to patients with SEP without ARDS, downregulation of CXCR4, STK17B, TNFRSF1B, CD14 and PLAUR.
CONCLUSIONS. A specific pattern of gene expression can be identified in patients with severe sepsis, characterized by upregulation of genes involved in the inflammatory and immune response. Those patients that present ARDS in the context of sepsis showed downregulation of those genes.
GRANT ACKNOWLEDGMENT. Seventh Framework Programme of the European Union, grant number 26486, Instituto de Salud Carlos III (FIS 11/2791), and Spanish Lilly Foundation.

0003
BACTERIAL FLAGELLIN MAY LEAD TO LUNG FIBROSIS THROUGH EPITHELIAL-MESENCHYMAL TRANSITION OF ALVEOLAR EPITHELIAL CELLS

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INTRODUCTION. Pathogen-associated molecular patterns (PAMPs) are molecules recognized by cells of the innate immune system. In addition, PAMPs are recognized by toll-like receptors and other pattern recognition receptors. Toll-like receptor 5 (TLR5) recognizes bacterial flagellin and activates host inflammatory responses. However, the pathological roles of TLR5 stimulation in pulmonary fibrosis have yet to be elucidated; pulmonary fibrosis sometimes occurs in severe lung infection caused by flagellated bacteria such as Pseudomonas or Legionella species. In this study, we report the possible mechanism that epithelial-mesenchymal transition (EMT) by flagellin leads to pulmonary fibrosis.
OBJECTIVES. We aimed to elucidate the mechanism by which bactrerial flagellin causes pulmonary fibrosis. The molecular mechanisms responsible for A549 cell responses (alveolar epithelial type II cells) with flagellin-induced EMT-related changes were closely examined, and the effects of transforming growth factor beta 1 (TGF-b1), a key factor in the induction of EMT, were augmented.
METHODS. We cultured A549 cells in a culture medium and stimulated them by using bacterial flagellin (*Bacillus subtilis*) and/or recombinant human TGF-b1. We also performed the dual-luciferase reporter gene assay after transfection with the NF-κB luciferase reporter gene, microarray analysis, immunoblot analysis, reverse transcription-polymerase chain reaction, and sequencing.
RESULTS. Microarray analysis of gene expression indicated that flagellin induced a change in gene expression that was similar to the changes induced by TGF-b1. Biochemical analysis revealed that TGF-b1 and flagellin increased the levels of the fibronectin protein and reduced those of the E-cadherin protein. Simultaneous treatment with TGF-b1 and flagellin significantly augmented these EMT-related changes. Flagellin strongly activated p38 MAP kinase, and the activation was sustained for more than 30 h. SB203580, an inhibitor of p38 MAP kinase, inhibited the upregulation of fibronectin by both flagellin and TGF-b1. Simultaneous treatment with TGF-b1 and flagellin augmented the activation of p38 MAP kinase by TGF-b1 or flagellin alone.
CONCLUSIONS. These results strongly suggest that flagellin cooperates with TGF-b1 in the induction of EMT in alveolar epithelial cells. It also suggests that flagellated bacteria tend to cause pulmonary fibrosis in severe lung infection.
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0004
GENETIC PREDISPOSITION TO ACUTE RESPIRATORY DISTRESS SYNDROME IN PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK

P. Cardinal-Fernández[1], A. Ferruelo[1], M. El-Assar[1], C. Santiago[2], F. Gómez[2], A. Martín-Pellicer[1], F. Frutos-Vivar[1], O. Peñuelas[1], N. Nin[1], A. Esteban[1], J.A. Lorente[1]

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INTRODUCTION. Genetic factors have been invoked to explain differences in susceptibility to acute respiratory distress syndrome (ARDS) in patients sharing the same risk factors. As polymorphism frequency is highly dependent on the specific population under scrutiny, results on genetic association should be validated in different populations.
OBJECTIVE. To analyze the association between polymorphisms of candidate genes and susceptibility to ARDS in patients with sepsis.
METHODS. We studied patients ≥18 years of age consecutively admitted to the intensive care unit (ICU) of an academic center from July 2005 to July 2008 with the diagnosis of severe sepsis or septic shock. Exclusion criteria were second admission to the ICU, proven viral pneumonia, home oxygen therapy, diagnosis of metastatic cancer, and absence of informed consent. Severe sepsis, septic shock and ARDS were defined according to the American College of Chest Physicians/Society of Critical Care Medicine, and the American-European Consensus Conference, respectively. This study was approved by the local Ethics Committee. Genomic DNA was extracted from a whole blood sample obtained on the first day of ICU admission. Angiotensin converting enzyme (ACE) insertion/deletion (I/D) polymorphism was determined by PCR amplification as previously described [1]. Single nucleotide polymorphisms (SNPs) of tumor necrosis factor (TNF) α −376, −308 and −238; interleukin 8 −251; vascular endothelial growth factor +405 and +936; and pre-B cell colony enhancing factor (PBEF) −1,001 were identified using TaqMan® SNP genotyping Assay. We conducted a multivariate logistic regression analysis to prove the association of the genetic polymorphisms with the diagnosis of ARDS.
RESULTS. Thirty five of the 149 included patients presented ARDS. As compared to patients without ARDS, patients with ARDS were more often female, presented a higher mortality rate, were taking ACE inhibitors or angiotensin II receptor blockers less often, had a lower glucose serum concentration on ICU admission, and had a higher proportion of the allele D of the ACE gene. In multiple analysis the D allele of the ACE gene was independently associated with susceptibility to ARDS (odds ratio 4.75, 95 % confidence interval 1.02–22.20, $p = 0.048$).
CONCLUSIONS. The presence of the allele D of the ACE gene is associated with ARDS in patients with severe sepsis or septic shock.

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GRANT ACKNOWLEDGMENT. Seventh Framework Programme of the European Union, grant number 26486, Instituto de Salud Carlos III (FIS 11/2791), and Spanish Lilly Foundation.

0005
THE ROLE OF ATF3 IN ALI AND VILI-INDUCED APOPTOSIS

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INTRODUCTION. Acute respiratory distress syndrome (ARDS) is a significant cause of morbidity and mortality in critically ill patients. Using microarray and gene deficient mice, our group recently identified and demonstrated that absence of the transcription factor ATF3 confers susceptibility to acute and ventilator induced lung injury (ALI/VILI).
OBJECTIVES. To determine the role of ATF3 in ALI and VILI-induced cellular apoptosis.
METHODS. To test the functional role of ATF3 in VILI-induced apoptosis in vivo, we randomized anesthetized age- and weight-matched male wild type (wt) and ATF3 knock out ($ATF3^{-/-}$) mice to lipopolysaccharide (LPS, 10 mcg/kg) or saline inhalation followed by mechanical ventilation with low (LTV, 6 ml/kg; PEEP 2 mmHg) or high tidal volumes (HTV, 20 ml/kg; PEEP 0 mmHg) for 3 h. Mechanisms of ATF3-dependent regulation of apoptotic mediators were explored in vitro using primary BM derived macrophages and adenovirus vectors for both gain- and loss- of function experiments.
RESULTS. ATF3 deficiency confers significant susceptibility to VILI. ATF3 deficient mice had a marked increase in apoptosis as evidenced by increase TUNEL and Caspase 3 immunostaining. The expression of Fas, Daxx, pJNK (phospho JNK), and Bad was markedly increased in ATF3 deficient animals compared to wild type controls in response to VILI. In vitro and cell-stretch experiments in primary pulmonary (Broncho (distal)alveolar epithelial cells BEAS2b) or bone marrow derived macrophages demonstrate that the absence of ATF3 promotes activation of pJNK and translocation of Daxx to the nucleus. Infection of either pulmonary or bone marrow derived macrophages with the adenovirus overexpressing ATF3 mitigates activation of pro-apoptotic signaling.
CONCLUSIONS. ATF3 protects both pulmonary and bone marrow derived macrophages from VILI and cyclic stretch induced apoptosis. Adenovirus vector overexpressing this gene arrogates this effect.
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GRANT ACKNOWLEDGMENT. This work is supported by the Canadian Institutes of Health Research (Grant # MOP-106545 to CCDS), the Ontario Thoracic Society (OTS2010/2011/2012, to CCDS), the Physicians Services Incorporate (PSI 09-21, to CCDS) and the Early Research Award from Ministry of Research and Innovation of Ontario, Canada.

New data on renal replacement therapy: 0006–0010

0006
PARATHYROID HORMONE SECRETION DURING CITRATE-BASED RENAL REPLACEMENT THERAPY

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INTRODUCTION. Regional anticoagulation with citrate is a well established technique to maintain circuit patency during continuous renal replacement therapy (CRRT). Previous studies showed a negative daily calcium balance and significant parathyroid hormone (PTH) release when using protocols aiming for serum ionized calcium (Ca_i) levels between 0.8–1.1 mmol/L which raises concern that citrate may be harmful to bone metabolism [1–3]
OBJECTIVES. The objective of our study was to assess whether significant PTH release during citrate based CRRT could be prevented by aiming for target systemic Ca_i levels in the physiologic range (1.12–1.20 mmol/L).
METHODS. 30 consecutive critically ill patients with acute kidney injury receiving citrate-based CRRT were prospectively evaluated in a single centre observational study. Patients with chronic kidney disease stage IV or V were excluded. The primary outcome was variation in serial intact PTH (PTHi) concentrations whilst on CRRT for a 48 h period. There was no change in clinical management.
RESULTS. The mean age was 70.4 years (SD 11.3); 56.7 % were male. The mean serum Ca_i levels [mmol/L] were 1.15 (SD 0.09), 1.13 (SD 0.09), 1.17 (SD 0.05) and 1.16 (SD 0.04) at baseline, 12 h, 24 h and 48 h, respectively ($p = 0.254$) and were outside the desired target range in 30.0, 25.4 and 17.4 % of patients at 12, 24 and 48 h, respectively. Median PTHi levels [pg/ml] were 66.5 (IQR 43–111), 109 (IQR 59.5–151.5), 88 (IQR 47–124) and 85 (IQR 53–133) at baseline, 12, 24 and 48 h, respectively. The differences between baseline and 12 h and across all time points were statistically not significant ($p = 0.164$ and $p = 0.532$, respectively). In the mixed effects model each 0.1 mmol/L increase in serum Ca_i was associated with a 30.2 % decrease in PTHi ($p < 0.001$). Serum Ca_i <1.12 mmol/L was associated with a 61.4 % increase in PTHi ($p < 0.001$). Results were unchanged after adjustment for age, gender, serum magnesium, serum phosphate and time spent on CRRT.
CONCLUSIONS. The physiologic relationship between serum Ca_i and PTH secretion is maintained during citrate based CRRT. We observed an initial rise in PTHi levels within 12 h of starting citrate based CRRT which subsided within the subsequent 36 h if systemic Ca_i levels were maintained within the physiologic range.
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0007
CITRATE TREATMENT REDUCE ENDOTHELIAL DEATH AND INFLAMMATION

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INTRODUCTION. Hyperglycemia occurs frequently in critically ill patients, a condition that is associated with oxidative stress and protein kinase C (PKC) dependent inflammation [1, 2]. Glucose gives rise to glucose degradation products (GDPs), precursors of advanced glycation end products (AGEs) that cause additional cellular damage and inflammation. Citrate anticoagulation during continuous renal replacement therapy (CRRT) has gain interest and is now a real alternative to heparin in the ICUs practice. Citrate is metabolised to bicarbonate in the patients, but not much is known about citrates effect on endothelial cells.
OBJECTIVES. We evaluated the effect of citrate on glucose- and GDP-induced endothelial inflammation by measuring changes in viability, inflammation and function in primary human umbilical vein endothelial cells [3].
METHODS. The extent of apoptosis/necrosis was measured by flow cytometry and visualised with confocal microscopy by staining with Annexin V or propidium iodide respectively. Protein kinase C (PKC) βII activation was evaluated with Western blotting.
RESULTS. Incubation with glucose (30 mM) and GDP (50 μM) significantly increased PKCβII-expression, endothelial cell death and inflammation. The addition of citrate decreased hyperglycemia-induced apoptosis ($p = 0.021$), necrosis ($p = 0.04$) and reduced the PKCβII-expression ($p = 0.021$) down to background levels. Citrate improved endothelial function by reducing the inflammatory markers ($p = 0.01$) and by decreasing neutrophil diapedesis ($p = 0.012$).
CONCLUSIONS. These results suggest that citrate may have therapeutic potential by reducing hyperglycemia-induced endothelial inflammation and abolishing endothelial dysfunction
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0008
EARLY INITIATION OF RENAL REPLACEMENT THERAPY IS ASSOCIATED WITH DECREASED RISK FOR HOSPITAL MORTALITY IN THE CRITICALLY ILL

S.T. Vaara[1], A.-M. Korhonen[1], K.-M. Kaukonen[1], S. Nisula[1], O. Inkinen[2], S. Hoppu[3], J.J. Laurila[4], L. Mildh[1], M. Reinikainen[5], V. Lund[6], I. Parviainen[7], V. Pettilä[1], the FINNAKI Study Group

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INTRODUCTION. The most severe form of acute kidney injury (AKI) is treated with renal replacement therapy (RRT). Optimal timing of RRT initiation is unclear, although evidence of the beneficial effect of early RRT initiation is evolving.
OBJECTIVES. We aimed to evaluate factors associated with hospital mortality in patients treated with RRT, especially 1. time from intensive care unit (ICU) admission and 2. fluid accumulation at RRT initiation.
METHODS. The FINNAKI study was a prospective, observational cohort study in 17 Finnish ICUs between September 2011 and February 2012. We collected data of patient characteristics and of the given RRT. We calculated cumulative fluid balance from ICU admission to RRT initiation (day of RRT initiation included) and used baseline weight to define the degree of fluid accumulation. We entered age, surgical admission, Simplified Acute Physiology Score II (SAPS II), time from admission to RRT (hours), degree of fluid accumulation (%), severe sepsis (yes/no), latest creatinine and lactate values prior to RRT initiation, and initial RRT modality (continuous or intermittent) in a logistic regression model for hospital mortality. We studied RRT initiation >24 h from admission (late RRT), and fluid balance >10 % in separate models.
RESULTS. We analyzed 261 patients. Hospital mortality (95 % confidence interval) was 34 (28–40) %. Non-survivors had a higher degree of fluid accumulation compared to survivors (Table). In logistic regression, higher SAPS II score, medical admission, lower creatinine prior to RRT initiation, longer time from admission to RRT initiation, and higher degree of fluid accumulation were associated with increased risk for hospital mortality. In the second and third models, late RRT initiation [odds ratio (OR) 95 % CI 2.69 (1.07–6.73), $P = 0.035$] and fluid accumulation over 10 % [OR 2.80 (1.19–6.56), $P = 0.018$] were associated with increased risk for hospital mortality in addition to higher SAPS II score, medical admission, and lower creatinine.

Table 1 Patient characteristics

	All	Survivors	Non-survivors
Age (years)*	65 (55–74)	63 (52–71)	70 (58–77)
SAPS II score*	52 (41–66)	47 (36–56)	66 (55–81)
Continuous RRT as initial modality*	175/251 (67 %)	100/164 (61 %)	75/87 (86 %)
Time from ICU admission to RRT (h)**	13 (3–41)	12 (2–41)	16 (6–41)
Fluid accumulation (%)*	5.4 (1.6–10.7)	3.9 (0.8–9.3)	9.7 (4.4–14.1)

Values are expressed as median (IQR) or count and percentage. Comparison between survivors and non-survivors; *$P < 0.001$; **$P = 0.206$

CONCLUSIONS. In this prospective cohort study in critically ill patients with RRT, patients with late RRT regarding both time from admission to RRT initiation and degree of fluid accumulation had an increased risk for hospital mortality.
GRANT ACKNOWLEDGMENT. We thank for a grant from the Instrumentarium Foundation, Academy of Finland, and HUS-EVO grant TYH2011210.

0009
BLOOD PUMP ALARM ACTIVATION DURING CONTINUOUS RENAL REPLACEMENT THERAPY: EFFECTS ON FILTER LIFESPAN

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INTRODUCTION. Intensive care patients frequently require continuous renal replacement therapy (CRRT) during their treatment. CRRT filter life should reach 72 h before a routine change is recommended. Often despite anticoagulation, premature clotting reduces circuit life and efficiency of dialysis, and also increases blood loss, workload and costs of treatment. Frequent interruptions to circuit blood flow, as occurs when blood pump alarms are activated, can reduce filter lifespan. We sought to evaluate the relationship between the frequency of blood pump alarm and filter lifespan.
OBJECTIVES. Primary: To evaluate the effect of blood pump stoppages (measured as the hourly average of blood pump alarm activation) on dialysis filter life. Secondary: To assess which other factors are associated with reduced duration of dialysis filter life in our ICU.
METHODS. Following a pilot study and power calculation based on our primary outcome, we prospectively gathered data on the filters used for 30 consecutive patients who were receiving CRRT over a 4 month period. Exclusion criteria were applied and data gathered using 'ICIP' clinical information system. Detailed blood pump alarm activation data was gathered directly from the data cards in the dialysis machines (Prismaflex). For the purposes of statistical analysis we categorised filter lifespan as "very short" if <12 h in duration and "short" if <24 h duration.
RESULTS. Data was available for a total of 129 filters in 30 consecutive patients. Average filter lifespan was 20.76 h (median 14 h), with an overall average hourly blood pump alarm of 2.5/filter. Average hourly blood pump alarm was highly predictive of a very short filter life ($p = 0.047$; OR 1.22; 95 % CI 1–1.5), and was also predictive of short filter life ($p = 0.076$; OR 1.52; 95 % CI 0.97–2.54). Use of no anticoagulation (when compared with heparin anticoagulation) was a predictor of very short filter life ($p = 0.01$, OR 15.46); use of prostacyclin (when compared to heparin) was not a significant predictor of very short filter life ($p = 0.76$). When compared with the right internal jugular (RIJ) site, use of both left internal jugular ($p = 0.03$) and right femoral (0.003) sites were highly predictive of very short filter life. There was no difference in filter life between using the left femoral site compared with right internal jugular site.
CONCLUSIONS. An increased number of blood pump alarms is a positive predictor of both short and very short filter life. To our knowledge, this is the first study to date to quantify the significance of this relationship. Our results confirm that interruptions to blood flow (following pump alarm) within the CRRT circuit play an important role in early filter clotting. Further work is necessary to investigate the events which lead to blood pump alarm activation, and what steps can be taken to minimise their occurrence.

0010
RENAL REPLACEMENT THERAPY IN ICU- PATIENTS WITH LIVER CIRRHOSIS

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INTRODUCTION. Current guidelines recommend not initiating renal replacement therapy (RRT) in critically ill patients with liver failure without liver transplant option and acute kidney injury (AKI), whereas in patients with liver disease AKI should be aggressively treated [1].
OBJECTIVES. In this study, we evaluated risk factors for RRT in patients with liver cirrhosis, the impact of RRT on mortality in these patients, as well as independent predictors of mortality in patients with liver cirrhosis requiring RRT.
METHODS. We analysed consecutive patients admitted to the ICU between 2005 and 2010. Renal function was evaluated according to the Acute Kidney Injury Network (AKIN) criteria. Patients were followed for 1 year.
RESULTS. Of 2006 patients, 244 patients had liver cirrhosis. Of these patients, 67 % were male, median age was 55 years (IQR 48–63). The main reasons for ICU admission were sepsis/septic shock (41 %), upper GI-bleeding (25 %), AKI (21 %), and hepatic encephalopathy (11 %). In 33 % (80/244) of patients RRT was necessary, of which 84 % (67/80) had AKIN grade 3 on admission. Child Pugh Score, MELD and SAPS II score on admission were significantly higher in patients requiring RRT as compared to patients without ($p < 0.001$). Within multivariate analysis MELD score >30 (without correction for RRT) stayed a significant predictor for RRT ($p < 0.001$) with a sensitivity and specificity of 60 and 78 %, whereas SAPS 2 score was not. 28 day, 90 day and 1 year mortality in patients with liver cirrhosis requiring RRT at the ICU were 79, 86 and 88 %, respectively. RRT, even if corrected for age, sex, SAPS II score and transplant listing was an independent predictor of 90-day mortality (HR = 1.6, 95 % CI 1.15–2.23). Neither mode of RRT nor type of anticoagulation influenced outcome. Subgroup analysis showed a total of 16 % (38/244) of patients were listed for transplantation on admission, 13 (5 %) underwent LTX during follow up. Of the listed patients, 16 (42 %) had RRT. 90-day mortality of patients requiring RRT did not differ in patients not listed and listed for liver transplantation (86 vs. 88 %, respectively). Multivariate cox regression analysis revealed SAPS II score ($p < 0.01$) and age ($p < 0.05$) as only independent predictors for 90-day mortality in patients with liver cirrhosis requiring RRT.
CONCLUSIONS. Necessity of RRT in critically ill patients with cirrhosis is an independent predictor for 90-day mortality. MELD score was an independent predictor for RRT in this patient cohort. Transplant listing status has no impact on outcome in patients requiring RRT. The decision to initiate RRT in patients with cirrhosis at the ICU should be based on severity of illness and not on the transplant listing status.
REFERENCE(S). 1. Borchard, et al. Am J Respir Crit Care Med. 2010.

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0011
THE ETHICAL CLIMATE IN EUROPEAN ICUS. RESULTS FROM THE APPROPRICUS STUDY

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INTRODUCTION. The ICU generates stress for clinicians both because of the high patient mortality and morbidity and because moral dilemmas arise daily. The ethical climate is defined as the organizational conditions and practices that affect the way difficult patient care problems, with ethical complications, are discussed and decided.
OBJECTIVES. To determine the quality and the variability of perceived ethical climates in European ICUs as well as its relation to perceptions of inappropriateness of care and intentional jobleave.
METHODS. A single-day cross-sectional evaluation of perceptions of inappropriate care among 1953 ICU nurses and physicians providing bedside care to adult ICU patients in 10 European countries. A 7-item questionnaire was used to assess the (perceived) ethical climate. Factoranalysis was used to reduce the 7 dimensions of the ethical climate and to better understand the variability between (perceived) ethical climates.
RESULTS. Factoranalysis with varimax rotation resulted in a two-factor solution: the first factor (30 % of variance) concerns 4 items dealing with discussion of ethical problems (do clinicians talk about feelings and opinions); the second item (30 % of variance) concerns 3 items dealing with decision-making (is there bedside interdisciplinary decision-making). A scatterplot shows great variability in the quality of discussion and actual decision-making about ethical problems (1) between clinicians within ICUs, (2) between ICUs within a country, and (3) between countries. There is a clear correlation between the quality of the ethical climate and the percentage of clinicians in a given country indicating at least one of their patients as receiving inappropriate care (percentages ranging from 8 % in the Netherlands to 43 % in Poland of clinicians indicating inappropriate care). The quality of ethical climate is also correlated with intentional jobleave (percentages ranging from 17 % in the Netherlands to 42 % in Germany of clinicians with intentional jobleave).
CONCLUSIONS. There is a high variability in the quality of (perceived) ethical climates within and between European countries. Less discussing and interdisciplinary deciding about ethical problems is correlated with higher perceptions of inappropriate care and higher intentional jobleave.
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0012
IMPROVING INTERPROFESSIONAL TEAMWORK IN THE ICU: A SINGLE CENTRE INTERVENTION STUDY

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INTRODUCTION. Literature emphasized the importance of interprofessional teamwork (IT) in the ICU. A key factor is the quality of interdisciplinary communication between health care providers.
OBJECTIVES. The aim of this pre-post test study was to evaluate the quality of IT in the surgical unit of the Ghent University Hospital ICU and to assess whether teamwork could be improved through a specific intervention. This 12 week-intervention consisted of (1) optimizing, structuring and extending the existing weekly interprofessional rounds with collaborative decision-making and clear communication of goal-directed actions, including the psychosocial aspects of care (2) to guarantee the maintenance of effective information exchange over time between all professions with the help of an electronic follow-up information tool.
METHODS. The perception of teamwork prior to and after the intervention was assessed with PROSE (Project Systems Experts) Online Diagnostics System (http://www.prose.eu), a self assessment questionnaire designed to measure teamwork in health care related situations [1]. This 60-item validated questionnaire consists of 3 IT domains (of 20 items each): organizational factors, process of care factors, attitudes and beliefs. The maximum score for each domain on a Likert-scale (1 = strongly disagree; 5 = strongly agree) is 100 with a higher score indicating better perceived IT. A score of 50 is considered as sufficient, 60 as good, 70–100 as excellent. Ten priority-items for improvement were selected by the ward's management team, prior to the intervention. The impact of the intervention on the total group, between and within 4 subgroups (categorized according to the 3 architectural subunits consisting of nurses only and a fourth group consisting of all other health care providers) was measured by linear mixed models with random intercept using SAS. Pre- en postintervention values with [95 % confidence interval] and p value are reported.
RESULTS. Response rates before and after the intervention were 65 % (67/99) and 52 % (51/99) respectively. The intervention had a clear impact on the first and second domain of IT for the total group (pre 58 [46,70], post 65 [54,76], $p < 0.001$and pre 57 [46,68], post 63 [51,75], $p < 0.001$, respectively) and within all subgroups of health care providers despite baseline differences between subgroups in IT domain 1 and 2. Nine of the 10 a priori selected priority-items clearly improved after the intervention ($p < 0.05$).
CONCLUSIONS. The quality of IT in this surgical ICU which was acceptable at baseline, improved to good after an intervention focusing on organizational and process of care factors.
REFERENCE(S). 1. PROSE (2007). The PROSE Versions. http://www.prose.be/eng/products.htm July 2007.
GRANT ACKNOWLEDGMENT. The authors thank the health care providers of the surgical ICU Ghent University hospital who allowed us to further study this topic.

0013
DOCTORS, NOT PARENTS, DECIDE TO FORGO LIFE SUSTAINING TREATMENT IN PEDIATRIC INTENSIVE CARE

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INTRODUCTION. Prospective observational studies of pediatric end-of-life decision making are scarce. Yet, especially these insights into actual practice are considered helpful by physicians to become more sensitive in their communication to the needs of parents.

OBJECTIVES. Aim of this study was to investigate how physicians communicate decisions to forgo life-sustaining treatment (LST) to parents and how they involve parents in the decision making process.

METHODS. Over a period of two and a half years we conducted a prospective qualitative study in two Dutch level III pediatric intensive care units. We observed and digitally recorded 47 meetings between physicians and parents regarding decisions to forgo LST in 19 critically ill children between the age of 0 and 17 years. The transcripts of these meetings were analyzed following the principles of grounded theory.

RESULTS. The number of recorded meetings per patient varied between 1 and 8 with an average duration of 30 min. In the majority of meetings physicians took up two third of that time. Early in the decision making process physicians extensively explained the child's grave situation and prognosis. It was repeatedly stressed that medically everything was still done that could be done but that eventually 'the child led the way'. In later meetings physicians informed parents that the medical team had decided to forgo LST, either because death was inevitable or because neurological damage was too severe and the child would survive in a vegetative state. In both situations it was stressed that continuation of LST would only prolong the suffering of the child. Furthermore, physicians underlined that parents were not in any way responsible for this decision. Incidentally parents were asked about their views or it was checked if they could accept the presented decision. In these rare cases parents clearly expressed their points of view. Only parents who strongly disagreed with the presented decision spontaneously expressed their objections. In two exceptional cases—both children with a congenital disorder and severe impairment—parental views on future mechanical ventilation were explored and their wishes followed. In these cases a long lasting relationship existed between parents and physician.

CONCLUSIONS. Parents were carefully informed about the condition and prognosis of their child. The tone of this information was very pessimistic, preparing parents for the foreseen decision of the medical team to forgo LST. This decision was not presented as a choice, but as inevitable in view of the child's best interests. In most cases physicians did not actively explore parental views and wishes. Instead, they underlined that parents couldn't and shouldn't make these difficult decisions. There were two exceptional cases of shared decision making.

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REFERENCES. Will follow.

0014

SPOKEN LANGUAGE DISCORDANCE AND ALL CAUSE MORTALITY IN CRITICALLY ILL PATIENTS: A COHORT STUDY

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INTRODUCTION. Limited proficiency in the dominant language spoken is associated with decreased quality of care in the inpatient setting. In the US, the significance of limited English proficiency by patients in the ICU is unknown.

OBJECTIVES. We hypothesized that the lack of English language proficiency would be associated with increased all cause mortality in the critically ill.

METHODS. We performed a two center observational study of patients treated in medical and surgical intensive care units in Boston, Massachusetts. We studied 49,750 patients, age $\geq$18 years, who received critical care between 1997 and 2007. The exposure of interest was English language proficiency. Language is determined by the patient or family members who interact with administrative staff during hospital registration for an inpatient or outpatient visit. The primary outcome was all cause 30-day mortality following critical care initiation determined by the US Social Security Administration Death Master File. Secondary outcomes included mortality at 90 and 365 days, and in-hospital mortality. Unadjusted associations between language and outcomes were estimated by logistic regression analysis. Adjusted odds ratios were estimated by multivariable logistic regression models with inclusion of covariate terms thought to plausibly interact with both English language proficiency and mortality. Adjustment included age, race, gender, Deyo–Charlson Index, patient type (medical versus surgical), sepsis, creatinine, hematocrit, white blood count and the number of organs with acute failure.

RESULTS. English language proficiency was a strong predictor of 30-day mortality and remained a robust predictor following multivariable adjustment. Patients with limited English language proficiency had improved outcomes: limited English proficiency OR 0.63 (95 % CI, 0.55–0.72; $P < 0.001$); relative to patients with English language proficiency. Similar estimates were observed following multivariable adjustment; limited English proficiency OR 0.69 (95 % CI, 0.60–0.81; $P < 0.001$); relative to patients with English language proficiency. Similar significant robust associations post multivariable adjustments are seen with death by days 90 and 365 post-critical care initiation as well as in-hospital mortality. Additional adjustment for Neighborhood Poverty rate (a proxy for socioeconomic status) did not alter the language proficiency-mortality association.

CONCLUSIONS. In our US based cohort, English language proficiency is a robust predictor of the risk of all cause patient mortality in the critically ill. Surprisingly, limited English proficiency is associated with improved outcomes following critical care and appears to be independent of race and socioeconomic status. These observations may support the immigrant paradox phenomenon whereby worse health outcomes are observed in individuals as they adopt unhealthy health habits of the resident population over time.

0015

HOW ARE PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) PREPARED TO THE EVENTUALITY OF AN INTENSIVE CARE UNIT (ICU) ADMISSION?

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INTRODUCTION. ICU admission for acute respiratory failure is a common event in patients with advanced COPD. How COPD patients are prepared to such an event by their attending pulmonologist is not known.

OBJECTIVES. (1) to describe the knowledge that COPD patients admitted to the ICU have about their disease; (2) to describe how COPD patients are informed of ICU admission risks by their pulmonologists; (3) to describe the respective views of attending pulmonologists and ICU physicians about censoring ICU admissions or intubation decisions in these patients.

METHODS. This is an ancillary study of the "Famirea X" main study that was conducted within 19 French ICUs. COPD patients and their relatives were asked to describe their knowledge of COPD at ICU discharge, using self-administered questionnaires. In parallel, a postal-based survey was conducted among pulmonologists about their COPD-related practices regarding patients information, use of oxygenotherapy and non-invasive or invasive mechanical ventilation. Regarding patients information the pulmonologists were presented with a list of 15 questions about disease severity and progression that they answered on a 4-items scale (never, sometimes, frequently and always). A panel of pulmonologists and ICU physicians was asked to describe the impact of 16 disease-describing items on ICU admission and intubation decisions.

RESULTS. 126 COPD patients and 102 of their relatives completed the self-administered questionnaire. 173 pulmonologists and 135 ICU physicians answered the postal-based survey. ICU admission was completeley unexpected in 39 (31 %) patients and 51 (54 %). Fifty percent of the patients reported not having been informed by their pulmonary physician of a possible ICU admission during the course of their disease. The eventuality and modalities of mechanical ventilation were usually not explained to COPD patients during regular pulmonologist visits. The "Age", "no family", "depression", "quality of life", and "opinion of the patient or its relatives" items were stronger incentive to limit intensification of medical care in ICU for pulmonologists than they were for ICU physicians. Conversely, the items "number of respiratory episodes with mechanical ventilation during the last year", "heart failure", "FEV1 <30 %", and "non invasive ventilation at home" had a stronger impact on the decision process of ICU physicians.

CONCLUSIONS. The information provided by attending pulmonologists to ther COPD patients regarding the course of the disease, the eventuality of ICU admissions, and the corresponding modalities of care appeared to be scarce. Diverging views about prognostic factors and their decisional influenced were present between the interviewed attending pulmonologists and intensivists. This calls for coordinated educational efforts and improved communication between the patients, their families, and the different physicians involved.

Assessing the impact of interventions and organisations in intensive care 1: 0016–0020

0016

THE EFFECT OF THREE INTERVENTIONS TO REDUCE ICU DELAYED DISCHARGE IN A CENTRAL LONDON TEACHING HOSPITAL AND TRAUMA CENTRE

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INTRODUCTION. Delayed discharge from intensive care, is a significant problem both in the UK and abroad [1, 2]. This has adverse effects on emergency admission lead time and a reduced capacity for high-risk elective surgical admissions and optimization [3].

OBJECTIVES. Here, we describe the effect on admission delay, out-of-hours discharge and standardised mortality ratio (APACHE II) of the introduction of three interventions aimed at reducing delayed discharge from a 32-bedded central London mixed adult ICU.

METHODS. Firstly, one whole time equivalent ICU bed manager was employed. Secondly, critical care discharge was prioritised to maintain one free resuscitation bed at all times. Thirdly, an early morning review of planned intensive care was conducted between the ICU senior nurse, operating theatre staff and hospital bed managers. The effect of these interventions was assessed using the *Medtrack* clinical information system (MASH Ltd). A 15 month period pre- and post- interventions was analysed, although data going back to 2007 are shown in figure 1 to provide maximum context. Discharge delay was defined as any delay >3 h from the decision to discharge. Time between Emergency department and ICU admission was used as a surrogate of upstream delay. The Statistical tests were performed using Sigmaplot 11.0.

RESULTS. The discharge interventions were associated with a significant reduction in delayed discharge (pre: mean 2719 h/month; post mean 1,891 h/month; $p < 0.001$) figure 1A) with an associated increased utilisation of intensive care beds reflected by both higher numbers of admissions (pre mean admissions 143/month; post mean admissions 165/month; $p < 0.001$) and occupancy (pre: 93.2 %; post: 101.9 % $p < 0.001$). There was a small non-significant reduction in lead-time delay to emergency admissions (342 min pre- versus 323 min post-intervention; $p = 0.31$). However, there was also an associated increase in ICU standardised mortality ratio (figure 1B), not explained by re-admissions to critical care (unchanged pre- versus post-interventions), and an inability to reduce out-of-hours discharge (51.6 % of discharges pre-intervention versus 49.2 % discharges post-intervention; $p = 0.29$).

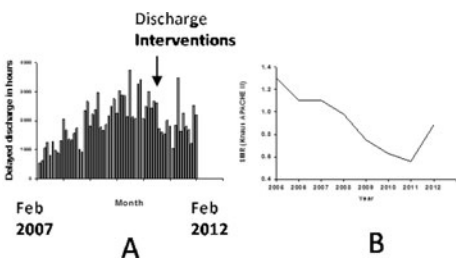

Figure 1

CONCLUSIONS. It is possible to modulate the flow of patients through an intensive care unit using an array of interventions to accelerate the discharge of patients who have survived critical illness within a hospital with a constrained total bed pool. However, the discharge

delay interventions appear to have predominantly increased occupancy and patient turnover rather than reducing delays in admissions or preventing out-of-hours discharge. Finally, covert mortality benefit from delayed discharge may be lost when discharge is prioritised.
REFERENCE(S). 1. Williams TA, et al. Aust Crit Care. 2010;23:141–9. 2. Levin PD, et al. J Crit Care. 2003;18:206–11. 3. Hopkins PA, et al. Crit Care. 2010;14:suppl 1. P474.

0017
MEASURING FAMILY AND PATIENT SATISFACTION IN THE INTENSIVE CARE UNIT. DOES A CORRELATION EXIST BETWEEN THE ANSWERS OF THE RELATIVES AND THE ANWERS OF PATIENTS?

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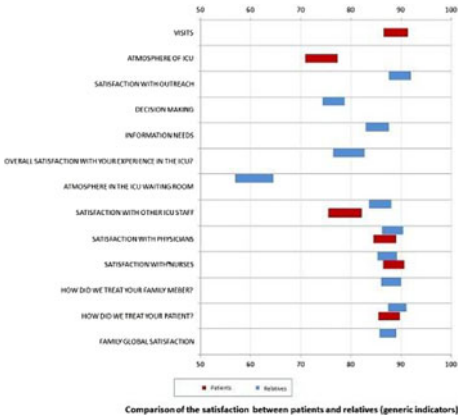
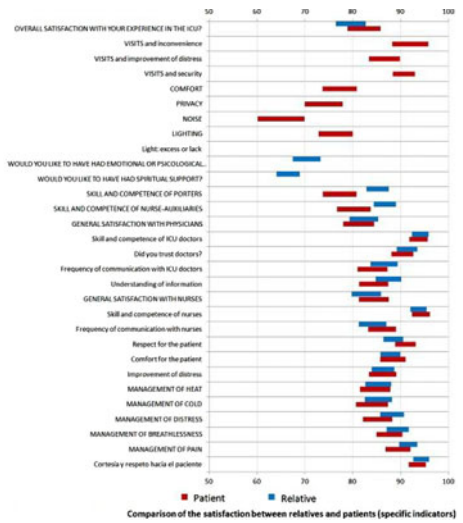
INTRODUCTION. Critically ill patients in the Intensive Care Unit (ICU), because of their illnesses or because of the severity of their condition, are often unable to appreciate the processes of care, so that family members play an essential role in daily decision making. Immersed in a trend towards the improvement of quality, the measurement of family and patient satisfaction are, with no doubt, one of the principal instruments to begin improvements in the quality of the ICU.
OBJECTIVES. To measure family satisfaction with care in ICU (relatives of survivors and non-survivors) and to measure patient satisfaction with care in ICU when their conditions let them to be interviewed. We want to know if there is a correlation between the answers of the families and the answers of patients.
METHODS. Prospective study involving direct surveys of patients and relatives. We administered a validated questionnaire (FSC-ICU) to family members and patients admitted in ICU. We asked about aspects of care related to the overall ICU experience, communication and decision making. For patients and family members of survivors, the questionnaire was administered while the patient was discharged from ICU, but still in the hospital. For family members of non survivors, the questionnaire was mailed out to the relative 1 month after the patient's death.
RESULTS. We obtained 364 surveys: 141 patients' surveys,192 relatives of survivors' surveys and 31 family members of non survivors' surveys. The majority of family respondents were satified with overall care and decision making (mean ± SD item score, 79.60 ± 21.86 and 76.39 ± 23.42, respectively). Similarly, the majority of patients were satified with overall care (82.38 ± 21.25). We measured satisfaction with generic and specific indicators and we compared these answers between relatives and patients (Graphics 1).



Generic indicators



Specific indicators

CONCLUSIONS. 1. Most family members were satisfied with the care provided to their critically ill relative in ICU (survivors and non survivors′ relatives). 2. Most patients were highly satisfied with the care provided to them in ICU. 3. It seems to be a correlation between the main answers of the relatives and the main answers of patients when aspects of care and of the decision making that imply both are compared. 4. There is not a correlation between the perception of care provided by other members (other ICU staff) to the patiens and the understanding of information provided by doctors.
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0018
ICU ORGANIZATION, VIEWS AND PRACTICES OF CAREGIVERS TO IMPROVE PATIENT'S COMFORT: A FRENCH SURVEY

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INTRODUCTION. In the ICU, patients are exposed to numerous sources of discomfort. Most of them are related to patient's condition but ICU design or care organization can also represent some barriers to taking them into account. Moreover, opinions of caregivers on discomfort sources and how they evaluate and consider them remains poorly known.
OBJECTIVES. To determine architectural and organizational characteristics of ICUs regarding comfort support, to evaluate the importance of these sources to the eyes of caregivers and what were their practices to improve patient well-being.
METHODS. An e-mail invitation to complete an online, closed-ended questionnaire was issued to ICU caregivers registered in the mailing list of the French society of intensive care (SRLF).
RESULTS. 915 staff (55 % were nurses) from 264 adult and 28 pediatric ICUs completed the questionnaire. Concerning ICU design and organization: 68 % of ICUs had only single-rooms and 66 % had natural light in each room; patients had access to television in 59 % of ICUs, to telephone in 26 % and to radio in 38 %; time was available in each room in 68 % of ICUs but date only in 11 %. 49 % of adult ICUs had visiting times <4 h but 64 % of respondents considered 24-h policy as very useful or essential to improve the patient's well-being. Some care activities were planned for family participation in only 0.5 % of adult ICUs whereas 27 % of caregivers considered that it is or could be very useful or essential to improve the patient's well-being. 95 % of ICUs allowed children visiting, with or without restrictions and 70 % of respondents considered that children visiting were very useful or essential to improve patient's well-being. When considering both paramedics and doctors, the most important sources of patient discomfort were anxiety, sleep disturbance, feeling of being attached, noise and pain. At the opposite, sources of discomfort considered as less important notably included lack of privacy or lack of moral support, light at night, missing proxies and missing information. As expected from caregivers scoring, the sources of discomfort that caregivers considered with more regularity were pain, discomfort related to position in bed and anxiety. However, only 42 % of ICUs used a nurse-driven protocol for analgesia whereas 93 % of respondents considered it as very useful or essential to improve the patient's comfort. Finally, noise, sleep disturbance and lack of space and time references were less frequently taken into account on a daily basis than expected from caregivers scoring. Relaxation techniques were anecdotally practiced.
CONCLUSIONS. This survey showed that not enough ICUs are designed to promote patient's privacy and resting or have an organization favoring access to proxies and their participation in care. It also highlighted that some sources of discomfort are less considered by caregivers, although considered as very significant.

0019
INSTRUMENTS TO MEASURE FAMILY SATISFACTION WITH INTENSIVE CARE, A SYSTEMATIC REVIEW

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INTRODUCTION. To improve quality of care in the intensive care unit (ICU), a wide range of strategies has been developed including the use of clinical quality indicators. One of those indicators is measurement of patient and family satisfaction with care, because delivering autonomous patient-centered medical care has become more and more important. Since most ICU patients cannot make decisions themselves, family members are involved as surrogate decision-makers and are therefore actively involved in the process of care. Thus, family satisfaction tools can be used in the evaluation of satisfaction with care and the results of these surveys can serve as a quality indicator of the care provided.
OBJECTIVES. The primary aim of this review was to identify tools to assess family satisfaction with ICU care. The secondary aim was to determine which tool would be eligible for translation and use in a Dutch ICU setting.
METHODS. We searched MEDLINE, EMBASE, CENTRAL (*the Cochrane Library*), and Web of Science. The keywords and medical subject headings used were "questionnaires", "family satisfaction" and "Intensive Care".
RESULTS. The search detected 720 references of which 67 were retrieved for complete assessment. These articles included evaluation of family needs, family satisfaction with end of life care, decision-making, and overall ICU care. We detected seven instruments that evaluated family satisfaction with intensive care. No comparative studies for these questionnaires were found. Baseline characteristics of the instruments can be found in Table 1.

Table 1 Baseline characteristics of identified tools

Tool	First description	No of studies	No of research groups	No of settings	Domains/ items	Item response scale (Likert)	Studied object
Critical Care Family Needs Inventory (CC-FNI)	Molter ('79)	36	22	33	5/45	4 point (1: not important, 4: very important)	Family needs
Family Satisfaction in the ICU (FS-ICU)	Heyland ('01)	19	8	15	2/34 (3 open questions)	5 point (1: excellent, 5: poor)	Family satisfaction with care and decision-making
Society of Critical Care Medicine-Family Needs Assessment (SCCM-FNA)	Johnson ('98)	2	2	2	4/14	4 point (1: almost all of the time, 4:none of the time)	Family satisfaction with care
Critical Care Family Satisfaction Survey (CC-FSS)	Wasser ('01)	6	5	6	5/20	5 point (1: very dissatisfied, 5: very satisfied)	Family satisfaction family satisfaction with care
Myhren	Myhren ('04)	2	1	1	4/29	5 point (1: not at all, 5: to a very high degree)	Family satisfaction with communication and psychological stress
Cuthbertson			Cuthbertson ('00)	2	2	2	na/18 (8 open questions)
2 point (1: yes, 2: no)	Family					satisfaction with end of life care	
Siddiqui	Siddiqui ('11)	1	1	1	na/25	2 point (1: yes, 2: no)	Family satisfaction with care in 3rd world environment

CONCLUSIONS. There is wide variety of studies on instruments measuring family satisfaction with intensive care. We found seven different tools from which the FS-ICU and the CC-FNI were the most frequently described instruments by independent investigators and used in different settings. The CC-FNI however, measures not satisfaction with care itself, but what families need regarding information, comfort and three other domains. The other questionnaires measure family satisfaction with care but differ with respect to the specific aspect of care that is studied, or specific patient population. Cuthbertson et al. specified the instrument on end of life care, which is an important aspect of ICU care since mortality is high in the ICU patient population. The FS-ICU measures two aspects of family satisfaction: satisfaction with decision-making, which is an important aspect of end of life care in combination with satisfaction with care. Furthermore, it also contains open questions beside the five point Likert scale, which increases the validity. Therefore we advocate the use and translation into Dutch of the FS-ICU as a well-studied, feasible instrument to measure family satisfaction, covering all aspects of family satisfaction with intensive care. A next step would be to develop a Dutch version of this questionnaire. The practicability and validity in the Dutch setting needs further study.

0020

IMPROVING PATIENT SAFETY: USEFULNESS OF REAL TIME AUDITS TO DETECT MEDICAL ERRORS IN CRITICAL CARE UNIT

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INTRODUCTION. Medical errors cause substantial morbidity and add up in direct healthcare cost and many of these accidents can be prevented. Efforts to improve their detection are a fundamental key to improve the health care process.

OBJECTIVES. To asses the incident of incidents and adverse events (AE) that the patients present during their stay in the Critical Care Burn Unit.

METHODS. We realized a prospective study "cohort" during June to September, 2010. For it we designed an audit with 47 items grouped in 13 categories of processes involved in the care of the burnt patient: Monitoring and equipments failure, Medication, Transfusion, Devices, Laboratory and radiology studies, Treatments, Airway, Patient care management, Protocols, Patient identification system, Health records, Communication and Patient transport. Every day in a meeting, being present the whole intensive care health care team involved in the care of the patient, the audits was performed and all the incidents occurred in 24 previous hours were registered.

RESULTS. During the analyzed period 387 incidents were detected. The 90.4 % (350/387) were "Near Miss". 37 AE (9.6 %) were detected. The most frequent incidents were errors in prescribing medication (32 %) followed by failure in the equipments or monitoring 18.6 %.The 37 detected AE were: 15 delay in surgical treatment, 7 pulmonary atelectasis due to obstruction/displacement of tracheal tube, 1 accidental extubation, 4 pressure ulcers and 10 surgical treatment complications. All the AE were associated with a increased hospital leght of stay. After the analysis of the results, a series of measures were made to diminishing the incident of incidents and improving the quality of care: Export of the information analyzed to all the members of the Service promoting to the reflection and capture of initiatives to improve the quality of care (improvement in the communication between intensive care health care team, review of the orders of treatment at bedside patient, review and development of protocols, purchase of material, meetings with members of different Services involved in the care of the patient to improve and to optimize the presentations and the accomplishment of chats of formation directed to updating the managing of certain pathologies or procedures.

CONCLUSIONS. Patients admitted to Intensive Care Unit (ICU) are particularly more vulnerable to suffer from AE as a results of severe illness and due to the high complexity and its multiple interventions. It is for it that in ICU is fundamental to promote the safety culture and to promote initiatives for the detection of incidents. The audits are of great usefulness to know the "weak" points of every ICU and with these own objective information we can develop specific lines to action directed to achieve its improvement and thereby improve the safety and quality of care.

Brain injury: 0021–0025

0021

SODIUM LACTATE INFUSION PREVENTS INTRACRANIAL HYPERTENSIVE EPISODES IN SEVERE TRAUMATIC BRAIN INJURY: A DOUBLE-BLIND RANDOMIZED CONTROLLED STUDY

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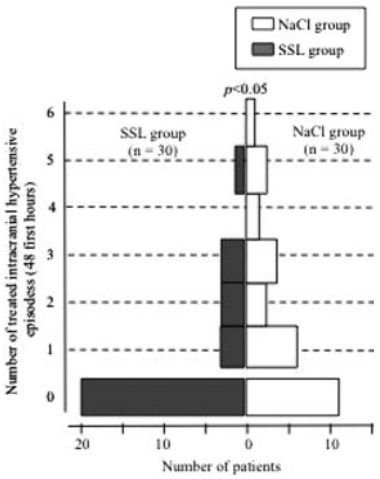
INTRODUCTION. The efficiency of lactate as an energetic substrate during brain injury has been shown in experimental studies [1, 2]. In severe traumatic brain injury (TBI), sodium lactate (SL) was reported to induce a more profound and longer decrease in raised intracranial pressure (ICP) than with mannitol [3].

OBJECTIVES. The aim of this trial was to evaluate the efficiency of SL infusion to prevent intracranial hypertensive episodes (IHE) in severe TBI.

METHODS. In this double-blind, randomized controlled study, severe TBI with a Glasgow coma scale score (GCS) ≤ 8 and requiring a monitoring of intracranial pressure were included. Exclusion criteria were: GCS = 3, post-resuscitation hemodynamic instability or respiratory distress, osmotherapy or barbiturates in the previous 6 h, emergent cranial surgery. Patients were randomly allocated in 2 groups receiving intravenously 0.5 ml kg/h of either 0.9 % NaCl (NaCl group) or semi-molar sodium lactate (SSL group) during 48 h. Collected data were: hourly ICP and cerebral perfusion pressure (CPP); cerebral flux velocities; arterial and urinary samples for blood gases, electrolytes, measured osmolality. Fluid, sodium and chloride balances were calculated after 24 and 48 h of infusions. The major endpoint was to evaluate the efficacy of SSL intravenous infusion to prevent raised ICP during the first 48 h. Results were expressed as mean ± SD or median [25–75 percentiles], frequencies. Statistical analysis was performed using a Mann–Whitney or unpaired "*t*" test, a two-way analysis for repeated measures and a chi2 as appropriate.

RESULTS. 60 TBI were included. Patients were initially comparable regarding demographic characteristics and neurological severity. The occurrence of raised ICP during the first 48 h was significantly lower in the SSL group versus the NaCl group (23 vs. 53, $p = 0.04$) (Fig). The number of patients presenting at least one treated IHE was significantly lower in the SSL group compared with the NaCl group (10 (34 %) vs. 19 (64 %), $p = 0.02$). No significant changes over time, nor significant differences between the 2 groups were found for serum osmolality at 48 h. Patients receiving SSL had a larger fluid balance during the study period (420 [−410 to −1,405] vs 2100 [780 to 3,416] ml, $p < 0.05$).



Occurence of raised ICP in both groups

CONCLUSIONS. Our results show that infusion of SSL in severe TBI decreases the occurrence of raised ICP. The absence of significant modification of plasma osmolality does not support a pure osmotic effect of SSL [3]. Several mechanisms could explain these beneficial effects: energetic substrate, cerebral vasodilation, decrease in cellular volume due to a cellular extrusion of chloride and water in exchange with entry of lactate.

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0022

CONTRALATERAL EXTRAAXIAL HEMATOMAS AFTER URGENT NEUROSURGERY OF A MASS LESION IN PATIENTS WITH TRAUMATIC BRAIN INJURY (TBI). CLINICAL FEATURES AND RISK FACTOR ANALYSIS

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INTRODUCTION. This entity has repeatedly been described in small series of cases and descriptive studies. However, the available evidence to date is limited to small series of cases and descriptive studies.

OBJECTIVES. To evaluate the incidence and risk factors to suffer this complication. To describe the clinical characteristics of patients who develop it.

METHODS. Retrospective cohort study with prospective data collection. All patients consecutively admitted to an ICU of a tertiary care hospital from 2006–2010 were studied. Inclusion criteria: severe trauma (ISS $\geq$ 16), Neurosurgery (NeuroSx) in the 1st 24 h. Exclusion criteria: subacute/chronic subdural hematomas, 1st bilateral NeuroSx. Case definition: who after the 1st NeuroSx requires immediate contralateral NeuroSx by occurrence of a new extraaxial injury or significant growth of a previous; Rest of the sample: those who do not require 2nd NeuroSx and those requiring reoperation for recurrence of ipsilateral lesions. Variables: demographics, prior anticoagulation, injury mechanism, initial neurological assessment, traumatic injuries and severity assessed by AIS and ISS, presence of coagulopathy, initial CT findings, 1 st NeuroSx, postoperative CT and 2 nd NeuroSx, clinical course and outcome. Inferential statistics using Student's t test for quantitative variables and c^2 for categorical variables was carried out. Multivariate analysis was performed by logistic regression. $p < 0.05$ was considered significant.

RESULTS. 120 patients met inclusion criteria. 11 cases (incidence 9.2 %). Global descriptive data: mean age 42.5 ± 17.8 years. 81.7 % were males. Mean ISS 30.8 ± 10.4. Most common mechanism of injury: traffic (30 %). Univariate analysis of risk factors: the case group showed a significantly higher frequency of coma or severe TBI (GCS $\leq$ 8) at admission (90.9 vs. 55.6 %), contralateral injury in the preoperative CT (100 vs. 43 %) and contralateral skull fracture (90.9 vs. 10.1 %). Increased frequency of decompressive

craniectomy in cases (90.9 vs. 54.1 %). There were no significant differences in the severity Scores, mortality, neurological outcome at discharge or ICU stay. Multivariate analysis of risk factors identified as independent risk factor the presence of contralateral fracture (RR 47.9, 95 % CI 5.2 to 443).
CONCLUSIONS. Is a rare entity, albeit with a high mortality. Therefore requires a high index of suspicion, especially in patients with severe TBI, with minimal contralateral injury and fundamentally with contralateral skull fracture on the initial CT. Of all the identified risk factors, the contralateral skull fracture is the most powerful to predict the development of this complication.
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0023
IMPACT OF PROGESTERONE ADMINISTRATION ON OUTCOME OF PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY

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INTRODUCTION. Traumatic brain injury (TBI) is an insult to the brain from an external mechanical force. It is generally agreed that a TBI with a GCS of 8 or below is severe. No medication exists to halt the progression of secondary injury, but the variety of pathological events presents opportunities to find treatments that interfere with the damage processes. Neuroprotection, methods to halt or mitigate secondary injury, have been the subject of great interest for their ability to limit the damage that follows TBI. The effects of Progesterone on the reproductive and endocrine systems are well known, but there is a growing evidence that the hormone also exerts neuroprotective effects on the central nervous system by decreasing overall cerebral edema, protecting and rebuilding the blood–brain barrier, down-regulating the inflammatory cascade, and limiting cellular necrosis and apoptosis.
OBJECTIVES. To evaluate the effect of progesterone administration on improvement of outcome of patients with traumatic brain injury (TBI) as measured by Glasgow outcome scale (GOS)
METHODS. 100 patients—selected from those admitted to Alexandria University Hospital in Egypt with Glasgow Coma Score ≤8—were categorized at random into two groups—Fifty patients per each—control and Progesterone group. The Progesterone group were given 1 mg/kg Progesterone by intramuscular injection-within 8 h of admission—and then every 12 h for 5 consecutive days. The neurological outcome—after 30 days-was evaluated by: Glasgow Outcome Scale (GOS) as well as Duration of ICU stay. For statistical analysis, GOS scores were dichotomized into favorable or unfavorable outcomes. Patients in the upper two GOS outcome groups (good recovery or moderate disability) are considered of favorable outcome, and patients in the other groups (severe disability, vegetative state, or death) are considered of unfavorable outcome.
RESULTS. In the progesterone group 33/50 patients (66 %) had favorable outcome and 17/50 (34 %) with unfavorable outcome versus 23/50 patients (46 %) with favorable outcome and 27/50 (54 %) with unfavorable outcome in the control group. ($p = 0.072$). Days of ICU stay had a mean value of 10.88 ± 7.98 in the progesterone group versus 19.96 ± 10.36 in the control ($p < 0.001$).
CONCLUSIONS. No significant difference in the outcome between the 2 groups but there is significant decrease in ICU length of stay in the progesterone group.
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0024
LATE DECOMPRESSIVE CRANIECTOMY AFTER TRAUMATIC BRAIN INJURY: NEUROLOGICAL OUTCOME AT 6 MONTHS AFTER ICU DISCHARGE

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INTRODUCTION. The choice of optimal treatment in traumatic brain injured (TBI) patients is a challenge. The aim of this study was to verify the neurological outcome of severe TBI patients treated with decompressive craniectomy (early <24 h, late >24 h), compared to conservative treatment, in hospital and after 6-months.
METHODS. This is a retrospective cohort study which includes patients with severe head trauma (Glasgow Coma Scale < 9) admitted to the 10-bed ICU of the Emergency Department of a tertiary referral center (Careggi Teaching Hospital, Florence, IT) from 2005 through 2009. Internal Review Board approved.
Patients treated with decompressive craniectomy were divided into 2 groups: "early craniectomy group" (patients who underwent to craniectomy within the first 24 h); and "late craniectomy group" (patients who underwent to craniectomy later than the first 24 h). As a control group, patients whose intracranial hypertension was successfully controlled by medical treatment were included in the "no craniectomy group".
Continuous variables were analyzed with Kruskal–Wallis test and Dunn's multiple comparison test post hoc. Categorical data were examined with Fisher′s exact text (95 % CI). Results were expressed as mean ± SD. P values significant if <0.05.
RESULTS. A total of 186 TBI patients were retrospectively studied. Groups included 41 patients who required early decompressive craniectomy, 21 patients treated with late craniectomy (7.7 days after trauma, on average), and 124 patients for whom intracranial hypertension was successfully controlled through conservative treatment. Groups were comparable in age and trauma/critical illness scores, except for a significantly higher Marshall score in early craniectomized patients (3.2 vs. 2.4 and 2.7; $P = 0.0148$). The Glasgow Coma Scale was comparable between "Early craniectomy group", "Late craniectomy group" and "No craniectomy group" at ICU discharge (10.7 ± 4.3 vs. 10.5 ± 3.5 vs. 11 ± 4, respectively), at the time of hospital discharge (10.7 ± 4.3 vs. 10.5 ± 3.5 vs. 11 ± 4, respectively), and Glasgow Outcome Scale was comparable at 6 months (3.3 ± 1.4 vs. 3.00 ± 1.1 vs. 3.6 ± 0.9, respectively).
CONCLUSIONS. The main finding in our experience is that a late craniectomy in patients with refractory intracranial hypertension produced a comparable 6-months neurological outcome if compared to patients responder to standard treatment.

0025
SEVERE TRAUMATIC BRAIN INJURY IN A HIGH INCOME COUNTRY: A POPULATION-BASED PROSPECTIVE COHORT STUDY

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INTRODUCTION. In high income countries only few epidemiological studies on severe traumatic brain injury (TBI) are available, and these few studies have different designs. Severe traumatic brain injury is a high burden for society.
OBJECTIVES. To describe characteristics and the outcome of patients with severe TBI in a national cohort of a high income country.
METHODS. The study included adults sustaining severe traumatic brain injury (TBI) from blunt or penetrating trauma with an Abbreviated Injury Scale score of the head region (HAIS) >3, admitted to all eleven French and German speaking trauma centres in Switzerland. The follow-up lasted 1 year. Start of inclusion was May 2007; last follow-up was in April 2011. Outcome measures were Glasgow Coma Scale (GCS) at 14 days, mortality, Extended Glasgow Outcome Score (GOSE) and Neurobehavioral rating scale-revised (NBRS-R) at 3, 6 and 12 months. Descriptive statistics were performed.
RESULTS. 1012 potential patients were screened for inclusion; 922 patients were included (74.1 % men). The incidence rate was 8.5 per 100,000 population. Median age was 55 years [inter quartile range 33, 71] with two age peaks (20–29.9, 60–69.9 years). Median GCS at scene was 9 [4, 14] and 5 [3, 14] in the emergency department. Both pupils were reactive in 73.7 % at scene and 72.3 % in the emergency department. Among all TBI, 95.7 % were blunt trauma. Injury Severity Score was 25 [20, 34], and 30.7 % of patients had multiple trauma. Falls were the mechanism in 52.6 %, road traffic accidents in 32.3 % (most were car divers, pedestrians and cyclists). Median arrival time (h:min) to the hospital for direct admission was 00:46 [00:35, 01:01], for indirect admission 3:12 [2:15, 4:20]; 44.1 % were intubated on scene. Hematoma evacuation was performed in 23.7 %, intraventricular drainage in 8.0 % and intracranial monitoring in 19.1 %. Median ICU stay was 9 days [4,20], hospital stay was 11 days [6, 21]; SAPS 2 Score 44 [29, 57]. Death rate was 30.3 %; median time to death was 2 days [1,6]; most deaths occurred during early ICU stay. Median GCS of survivors at 14 days was 15 [14, 15]. Median GOSE of survivors at 3 months was 5 [3, 7], at 6 months 6 [4, 8] and at 12 months 7 [5, 8]. Median NBRS-R of survivors at 3 months was 32 [29, 37], at 6 months 31 [28, 35], and at 12 months 30 [27, 35].
CONCLUSIONS. This population-based prospective cohort study included older patients and more falls compared to earlier studies in other European countries. High rates of cyclists and pedestrians with severe TBI were observed in the population with road traffic accidents. Most survivors were conscious at 14 days. GOSE increased slightly over a period of 1 year.
GRANT ACKNOWLEDGMENT. Bangerter-Rhyner Foundation; SUVA Foundation.

Shock: 0026–0030

0026
SYSTEMIC AND MICROCIRCULATORY EFFECTS OF DOBUTAMINE IN SEPTIC SHOCK PATIENTS

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INTRODUCTION. Dobutamine is the only inotropic drug recommended by the Surviving Sepsis Campaign. Nevertheless, it frequently produces heterogenous responses.
OBJECTIVES. Our goal was to characterize the different hemodynamic and microcirculatory responses to dobutamine and to identify their predictors. Our hypotheses were that dobutamine mainly produces tachycardia and vasodilation and fails to improve the microcirculation of septic shock patients.
METHODS. Dobutamine (0, 2.5, 5.0, and 10.0 μg/kg/min) was administered at 20 min intervals, in 23 septic shock patients with evidence of hypoperfusion. Systemic hemodynamics was evaluated by means of arterial and pulmonary thermodilution catheters, and sublingual microcirculation by sidestream dark field (SDF) imaging.
RESULTS. In the whole group, dobutamine increased heart rate, cardiac index, and stroke volume index (SVI). Mean blood pressure remained unchanged, and systemic vascular resistance decreased. Individual responses were heterogeneous. SVI only increased in 52 % of the patients. Patients who increased SVI showed lower changes in mean blood pressure (3 ± 16 vs. -10 ± 6 mm Hg, $p = 0.02$) and higher increases in cardiac index (1.47 ± 0.93 vs. 0.20 ± 0.5 l/m/m^2, $p = 0.0005$) than nonresponders. Changes in SVI were correlated with the echocardiographic left ventricular ejection fraction (Pearson $r = 0.55$, $p = 0.006$). Perfused capillary density (14.0 ± 4.3 vs. 14.8 ± 3.7 mm/mm^2, $p = 0.20$), as well as the other microcirculatory variables, remained unchanged regardless of cardiac output and blood pressure modifications.
CONCLUSIONS. Dobutamine produced variable effects on systemic hemodynamics. SVI only improved in half of the patients. Systolic dysfunction was the only variable associated with the increase in SVI. Finally, dobutamine lacked beneficial effects on sublingual microcirculation.
GRANT ACKNOWLEDGMENT. Supported by the grant PICT-2010-0495, Agencia Nacional de Promoción Científica y Tecnológica, Argentina.

0027

EFFECTS OF NOREPINEPHRINE ON MEAN SYSTEMIC PRESSURE AND VENOUS RETURN IN HUMAN SEPTIC SHOCK

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INTRODUCTION. Norepinephrine exerts venoconstriction that could increase both the mean systemic pressure and the resistance to venous return but this has not yet been investigated in human septic shock. We examined the relative importance of both effects and the resulting effect on venous return when decreasing the dose of norepinephrine.

METHODS. We included sixteen patients with septic shock in whom a decrease in the dose of norepinephrine was planned. For estimating the venous return curve, we constructed the regression line between the pairs of cardiac index (CI, pulse contour analysis) and central venous pressure (CVP) values. These values were measured during 15-sec end-inspiratory and end-expiratory ventilatory occlusions performed at two levels of positive end-expiratory pressure, in view of widening the range of CI:CVP measurements and increasing the accuracy of the regression line. The x-axis intercept of the regression line was used to estimate the mean systemic pressure and the inverse of the slope of the regression line to quantify resistance to venous return. These measurements were obtained before and after decreasing the dose of norepinephrine. Passive leg raising was performed before and after decreasing the dose of norepinephrine.

RESULTS. Decreasing the dose of norepinephrine from 0.81 ± 0.99 to 0.64 ± 0.85 μg/kg/min decreased the mean systemic pressure from 33 ± 12 to 26 ± 10 mmHg ($p = 0.0003$). The slope of the multipoint CI:CVP relationship increased ($p = 0.02$). The resistance to venous return decreased, i.e., 1/slope decreased. Simultaneously, CI decreased from 3.47 ± 0.86 to 3.28 ± 0.76 L/min/m^2 ($p = 0.04$), indicating a decrease in venous return. Passive leg raising increased CI to a larger extent after (8 ± 4 %) than before (1 ± 4 %) decreasing norepinephrine ($p = 0.001$), suggesting an increase in unstressed blood volume at the lowest dose of norepinephrine.

CONCLUSION. In septic shock patients, decreasing the dose of norepinephrine decreased the mean systemic pressure and, in a lesser extent, the resistance to venous return. As a result, venous return decreased.

0028

RELATIONSHIP OF SYSTEMIC, HEPATOSPLANCHNIC AND MICROCIRCULATORY PERFUSION PARAMETERS WITH SIX-HOUR LACTATE CLEARANCE IN HYPERDYNAMIC SEPTIC SHOCK PATIENTS: AN ACUTE CLINICAL-PHYSIOLOGICAL PILOT STUDY

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INTRODUCTION. Recent clinical studies have confirmed the strong prognostic value of persistent hyperlactatemia and delayed lactate clearance in septic shock. Several potential hypoxic and non-hypoxic mechanisms have been associated to persistent hyperlactatemia, but the relative contribution of these factors has not been specifically addressed in comprehensive clinical physiological studies.

OBJECTIVES. Our aim was to determine potential hemodynamic and perfusion-related parameters associated to 6 h lactate clearance in a cohort of hyperdynamic hyperlactatemic septic shock patients.

METHODS. We conducted an acute clinical physiological pilot study including 15 hyperdymamic septic shock patients undergoing aggressive early resuscitation. Several hemodynamic and perfusion-related parameters were measured immediately after preload optimization and 6 h thereafter, with 6 h lactate clearance as the main outcome criterion. Evaluated parameters included cardiac index, mixed venous oxygen saturation, capillary refill time and central-to-peripheral temperature difference, thenar tissue oxygen saturation (StO_2) and its recovery slope after a vascular occlusion test, sublingual microcirculatory assessment, gastric tonometry (pCO_2 gap) and plasma disappearance rate of indocyanine green (ICG-PDR). Statistical analysis included Wilcoxon and Mann–Whitney tests.

RESULTS. Five patients presented a 6 h lactate clearance <10 %. When compared to 10 patients with a 6 h lactate clearance ≥10 %, they presented a worse hepatosplanchnic perfusion as represented by significantly more severe derangements of ICG-PDR (19.6 (9–32) vs. 9.7 (8–19) %/min, $p < 0.05$) and pCO_2 gap (7.7 (3–58) vs. 33 (9.1–62) mmHg, $p < 0.05$) at 6 h. No other systemic, hemodynamic, metabolic, peripheral or microcirculatory parameters differentiated these subgroups. We also found a significant correlation between ICG-PDR and pCO_2 gap ($p = 0.02$).

CONCLUSIONS. Impaired 6 h lactate clearance could be associated to hepatosplanchnic hypoperfusion in some hyperdynamic septic shock patients. Improvement in systemic, metabolic and peripheral perfusion parameters does not rule out the persistence of hepatosplanchnic hypoperfusion in this setting. Severe microcirculatory abnormalities can be detected in hyperdynamic septic shock patients, but their role on lactate clearance is unclear. ICG-PDR may be a useful tool to evaluate hepatosplanchnic perfusion in septic shock patients with persistent hyperlactatemia.

ClinicalTrials.gov Identifier: NCT01271153

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0029

SERIAL EVALUATION OF PERIPHERAL PERFUSION TO PREDICT OUTCOME IN CRITICALLY ILL PATIENTS

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INTRODUCTION. The rationale of peripheral perfusion monitoring is based on the concept that peripheral tissues are the first to reflect hypoperfusion during shock, and the last to reperfuse during resuscitation. Therefore, early detection of persistent inadequate tissue perfusion is crucial to institute prompt therapy, avoiding further organ damage. Serial assessments of peripheral perfusion could provide valuable insights about its potential role as a target for resuscitation and could help to assess the severity of organ dysfunction over time.

OBJECTIVE. To evaluate whether repeated measurements of the peripheral circulation and its alterations over time in the postresuscitation phase could predict mortality.

METHODS. We prospectively evaluated 221 consecutive adult patients admitted to the Intensive Care Unit (ICU) who had undergone initial resuscitation and stabilization within 12 h of ICU admission (MAP >65 mmHg and no change in vasopressor infusion rate for 2 h), and were expected to stay for more than 24 h. Demographic, laboratory, clinical data, and all the variables to determine the severity of illness and to assess peripheral perfusion were collected within 12 h of ICU admission (T0) and 24 h thereafter (T1). Peripheral perfusion was evaluated using a combination of the capillary refill time (CRT), peripheral perfusion index (PPI), and forearm-to-fingertip skin temperature gradient (Tskin-diff). Abnormal peripheral perfusion was considered as a CRT >5, a PPI <1.4, or Tskin-diff >4.

RESULTS. Table 1 shows the trends of CRT and PPI during the first 24 h of ICU stay.

Table 1 Evolution of peripheral perfusion (n = 221)

Peripheral perfusion variable	On admission (T0)	24 h after admission (T1)	Number of patients	Increase in SOFA >0 (%)	ICU mortality (%)	Length of ICU stay (median [IQR])
CRT	Normal	Normal	95	17.0	12.6	7 [3–14]
		Abnormal	19	26.3	42.1*	18 [4–33]*
	Abnormal	Normal	39	15.4	15.4	7 [3–11]
		Abnormal	68	53.7*	39.7*	6 [3–10]
PPI	Normal	Normal	96	11.5	12.5	7 [3–13]
		Abnormal	26	50*	38.5*	16 [6–27]*
	Abnormal	Normal	48	22.9	14.6	7 [3–11]
		Abnormal	51	57.1*	47.1*	6 [3–10]

T0, on admission; T1, 24 h after admission; ICU, Intensive Care Unit
* $p < 0.05$ vs. Normal evolution

Independent of systemic hemodynamics, unfavorable evolution of peripheral perfusion was significantly correlated with more severe organ dysfunction, and increased mortality for all parameters. Univariate analysis showed that the persistence of abnormal peripheral perfusion (abnormal-abnormal) had the strongest correlation with morbidity and was associated with shorter length of stay (7 [3–10] vs. 5 [3–8], $P < 0.05$) for Tskindiff. Generalized mixed-model analysis showed that the risk for mortality at T1 for abnormal CRT, PPI, and Tskindiff was: OR (95 % CI), 5.4 (2.8–10.7), 6.3 (3.2–12.6), and 2.7 (1.3–5.7), respectively.

CONCLUSIONS. Sequential assessment of peripheral perfusion during the first few days of ICU admission is a good indicator of prognosis. Unfavorable evolution of the peripheral perfusion is a good predictor for ICU mortality during the first 24 h of ICU admission.

0030

VENOUS-ARTERIAL CO_2 GAP (DCO_2) CAN BE COMPLEMENTARY OF CENTRAL VENOUS OXYGEN SATURATION ($SCVO_2$) AS TARGET END POINTS DURING FLUID RESUSCITATION

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INTRODUCTION. Fluid resuscitation is of utmost importance to correct oxygen delivery, but end points are difficult to define, and overfilling is as serious a problem as hypovolemia in the critically ill [1, 2].

OBJECTIVES. To describe changes of $ScvO_2$ and dCO_2 during an experimental, stroke volume (SVI) guided fluid resuscitation.

METHODS. In 12 anaesthetised, mechanically ventilated pigs, invasive hemodynamic monitoring (PICCO, PULSION Medical, Germany) arterial and central venous blood gas analyses were performed. 30 min after instrumentation ($t_{baseline(bsl)}$), animals were bled till the SVI dropped by 50 % (t_0). Dividing the SVI_{bsl}-$SVI_{50\ \%}$ into 4 equal intervals (t_1–t_4), fluid resuscitation was performed in 4 steps till each SVI goal was achieved by administering Lactated Ringer (LR) solution. Reaching the target SVI animals were allowed to stabilise for 20 min after which hemodynamic and blood gas measurements were performed. Data are summarised as mean ± standard deviation, for statistical analysis ANOVA and Pearson's correlation and the SPSS® v18 program were used.

RESULTS. 314 ± 65 ml blood had to be drained to reach the target of 50 % reduction in SVI (t_{bsl}:26.8 ± 4.7 vs. t_0:13.4 ± 2.3 ml/m^2, $p < 0.01$). For resuscitation, 951 ± 307 ml LR was administered in total by t_4 to achieve the target value obtained at t_{bsl} ($SVIt_4$: 26.6 ± 4.1 ml/m^2). When hypovolemia was accomplished (t_0), $ScvO_2$ dropped significantly ($t_{bsl} = 78 \pm 7$ vs. $t_1 = 61 \pm 5$ % $p = 0.02$), and increased significantly by t_4 but on average it remained 5 % lower than at t_{bsl} (t4 = 73 ± 9 %), and showed good correlation with SVI ($r^2 = 0.564$, $p < 0.001$). Similar changes were observed in changes of dCO_2: there was a significant increase during hypovlemia (t_{bsl}:5.3 ± 2.0 vs. t_0:9.6 ± 2.3 mmHg, $p = 0.001$) which returned to normal by t_4 (5.1 ± 2.6), and dCO_2 also showed significant correlation with SVI ($r^2 = -0.591$, $p < 0.001$).

CONCLUSION. In anaesthetized, mechanically ventilated pigs, during fluid resuscitation of moderate hypovolemia, $ScvO_2$ and dCO_2 showed good correlation with hemodynamic changes. It is important to note, that baseline $ScvO_2$ value if taken as end point for resuscitation (for example: baseline value during surgery), may be misleading and may result in fluid overload, as indicated in the current experiment by an average of 5 % lower $ScvO_2$ values after resuscitation at the same SVI values as at baseline. However, using the normalisation of dCO_2 as a complimentary end point may help to avoid under, or overfilling hypovolemic patients.

Poster Corner Sessions
Ventilator-induced lung injury: 0031–0044

0031
TPL2 KINASE CONTRIBUTES TO VENTILATOR-INDUCED LUNG INJURY IN A MOUSE MODEL

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INTRODUCTION. Shear forces generated during HVT ventilation induce alveolar-capillary barrier disruption and pulmonary inflammation, a process known as ventilator-induced lung injury (VILI). Several studies have identified extracellular-signal regulated kinase (ERK1/2) as a key intracellular signaling molecule in stress-induced activation of inflammation [1]. TPL2 is a serine-threonine kinase which plays a key physiological role in the regulation of immune responses to pro-inflammatory stimuli [2]. TLP2 mediates inflammatory signals from TNFa, IL-1, and Toll-like receptors to activate ERK1/2 and NFkB. TPL2 ablation or inhibition ameliorates LPS-induced septic shock [2].

OBJECTIVES. We tested the hypothesis that TPL2 ablation would ameliorate HVT stress-induced activation of inflammation, and would protect from VILI.

METHODS. We used male wild-type C57Bl6 (WT), and TPL2-deficient ($TPL2^{-/-}$) mice on C57Bl6 background, 8–10 weeks of age, n = 8 per group. Mice were anesthetized, tracheostomized, and mechanically ventilated for 4 h with HVT, titrated to peak inspiratory pressure of 35 cmH_2O, and FiO_2 of 30 %, and PEEP of 1.5 cmH_2O. At the end of the experiment arterial blood was collected for gas analysis, followed by slow lung inflation to airway pressure (Paw) of 25 cmH_2O, bronchoalveolar lavage fluid (BALF) and lung tissue collection. Inspiratory capacity was defined as the volume inflated at Paw of 25 cmH_2O. Control mice were subjected only to lung inflation and sample collection. BALF protein and IL-6 concentrations were measured using BCA and ELISA, respectively.

RESULTS. Mechanical ventilation with HVT induced VILI in WT mice, characterized by decrease in PaO_2 (71 vs. 160 mmHg in control mice) and inspiratory capacity (60 % of control), and increase in BALF concentration of protein (2 ± 0.5 vs. 0.2 ± 0.1 mg/ml) and IL-6 (1.12 ± 0.16 vs. 0.04 ± 0.01 mg/ml; $p < 0.001$ for all comparisons). Control WT and $TPL2^{-/-}$ mice were not different in lung mechanics, BALF protein and IL-6 concentrations. Lung injury induced by HVT ventilation was less in $TPL^{-/-}$ than in WT mice. At the end of the experiment $TPL2^{-/-}$ mice had higher PaO_2 (145 ± 18 vs. 71 ± 13 mmHg, $p < 0.001$) and inspiratory capacity (90 ± 7 vs. 60 ± 9 % of control, $p < 0.001$) than WT mice. Additionally BALF protein and IL-6 concentrations were less in $TPL2^{-/-}$ than in WT mice (1 ± 0.4 vs. 2 ± 0.5 mg/ml protein, 0.52 ± 0.32 vs. 1.12 ± 0.16 mg/ml IL-6, $p < 0.01$).

CONCLUSIONS. Indices of high permeability pulmonary edema and inflammation, induced by HVT ventilation are reduced in mice genetically deficient in TPL2, suggesting that TPL2 contributes to VILI. Pharmacologic inhibition of TPL2 could be evaluated as a therapeutic modality in VILI.

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0032
CONVENTIONAL DENDRITIC CELLS INITIATE AND CONTROL ACUTE LUNG INFLAMMATION BY REGULATING NEUTROPHIL INFILTRATION AND BALANCE OF TH1/TH2 RESPONSE IN ACUTE LUNG INJURY

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INTRODUCTION. Conventional dendritic cells (cDCs) have been involved in various inflammatory lung diseases; however, their role in the pathogenesis of acute lung injury (ALI), which is essentially inflammatory, remains unclear.

OBJECTIVES. To clarify the role of pulmonary cDCs in the pathogenesis of lipopolysaccharide (LPS)-induced ALI, and how inflammatory responses and lung injury may be modulated by cDCs in vivo.

METHODS. C57BL/6 mice were pretreated with Fms-like tyrosine kinase 3-ligand (FLT3L) and lestaurtinib separately for 5 consecutive days. A murine model of ALI was subsequently generated by intra-tracheal application of LPS and lung specimens were harvested 6 or 24 h later. The accumulation and maturation of pulmonary cDCs was measured by flow cytometry. Lung injury was estimated by lung wet weight/body weight ratio (LWW/BW) and histopathological assessment. TNF-α, IL-6, IFN-γ, IL-4, MPO activity and transcription factor T-bet/GATA-3 mRNA ratio were quantified to evaluate lung inflammation.

RESULTS. The accumulation and maturation of pulmonary cDCs peaked within 24 h after LPS challenge. FLT3L pretreatment significantly stimulated the accumulation and maturation of pulmonary cDCs, leading to markedly deterioration of LWW/BW and lung histopathological changes. Meanwhile lung MPO activity and T-bet/GATA-3 mRNA ratio were elevated. Furthermore the production of IL-6, TNF-α and IFN-γ was markedly increased by FLT3L pretreatment. In contrast, lestaurtinib pretreatment markedly inhibited the accumulation and maturation of pulmonary cDCs, leading to significant improvement of LWW/BW and lung histopathological changes. Meanwhile lung MPO activity and T-bet/GATA-3 mRNA ratio were decreased. Furthermore lestaurtinib efficiently suppressed the production of IL-6, TNF-α and IFN-γ.

CONCLUSIONS. This study thus demonstrated that pulmonary cDCs could initiate and control acute lung inflammation of LPS-induced ALI through the regulation of neutrophil infiltration and balance of Th1/Th2 response.

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0033
ANTIOXIDANT EFFECT OF HUMAN ADIPOSE-DERIVED MESENCHYMAL STEM CELLS IN STRETCH-INDUCED ALVEOLAR EPITHELIAL CELL INJURY

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INTRODUCTION. Acute lung injury (ALI) is characterized by an overwhelming inflammatory response and an oxidative damage secondary to previous injuries (sepsis, pneumonia). The only suitable treatment is supportive. Therefore, cellular based therapy is a promising alternative as a novel strategy for the treatment of ALI. The increasing interest for the clinical application of human adult adipose-derived mesenchymal stem cells (ADMSC) is based on their anti-inflammatory, regenerative and antioxidant properties, but the mechanisms involved in these effects are still unknown.

OBJECTIVES. To demonstrate the antioxidant effects of ADMSC in stretch-induced injury in alveolar epithelial cells

METHODS. Adipose tissue samples (from patients undergoing breast reduction) were taken to obtain ADMSC. Human A549 cells were cultured with DMEM serum free and exposed to a 15 % cellular stretch, representing 50 % distension of total lung capacity. All cells were studied after 24 h under different conditions (n = 3 per condition): A549 cells under 0 % stretch; A459 + ADMSC co-cultured under 0 % stretch; A549 cells under 15 % stretch; A459 + ADMSC co-cultured under 15 % stretch. ADMSC were added at a 3:1 cell ratio. Total superoxide dismutase (SOD) activity and 8-isoprostane (8-iso) assays (ELISA) were performed in cell lysates and supernatant, respectively. The presence of 3-nitrotyrosine and oxygen free radicals in cells was evaluated by immunoreactivity to 3-nitrotyrosine (human polyclonal antinitrotyrosine antibody, dilution 1:75) and oxidized dihydroethidium (DHE). Statistical differences were tested by an ANOVA.

RESULTS. Cell stretching induced a decrease in SOD activity and an increase in 8-iso concentration, immunoreactivity to 3-nitrotyrosine and fluorescence for oxidized DHE. All these changes were significantly attenuated by ADMSC co-culture.

CONCLUSIONS. Cell stretching induces oxidative and nitrosative stress that is attenuated by ADMSC.

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0034
BYPASSING THE INFLAMMASOME: CRUCIAL ROLE FOR NEUTROPHIL SERINE PROTEASES IN VENTILATOR-INDUCED LUNG INJURY

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INTRODUCTION. Proinflammatory mediators, predominantly the cytokine IL-1β, have been shown to play an important role in the pathogenesis of ventilator-induced lung injury (VILI), which is TLR4 dependent. The processing of the inactive precursor pro-IL-1β into bioactive IL-1β is mediated by several types of proteases, of which the inflammasome is the most important. In the present study, we demonstrate that the inflammasome is bypassed in IL-1β activation in VILI. Moreover, from a series of experiments we suggest a possible mechanism considering IL-1β mediated inflammation in VILI.

OBJECTIVES. Unraveling the mechanisms behind IL-1β mediated inflammation in VILI

METHODS. Mice (n = 8 per group) were ventilated 4 h using clinically relevant ventilator settings (e.g. tidal volume 8 ml/kg). Ventilated and non-ventilated wildtype untreated, $caspase1^{-}/^{-}$, neutrophil depleted, anti-KC treated, α1-antitrypsin treated and $IL1\alpha\beta^{-}/^{-}$ mice were studied in this set-up.

Lungs and plasma were collected to determine blood gas values, cytokine profiles, neutrophil influx and histopathological measures.

RESULTS. Ventilated mice showed increased IL-1β, KC and TNFα concentrations in lung homogenate, increased IL-6, IL-10, KC and TNFα in plasma and increased neutrophil influx in the lungs compared to non-ventilated mice. No significant differences were observed between wild-type mice and caspase-1 deficient mice. Mice treated with anti-KC and neutropenic mice demonstrated lower pulmonary neutrophil numbers and cytokine concentrations in lung homogenate after ventilation in comparison to ventilated non-treated mice. Mice treated with α1-antitrypsin showed decreased KC levels in plasma. Ventilation-induced KC production in the lungs was completely abrogated in $IL1\alpha\beta^{-}/^{-}$ mice.

CONCLUSIONS. We suggest the following hypothesis concerning inflammation in VILI. Ventilation-induced TLR4 activation can induce production of cytokines, e.g. KC and pro-IL-1β, via the transcription factor NFκB. KC is released and recruits neutrophils to the site. The inflammasome is bypassed in IL-1β cleavage. Pro-IL-1β is excreted in the inactive form and then cleaved by neutrophil serine proteases, like proteinase-3, that are excreted by those neutrophils. The active IL-1β now present extracellularly can bind its receptor, IL-1R, that in turn can induce the release of more cytokines. This way, a positive feedback loop is activated that can explain the great amount of inflammation seen in VILI.

0035
PROTECTIVE EFFECT OF URINARY TRYPSIN INHIBITOR ON SEPTIC RAT LUNGS

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INTRODUCTION. The excessive inflammatory cascade and oxidative stress leading to multiple organ failure and early death in sepsis. Urinary trypsin inhibitor (UTI) is a broad-spectrum protease inhibitor, it able to inhibit the biological activity of trypsin and neutrophil elastase, scavenge oxidants, reduce the overproduction of inflammatory mediators.

OBJECTIVES. To investigate the protective effect of the UTI on the lungs of septic rats.

METHODS. We established the sepsis model by cecum ligation and puncture (CLP), and the UTI group received an intravenous administration of 50 000 μg/kg at 0 h and 12 h after the operation, while the model group and sham group were given the same amount of saline. 24 h after the operation, rats were killed to collect the lungs and plasma specimen. The arterial blood gas and lactic acid were measured. The expression of TNF-α and IL-1β in the plasma were detected by ELLSA. The pathological changes of the lung tissue were demonstrated by HE staining. Chemical colorimetry method was used to determine the level of SOD and MDA in the lung tissue. The apoptotic cells were detected by TUNEL method. The NF-κB mRNA expression was examined by Real-time fluorescence quantitative PCR.

RESULTS. (1) The survival rate of rats in UTI group (60 %) was higher than in model group (43.3 %) ($\chi^2 = 1.669$, $P > 0.05$). (2) HE staining showed the pathological changes of

pulmonary were attenuated in UTI group compared with the model group, and the lung injury scores was decreased ($t = 5.285$, $P < 0.01$). (3) The levels of TNF-α, IL-1β in the plasma were lower in UTI group than that in model group ($t = 8.926$, $P < 0.01$; $t = 10.105$, $P < 0.01$). (4) Compared with the model group, the activity of SOD was higher in UTI group ($t = 5.440$, $P < 0.01$), and the level of MDA was lower ($t = 6.632$, $P < 0.01$). (5) The number of apoptosis cells in lung tissue was significantly decreased in UTI than that in the model group ($t = 7.539$, $P < 0.01$). (6) The NF-κB mRNA expression was downregulated in UTI group compared with the model group ($t = 3.276$, $P < 0.01$).
CONCLUSIONS. UTI can play a protective role in acute lung injury resulting from sepsis. NF-κB signal pathway might participate in restraining the inflammatory responses, inhibiting the oxidation stress, and reducing the apoptosis in lung tissue.
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0036
HIGH FREQUENCY OSCILLATION AND PRONE POSITION VENTILATION IN EXPERIMENTAL MODEL OF ARDS: HAEMODYNAMIC PARAMETERS CHANGES

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INTRODUCTION. High frequency oscillation (HFO) and prone position ventilation have their places in the treatment of an inhomogeneous pulmonary pathology of ARDS. Possible benefits of early used HFO include improved ventilation and oxygenation, reduced risk of ventilator induced lung injury development, lower plasmatic levels of pro-inflammatory cytokines, and therefore reduced mortality of ARDS patients. Prone position ventilation improves oxygenation, but without an impact on mortality or length of hospitalization.
OBJECTIVES. To compare haemodynamic effects of HFO and prone position in experimental model of ARDS.
METHODS. Total of 16 experimental piglets were randomised into 2 groups of 8 piglets: PP group ventilated conventionally in prone (18 h) and supine (6 h) position, HFO group ventilated 24 h in supine position with HFO. Mean arterial pressure (MAP), central venous pressure (CVP), mean pulmonary artery pressure (mPAP) and pulmonary capillary wedged pressure (PCWP) were measured invasively, indexed systemic (SVRI) and pulmonary (PVRI) vascular resistances were calculated.
RESULTS.

Table 1 Results (HFO group)

HFO group	1 h	3 h	6 h	9 h	12 h
MAP (mmHg)	68.3	64.0	52.4	58.3	60.2
mPAP (mmHg)	28.6	29.6	28.0	28.2	27.5
SVRI (dyn.s.cm^{-5} m^{-2})	1.054	967	1.004	1.141	1.204
PVRI (dyn.s.cm^{-5} m^{-2})	178	294	365	458	360

Results (PP group)

PP group	1 h	3 h	6 h	9 h	12 h
MAP (mmHg)	87.6	95.1	84.8	83.1	85.0
mPAP (mmHg)	29.9	35.6	29.9	27.5	24.0
SVRI (dyn.s.cm^{-5} m^{-2})	1.455	1.469	1.392	1.710	1.646
PVRI (dyn.s.cm^{-5} m^{-2})	556	412	332	229	223

MAP is lower in HFO group than in PP (3 h: $p = 0.001$; 6 h: $p = 0.016$; 9 h: 0.007; 12 h: 0.041). mPAP is higher in PP group (3 h: $p = 0.001$), as well as PVRI (1 h: $p = 0.003$) and SVRI (9 h: 0.027). CVP and PCWP values show no differences between groups.
CONCLUSIONS. Early used HFO lowers PVRI in first hours of ARDS, PP has milder impact on systemic pressures—combination of both procedures can be beneficial.
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0037
MICRORNA-146A CONTRIBUTES TO VENTILATOR-INDUCED LUNG INJURY

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INTRODUCTION. Ventilator-induced lung injury (VILI) is characterized by high permeability pulmonary edema and lung inflammation. TLR signaling activation leading to production of cytokines such as IL-6 and TNFa contributes to lung inflammation in VILI [1]. Micro-RNAs (miRNAs) are small, non-coding RNA sequences that regulate gene expression by decreasing mRNA stability and/or translation [2]. VILI is characterized by changes in lung miRNA expression profile [3]. MiR-146a is one of the miRNAs whose expression increases in VILI. MiR-146a target genes include IRAK1, TRAF6, and SMAD4 [2, 3]. MiR-146a is considered a negative regulator of TLR signaling through down-regulation of IRAK1 and TRAF6 [2].
OBJECTIVE. To examine the role of miR-146 in VILI. We hypothesized that administration of a precursor of miR-146a would ameliorate the inflammatory response through inhibition of TLR activation via down-regulation of TRAF6 and IRAK1.
METHODS. Adult male C57Bl6 mice ($n = 7$ per group) were anesthetized, tracheostomized and treated with pre-miR-146a, anti-miR-146a, or negative control miRNA, injected intratrachealy prior to mechanical ventilation with high tidal volume (HVT, adjusted to peak inspiratory pressure, PIP, of 35 cmH_2O). Mice were ventilated with HVT for 210 min or until PIP reached 43 cmH_2O (a threshold after which mice develop hypotension and die within minutes). Control mice were subjected only to sample collection. Pulmonary expression of miR-146a, IRAK1 and TRAF6 was evaluated using qPCR. BALF concentrations of protein and IL-6 were measured using BCA and ELISA, respectively.
RESULTS. Pulmonary expression of miR-146a increased after high VT ventilation 3.5-fold. Treatment with pre-miR146a was associated with a greater increase in miR-146a levels, 6.6- fold, while treatment with anti-miR-146a resulted in an 8-fold decrease. The expression of miR-146a target genes TRAF6, IRAK1 decreased in mice treated with pre-miR146a (3-fold and 2-fold respectively), while it was unchanged in mice treated with anti-miR-146a. Contrary to our hypothesis, mice treated with pre-miR-146 developed severe VILI earlier than mice treated with anti-miR-146 or negative control (190 ± 18 min vs. 210 ± 0 min, $p = 0.02$). BALF concentrations of protein and IL-6 were not different among groups of ventilated mice.
CONCLUSIONS. miR-146a contributes to VILI in this mouse model. Despite negative regulation of TLR signaling miR-146a exacerbates VILI, possibly by affecting alveolar barrier function through modulation of TGF-β signaling via SMAD4.
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0038
EFFECT OF PROTECTIVE VENTILATION ON THE INFLAMMATORY RESPONSE AND NEURONAL ACTIVATION, IN AN EXPERIMENTAL MODEL OF ACUTE LUNG INJURY INDUCED BY INSTILLATION OF LIPOPOLYSACCHARIDE

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INTRODUCTION. Previous studies in our group have found neural activation associated with the use of non-protective ventilatory strategies during mechanical ventilation (MV).
OBJECTIVES. (1) To compare 2 strategies using protective ventilatory tidal volume (VT) under two levels of PEEP in an experimental model of intratracheal instillation of lipopolysaccharide (LPSit) in rats. (2) To assess whether there is a differential pattern of neural activation associated with the level of PEEP or the degree of lung injury.
METHODS. 30 male Sprague–Dawley adult rats ventilated, under mechanical ventilation (MV) with $VT = 7$ ml/kg and $FiO_2 = 0.4$ randomized into 5 groups. Depending on the level of PEEP and it instillation of LPS or saline (Sit): 1. LPSit + PEEP = 2, 2. LPSit + PEEP = 7, 3. Sit + PEEP = 2, 4. Sit + PEEP = 7 and 5. Basal group: no MV + exanguination after anesthesia.
Analysis: We analyzed cytokine levels in lung and plasma by LUMINEX. The brains were processed for immunohistochemistry of c-fos to determine the level of neuronal activation (Image J) in different brain areas (hypothalamus, hippocampus, cortex, amygdala and nucleus of the solitary tract). The data were analyzed by ANOVA ($p < 0.05$).
RESULTS. In groups with LPSit, the use of PEEP = 7 cmH_2O decreased levels of IL-6 and TNF-α, both pulmonary and systemic, as compared to the groups ventilated with PEEP = 2. This reduction was also observed in the chemokine MCP-1, but only in the lungs. We have found neuronal activation in the studied areas in all MV animals, although no significant differences in the degree of activation in relation to the level of PEEP were found. By contrast, no signal was observed in non ventilated animals.
CONCLUSIONS. The decrease in the inflammatory response (IL-6 and TNF-α) observed in animals receiving PEEP of 7 cmH_2O may be associated with protection against atelectasis, since LPS-induced inflammation was enhanced in animals receiving low levels of PEEP. In the brain, protective mechanical ventilation per se also induces neuronal activation, which is not observed in animals not subjected to VM. Finally, the protection, at the inflammatory level, due to the increase in the level of PEEP, does not translate into a differential activation pattern in the areas analyzed.
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GRANT ACKNOWLEDGMENT. Ministry of Science and Education of Spain (BFU2006-07124/BFI) and Fundació Parc Taulí. JLA is supported by Program I3 de Estabilización (ISCIII) and Health Department of the Generalitat de Catalunya. MEQ and FP are supported by CIBER de Enfermedades Respiratorias (ISCIII).

0039
STUDY ON THE EFFECT OF $PACO_2$ ON PULMONARY ARTERY PRESSURE OF MECHANICALLY VENTILATED RABBITS

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INTRODUCTION. Despite the immense number of publications on the effects of hypoxia, current literature contains scarce data on the effects of hypercapnia on pulmonary circulation.
OBJECTIVES. To study the effect of $PaCO_2$ on the pulmonary artery pressure of rabbits under mechanical ventilation.
METHODS. For this experiment 5 rabbits (3.5 kg mean weight) were sedated using midazolam and ketamine, tracheostomized and mechanically ventilated with Vt 15 mL/Kgr, $f = 35$, $FiO_2 = 0.6$, PEEP = 4 (Harvard Apparatus Dual Phase Control Respirator). Animals underwent Right Heart Catheterization (RHC) via internal jugular vein (4.5 F catheter). Pulmonary artery pressures (PAP) and airway pressures were monitored and recorded via a polygraphic system (NIHON COHDEN). Blood was sampled via RHC catheter and blood gases analyses were performed via analyzer (CRITICAL CARE XPRESS NOVAMEDICAL). All animals underwent a protocol that included sequential RHC measurements at three stages: baseline (normocapnia, normoxia), acute hypercapnic acidosis and reversal of hypercapnia. RHC and protocol standardization were performed at 7 rabbits at a preliminary stage preceding the study.
RESULTS. At baseline (mmHg) PCO_2, PO_2, sysPAP, diasPAP were 37.3 (5.1), 55.1 (4), 25.4 (2.4), 12.8 (1.8) and pH was 7.40 (0.3), respectively. During hypercapnic acidosis pressures for PCO_2, PO_2, sysPAP, diasPAP were 61.4 (5.7), 64.8 (8.2), 32.6 (1.8), 19.9 (1.1) and pH was 7.19 (1.1) respectively. Associations between PCO_2, pH changes and sysPAP, diasPAP levels were significant ($p < 0.05$).
CONCLUSIONS. Acute hypercapnic acidosis may induce increases in PAP during mechanical ventilation.

0040

BAL FLUID (BALF) ACTIVIN A (ACTA) LEVELS IN ARDS PATIENTS VENTILATED WITH CONVENTIONAL MECHANICAL VENTILATION (CMV) VS HIGH FREQUENCY OSCILLATORY VENTILATION (HFOV)

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INTRODUCTION. HFOv is a lung protective strategy in ARDS with beneficial effects on lung recruitment and ultimately on survival [1]. ActA is a cytokine that is elevated in early ARDS [2] but its functional role remains unknown.

OBJECTIVES. To measure ActA BALF levels in early ARDS patients treated with HFOv vs ARDS-net CMV

METHODS. 16 severe ARDS patients ($PaO_2/FiO_2 < 150$) were randomly assigned to receive HFOv [1] until $PaO_2/FiO_2 > 200$ or CMV (ARDS-net). BAL was performed within 24 h from ARDS onset, before randomization. A second BAL sample was obtained 4 days later. BALF was also collected from 11 control patients with no significant respiratory pathology. ActA levels were determined by Elisa. Non-parametric statistics were used to compare measurements between different groups.

RESULTS. There were no differences between groups in the patients' demographic and clinical characteristics. BALF main results are shown in figure 1. BALF ActA levels were higher in ARDS patients compared to controls ($p < 0.0001$). Post intervention ActA levels remained high in the HFOv group vs baseline ($p = 0.11$) whereas they decreased in the CMV group ($p < 0.05$). Notably, post intervention ActA levels in the CMV group did not differ from those of controls. These results were associated with improved lung mechanics and oxygenation after intervention in the HFO group, compared to stabilization of these variables in the CMV group.

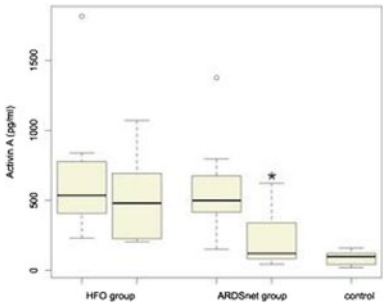

Figure 1: BALF ActA levels before and after intervention in the HFOv group (left) and CMV-ARDSnet group (middle). ActA levels for the control patients are shown on the right. Post-intervantion ActA levels remain high in the HFO group compared to baseline while they are decreased (*) in the CMV group

CONCLUSIONS. Our results suggest an anti-inflammatory and remediating activity of ActA in early ARDS. This activity has also been proposed by in vitro studies [3]. Further research is required to better understand the role of ActA in human ARDS.

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0041

TAK-1 SIRNA NORMALIZES AUTOPHAGY AND APOPTOSIS IN SEPTIC MOUSE LUNG

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INTRODUCTION. Severe sepsis is a serious disorder with organ dysfunction via systemic inflammation. Transforming growth factor-beta-activated kinase-1 (TAK-1) is an essential regulator in transcriptional factor such as nuclear factor-kB and activator protein 1. LC-3II is a key regulator in the progression of autopghagy.

OBJECTIVES. The aim of this study was to investigate the inflammatory activity of TAK-1 and the regulatory mechanisms of cell death in septic lung.

METHODS. In BALB/C male mice (8–12 week-old), sepsis was induced by cecal ligation and puncture (CLP), and the lung was harvested 24 h after the onset of sepsis. At 10 h after CLP, siRNAs targeting TAK-1 and the mismatched siRNA were delivered by intravenous injection of the liposome complexes. Accumulation of Cy3-labeled siRNA were confirmed by immunostaining. Western blot analysis and RT-PCR analysis were performed to determine the changes in expression of TAK-1, which are associated with autophagy and apoptosis. The densitometric comparisons were made using one-way analysis of variance followed by Tukey′s multiple comparison test. The data were presented as mean ± SEM ($n = 4$). Differences were considered significant when P values were <0.05.

RESULTS. Injected Cy3-labbeled siRNA-lipo-complexes were strongly observed in type 2 alveolar cells. Septic mice showed a significant increase in TAK-1 and a significant appearance of autophagy and apoptosis in lungs, compared with control (24 h after sham operation). TAK-1 siRNA, but not mismatched siRNA, caused a dose-dependent suppression of sepsis-induced activation of ATG5 and ATG8 (LC-3) and caspase-3 in lungs. The other ATG subtypes did not alter the expression in the lung after CLP. Finally, 50 μg of TAK-1 siRNA greatly improved the survival of septic mice ($n = 15$).

CONCLUSIONS. We suggest that sepsis-induced autophagy and apoptosis could be augmented by TAK-1 activation. Increased TAK-1 activates ATG5, ATG8 and caspase3 and accelerates autophagy and apoptosis in septic lung. As gene silence of TAK-1 strongly improved mortality in septic mice, TAK-1 siRNA could be a future medication in polymicrobial sepsis.

0042

ACTIVATION OF CANONICAL WNT PATHWAY PROMOTES MICE BONE MARROW DERIVED MSCS DIFFERENTIATING INTO TYPE II ALVEOLAR EPITHELIAL CELLS, SURVIVAL AGAINST OXIDATIVE STRESS, AND MIGRATING TOWARDS INJURED LUNG TISSUE IN VITRO

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INTRODUCTION. Acute lung injury (ALI) with high morbidity and mortality is extremely detrimental for the outcomes of patients in intensive care units. Mesenchymal stem cells (MSCs), which can differentiate into type II alveolar epithelial (AT II) cells in vivo and in vitro to maintain the integrity of alveolar epithelium is a promising treatment for ALI, however the transplanted and differentiated rates are limited. Exploration of the underling mechanisms, which are unclear still, is beneficial for the application of MSCs in ALI. Canonical wnt signaling, a fundamental and critical pathway in the development, proliferation and differentiation of cells is hypothesized as the key modulatory factors.

OBJECTIVES. To explore the role of canonical wnt signaling in the differentiation of MSCs into AT II cells under modified co-culture system, as well as the migratory ability to injured lung tissue and survival against cytotoxicity induced by oxidative stress in vitro. The latter two can ensure the location and survival of MSCs in the impaired lung tissue, thus indirectly influencing the differentiation of MSCs into AT II cells.

METHODS. We drove the differentiation using modified co-culture systems with murine lung epithelial-12 (MLE-12) cells and small airway growth medium (SAGM) in our study, and LiCl, Wnt3a or DKK 1 was added into the medium respectively to activate or inhibit the canonical wnt pathway.

RESULTS. We found GSK 3β and β-catenin of canonical wnt pathway upregulated during differentiation, and correspondingly the level of surfactant protein (SP) C, SPB and SPD, the specific markers of AT II cells, in mMSCs was increased when adding Wnt3a or LiCl to the co-culture system to activate the wnt/β-catenin signaling and partly depressed via inhibiting the pathway using DKK 1. Additionally, activation of wnt/β-catenin signaling promoted mMSCs migrating towards ALI mice derived-lung tissue in the lower chambers of Transwell inserts, and ameliorated the cell death and the reduction of Bcl-2/Bax induced by H_2O_2, which simultaneously caused reduced GSK 3β and β-catenin in mMSCs.

CONCLUSIONS. These data provides a potential mechanism involving canonical wnt pathway activation in the differentiation of mMSCs into AT II cells, which may be significant in their application in ALI.

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0043

PHYSIOLOGIC EFFECTS OF HIGH FREQUENCY POSITIVE PRESSURE VENTILATION (HFPPV) USING A CONVENTIONAL VENTILATOR IN A SEVERE ARDS ANIMAL MODEL

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INTRODUCTION. The protective mechanical ventilation in ARDS is based on the reduced stretch of pulmonary tissue, sometimes resulting in a severe hypoventilation. The high frequency ventilation offered by HFOV has been successfully used in ARDS models and patients, however the effects of HFPPV have not been fully explored.

OBJECTIVES. To explore the physiologic effects of HFPPV using a conventional mechanical ventilator.

METHODS. We induced lung injury in 11 pigs with whole-lung lavage with warmed saline followed by approximately 3 h of injurious mechanical ventilation with the lowest PEEP to keep the oxygen saturation >90 % and high plateau pressures ($\sim$42 cmH_2O). We then allowed the animals to stabilize with the tidal volume fixed at 6 mL/kg for a period of 1 h, and the PEEP, selected with the PEEP-FiO_2 table (ARMA-study), was kept constant during all steps of HFPPV. The respiratory rates (RR) tested were 30, 60, 90, 120, or 150 breaths/min (Servo-300 ventilator), and 5 Hertz with the HFOV ventilator (Sensormedics-3600B). During each HFPPV step and during the HFOV strategy, the tidal volume was set to reach a $PaCO_2$ of 60 ± 3 mmHg. The equilibrium was considered if the $PaCO_2$ was stable (<5 % of variation) for >30 min. Data are shown as mean ± SD and the one-way ANOVA for repeated measures was used in the analysis.

RESULTS. The weight of animals was 34 ± 6 kg. Post lung injury induction, the static compliance of the respiratory system was 10 ± 4 mL/cmH_2O and the P/F ratio was 86 ± 23 mmHg. The use of HFPPV allowed a reduction in the $PaCO_2$ levels, beside the use of a low tidal volume and driving pressure, according to the following table:

Table

Variable	TV = 6	RR = 30	RR = 60	RR = 90	RR = 120	RR = 150	HFOV	ANOVA P value
$PaCO_2$	87 ± 18 *	60 ± 2	60 ± 2	60 ± 1	60 ± 1	60 ± 2	63 ± 5	<0.001
TV (mL/kg)	6.1 ± 0.2	8.6 ± 1.6	5.9 ± 1.0	5.2 ± 1.0	4.6 ± 0.9	4.2 ± 0.7	2.9 ± 0.5*	<0.001
DP (cmH_2O)	18 ± 3	28 ± 9	21 ± 8	19 ± 5	16 ± 3	15 ± 2[&]	—	<0.001
Pplateau (cmH_2O)	32 ± 5	42 ± 8	35 ± 8	32 ± 5	30 ± 4	29 ± 4[$]	—	<0.001
P/F ratio	91 ± 16	132 ± 44	129 ± 62	119 ± 52	110 ± 43	115 ± 51	181 ± 67[#]	<0.001

DP denotes driving pressure
* Tukey's post hoc analysis, $P < 0.05$ vs others
[#]Tukey's post hoc analysis, $P < 0.05$ vs others except RR = 30
[&]Tukey's post hoc analysis, $P < 0.05$ vs RR = 30
[$]Tukey's post hoc analysis, $P < 0.05$ vs RR = 30

CONCLUSIONS. HFPPV done with a conventional mechanical ventilator is able to maintain a stable $PaCO_2$ in clinically acceptable values, allowing reductions in the tidal volume, driving pressure and plateau pressure. HFPPV is a potential technique to ventilate severe ARDS patients and merits further investigation.

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0044

CO_2 DIALYSIS IN THE TREATMENT OF PATIENT WITH ARDS AND BRAIN TRAUMA: A CASE REPORT

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INTRODUCTION. Protective mechanical ventilation with low tidal volumes (Vt) has been established as a key therapeutic strategy for treating ALI/ARDS. It has contributed in strong improvement in outcome, but despite this, the mortality rate remains high.

OBJECTIVES. We report a case of a 40 years old male patient involved in a head on motorcycle with a car

METHODS. He was admitted to our Intensive Care Unit (ICU) for Acute Respiratory Distress Syndrome (ARDS) and brain trauma. His chest CTs showed a diffuse opacity involving both lungs and his brain CTs reported a brain swelling without intracranial bleeding. At admission he had been mechanically ventilated with a protective modality (Vt < 6 ml/kg and plateau pressure <30 cmH_2O). Despite this he had an oxygen saturation of 81.2 % and his blood gas analysis was as follows: pH 7.20, PaO_2 54 mmHg, $PaCO_2$ 78 mmHg and PaO_2/FiO_2 ratio 54 mmHg with a fraction of inspired oxygen (FiO_2) = 1. Due to his neurological damage we couldn't use recruitment maneuvers and prone position. In the second day the blood gas analysis reported an increasing in $PaCO_2$ that rised up to 112 mmHg. Thus we decided to use a new mini invasive device named Abylcap CO_2 removal(Bellco-Mirandola -Modena) used with a Continuous Venous–Venous Haemofiltration pump driven system (Lynda, Bellco;Mirandola; Modena). The extracorporeal carbon dioxide removal ($ECCO_2R$) circuit was connected to the right femoral vein, accessed via a 14 F double lumen catheter. This system is supplied by a membrane exposed to an high oxygen flow, that provide an extracorporeal CO_2 removal while gets an improvement in oxygenation referred as 20 %. The blood flow applied through the circuit was 300 ml/min (range from −150 ml/min to +300 ml/min), and anticoagulant therapy based on heparin was used.

RESULTS. We observed a progressive improvement in blood gas analysis that, 4 days after the start, became as follow: pH 7.35, $PaCO_2$ 41 mmHg, PaO_2 130 mmHg, SaO_2 98 % and PaO_2/FiO_2 ratio 260 at FiO_2 = 0.5. Despite this in fifth day our patient died as a consequence of malignant cerebral edema.

CONCLUSIONS. Hypercapnia is not an easy partner for patients with low compliance, severe hypoxia and brain trauma, and it is closely related to protective ventilation. This device has been demonstrated useful in reducing hypercapnia while allowed to continue protective ventilation. In agree with other authors [1], we think that this device could play a role in adjusting respiratory acidosis consequent to tidal volume reduction in a protective ventilator setting. Furthermore we think that in patients with some type of head injury this device could be an interesting therapeutic option, but new experiences are needed.

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Satisfying Metabolic Demand in the ICU: 0045–0058

0045

METABOLIC MODULATION BY TETRATHIOMOLYBDATE, A SLOW-RELEASE SULPHIDE DONOR

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INTRODUCTION. Hydrogen sulphide (H_2S) is a gasotransmitter that, alongside nitric oxide and carbon monoxide, acts as a signalling molecule exerting control over metabolic, cardiovascular and immune systems. H_2S blocks cytochrome c oxidase and mitochondrial respiration, thus H_2S administration offers therapeutic potential for conditions where a reduction in metabolism is desirable. Although showing promise in murine models, a 'suspended animation' effect has not been replicated in larger models ranging from rat to sheep using either gaseous H_2S or the intravenous donor, sodium hydrogen sulphide (NaHS). We recently discovered that the copper chelating agent, tetrathiomolybdate (TTM) releases H_2S; unlike NaHS, preliminary experiments with TTM showed considerable metabolic depressant effects in rat shock models.

OBJECTIVES. To characterize pharmacokinetic, metabolic and haemodynamic effects of TTM versus NaHS in healthy rats.

METHODS. Male Wistar rats were anaesthetized with isoflurane allowing insertion of carotid arterial and jugular venous lines for blood sampling and BP monitoring, and drug administration, respectively. After recovery, BP was measured following boluses of either TTM (0.2, 2 and 20 mg/kg) or NaHS (1 mg/kg). In separate experiments, plasma sulphide levels (measured using a monobromobimane-based HPLC assay) were determined up to 2 h following bolus i.v. administration of TTM (10 mg/kg) or NaHS (1 mg/kg), or by infusion (TTM 10 mg/kg/h). In a third study, awake animals were placed into metabolic cages to measure global O_2 consumption and CO_2 production. Placebo, TTM (10 mg/kg/h) or NaHS (2 mg/kg/h) were given by continuous i.v. infusion for 24 h in equivalent volumes. Higher doses of NaHS were toxic.

RESULTS. NaHS bolus had a greater impact on blood pressure compared to TTM despite plasma sulphide levels being considerably higher with TTM. The plasma sulphide half-life was far longer for TTM (17 min vs < 1 min for NaHS). Plasma sulphide levels following TTM infusion reached steady state after 2 h (data not shown). In the 24 h study, TTM caused a fall in metabolism (O_2 consumption) not observed with NaHS. The animals' behaviour was normal with both drug infusions.

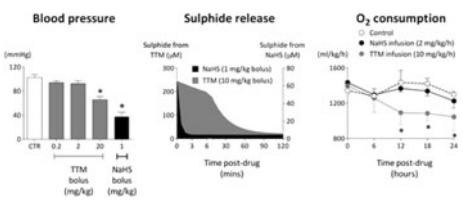

Figure 1

Data shown as mean ± SEM (n = 3–6/group). Statistics: 1 or 2-way RM ANOVA + Dunnett's test, *p < 0.05. Sulphide release shown as (coloured) AUC of one-phase decay regression lines of plasma sulphide levels.

CONCLUSIONS. Induction of hypometabolism with TTM but not NaHS in awake rats likely relates to differences in the magnitude of sulphide release and pharmacokinetic profile. Slow-releasing sulphide drugs allow better modulation of metabolism without obvious toxicity.

GRANT ACKNOWLEDGMENT. Funded by Magnus Invention.

0046

CAN INTRAVENOUS N-3 FATTY ACIDS, AS PHARMACONUTRITION, MODIFY PLASMA PHOSPHOLIPIDS COMPOSITION AND CLINICAL OUTCOME IN CRITICALLY ILL ELDERLY?

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INTRODUCTION. Fatty acids (FA) are cell membrane components and precursors for functional molecules including important lipid mediators that influence inflammation and immunity. The aim of this study was to verify if plasma phospholipid FA in critically ill elderly patients in Intensive Care Unit (ICU) are different from healthy volunteers and to evaluate the effect of the intravenous administration of n-3 FA-rich lipid emulsion (FLE), as pharmaconutrition, on plasma phospholipid FA composition and clinical outcome.

MATERIALS AND METHODS. We evaluated 45 elderly patients (60 to 80 years old) in the first 48 h of ICU admission and receiving enteral nutrition. Fifteen patients received FLE (Omegaven; 0.2 g/kg/day) for 6 h for 3 consecutive days, and thirty patients did not receive lipid emulsion (control). Nineteen healthy elderly subjects formed the healthy control group. Blood samples were collected in 3 timepoints: before FLE supplementation (T0), and 24 h (T1) and 48 h (T3) after the third FLE infusion. FA were measured in plasma phosphatidylcholine (PC) by gas chromatography.

RESULTS. Twenty one patients died during ICU stay (15 from control group (44 %) and 6 from FLE (40 %). Survivors had higher levels of docosahexaenoic acid (DHA) and total n-3 FA in plasma PC at T0 than non-survivors (p = 0.001 and p = 0.002, respectively) and they had a lower ratio of n-6 to n-3 FA (p = 0.001). No difference was found in total saturated FA, although critically ill patients had a lower myristic acid concentration than the healthy elderly. At T0 non-survivors had higher oleic acid and total monounsaturated FA compared with survivors and healthy elderly. After FLE supplementation no difference was found in saturated and monounsaturated FA, but as expected, the n-3 FA eicosapentaenoic (EPA) and DHA and also total n-3 FA were significantly increased as compared to the control group. Furthermore, arachidonic acid (ARA) and total n-6 PUFA were reduced, as well as n-6:n-3 and ARA/EPA ratios. No effect of FLE on mortality was observed, but there was a tendency to fewer days of mechanical ventilation (9.54 ± 1.15 (C) and 6.85 ± 1.15 (FLE), p = 0.15) and ICU stay (12.39 ± 1.59 (C) and 10.0 ± 1.55 (FLE) p = 0.356).

CONCLUSIONS. Critically ill patients have altered plasma PC FA profiles and the maintenance of total n-3 FA and DHA is positively related to survival of these patients. FLE, as pharmaconutrition, is safe, modulates FA composition and can be an auxiliary therapy in critically ill patients.

GRANT ACKNOWLEDGMENT. CAPES, FAPESP

0047

COMPARISON OF DIFFERENT METHODS OF ENERGY EXPENDITURE DETERMINATION IN CRITICALLY ILL PATIENTS WITH INTRACRANIAL HEMORRHAGE

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INTRODUCTION. Early nutrition support with adequate protein and energy intake to avoid protein-energy deficiency and overfeeding is the main goal of nutrition in critically ill hypermetabolic and hypercatabolic patients (pts) with intracranial hemorrhage (ICH).

OBJECTIVES. To compare the results of rest energy expenditure (REE) determination by Harris-Benedict equation (REE_{pred}) and by indirect calorimetry (REE_{IC}) in patients ICH.

METHODS. We analyzed 109 episodes of REE determination in 25 pts with ICH and GCS 4–12 (age 50.3 ± 16.0; male 15 (60 %), female 10 (40 %). Seven pts (28 %) had severe traumatic brain injury, 11 pts (44 %)—aneurismal subarachnoid hemorrhage, 3 pts (12 %) - hemorrhagic stroke, 4 pts (16 %)—arteriovenous malformation. MEDGRAPHICS CCM Express (Medical Graphics Corporation, USA) was used for indirect calorimetry. REE_{IC} was measured by IC during 60–90 min and compared with REE_{pred} calculated by Harris-Benedict equation. Respiratory coefficient (RQ) was measured by IC to determine the balance of nutrition support. All pts were operated. Enteral nutrition from the first day of ICU stay on the basis of 20–25 kcal/kg per day was provided. Energy expenditure was calculated by Harris-Benedict equation. Protein turnover was estimated by nitrogen balance determination. Average protein supply was 1.5–2.0 g/kg per day. Mixed enteral and parenteral or total parenteral nutrition were provided in case of impossibility or insufficiency.

RESULTS. REE_{IC} (1,984 ± 457 kcal) was higher than REE_{pred} (1,701 ± 196 kcal) by 17 % (p < 0.05) (REE_{IC}/REE_{pred} 117 ± 28 %). Respiratory coefficient (RQ) was 0.97 ± 0.16. In pts with RQ < 0.8 (n = 5) REE_{IC} was 2,101 ± 557 kcal, REE_{pred}—1,691 ± 188 kcal, REE_{IC}/REE_{pred}—122 ± 28 %, in pts with RQ 0.8–0.85 (n = 20): REE_{IC}—2,206 ± 438 kcal, REE_{pred}—1,699 ± 183 kcal (p < 0.05 compared with REE_{IC}), REE_{IC}/REE_{pred}—130 ± 29 %, in pts with RQ >0.85 (n = 84): REE_{IC}—1,924 ± 444 kcal (p < 0.05 compared with REE_{IC} at RQ 0.8–0.85), REE_{pred}—1,702 ± 201 kcal (p < 0.05 compared with REE_{IC}), REE_{IC}/REE_{pred}—113 ± 27 %.

CONCLUSIONS. REE determination by Harris-Benedict equation accompanied by underestimation 17 % energy expenditure in comparison with indirect calorimetry in critically ill patients with ICH.

0048

LEAKAGE OF ALBUMIN IN MAJOR ABDOMINAL SURGERY

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INTRODUCTION. Major elective surgery may serve as a model for some inflammatory changes that also occurs during the systemic inflammatory response syndrome in sepsis. A classical study by Fleck et al.[1] reported doubling of albumin transcapillary escape rate (TER) immediately after thoracic surgery. In a previous pilot study we couldn't confirm any increase in TER, 2 days after major abdominal surgery (unpublished data).

OBJECTIVES. The present pilot study aimed to characterize the time course of changes in P-albumin and leakage of albumin during major abdominal surgery.
METHODS. Eleven patients, age 67 (57–74), BMI 24.0 (20.1–27.6), scheduled for pancreatic (n = 8) or oesophageal resection (n = 3) participated in the study. P-albumin, B-Haematocrit (Htc), and B-Haemoglobin (Hb) were repeatedly measured over 3 days, loss of albumin and Hb in bleeding and drains were assessed, and data of all intravenous infusions were collected. Baseline blood volume was calculated anthropometrically, and dilution of plasma was calculated from changes in B-Htc with respect to measured losses and transfusions. The cumulative difference between calculated albumin mass balance from gains and losses of albumin and the corresponding intravascular albumin mass (IAM) derived from P-albumin and plasma volume derived from Hb is presented as the cumulative perioperative albumin shift (CPAS), supposedly to the extracellular space. Data are presented as median (range) and statistical evaluation was performed by Friedman's ANOVA followed by Dunn's correction for multiple testing.
RESULTS. Surgery commenced for 343 min (224–490) and bleeding was assessed to 1,010 mL (500–4,500). P-albumin decreased significantly ($p < 0.0001$), mainly during the first part of the perioperative procedure, from 32.2 g/L (24.3–38.9) at baseline to 18.5 g/L (12.2–28.0, $p < 0.001$) at start of surgical reconstruction, and to 19.2 g/L (14.5–25.5, $p < 0.001$ compared with baseline, and non significant versus start of reconstruction) 3 days postoperatively. CPAS reached maximum 19 g (−1 to 47, $p < 0.001$) at the end of surgery and thereafter did not change significantly over time.
CONCLUSIONS. In this pilot study, the perioperative fall in P-albumin mainly occurred during the first part of the procedure until start of surgical reconstruction. The calculated albumin escape from circulation was also most prominent during surgery. This contrasts to previous reports [1], and may be caused by differences in the routines for fluid treatment. Future studies on manipulations of capillary patency for albumin in similar surgical patients should be performed during circulatory stable stages of surgery rather than during the early postoperative period in order to capture the largest flux of albumin.
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GRANT ACKNOWLEDGMENT. Financial support was provided through the regional agreement on medical training and clinical research (ALF) between Stockholm County Council and Karolinska Institutet.

0049
PREDICTING ENERGY EXPENDITURE IN SEPSIS: A COMPARATIVE STUDY OF HARRIS-BENEDICT AND SCHOFIELD EQUATIONS VERSUS WEIR DERIVATION IN SEPTIC PATIENTS

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INTRODUCTION. Given the difficulties of indirect calorimetry in many intensive care units (ICU), clinicians routinely employ predictive equations (Harris-Benedict (HBE) and Schofield equations are commonly used) to estimate energy requirement of critically ill patients. Some extrapolate CO_2 production ($V\square CO_2$) and O_2 consumption ($V\square O_2$) by the Weir derivation to estimate energy expenditure. These derivative methods have not been compared with predictive equations.
STUDY OBJECTIVES. We compared prediction of energy requirement by the HBE and Schofield equations with energy expenditure as estimated by the Weir derivation in a cohort of critically ill patients with varying severity of sepsis in an ICU of a metropolitan hospital.
METHODS. HBE and Schofield equations are age based, weight determined, gender specific derivations that may incorporate stress and/or activity factors. These were compared with the estimated energy expenditure as calculated by the Weir derivation. We used end-tidal CO_2 derived $V\square CO_2$ (Evita, Drager) and deduced $V\square O_2$ assuming a respiratory quotient of 0.8381.
RESULTS. 60 mechanically ventilated patients with varying severity of sepsis were included in this study. Their mean (±standard deviation) APACHE II score was 25.7 (±8.4). All patients received nutrition (85 % enteral; 13.7 % parenteral and 1.3 % combined) in addition to standard management for sepsis and multi-organ supportive therapy. Overall, 75 % required inotropes and 6.7 % received continuous renal replacement therapy. Total energy expenditure (TEE) derived from both equations correlated well (mean EE of 7,810.7 kJ ± 1,669.2, 8,029.1 kJ ± 1,418.6 and 7,660.8 kJ ± 2,092.2 for HBE, Schofield and Weir respectively) with the measured energy expenditure (MEE) by Weir equation (within 8 % of each other). Better correlations were observed in patients with APACHE II scores <25 and those with SIRS and severe sepsis as opposed to those in Septic Shock.

Comparative energy expenditure

Kilo joules/day	SIRS (N = 15)	Severe sepsis (N = 20)	Septic shock (N = 25)
Weir estimation (MEE)	7,945 (±2,330)	7,682 (±1,920)	7,473 (±2,141)
Weir–Harris Benedict difference	404	−370	−455
Weir–Schofield difference	150	−591	−761

CONCLUSION. In a cohort of patients with SIRS, severe sepsis or septic shock, the predictive equations, ubiquitously used in ICUs, matched reasonably well with Weir derivations, with better correlations in patients with less severe sepsis (SIRS and severe sepsis and APACHE II < 25) when compared to more critically ill patients (patients with septic shock and APACHE > 25). In our study, predictive equations were not a poor substitute for calculating energy prescription in critically ill patients. As indirect calorimetry still remains the 'gold standard', further research is warranted to validate these results.

0050
ARE THE LEVELS OF GLUCOSE ESTIMATED BY HBA1C THE TRUE GOAL OF GLYCEMIC CONTROL IN CRITICALLY ILL PATIENTS?

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INTRODUCTION. Acute hyperglycemia increased mortality in critically ill patients. It is recommended to keep glucose levels between 140 and 180 mg/dL, whether the patient is diabetic or not. A recent retrospective study suggests that in patients with preexisting hyperglycemia, maintaining lower levels of glucose increases mortality.
OBJECTIVES. Determine if the variation in time-weighted average glucose (Glu_{TW}) in relation to the estimated glucose (Glu_{EST}) calculated by the glycosylated hemoglobin (HbA1c) is associated with increased mortality in critically ill patients.
METHODS. Prospective, observational, cohort study with patients admitted to a mixed Intensive Care Unit (ICU) with estimated lenght of stay ≥48 h, with HbA1c on admission and without factors that could modify its value. We determined the Glu_{EST} according to the formula: Glucose = 28.7 × HbA1c − 46.7. Glu_{TW} was calculated as described by Finney et al. and then we determined the percentage of variation between Glu_{TW} and Glu_{EST}. Since the relationship between the percentage of variation and mortality was not linear, we established cutoffs of 25 and 50 % to analyze the relative risk of mortality.
RESULTS. We admitted 41 patients, 56 % male, 67.17 ± 16.7 years of age, body mass index of 26.39 ± 5.9 kg/m2, glomerular filtration rate of 68.03 ± 22.6 ml/min, SAPS-3: 60.24 ± 16.5 points, 36.6 % with a sepsis diagnosis, 75.6 % under mechanical ventilation and 26.8 % with steroids at admission. During stay, 73.1 % received only enteral nutrition. The hourly insulin requirement was 1.32 ± 1.66 units/h. The HbA1c was 5.99 ± 1.45 % and the Glu_{EST}: 125.24 ± 41.6 mg/dL. There were 6 deaths (14.6 %) in ICU and 11 deaths at 28 days (26.8 %). The percentage of variation between Glu_{TW} and Glu_{EST} was 33.95 ± 26.1 %. A variation greater than 25 % confers an odds ratio (OR) of 1.182 (95 % CI: 0.189 to 7.372, $p > 0.99$) and 1.778 (95 % CI: 0.391 to 8.085, $p = 0.716$) of death in ICU and at 28 days, respectively. The variation greater than 50 % confers an OR of 0.500 (95 % CI: 0.52 to 4.834, $p > 0.99$) and 1.031 (95 % CI: 0.218 to 4.879, $p = 1.0$) of death in ICU and at 28 days, respectively. The negative variation confers an OR of 2.133 (95 % CI: 0.184 to 24.762, $p = 0.54$) and 0.90 (95 % CI: 0.084 to 9.69, $p = 0.93$) of death in ICU and at 28 days, respectively. Steroids at admission confers a significantly higher OR of death at 28 days (OR 6.0, 95 % CI: 1.304 to 27.616, $p = 0.041$).
CONCLUSIONS. In critically ill patients, the variation in blood glucose compared to that estimated according to the HbA1c at admission, does not confer increased risk of mortality.
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0051
RESPIRATORY, METABOLIC AND HEMODYNAMIC EFFECTS OF DEXMEDETOMIDINE IN AGITATED, VENTILATED PATIENTS: PRELIMINARY REPORT

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INTRODUCTION. Mechanically ventilated patients are frequently sedated to a point where communication is impossible. Studies have shown that rapid discontinuation of opioids and benzodiazepines during ventilator weaning, may lead to withdrawal symptoms. Dexmedetomidine has been suggested as an alternative to opioids and other sedatives to help alleviate agitation symptoms.
OBJECTIVES. To investigate the respiratory, metabolic and hemodynamic effects of dexmedetomidine in agitated, mechanically ventilated patients.
METHODS. Metabolic [oxygen consumption (VO_2), CO_2 production (VCO_2), resting energy expenditure (REE)], respiratory [minute ventilation (V_E), tidal volume (V_T), respiratory rate (RR)] and hemodynamic (HR, SAP, MAP) parameters were measured in 12 ventilated ICU patients. Measurements were performed first under sedation with remifentanil–propofol, then after sedation interruption, and finally after dexmedetomidine administration (0.2–0.4 mcg/kg).
RESULTS. Sedation interruption produced significant increases in the hemodynamic parameters (MAP by 55 %, HR by 49 %), and metabolic rate (increase in VO_2 by 75 %, VCO_2 by 128 % and REE by 100 %), leading to high respiratory demands (increase in VE from 9 to 18 l/min). The VE was increased due to an almost twofold increase in the RR; VT remained constant. In 11 out of 12 patients, dexmedetomidine administration decreased the hemodynamic (SAP, MAP and HR), metabolic (VO_2, VCO_2, REE) and respiratory parameters to values close to those observed with sedation. Dexmedetomidine induced mild sedation (average RASS −2.73) and patients became more cooperative with the ventilator.

Respiratory, metabolic and hemodynamic parameters

	VO_2 (ml/min)	VCO_2 (ml/min)	VE (l/min)	REE/ predicted (%)	MAP (mmHg)
RemiFNT + Propofol	250 ± 12	222 ± 11	9.2 ± 0.6	95.7 ± 4	89 ± 18
No sedation	436 ± 69	507 ± 66	18.7 ± 2.6	171 ± 22	141 ± 26
Dexmedetomidine (0.2–0.4 mcg/kg)	244 ± 13	254 ± 16	12.1 ± 0.9	95.1 ± 4.6	90 ± 23

CONCLUSIONS. Agitated, mechanically ventilated patients had significantly elevated hemodynamic, metabolic and respiratory demands. Dexmedetomidine significantly decreased these demands, induced mild sedation and facilitated patient cooperation with the ventilator.

0052
PREDICTORS OF OUTCOME AND COSTS OF ACUTE PANCREATITIS: RESULTS FROM THE EAGLE-TRIAL-GROUP

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INTRODUCTION. About 15 % of patients with acute pancreatitis (AP) develop severe AP with a mortality up to 15 %. By contrast, mortality is low in uncomplicated AP. Early prediction of severity is difficult and mainly based on a number of scores such as RANSON, BISAP and APACHE-II-score. Regarding a substantial part of the patients being transferred to the ICU and also long-term sequelae, AP also results in a marked socio-economic burden. However, little is known about direct costs of AP and their association to aetiology, length of stay and ICU-admission.
OBJECTIVES. Therefore, we performed a prospective analysis on costs and prognosis in 105 patients referred to a university hospital for AP and screened for the EAGLE-study.
METHODS. EAGLE is a multi-centric RCT on early-goal-directed therapy in severe acute pancreatitis. Due to inclusion criteria (APACHE-II-score ≥8 within 48 h after the onset of pain) only a minority of the screening-patients will be included in the trial.

Screening logs of all patients referred and all further data until death or discharge were prospectively analysed regarding the endpoints aetiology, prognostic markers, costs and outcome.
RESULTS. n = 105 (35 female, 70 male); age 50 ± 16 years, aetiology: 35.2 % alcoholic, 29.5 biliary, 8.6 % post-ERCP, 4.8 % drug-related, 7.6 % idiopathic, 14.3 % various. ICU-transfer 13/105 (12.4 %), mortality 6/105 (5.7 %), DRG-based costs (DRG: Diagnosis Related Groups): 4,154 ± 5,681 (570–51,770) €.
Ranson-score on admission (AUC 0.867; p = 0.003), BISAP-score-0 h (AUC 0.928; p < 0.001), APACHE-II-0 h (AUC 0.972; p < 0.001) and Ranson at 48 h (AUC 0.971; p < 0.001) were excellent predictors of mortality. In addition to these scores, GOT (AUC 0.919; p < 0.001), hypocalciemia (AUC 0.821; p = 0.008), GPT (AUC 0.803; p = 0.014) and creatinine (AUC 0.745; p = 0.048) on admission were significant "stand-alone"-predictors of mortality. DRG-costs were significantly higher in ICU-patients (10,696 ± 15,137 vs. 3,301 ± 1,567€; p < 0.001). Costs were neither different for biliary (5,317 ± 8,931 vs. 3,721 ± 3,625€) nor for alcoholicAP (4,155 ± 4,890 vs. 4,203 ± 6,126€) compared to other aetiologies. In multivariate analysis, ICU-transfer (+5,454€; p = 0.001) and length of hospital stay (+533€ per day; p < 0.001) were independently associated to the DRG-costs.
CONCLUSIONS. APACHE-II- and BISAP-score well as GOT on admission are excellent predictors of mortality in AP. Ranson-score provides best prediction after 48 h. The overall direct costs of AP are about 4,100€. Costs are independently associated to length of hospital stay and ICU-transfer.
GRANT ACKNOWLEDGMENT. Deutsche Forschungsgemeinschaft DFG: HU 1707/2-1

0053
ENERGY TARGET BASED ON ACTUAL OR IDEAL WEIGHT: THE NUTRITIONDAY ICU EXPERIENCE

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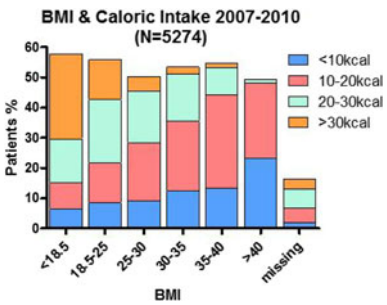
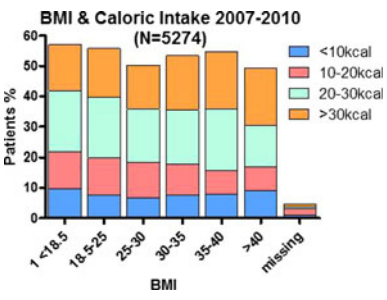
INTRODUCTION. Energy targets based on current recommendations are 25–30 kcal/kg body weight. Typically calculations are based on actual body weight. This practice may be associated with overnutrition in obese patients. An alternative approach would be to use ideal body weight but this calculation base would be associated with overnutrition in the malnourished patients.
OBJECTIVES. To determine what is the weight use for calculation of energy targets.
METHODS. We used the cross-sectional data from the nutritionDay ICU survey 2007–2010 to determine the energy intake profile depending on BMI calculated either based on actual of ideal body weight.
RESULTS. We included 5,274 ICU patients. We found that based on actual weight intake is decreasing with increasing BMI whereas based on ideal body weight intake is similarly distributed for all BMI categories.



Energy actual body weight



Energy actual body weight

CONCLUSIONS. Current practice of calculating energy targets suggests that all patients receive a similar
GRANT ACKNOWLEDGMENT. ECCRN project supported by the European Society for Clinical Nutrition (ESPEN) and the Medical University Vienna.

0054
ARE WE MEETING THE NUTRITIONAL REQUIREMENTS OF OUR CARDIOTHORACIC ADULT ICU PATIENTS?

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INTRODUCTION. Malnutrition in ICU patients often leads to a poor clinical outcome due to the greater risk of associated complications, such as ventilator dependence and infection. It is commonly due to a catabolic state induced by acute severe illness, and cardiothoracic patients often have an enhanced catabolic state following surgery.
OBJECTIVES. To determine whether we are initiating early nutrition and meeting the calorific requirements of our cardiothoracic Adult Intensive Care Unit (AICU) patients in accordance with ESPEN guidelines.
METHODS. An audit of nutrition delivery to patients admitted to the AICU at the Royal Brompton Hospital over a 4 month period was conducted to determine whether nutritional requirements are being met. Data was collected on route of feeding, time to initiation of feeding, average daily kcal/kg BW, duration of admission, length of ventilation, whether post-operative, failure of at least one organ, presence of infection, use of prokinetics and whether they were reviewed by a dietician. A statistician was used to determine significance.
RESULTS. 215 patients were admitted to the AICU at the Royal Brompton Hospital over a 4 month period. 115 of these patients were admitted for more than 48 h. Feeding was initiated within 24 h of admission for just over half (53 %), 36 patients (31 %) required enteral nutrition and/or TPN, of which 6 patients (17 %) received at least 20 kcal/kg BW. The length of ventilation for patients who were given enteral nutrition ranged from 1 to 54 days with a mean of 8 days (P = 0.0001, Kruskal–Wallis Test). Duration of admission ranged from 3 to 54 days with a mean length of stay of 9 days for enterally fed patients. Patients requiring TPN were admitted for 8 to 10 days with a mean length of stay (LOS) of 9 days. For patients who maintained oral intake alone, the duration of admission ranged from 3 to 10 days with a mean LOS of 4 days. 54 % (19/35) of enterally fed patients developed an infection compared from 66 % (2/3) of TPN fed.
CONCLUSIONS. Over 4 months, just under half the patients were fed after 24 h. Patients who had a prolonged admission and prolonged ventilation were more likely to receive enteral nutrition and/or TPN. Medical admissions, and patients with failure of one or more organs, or infection were more likely to need supplementary nutrition. Approximately half of patients who received enteral nutrition and/or TPN were fed within 24 h, in compliance with the ESPEN guidelines, potentially indicating the difficulty of judging which patients would be unable to maintain a full oral diet within 3 days of admission. Additionally, the high incidence of right ventricular dysfunction associated with in the complex cardiothoracic patient population may limit the potential to feed patients at standard recommended rates.
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0055
THE CALORIC INTAKE OF PATIENTS UNDERGOING CARDIAC SURGERY, HOW MUCH IS IT AND DOES IT COVER THE NEEDS?

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INTRODUCTION. Malnutrition has proved to be an independent risk factor in correlation to postoperative outcome. Little is known about the cumulative energetic intake of patients undergoing cardiac surgery, certainly when compared to their caloric needs.
OBJECTIVES. To determine the total caloric intake and to compare it to energy requirements.
METHODS. An observational study was conducted in patients undergoing elective CABG (Coronary Artery Bypass Graft) or valve surgery at the Universitair Ziekenhuis Brussel, from February to April 2012. Preoperative nutritional status was assessed using the NRS 2002, a blood sample and a clinical evaluation. Metabolic needs were calculated using the Harris-Benedict Formula. The daily caloric intake was objectified by a nutritionist, on the Intensive Care Unit and the ward. Intravenous solutions, parenteral and enteral nutrition were taken into account in the caloric intake. The caloric deficits were determined.
RESULTS. Of the 19 patients that were included mean age was 70 ± 10 years and 74 % were male. Mean APACHE II score was 13 ± 6. The Total Energy Expenditure was 2049 ± 430 kcal/day. The Total Caloric Intake was 765 ± 450 kcal/day (37 % of the TEE). On 213 days of hospitalisation, the energy deficit was −265,835 ± 606 kcal. Only patients who received parenteral or enteral feeding (10 %) achieved their recommended caloric intake on 4 occasions.
CONCLUSIONS. Caloric deficits, although relatively easy treatable, are a major and underestimated problem in patients undergoing elective cardiac surgery.

0056
COMPLIANCE WITH GUIDELINES ON NUTRITION IN SEVERE ACUTE PANCREATITIS

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INTRODUCTION. Severe acute pancreatitis (SAP) is a systemic inflammatory syndrome, which may create a highly catabolic state with significant morbidity and mortality and should be treated early and aggressively. Recent evidence shows that patients with SAP benefit from early nutritional support due to the high metabolism that occurs during the inflammatory process, pancreatic infection, septicaemia and multi-organ failure [1]. Enteral feeding improves gut blood flow and prevents bacterial translocation from the gut flora causing severe septicaemia [2].
OBJECTIVES. Measure our compliance with routes of delivering nutrition according to evidence based guidelines [1, 2] and consequent outcomes in a single ICU within a regional hepatobiliary referral hospital.
METHODS. A retrospective case note review of proven SAP cases between 2008–2011. Three nutrition modalities were evaluated: enteral feeding including oral route (EN), total parenteral nutrition (TPN) and nil by mouth (NBM). Data collection also included age, sex,

APACHE 2 score, organ failure, length of stay (LOS) and ICU mortality. LOS was reported as median [range] and all other data as mean [SD].
RESULTS. Forty three SAP case notes were reviewed. The age was 57 [19] years, LOS 5 [1–74] days.

Results and outcomes (*mean [SD]; ^median [range])

	EN	TPN	NBM
Cases (n, %)	19 (44 %)	14 (33 %)	10 (23 %)
Age (years)*	49 [20]	61 [14]	68 [18]
Sex (n, %)	13 (68 %)	9 (64 %)	6 (60 %)
APACHE2 score*	14 [7]	21 [7]	23 [7]
Organ failure cases/group (n, %)	13 [68 %]	13 [93 %]	9 [90 %]
Organ failures/case^	1 [0–3]	2 [0–3]	3 [0–3]
LOS^	4 [1–29]	25 [2–74]	2 [1–6]
Mortality (n, %)	6 [32 %]	10 [71 %]	6 [60 %]

CONCLUSIONS. We complied with current evidence based guidelines of delivering nutrition by the enteral route in 44 % of our patients. This group demonstrated a large reduction in morbidity reflected in LOS compared to the TPN group and mortality compared to both the TPN and NBM groups. However their lower APACHE 2 score may indicate a less sick group where enteral absorption was possible.
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GRANT ACKNOWLEDGMENT. Royal Blackburn Hospital, ICU department.

0057
PREDICTED VS MEASURED ENERGY EXPENDITURE IN CRITICALLY ILL

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INTRODUCTION. Accurate measurement of resting energy expenditure (REE) is helpful in determining the energy needs of critically ill patients requiring nutritional support. Currently, the most accurate clinical tool used to measure REE is indirect calorimetry, which is expensive, requires trained personnel, and has significant error at higher inspired oxygen concentrations
OBJECTIVES. The purpose of this study was to compare REE measured by indirect calorimetry with the energy needs by using the ESPEN recommendations (*European Society for Clinical Nutrition and Metabolism*).
METHODS. We performed a retrospective study in a hospital intensive care unit, where standardized indirect calorimetry measurements were made in 84 ventilated, adult critical care patients, and the predicted energy needs was calculated using the ESPEN recommendations.
RESULTS. We enrolled 84 critically ill patients, 72.6 % male with a median age of 60 ± 17.15 years and a mean body mass index of 25.81 ± 5.15, mortality rate—23.5 %. Type of admission: neurosurgery 53.6 %, medical 14.3 %, transplantation 7.1 %, emergency surgery 9.5 % and elective surgery 15.5 %. We performed 136 measurements using indirect calorimetry (3.38 measurements/patient). Mean REE by indirect calorimetry was 24.79 ± 6.42 kcal/Kg/day and ESPEN guidelines recommends that the critically ill should receive approximately 25–30 kcal/Kg/day
CONCLUSIONS. These data supports some previous findings showing a correlation between REE determined by indirect calorimetry and the use of predictive equations to assess energy needs of critically ill patients. However indirect calorimetry if available, remains the most appropriate clinical tool for accurate measurement of patient's energy needs
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0058
RELATIONSHIP BETWEEN BMI AND O/E RATIO IN CRITICALLY ILL PATIENTS: DATA FROM NUTRITIONDAY

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INTRODUCTION. The Body Mass Index (BMI) is an indicator of nutritional status. Many studies showed that particularly lower BMIs (<20) are associated with poor outcome in critically ill patients.
OBJECTIVES. We analysed the data collected during ICU NutritionDay from 2007 to 2011 in order to examine how the outcome change in relation to BMI during the ICU stay.
METHODS. We analysed the whole ICU NutritionDay database (from 2007 to 2011) and we divided patients into 6 BMI groups (<20, 20–25, 25–30, 30–35, 35–40 and >40). 107 patients have been excluded from our analysis because of failing data about weight and/or height. Based on SAPS2 at admission, we calculated the predicted mortality of each patient and the O/E ratio with 95 % confidence intervals.
RESULTS. We included 4,120 patients. As expected, our data showed higher values of O/E Ratio in the groups with under- and overfeeding (BMI <20, BMI 35–40 and BMI >40; Fig. 1). In these groups female were about 50 % (<20 = 49.6 %, 35–40 = 50.7 % and >40 % = 51.9 %); in the other groups female were less than 40 % (20–25 = 37.3 %, 25–30 = 37.8 % and 30–35 = 37.1 %). The BMI 35–40 group showed surprisingly the highest O/E Ratio values while in BMI >40 group more than 60 % of patients were admitted for medical reasons; these were about 50 % in all other groups.
CONCLUSIONS. We concluded that the patients with a BMI between 20 and 35 have a better observed outcome than expected. We didn't found any straight linear-shaped relationship between BMI and O/E Ratio.
GRANT ACKNOWLEDGMENT. ECCRN

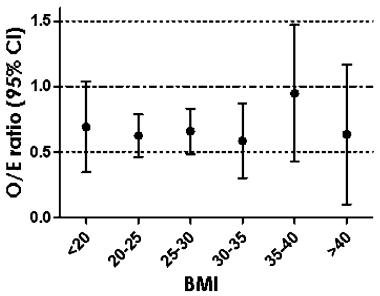

Fig. 1

Trauma update: 0059–0072

0059
FIBRINOGEN SYNTHESIS IN A CHRONIC PIG MODEL OF BLUNT LIVER INJURY AFTER FIBRINOGEN SUBSTITUTION

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INTRODUCTION. Data from animal studies have shown that the early substitution of fibrinogen is effective to treat trauma associated coagulopathy. However, the impact of exogenous fibrinogen substitution on endogenous fibrinogen metabolism is largely unknown.
OBJECTIVES. This study elaborated the use of exognous fibrinogen on endogenous fibrinogen synthesis in a chronic porcine model of coagulopathy with blunt liver injury.
METHODS. Experiments were approved by the local governmental animal care and use office. Haemorrhagic shock and hypothermia (34.0–35 °C) were induced in 12 anaesthetized pigs (34–41 kg) by exchanging 60 % of their blood volume with lactated Ringer's solution (RL). Subsequently, a standardized blunt liver injury was induced with a force of 240–308 N. After a shock period of 5 min, resuscitation was performed with RL and washed red blood cells were re-transfused (13 mL/kg). Next (20 min after trauma), animals randomly received saline solution (controls (C); $n = 6$), or 100 mg/kg fibrinogen (Haemocomplettan, CSL Behring (F); $n = 6$). PT, thromboelastometry (TEM) and fibrinogen levels were monitored for 24 h and blood loss was measured. For statistical analysis an unpaired t test was applied. TEM parameters were analyzed using Mann–Whitney U test.
RESULTS. Coagulation parameters 20 min after trauma and volume resuscitation were severly impaired which was indicated by a significant prolongation of clot initiation (CT), clot formation (CFT), and reduction in clot firmness (MCF) as well as fibrinogen concentration (Figure 1 and 2). Substitution with fibrinogen (F: 1.71 g/L, C: 0.62 g/L; $P < 0.001$) restored coagulopathy significantly. 6 h after trauma the plasma concentration of fibrinogen in the control group increased continously over time reaching a maximum of 4.7 g/L 24 h after trauma. In contrast, plasma fibrinogen concentration in substituted animals showed a later increase (12 h after trauma). The increase of fibrinogen concentration in both groups was associated with a shorteance of TEM variables and increase in clot firmness. 24 h after trauma no difference in coagulation parameters and fibrinogen levels was observed between groups. However, blood loss was significantly reduced following fibrinogen substitution (F: 976 ± 191 mL; C: 1,478 ± 270 mL; $P = 0.004$).

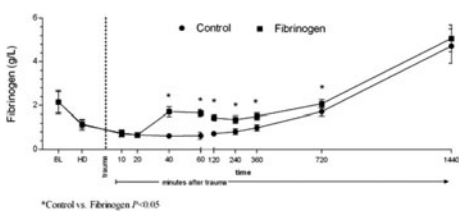

Figure 1

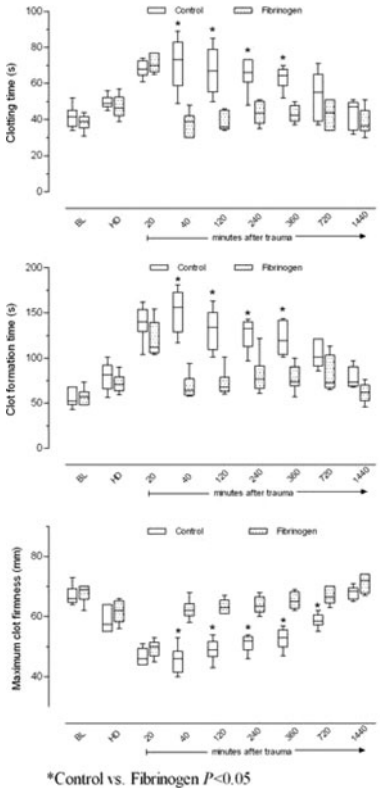

Figure 2

CONCLUSIONS. In this ongoing research project we could show that trauma and hypothermia induced coagulopathy could be reversed by the administration of fibrinogen. Although the application of fibrinogen may be a reasonable approach to reduce the need for blood cell transfusion, the provision of exogenous fibrinogen may delay the onset of endogenous fibrinogen synthesis.

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0060

TACHOSIL IN A PIG MODEL WITH BLUNT LIVER INJURY UNDER SEVERE HYPOTHERMIA

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INTRODUCTION. Rapid control of haemorrhage is one key aspect in damage control surgery. To control bleeding, local haemostatic agents may be useful in addition to standard techniques, especially if hypothermia and coagulopathy complicate surgery. TachoSil is a ready-to-use haemostatic dressing coated with fibrinogen and thrombin that can directly be applied to the bleeding area.

OBJECTIVES. This experimental study was undertaken to evaluate the efficacy of TachoSil in a coagulopathic model of blunt liver trauma in pigs under severe hypothermia.

METHODS. Ethical approval was given by the local governmental animal care and use office. 18 anesthetised pigs (30–37 kg) underwent surgical preparation including cannulation and splenectomy. Haemorrhagic shock and severe hypothermia (33.5 ± 0.5 °C) were induced by isovolemic exchange of 70 % of blood volume with lactated Ringer's solution (RL) and hydroxyethylstarch 130/0.4 (1:1) prior to re-transfusion of salvaged erythrocytes (20 mL/kg within 10 min). Next, a blunt grade III liver trauma was induced with a force of 239–275 Newton, gradually followed by a period of shock (5 min) and fluid resuscitation (6 mL/kg/min RL over 5 min). During this time (first 10 min from infliction of trauma) the lesion was allowed to bleed freely until the animals randomly received treatment with either a TachoSil or a placebo (TachoTop) patch. Blood loss, haemodynamic and coagulation parameters were observed for 2 h. Post mortem, macroscopic examinations of livers were performed to evaluate the severity of liver trauma. An unpaired *t* test was applied for statistical analysis (mean ± SD).

RESULTS. The combination of hypothermia and haemodilution induced severe coagulopathy as measured by thromboelastometry and global coagulation parameters. Following trauma, coagulopathy worsened in the control group over time. 120 min after trauma, both the fibrinogen concentration (56 ± 13 mg/dL) and PT (23 ± 5 s) were significantly different in the control group as compared to the TachoSil group (Fibrinogen: 100 ± 31 mg/dL; P = 0.001; PT: 16 ± 3 s; P < 0.05). Correspondingly, total blood loss was significantly reduced in the TachoSil group (P < 0.001, Figure 1). Macroscopic examination showed comparable degrees of injury with a tight adherence of the TachoSil patch to the area inflicted.

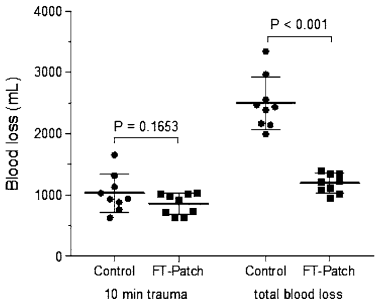

Figure 1

CONCLUSIONS. Despite severe hypothermia and coagulopathy, TachoSil effectively controlled haemorrhage in a swine model with blunt grade III injury. Thus, TachoSil might be used as first line therapy to control bleeding, especially in terms of "bridging" therapy if control of the underlying coagulopathy cannot be achieved in a timely manner.

GRANT ACKNOWLEDGMENT. This research project was supported by Nycomed (Roskilde, Denmark).

0061

EFFICACY AND SAFETY OF UNCROSS-MATCHED TYPE-O RED BLOOD CELLS FOR RESUSCITATION OF TRAUMA PATIENTS: AN OBSERVATIONAL STUDY AND PROPENSITY ANALYSIS

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INTRODUCTION. Early transfusion of red blood cells (RBCs) is recommended for trauma resuscitation of severe hemorrhagic shock and many trauma centers maintain a supply of uncross-matched type-O RBCs (UORBCs) in the emergency department (ED) for immediate use. However, the efficacy and safety of this strategy is not well evaluated in a controlled study.

OBJECTIVES. Our objective was to evaluate the impact of UORBCs on mortality and morbidity using the propensity-score matching method.

METHODS. We conducted an observational cohort study over 4 years (2008–2011). Adults blunt trauma patients were eligible for inclusion if they were admitted to our ICU, administered two or more units of RBCs during first 24 h of hospitalization, and survived 48 h or longer. Ten units of type-O Rh + RBCs were available for immediate transfusion, 45 to 60 min sooner than cross-matched RBCs. UORBCs were administered to any patient with signs of severe hemorrhagic shock at the discretion of the attending emergency physicians. We used propensity-score matching to adjust for clinical profiles between patients with and without UORBCs administration. Outcome measures were survival to hospital discharge, risk of transfusion-related acute lung injury (TRALI), hemolytic and allergic reactions.

RESULTS. Of 128 eligible patients, 31 were enrolled in UORBCs group and 97 were enrolled in non-UORBCs group. The propensity-score matching process selected 30 patients each from both groups. Matched groups had similar clinical profiles including age, gender, injury severity score, revised trauma score, occurrences of hypotension (systolic BP = < 89 mmHg) and impaired consciousness (GCS score = < 8) on ED arrival. There was a significant difference favoring UORBCs administration in survival to discharge (93.3 % vs. 66.7 %, log-rank p = 0.011, adjusted hazard ratio 0.06, 95 %CI 0.01–0.62). However, we did not detect any significant differences in occurrence of TRALI (6.7 vs. 0.0 %), hemolytic reaction (3.3 vs. 10.0 %) and allergic reaction (0.0 vs. 3.3 %).

CONCLUSIONS. Our findings suggested that UORBCs administration could increase the survival chance and not increase the adverse event related to transfusion in blunt trauma patients.

0062

TRAUMA RESUSCITATION USING ECHOCARDIOGRAPHY IN A DEPLOYED MILITARY INTENSIVE CARE UNIT

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INTRODUCTION. Casualties presenting to a military intensive care unit (ICU) following severe traumatic injury suffer haemodynamic instability. Volume status in critically ill patients is difficult to determine. There is interest in the use of transthoracic echocardiography (TTE) to perform real time assessment of haemodynamic status in critical care resuscitation. We describe a feasibility study carried out in a military hospital in Afghanistan, examining the use of focused echocardiography in trauma resuscitation.

OBJECTIVES. To assess the feasibility of use of focused TTE (fTTE) following severe trauma in guiding volume resuscitation.

METHODS. fTTE was performed by a senior intensivist on patients admitted to ICU following severe traumatic injury. A baseline study was performed on admission, and repeated after subsequent therapeutic inputs, e.g. fluid challenge. fTTE data was captured electronically and independently verified by a cardiologist blinded to clinical data. Data were collected on mechanism of injury, TTE view availability, overall LV function, perceived clinical volume status, inferior vena cava (IVC) dimensions and fTTE-assessed volume status. Additionally, Doppler interrogation of the LV outflow tract was performed to provide a velocity time integer (LVOT VTi), and LVOT VTi variability was used as an indicator of preload.

RESULTS. 23 patients were recruited, and 48 individual studies performed. All patients were intubated and ventilated. 17 patients were victims of blast injury.

TTE windows available in this setting were as follows: parasternal long axis 68 %, parasternal short axis 66 %, apical 4 chamber 64 %, subcostal 66 %. IVC imaging was possible in 85 %, and doppler interrogation of the LVOT VTi was achieved in 37 %.

No overt evidence of myocardial contusion was seen. In 12 % of cases, hypovolaemia was so profound that systolic LV cavity obliteration was noted.

The mean maximal IVC diameter in volume-optimised patients at first fTTE (Group 1, n = 18) was 2.0 cm (1.55–2.67), compared with 1.56 (0.8–2.0) in the hypovolaemic cohort (Group 2, n = 25). The mean minimum IVC diameter in Group 1 was 2.0 (1.48–2.37) vs. 1.19 (0–1.74) in the Group 2. IVC collapsibility was entirely absent in Group 1 vs. 26.5 % collapsibility in Group 2.
Data derived from fTTE suggested hypovolaemia in 69 % of cases. Of patients arriving on the ICU, only 31 % were volume optimised using fTTE criteria. Overall, fTTE data led to a change in volume management strategy in 47 % of cases.
CONCLUSIONS. This study has demonstrated, for the first time in a deployed military setting, that echocardiography performed by intensivists is feasible and contributes positively to early resuscitation.
GRANT ACKNOWLEDGMENT. Research Division, Royal Centre for Defence Medicine.

0063

LOW RATIO OF INTRAVENOUS FLUID ADMINISTRATION TO PACKED RED BLOOD CELL IS ASSOCIATED WITH IMPROVED SURVIVAL IN TRAUMA PATIENTS: AN OBSERVATIONAL STUDY AND PROPENSITY ANALYSIS

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INTRODUCTION. Recent studies have suggested a survival advantage in trauma patients who received higher ratio of fresh frozen plasma (FFP) to packed blood cell (PRBC) and restrictive intravenous fluid (IVF). However, the relationship between the ratio of IVF volume to PRBC and outcomes was not fully examined.
OBJECTIVES. We hypothesized that trauma patients who received low ratio of IVF to PRBC (low ratio group) have higher survival rate than patients who received high ratio of IVF to PRBC (high ratio group)
METHODS. We conducted an observational cohort study over 6 years (2006–2011). Adults blunt trauma patients were eligible for inclusion if they were admitted to our ICU, administered one or more units of PRBC and FFP during first 24 h, and survived 24 h or longer. The directions of IVF and transfusion were dependent on the attending doctors. We defined low ratio of IVF to PRBC as less than 1L of IVF per unit of PRBC during 24 h. We used propensity-score matching to adjust for differences between low ratio group and high ratio group. Primary endpoint was survival to discharge.
RESULTS. Of 112 eligible patients, 41 were enrolled in low ratio group and 71 were enrolled in high ratio group. The propensity-score matching process selected 14 patients each from both groups. Matched groups were similar in demographics, injury severity, admission vitals, blood component requirements and the ratio of FFP to PRBC during 24 h. Matched low ratio group had less IVF (4.1L vs. 7.8L, $p = 0.0003$) and lower ratio of IVF to PRBC (0.8L vs. 1.3L per unit of PRBC, $p < 0.0001$) during 24 h. In Kaplan–Meier analysis, there was a significant survival difference favoring low ratio of IVF to PRBC (92.9 % vs. 57.1 %, log-rank $p = 0.032$).
CONCLUSIONS. Less than 1L of IVF per unit of PRBC was associated with improved survival in trauma patients.

0064

TERLIPRESSIN IS SUPERIOR TO LACTATED RINGER SOLUTION FOR CEREBRAL PERFUSION PRESSURE DURING RESUSCITATION IN A MODEL OF HAEMORRHAGIC SHOCK

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INTRODUCTION. Terlipressin (TERLI) in cases of haemorrhagic shock (HS) is a promising treatment to increase mean arterial pressure (MAP) and survival rates similarly to fluid resuscitation [1]. Besides haemodynamic recovery, restoration of cerebral perfusion pressure (CPP) is also essential for an appropriate neurological outcome [2]. To our knowledge, no studies have compared the cerebral effects regarding resuscitation with TERLI and fluid for HS.
OBJECTIVES. To evaluate the effects of TERLI vs. fluid resuscitation with lactated Ringer's solution (LR) on cerebral variables in a model of HS.
METHODS. HS was induced in 27 pigs of 20–30 kg to target MAP of 40 mmHg and maintained for 30 min. Animals were randomized into three groups of 9 animals each: Control, LR and TERLI groups. Brain tissue oxygen pressure ($PbtO_2$) and intracranial pressure (ICP) were assessed by intraparenchymal oxygen probe (Raumedic PTO). Cerebral and haemodynamic measurements and analysis of blood gases were performed prior HS (baseline), after HS prior treatment and 5, 30, 60, 90 and 120 min after treatment. Data were subjected to analysis of variance for repeated measures followed by Tukey test; $P < 0.05$ was considered significant.
RESULTS. In all groups HS resulted in significant decrease of CPP, $PbtO_2$, ICP and cardiac index (CI), and significant increase of blood lactate compared to baseline (Tables 1 and 2). TERLI restored baseline values of CPP and MAP from 30 to 90 min post-treatment; these variables were significantly higher in TERLI group than in LR and control groups after treatment ($P < 0.001$) (Tables 1 and 2). TERLI and LR restored baseline values for $PbtO_2$ which was not observed in control group ($P < 0.001$) (Table 1). Treatment with LR resulted in ICP values significantly higher than in TERLI and control groups from 30 to 120 min after treatment ($P < 0.001$). TERLI and LR groups had CI values significantly higher than control group from 30 to 120 min post-treatment ($P < 0.001$); resuscitation with LR restored CI baseline values from 30 to 120 min post-treatment. All groups had significant increase in blood lactate levels after therapy compared with baseline levels; no significant differences of lactate were observed among groups from 5 to 120 min after treatment (Table 2). Tables 1 and 2: Values were presented as mean ± SD; *within a group, values are significant different from Baseline ($P < 0.001$); †within a time-point values are significant different from Control group ($P < 0.001$); §within a time-point values are significant different from LR group ($P < 0.001$).

Table 1 CPP, $PbtO_2$ and ICP

Parameter	Group	Baseline	Shock	5 min post-treatment	30 min post-treatment	60 min post-treatment	90 min post-treatment	120 min pos-treatment
CPP (mm Hg)	Control	63 ± 5	39 ± 3*	37 ±6*	36 ± 6*	37 ± 10*	37 ± 11*	36 ± 10*
	LR	67 ± 4	41 ± 6*	52 ±6*†	47 ± 7*	44 ± 8*	43 ± 8*	41 ± 9*
	TERLI	64 ± 4	40 ± 5*	54 ±9*†	61 ± 7†§	58 ± 8†§	56 ± 10†§	49 ± 12*
$PbtO_2$ (mm Hg)	Control	36.8 ± 5.7	26.6 ± 6.3*	26.6 ± 6.5*	23.6 ± 7.9*	24.6 ± 7.7*	24.6 ± 8.0*	24.3 ± 8.0
	LR	35.6 ± 3.0	23.3 ± 4.7*	40.7 ± 7.9	33.5 ± 7.2	30.7 ± 8.1	30.1 ± 8.5	29.4 ± 8.4
	TERLI	36.0 ± 5.3	23.6 ± 5.7*	30.0 ± 8.0	34.1 ± 8.6	34.2 ± 8.2	30.0 ± 6.9	30.8 ± 2.7
ICP (mm Hg)	Control	5 ± 2	1 ± 1*	1 ± 1*	2 ± 1*	1 ± 1*	1 ± 1*	1 ± 1*
	LR	5 ± 1	1 ± 1*	9 ± 2*†	8 ± 2*†	7 ± 1*†	7 ± 2*†	7 ± 2*†
	TERLI	5 ± 1	2 ± 2*	1 ± 1*§	3 ± 2*§	3 ± 2*§	3 ± 2*§	3 ± 2*§

Table 2 MAP, CI and blood lactate

Parameter	Group	Baseline	Shock	5 min post-treatment	30 min post-treatment	60 min post-treatment	90 min post-treatment	120 min post-treatment
MAP (mm Hg)	Control	68 ± 4	40 ± 3*	38 ± 6*†	37 ± 7*	39 ± 10*	39 ± 12*	38 ± 10*
	LR	72 ± 4	42 ± 6*	61 ± 6*†	55 ± 7*†	51 ± 8*†	50 ± 7*†	48 ± 8*†
	TERLI	70 ± 5	41 ± 4*	55 ± 9*†	64 ± 8†	61 ± 10†§	60 ± 11†§	53 ± 14†§
CI (L/min/m^2)	Control	4.9 ± 0.5	2.1 ± 0.4*	1.9 ± 0.3*	1.8 ± 0.2*	1.8 ± 0.2*	1.8 ± 0.3*	1.8 ± 0.2*
	LR	5.0 ± 0.6	2.2 ± 0.3*	5.8 ± 0.7*†	5.0 ± 0.7†	4.7 ± 0.8†	4.6 ± 0.6†	4.4 ± 0.7*†
	TERLI	5.0 ± 0.9	2.1 ± 0.2*	2.7 ± 0.3*§	2.8 ± 0.4*†§	2.9 ± 0.4*†§	2.9 ± 0.4*†§	2.9 ± 0.5*†§
Blood lactate (mmol/L)	Control	1.4 ± 0.6	4.7 ± 2.7*	6.7 ± 4.1*	8.4 ± 4.5*	8.5 ± 4.4*	8.7 ± 4.3*	8.9 ± 4.2*
	LR	1.4 ± 0.3	5.9 ± 2.2*	7.7 ± 2.8*	6.2 ± 2.8*	5.2 ± 2.7*	4.5 ± 2.8*	5.3 ± 2.9*
	TERLI	1.6 ± 0.5	5.0 ± 0.8*	5.7 ± 2.3*	6.4 ± 2.4*	7.2 ± 3.2*	7.8 ± 3.7*	8.1 ± 4.0*

CONCLUSIONS. Resuscitation with TERLI was superior to LR for CPP recovery in a model of HS, with significant improvement of $PbtO_2$ and haemodynamics compared to control group.
REFERENCES. 1. Bayram B, et al. Am J Emerg Med. 2011 (in press). 2. Lienhart HG, et al. Curr Opin Crit Care. 2008;14:247–53.
GRANT ACKNOWLEDGMENT. Fundação de Amparo à Pesquisa do Estado de São Paulo (11/00348-1).

0065

RESUSCITATION WITH FLUID OR TERLIPRESSIN DOES NOT INFLUENCE COAGULATION STATUS IN A MODEL OF SEVERE CONTROLLED HAEMORRHAGIC SHOCK

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INTRODUCTION. Terlipressin (TERLI) is a promising treatment in cases of haemorrhagic shock (HS), with haemodynamic recovery similar to fluid resuscitation [1]. However, fluid resuscitation has been associated with haemodilution of coagulation factors [2], and no studies have compared its effects with TERLI treatment on coagulation status after HS resuscitation.
OBJECTIVES. To evaluate the effects of TERLI vs. fluid resuscitation with lactated Ringer solution (LR) on coagulation variables in a model of HS.
METHODS. HS was induced in 27 pigs of 20–30 kg to a target mean arterial pressure of 40 mmHg and maintained for 30 min. Animals were randomized into three groups of 9 animals each: control, LR and TERLI groups. The volume of LR administered was three times the volume of blood shed. TERLI was administered by an intravenous bolus of 2 mg. Blood samples were withdrawn prior HS (baseline), after HS prior treatment and 30 and 120 min post-treatment for assessment of haematocrit (HT), haemoglobin (HB), platelet count, fibrinogen concentration, thrombin time (TT), prothrombin time (PT) and activated partial thromboplastin time (APTT). Data were subjected to analysis of variance for repeated measures followed by Tukey test. Differences were considered significant when $P < 0.05$.
RESULTS. HS resulted in no significant differences on HT, HB, fibrinogen concentration, platelet count, TT, PT and APTT among groups (Tables 1 and 2). LR group had lower values of HT and HB than TERLI and control groups at 30 and 120 min post-treatment ($P < 0.001$). Platelet count was similar between LR and TERLI groups, but significantly lower in LR group compared to control group 30 and 120 min after treatment ($P < 0.001$) (Table 1). There were no significant differences in fibrinogen levels, TT, PT and APTT among groups after treatment (Table 2). Tables 1 and 2: Values were presented as mean ± SD; *within a group, values are significant different from Baseline ($P < 0.001$); † within a time-point values are significant different from Control group ($P < 0.001$).

Table 1 Haematocrit, haemoglobin, platelet count

Variable	Group	Baseline	Shock	30 min post-treatment	120 min post-treatment
Haematocrit (%)	Control	27.2 ± 2.0	26.2 ± 3.5	23.4 ± 3.0	23.6 ± 3.1
	LR	25.8 ± 2.8	25.6 ± 3.1	17.0 ± 4.0*†	17.4 ± 4.0*†
	TERLI	26.0 ± 2.3	25.1 ± 1.8	24.1 ± 2.7§	23.0 ± 3.4§
Haemoglobin (g/dL)	Control	8.9 ± 0.7	8.970.6	8.3 ± 0.5	8.2 ± 0.5
	LR	8.3 ± 0.8	8.6 ± 0.9	6.1 ± 1.3*†	6.2 ± 1.4*†
	TERLI	8.7 ± 0.7	8.4 ± 0.7	8.0 ± 0.8§	7.4 ± 1.1§
Platelet count (platelets/ μL)	Control	434,333 ± 78,237	428,667 ± 70,982	366,667 ± 77,774*	359,667 ± 76,958*
	LR	336,625 ± 62,278	338,500 ± 85,070	249,750 ± 66,480*†	251,250 ± 77,078*†
	TERLI	366,667 ± 70,822	362,222 ± 59,621	333,111 ± 59,290	305,889 ± 58,364

TT, PT, ATPP

Table 2

Variable	Group	Baseline	Shock	30 min post-treatment	120 min post-treatment
TT (s)	Control	26.7 ± 16.8	38.6 ± 20.9	43.6 ± 17.9	44.1 ± 19.1
	LR	40.5 ± 18.1	38.0 ± 20.0	43.4 ± 20.0	34.1 ± 19.7
	TERLI	31.4 ± 15.8	41.7 ± 13.4	43.6 ± 16.1	37.3 ± 17.9
PT (s)	Control	13.8 ± 1.9	13.1 ± 1.4	13.6 ± 0.9	13.6 ± 1.0
	LR	12.3 ± 2.0	12.3 ± 1.5	12.2 ± 1.0	12.9 ± 1.5
	TERLI	13.4 ± 1.7	12.2 ± 3.9	14.0 ± 2.0	14.0 ± 1.2
ATPP (s)	Control	29.0 ± 3.8	27.5 ± 14.3	29.9 ± 6.4	29.5 ± 6.3
	LR	29.5 ± 8.7	26.3 ± 9.9	31.1 ± 4.3	23.4 ± 2.9
	TERLI	24.4 ± 5.4	24.7 ± 6.8	25.2 ± 6.3	24.5 ± 4.5

CONCLUSIONS. Resuscitation with LR and TERLI had no significant differences with control group regarding coagulation status in a model of HS.
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0066

THE SURGICAL MANAGEMENT OF SEVERE PENETRATING LIVER TRAUMA: A DYNAMIC APPROACH ACCORDING TO INITIAL RESPONSE TO THERAPY

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INTRODUCTION. Penetrating Liver Trauma (PLT) can be a major technical challenge in the operating room albeit most blunt liver injuries are managed non-operatively. Furthermore, deep penetrating liver injuries may not always respond to common damage control techniques such as Pringle Maneuver and Pac ing (PMP).
OBJECTIVES. Describe our approach for patients with severe PLT according to their initial response or lac thereof to PMP.
METHODS. We reviewed 146 patients with PLT managed at a Regional Level I Trauma Center, from 01/2003 to 12/2011 using a stepwise approach that rapidly moves toward exposure of deep intra-hepatic structures and major vessel ligation (VL) in those patients not responding to PMP.
RESULTS. Fifty eight patients had superficial liver lacerations that required no treatment; PMP was required in 88/146. GSW occurred in 78/88 (88.6 %). The overall median age was 30 years. Fifty five responded to PMP alone whereas 33 continued to bleed despite PMP. These patients underwent immediate intra-hepatic vessel exposure and vessel ligation (PMP + VL). Ten patients required ligation of major intra-hepatic branches which included the supra-hepatic veins (n = 4), portal vein (n = 4), retro-hepatic cava (n = 1) and hepatic artery (n = 1). The remaining 23 patients required VL of smaller intra-hepatic vessels, combined with other hemostatic techniques such as topical agents and/or hepatorrhaphy.

General characteristics

Clinical outcomes in severe PLT	PMP alone, n = 55	PMP+VL, n = 33	p
Intra-operative bleeding, cc, median (IQR)	1,500 (1,000–2,500)	2,500 (1,500–4,000)	0.006
Associated injuries, n (%)	37 (36.7)	24 (72.7)	0.591
Complications, n (%)	25 (46.3)	19 (57.6)	0.307
Mortality, n (%)	2 (3.6)	12 (36.4)	0.001

CONCLUSION. PMP is an effective first line therapy for hemorrhage control for most patients with severe PLT. For those patients that fail to respond to PMP, immediate intra-hepatic exploration and major vessel ligation is required.

0067

PREDICTIVE PERFORMANCE OF A PREHOSPITAL ACTIVATION CODE TO IDENTIFY PATIENTS IN HAEMORRHAGIC SHOCK

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INTRODUCTION. Early detection and treatment are key points in the management of haemorrhagic shock (HS). Prehospital identification of patients in HS may accelerate and optimize their management on arrival in the trauma centre [1, 2]. Various simple parameters are available on scene and could be used to recognize these patients, such as systolic arterial pressure (SAP), heart rate (HR) and capillary haemoglobin (Hb cap).
OBJECTIVE. The objective of this study was to evaluate the predictive performance of a prehospital activation code to recognize haemorrhagic shock.
MATERIALS AND METHODS. This retrospective study included patients admitted for severe trauma over 2 years in two trauma centres in the Paris Area. HS was defined as SAP < /= 90 mmHg on admission and or transfusion of more than four units of blood in the first 6 h. The activation code included: HR >/=120 b/min, SAP < /= 90 mmHg, Hb cap < /= 9 g/dl, delta between two prehospital Hb cap measurements (ΔHb cap) >/=3 g/dl, prehospital introduction of vasopressors. The code could be activated when at least one of these criteria was met. The predictive performances were expressed as sensibility, specificity, positive and negative predictive value, positive and negative likelihood ratio (LR); results were expressed as median and interquartile range [IQR].
RESULTS. Of 869 patients admitted for major trauma, 120 were excluded because of incomplete data. Of the 749 analysed patients (age 33 [24, 47], IGSII 22 [12, 45], ISS 17 [9, 29]), 110 were in HS. The table shows the predictive performance of the code and each criterion during prehospital screening. The positive predictive value of the code was 33,5 %, the negative predictive value was 97,5 %. If applied the code would have missed HS in in 11 % of the HS cases and falsely predicted HS in 23 % of all cases.
DISCUSSION. Despite not perfect, the code displayed a satisfactory predictive performance with a particularly excellent negative LR for prehospital detection of patients with HS. The pertinence of the integration of the code into a HS specific and comprehensive management procedure requires a prospective multicentre evaluation.

Predictive performance of each criterion and code

	Sensibility % (IC)	Specificity % (IC)	LR+ (IC)	LR− (IC)
SAP ≤90 mmHg	60 (49.7–67.8)	85 (82.3–87.8)	4.1 (3.1–5.1)	0.47 (0.3–0.6)
HR ≤120 b/min	37 (27.1–44.7)	88 (85.5–90.2)	3.1 (2.2–4.3)	0.71 (0.6–0.8)
Hb cap ≥3 g/dl	38 (26.3–43.8)	92 (89.6–93.8)	4.8 (2.9–6.2)	0.6 (0.5–0.8)
Vasopressor	50 (40.8–59.1)	90 (88.2–92.7)	5.4 (3.9–7.3)	0.6 (0.4–0.7)
Code (at least one criterion present)	89 (81.9–93.6)	72.9 (69.3–76.2)	3.2 (2.7–3.9)	0.2 (0.1–0.3)

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0068

POLYTRAUMA PATIENTS IN EMERGENCY OF A TERTIARY HOSPITAL. HAVE THEY CHANGED THEIR CHARACTERISTICS?

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INTRODUCTION. Severe trauma has been a real public health problem in recent years by high mortality and severe disabilities that produces, forcing years ago protocol handling. Nevertheless few records exist of polytrauma patients attending hospital emergency room (its) services, which makes it difficult to plan and organize teams of Trauma care. Then present the results of a year—a prospective electronic registry of polytrauma patients who attend our her.

METHODS. All the trauma patients which have been treated in the service of emergency of the Hospital Universitario La Paz of Madrid (tertiary hospital) have been collected in an electronic record. They have been collected demographic variables (age and sex), GSC's arrival, radiological test done (TAC I ECO-fast), type of trauma, injury mechanism and ultimate fate of the patient. The collection period was from January 1 to December 31, 2011.

RESULTS. During the year 2011 have been treated a total of 421 (incidence of the 0.4) trauma patients. A 65.2 % were male, and the overall average age was 42, 2 ± 17, 9 years old. Traumatic brain injury was the most common trauma (73.5 %), followed by the orthopaedic trauma (71.9), thoracic trauma (61.4) and abdominal trauma (36). TAC was made to 78.6 patients and ECO-fast to the 3.2. The median of the GSC was 14, 6 patients requiring intubation orotraqueal. 20.1 The patients required admission to the ICU, a 1.5 required urgent surgery and with 68.4 % were managed in the emergency room and discharged from the service. The most frequent injury mechanism was the accident of car (44.2 %), followed by accident of motorbike (15.4 %), precipitated (13.1 %), bicycle (6.2 %) and other accident (21,1 %).

CONCLUSIONS. (1) trauma patient prototype remains a man of middle ages which has suffered an accident, brain and orthopedic trauma, which is performed with a body-TAC, and that is managed in the emergency service.

(2) It is necessary to develop multicentre prospective (at regional and national level) records trauma patient to better understand its features and be able to optimize the care of such patients with the development and creation of trauma teams.

0069

EFFECT OF PARTIAL BRAIN ISCHEMIA ON THE METABOLIC AND HEMODYNAMIC RESPONSES TO HEMORRHAGE HYPOTENSION MEASURED IN THE BRAIN AND SMALL INTESTINE

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INTRODUCTION. During hemorrhage blood is redistributed in favor of the vital organs and on the expense of the less vital organs. Bilateral carotid occlusion (BCO) is an animal model of arteriosclerosis, which is considered to be the leading cause of mortality due to reduced blood supply to the brain, in industrialized countries.

OBJECTIVES. The purpose of the present study was to investigate how BCO influences the responses of the brain (vital organ) and small intestine (less vital organ) to hemorrhagic hypotension

METHODS. Rats were bled until mean arterial pressure (MAP) of 40 mmHg was achived, with or without the induction of BCO 24 h prior to the bleeding session. MAP level was maintained for 15 min, after which the animals were resuscitated with the withdrawn blood. Metabolic and hemodynamic monitoring from both organs were carried out using the Multi-Site Multi-Parametric system, which simultaneously monitors tissue blood flow using laser Doppler flowmeter and mitochondrial NADH redox state using surface fluorometery.

RESULTS. While hemorrhage under normoxic conditions caused a decrease in blood supply (30 ± 7 %, $p < 0.01$) to the intestine, and mitochondrial dysfunction (132 ± 10 %, $p < 0.01$), the brain preserved its normal function. However, under partial ischemic conditions hemorrhage caused deterioration in both organs. Blood supply to both brain and intestine rapidly decreased and remained low through the entire hemorrhage period (79.5 ± 8 %, $p < 0.001$ and 56 ± 10 % $p < 0.001$), respectively). In addition, mitochondrial dysfunction was observed in both brain (137 ± 9 %, $p < 0.01$) and intestine (145 ± 12 %, $p < 0.01$). Furthermore, the responses of CBF to hypotension, exhibited an event called Ischemic-Depolarization (ID) revealed by a vasoconstriction of small vessels in the cortex.

CONCLUSIONS. The Impaired blood supply to the brain decreased cerebral autoregulation abilities and therefore decreased its protection during hemorrhage. The ID demonstrated the severity of the ischemic damage to normal mitochondrial function under combination of partial ischemia and hemorrhagic hypotension. These results emphasis the importance of adequate cerebral perfusion for the maintenance of body homeostasis.

0070

PREHOSPITAL CONTROL OF SYSTOLIC ARTERIAL PRESSURE IN HAEMORRHAGIC SHOCK

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INTRODUCTION. Early resuscitation of haemorrhagic shock (HS) is mainly pressure driven. Recent European Recommendations suggest a systolic arterial pressure (SAP) between 80 and 100 mmHg as target range in HS with patients without severe brain injury until bleeding is under control [1].

OBJECTIVE. The objective of this study was to assess the level of SAP of severe trauma patients in HS on arrival in the trauma centre.

MATERIALS AND METHODS. This observational study included patients admitted for severe trauma in two trauma centres in the Paris Area over two years. HS was defined as SAP < /= 90 mmHg on admission and/or transfusion of more than four units of blood in the first six hours and/or prehospital administration of vasopressors (norepinephrine, NEP). Epidemiological, clinical and biological data were collected. Results were expressed as median [interquartile range] and percentage. The statistical analysis used the Chi-Square and Student *t* test, a level of $p < 0.05$ was considered as significant.

RESULTS. 111 patients in HS without traumatic brain injury were admitted, 19 were excluded because of cardiac arrest on arrival. Of the 92 remaining patients, 40 % (n = 37) had a SAP >100 mmHg upon arrival in the trauma bay, 43 % (n = 16) of them received continuous infusion of NEP started by the prehospital EMS. 31 (34 %) had a SAP <80 mmHg, 14 (45 %) were treated with NEP. Patients with NEP and without are compared in table 1.

DISCUSSION. In this sample of trauma patients in HS, implementation of a recommended arterial systolic pressure was not achieved in almost 75 % of cases. NEP was quite often successfully introduced on scene to stabilize SAP when volume expansion did not succeed alone. This did not induce an excessive increase in SAP in patients in HS on arrival at the hospital compared to patients managed without NEP. Overall patients receiving NEP were more severely injured and showed more organ dysfunction and higher mortality. These observations suggest that a prospective trial on the use of NEP in early resuscitation and optimal therapeutic targets in HS appears necessary.

Characteristics of patients with and without NEP

	NEP− (n = 53)	NEP+ (n = 39)	p
Age (years)	35 [21–54]	34 [27–49]	ns
Sex ratio M/F (n)	38/53	27/39	ns
SAPS II	42 [23–55]	49 [42–70	0.003
ISS	29 [17–43]	41 [34–50]	0.001
SOFA H24	8 [6–11]	11 [8–13]	0.02
Initial SAP (mmHg)	95 [80–110]	72 [60–80]	<0.001
Volume expansion (mL)	1,000 [750–1,500]	1,500 [1000–2,000]	0.01
ΔHb cap, g/dL	2[1–4]	3.1 [1–5]	ns
Prehosp intubation, n (%)	27 [51]	33 [85]	<0.001
SAP admission (mmHg)	90 [74–110]	96 [75–114]	ns
Lactate H0, mmol/L	3 [2–6]	6 [3–10]	0.001
Transfused RBC (n)	7 [5–11]	9.5 [6–13]	0.05
Mortality, n (%)	10 [19]	17 [53]	<0.001

(Δ Hb Cap=Initial prehospital capillary haemoglobin - capillary haemoglobin on arrival)

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0071

PREVENTION OF HYPOTHERMIA IN PRE-HOSPITAL SEVERELY INJURED TRAUMA PATIENTS. A SIMPLE SYSTEM

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INTRODUCTION. Abnormalities in patient body temperature is frequently associated in severe injury trauma and the increases in mortality is associated with profound hypothermia, especially below 35 °C [1–2].

OBJECTIVES. We have studied the prevention of hypothermia in pre-hospital severely injured trauma patients using a simple system to reduce hypothermia during a pre-hospital management of trauma patient.

METHODS. We enrolled 246 patients from 11/2006 to 02/2012, during winter season (outside temperature of less 10 °C) with severe trauma. To define the severity of the trauma has been used the ISS and has been measured the tympanic temperature, average of 4 measurements, 2 for each ear, at the start and arrival in hospital. The P values for categorical variables were derived from the Chi-square or two-side Fisher's exact Test. All patients received infusion of IV liquid preheated to a temperature of 36 degree C, according to their clinical needs. The pH of blood of each patient was measured on arrival at hospital. Were excluded from the study patients under 18 years of age, patients with severe head injury, GCS <9, and cardiac arrest. 27 patients were excluded from the study because it was not possible to correctly measure the temperature according to the protocol approved. 219 patients were studied, in 150 of them (group A) has been used a self-heating system (Ready-Heat II, Techtrade Llc,New York,USA) in order to prevent hypothermia, in the remaining 69 (B) only an emergency blanket (Boscarol, Bolzen, Italy) with a metallic reflecting agent.

RESULTS. We did not find statistical differences for sex (62 female in A, 28 in B), age (mean age 51 ± 14 in A, 49 ± 12 B), ISS (34 ± 9.2 vs. 36 ± 8.1) and MAP (90 ± 22 vs. 85 ± 17) between patients enrolled in the two groups, the mean temperature was 33.84 ± 0.62 in group A and 33.78 ± 0.72 in B one at the start. The mean air temperature during the rescue procedures was 1.33 ± 4.40 °C in group A and 1.14 ± 4.79 in B ($p = 0.24$). The mean time between the beginning of the emergency procedures and the arrival in hospital was 48 ± 12 min in group A and 45 ± 10 in the B one. Upon arrival at the hospital, the mean temperature was 34.82 ± 0.58 in group A and 33.99 ± 0.67 in B ($p < 0.001$), the pH of blood was of 7.33 ± 0.07 in A and 7.19 ± 0.07 in B ($p < 0.01$).

CONCLUSIONS. The self-heating system has proven a valuable method for reducing the deterioration of hypothermia in trauma patients exposed to weather conditions favoring hypothermia. This can potentially reduce the harmful effects resulting from hypothermia.

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0072

DEGREE OF NECK IMMOBILISATION, INFLUENCE ON JUGULAR VENOUS PRESSURE AND PATIENT COMFORT: COMPARISON OF FOUR TYPES OF NECK COLLARS

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INTRODUCTION. Cervical spine immobilisation with a neck collar is routine during initial evaluation of trauma victims. A tight neck collar may obstruct venous outflow by compressing neck veins, adding to the amount of blood in the brain, and and thus risking further increase in intracranial pressure in patients with cerebral injury and/or cerebral oedema.

OBJECTIVES. To compare four different types of neck collars regarding efficacy of immobilizing the neck, effect on jugular venous pressure (as a surrogate for intracranial pressure) and patient comfort in healthy volunteers.
METHODS. The characteristics of four different neck collars Laerdal Stifneck® (SN) (Laerdal Medical AS, Norway), Vista® (VI) (Aspen Medical Products, USA), Miami J® Advanced (MJ) (Össur hf, Iceland) and Philadelphia® (PH) (Össur hf, Iceland) were studied in ten volunteers (5 men, 5 women). Efficacy of neck immobilisation was measured with goniometry, effect on jugular venous pressure was measured directly through a catheter inserted from the cubital fossa under fluoroscopy and participants graded the various collars according to comfort on a scale from one to five.
RESULTS. The mean age of participants was 27 ± 5 yr, height 176 ± 11 cm, weight 80 ± 9 kg and BMI 26 ± 5. The mean neck movement (53 ± 9°) decreased significantly from baseline with all the collars ($p < 0.001$) to the following values: SN 18 ± 7°, MJ 21 ± 10°, PH 22 ± 8° and VI 25 ± 9°. There was not a significant difference between SN and MJ ($p = 0.06$) nor MJ and PH ($p = 0.98$) but the difference was significant across all other conditions. The average pressure in the jugular vein (9.4 ± 1.4 mmHg) increased with all the collars to the following values: SN 10.5 ± 2.1 mmHg, MJ 11.7 ± 2.4 mmHg, VI 13.5 ± 2.5 mmHg and PH 16.3 ± 3.3 mmHg. There was not a significant difference between baseline and SN nor between SN and MJ and MJ and VI but otherwise the difference was significant. VI received the highest grade for comfort (4.2 ± 0.8) followed by MJ (3.9 ± 1.0), SN (2.8 ± 1.0) and PH (2.2 ± 0.8). There was not a significant difference between VI and MJ and SN and PH, otherwise there was.
CONCLUSIONS. The SN collar immobilized the best and had least effect on jugular venous pressure but came third on comfort and suites therefore for emergency situations. The MJ collar showed broad-spectrum qualities for both acute and long-term treatment, being in second place in all features with insignificant difference from the collar in first place. The VI collar could be used when there is lower demand of immobilization and the PH collar should only be for short term use. This seems to fit with the current clinical use of these collars. The methodology used in this study may give new criteria regarding design of neck collars.
GRANT ACKNOWLEDGMENT. The study was supported by Össur hf Iceland.

Acute coronary syndrome in the ICU: 0073–0086

0073
MYOCARDIAL INFARCTION AND PERCUTANEOUS REVASCULARIZATION: SHORT-TERM PROGNOSIS IN >75 YEARS OLD

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INTRODUCTION. The cohort of elderly patients with myocardial infarction usually show a differential management in terms of resource use, with a high rate of comorbidity, complex coronary lesions and high rate of complications.
OBJECTIVE. Short-term monitoring of patients (p) >75 years with myocardial infarction in 2009 in which a percutaneous coronary intervention was performed (ICP).
MATERIALS.
Design : Retrospective study.
Location: Cardiology consultation in a third level hospital.
Subjects: Patients >75 years old who suffered a myocardial infarction in 2009 and who were referred to a percutaneous coronary intervention. Follow-up at 6 and 12 months after hospital discharge.
METHODS. We performed a complete medical history, examination, electrocardiogram and recorded the presence of cardiovascular events after discharge, quality of life assessed by Karnofsky scale and new hospital admissions or emergency attendances.
FINDINGS. The sample comprised 25 p, with mean age of 78.32 years, 56 % male, 96 % had hypertension, 48 % had dyslipidemia, 52 % diabetic, 19 had NSTEMI and 6 p had SCASEST. 11 % had a history of ischemic heart disease, 5 % had a previous revascularization. The TIMI was ≥5 in 48 %, 50 % had multivessel disease, in 34 % the revascularization was complete. 40 % had left ventricular dysfunction at discharge. The average Karnoksky score was 93 (six months) and 91 (12 months). Survival at 6 and 12 months was 92 and 84 % respectively. 3 patients died, 1 at 3 months, due to a malignant arrhythmia, and 2 patients at 8 months, because of myocardial infarction and refractory heart failure. 3 patients had to be re-admitted in the 12 months follow-up, 1 had a brady-arrhythmia, requiring permanent pacemaker, and 2 for unstable angina with conservative management.
CONCLUSIONS. The group of elderly patients with myocardial infarction, who underwent ICP have a good prognosis in the short term, with a low rate of mortality and cardiovascular complications, with an acceptable quality of life.

0074
STUDY ABOUT SURVIVAL AND QUALITY OF LIFE IN >75 YEARS OLD WITH ACUTE CORONARY SYNDROME

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INTRODUCTION. Acute coronary syndrome without ST-segment elevation (NSTE ACS) is one of the clinical entities that have suffered more variations in terms of pathophysiologic knowledge and therapeutic approach especially in cardiology in recent years.
OBJECTIVE. To analyze the survival and quality of life at 6 months after discharge of patients >75 years old
MATERIALS AND METHODS.
Design : Retrospective study.
Location: third level hospital.
Subjects: Patients >75 years old with the diagnosis of myocardial infarction without ST-segment elevation (NSTE ACS).
METHODS. We studied 52 consecutive patients admitted with NSTE-ACS and Tn positive in 2005. We analyzed gender, TIMI score, origin, destination at discharge, survival after discharge and quality of life (Karnofsky scale telephone survey).
FINDINGS. We analyzed 52 patients (p), including 29 men (55.8 %). TIMI: in 40 p (76.9 %) of 3–4 points and 12 p (23.1 %) of 5–7. Killip clinical grade: 35 p (67.3 %) in grade I, 8 p (15.4 %) in grade II, 6 p (11.5 %) in grade III and 3 (5.8 %) in grade IV. Source: 38 p (73.1 %) were admitted from the emergency room, 12 p (23.1 %) from the ICU and 2 p (3.8 %) from another center. Coronary angiography was performed in 19 p (35.2 %). In 5 p (9.3 %) coronary angiography was performed within 48 h of admission. ICP was performed at 16 p (29.6 %), all grade I-II Killip. The culprit vessel was the DA in 14 p (73.8 %), the CD 4-p (21.1 %) and the CX in 1 p (5.3 %). There was no need rescue angioplasty. In 9 p (16.9 %), thrombolysis was used. None underwent coronary bypass surgery. The discharge destination was as follows: 44 p (84.6 %) at home, 2 p (3.8 %) were referred to another center, and 4 (7.7 %) died during in-hospital. Survival: Of the 38 patients interviewed by telephone, 36 p (94.7 %) survived at 3 months and 2 p died within the first 2 months. At 6 months, 35 survived (92.1 %) of these 38 patients survived. All PCI patients surviving at 6 months follow up after discharge. Quality of life: 18 (50 %) with[70 points, 10 p (27.7 %) with 60 points, 7 patients (19.4 %) with 50 points and 1 patient (2.9 %) with 40 points.
CONCLUSIONS. Survival of elderly patients with myocardial infarction in the short term is high, particularly those undergoing PCI. The quality of life for most of these patients is good, incapable of normal activity, but may make an independent life.

0075
INITIAL RISK STRATIFICATION IN PATIENTS WITH ST-ELEVATION MYOCARDIAL INFARCTION BY ECG PATTERN AND TIMI SCORE

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OBJECTIVE. To determine whether the initial ECG pattern adds positive predictive value to the TIMI risk score in patients with ST-elevation myocardial infarction (STEMI).
METHODS. The study population comprised all patients with STEMI admitted consecutively to the ICU of Carlos Haya hospital, Malaga, Spain between 2004 and 2008. Data were recorded prospectively on age, sex, initial Killip class, and mortality. Part of the initial evaluation included the TIMI Risk Score and an analysis of the initial ECG pattern. Patients were classified as "High Risk" or "Low Risk". The High Risk group comprised all patients with a TIMI >3 and/or "High Risk" ECG, compatible with proximal occlusion of the anterior descending artery (LADp), ↑ST anterior and ↓ST inferior, or ↑ST ≥2 mm in V1, or RBBB), or in the right coronary artery (RCp, ↑ST ≥1 mm in V4R), and those who had primary ventricular fibrillation (primary VF). Analyses were done with the Student *t* test, Chi-square, logistic regression, and the area under the ROC curve.
RESULT. The study included 806 patients, 75.6 % men, mean age 63.11 + 12.83 years, TIMI 3.57 ± 2.38; 81.4 % were Killip class 1. Mortality in the ICU was 10.3 % and in the hospital 11.3 %. Those who died were older (72.73 ± 10.88 vs. 61.90 ± 12.61 years) ($p < 0.001$) and had a higher TIMI (6.43 ± 2.61 vs. 3.21 ± 2.08) ($p < 0.001$). The patients were grouped according to whether their TIMI was ≤3 or > 3. In the 431 patients with TIMI ≤3 mortality was 2.9 % and in the 375 with TIMI >3 the mortality was 19.7 % ($p < 0.001$). In 465 patients there was no high-risk ECG and their mortality was 8.2 %; in the 341 with a high-risk ECG the mortality was 14.4 % ($p < 0.05$). In the 162 patients with TIMI ≤3 and a high-risk ECG the mortality was 3.1 %. In the patients with TIMI >3 and a low-risk ECG the mortality was 16.8 % and in the 174 with a high-risk ECG it was 26.8 % ($p < 0.001$). Logistic regression analysis showed that a high-risk ECG complemented the TIMI coded as continuous: TIMI: OR 1.72 (1.55–1.92) and ECG:OR 1.81 (1.09–2.98). It also complemented the TIMI coded as >3 points, with an OR of 11.1 (5.65–21.81) and for the ECG, 1.79 (1.13–2.85). The discrimination of mortality evaluated with the area under the ROC curve was 0.832 (0.786–0.878) for the continuous TIMI, and when complemented with the high-risk ECG it was 0.837 (0.79–0.88). The area of the model that included ECG and TIMI in categories was 0.77 (0.72–0.82). The area for the high-risk ECG was 0.59 (0.53–0.65) and for the TIMI in categories it was 0.74 (0.69–0.79).
CONCLUSIONS. In patients with STEMI a high-risk ECG was associated with greater mortality, though with a poor discriminatory capacity. The ECG complemented the TIMI, slightly improving its discriminatory capacity.

0076
DOES PATIENT GENDER INFLUENCE IN MANAGEMENT OF ACUTE CORONARY SYNDROME WITH ST ELEVATION IN OUR FIELD?

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OBJECTIVES. Analysing specific features and management, both extra and in-hospital, of the acute coronary syndrome with ST segment elevation (STEMI) in our field according to patient gender.
METHODS. A prospective study was performed in all patients admitted with STEMI in our field (University Hospital Virgen de las Nieves in Granada) during a 2 years period (January 2010- December 2011). To that end, we used ischemic cardiopathology in Andalucía data base registers (ARIAM group). Statistical analysis was made through χ^2, considering $p < 0.05$ as significant. Categorical variables were expressed as percentages and qualitative variables as average and standard deviation.
RESULTS. Patients admitted with STEMI was 232. 81 % were men and 19 % women. Average age was 66.21 ± 12.15, being women (70.55 ± 11.23) older than men (61.68 ± 13.06). Among cardiovascular risk factors we found significant differences included: Smoker (94.7 % men), diabetes mellitus (80.2 % men), history of coronary heart disease (88.23 % men) and HTA (75.6 % men). Between the comorbidities there were also differences statistically significant in chronic obstructive pulmonary disease being 95.5 % men. 70.83 % of men and 43.18 % of women were revascularized through fibrinolysis and coronarography was performed at some time during admittance to 98.6 % of men and 70.4 % of women. Regarding the times, we found significant differences in the symptoms onset-contact with first health system being 125.87 ± 176.75 in men and 205.36 ± 221.75 in women. We did not find differences in the rest of the times (symptoms onset-fibrinolysis hour, symptoms onset-coronariography, neither in the symptoms onset-balloon inflation). There were no differences statistically significant regarding the average stay in ICU neither in mortality at hospital discharge.
CONCLUSIONS. Men are younger but more pluripathological than women. Women are older and has a bigger delay in symptoms onset until first health system contact, which could influence when deciding the carrying out of a reperfusion therapy.

0077

BENEFICIAL EFFECTS OF THE PRESCRIPTION OF FIXED DOSE COMBINATION OF BETA-BLOCKER AND DIURETIC IN PATIENTS WITH RENAL FAILURE AND HISTORY OF NON-ST-SEGMENT-ELEVATION ACUTE CORONARY SYNDROME

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INTRODUCTION AND OBJECTIVES. The use of fixed combinations is an increasingly common fact, offering numerous benefits, especially in medicated patients. The aim of this study was to analyze the impact of the use of fixed dose combination of beta-blocker (BB) and diuretic on the prognosis of patients with renal failure discharged from hospital for an episode of non-ST-segment-elevation acute coronary syndrome (NSTEACS).

METHODS. Prospective analysis of all patients with renal failure (defined by a renal clearance <60 ml/min/m 2, according to abbreviated MDRD equation) consecutively discharged for an episode of NSTEACS, from July 2008 to December 2009. We studied clinical and epidemiological variables, establishing a prognostic analysis based on the use of fixed combination compared with conventional treatment. We completed a median follow up of 20 months in 100 % of cases.

RESULTS. We included 134 patients, 37.3 % women. The mean age was 73.3 ± 8.7 years. 76.1 % of patients were hypertensive, 49.3 % diabetic, 50 % dyslipidemic and 49.3 % anemic. They showed a Charlson comorbidity index 4.5 ± 2 and a TIMI Risk score of 3.4 ± 1.3. We found left ventricular systolic dysfunction in 30 % of cases. 35 patients (26.1 %) were treated with fixed combination of BB and diuretic, and had higher percentage of adherence to treatment compared with patients receiving conventional treatment (88.6 vs. 74.7 %, $p = 0.03$), lower cardiovascular death rate after long term-up follow-up (2.9 vs. 19.2 %, $p = 0.01$). There were no differences in other prognostic variables studied ($p > 0.2$). After adjustment, the use of fixed combination predicted lower risk of cardiovascular death (OR 0.12, 95 % CI, 0.04 to 0.34).

CONCLUSIONS. The use of fixed combination of BB and diuretic in patients with renal failure and history of NSTEACS was associated with a more favourable prognosis, in terms of long-term follow-up cardiovascular mortality. This seems justified by the greater adherence to treatment.

0078

DIFFERENCE DIAGNOSIS OF ACUTE ISCHEMIC STROKE WITH LEFT HEMIPARALSIS AND ACUTE AORTIC DISSOCIATION

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INTRODUCTION. Intravenous thrombolysis using tissue plasminogen activator (tPA) can improve patient outcomes in acute ischemic stroke(ASI) if administered within 3 h onset. However, patients with acute aortic dissection (AAD) should avoid tPA therapy due to the possibility of tPA administration inducing rupture of AAD. Therefore, we should discriminate ASI and AAD in Emergency room. Especially, it is necessary to take account to patients of ASI with left hemiparesis. In this study, we investigated difference of clinical data between ASI with left hemiparesis and AAD.

METHODS. The study group comprised 14 patients (6 males, 8 females; 63.9 ± 13.6 years) of AAD and 52 patients of AIS with left hemiparesis (24 males, 28 females; 73.8 ± 10.1 years) transported to our hospital from 2007 to 2010. We investigated systolic blood pressure and diastolic blood pressure each groups at Emergency room from our hospital clinical record. We compared blood collection data such as white blood cell (WBC) ($10^3/\mu L$), Hemoglobin(Hb)(g/dL), Platelet($10^3/\mu L$), C-reactive protein(CRP) (mg/dL), International normalized ratio (INR), fibrinogen(mg/dL), activated partial thromboplastin time (APTT) (s) and fibrinogen degradation products (FDP) (μg/mL) between ASI group and AAD group.

RESULTS. There was no significance about systolic blood pressure and diastolic blood pressure between two groups. There was no significance about Hb, CRP, INR, fibrinogen, and APTT between 2 groups. WBC had significantly risen in AAD group (ASI group; 7,488.4 ± 2,840.9 × $10^3/\mu L$ and AAD group; 11,750 ± 4,380.7 × $10^3/\mu L$, $p < 0.05$).
FDP also had significantly risen in AAD group (ASI group; 7.8 ± 1.1 μg/mL, AAD group; 97.6 ± 166.1 μg/mL, $p < 0.01$).

CONCLUSIONS. The elevated FDP value may be one of the clues used to diagnose acute aortic dissection (AAD) with left hemiparesis.

0079

PREDICTORS OF INOTROPIC DRUGS UTILIZATION IN ADULT CARDIAC SURGERY WITH CARDIOPULMONARY BYPASS

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INTRODUCTION. Heart dysfunction is frequent after cardiopulmonary bypass (CPB) in cardiac surgery and is commonly treated with inotropic drugs. Despite wide utilization, there are no evidence-based clinical guidelines on the most appropriate use of inotropes. Additionally, use of inotropes in adult cardiac surgery (ACS) is associated with increased morbility and mortality (**1**).

OBJECTIVES. Our primary endpoint was to identify which factors are independently associated with the use of inotropic therapy in patients undergoing ACS with CPB in our institution.

METHODS. Data were retrospectively collected from our database after reviewing electronic medical records. We studied patients undergoing adult cardiac surgery with CPB in our Institution from January 2002 to December 2011. Inotropic support was defined by continuous infusion for at least 1 h of one or more of the following drugs: dobutamine, dopamine, adrenaline, noradrenaline, amrinone, levosimendan.

RESULTS. Of the 6,555 patients studied, 34.05 % received positive inotropic drugs in the operating theatre and/or in ICU. No institutional protocol influenced the administration of inotropic drug. We studied a total of 33 variables as possible predictors of inotrope use divided in demographic (3), pre-operative (22) and surgery related factors (8). Logistic regression analysis identified 15 independent predictors of inotropic support: 9 preoperative/demographic (Additive Euroscore, NYHA class, diabetes, preoperative EF, weight, creatinine clearance, preoperative use of: diuretics, Calcium Channel blockers, anti-arrhythmic drugs), 6 surgery related (reintervention, Mitral Valve, Double-Valve, Combined Intervention, duration of surgery, cross-clamp time). The predictive ability of different logistic regression models was then evaluated by means of the Receiver Operating Characteristic curve. The best model resulted in an area under the curve of 0.8337 (95 % confidence interval 0.8234 to 0.844, <0.0001), Fig. 1.

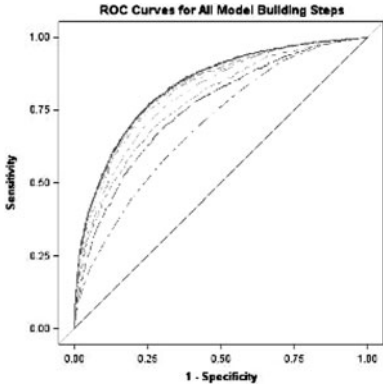

Fig 1: The receiver operating characteristic curves

CONCLUSIONS. Several factors may influence use of inotropic support in patients undergoing CPB. As shown by others, great variability can be found among different centers and single anesthesiologists [2]. This indicate a wide difference approaching the use of inotropic therapy. In effect in some centers weaning from CPB with inotropic drugs is a consolidated routine. Anyway in our Institution we found a similar percentage (34.05 %) of inotropic therapy compared with overall incidence in several previous studies [3, 4]. We think it's necessary to improve the knowledge of factors related to inotropic use in cardiac surgery in order to help optimization of anaesthesia management with a more targeted therapy.

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0080

QT INTERVAL IN PATIENTS WITH ST-ELEVATION MYOCARDIAL INFARCTION. RELATION WITH MORTALITY AND COMPLEMENTARITY WITH THE TIMI AND APACHE II

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OBJECTIVES. To analyze in patients with ST-elevation myocardial infarction (STEMI) the relation between mortality and a prolonged QT interval and the TIMI and APACHE II scales.

METHODS. We undertook a nested cohort case–control study (N = 524) of patients with STEMI admitted to Carlos Haya hospital, Malaga, Spain between 2007 and 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 those who survived (1 of every 6). Patients with extra-hospital cardiac arrest or mechanical ventilation were excluded. Data were recorded on age, sex, inital Killip class, TIMI, APACHE II, and mortality. These data were obtained from the UCI-CX program, a prospective detailed registry of the clinical histories. Data were obtained from the history records of the ECG on hospital admission and the heart rate, and the QT interval and the corrected QT (QTc) were analyzed. QT was considered to be prolonged when it was ≥0.45 s in men and ≥0.47 s in women. The analyses were done with the Student t test, Chi square test, and logistic regression.

RESULTS. Of the 38 (7.25 %) patients who died in the hospital, 34 (6.5 %) died in the ICU. A first ECG was obtained in 104 patients, 34 of the 38 patients who died and 70 of the 81 who survived. The QTc interval was prolonged in 30 patients (28.8 %), of whom 18 were cases (52.9 % of the cases) and 12 controls (17.1 % of the controls) ($p < 0.001$). The total sample was weighted according to the sampling fraction and the mean age was 65.29 ± 13.54 years; 79 % were men. Killip Class I: 71.8 %, APACHE II: 10.96 ± 4.35, and TIMI 3.89 ± 2.54. The APACHE II was higher in those who died compared with those who survived 19.11 ± 7.37 vs 10.32 ± 3.26 as was the TIMI: 7.37 ± 2.95 vs 3.62 ± 2.30; the differences were significant. After the weighting, the sample that underwent ECG (n = 454) had a QTc interval of 0.433 ± 0.033 s. The QTc in those who died (n = 34) was 0.457 ± 0.044 s and in those who survived (n = 414) it was 0.431 ± 0.031 s ($p < 0.001$). The QTc interval was prolonged in 19.8 % of the patients (n = 90), with a mortality of 20.9 % (n = 18), and it was normal in 80.2 % (n = 364), with a mortality of 4.4 % (n = 16) ($p < 0.001$). Logistic regression showed a relation between mortality with a prolonged QT and the TIMI (TIMI: OR:1.59 (1.29–1.97); QT: OR: 3.20 (1.06–9.67)). The area under the ROC curve for this model was 0.86 (0.78–0.94); individually, for TIMI it was 0.84 (0.76–0.91) and for prolonged QT it was 0.68 (0.56–0.79). A second model was constructed with the APACHE II, with OR 1.66 (1.32–2.08) and prolonged QT with OR 4.53 (1.21–16.97); the area under the ROC curve for this model was 0.92 (0.87–0.98), and individually, for the APACHE II it was 0.88 (0.81–0.95).

CONCLUSIONS. In patients with STEMI the discrimination of the TIMI and APACHE can be improved by the analysis of the QTc on hospital admission.Hospital mortality was greater in patients with a prolonged QTc given equal TIMI and APACHE values.

0081

FACTORS ASSOCIATED WITH THE DEVELOPMENT OF AN EPISODE OF ACUTE CORONARY SYNDROME IN PATIENTS EVALUATED BY A CHEST PAIN UNIT

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INTRODUCTION AND OBJECTIVES. Chest pain is a source of frequent hospital emergency care. The underlying cause to it can be potentially fatal, why have established chest pain units (CPU) as a tool for risk stratification. The aim of this study is to determine the independent predictors of hospitalization for acute coronary syndrome (ACS) in patients evaluated by a CPU.

MATERIALS AND METHODS. Prospective analysis of all patients consecutively referred to the CPU, from June 2009 to October 2011. We analyzed the percentages of patients admitted with ACS after completing a follow-up with a median of 8 months.

RESULTS. We included 837 patients, 41.6 % women, mean age 59.58 ± 13.36 years, after mid-term follow-up, 25 patients required hospitalization for ACS, which showed compared to other patients, higher cardiovascular risk profile, more advanced mean age (66.5 ± 12.1 vs. 59.6 ± 13.3, $p = 0.01$), higher prevalence of previous ischemic heart disease (55 vs. 22.8 %, $p = 0.0001$) and prior coronary revascularization procedure (40 vs. 13.6 %, $p = 0.001$), hypertension (84 vs. 56 %, $p = 0.004$) and diabetes (40 vs. 12.4 %, $p = 0.001$). We found a higher percentage of abnormal results in inducible myocardial ischemia test in patients admitted with ACS (100 vs. 18.5 %, $p = 0.0001$), higher Duke treadmill score (−9.1 ± 7.8 vs. 5.4 ± 5.5, $p = 0.0001$) and lower percentage of normal angiographically coronary arteries (0 vs. 26.4 %, $p = 0.05$). After adjustment, high risk Duke treadmill score (defined as score ≤ −11) and a history of diabetes was associated with higher risk of hospitalization for ACS (OR 8.9, 95 % CI, 6.5 to 16.8 and OR 5.6, 95 % CI, 1.01 to 12.1, respectively).

CONCLUSIONS. Patients discharged from CPU and requiring hospitalization for ACS after the mid-term follow-up show a less favorable cardiovascular risk profile and higher percentage of abnormal results in inducible myocardial ischemia test. A history of diabetes and high risk Duke treadmill score were independent predictor of admission for ACS in these patients.

0082

GRACE SCORE AND CARDIAC MAGNETIC RESONANCE FOR PREDICTING CARDIAC EVENTS AFTER HOSPITAL DISCHARGE IN PATIENTS WITH ST SEGMENT ELEVATION ACUTE MYOCARDIAL INFARCTION

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INTRODUCTION. Grace Score permits an early stratification of the risk of events in patients with ST segment elevation acute myocardial infarction (STEMI). Cardiac magnetic resonance (CMR) is the reference imaging technique for the complete non invasive characterization of the structural consequences of STEMI. Prognostic implications of a combined analysis of Grace Score and CMR to predict events after hospital discharge in STEMI patients has not been analyzed yet.

OBJECTIVE. To determine the prognostic implications of a combined analysis of Grace Score and CMR to predict events after hospital discharge in STEMI patients.

METHODS. We prospectively included 461 patients admitted with STEMI. Grace Score was determined at the time of admission. CMR was carried out in the first week post-STEMI and a quantitative (% of ventricular mass) and semi-quantitative analysis (number of segments with late gadolinium enhancement (LGE) in >50 % of wall thickness) of the extent of infarction were performed. Events during follow-up (death, myocardial infarction, re-admission for heart failure) were registered.

RESULTS. Of the 461 patients included CMR was performed in 390 patients; 71 patients were excluded due to events during hospitalization or contraindication to CMR. During a median follow up of 644 days 17 deaths, 25 infarctions and 26 re-hospitalizations for heart failure were detected; 52 patients (13 %) had a first post-discharge event. The event rate in patients with low (≤125), intermediate (126–154) and high (≥155) risk in Grace Score was 6/106 (6 %), 20/156 (13 %) and 26/126 (21 %) respectively ($p < 0.01$). The percentage of infarct mass was greater in high risk patients (20 ± 15 %, 20 ± 14 %, 25 ± 16 %, $p = 0.01$) but the Grace score showed a weak association (area under the curve 0.58 [0.52 to 0.63]) with extensive infarcts (>20 %, median) and did not significantly relate to ejection fraction. In the multivariate analysis, independent predictors of events were high risk Grace Score (3.4 [1.4 to 8.3], $p = 0.007$) and extent of the infarction (number of segments) (1.3 [1.2–1.4], $p < 0.001$). Risk of events was higher in patients with > 5 segments (23/296, 8 % vs. 29/92, 31 %, $p < 0.001$). The extent of infarction in 0–5 or >5 segments allowed to discriminate the event risk in patients with low (1 vs. 23 %, $p = 0.001$), intermediate (10 vs. 23 %, $p = 0.05$) and high (11 vs. 46 %, $p < 0.001$) risk in Grace Score.

CONCLUSION. Our results illustrate that for predicting events in patients with STEMI clinical assessment and the use of sophisticated techniques are both useful. Grace Score permits a simple and early risk stratification that can be optimized by determining the extent of the infarction with CMR.

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0083

CLINICAL AND EPIDEMIOLOGICAL CHARACTERISTICS OF PATIENTS WITH ACUTE HEART FAILURE: GENDER-ASSOCIATED DIFFERENCES

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INTRODUCTION. Little is known about gender-associated differences in baseline characteristics and outcome in acute heart failure (AHF) pts. The increasing incidence of HF pts obliges to investigate possibilities of their improved management. The aim of the present study was to investigate AHF gender-associated differences that might be used to improve patient treatment, life quality and outcome.

METHODS. A prospective observational study on 22,713 Emergency (ED) pts was conducted at the Sisters of Mercy University Hospital Center, Zagreb, Croatia, during 2010. The survey included 726 consecutive AHF pts treated at appropriate level of care: Intensive care unit (ICU), Intermediate care or ED. Main outcome measures were clinically relevant gender-associated differences. The secondary outcome measure was the proportion of patients with different types of AHF. Good outcome was defined as discharge from the ED or hospital.

RESULTS. In 2010 a total of 22,713 ED patients were screened, 11,555 of whom were recorded in the first 6 months. There was a total of 1,526 (6.7 %) patients with suspected or confirmed AHF, 894 (7.7 %) of them in the first 6 months. Following the exclusion of patients with a false-positive diagnosis (n = 151) and engagement of exclusion criteria (n = 17), a complete statistical analysis was done on 726 patients; 409 (56.3 %) of those enrolled were women. The patients were allocated into six groups according to the recently published ESC Guidelines for the diagnosis and treatment of AHF: (1) Worsening or decompensation of CHF (49.5 %); (2) Hypertensive HF (23.6 %); (3) Isolated right HF (11.8 %); (4) Pulmonary edema (7.5 %); (5) Cardiogenic shock (3.8 %); and (6) ACS and HF (3.8 %). Females had a higher SAPS II score (28.5:26.6 points; $p = 0.001$; 95 % CI 0.76–3.11); there was no difference in APACHE II score (11.3:10.6 points). The overall mortality rate was 67 pts (9.2 %).

The chief complaint was dyspnea (85.5 %). Females suffered more frequently from hypertensive AHF, and males from acute coronary syndrome associated AHF ($p = 0.046$). Females were older ($p < 0.001$; 95 % confidence interval [CI] 3.63–6.47), with higher body mass index ($p = 0.032$; 95 %CI 0.22–4.9), hypertension history ($p < 0.001$), hypertension at ED presentation ($p < 0.001$), nitrate administration ($p = 0.04$), atrial fibrillation ($p = 0.028$), digitalis therapy ($p = 0.011$), urinary tract infections ($p = 0.006$). Males had a higher frequency of ST-elevation myocardial infarction ($p = 0.037$), dilated cardiomyopathy ($p < 0.001$), ultrasound confirmed four chamber dilation ($p = 0.022$), left ventricle dilation ($p < 0.001$), and lower ejection fraction ($p = 0.003$; 95 % CI, 2.12–10.58). In co-morbidities males were more frequently smokers ($p < 0.001$) with a history of chronic obstructive pulmonary disease ($p = 0.001$).

CONCLUSIONS. Early identification and treatment of gender-associated co-morbidities might decrease the number of pts suffering from worsening of CHF and improve AHF pts outcome and their life quality.

0084

FUNCTIONAL OUTCOME AFTER OUT OF HOSPITAL CARDIAC ARREST: A 1 YEAR FOLLOW-UP

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BACKGROUND. Cardiac arrest survivors may experience hypoxic brain injury that results in cognitive impairments which frequently remains under diagnosed, especially when the patients recover basic level of functioning. We propose a prospective study; our aim is to describe the functional status of cardiac arrest survivors, 12 months after the onset.

METHODS. In this prospective study, all adult patients admitted alive after an out of hospital cardiac arrest in one intensive care unit and conscious within the first week have been consecutively included between January 2009 and June 2010. Exclusion criteria included terminal illness, psychoactive or anticonvulsive medication, known history of neurologic disease or alcohol or drug abuse. Follow up consisted of regular interviews and cerebral MRI when possible. The primary outcome measure was the Glasgow Outcome Scale Extended GOS E 12 months after the cardiac arrest.

RESULTS. Thirteen patients (mean age 46.5) have been consecutively included. Mean low flow duration was above 45 min. Cerebral MRI was performed within the first month and showed anomaly in half the patients. At 1 year, almost 70 % of the patients were not autonomous for elaborate activities such as managing their finances or return to their premorbid job because of neuropsychological sequelae. Cognitive disorders included mostly executive dysfunction but behavioural concern was not uncommon and psychological consequences of the caradiac arrest was important and constituted a burden for the significant others.

CONCLUSION. We include only patients conscious within the first weeks after a cardiac arrest and at 1 year, only 13 % of them were free of sequelae at 1 year whereas half of them needed help for basic to elaborate activities of daily living. This small sample study calls for more large ones, proposing systematic follow-up for survivors after a cardiac arrest.

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0085

LONG-TERM PROGNOSIS IN PATIENTS WITH ANGINA WITHOUT CORONARY LESSIONS

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OBJECTIVE. To determine the influence in the outcome of patients admitted for coronary chest pain with no obstructive lesions.

MATERIALS AND METHODS.

Design: Retrospective study.

Location: Cardiology ward.

Subjects: We included all patients admitted to the cardiology ward from 2000 to 2008, with the diagnosis of chest pain, and in which a coronary angiography was performed in the first entry. We contacted to all patients by telephone and asked about the existence of new hospital admissions for cardiac causes. In all those who had been readmitted, we collected if new ischemia tests had been performed ischemia, or a new coronary angiography, the appearance of new lesions or progression of previous in it and if any kind of intervention had been made. We also measured sex, traditional cardiovascular risk factors, menopause, the presence of a hiatal hernia, the electrocardiogram on admission, test positive in the presence of ischemia or coronary slow flow.

RESULTS. There were 12 readmissions in 6 patients in whom coronary angiography was repeated and half showed new lesions in coronary arteries. There were 5 deaths in the follow-up, 4 non-cardiac origin and one due to myocardial infarction in a patient with

coronary angiography at 1 month of discharge. As for the distribution of clinical variables only statistically significant differences in the smoking variable that appeared to 7 times more often in men and in the use of aspirin at discharge which was 3 times more common in men. We found no significant differences in the conduct of test ischemia, the same positivity and the presence of slow coronary flow in the first entry. There were no gender differences in the rate of readmissions, death, need for coronary angiography and the emergence of new coronary lesions. In patients readmitted found no clinical variable was associated with a greater likelihood of future income. In the 12 patients readmitted were no significant differences in the appearance of new coronary lesions, segmental abnormalities of contraction, slow flow and execution of test ischemia.
CONCLUSIONS. In our series, these patients have a good prognosis, with a low rate of complications and need for future interventions due to high comorbidity associated with diffuse coronary disease in most cases and with a high rate of resource consumption and in-hospital complications.

0086
IMPROVEMENTS IN THE PROGNOSIS OF PATIENTS WITH HYPERTENSION DISCHARGED FOR NSTEACS WITH THE USE OF FIXED DOSE COMBINATION OF ACE INHIBITOR AND CALCIUM CHANNEL BLOCKER

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INTRODUCTION AND OBJECTIVES. The use of fixed combinations in the treatment of patients with hypertension has several benefits. One of the most notable is the better adherence to pharmacological treatment. The aim of this study was to analyze the impact of the use of fixed dose combination of ACE inhibitor and calcium channel blocker (dihydropyridine) on the prognosis of hypertensive patients discharged from hospital for an episode of non-ST-segment-elevation acute coronary syndrome (NSTEACS)
METHODS. Prospective analysis of all hypertensive patients consecutively discharged for an episode of NSTEACS, from July 2008 to December 2009. We studied clinical and epidemiological variables, establishing a prognostic analysis based on the use of fixed combination compared with conventional treatment. We completed a median follow up of 23 months in 100 % of cases.
RESULTS. We included 417 patients, 65.2 % men. The mean age was 68 ± 10.4 years. 45.3 % of patients were diabetic, 58.5 % dyslipidemic and 79.1 % the reason for prior admission was unstable angina. They showed a Charlson comorbidity index 2.4 ± 2.1 and a TIMI Risk score of 3 ± 1.4. We found left ventricular systolic dysfunction in 22 % of cases. 124 patients (29.7 %) were treated with fixed combination of ACEI and CCB, and had higher percentage of adherence to treatment compared with patients receiving conventional treatment (88.7 vs. 77.8 %, p = 0.03), lower cardiovascular death rate after long term-up follow-up (1.6 vs. 6.8 %, p = 0.02), admission for heart failure (HF) (5.6 vs. 11.9 %, p = 0.03), admission for a new episode of acute coronary syndrome (ACS) (13.7 vs. 21.8 %, p = 0.03) and major adverse cardiovascular events (MACE) (17.7 vs. 29.4 %, p = 0.01). After adjustment, the use of fixed combination predicted lower risk of developing heart failure (OR 0.39, 95 % CI, 0.16 to 0.94), ACS (OR 0.55, 95 % CI, 0.30 to 0.98) and MACE (OR 0.5, 95 % CI, 0.29 to 0.86).
CONCLUSIONS. The use of fixed combination of ACEI and CCB (dihydropyridine) in patients with hypertension and history of NSTEACS was associated with a more favorable prognosis. This seems justified by the greater adherence to treatment.

Prevention of ICU-aquired infections: 0087–0100

0087
SELECTIVE DECONTAMINATION OF THE DIGESTIVE TRACT IN A MIXED ICU IN A UNIVERSITY TERTIARY-CARE HOSPITAL: INITIAL 6 MONTHS IMPACT

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INTRODUCTION. Selective Decontamination of Digestive tract (SDD) is an antimicrobial prophylaxis initially proposed to reduce the incidence of severe infections of lower airways [1]. Further evidence demonstrated that SDD reduces mortality [2] in critically ill patients requiring mechanical ventilation. Despite of the evidence the use of SDD remains controversial.
OBJECTIVES. To prospectively evaluate the initial impact after 6 months 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 October1, 2011 to March 31,2012 who were expected to required tracheal intubation for longer than 48 h were included in SDD, and were given 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 one weekly. Diagnostic samples were obtained if clinically indicated. We compared all consecutive patients admitted to ICU who acquired nosocomial ICU infections from April 1 to September 30, 2011 (A group) and from October 1, 2011 to March 31, 2012 (B group) In each of the study 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 of the infections (Catheter-related and other secondary bacteremia, pneumonia and urinary infection) 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 $p = 0.05$.The data were analyzed using PASW statistical software (SPSS, Chicago IL).
RESULTS. Results are shown in Table 1,

Table 1 SDD

SDD	NO (Grupo A): N = 43	YES (Grupo B): N = 36	P
Male/female	67.9/32.6	66.7/33.3	0.942
Age (years)	59.9 ± 18.4	63.6 ± 13.3	0.302
APACHE II score	20.6 ± 7.7	23.6 ± 8.8	0.107
Days in ICU	28 (16–48)	35 (20–52)	0.197
Deaths, n (%)	13 (30.2)	14 (38.9)	0.419
Renal replacement therapy, n (%)	11 (25.6)	17 (47.2)	0.045
Septic shock, n (%)	18 (41.9)	22 (61.1)	0.373
Extended Spectrum Beta-lactamase bacteria infections, n (%)	15 (34.9)	10 (27.8)	0.499
Nosocomial pneumonia, n (%)	25 (58.1)	13 (36.1)	0.051

Table 2 Rate of nosocomial infections

	NO (Group A) N = 43	SDD YES (Group B) N = 36	P	RR (95 % CI)
Primary and catheter-related bacteremia/1,000 days of CVC	1.997	1.999	0.998	1.001 (0.363; 2,761)
Other secondary bacteremia/ 1,000 days in ICU	4.93	3.17	0.178	0.643 (0.337; 1,223)
Nosocomial pneumonia/ 1,000 days of MV	9.40	4.06	0.009	0.432 (0.230; 0.812)
Urinary infection/1,000 days of urinary catheter	1.52	2.12	0.496	1.390 (0.5339; 3.586

Table 3 Antibiotics daily dose (grams)/100 stays

ICU sections	Section 1		Section 2		Section 3	
SDD	NO (Group A)	YES (Group B)	NO (Group A)	YES (Group B)	NO (Group A)	YES (Group B)
Tobramycin	3.6	0	1.89	1.62	2.67	1.35
Amikacin	3.21	1.62	0.93	0.54	0	2.13
Ceftazidime	0.48	1.59	2.61	1.86	0	1.2
Ciprofloxacin	3.7	0.8	4.63	4.32	8.04	5.18
Meropenem	29.76	19.2	1.89	2.1	10.23	19.77
Imipenem	8.5	6.3	3.94	4.92	6.07	3.36
Vancomicyn	0.39	1.39	5.56	1.8	0.9	1.09
Colistin	10.24	12.88	0.45	0.04	0	1.48

There were not statistical significance differences between both groups in risk factors for infections or type of ICU admission. We had a significant reduction in nosocomial pneumonia rates. There was neither an increased incidence of antibiotic-resistant bacteria (ARB) infections nor any infection by Clostridium difficile. There was a decreased of the antibiotics daily doses/100 UCI stays during SDD protocol application for tobramycin, imipenem and ciprofloxacin.
CONCLUSIONS. We have demonstrated a significant reduction in nosocomial pneumonia rates after 6 months of application of SDD without an increase of ARB infections.
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0088
HAND HYGIENE COMPLIANCE TOWARDS WHO 5 MOMENTS OF HAND HYGIENE AMONG NURSES AND PHYSICIANS IN HIGH RISK AREAS IN A TERTIARY HOSPITAL IN NEW DELHI, INDIA

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INTRODUCTION. Health care associated infections (HCAI) are a major problem for patient safety and its surveillance and prevention must be a top priority for the hospitals. World Health Organization (WHO) guidelines recommend specific five moments of hand hygiene to reduce transmission of microorganisms to patients by health care workers (HCW).
OBJECTIVES. To identify the compliance to the WHO five moments in high-risk areas among nurses and physicians after an awareness drive.
METHODS. First Hand Hygiene (HH) audit was done in Aug 2011 that revealed a HH compliance of 34 % among the physicians and 37 % in nurses. A preliminary hand hygiene awareness survey was conducted to identify the gaps. 90 % of HCW identified HH as the most important way to prevent HCAI but the awareness about the WHO five moments of HH was 100 % in nurses, 90 % in physicians, 83 % in physiotherapist and 60 % in technicians. Forgetfulness was listed as the major cause for non-compliance to hand hygiene by 50 % and >80 % suggested that awareness drive would be the best way to increase HH compliance. A 2-month awareness drive was run with a specific aim to increase compliance to HH. Subsequently HH surveillance was done in Nov 2011 and later in Feb 2012 in high-risk areas that included MICU, PICU, NICU, CTVS ICU, ICCU, Dialysis unit and The Emergency room. The surveillance time was 9.00 AM to 5.00 PM and 60 min observation time was spent in each high-risk area by an unidentified observer. In this observational study, data was collected prospectively.
RESULTS. A total of 410 HCWs were observed during the study, which included 252 (61.4 %) nurses and 158 (38.6 %) doctors. The overall compliance to hand hygiene increased among both doctor and nurses during each surveillance time period i.e. in November 2011 and in February 2012. Among the doctors, the compliance rate which was 34 % in august 2011, increased to 51.4 % in November 2011 and 67 % in February 2012. Whereas, among the nurses, the compliance rate which was 37 % in august 2011, increased to 58 % in November 2011 and 74.6 % in February 2012. The cardiothoracic ICU showed highest improvement in overall compliance rate among both doctors and nurses. The

compliance to WHO-5 moments of HH showed improvement in November 2011 but no significant improvement during subsequent surveillance.
CONCLUSIONS. There was increase in compliance rate to hand hygiene among both doctors and nurses in high risk areas. Regular awareness drive is essential to maintain and increase compliance to hand hygiene practices.
REFERENCE(S). 1. WHO guidelines on hand hygiene in health care. World Health Organization 2009. 2. Centers for Disease Control and Prevention. Guideline for Hand Hygiene in Health-Care Settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. MMWR 2002;51 (No. RR-16).

0089
EARLY INVASIVE FUNGAL INFECTIONS (IFI) AND UNIVERSAL ANTIFUNGAL PROPHYLAXIS (UAP) AFTER LIVER TRANSPLANTATION (LTX): CHANGING THE APPROACH ACCORDING TO THE RISK

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INTRODUCTION. IFIs occur in 4 to 42 % of LTx patients, even if lower figures (1–4 %) has recently been reported. *Candida* (35–91 %) and *Aspergillus* (1–8 %) account for nearly all IFIs with high attributable mortality (30–70 %). While targeted antifungal prophylaxis (TAP) in high risk (HR) pts seems justified, more controversial is AP in low risk (LR) pts.
OBJECTIVES. We retrospectively reviewed 192 consecutive LTx recipients (Jan 2009–Oct 2011, 6 combined kidney liver tx, KLTx) who received UAP to determine 1. the incidence of early (3 months) IFIs and the associated risk factors (RFs); 2. the proportion of pts at high (HR) and low risk (LR) for IFIs; 3. how appropriate (or not) was UAP in this series.

METHODS. Immunosuppression included antithymocyte serum, steroids and IL_2 inhibitors. Anti-infective prophylaxis included cefotaxime and tobramycin (48 h), oral nystatin, systemic antifungal (Fluconazole [FLU], 3 mg/kg/day, 3–4 weeks) and antiviral prophylaxis. Amphotericine B lipid/liposomal formulations (ABL) were used as TAP/pre-emptive treatment (3–5 mg/kg/day, 7–10 days) in case of fulminant hepatic failure (FHF), post-transplant abdominal reexploration, retransplantation, renal failure, CRRT, acute rejection, documented mould colonization and/or positive galactomannan assay. IFIs were defined according to Singh et al. (2011), pts at high and low risk for IFI according to Pappas et al. (2010).
RESULTS. Median age was 54 y, MELD score 15 ± 7. LTx indications were viral cirrhosis (70 %), ETOH cirrhosis (25 %), miscellaneous (5 %) (HC in 50 % of the cases). Mortality rate at 3 months was 5 %. Infections episodes (76) were present in 40 pts (21 %). 45 pts were at HR (24 %), 147 (76 %) at LR for IFI. 4 IFIs were recorded in 4 pts (2 %, CI 95 % 0.02 %-3.98 %) and were more represented in HR pts (6.6 %, vs 0.7 %, $p = 0.04$): 2 had *C Glabrata* candidemia and recovered; 2 had invasive *Aspergillosis* (1 proven, LRTI, 1 probable) and recovered. *Candida* colonization was present in 15 pts (8 %, *C Albicans* 56 %). At univariate analysis ($p \leq 0.05$), independent RFs for IFI were HR, KLtx, CRRT, FHF, fungal colonization, peritonitis, bloodstream infection. Rejection, retransplantation, transfusion >15 PRC Units, relaparotomy, choledochojejunostomy did not reach statistical significance.
DISCUSSION. In this series of pts incidence of IFI (2 %) and outcome (no mortality) were at the lowest reported levels. TAP/preemptive approach with broader spectrum antifungals (ABL) in the HR group might have played a role in achieving these results, reinforcing the need for strict definition of pts at HR for IFI and for a correct choice of the antifungal agent. Our study confirms the futility of UAP with FLU in LR pts (1 episode of *C Glabrata* candidemia in LR pts, with *C Glabrata* not responsive to FLU). Due to the different risk factors for *Candida and Aspergillus*, and in presence of different *Candida* epidemiology, broad spectrum antifungals should be considered for TAP.

0090
THE IMPACT OF GLUTAMINE ON ORGAN FUNCTION AND MORTALITY OF PATIENTS WITH SEVERE SEPSIS

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OBJECTIVES. To determine the effect of treatment with glutamine on organ function and mortality in patients with severe sepsis.
METHODS. This was a single-centre, prospective, randomizes controlled study, conducted in Surgical Intensive Care Unit (SICU) of an academic tertiary care hospital in China. 40 patients with severe sepsis were randomized enrolled into control group (n = 21) and glutamine groups (n = 19). All the Patients received basic therapy according to surviving sepsis campaign guideline. Patients in glutamine group received additional therapy with intravenous infusion of glutamine (0.67 g kg^{-1} day^{-1}) for 7 days. Sepsis-related organ failure assessment(SOFA) during therapy period, mortality of 28-day and 60-day mortality were assessed.
RESULTS. There were no significant differences of basic information between two groups, such as age, genders, primary disease, sites of infection, APACHE II and SOFA before therapy. On day 7, the concentration of plasma glutamine in glutamine group was significantly higher than that in control group ($p = 0.040$). On day 7, SOFA of kidney in glutamine group was significantly lower thanthat in control group ($p = 0.048$. SOFA of kidney in glutamine group on day 7 was significantly lower than that on day 0 ($p = 0.008$). In glutamine group, creatinine on day 7 was significantly lower than that on day 0, day 3 and day 5 respectively (p value were 0.001, 0.003, 0.035 respectively). On day 7, the creatinine clearance in glutamine group was significantly higher than that in control group ($p = 0.044$). On day 7, the morbidity of acute kidney injury in glutamine group was significantly lower than that in control group ($p = 0.036$). There was no significant difference of 28-day mortality between glutamine group and control group (31.58 vs. 42.86 %, $p = 0.462$). The 60-day mortality of glutamine group was significantly lower than that of control group (36.84 vs. 76.19 %, $p = 0.024$).
CONCLUSIONS. Administration of glutamine can increase the concentration of plasma glutamine of patients and decrease 60-day mortality of patients with severe sepsis. The impact of glutamine on organ function was to improve renal function and decrease morbidity of acute kidney injury associated with severe sepsis.Clinical trial: Chi CTR-TRC-1100–1445.
REFERENCE(S). 1. Hu YM, Pai MH, Yeh CL, Hou YC, Yeh SL.Glutamine administration ameliorates sepsis-induced kidney injury by downregulating the high-mobility group box protein-1-mediated pathway in mice. Am J Physiol Renal Physiol. 2012;302(1):F150–8. 2. Rodas PC, Rooyackers O, Hebert C, Norberg Å, Wernerman J.Glutamine and glutathione at ICU admission in relation to outcome. Clin Sci (Lond). 2012;122(12):591–7. 3. Wernerman J, Kirketeig T, Andersson B, Berthelson H, Ersson A, et al. Scandinavian glutamine trial: a pragmatic multi-centre randomized clinical trial of intensive care unit patients. Acta Anaesthesiol Scand. 2011;55(7):812–8.

0091
TOWARDS ZERO CENTRAL LINE ASSOCIATED BLOOD STREAM INFECTION (CLABSI): A SINGLE CENTRE EXPERIENCE

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INTRODUCTION. Central line associated blood stream infection is associated with significant morbidity and mortality and has significant financial implications [1].
OBJECTIVES. To reduce and eliminate central line associated blood stream infection rates in our medical surgical intensive care through implementation of a comprehensive programme.
METHODS. Prospective interventional study. As a part of hospital wide drive to reduce CLABSI, a comprehensive programme was implemented in June 2011. This programme included a 2 stage implementation of interventions. The first stage involved the implementation of CVC insertion bundle (hand hygiene, using 2 % chlorhexidine for skin antisepsis, maximum barrier precautions, avoiding femoral site and removing the catheter when no longer needed) recommended by the Center for Disease Control (CDC) [2], CVC insertion step checklist, dedicated central line trolleys, hospital wide education of all staff involved in insertion and maintenance of central lines and feedback to individual units. In addition nurses were empowered to stop the procedure if there was any deviation in practice. The second stage intervention involved implementation of CVC maintenance checklists, spot checks on maintenance techniques and a CVC prevention policy. The need for central line and line assessment was incorporated as a part of our daily goals.
RESULTS. Our baseline CLABSI rates in the first half of 2011 were 3–5 infections per 1,000 catheter days. Following the implementation of first stage of interventions described above, CLABSI rates declined to zero infections/1,000 catheter days the following month and remained at zero for the subsequent 6 months (see fig 1). Implementation of second stage interventions improved compliance with CVC maintenance bundle (fig 2). Eighty percent of our CLABSI′s were due to gram negative pathogens (see figure 3).

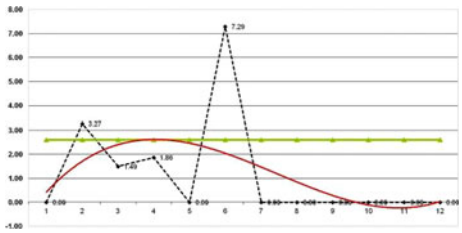

Figure 1: CLABSI rates 2011

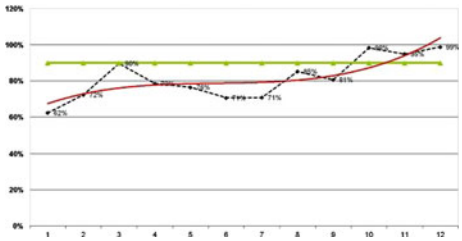

Figure 2: Central line bundle compliance 2011

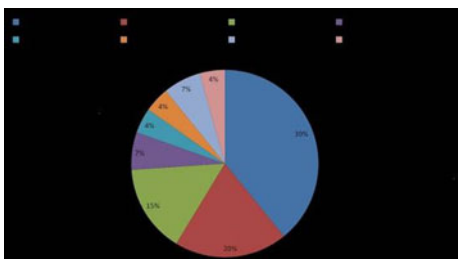

Figure 3: Pathogens causing CLABSI 2011

CONCLUSIONS. With implementation of a comprehensive programme, of process management steps, we were able to reduce CLABSI rates from 3–5/1,000 days to zero which continued for the next 6 months. The next challenge is sustaining the rate at zero.
REFERENCE(S). 1. Srinivasan et al., vital signs: Central Line—Associated Blood stream infections—USA, 2001, 2008 and 2009, Morbidity and Mortality weekly report (MMWR). CDC. 2011;60(08):243–8. 2. O′ Grady, et al. Guidelines for prevention of central line associated blood stream infection. Am J Infec control. 2011;39:S1–33.
ACKNOWLEDGMENT: Dr Sam Sara and Entire Dzero team (physicians and nurses) for supporting this project, CLABSI task force group for driving and implementing this project, Infection control team for helping us with surveillance, data collection and feedback.

0092
TIME LAPSE TO IMPLEMENTATION OF ANTIMICROBIAL ADVICE

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INTRODUCTION. Early administration of broad spectrum antibiotics is recommended for patients suspected of sepsis. Once a pathogen has been identified, e.g. through positive blood cultures (PBC), antibiotic treatment should be goal-directed and pathogen specific. When followed closely, these steps reduce the development of antibiotic resistance and reduce mortality [1].

OBJECTIVES. The aim of the study was to investigate the time between the reporting of PBC to the implementation of the accompanying specific microbiology advice.
METHODS. A 4 month prospective observational study in a district general hospital recorded the timing and antimicrobial recommendations in patients with PBC. Data on patient demographics, physiological scores (Modified Early Warning Score (MEWS)), documentation and execution of microbiology advice were collected.
RESULTS. Sixty nine patients had PBC, but 17 were excluded because of incomplete medical notes. Fifty two patients were evaluated: 23 males and 29 females with an average age of 67.2 years (range 21 to 91 years). Mean MEWS at the time of PBC was three.
Laboratory staff evaluated blood cultures during the day, from 08:30 to 19:30. When PBC is detected, the microbiologist reported the results to the clinical team on average in 22 min. Forty six patients (88 %) had the microbiologist advice documented in their medical notes. At the time of result communication, the antimicrobial cover was deemed adequate by the microbiologist in 33 patients (63 %). A change or optimization of antibiotic(s) was advised in 29 patients, but only implemented in 27 patients. Nine patients (17 %) had the recommended antibiotic(s) administered within one hour, seven patients (14 %) waited between one and four hours, nine patients (17 %) waited four to 12 h, and in two patients (4 %) the delay exceeded 12 h (Fig. 1). Specialist microbiologist advice was not followed in two cases.

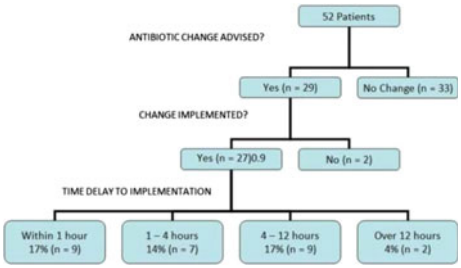

Fig. 1

CONCLUSIONS. A PBC prompts urgent action, and appropriate antibiotic therapy may prevent deterioration. The clinical team should strive to minimise delays in execution of microbiology advice, and reasons for deviation must be clearly recorded. However, inherent lag-time in the microbiology laboratory cannot be underestimated. Workforce management in our institutions precludes overnight policing of automated BC systems; new positive BCs could be ignored up to 13 h, thus hindering our efforts. Future antibiotic guidelines should instruct prompt administration of antibiotics as directed by microbiology results.
REFERENCE(S). 1. Dellinger RP, Levy MM, Carlet JM, et al. "Surviving Sepsis Campaign: International guidelines for management of severe sepsis and septic shock: 2008." Crit Care Med. 2008;36:296–327.

0093

INFLUENCE OF INFECTION DURING THE POSTOPERATIVE PERIOD AFTER HEART TRANSPLANTATION IN IN-HOSPITAL MORTALITY

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INTRODUCTION. Infection is a major complication after heart transplantation (HT).
OBJECTIVES. To determine the relevance of infection in in-hospital mortality after HT.
METHODS. Historical cohort study of all HT patients in a single institution from January, 1991 to December, 2009 followed until June, 2010. Centers for Desease Control and Prevention (CDC) criteria were used to define nosocomial infections and Surviving Sepsis Campaigne (SSC) criteria were used to define sepsis, severe sepsis and septic shock (SS). Multiorgan failure (MOF) was defined as failure of at least two organs (sequential organ failure score -SOFA score- greater than 2 in at least 2 systems) or total SOFA score greater than six. The treatment of sepsis was based on local protocols according to the SSC. The event of interest was death during hospitalization after HT. Chi-squared or t-Student test were used to determine bivariate associations. Logistic regression was used to assess the simultaneous effect of several factors.
RESULTS. From 594 HT performed, 85 (14.3 %) died during hospitalization after HT. 95 episodes of infection (62 uncomplicated sepsis, 9 severe sepsis and 26 septic shock) were identified in 75 patients (12.6 %) during this period. The following conditions were more frequent in dead patients: history of diabetes mellitus (26.3 vs. 11.6 %, p 0.002) or stroke (7.7 vs. 1.2 %, p 0.03), urgent HT (27.3 vs. 17.9 %, p 0.05), previous extracorporeal circulation (47.4 vs. 24.1 %, $p < 0.001$), circulatory assistance device for more than 3 days (25 vs. 12.4 %, p 0.001), mechanical ventilation for more than 5 days (20 vs. 12 %, p 0.05), postoperative fever (36.9 vs. 24.6 %, p 0.02), acute renal dysfunction (74.4 vs. 42 %, $p < 0.001$) or renal replacement therapy after HT (43.9 vs. 9.1 %, $p < 0.001$) and acute graft failure (AGF, 40.5 vs. 14.2 %, p 0.001). In the final logistic regression model only AGF [odds ratio (OR) 6.02; 95 % interval of confidence (IC) 3.4–10.763; $p < 0.001$] remained with significative association. Significant differences in incedience of infecton were not found (16.7 vs. 12.1 %, p 0.28). Stratified analysis according to the SOFA score showed that sepsis was independent predictor of mortality if MOF was present [OR 7.69; 95 % CI 3.32–17.8; $p < 0.001$].
CONCLUSIONS. In our series incidence of sepsis is 12.6 %. Infections was risk factor of mortality if MOF is present. Patients with septic MOF after HT had almost 8 times higher risk of mortality.

0094

CHANGING ICU MICROBIOLOGICAL ECOLOGY IN RESPONSE TO NATIONWIDE INFECTION CONTROL CAMPAIGNS

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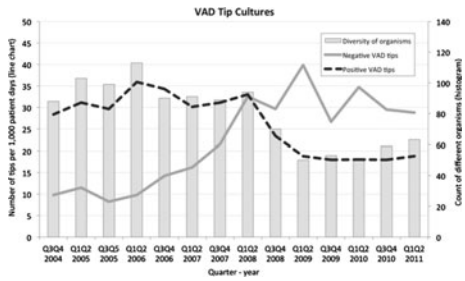
INTRODUCTION. Nationwide infection control guidelines initiated in 2001[1] have been effective at reducing the incidence of methicillin–resistant *Staphylococcus aureus* (MRSA) in the UK National Health Service[2]. For example, in our ICU we introduced a variety of policies including screening for MRSA, central line bundles, and alcohol hand-gel by 2006. The consequences of these policies on the broader ICU microbiological ecology are uncertain. In part this is due to a prevailing scarcity of habitual bacteriological surveillance. We have routinely cultured the tips of vascular access devices (VAD) from unselected ICU patients since 2004 and have used these results to monitor the nosocomial microbiological burden.
OBJECTIVES. To examine changes in microbiological ecology following nationally coordinated infection control campaigns.
METHODS. Results for routine VAD tip cultures from ICU were identified from the microbiology database from July 2004 to June 2011 (1,960 results). Demographic data and unit activity over the same period was identified using Intensive Care National Audit and Research Centre (ICNARC) databases.
RESULTS. The mean length of stay, unit occupancy, and admission characteristics were unchanged over the study period. The relative proportions of positive tips compared to negative reversed (see figure) while the breadth of species grown from positive VAD tips also reduced (χ^2 $p \leq 0.05$ see figure). Analysis of important pathological species showed that the burden of the following reduced (χ^2 $p \leq 0.05$): coliforms, fungi and yeasts, MRSA, Pseudomonas spp., whereas *Staphylococcus epidermidis* did not. There was a decline in the occurrence of locally important drug resistant organisms: Tazocin®-, ciprofloxacin-, and gentamicin-resistant *Pseudomonas aeruginosa*, and ciprofloxacin-resistant coliforms.



O'Leary et al. Figure: VAD Tip Culture Data

CONCLUSIONS. There are no established techniques for the surveillance of organisms present within the critical care environment and our understanding about how ICU nosocomial microbes respond to large scale infection control campaigns is poor. We have used tips from routinely-cultured VADs to assess the organisms present within the ICU patient population. This study indicates that nationally co-ordinated infection control policies are associated with a reduction in the microbiological burden within our ICU. Furthermore, there is concern that the focus on MRSA may lead to the selection of other drug resistant organisms. Our data, albeit limited, suggests that this is not the case. It is not possible to correlate individual practices or policies with the results presented here but this study lends support to the view that a multi-faceted approach to infection control is effective at reducing the burden of pathogenic bacteria within ICUs [3].
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0095

A 5 YEAR STUDY OF COAGULASE NEGATIVE STAPHYLOCCOCUS RESISTANCE PROFILE IN AN ICU OF A GREEK TERTIARY-TRAUMA HOSPITAL

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INTRODUCTION. Coagulase negative staphylococci (CoNS) and particularly multidrug resistant isolates have been recognized as a serious cause of nosocomial infections in Intensive Care Units (ICUs).
OBJECTIVES. We aimed to study the resistance profile of CoNS isolations considered as pathogen for ICU patients during a 5 year period.
METHODS. From July 2006 till June 2011 we examined $n = 121$ CoNS isolations recovered from blood cultures of equal number of patients hospitalized in an ICU of a Greek tertiary-trauma hospital. Species identification and susceptibility testing were performed using the automated VITEK II system. The estimation of minimum inhibitory concentrations (MIC) levels of daptomycin, vancomycin, teicoplanin and linezolid was done by E-test (BIOMERIEUX) when it was judged necessity to confirm some isolations' resistances. The interpretation of results was done according to the Clinical and Laboratory Standard Institute guidelines. The resistance percentage of each antibiotic was recorded yearly.
RESULTS. Six different Staphylococcus species were identified among the 121 CoNS isolates collected: $n_1 = 46$ S. epidermidis, $n_2 = 28$ S. hominis, $n_3 = 17$ S. haemolyticus, $n_4 = 13$ S. cohnii, $n_5 = 10$ S. capitis and $n_6 = 7$ S. lugdunensis. Methicillin resistance isolates were observed in all of the six species identified, with an overall prevalence of c.a. 91.7 %. All the examined CoNS isolates were susceptible to vancomycin and daptomycin. The percentage of resistance of the isolates against penicillin, gentamicin, co-trimoxazole, clindamycin and erythromycin oscillated between 30.8–95.4 % and didn't present a clear tension in the examine period. The CoNS isolates showed an increasing tension of resistance percentage between the first till fifth year against teicoplanin (0, 4.5, 5, 6.3, 14.3 %) and linezolid (0, 0, 9, 25, 30 %), in years 1–5. All linezolid and teicoplanin resistant staphylococcal isolates were resistant to methicillin, too.
CONCLUSIONS. The examined CoNS isolates present a remarkable increase of resistance to linezolid and teicoplanin in contrast to daptomycin and vancomycin which could be an alternative solution for treating ICU-patients' infections caused by CoNS. These data enforced the necessity of taking the appropriate measures in the ICU-environment and during the clinical practice to avoid the dissemination and the amplification of these resistances.
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0096
THE GENE EXPRESSION ANALYSIS OF BLOOD REVEALS S100A11 AND AQP9 AS POTENTIAL BIOMARKERS OF INFECTIVE ENDOCARDITIS

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INTRODUCTION. The diagnostic and prognostic assessments of infective endocarditis (IE) are challenging.

OBJECTIVES. To investigate the host response during IE and to identify potential biomarkers, we determined the circulating gene expression profile using whole genome microarray analysis.

METHODS. A transcriptional case–control study was performed on blood samples from patients with native valve IE (n = 39), excluded IE after an initial suspicion (n = 10) at patient's admission, and age-matched healthy controls (n = 10). Whole blood samples were collected on PAXgene tubes and gene expression was studied using whole human genome microarray (Agilent 4x44k G4112A). Data analysis was conducted using R and bioconductor librairies.

RESULTS. Whole genome microarray analysis showed that patients with IE exhibited a specific transcriptional program with a predominance of gene categories associated with cell activation as well as innate immune and inflammatory responses. Quantitative real-time RT-PCR performed on a selection of highly modulated genes showed that the expression of the gene encoding S100 calcium binding protein A11 (*S100A11*) was significantly increased in patients with IE in comparison with controls ($P < 0.001$) and patients with excluded IE ($P < 0.05$). Interestingly, the upregulated expression of the *S100A11* gene was more pronounced in staphylococcal IE than in streptococcal IE ($P < 0.01$). These results were confirmed by serum concentrations of the S100A11 protein. Finally, we showed that in patients with IE, the upregulation of the aquaporin-9 gene (*AQP9*) was significantly associated with the occurrence of acute heart failure ($P = 0.02$).

CONCLUSIONS. Using transcriptional signatures of blood samples, we identified *S100A11* as a potential diagnostic marker of IE, and *AQP9* as a potential prognostic factor. Further studies are required to determine the statistical characteristics of a diagnostic test based on these markers.

0097
EFFECT OF LIPOPOLYSACCHARIDE ON THE MITOCHONDRIAL FUNCTION OF ISOLATED HUMAN MONOCYTES AND PLATELETS

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INTRODUCTION. The presence of an unknown plasma factor has been proposed which induces uncoupling of platelet mitochondria without inhibition of the respiratory complexes in critically ill patients during the initial stage of sepsis [1]. In one study, activation of a murine macrophages cell line with lipopolysaccharide (LPS, 10 μg/ml for 24 h) and interferon-γ induced a reduction in complex-I-dependent enzymatic activity over time [2]. We hypothesized that changes in mitochondrial function of human blood cells in the context of sepsis might be a direct effect of LPS.

OBJECTIVES. To assess the direct effect of LPS on the mitochondrial complex enzyme activities of isolated human monocytes and platelets.

METHODS. Blood from 8 healthy volunteers was collected, and CD14 + human monocytes were isolated from peripheral blood mononuclear cells by negative isolation by magnetic separation using the Dynabeads Untouched Human Monocytes kit (Invitrogen, Basel, Switzerland) following the manufacturer's instructions. The platelets were prepared from platelet-rich plasma by centrifugation. The cells were cultured in 6-well plates with or without LPS (1 μg/ml, 24 h) in RPMI-1640 medium with 10 % FCS at 37 °C in 5 % CO_2. Citrate synthase and mitochondrial complex activities were determined spectrophotometrically using Abcam's microplate assay kits (Abcam Inc., Cambridge, England).

RESULTS. Table 1 shows citrate synthase and mitochondrial complex activities of platelets and monocytes after incubation with and without LPS. Complex I-, II- and IV-dependent enzymatic activities of human monocytes and platelets did not differ between the two conditions.

Table 1

	Cultured without LPS (control) [mOD/min/mg cellular protein]	Cultured with LPS [mOD/min/mg cellular protein]	p
Citrate synthase platelets	890.0 ± 411.9	766.4 ± 395.1	0.126
Citrate synthase monocytes	606.6 ± 390.2	577.9 ± 474.0	0.584
Complex I platelets	5.4 ± 2.1	5.8 ± 1.5	0.376
Complex I monocytes	5.4 ± 1.7	4.4 ± 1.3	0.070
Complex II platelets	8.4 ± 5.8	9.0 ± 4.5	0.698
Complex IV platelets	27.3 ± 9.2	30.9 ± 10.2	0.067
Complex IV monocytes	27.9 ± 28.9	23.1 ± 22.5	0.208

CONCLUSIONS. Our preliminary data suggest that LPS (1 μg/ml, 24 h) does not affect mitochondrial complex I-, II or IV-dependent enzymatic activities of isolated human monocytes and platelets. Additional experiments are necessary to determine if LPS affects mitochondrial function of isolated human monocytes and platelets.

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0098
BACTEREMIA DUE TO ESKAPE MICRORGANISMS: CLINICAL FEATURES AND IMPACT ON OUTCOME

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INTRODUCTION. The ESKAPE pathogens (*Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa* and *Enterobacter* spp.) are responsible for a substantial number of infections, mainly nosocomial, and often present antimicrobial resistances that may lead to inappropriate antibiotic therapy.

OBJECTIVES. To characterize bacteremia due to ESKAPE pathogens in critically ill patients and to evaluate their impact on clinical outcome.

METHODS. Retrospective, single-center, observational cohort study of 203 bacteremia between September 2010 and February 2012 in an Intensive Care Unit (ICU) of a University Hospital in Oporto, Portugal. Mortality (ICU, hospital and 28 day) was the primary outcome. Secondary outcomes were: duration of mechanical ventilation (MV), ICU length of stay (LOS), vasopressor support or renal replacement therapy (RRT) after bacteremia.

RESULTS. 100 (49 %) episodes were ESKAPE bacteremia (EB). Most of the patients were male (57 %), mean age of 63 ± 14.8 years and mean SAPS II score of 57 ± 16.9. ICU, hospital and community-acquired bacteremias were EB in 59, 22 and 19 % respectively ($p = 0.011$). 64 % of EB were secondary: pneumonia (18 %), urinary tract infection (15 %) and intra-abdominal infection (15 %). Ps. aeruginosa (29 %) was the most frequent ESKAPE pathogen followed by Staph aureus (22 %). Antibiotics were previously used in 71 % of EB episodes. EB occurred significantly later in terms of ICU days (day 6 vs. day 0; $p = 0.008$). In univariate analysis, risk factors for EB were previous use of antibiotics ($p = 0.004$), namely amoxicillin/clavulanate acid ($p = 0.01$), previous isolation of an ESKAPE pathogen ($p = 0.03$), site of acquisition ($p = 0.01$) and hospital LOS ≥5 days ($p = 0.002$) but only this last risk factor was independently associated with EB (OR 2.52; 95 % CI 1.38–4.57). ESKAPE pathogens were significantly associated with higher rate of antibiotic inadequacy (34 vs. 17 %; $p = 0.007$) and combination therapy (55 vs. 39 %; $p = 0.028$) but no differences were found regarding antibiotherapy duration. Antibiotic inadequacy in EB was associated with significantly higher ICU (49 vs. 23 %; $p = 0.01$) and hospital mortality (46 vs. 23 %; $p = 0.024$).

Global ICU (41 vs. 34 %; $p = 0.31$), hospital (50 vs. 44 %; $p = 0.43$) and 28 day (40 vs. 32 %; $p = 0.25$) mortality were higher in EB but without statistical significance. No significant differences were found in duration of MV, ICU LOS, vasopressor support or RRT after bacteremia.

CONCLUSIONS. Hospital LOS ≥5 days was the only independent risk factor for bacteremia due to ESKAPE. ESKAPE pathogens were associated with significant higher antibiotic inadequacy. However, ESKAPE pathogens are not significantly associated with a worse outcome.

0099
CLOSTRIDIUM DIFFICILE ASSOCIATED DIARRHOEA IN CRITICAL CARE

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INTRODUCTION. *Clostridium difficile* is acknowledged as an important pathogen in critically ill patients. Recognised risk factors include antibiotics, acid suppressing drugs, age and emergency surgery. Relatively few studies describe the prevalence of *C. difficile* associated diarrhoea (CDAD) in critically ill patients, however rates of up to 7 % are described [1–3]. This infection may be imported, acquired or exported from intensive care but this has not been studied in detail. Widespread use of broad-spectrum antibiotics in critically ill patients may lead to an unrecognised burden of CDAD in patients discharged to the ward.

OBJECTIVES. To describe the incidence of imported, acquired and exported CDAD amongst individuals admitted to a single university hospital critical care unit over a 3-year period (May 2006–April 2009); and the demographics and outcome of these patients.

METHODS. Critically ill patients at our institution with diarrhoea have at least one sample sent to exclude CDAD, if suspected by the resident clinician. All stool samples positive for C. difficile (identification of A or B toxin via ELISA testing) from patients admitted to critical care between May 1st 2006 and April 30th 2009 were identified from the microbiology database. The sample date was then cross-referenced to the dates of critical care admission. Identified cases were sub-classified as 'Imported', 'Acquired' or 'Exported' according to the date of diagnosis of infection in relation to date of critical care admission and discharge: ≤28 days prior to and within 48 h of admission; ≥48 h after admission up to 48 h after discharge; and ≥48 h after discharge respectively.

RESULTS. In a three-year period, 3,401 patients were admitted to the critical care unit; of which 84 (2.47 %) were identified as having contracted CDAD at some point during their hospital admission. The number of patients with imported, acquired or exported CDAD is shown in Table 1. Unsurprisingly the majority (52 %) are acquired in critical care, but more than a third were identified as occurring after discharge. Mortality for the cohort overall was 23 %, but occurred in 1 in 3 patients with imported or critical care-acquired CDAD. Amongst those with exported CDAD death occurred in only one patient (3.3 %). Acquisition of CDAD and death increased with age (Table 2).

Table 1

May 2006–April 2009	Males		Females		All	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
Imported	7	3	3	2	10	5
Acquired	25	9	19	4	44	13
Exported	16	1	14	0	30	1
Total	48	13	36	6	84	19

Table 2

Age (years)	Admissions	Cases	Deaths
0–29	374	3	1
30–49	763	14	1
50–69	1,322	34	8
≥70	942	33	9
Total	3,401	84	19

CONCLUSIONS. The prevalence of CDAD was 2.47 %, acquisition and death were more likely in those with imported or acquired disease, and increasing age. Exported CDAD accounted for 36 % of cases; antibiotic stewardship should extend to limiting antibiotic use at discharge from critical care.

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0100

BEDSIDE CHEST ULTRASONOGRAPHY COMBINED WITH INTRAPLEURAL UROKINASE FOR TREATING MULTILOCULATED PARAPNEUMONIC EMPYEMA IN CRITICALLY ILL CHILDREN

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INTRODUCTION. The bedside combined use of chest ultrasonography (U/S) and intrapleural fibrinolytic therapy has added an alternative to surgical intervention in children with severe pneumonia and parapneumonic loculated effusions.

OBJECTIVES. To describe the changing pattern of childhood complicated parapneumonic effusions in our PICU during the last 6 years and the combined diagnostic and therapeutic approach using bedside chest U/S and intrapleural urokinase.

METHODS. During 2006–2009 (A) and 2010–2012 (B), 16 of 35 children admitted with pneumonia were diagnosed to have significant (>1/4 of thorax) empyema (46 %). Insertion of chest tube was the first procedure. Patients with multi-loculated parapneumonic effusion received six doses of intrapleural urokinase (40,000 IU/kg/dose every 12 h). After 4 h, the clamped catheters were released and connected to water-seal suction at a negative pressure of 15 cmH_2O. Surgical intervention was reserved for patients with necrotic pneumonia and pulmonary abscess.

RESULTS. All patients (age 3.8 ± 0.7 year, females:males 7:9) had a history of antimicrobial use the previous 7 days. Streptococcus pneumoniae (n = 3) and Staphylococcus aureus (n = 1) were more frequently isolated from pleural effusions.The most commonly used antimicrobial agents were: third-generation cephalosporin and ureido-penicillin with vancomycin; clindamycin was added in cases of necrotic pneumonia (n = 5). More patients in period B experienced severe necrotic pneumonia compared to A (5 vs. 0), needed urokinase (4 vs. 1), or required surgery (2 vs. 0) ($p < 0.04$). Additionally, patients in B had prolonged length of stay (13 ± 4 vs. 5 ± 1 days $p < 0.05$). Five patients received urokinase (31 %) and 2 (12.5 %) required an operative intervention for extended lobar necrotic pneumonia or pulmonary abscess with tracheobronchial fistula. Patients requiring surgical intervention were more days febrile before PICU admission compared to those treated by chest tube alone or urokinase (15 vs. 7 or 8, $p = 0.07$), and had longer length of stay (21 vs. 5 or 12, $p = 0.005$). There were no significant differences between groups regarding pleural effusion characteristics, amount of drained pleural fluid (130 ± 1 vs. 406 ± 76 vs.457 ± 132 ml), fever, and duration after chest tube insertion (8 ± 8 vs. 2 ± 1vs.10 ± 7 days, respectively). None of the patients experienced any side effects due to urokinase; all patients discharged in good condition.

CONCLUSIONS. An increasing longitudinal trend of parapneumonic loculated pleural effusions has been recorded in our PICU. Aggressive intrapleural fibrinolytic treatment with urokinase based on bedside chest U/S confers significant benefit in effectively treating multi-loculated pleural effusions, reserving surgical intervention for necrotic pneumonia and pulmonary abscesses.

Sedation, analgesia & delirium: 0101–0114

0101

SEDATION, ANALGESIA AND DELIRIUM RELATED PRACTICES IN PORTUGUESE INTENSIVE CARE UNITS: NATIONAL SURVEY

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INTRODUCTION. Patients in Intensive Care Units (ICUs) are often sedated and treated for pain for long periods of time. Sedation, analgesia and delirium related practices show large world-wide variations: the extent of this variation in Portuguese ICUs was not known.

OBJECTIVES. To describe the Portuguese sedation, analgesia and delirium related practices through a national survey.

METHODS. Portuguese public hospital's ICUs (not pediatric, coronary or cardio-thoracic) were identified and contacted. Authorization to participate was obtained from all ICUs' directors. The survey used the online platform Survey Gizmo 3.0®; it was anonymous, filled online and only once. Its web link was sent to participants via e-mail. Answers were collected from April to May 2011. Statistics used Pearson's Chi-Square or Fischer test, with significance for $P < 0.05$.

RESULTS. Answers were obtained from 30 ICUs, 90 % of them being general ICUs. There was a protocol for sedation and analgesia in 40 % of the ICUs. Of those, 17 % reported to apply the protocol in all patients. NRS (Numerical Rating Scale), VRS (Verbal Rating Scale) and VAS (Visual Analogic Scale) scales were used in 80 % of the units. PAINAD (Pain Assessment in Advanced Dementia) and BPS (Behavior Pain Scale) were seldom used. Heart rate and arterial blood pressure were used to evaluate pain in 80 % of the ICUs, respiratory frequency in 57 %, tears in 43 %, sweating in 40 % and facial expression in 10 %. Sedation scales were applied in 97 % of the units, the Ramsay Scale being the most used (in 80 % of the units). SAS (Sedation Agitation Scale), MAAS (Motor Activity Assessment Scale) or RASS (Richmond Sedation Agitation Scale) scales were used in 43 % of the units. VICS (Vancouver Interaction and Calmness Scale) scale wasn't applied in any ICU. BIS was used to assess sedation status in 53 % of the ICUs and EEG in one ICU. Daily Interruption of Sedation was applied in 90 % of the units. Of those, 41 % applied it in less than 25 % of the patients. Restraining was used in 87 % of the units. Oversedation was estimated by respondents to affect more than 50 % of the patients in 23 % of the units. Delirium was assessed in 40 % of the units, using either CAM-ICU (Confusion Asessment Method for the ICU) or ICDSC (Intensive Care Delirium Screening Checklist).

CONCLUSIONS. Sedation, analgesia and delirium related practices in Portuguese ICUs were found to be similar to practices reported worldwide. Practices did not comply with the best evidence based recommendations and may be improved: sedation and analgesia protocols existed in less than half the ICUs and were seldom applied; pain wasn't properly evaluated in ventilated patients and in those with dementia, in the majority of the ICUs; validated sedation and delirium scales were seldom used.

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0102

EFFECT OF SEDATIVES ON COLON MOTILITY IN VITRO

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INTRODUCTION. Sedatives are known for their adverse effect on small bowel motility. This characteristic is usually equated with an adverse effect on colon motility. An in vitro setting allows to examine the effect of sedatives on colon motility separately.

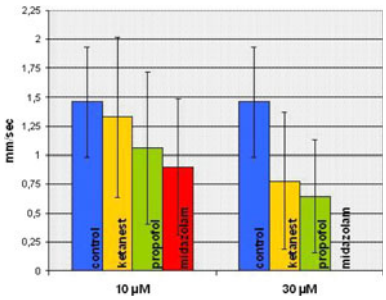
OBJECTIVES. The aim of this study was to compare the effect of ketamine, propofol and midazolam versus a control on guinea pig's colon motility in vitro.

METHODS. Guinea pig's colonic segments fixed on a polyacrylic tray in a tissue bath allow the evaluation of the transit (mm/s ± standard deviation) of a wooden pellet. Two concentrations (10 and 30 μM), well known for their inhibitory effect on small bowel motility in vitro, were tested.

RESULTS. The mean transit of the control segments was 1.46 ± 0.48 mm/s.

10 μM: In all segments mean transit was slower than in control segments. While the effect of ketamine (1.33 ± 0.69 mm/s) was neglectable ($p > 0.8$), propofol (1.06 ± 0.65 mm/s; $p = 0.03$) and midazolam (0.9 ± 0.58 mm/s; $p = 0.001$) had a pronounced inhibitory effect on colonic transit.

30 μM: Compared to control segments, higher concentrations resulted in a significant prolongation of transit ($p < 0.001$). Higher concentrations of ketamine reduced transit markedly (0.78 ± 0.59 mm/s, $p = 0.03$), while propofol influenced transit without significance (0.64 ± 0.49 mm/s, $p = 0.1$) compared to 10 μM. Midazolam caused a complete block of persitalsis.



Hypnotics

CONCLUSIONS. All tested substances had an adverse effect on colonic transit. Midazolam had the most pronounced influence even leading to a complete block of peristalsis at high concentrations.

These results show that a selective use of sedatives might be beneficial for sustaining colon motility.

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0103

EFFECT OF PIRITRAMIDE VS. TRAMADOL ON GUINEA PIG'S SMALL BOWEL MOTILITY IN VITRO

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INTRODUCTION. Opioids are well known for their adverse effect on gastrointestinal motility. Besides the continuous administration of opioids in critically ill patients, bolus application is standard on the ward. Here piritramide and tramadol are the most commonly used opioids in our hospital.

OBJECTIVES. The aim of this study was to compare the inhibitory potency of piritramide and tramadol on guinea pig's small bowel motility in vitro.

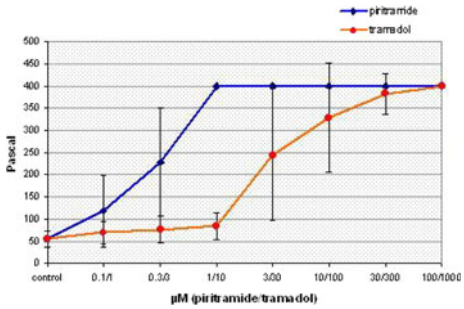
METHODS. Guinea pig's small bowel segments of 8 cm length were set up in parallel organ baths containing oxygenated Tyrode's solution. Peristalsis was elicited by luminal perfusion (0.5 ml/min) against an aboral resistance of 400 Pascal. Perfusion of the segments resulted in an increase of the intraluminal pressure up to a pressure threshold (PT), at which peristaltic contractions were triggered. Pressure was 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. Increasing concentrations of piritramide (0.1; 0.3; 1; 3; 10; 30; 100 μM) and tramadol (1; 3; 10; 30; 100; 300; 1,000 μM) were compared to controls.

RESULTS. Mean pressure threshold of the control segments was 54.9 ± 17.0 Pa.

Increasing concentrations of both substances resulted in an inhibition of peristalsis ($p < 0.001$; piritramide $\eta^2 = 0.907$, tramadol $\eta^2 = 0.861$). Piritramide ≥0.3 μM increased pressure threshold significantly (228.4 ± 121.1 Pa; $p < 0.001$), a complete block of peristalsis was reached at 1 μM.

Low doses of tramadol had no remarkable influence on peristalsis. 30 μM increased the pressure threshold significantly (244.9 ± 149.2 Pa; $p < 0.001$), while a block of peristalsis was seen at 1,000 μM.

Significant higher concentrations of tramadol were necessary to inhibit guinea pig's small bowel motility compared to piritramide ($p < 0.001$).



Opioids

CONCLUSION. This study clearly demonstrated the high potency of piritramide to inhibit small bowel motility. Especially at low doses tramadol seemed to be beneficial to pursue peristalsis. Tramadol might have advantages compared to piritramide to prevent gastrointestinal motility disorders.
GRANT ACKNOWLEDGMENT. Styrian Department for Science and Research.

0104
SEDATION PRACTICE IN NORDIC AND NON-NORDIC ICUS: A EUROPEAN SURVEY

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INTRODUCTION. Tailored sedation is central to therapy in the intensive care unit (ICU) patients. Over-sedation is associated with prolonged ICU stay and development of long-term psychological problems. A trend toward lighter sedation has been evident in the past decade as practice has become protocolized, but studies demonstrate that patients in some settings are still over-sedated. Whether there is consensus in sedation practices across Europe is unknown.
OBJECTIVES. The aim of this survey was to assess current strategies of sedation in a European context and to compare sedation practice in ICUs in Nordic and non-Nordic countries
METHODS. This was a cross sectional survey of nurses attending the 4th Congress of the European federation of Critical Care Nursing associations (EfCCNa) in Copenhagen, March 2011. The survey tool was informed by the literature and developed by the authors and members of the EfCCNa research and development committee. The final version consisted of 34 items divided into five sections: demographic data; formal sedation practice and collaboration; medications; delirium; and education and standards. The questionnaire was piloted in Denmark, France, Greece and the UK.
RESULTS. Respondents came from 22 countries and had >18 years of experience in nursing. Non-Nordic countries reported greater use of sedation weaning protocols (82 vs. 61 %, $p = 0.01$), whereas Nordic countries reported greater use of formal sedation (91 vs. 67 %, $p < 0.00$) and pain (91 vs. 69 %, $p < 0.00$) assessment tools. Both groups reported infrequent delirium assessment (Nordic 40 % vs. non-Nordic 35 %, $p = 0.51$). Nordic ICUs were smaller (10 vs. 15 beds, $p < 0.00$), and the nurse to patient staffing ratio was higher (1:1, 75 vs. 26 %, $p < 0.00$). Significantly more Nordic than non-Nordic nurses perceived the circadian rhythm was maintained consistently (66 vs. 49 %, $p < 0.00$), and reported less use of physical restraints (14 vs. 36 %, $p < 0.00$) and neuromuscular blocking agents (3 vs. 16 %, $p < 0.00$).
CONCLUSIONS. Although Nordic countries might be closer to the ultimate goal of lighter sedation and comfortable mechanically ventilated patients, there is still room for improvement in all countries surveyed. This study raises awareness of current patterns and target sedation practice, and helps pave the way to optimized sedation in intensive care patients.
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0105
EVALUATION OF AN ALGORITHM ASSOCIATED WITH A DAILY ARREST OF SEDATION COMPARED WITH A SINGLE ALGORITHM IN ICU

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INTRODUCTION. The role of sedation in intensive care patients is critical. When sedation is too light, patients may experience discomfort, anxiety and ventilator asynchronism. To the contrary, an excess of sedation is associated with hemodynamic instability and prolonged mechanical ventilation. We identified in a preliminary study that, despite a nurse-driven algorithm, an excess of sedation was associated with severity.
OBJECTIVES. The purpose of this study is to evaluate the modification of the sedation management in our intensive care unit (ICU). Our hypothesis was that the addition of a daily stop in sedation, associated with a nurse-driven algorithm, would reduce the length of mechanical ventilation.
METHODS. We prospectively included 37 patients in a case–control study segmented in two periods around the introduction of the new algorithm. Briefly, in the first period, sedation was administered according to a nurse-driven algorithm based on Ramsay score (*standard* group). In the second period, this nurse-driven algorithm was completed by a daily stop of sedation (*stop* group). Sedation was composed of sufentanil and midazolam administered intravenously. Only patients with sufficient data completeness were included in the study. The observed differences were called statistically significant if the *p* value was below 0.05. P-values were computed with Wilcoxon rank sum test for quantitative parameters (expressed as median [IQR]), and with Fisher exact test for qualitative ones (expressed as absolute count (percentage)).
RESULTS. During the study period, 88 patients were evaluated, of which 37 were included in the study (20 in the *stop* group, 17 in the *standard* group). The length of mechanical ventilation was reduced in the *stop* group (11 j [5–13] *vs.* 18 j [12–25], $p = 0.01$). The length of ICU stay was reduced in the *stop* group (17 j [11–22] *vs.* 26 j [21–36], $p < 0.01$). The ventilator-free-days were increased in the *stop* group (18 j [15–22] *vs.*12 j [4–17], $p = 0.02$). The adequation of sedation target was low (*stop*: 11 (55 %) vs. *standard*: 12 (67 %) patients in the target, $p = 0.08$). The number of tracheal re-intubations was significantly lower in the *stop* group (6 (23 %) *vs.*13 (46 %), $p = 0.008$). Self-extubations (5 (19 %) *vs.* 4 (14 %), $p = 1$) and agitation periods (4 h [0–10] *vs.* 3 h [0–8], $p = 0.59$) were similar in both groups.
CONCLUSIONS. The addition of a daily stop of sedation to a nurse-driven sedation algorithm is associated to a reduction of length of ventilation and of ICU stay. This is associated to a reduction in the length of sedation. These preliminary results support the improvement of our sedation practice and may support the association of the two major sedation protocols in use.

0106
ADVANTAGE OF REMIFENTANIL VS COMBINATION MORPHINE/ PROPOFOL SEDATION OF MECHANICAL VENTILATED PATIENTS

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INTRODUCTION. The consequences of inadequate sedation and analgesia of patients underwent mechanical ventilation can be substantial.Therapeutic sedation has inherent risks, however, particularly when excessive or prolonged. The pharmacodynamic effects of traditionally used sedative and opioid drugs are unpredictable and often prolonged in the critically ill patient for various reasons. The pharmacokinetics is altered with different volumes of distribution and elimination half-lives.The opioid part of a sedation regime is kept to a minimum to protect against opioid accumulation and an unpredictable recovery/ weaning from mechanical ventilation.
OBJECTIVES. The study compared the safety and efficacy of an analgesia based sedation regime using remifentanil with a conventional hypnotic-based sedation regime in critically ill patients requiring mechanical ventilation for up to 72 h in comparison with a standard sedative regime of propofol and morphine.
METHODS. In this prospective, randomized, single-centered study, a total of 60 patients,who had undergone abdominal surgery following 6 weeks, were postoperatively assigned to one of two treatment regiments for sedation in the ICU for up 72 h. Patients in the first group ($n = 30$) received remifentanil (6 mμ–9 mμ/kg/h). Patients in the second group ($n = 30$) received propofol (20 mg/h) and Morphine (3 mg/8 h). Patients were sedated to an optimal Riker Sedation Agitation Scale (RcSAS) score of -1 or 1, Ramsy score (RS) of 1 to 3 and a pain intensity (PIS) score of 0 or2. Heart rate (HR) and mean arterial pressure (MAP), APACHE ll and SOFA score were monitored throughout the treatment period. Adverse events were recorded too.
RESULTS. From 30 patients received analgesia based sedation (ABS), 29 of the patients receiving remifentanil without the use of supplementary hypnotic agents. In the hypnotic based sedation (HBS) 20/30 of patients either morphine or fentanyl was used as the analgesic agent, titrated to obtain adequate pain control. The variation in the mean RcSAS over 24 h was −1 to +1 for remifentanil group and −2.7 to +3.0 in the comparator group. The variation in the mean PIS over 24 h was 1.5 to 1.6 for the remifentanil group and 1 to 3.7 for the comparator group.Variation of MAP, HR, pCO_2 was less in remifentanil than in control group.
CONCLUSIONS. Sedation with remifentanil was well tolerated. No significant difference in duration of mechanical ventilation of critically ill patients and total mortality rate is noticed, but it is decided that it definitely improves the healing process in comparison to standard sedation regimes with combination continue Propofol with intermittent bolus morfin in ICU patients requiring ventilation for up to 72 h.
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0107
PROPOFOL VERSUS REMIFENTANIL FOR THE MANAGEMENT OF ANALGO-SEDATION DURING THE PERCUTANEOUS TRANSCATHETER AORTIC VALVE IMPLANTATION

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INTRODUCTION. Minimally invasive approaches for valve repair and replacement are becoming attractive alternatives extending treatment options to the increasing population with severe comorbidities [1–4].
OBJECTIVES. To analyze the differences in terms of hemodynamic response, use of Midazolam *rescue dose,* gas exchange parameters, B-type Natriuretic Peptide (BNP) and C-Reactive Protein levels.
METHODS AND DESIGN. Analysis of a prospective and randomized collected database.
SETTING. An Operating/Angiography Room in a University Hospital with on-site capabilities for surgical and percutaneous valvular interventions. *Patients:* A total of 80 patients (33 M and 47 F) with an ASA score II-III submitted to percutaneous transcatheter aortic valve implantation from February 2009 to February 2011. Patients with LVEF <25 %, preoperative Congestive Heart Failure, neurological deficits, preoperative sepsis, preoperative use of steroids, drugs and/or alcohol abuse, psychiatric disorders were excluded. *Randomization:* once obtained the preoperative informed consent the patients were randomly assigned to Group 1 (Remifentanil during the whole procedure aimed at maintaining a RASS score between -2 and 0 with a maximum infusion rate of 0.2 microg/kg/min) or Group 2 (Propofol with the same goal and a maximum infusion rate of 3.5 mg/kg/h). *Data collection:* Preoperative and intraoperative main data; total amount of intraoperative fluids, intraoperative *rescue use* of Midazolam, intraoperative rescue use of vasoactive drugs and/or IABP. Hemodynamic parameters were collected preoperatively (T0) and each hour intraoperatively (T1, T2, T3) by Pressure Recording Analytical Method. Gas exchange parameters (pH, $PaCO_2$) and Lactate blood levels were collected at the same timepoints.

Moreover we have collected preoperative (T0) and postoperative (T1) BNP and CRP blood levels. *Statistics: Chi* square test, Mann–Whitney test and unpaired *t* Test were used when appropriate. A p value of <0.05 was considered significant.
RESULTS. No differences in preoperative variables between the two groups (p = NS for all measurements). The amount of intraoperative fluids was higher in group 2 (p = 0.007); the *rescue use* of Midazolam was lower in group 1 ($p = 0.005$); MAP was lower at T2 in group 2 ($p = 0.045$); CI was lower at T1 in group 2 ($p = 0.01$); SVV was higher at T1 in group 2 ($p = 0.007$); pH was higher at T1 and T2 in group 1 ($p = 0.02$) despite the higher $PaCO_2$ at T1, T2 and T3 in the same group ($p = 0.001$); BNP and CRP levels were lower in group 1 at T1 ($p = 0.0012$ and $p = 0.002$ respectively). Six patients were intubated in group 2, while only two patients in group 1.
CONCLUSIONS. We can hypothesize a better profile in terms of hemodynamics and analgo-sedation management for the patients of group 1.
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0108

EXPERIENCE IN SEDOANALGESIA IN CRITICALLY ILL PATIENTS ADMITTED TO AN INTENSIVE CARE UNIT (ICU) IN NEED FOR NONINVASIVE MECHANICAL VENTILATION

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OBJECTIVE. To describe our experience (in terms of security and effectiveness) in sedoanalgesia of critically ill patients admitted to a medical Intensive Care Unit (ICU) in need for Noninvasive Mechanical Ventilation (NIMV).
METHODS. A prospective and descriptive study was carried out between May 2009 and August 2011 in all critically ill patients treated with NIMV. We used Vision® Noninvasive Ventilator with Respironics oronasal masks. The following parameters were analized: age, gender, APACHE II, reason for NIMV (COPD, pneumonia, thoracic trauma), reason for exclusion, reasons for using sedoanalgesia, type of sedoanalgesic drugs used, dosage and time spent under sedation, length of ICU stay, complications during NIMV, need for catecholamines, renal failure and methods for monitoring sedoanalgesia. Statistical analysis using Student's *t* test and standard deviation.
RESULTS. Of 39 patients who needed NIMV, 25 received sedoanalgesia (14 male, 9 female); mean age 66.6 ± 21 years old; APACHE II 17.6 ± 7; reason for NIMV: COPD: 10 patients, acute pulmonary edema/congestive heart failure: 4 patients, pneumonia: 4 patients, thoracic trauma: 5 patients, post-extubation: 2 patients. 5 patients were excluded (2 needed intubation before 6 h, 1 epidural analgesia, 1 emergency surgery and 1 sedation for less than 24 h). Reason for sedoanalgesia: pain: 5, discomfort with oronasal mask: 11; psychomotor agitation: 9. Drugs used for sedoanalgesia: propofol (PF) 9 patients (6 due to discomfort, 3 due to agitation), remifentanil (RE) 10 patients (5 due to pain, 5 due to discomfort), Haloperidol (HP) 6 patients due to agitation. Mean dosage: 1.84 ± 0.40 mg/kg/h in PF group, 3.97 ± 0.71 μg/kg/h in the RE group and 30.45 ± 15.10 mg/day in the HP. Time spent under sedation (days): 6 ± 3.4 (PF), 5.3 ± 3.5 (RE) and 5.6 ± 2.4 (HP) with a mean length of ICU stay of 10 ± 4.6 days. Complications: intubation 2, bronchoaspiration 2, upper gastrointestinal bleeding 1, convulsion 1. 6 patients needed catecholamines and 4 had renal failure (1 continuous renal replacement therapy). The methods for monitoring sedoanalgesia were: Visual Analogue Scale (VAS) in 5 patients and Richmond Agitation-Sedation Scale (RASS) in 14 patients
CONCLUSIONS. In our series, 64 % patients submitted to NIMV received some type of sedoanalgesia. The drugs more commonly used were: RE and PF in 40 % and 36 % respectively, followed by HP in 24 %. In 76 % patients sedoanalgesia was monitored, 20 % using VAS (100 % of the patients whose indication for sedoanalgesia was pain control) and 56 % using RASS scale.

0109

MINIMAL SEDATION PROTOCOL DIMINISHES RATES OF USE OF INVASIVE DEVICES AND DEVICE ASSOCIATED INFECTION IN A GENERAL ICU

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INTRODUCTION. In recent years, many data showing association of less use of sedatives in ICU with shorter ICU LOS, hospital LOS and even lower mortality rates have been published. Device-associated infections are a frequent cause of prolonged ICU LOS and worse prognosis.
OBJECTIVES. To examine whether a new strategy of sedation in a general ICU is associated with lower rates of use of invasive devices and lower rates of device associated infections.
METHODS. We collected prospectively data from an electronic database for all patients admitted to a single general ICU of a private brazilian hospital from 01st march 2011 until 31 august 2011 and compared to a historical coorte from the same database from all patients admitted to the same ICU from 01st march 2010 until 31 august 2010.We initiated a new minimal sedation protocol standardized care in 01st march 2011. We compared use of invasive devices and rate of device associated infection during each study periods. We compared also ICU LOS and mortality rates in the same periods. For statistical analysis we have used Chi-sqare test and *t* test.
RESULTS. In months analyzed in 2011 we have less consumption of midazolan, fentanil, propofol, morphine in relation to the months analyzed in 2010, showing that our protocol of minimal sedation was efficient and assuring differences between the two groups studied. We found statistical lower rates of use of mechanical ventilation, central catheters and vesical catheters in 2011 group. We also found statistical lower rates of central venous line-associated blood stream infection and ventilator associated pneumonia in 2011 group. No statistical difference was found related to catheter- associated urinary tract infection. The 2011 group had also statistical shorter ICU-LOS than 2010 group.
CONCLUSIONS. After initiation of a minimal sedation protocol, we achieved less rates of utilization of all invasive devices and fewer rates of central venous line-associated blood stream infection and ventilator associated pneumonia and shorter ICU LOS in a general brazilian ICU.

0110

RANDOMIZED CLINICAL TRIAL ON SEDATION FOR ENDOSCOPIC PROCEDURES: KETAMINE VERSUS PROPOFOL

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INTRODUCTION. The ideal sedative drug for endoscopic procedures (EP) would have analgesic, anaesthetic, amnestic and anxiolytic effect, preserving airway and cardiorespiratory tone. Ketamine is commonly used for pediatric EP and adult sedation. However, the safety of this agent in adult EP is not studied.
OBJECTIVES. To assess safety outline of ketamine versus propofol (respiratory failure, hypotension, arrhythmias,perforation, ICU admission, death).To assess time of sedation (minutes between IV bolus and patient following commands), and recovery time (minutes between the last bolus or end of perfusion and patients following commands).
METHODS. Phase IV clinical trial, prospective, randomized, double blind, with parallel groups and controlled with active treatment, conducted in a tertiary hospital during 2011. The Inform Consent was taken. The patient was monitored in the operating room. Ketamine group received: 2–3 mg of iv Midazolam + 1–2 mg/kg of iv ketamine. Propofol group received: Initial bolus of 0.5–1 mg/kg iv + perfusion of 2–6 mg/kg/h iv ± 50–100 mcg of iv phentanyl, if needed. The study was blinded for the patients and endoscopist. Assuming an 18 % difference in respiratory failure between groups as clinically relevant was calculated a simple size of 822 patients (IC95 %).
RESULTS. High rates of adverse effects were observed in Ketamine group and the clinical trial was interrupted. The analysis was performed with the data of the first 86 randomized patients.Baseline characteristics are shown in table 1.

Table 1 Demographic characteristics

Group characteristics	Ketamine (n = 36)	Propofol (n = 48)	p (IC 95 %)
Age (y) median(range)	56.75 (22–80)	54.79 (24–89)	0.539
Weight, kg, median (range)	76.08 (48–107)	70.25 (45–95)	0.057
ASA I (%)	38.9	64.6	
ASA II (%)	58.3	29.2	
ASA III (%)	2.8	6.3	
ASA IV (%)	–	–	
Male (%)	66.7	60.4	,557

No significant differences were observed. The median dose of propofol was 195 ± 77 μg/kg/min, phentanyl dose (given to 41 % patients) was 66.25 ± 3 μg/kg/min. Ketamine dose was1.37 ± 1 mg/kg + Midazolam 53 ± 4 μg/kg. There were no differences in the primary endpoint but it was observed a delayed awakening in the Ketamine group (Table 2).

Table 2: Primary outcomes

Outcomes	Ketamine (n = 36)	Propofol (n = 48)	p (IC95 %)
Complications Yes (n)	4	9	,3
Arrhythmias (%)	25	23.1	
Respiratory depression (%)	0	7.7	
Hypotension (%)	0	30.8	
ICU admission (%)	0	7.7	
Perforation (%)	0	7.7	
Surgery (%)	0	7.7	
Delayed awakening (%)	75	0	

Sedation and recuperation time were both longer in Ketamine group, being recuperation time statistically significant (p,001)(Table 3).

Table 3 Secondary outcomes

Outcome, median (range)	Ketamine (n = 36)	Propofol (n = 48)	p (IC95 %)
Sedation time	22.0 (10–30)	17.9 (10–25)	0.07
Recuperation time	10.9 (5–15)	6.8 (5–10)	0.001

CONCLUSIONS. Ketamine aswell as propofol have an appropiate safety profile in EP. Ketamine presented a significant longer recovery time and higher adverse events rate in low comorbility patients. After the assessmment of the results we can not recomend Ketamine as a first line sedation drug for EP in patients without ongoing illness. Ketamine use should be evaluated in ASA IV patients undergoing EP.

0111

PROSPECTIVE, RANDOMIZED STUDY TO ASSESS THE ROLE OF DEXMEDETOMIDINE IN PATIENTS WITH POSTERIOR FOSSA TUMORS UNDERGOING CRANIOTOMY AND REQUIRING POST OPERATIVE VENTILATION IN ICU

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INTRODUCTION. Preliminary data on the perioperative use of dexmedetomidine in patients undergoing craniotomy for brain tumor under general anaesthesia indicate that the intraoperative administration of dexmedetomidine is opioid-sparing, results in less need for antihypertensive medication, and may offer greater hemodynamic stability at incision and emergence. Dexmedetomidine, alpha 2 adrenoceptor agonist used as adjuvant to anaesthetic agents.
OBJECTIVES. This prospective, randomized, double-blind study was designed to assess the perioperative effect of postoperative infusion of dexmedetomidine in patients with posterior fossa tumors undergoing craniotomy and requiring post operative ventilation in ICU
METHODS. Orty patients with CT- scanning proof of supratentorial tumors. The patients were classified equally into 2 groups (twenty patients in each group). Group A: The dexmedetomidine was given as a bolus dose of 1 microg/kg in 20 min before induction of anaesthesia, followed by a maintenance infusion of 0.4 μg/kg/h. Group B: The patients received similar volumes of saline.
RESULTS. The heart rate and mean arterial blood pressure, decreased in patients of group A (dexmedetomidine group) more than group B (placebo group) with significant statistical

difference between the two groups (P value < 0.05). No significant statistical difference between the two groups regarding the central venous pressure and arterial partial pressure of Carbon Dioxide (P value > 0.05). The intraoperative end-tidal sevoflurane (%) in patients of group A less than in patients of group B (P value < 0.05).The intracranial pressure decreased in patients of Group A more than group B (P value < 0.05). The Glasgow coma scale (GCS) improved in patients of group A and deteriorated in patients of Group B with significant statistical difference between the two groups (P value < 0.05). The total fentanyl requirements from increased in patients of group B more than in patients of group A (P value < 0.05).

CONCLUSIONS. Continuous postoperative infusion of dexmedetomidine for posterior fossa tumors maintained the haemodynamic stability, reduced fentanyl requirements, decreased intracranialpressure, and improved significantly the outcomes.

0112

TRANSFORMATION IN SEDATION PRACTICE WITH 24-HOUR INTENSIVIST LED CARE FOLLOWING MERGER OF A CARDIAC AND A GENERAL INTENSIVE CARE

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INTRODUCTION. Glenfield Hospital had independent cardiac and general intensive care units. Care on the cardiac unit was surgically led and sedation practice did not comply with international guidelines. In 2009, a planned reconfiguration of services saw the units merge, providing 24-h Consultant Intensivist led care. There were immediate improvements in sedation practice and documentation [1]. Potential improvements in depth of sedation and sedation hold compliance were identified.

Further staff training and education and an updated critical care sedation guideline was introduced and a re-audit performed.

OBJECTIVES. To examine the compliance with local guidelines, based on national and international sedation recommendations from the Society of Critical Care Medicine [2], the Surviving Sepsis Campaign [3] and the Department of Health (UK) [4]. Specifically: • Mode of sedation and appropriateness of agents selected

- Recording of sedation scores
- Depth of sedation
- Daily sedation/analgesic holds
- Sedation score when sedation was restarted

METHODS. The data was collected daily (31/11/11–13/12/11) for all patients sedated for >24 h and compared to data collected in 2009 and 2010. The delivery mode, sedative agent, duration of usage, sedation score and documentation/compliance with sedation holds was recorded.

RESULTS.

Comparison of sedation practice in 2009, 2010, 2011

	Cardiac ICU (pre-merger)	General ICU (pre-merger)	Combined Unit 2010	Combined Unit 2011
Total number of patients	10	6	10	6
Patient episodes	49	10	42	28
Sedation as continuous infusion (%)	100	100	100	100
Sedative: propofol, midazolam, ongoing hold	21,15,13	5,5,0	29,13,0	24,4,0
Sedation score documented (%)	82	90	100	100
Mean sedation score	−5	−1	−3	−3
Sedation hold (%)	37	40	38	71
Reason for non-compliance documented (%)	8	40	96	88
Sedation score recorded on restarting sedation (%)	66	80	100	100

CONCLUSIONS. These results demonstrate continued improvement in sedation practice. Standards of documentation and use of appropriate sedation were maintained. There were massive improvements in daily sedation hold performance. The mean sedation score remained high and may be an area to focus on in future. Sedation practice has been transformed in our unit as a result of 24-h Consultant Intensivist-led care.

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0113

SLEEP IN THE INTENSIVE CARE UNIT: CHANGING THE CULTURE

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INTRODUCTION. The intensive care unit is a hostile environment in nature. It is very common that sleep is impaired in lucid patients. The maintenance of the sleep-wake cycle has impact on patient health, beyond the humanitarian aspect. It has been described reduction of anxiety, catecholamine levels, pain perception, among others.

OBJECTIVES. Describe the sleep control program, adopted in a general brazilian ICU from the analysis of interviews with patients after discharge.

METHODS. This prospective observational study in an ICU of 23 beds. In 2011, based on the analysis of research in the ICU after discharge, we performed the measurement of environmental noise at different times of day and night in the ICU with a decibel meter Brand ICEL model DL-4050. With these results we started a phase of training with the team, forming a team of "Good Night Cinderella" responsible for monitoring the noise level, lighting and provision of a kit for the hospitalized patient. This kit is composed of ear plugs and eye mask.

RESULTS. The questionnaires after discharge showed that 29.3 % of patients complained of insomnia (29.24 %) and 29.24 % of the noise. Measurements of ambient noise ranged from 58 to 68.4 dB. In our country the recommended noise levels for acustic confort in ICU are 25–35 dB

CONCLUSIONS. The maintenance of sleep-wake cycle should be part of good practice in an ICU, with participation of the entire multidisciplinary team. Controlling environmental stressors, as well as changing the behavior of staff, and the introduction of pharmacological and nonpharmacological measures form the pillars of this policy of comfort.

0114

VALUE OF THE EFFECTIVE ANALGESIA IN NEAREST POSTOPERATIVE PERIOD SURGERY OF ESOPHAGUS

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AIM. To evaluate the effectiveness of ketorolac in combination with lidocaine epidural nalgesia as an option for postoperative analgesia in patients after extended operations on esophagus

MATERIALS AND METHODS. Postoperative analgesia by means of continuous intravenous infusion of ketorolac in combination with prolonged epidural analgesia was conducted in 24 patients after reconstructive operations on esophagus. From the operational guide: in 9 patients was performed one-stage shunting retrosternal esophagokoloplasty from the parts of transverse colon and the descending part of large intestine. 15 patients underwent extirpation of esophagus with thoracoabdominal access with esophagogastroplasty. Assessment of the effectiveness of analgesia was performed with the aid of digital rating scale (Numerical Rating Scale, NRS), where 0 is no pain, 10 max pain.

RESULTS. Tracing the dynamics of the intensity of pain reaction, we noted that at the 3 stage of anesthesia (after extubation of a patient) the intensity of pain perception in almost all patients has made 6.2 ± 0.4 points, which corresponded to the upper limit of the zone of moderate intensity of pain perception. In subsequent phases of anesthesia was observed the decrease of the intensity of pain perception to 2.3 ± 0.4, which corresponded to a weaker perception of pain sensitivity. The effectiveness of the proposed variant of postoperative analgesia was reflected in the indicators of hemodynamics. Provision of maximal reduction in pain sensitivity has contributed to more rapid stabilization of heart rate, average A/P and to a lesser extent changes of intracardiac hemodynamics. Tracing the dynamics of gas exchange and oxygen status on the stages of early postoperative period has shown the best indicators of the stability of SaO_2, PaO_2, PaO_2/FiO_2, and pH and dynamic changes of cLac in the combined use of ketorolac infusion and epidural analgesia. The combination of continuous infusion of ketorolac and epidural analgesia significantly reduced the number of respiratory complications in L the immediate postoperative period after surgical interventions on esophagus. Mortality rate in this group of patients has made 4.2 % (1 patient), due to insufficient anastomosis.

CONCLUSIONS. Combined epidural analgesia with lidocain and continuous infusion of ketorolac provides more effective postoperative analgesia and more reduction of the intensity of pain perception, promotes the stabilization of hemodynamic parameters with the optimization of gas exchange, helps to early activation of patients with a decrease in respiratory complications and in timing of staying of patients in a department of resuscitation and intensive care.

Acute brain injury: Therapeutic cooling & outcome prediction: 0115–0126

0115

THERAPEUTIC MILD HYPOTHERMIA AFTER CARDIAC ARREST IN SHOCKABLE AND NONSHOCKABLE RHYTHMS: DOES IT IMPROVE BOTH SURVIVAL AND NEUROLOGICAL OUTCOME?

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INTRODUCTION. Though therapeutic mild hypothermia (TMH) after resuscitation from cardiac arrest (CA) has been postulated and studied to be associated with good outcome of the patients, there is no dearth of data which doesn't favour TMH. Also, there is lack of data which has separately compared the efficacy of TMH in patients after cardiac arrest in ventricular tachycardia/ventricular fibrillation, the shockable rhythm (SR) and pulseless electrical activity/asystole (PEA/Asys), the nonshockable rhythm (NR) for two separate but important parameters of outcome: survival and neurological outcome.

OBJECTIVES. To find out whether TMH is associated with good outcome after CA in shockable rhythm compared to nonshockable rhythm, in terms of survival as well as neurological outcome.

METHODS. We reviewed medical records of all CA patients (in-hospital or out of hospital arrest) in whom cardiopulmonary resuscitation (CPR) was done at our hospital from 1st February 2011 to 31st January 2012 (12 months). The following information was collected: first documented rhythm (FDR), whether TMH done or not, 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 TMH with SR as well as nonshockable rhythm for both the parameters of outcome i.e. survival to hospital discharge and good neurological outcome, by logistic regression analysis.

RESULTS. We had 297 CA patients (168 SR, 129 NR) in whom CPR was done. Return of spontaneous circulation was achieved in 90 patients. TMH was induced in 57 patients (33 SR, 24 NR). Survival to hospital discharge was observed in 27 patients (18/33 [54.5 %] SR, 9/24 [37.5 %] NR), out of which 18 patients (10/33 [30 %] SR, 8/24 [33 %] NR) had good neurological outcome. On analysis, TMH was found to be associated with increased odds of survival to hospital discharge (though statistically not significant) in SR patients compared to nonshockable rhythm patients (Odds ratio [OR] 2.00; 95 % confidence interval [CI] 0.68–5.85; p 0.20), but it was not associated with any better neurological outcome in terms of CPC score in patients presenting with SR rather than nonshockable rhythm (OR 0.87; 95 % CI 0.28–2.68; p 0.81). Rather, odds for good neurological outcome were more in favour of nonshockable rhythm (PEA/Asys).

CONCLUSION. Though TMH might be associated with better survival chances in patients presenting with shockable rhythm, neurological outcome was no better (rather worse) in this group of patients when compared to patients with nonshockable rhythm as the first documented rhythm.

0116

A COMPARISON OF 2 THERAPEUTIC HYPOTHERMIA COOLING DEVICES ON NEURO INTENSIVE CARE

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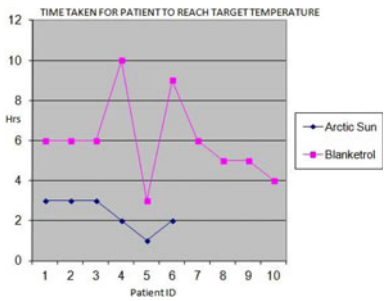
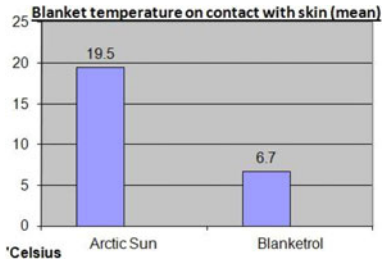
INTRODUCTION. Severe traumatic brain injury (TBI) requires active ICP management. Algorithm driven therapy often leads to the decision to actively cool patients with raised intracranial pressure to control secondary insults associated with increased metabolism. Fever, in the presence of TBI is associated with worsened neurological outcomes as an increased metabolic rate leads to glutamate release, neutrophil activity therefore secondary pathogenic events and an evolving Ischaemic cascade [1–3]. Achieving prescribed cooling therapy in a timely fashion is in the patient's best interest, however, differing methods of achieving target temperatures are used in the UK [4] and many devices are marketed.
OBJECTIVES. A comparison of two topical cooling devices- Arctic Sun sticky pads with coolant and the Blanketrol gel pad. This audit sought to ask, which device used on our ICU is most efficient at achieving timely therapy and the risks linked to devices used.
METHODS. 16 patients audited over a 12 week period. All had intracranial insults requiring level 3 care.
Data collected: Target temperature, Time to target, Device temperature next to skin, patient shivering and additional sedation and Tissue viability.
RESULTS. • Arctic Sun—fastest at a mean of 2.3 h to target temperature
• Blanketrol—mean of 6 h



Time to Target Temp

Blanket temperature on contact with skin

(see figure)



[Skin Temperature]
Indications for cooling
- 9 for raised ICP, 7 for pyrexia control
Reported Skin problems and shivering
Blanketrol
1 patient was clinically shivering requiring increased sedation.
2 patients needed re-sedation which may have delayed weaning.
1 patient developed a sacral pressure sore.
Arctic Sun
1 patient had Arctic Sun pads applied to friable skin, resulting in broken skin.
CONCLUSIONS. The most effective topical device at reaching the target temperature is the Arctic Sun.
Although our protocol chooses Blanketrol for fever control these patients may require sedation to tolerate the freezing blanket temperatures.
Arctic Sun has an 'awake patient' protocol for gentle normothermia.
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0117

THE RESULTS OF AN INTERNAL PILOT FOR THE EUROPEAN STUDY OF THERAPEUTIC HYPOTHERMIA (32–35 °C) FOR INTRACRANIAL PRESSURE REDUCTION AFTER TRAUMATIC BRAIN INJURY (EUROTHERM3235TRIAL) ISRCTN 34555414

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INTRODUCTION. The evidence shows that treatment with therapeutic hypothermia to reduce intracranial hypertension may improve patient outcome after Traumatic Brain Injury (TBI)
OBJECTIVES. An internal pilot/feasibility trial was conducted from Jan. 2009 to Aug. 2011 on the first 50 randomised patients to a trial of titrated hypothermia for treatment of raised ICP
METHODS. We assessed: (1) Checking feasibility; all aspects of the protocol, randomisation and data collection. (2) Refining treatments; testing mechanics of the delivery of the cooling intervention. (3) Learning how to identify suitable participants. (4) Piloting randomisation and data collection. The database, online eCRF and reporting functions were tested during the internal pilot trial. (5) Recruitment feasibility was assessed.
RESULTS. (1) The protocol was developed in collaboration with an international advisory board from January to June 2009 and published in BMC Trials. The first patients were successfully randomised in November 09 to February 2010 testing the protocol and the CRF in paper form. Recruitment using the online randomisation service, eCRF and database(s) started in July 2010.
(2) In keeping with a pragmatic trial design, the protocol and data collection are not burdensome. But, we are collecting hourly data on ICP and core temperature for the first 5 patients randomised in each centre. This has allowed assessment of whether centres are able to manage therapeutic cooling according to the protocol. To date (26/09/11) only 2 out of 73 patients have crossed over from control to intervention group. There have been 7 SAEs to date all unrelated to the intervention.
(3) Currently 13 % of screened, ICP monitored patients after TBI are eligible. The trial inclusion criteria have been tighter than most previous trials and have been effective at recruitment of a homogenous group of TBI patients with brain swelling.
(4) Piloting randomisation and data collection has resulted in the refinement of centre support. There are (to 15/09/2011) 37 centres able to recruit patients. Of these sites, 29 have screened pts and 21 have now randomised at least 1 patient.
(5) Recruitment—438 patients have been logged on the eCRF database. Of these, 71 have been randomised (15/09/2011).
CONCLUSIONS. The pilot phase has shown that we can deliver this cooling protocol and in a less heterogeneous group of TBI patients. Therefore the most relevant recent systematic review is that by Peterson et al. Because we have demonstrated we can deliver cooling that the Peterson meta-analysis suggests is the most optimal. Our revised power calculation is now for 600 patients.
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GRANT ACKNOWLEDGMENT. ESICM (pilot) and HTA (main trial).

0118

ELECTROCARDIOGRAM AND ELECTROLYTE DISTURBANCES INDUCED BY SURFACE COOLING AFTER CARDIAC ARREST

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INTRODUCTION. Mild therapeutic hypothermia (MTH) increases survival and improves neurological outcome in post cardiac arrest (CA) patients after successful resuscitation. The speed and duration of cooling and rate of re-warming are key factors in determining whether hypothermia will be effective. However, the risk of side effects also increases with longer duration and will therefore attention is needed for prevention and/or early treatment of side effects.
OBJECTIVES. Determine retrospectively ECG and electrolyte disturbances induced by surface cooling in post-CA patients.
METHODS. Post-CA patients were cooled using body wraps (Medi-Therm®, Gaymar), between 2008–2010. Patients were treated according to standard MTH protocol aiming at target temperature of 32.0 °C and maintained for 24 h after which the patients were gradually warmed to normothermic temperature at a rate of ~0.5 °C/h. ECG parameters and electrolyte levels during induction, maintenance and re-warming phase were documented for patients who survived MTH.
RESULTS. 76 patients were included with a mean age of 62 ± 15 years (mean ± SD) and body weight of 76 ± 13 kg of which 74 % were male. Ventricular fibrillation was the initial rhythm in 54 % of the patients and 39 % had ST-elevation myocardial infarction. Among the 76 patients, 54 % survived to discharge with a mean Glasgow outcome scale of 12 ± 3. Temperature before induction of cooling was 34.8 ± 1.1 °C. Core target temperatures were reached within 211 ± 121 min with mean cooling rates of 0.70 ± 0.46 °C/h. Induction of MTH results in significant decreased heart rate and QRS duration, and increased QTc interval (Table). Electrolytes potassium, phosphorus and calcium decreased during cooling, which is in conjunction with the observed pH changes and increased diuresis. Potassium was supplemented in 91 % of the patients during the maintenance phase at an average of 4.2 ± 2.7 mmol/l. In the first hours of re-warming ECG and electrolyte changes returned to normal levels. No correlation was found between cooling rates and heart rate, QTc interval, QRS duration or electrolyte disturbances.
CONCLUSION. Mild ECG and electrolyte changes developed during the induction phase of surface cooling, persisted throughout the maintenance phase of hypothermia treatment and partly normalized at the beginning of the slow re-warming process.

ECG and electrolyte parameters

	Induction	Maintenance	Re-warming
Heart rate (bpm)	96 ± 30	61 ± 16*	81 ± 19†
QTc (ms)	461 ± 70	510 ± 73*	505 ± 61
QRS (ms)	139 ± 52	113 ± 36*	108 ± 28
Lowest potassium (mmol/l)	4.08 ± 0.78	3.64 ± 0.40*	4.47 ± 0.52†
Lowest phosphorus (mmol/l)	1.36 ± 0.76	1.10 ± 0.66*	1.19 ± 0.45†
Highest pH	7.35 ± 0.10	7.42 ± 0.07*	7.37 ± 0.06†
Diuresis (ml)	368 ± 333	1,502 ± 974*	742 ± 651†

All data are mean ± SD

* $P < 0.05$ Maintenance versus Induction
† $P < 0.05$ Re-warming vs Maintenance

0119

NEUROPROTECTIVE PROPERTIES OF HYPOTHERMIA

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INTRODUCTION. Recent years debated the use of craniocerebral hypothermia for treatment of acute period ischemic stroke

OBJECTIVES. Study affect on hemodynamics of craniocerebral hypothermia during the acute period of ischemic stroke.
METHODS. To 26 patients in the acute period of ischemic stroke craniocerebral hypothermia (CCH) was carried out. The surface of the head was cooled by the means of a special helmet from the therapeutic hypothermia ATG-01 machine. The temperature of the scalp was kept at +3 ± 2 °C for 8–24 h. Neurological deficit was recorded according to the North American scale of NIHSS. Parameters of Cerebral blood flow was estimated by the method of Transcranial Doppler (TCD), intracranial pressure was calculated, continuous monitoring of basal temperature was measured, in the region of heat loss and external auditory canal. In two patients, the surface temperature of the cerebral cortex of both hemispheres was recorded at 18 points with a radio thermometry.
RESULTS. Craniocerebral hypothermia (CCH) helped to increase the peak systolic velocity of the Cerebral blood flow by 69 % and the average velocity of Cerebral blood flow by 59 %. ICP was decreased by 31 %. The most significant effect was registered in ischemic stroke of less than 48 h. Neurological deficit initially on the scale of NIHSS was 11.1 ± 0.12, after CCH—5.8 ± 0.98 points (47.7 %). In ischemic stroke of more than 48 h and in group of patients not undergoing CCH, dynamics in the change of neurological deficits was not authentic.
CONCLUSIONS. CCH led to a decrease in auricular temperature and cerebral cortex temperatures by 2.1 °C. The recorded results are discussed from the point of view of the neuroprotective effects of CCH.
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0120
RISK FACTORS ASSOCIATED TO MORBID-MORTALITY PREVIOUS TO STARTING HYPOTHERMIA TREATMENT IN ICU PATIENTS AFTER CARDIAC ARREST

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INTRODUCTION. 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 associated initially 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 2011. Morbi-mortality was considered when GCS at hospital discharge was less than 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), time of advanced life support, time to hypothermia induction, 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. 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 22 out of 34 studied patients had morbid-mortality and 17 of them died. The age in the morbid-mortality group was significantly higher that the age in the other group (64.9 ± 13.5 vs. 51.5 ± 18.4; $p = 0.02$). There was a trend to a significant greater time of advanced life support in the morbid-mortality group compared to the other group 30 min. (IQR 20–50) vs. 20 min. (IQR 10–32); $p = 0.089$.
CONCLUSIONS. Age was the only risk factor significantly associated to a greater risk of hospital morbid-mortality, in patients who suffered cardiac arrest subjected to hypothermia. There was a trend to statistically significance in the time of advanced life support in those patients with hospital morbi-mortality.

0121
NSE FOR ASSESSMENT OF OUTCOME AFTER CARDIAC ARREST- THE IMPACT OF THE ANALYSIS METHOD

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INTRODUCTION. Neuron specific enolase (NSE) is the best documented biomarker for assessment of cerebral damage after cardiac arrest, and cut-off levels for a poor outcome have been published [1, 2]. Several authors have questioned the reliability of these cut-off levels after the introduction of induced hypothermia. There is currently no consensus on the use of NSE, or other biomarkers for prognostication. One reason may be a multitude of analysis methods and lack of standard.
OBJECTIVES. To compare two different analysis methods on the same sample.
METHODS. Frozen samples from hypothermia treated cardiac arrest patients were analysed on (LIAISON® NSE, (DiaSorin AB, Sundbyberg, Sweden, detection limit 0.04 μg/l, reference interval <12.5 μg/l) and NSE Cobas e601 (Roche Diagnostics, Mannheim, Germany detection limit 0.05 μg/l, reference interval 17 μg/l).
RESULTS. Samples from 50 patients were analysed in parallel. The median NSE level in the analysis on the LIAISON instrument was 14.3 μg/l (6.6–172.8 μg/l). The median NSE level analysed on the NSE Cobas e601 was 16.3 μg/l (0.5–231.2 μg/l). The mean difference between the two instruments was 5.3 μg/l, $r = 0.997$ ($p < 0.001$), with 36 % higher levels using the NSE Cobas e601.
CONCLUSIONS. This study shows that these two NSE analyses are not interchangeable. The use of different methods accounts for part of the variability in published studies. Knowledge of the local laboratory performance is essential for interpretation.
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0122
THE FEASIBILITY OF USING SERUM PROTEOMICS TO IDENTIFY NOVEL BIOMARKERS THAT PREDICT NEUROLOGICAL RECOVERY AFTER CARDIAC ARREST: A PILOT STUDY

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INTRODUCTION. Predicting neurological recovery after cardiac arrest is challenging, especially for patients that are treated with therapeutic hypothermia (TH). Specific biomarkers have been used in the past to aid in prognostication, but are unreliable for patients treated with TH.
OBJECTIVES. The objective of this study was to demonstrate the feasibility of two-dimensional gel electrophoresis (2DGE) to identify serum protein differences in patients undergoing TH that may aid in predicting neurological recovery after cardiac arrest.
METHODS. This was a prospective cohort feasibility study. Patients were included if they were age 18 or older, had an initial rhythm of ventricular fibrillation or pulseless ventricular tachycardia, and had return of spontaneous circulation within 60 min. TH was induced with a surface cooling device. Baseline demographics, clinical, physiological, and metabolic information were collected. Neurological recovery was assessed at 3 months either by telephone or chart review. Serum was collected from each patient every 12 h for the first 72 h of admission. The serum was analyzed with 2DGE. Protein spots were analyzed with time-of-flight mass spectrometry. All protocols were approved by our Research Ethics Board.
RESULTS. The pilot phase of this study has recruited 9 patients. Two patients were excluded because they had a subsequent cardiac arrest within the first 12 h of their intensive care unit admission. One additional patient was subsequently excluded when re-evaluation of the initial rhythm demonstrated asystole. Therefore 6 patients have been successfully enrolled, 5 male, one female. The mean age was 67.2 years. Ventricular fibrillation was the most common presenting rhythm. Four patients had a good neurological outcome (no neurological deficit). Two patients had a poor neurological recovery (severely disabled or dead). 2DGE has demonstrated dramatic changes in serum proteome from the time of ICU admission and during therapeutic hypothermia.
CONCLUSIONS. It is feasible to collect serum samples from patients post cardiac arrest for analysis with 2DGE and subsequent mass spectrometry. This study will form the basis for a larger investigation aimed at comparing serum proteomes between patients with good or poor neurological outcomes after cardiac arrest.
GRANT ACKNOWLEDGMENT. This work was supported by the Botterell Foundation of Queen's University.

0123
OPTIC NERVE ULTRASOUND TO ASSESS INTRACRANIAL PRESSURES IN CARDIAC ARREST SURVIVORS: A FEASIBILITY STUDY

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INTRODUCTION. Intracranial pressure (ICP) monitoring is routinely used in traumatic brain injury. ICP monitoring may also be useful in other patients with potentially elevated ICP, namely cardiac arrest survivors (CAS). No prospective study has examined the incidence of raised ICP amongst CAS. This pilot study will examine the feasibility of screening for elevated ICP in CAS, using optic nerve ultrasound (ONUS) as a non-invasive modality, in all CAS admitted to the Toronto Western Hospital between Jan 2012 and Dec 2012. The ultimate objective is to design a large prospective cohort study to evaluate the incidence of raised ICP among CAS, examine the role of ONUS, measure the incidence of predefined short and long term outcomes, and design intervention strategies for treating raised ICP in these patients. A single centre feasibility study is required as the initial step and we have designed the first study examining the role of ONUS in CAS.
OBJECTIVES. The primary outcome is the incidence of major protocol violations, defined as the inability to attain at least 5 out of 6 ONUS recordings during the first 72 h after return of spontaneous circulation.
METHODS. ONUS will be conducted by two independent ultrasonographers in 4 planes, where the ICP is defined as being elevated if any recording of the optic nerve sheath diameter is greater than 5.9 mm.
RESULTS. Thirteen CAS have been enrolled from Jan 2012 to April 2012, of which all have received ONUS measurements without protocol violation (6/6 ONUS measurements; 100 %). Three patients had findings suggestive of elevated ICP by ONUS, with a positive predictive value of 1.00 when compared to CT head for elevated ICP. The study is on-going and is expected to recruit 30 patients by completion in Dec 2012.
CONCLUSIONS. Measurement of ICP by ONUS in CAS admitted to the Toronto Western Hospital is feasible and did not result in any major protocol violations. The current study is on-going and, once completed, should aid in the design of a large multi centre trial using ONUS in all CAS to assess fort he incidence of elevated ICP.

0124
CEREBRAL OXYGEN DESATURATION IS ASSOCIATED WITH NEUROLOGIC COMPLICATIONS AND LONGER INTENSIVE CARE UNIT STAY IN HIGH-RISK CARDIAC SURGERY PATIENTS

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INTRODUCTION. Monitoring cerebral regional oxygen saturation (rSO_2) in low-risk coronary surgery patients avoided cerebral deoxygenation and improved outcome [1].
OBJECTIVES. We hypothesized that lower rSO_2 values would be associated with higher incidence of neurologic complications and longer intensive care unit (ICU) stay in high-risk cardiac surgical patients.
METHODS. Fifty high-risk patients (EuroScore > 5) were monitored during cardiac surgery with cerebral near infrared spectroscopy (NIRS) to estimate rSO_2. Interventions to improve cerebral deoxygenation (defined as a 20 % reduction of rSO_2 below baseline) were

based on an algorithm for the use of NIRS on optimizing factors that influence cerebral oxygen supply/demand (e.g., perfusion pressure and cardiac output, arterial oxygen content, haemoglobin, and the cerebral metabolic rate of O_2).
RESULTS. Patients who exhibited major neurologic complications were 28 %. They needed longer duration of mechanical ventilation (MV) (58 ± 69 vs 20 ± 52 h, p = 0.041) and ICU stay (8.3 ± 8.4vs 2.6 ± 2.7 days, p = 0.001) than patients without a neurologic complication. Baseline rSO_2 values were significantly lower in patients facing major neurologic complications (Dx 60.1 ± 1.9 vs 64.7 ± 1.2 %, p = 0.04; Sx 61.6 ± 1.6 vs 66.6 ± 1.2 %, p = 0.03) who also exhibited more episodes of cerebral desaturation during surgery (3.0 vs 1.5, p = 0.004). There was a significant inverse correlation between intraoperative rSO_2 and duration of MV (r = −0.68) and length of ICU stay (r = −0.62).
CONCLUSIONS. Preoperative rSO_2 values are associated with an increased risk of neurologic dysfunction. Cerebral oxygen desaturation during cardiac surgery is associated with prolonged MV needs and ICU stay.
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0125
REDUCTION OF ISCHAEMIC BRAIN DAMAGE AFTER XENON ADMINISTRATION IN A RAT MODEL OF GLOBAL CEREBRAL ISCHAEMIA

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INTRODUCTION. Cerebral ischaemia is among the leading causes of death, disability and economic expense in the world. Ideally, a neuroprotective agent should be effective when administered after the initial ischaemic insult, exhibiting fast onset of action, minimal adverse effects and no toxicity. The medical gas xenon has been shown to be neuroprotective both in vivo and in vitro, albeit predominantly when administered as a preconditioning agent.
OBJECTIVES. In the current study, we have used a rat model of global ischaemia to investigate whether xenon-induced neuroprotection is observed following the incidence of an ischaemic insult.
METHODS. Adult male Wistar rats underwent bilateral common carotid artery occlusion and were ventilated for 1 h with 21 %O_2/78 %N_2. They were then randomized to receive either the same mixture, 50 %O_2/50 %N_2O or 50 %O_2/50 %xenon. After 45 min, histological, immunochemical and molecular analysis of brain sections was undertaken. Cerebral infarct size and MMP-9 expression were evaluated.
RESULTS. Both N_2O and xenon administration reduced the infarct size but the result didn't reach significance level. In the molecular analysis, the xenon group demonstrated a statistically significant reduction in MMP-9 expression (Fig 1).

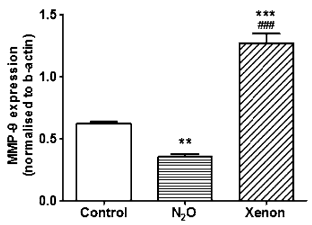

Figure 1: Relative reduction of MMP-9 in the N2O

CONCLUSIONS. In this model of global cerebral ischaemia, the administration of N_2O and xenon reduced the size of the ischaemic regions mainly in the cerebral cortex. The reduced expression of MMP-9 in the two groups confirms the neuroprotective role of these gases.
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0126
ROLE OF THYROID HORMONE IN HEMODYNAMIC MANAGEMENT OF ORGAN DONOR

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INTRODUCTION. In the organ donor, with respect to the process of brain death, a series of hemodynamic and endocrine changes occur, and they must be controlled in order to optimize the organs viability. In regards to the management of hemodynamic alterations, the efficacy of the thyroid hormone (T4) has been studied; thus far, studies show its controversial use.
OBJECTIVES. The goal of our study is to evaluate the effectiveness of treatment with T4 in donors who present hemodynamic instability in spite of support with vasoactive drugs.
METHODS. Retrospective study of donors in our hospital within the last 5 years (2007–2011). The following variables were evaluated: age, sex, past medical history, cause of brain death, hours (h) of stay in ICU, hours elapsed between diagnosis of brain death and organ extraction, need for vasoactive amines (type and dose), T4 administration and its effectiveness (mediated by lesser amine dose required and/or improvement of hemodynamic parameters). Results are shown as mean and standard deviation.
RESULTS. 170 patients were studied, of which 153 were included (17 excluded (10 %) for lack of data), with an average age of 55.28 years (range 16–80), 62 were female (40.52 %) and 91 male (59.48 %); 32 individuals presented history of diabetes mellitus (20.92 %) and 68 of hypertension (44.4 %). The principal causes of brain death were cerebrovascular accidents with 108 cases (70.59 %), 21 cases of severe craneoencephalic trauma (13.73 %), 18 cases of postanoxic encephalopathy (11.76 %) and 6 other causes (3.9 %).The mean ICU stay was 77.5 h (±66.24), hours elapsed between diagnosis of brain death and organ extraction was 7.19 h (±2.96). 136 patients (88.9 %) required vasoactive amines: 102 norepinephrine (75 %), for a mean of 32.43 h (±30.17), with mean dose in the first 48 h prior to donation of 0.3 μg/kg/min (±1.12), 8 required dopamine (5.9 %) for a mean of 48.3 h (±9.07), with mean dose of 4.9 μg/kg/min (±3.76), 26 (19.1 %) required both drugs.T4 was administered to 8 of these 136 patients whom required vasoactive amine support (5.8 %), they all presented hemodynamic improvement (100 %). In 5 cases the vasoactive amine dose was lowered and hemodynamic parameters improved (62.5 %), in one patient there was hemodynamic improvement without diminishing the vasoactive amine dose (12.5 %) and in 2 patients the dose was lowered maintaining hemodynamic parameters (25 %).
CONCLUSIONS. Although there are no conclusive studies published to date regarding the effectiveness of the T4 in donors, our experience from the last 5 years supports its effectiveness in hemodynamic improvement. Therefore, the indications for its administration should be clearly established in organ donation protocols, in the goal of obtaining hemodynamic stability with lesser use of vasoactive amines.
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Imaging to guide treatment of acute respiratory failure: 0127–0140

0127
REGIONAL VENTILATION DELAY INHOMOGENEITY MEASURED BY ELECTRICAL IMPEDANCE TOMOGRAPHY DURING PEEP TITRATION IN HEALTHY LUNGS AND DIFFERENT MODELS OF LUNG INJURY

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INTRODUCTION: To minimize further injury to the lung during mechanical ventilation in patients suffering from Acute Lung Injury (ALI), positive end-expiratory pressure (PEEP) needs to be optimized individually. Commonly used strategies to titrate PEEP are based on measurement of global lung mechanics and gas exchange. We recently demonstrated that Electrical Impedance Tomography (EIT) can be used to estimate tidal recruitment of the lung by measuring Regional Ventilation Delay Inhomogeneity (SD_{RVD}) [1] and thus might be helpful during PEEP titration.
OBJECTIVE. To investigate the value of Regional Ventilation Delay Inhomogeneity during PEEP titration in healthy lungs and different lung injury models.
METHODS. After approval of the local ethic committee, 26 pigs were anesthetized and mechanically ventilated. ALI was induced in 10 pigs by intraabdominal hypertension and central venous oleic acid injection (IAH/OA), 8 pigs were injured by acid aspiration (HCl) and 8 animals served as healthy control. During a decremental PEEP trial PEEP was reduced from 30 to 8 cmH_2O in steps of 2 cmH_2O after maximal recruitment. At each PEEP SD_{RVD} was measured by EIT during slow inflation [1] to estimate tidal recruitment and blood gases were taken. Statistical analyses were performed using repeated measures ANOVA and post hoc tests (Newmann-Keulls).
RESULTS. In lung injured pigs tidal recruitment (estimated by SD_{RVD}) was decreasing with increasing PEEP (fig 1). Whereas SD_{RVD} was always higher in the IAH/OA group when compared to healthy pigs, it was decreased to normal values at PEEP levels above 14 cmH_2O in the HCl group. In contrast, P/F ratio was comparable between both ALI groups, increased with higher PEEP and reached normal values at PEEP levels above 20 cmH_2O (fig 1).

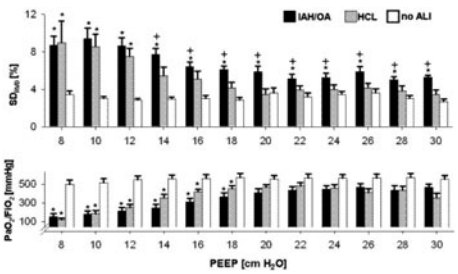

Figure 1: upper graph: Regional Ventilation Delay Inhomogeneity (SD_{RVD}); lower graph: P/F ratio. data as mean ± SEM. ANOVA: P < 0.05 for factors group, PEEP and their interaction, respectively; *P < 0.05 vs. no ALI, +P < 0.05 for differences between HCl and IAH/OA (post hoc), respectively.
CONCLUSIONS. Whereas P/F ratio was not able to discriminate differences between two lung injury models during decremental PEEP trial, EIT showed that the effect of PEEP on tidal recruitment depends on the underlying type of injury. Thus, EIT seems to be helpful to optimize individual ventilator settings by analyzing heterogeneity in regional lung mechanics.
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GRANT ACKNOWLEDGMENT. The study was funded by a DFG-grant to Hermann Wrigge (WR47-1-1)

0128
ASSESSMENT OF PULMONARY PERFUSION WITH FLUORO-DESOXYGLUCOSE AND POSITRON EMISSION TOMOGRAPHY: A VALIDATION STUDY

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INTRODUCTION. Lung Perfusion is a critical determinant of arterial oxygenation during ARDS. Positron emission tomography using ^{18}FDG as a radiotracer combined with computed tomography allows assessment of both lung aeration and cellular metabolism [1], as

well as an estimation of the amount of ^{18}FDG confined to the pulmonary vessels (blood fraction) [2].
OBJECTIVES. The aim of this study is to validate the use of ^{18}FDG blood fraction to assess pulmonary perfusion, using lung perfusion measured with PET and ^{15}O-labelled water ($H_2^{15}O$) as a reference, in both control and acute lung injury animals. To study a wide range of pulmonary perfusion pattern, supine, prone position and various PEEP or tidal volumes levels were selected.
METHODS. In 32 piglets, ALI was performed by tracheal instillation of hydrochloric acid. 17 animals were studied in supine position (SP) with low PEEP (5 ± 3 cmH_2O, n = 9) or high PEEP (12 ± 3 cmH_2O n = 8), and 9 in prone position (PP) with low PEEP (4 ± 2 cmH_2O). The remaining 6 ALI animals were ventilated with high tidal volume, adjusted to maintain trans-pulmonary pressure at or above 35 cm of H_2O (VILI-HCl group). Twelve additional piglets served as controls: 6 were studied using normal ventilatory settings (control group) and 6 with high tidal volume, adjusted to maintain trans-pulmonary pressure at or above 35 cm of H_2O (VILI group). PET images were acquired during both $H_2^{15}O$ and ^{18}FDG intravenous injection. Ten regions of interest (ROI) were defined within the lung along the anterior-to-posterior dimension. Lung perfusion and blood fraction were measured in each ROI by compartmental modelling of $H_2^{15}O$ lung kinetics [3] and ^{18}FDG kinetics [2], respectively. Lung perfusion in each ROI was expressed as a fraction of the whole lung perfusion.
RESULTS. Perfusion and blood fraction were strongly correlated (figure 1). Bland and Altman analysis of the relationship between perfusion and blood fraction is shown on figure 2. Mean difference amounted to 0 and 95 % limits of agreement to [−0.045 to 0.045] (figure 2).

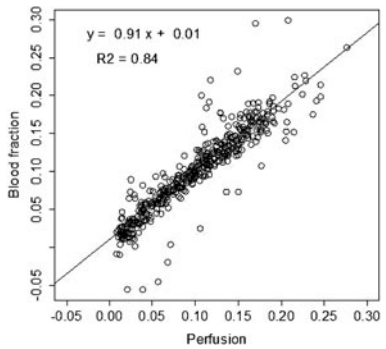

Figure 1

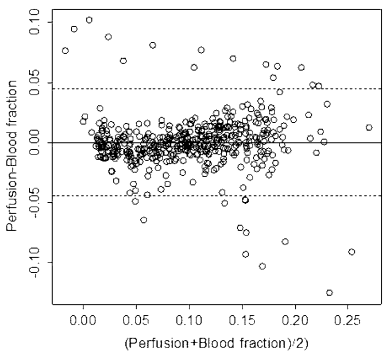

Figure 2

CONCLUSIONS. Blood fraction assessed from mathematical modeling of ^{18}FDG kinetics is a reliable estimate of lung perfusion.
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0129

EFFECTS OF CYCLIC SHORT RECRUITMENT MANEUVERS (SIGH) IN ACUTE RESPIRATORY FAILURE PATIENTS UNDERGOING PRESSURE SUPPORT VENTILATION: AN ELECTRICAL IMPEDANCE TOMOGRAPHY STUDY

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INTRODUCTION. Pressure support ventilation (PSV) is associated with decreased sedation and improved respiratory muscle function in intubated acute respiratory failure (ARF) patients. However, switching patients from controlled ventilation to PSV without increasing positive end expiratory pressure (PEEP) may lead to decreased mean airway pressure (Paw), loss of aeration in dependent lung regions and impaired gas exchange. Cyclic short recruitment maneuvers (Sigh) may represent an alternative strategy to prevent lung collapse in patients undergoing PSV.
OBJECTIVES. We assessed the effects of different Sigh strategies on pulmonary ventilation and aeration by electrical impedance tomography (EIT).
METHODS. We enrolled 9 consecutive (67 ± 13 year-old) ARF patients admitted to two intensive care units, intubated and undergoing PSV, with PaO_2/FiO_2 ≤300 mmHg and PEEP ≥5 cmH_2O. We applied on each patient's thorax a 16-electrode belt connected to a bedside EIT monitor (PulmoVista 500®, Dräger Medical GmbH, Lübeck, Germany). We randomly tested for 20 min 0, 0.5, 1 and 2 Sigh (35 cmH_2O for 3–4 s.) per minute, while PSV level, FiO_2 and PEEP remained unchanged. For each phase, we calculated from EIT raw data: 1. Percentage of tidal ventilation reaching non-dependent (Vt $\%_{non\text{-}dep}$) and dependent (Vt $\%_{dep}$) lung regions; 2. Relative changes in end-expiratory lung impedance (EELI) (that should reflect changes in end-expiratory lung volume), considering the 0 Sigh phase as baseline, both at the global ($\Delta EELI_{gl}$) and regional ($\Delta EELI_{non\text{-}dep}$ and $\Delta EELI_{dep}$) level. We collected ventilation parameters, hemodynamics and arterial blood gases. We compared no Sigh vs. Sigh phases by complex contrasts for one-way ANOVA and different Sigh rates effects by one-way ANOVA.
RESULTS. In comparison to no Sigh, Sigh increased PaO_2 ($p = 0.05$). Paw, minute ventilation (MVe), $PaCO_2$ and hemodynamics, instead, were not significantly affected by introduction of Sigh. Sigh did not modify Vt $\%_{non\text{-}dep}$ and Vt $\%_{dep}$. Sigh increased $\Delta EELI_{gl}$ ($p < 0.001$), mostly by modification of $\Delta EELI_{non\text{-}dep}$ ($p < 0.01$) while $\Delta EELI_{dep}$ changed slightly less consistently ($p = 0.06$). Increasing Sigh rates did not change Paw, PaO_2, MVe, $PaCO_2$ or hemodynamics. At higher Sigh rates, Vt $\%_{non\text{-}dep}$ and Vt $\%_{dep}$ values did not vary and $\Delta EELI_{gl}$ increased, although non-significantly ($p = 0.09$). Finally, during all Sigh phases, $\Delta EELI_{dep}$ was correlated with $PaCO_2$ values ($r = -0.62$, $p < 0.01$).
CONCLUSIONS. Sigh application in ARF patients undergoing PSV is associated with improved oxygenation and increased non-dependent and dependent EELI values. Increase of Sigh rate from 0.5 to 1 and 2/min does not show relevant physiological advantages. Changes in $EELI_{dep}$ following Sigh application may be an estimate of alveolar recruitment and shunt reduction.
GRANT ACKNOWLEDGMENT. Institutional. Dräger Medical GmbH, Lübeck, Germany, provided the EIT monitor free of charge.

0130

TOPOGRAPHIC DISTRIBUTION OF LUNG COMPLIANCE ASSESSED BY COMPUTER TOMOGRAPHY IN MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. Heterogeneity of lung mechanics together with other factors can induce a ventilator-induced lung injury (VILI). However, recent papers report that also the healthy lung is intrinsically inhomogeneous [1, 2]: knowledge of the topographic distribution of lung elasticity may be of clinical relevance. Lung Computer Tomography (CT) can yield quantitative information about volume distribution inside lung parenchyma; Image Registration (IR) technology allows to compare CT images shot at different inflation volumes.
OBJECTIVES. To quantify regional lung compliance by combining information provided by CT and respiratory mechanics in a group of eleven mechanically ventilated patients.
METHODS. Eleven intubated, sedated and ventilated patients, after approval by the local ethics committee and informed consent, were recruited to the study. They had no evidence of pulmonary pathologies. Recordings were made of flow, volume and pressure at airways opening together with esophageal pressure. Eight CT scans at a level between heart and diaphragm were performed during end-inspiratory hold maneuvers (IHM) at different inflation volumes (from 4 to 11 ml/kg in steps of 1 ml/kg). These were converted to Volume Maps (VM). By the Image Processing Toolbox for MatLab a manual multi-linear IR was performed, yielding for each patient a group of images with the same dimensions but subtending a different informative content, as determined by the different inflation volumes. This allowed the subtraction between different VM and yielded a map of the actual inflated volume. Dividing the volume map by the respective transpulmonary pressures, we obtained the compliance maps of the human lung.
RESULTS. Compliance maps of human lung exhibited a heterogeneous spatial distribution. The highest values of compliance were found in the dependent regions of the lung. Local compliances may show also negative values.
CONCLUSIONS. Quantitative analysis of CT scans reveals a distribution of lung elasticity determined by both gravitational and local factors. The finding of negative values of compliance is in line with other recent reports (2) and depend on lung regions which transiently deflate during global inspiration.
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GRANT ACKNOWLEDGMENT. The Italian Ministry of University and Scientific Research, The Swedish Medical Research Council (5315)

0131

EFFECT OF HIGH FLOW NASAL CANNULA AND BODY POSITION ON END-EXPIRATORY LUNG VOLUME. A COHORT STUDY OF HEALTHY INDIVIDUALS USING ELECTRICAL IMPEDANCE TOMOGRAPHY

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INTRODUCTION. Electrical impedance tomography (EIT) measures changes in lung impedance which are mainly related to changes in lung volume. Good correlation has been found between changes in end expiratory lung impedance (EELI) and changes in end expiratory lung volume (EELV). High-flow nasal cannula (HFNC) has been described as an excellent method of non-invasive oxygen delivery.The effects of prone positioning on regional lung ventilation have been described in non-intubated healthy adult subjects and in preterm infants on continuous positive airway pressure, but its impact on lung volume distribution in adult subjects with HFNC therapy has not been discussed to date.
OBJECTIVE. Compare the variation of global EELI in healthy subjects associated with the high flow application and to evaluate the influence of supine and prone position in regional impedance distribution.
METHODS. The study was approved by the Vall d'Hebron University Hospital Ethics Committee. Written informed consent was obtained from all participants.Twenty healthy volunteers were recruited. Two periods were defined, the first in supine position and the second in prone position. Each period was divided into three phases. In the first and the third

phases subjects were breathing ambient air, and in the second HFNC was implemented. Four regions of interest were defined, two ventral and two dorsal. For each respiratory cycle, global and regional end-expiratory lung impedance variation (ΔEELI) were measured by EIT and were expressed as a function of the tidal variation of the first stable respiratory cycle (units).
RESULTS. HFNC increased global EELI by 1.26 units (95 % CI 1.20, 1.31; $P < 0.001$) in supine position and by 0.87 units (95 % CI 0.82, 0.91; $P < 0.001$) in prone position. Distribution of ΔEELI was homogeneous in prone position, with no difference between ventral and dorsal lung regions (-0.01 units, 95 % CI -0.01, 0; $P = 0.176$), whilst in supine position a significant difference was found (0.22 units, 95 % CI 0.21, 0.23; $P < 0.001$) with increased impedance variation in ventral areas.
CONCLUSIONS. HFNC increased global EELI in our population, regardless of body position, suggesting an increase in functional residual capacity. Prone positioning was related to a more homogeneous distribution of ΔEELI, while in supine position ΔEELI was higher in the ventral lung regions.
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0132
COMPARISON OF THREE DIFFERENT PEEP TITRATION STRATEGIES IN EXPERIMENTAL ACUTE LUNG INJURY OVER A PERIOD OF 24 H

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INTRODUCTION. In context with protective ventilation strategies for patients suffering from Acute Respiratory Distress Syndrome (ARDS), reductions in tidal volume and driving pressures but not general use of higher positive end-expiratory pressure (PEEP) have improved outcome measures. Thus, setting an individualized PEEP in patients with ARDS is still controversial. Commonly used strategies are based on measurement of global lung mechanics and gas exchange. We recently demonstrated that Electrical Impedance Tomography (EIT) can be used to estimate tidal recruitment of the lung by measuring Regional Ventilation Delay Inhomogeneity (SD_{RVD}) [2] and thus might be helpful during PEEP titration.
OBJECTIVE. To compare two PEEP titration strategies aiming either at maximal oxygenation (open lung approach) or minimizing tidal recruitment as assessed by SD_{RVD} using EIT with the ARDS network table setting.
METHODS. After approval, eighteen anesthetized pigs were mechanical ventilated and instrumented. After induction of acute lung injury (ALI) by hydrochloric acid aspiration pigs were randomized to one of three ventilation strategies. In the ARDSnet group (that aims to reduce overdistention at end-inspiration) PEEP and FiO_2 were adjusted according to the original ARDS network PEEP/FiO_2 table. In two further groups, a decremental PEEP trial (reduction of PEEP from 30 in steps of 2 cmH_2O) was performed after maximal recruitment. At any PEEP step blood gases were taken and SD_{RVD} was measured [2]. Lowest PEEP levels were identified that avoid a decrease in oxygenation (open lung approach) (OLA group) or reduce tidal recruitment (as indicated by minimized SD_{RVD} (EIT group). After 4, 8, 12, 16, 20 and 24 h of ventilation SDRVD was measured using EIT and gas exchange was assessed. PEEP was adjusted if necessary. Statistical analyses were performed by repeated measures ANOVA.
RESULTS.

Table 1

	Group	4 h	8 h	12 h	16 h	20 h	24 h	ANOVA
PEEP (cmH_2O)	ARDSnet	7 (2)	7 (2)	6 (2)	7 (2)	8 (1)	7 (2)	
	OLA	19 (4)	19 (4)	19 (4)	19 (4)	19 (4)	19 (4)	#,*
	EIT	18 (4)	17 (5)	20 (6)	19 (5)	21 (3)	20 (3)	
PaO_2/FiO_2 (mmHg)	ARDSnet	221 (80)	219 (107)	157 (41)	154 (53)	154 (17)	176 (60)	
(at $FiO_2 = 1$)	OLA	313 (109)	307 (87)	290 (122)	350 (58)	268 (95)	271 (12)	#
	EIT	299 (143)	302 (115)	346 (50)	314 (43)	274 (76)	271 (48)	
SDRVD [%]	ARDSnet	9.0 (3.4)	9.7 (3.2)	10 (2.9)	10.4 (1.5)	8.8 (1.6)	7.4 (2.4)	
	OLA	4.2 (1.6)	5.2 (1.7)	5.6 (1.5)	4.8 (0.7)	5.1 (1.4)	5.6 (2.8)	#
	EIT	5.2 (1.9)	4.9 (1.9)	5.1 (2.1)	6.1 (2.7)	4.9 (2.4)	5.5 (2.9)	

rep. meas. ANOVA: #
$p < 0.05$ factor *group*,* $p < 0.05$ factor *time*, data given as mean and (SD)

CONCLUSION. In this model of ALI resulting PEEP values were higher with the OLA and the EIT-based strategy when compared to the ARDSnet protocol, but did not differ between OLA and EIT-based strategy over a period of 24 h. Higher PEEP levels with OLA and EIT reduced tidal recruitment when compared to the ARDSnet protocol.
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0133
MAPPING LUNG MECHANICS BY ELECTRICAL IMPEDANCE TOMOGRAPHY

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INTRODUCTION. Respiratory mechanics describe the ability of the lung to take up and to release air. Different approaches to measure and to display this ability are used in order to reduce side effects of mechanical ventilation. For this study a method to determine regional respiratory flow and regional time constants was developed using electrical impedance tomography (EIT) during mechanical ventilation.
OBJECTIVES. The aim of this study was to validate this method. Therefore, global respiratory flow from EIT was compared to spirometry and the calculated global time constants to results already published. The regional pattern of flow and the distribution of time constants in the lung measured by our method were described and compared qualitatively to computed tomography (CT).
METHODS. The in vivo aeration of porcine lungs was recorded and analyzed in the global, independent, middle and dependent region-of-interest (ROI) during pressure controlled ventilation by EIT. Flow was calculated by the first derivative of the aeration curve in all ROI. Four phases of the respiratory cycle during different ventilatory settings ($n = 7$ pigs) and after induction of lavage injury ($n = 6$ pigs) were discriminated. The four phases delivered peak and late inspiratory and expiratory flow (PIF, LIF, PEF, LEF). Using PIF and PEF the first and using LIF and LEF the second regional time constant (τ_1 and τ_2 in in- and expiration) were calculated and compared to the data published by Doebrich et al. [1]. Aeration before and after induction of lavage injury was examined by thoracic computed tomography as described by Gattinoni et al. [2].
RESULTS. The results from spirometry and EIT were in agreement. The linear regression analysis delivered the following results: $PIF_{EIT} = 0{,}804 \times PIF_{spiro} - 90.1$, $r^2 = 0.810$ und $PEF_{EIT} = 0.723 \times PEF_{spiro} - 70.1$, $r^2 = 0.777$. The regional analysis of the flow pattern depicted a heterogeneous distribution, as expected. The size of the global time constants was in agreement of data published by Doebrich et al. [1] (τ_1: 0.4–0.8 s, τ_2: 4.9–22.1 s). Regional time constants were determined for the first time and were distributed homogeneously, as expected. Early lung injury by lung lavage as also displayed by CT led to changes in the pattern of the time constants, especially in the dorsal region (prolonged τ_2).
CONCLUSIONS. The presented method can map mechanical characteristics of the lung. It needs further validation in late experimental ARDS and it has to prove its ability to measure meaningful data in patients.
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GRANT ACKNOWLEDGMENT. DFG Ma 2398/6.

0134
EFFECTS OF PLEURAL EFFUSION DRAINAGE ON OXYGENATION, RESPIRATORY MECHANICS AND HEMODYNAMICS: A PHYSIOLOGICAL STUDY

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INTRODUCTION. Pleural effusions are frequent in critically ill patients under mechanical ventilation but the benefits and the physiological effects of pleural drainage are not well established.
OBJECTIVES. We evaluated the effects of thoracenthesis of significant pleural effusions in mechanically ventilated patients. The primary end point was the improvement in oxygenation. Secondary end points included the change in respiratory mechanics and hemodynamic status.
METHODS. The following data were recorded before and 3 h after ultrasound guided drainage of pleural fluid: arterial blood gases, respiratory mechanics [pleural pressure, functional residual capacity (FRC), respiratory system compliance] and hemodynamics (blood pressure, heart rate, cardiac output). Respiratory settings were kept identical during the study period.
RESULTS. Sixteen patients were included. Eleven patients had an exsudative pleural effusion The duration of mechanical ventilation before the procedure was 4 [1–7.5] days. The drainage volume was 1,100 [800–1,435] ml during the first 3 h. The PaO_2/FiO_2 ratio was 175 [124–248] before the procedure and increased to 231 [177–277] 3 h after procedure ($p = 0.01$). There was no significant change in $PaCO_2$ after the procedure. Functional residual capacity improved from 881 [670–1,121] ml before the procedure to 1,504 [1,192–1,888] ml 3 h after procedure ($p = 0{,}04$). Respiratory system compliance was 27.5 [25.3–35.3] before the procedure and 29,8 [25–35] ml/cmH_2O after procedure ($p = 0.2$). Pleural pressure decreased from 11.5 [8.1–16] to 1.4 [1–2.7] cmH_2O ($p < 0.001$) Blood pressure, heart rate and cardiac output did not significantly change after drainage.
CONCLUSIONS. Pleural effusion drainage in mechanically ventilated patients is associated with a significant increase in oxygenation and FRC.
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0135
LUNG PATHOLOGY EXTENSION DOES NOT SIGNIFICANTLY INFLUENCE ACCURACY OF QUANTITATIVE COMPUTED TOMOGRAPHY ON TEN SECTION EXTRAPOLATION

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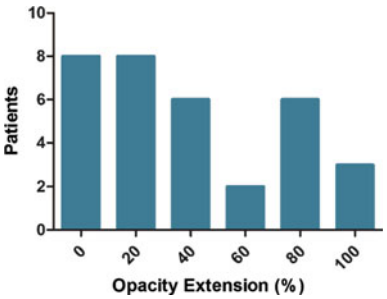
INTRODUCTION. Quantitative lung Computed Tomography in ALI/ARDS patients plays an important role in the evaluation of pathology extension and discrimination of potentially recruitable respiratory units, being radiation exposure and segmentation time the main issues hampering its clinical application. Methods have recently been proposed to optimize segmentation time extrapolating analysis from ten sample CT sections [1].
OBJECTIVES. The aim of this study is verifying whether accuracy of such approximation is influenced by lung pathology extension
METHODS. Lung CT Scans of 33 patients were retrospectively analyzed with *Maluna* (University of Göttingen, Germany).

Table 1 Patient data

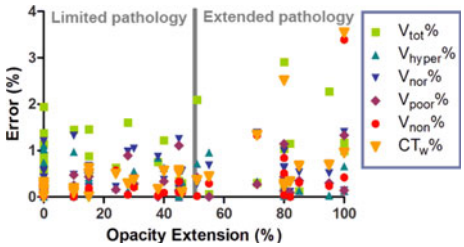
Total number	33	
Age mean ± SD	56.8 ± 19.0 years	
Sex	20 M (61 %) 13 F (39 %)	
CT indication	Acute Respiratory Failure	20 (61 %)
	Polytrauma	9 (27 %)
	Emphysema follow-up	4 (12 %)
Lung findings	Pneumonia	13 (39 %)
	ARDS	6 (18 %)
	Pulmonary Contusion	4 (12 %)
	Pulmonary Nodule	6 (18 %)
	Emphysema	2 (6 %)
	Negative	2 (6 %)
Respiration	Mechanically Ventilated	7 (21 %)
	Spontaneously Breathing	26 (79 %)
Opacity Extension mean (range)	38 % (0–100 %)	



Graph 1 Opacity extension distribution

For each patient, data obtained from the standard reconstruction (5 mm slices, smooth kernel) was compared with results from 10 extrapolated slices. *Opacity Extension (O.E.)* was estimated by a radiologist as percent of lung axial slices containing more than 5 cm^2 of opacity. The following variables were analyzed and error was calculated as unsigned percent variation from full resolution scan values: Total, Hyper, Normally, Poorly, Non Aerated Volumes (ml) and Mean Radiodensity (CTw, HU). Spearman's ρ correlation was calculated between each variable error and *Opacity Extension*, and statistical significance assessed. Worst (maximum) error on the above mentioned variables introduced by the extrapolation (Maximum Error) was further analyzed: patients were divided in two groups of *Opacity Extension* (cut-off 50 %), and difference between the two groups assessed with Mann–Whitney's *U* test.

RESULTS. Errors dependences on *Opacity Extension* are shown in *Graph 2* and correlations in *Table 2*.

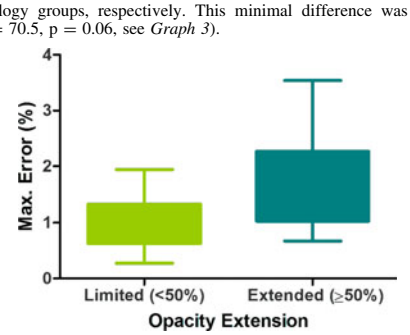


Graph 2 Variables error dependence on O.E

Table 2 Error OE correlations

Variable	Error			Correlation with OE	
	5th percent. (%)	Median (%)	95th percent. (%)	Spearman's ρ	p
V tot	0.10	0.78	2.46	0.019	0.914
V hyper	0.01	0.23	1.05	−0.204	0.256
V nor	0.10	0.51	1.39	0.229	0.200
V poor	0.00	0.23	1.20	0.270	0.128
V non	0.00	0.10	1.95	0.511	0.002**
CTw	0.01	0.32	2.82	0.685	<0.0001***
Mean error	0.19	0.44	1.42	0.396	0.023*
Max error	0.42	1.15	3.10	0.241	0.176

Mean worst error was 1.01 ± 0.42 % SD and 1.67 ± 0.91 % SD in the limited and extended pathology groups, respectively. This minimal difference was not statistically significant (U = 70.5, p = 0.06, see *Graph 3*).



Graph 3 Worst error in groups

All errors for each patient were below 3.55 %, 95th percentile being 1.41 %. When applied to operative decisions such as mechanical ventilation settings this bias is clinically irrelevant.

CONCLUSIONS. Pathology extension slightly influences some of the quantitative CT variables calculated with extrapolation-deduced quantitative analysis, but without any clinical relevance.

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0136
EFFECTS OF ACUTE HYPOVOLEMIA ON INTRAPULMONARY SHUNT IN A PIG MODEL OF ACUTE RESPIRATORY DISTRESS SYNDROME

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INTRODUCTION. In acute respiratory distress syndrome (ARDS) oxygenation and respiratory system compliance (Crs) are severely impaired. Besides ventilatory parameters, Crs and intrapulmonary shunt (shunt), responsible for the hypoxemia, can be influenced by the circulatory state [1, 2].

OBJECTIVES. In this secondary analysis of a previous study [3], we assessed the effect of acute hypovolemia on oxygenation parameters and Crs during ARDS.

METHODS. In an animal model of ARDS (surfactant depletion by lung lavage), we reanalyzed the effect of acute hemorrhage and retransfusion on shunt, PaO_2:FiO_2, global oxygen delivery (DO_2) and Crs. We included 10 pigs with ARDS-like syndrome and 8 mechanically ventilated pigs as control (CTRL). Pigs were ventilated during each period (Pré-hemorrhage-Hemorrhage-Retransfusion) with three successive ventilation mode: V1 = V_T:10 ml/kg, RR:15/min, PEEP:0; V2 = V_T:6 ml/kg, RR:25/min, PEEP:0; V3 = V_T:6 ml/kg, RR:15/min, PEEP:0. Statistical analyses were performed in both group using mixed effects ANOVA.

RESULTS. After hemorrhage, in both groups, independently from the ventilation mode, shunt decreased [CTRL: −6 % ($p = 0.002$); ARDS: −28 % ($p < 0.001$)] and Crs increased [CTRL: +2.5 ml/cmH_2O ($p = 0.006$; ARDS: +5.1 ml/cmH_2O ($p < 0.001$)]. Following retransfusion, shunt and Crs returned towards pre-hemorrhage values [Shunt CTRL: +5 % ($p = 0.01$); Shunt ARDS: +12 % ($p < 0.001$); Crs CTRL: −2.6 ml/cmH_2O ($p = 0.01$); Crs ARDS: −3.3 ml/cmH_2O ($p = 0.001$)]. In the ARDS group only, the decrease in shunt induced by hemorrhage was associated with an increase in PaO_2:FiO_2 [+113 mmHg; $p < 0.001$], however this did not prevent a reduction in DO_2 [−317 ml/min; $p < 0.001$].

CONCLUSIONS. Transpulmonary blood volume impacts respiratory system characteristics (shunt, Crs) and PaO_2:FiO_2 during ARDS. In clinical practice, clinicians should be aware that an acute improvement in lung compliance or in oxygenation parameters in patients with ARDS could be related to an acute decrease in transpulmonary blood flow.

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0137
BEDSIDE DETECTION OF TIDAL RECRUITMENT BY LUNG ULTRASOUND

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INTRODUCTION. Lung ultrasound (LUS) is an emerging application of ultrasonography to diagnose pulmonary problems at the bedside in ICU patients under mechanical ventilation. Preliminary studies in addition to observations from our group suggest that LUS can reliable detect lung collapse and re-expansion [1]. However, its validation with CT scan has not been established yet.

OBJECTIVES. To evaluate the ability of LUS to detect tidal recruitment in collapsed lung areas as compared with CT-scan in an experimental model of ALI/ARDS

METHODS. A two hit-model of ALI/ARDS was performed in three healthy pigs. We used repeated lung saline lavage combined with three hours of injurious mechanical ventilation. After ALI/ARDS was established, CT scan and LUS explorations were performed during end-inspiration and end-expiration pauses after three distinct periods of mechanical ventilation using different tidal volumes: 4 ml/kg, 6 ml/kg and 10 ml/kg. LUS exploration was performed in three regions in each lung: posterior, lateral and anterior. During a posterior offline analysis we measured total end-inspiration and end-expiration collapse areas by manually delineating the regions showing a LUS collapsed pattern en each section. Tidal recruitment was defined as the difference between end-expiration and end-inspiration areas. Normalized tidal recruitment was defined as the relationship between tidal recruitment and total end-expiratory area expressed in percentage values. For the CT-scan analysis we quantified lung collapse as non-aerated (−100 to +100 HU) lung volume/total lung volume. Tidal recruitment was calculated as the difference in these values at end-expiration and end-inspiration.

RESULTS. Mean (SD) values for tidal recruitment found in CT and LUS were: CT: 8.8 (4.4), LUS: 47.7 (17.1) for the 4 mL/kg, CT:11.3 (6.5), LUS:60.4 (18.8) for the 6 mL/kg and CT: 16 (11.8), LUS: 60.4 (17.5) for the 10 mL/kg ventilation period respectively. We obtained a good correlation between the percentage of tidal recruitment in the CT-scan and normalized tidal recruitment area measured with LUS (table 1 and Fig. 1).

CONCLUSIONS. In this preliminary report we found that LUS could be a reliable method for detecting tidal recruitment at the bedside in patients with ALI/ARDS.

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Table 1. Comparison CTscan vs LUS

		CT-scan	LUS
CT-scan	Pearson	1	0.859**
	Sig. (bilateral)		0.003
	N	9	9
LUS	Pearson	0.859	1
	Sig. (bilateral)	0.003**	
	N	9	9

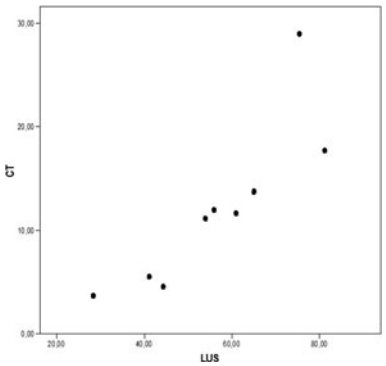

Figure 1. Comparison CT vs LUS

0138
VENTILATION DISTRIBUTION DURING DIFFERENT PRESSURE SUPPORT AND NAVA LEVELS

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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 part.
OBJECTIVES. The aim of this study was to observe ventilation distribution between dependent and non-dependent lung region during different levels of support during pressure support (PS) and Neurally Adjusted Ventilatory Assist (NAVA) ventilation.
METHODS. Ventilation distribution was measured with EIT. Three levels of support were tested: 5, 10 and 15 cmH_2O. The level of electrical activity of the diaphragm (Edi) during support of 10 cmH_2O was defined NAVA 100 %. Thereafter, also three levels of NAVA level were tested: 50, 100 and 150 %.
RESULTS. The ratio dependent/non-dependent distribution of ventilation is significantly higher at 5 cmH_2O of support compared to 10 and 15 cmH_2O. This is the same during NAVA. During NAVA there was significant less impedance loss between steps compared to pressure support.
CONCLUSIONS. There is relative more ventilation in the dependent part of the lung at lower support levels. This indicates that at higher support levels the contribution of the diaphragm is less.

0139
VENTILATION AREA MEASURED WITH EIT IN ORDER TO OPTIMIZE PEEP SETTINGS IN MECHANICALLY VENTILATED PATIENTS

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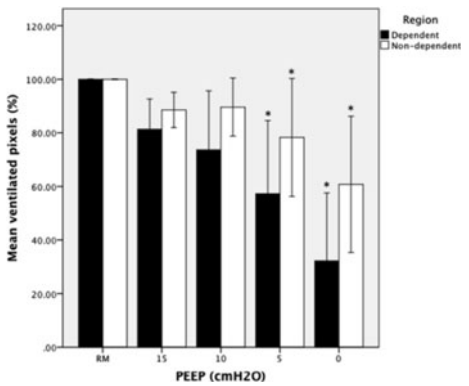
INTRODUCTION. Electrical Impedance Tomography (EIT) is a non-invasive imaging technique, which can be used to visualize ventilation. Ventilation will be measured by impedance changes due to ventilation.
OBJECTIVES. The aim of this study was to optimize PEEP settings based on the ventilation area of EIT images during a decremental PEEP trial.
METHODS. After a recruitment maneuver, a decremental PEEP trial was performed in 10 mechanically ventilated post cardiac surgery patients. Ventilation area, blood gases, FRC and compliance were measured at each PEEP level. The ventilation area was defined as the surface of ventilation at one lung slice measured with EIT and was expressed as percentage of its maximum obtained during a recruitment maneuver (RM).
RESULTS. The amount of ventilated pixels during the RM is set as 100 %. Figure 1 shows the amount of ventilated pixels as percentage compared to its maximum during the RM. The ventilation area was significantly smaller at 5 and 0 PEEP compared to its maximum at both the dependent and non-dependent lung. Also PaO_2/FiO_2 and FRC were significantly lower at these PEEP levels.



Ventilation distribution during a PEEP trial

Bars represent the mean ± SD. Black = dependent lung region, White = non-dependent lung region. * $p < 0.05$ compared to RM.
CONCLUSIONS. Changes in ventilation area based on EIT images can be used to set the PEEP level in mechanically ventilated patients.

0140
ANALYSIS OF ALVEOLAR VENTILATION WITH DIFFERENT DEGREES OF INTRAABDOMINAL HYPERTENSION IN PORCINE MODEL

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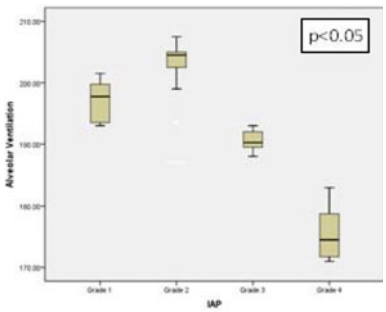
INTRODUCTION. Increased intra-abdominal pressure is a common condition in intensive care patients. The affection of respiratory mechanics is a complication by increasing intra-abdominal pressure; we have several methods allow us to assess the ventilatory changes in respiratory mechanics with increased intraabdominal pressure. One of these methods is volumetric capnography, with which we can measured the alveolar ventilation and dead space. The alveolar ventilation may be related to the amount of CO_2 exhaled, so that through this, we can determine changes at the alveolar ventilation with respect to different degrees of intra-abdominal hypertension (World Society of Abdominal Compartment Syndrome).
OBJECTIVES. Analyze the behavior of alveolar ventilation (VA) based on volumetric capnography with different degrees of intra-abdominal pressure in porcine model.
METHODS. 3 porcine models were evaluated, weighing 35 kg, which was induced in increased intra-abdominal pressure with the administration of saline solution 0.9 % through abdominal catheter, with measurements every minute and increased intraabdominal pressure 5 mm Hg every 10 min up to 30 mmHg intraabdominal pressure. Mechanical ventilation: PEEP 5, Vt of 320 ml, FiO_2 40 %. The measurement of production of carbon dioxide (VCO_2) was performed through of volumetric capnography (Dräger Evita XL). It was estimated exhaled tidal volume (Vte) every minute in each degree of intra-abdominal hypertension. The dead space volume (DV) was derived according to the formula of Fowler. Alveolar ventilation (VA) was defined as: VA = Vte-VD. We conducted analysis of variance of alveolar ventilation in relation to the degree of intra-abdominal pressure, we consider as significant $p < 0.05$. We use the SPSS V.18
RESULTS. The PIA initial average was 3 mmHg. With the gradually increase in intra-abdominal pressure we observed decrease in alveolar ventilation with increased dead space. Among other variables, we observed decrease in static compliance.



Alveolar ventilation and IPA

CONCLUSIONS. The increased intraabdominal pressure above that corresponding to grade 2 abdominal hypertension condition decreased alveolar ventilation obtained by volumetric capnography. These findings should be evaluated and considered in critically ill patients to maintain alveolar opening in intra-abdominal hypertension.
REFERENCE(S).
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GRANT ACKNOWLEDGMENT. Staff of the Unit of Research and Draeger Medical.

Acute kidney injury: Evaluation & treatment: 0141–0154

0141
EMPLOYING ADVANCED ALGORITHMIC METHODS TO PREDICT FUTURE CREATININE

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INTRODUCTION. Intensive care units are one of the arenas in the medical world where a large amount of digital data is continuously collected for all patients. It is also a place where doctors' immediate response to changes in the patients' status are of utmost importance. The ability to detect such changes, as early as possible, using the collected digital data, would significantly improve the medical treatment and may assist in saving lives.
OBJECTIVES. In this work, we explored the possibility of harnessing the power of computers and advanced algorithms for prediction of significant rise in the measured Creatinine (*Cr*) level (an indicator of risk of renal failure). The prediction is based on the digital measurements continuously collected in the ICU.

METHODS. The study was done in two stages. Initially, we collected data from 1,207 patients in the Rabin Medical Center ICU over a 28 month period. The data included demographic and admission parameters (gender, age, time of admission, comorbidities, etc.) and collected signals (blood pressure, blood gases, CBC, heart rate, temperature, blood biochemistry, etc.). We used the observed changes in *Cr* levels to construct a predictor that can identify the cases (patients at given times) whose maximal *Cr* level within the next 24/48/72 h will be at least 0.2 mg/dl higher than the current level. In the second stage we collected data of 155 new patients over one month, and evaluated the performance of the 24 h predictor. We also compared the computerized predictor to ICU doctors' assessment of *Cr* level in 24 h gathered during their rounds. In the initial (training) stage, we constructed predictors by a process of data cleaning and imputing, feature selection (mRMR [1]) and learning classifiers (Random Forest [2]).
RESULTS. The models show good performance for prediction of up to 72 h prior to *Cr* rise. The ROC curve for the 24 h prediction, constructed using cross-validation, had a AUC of 0.89. In the second (validation) stage, we saw that while doctors had insight as to future *Cr* levels, the computerized predictor performed significantly better (Sensitivity 71 %, Specificity 88 %) than the human intuition Sensitivity 33 %, Specifity 79 %).
CONCLUSIONS. This work demonstrates the enormous potential of harnessing computerized analysis of data which is continuously collected at Intensive Care Units. This analysis could give online indications for (future) changes in the patients' status and act as decision support systems. This work could be extended to other systemic indicators.
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GRANT ACKNOWLEDGMENT. Medial research.

0142

EVALUATING THE EFFECT OF INTRAVENOUS CONTRAST ON RENAL FUNCTION IN CRITICALLY ILL PATIENTS UNDERGOING RADIOLOGICAL INVESTIGATIONS: A RETROSPECTIVE COHORT STUDY

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INTRODUCTION. The incidence of radiocontrast-induced nephropathy (CIN) is widely quoted as being between 10 and 30 %. Critically ill patients often undergo radiological investigations requiring contrast media and the risk of acute kidney injury resulting from the contrast must be balanced against the need for high quality diagnostic imaging.
OBJECTIVES. The aim of this study was to determine if there was a significant decrease in renal function attributable to administration of intravenous contrast in our critical care patient population.
METHODS. A retrospective cohort study was conducted over an 27 month period in a seven bedded critical care unit (913 patient admissions during study period). Demographics were taken from a national database and serum creatinine values were taken from an electronic laboratory database. Serum creatinine values were collected prior to contrast administration and 72 h post contrast. Controls were then identified from the population of patients admitted to the unit over the same period but not receiving intravenous contrast and were matched for age,gender,admission diagnosis, APACHE score, use of vasopressors, and use of aminoglycoside antibiotics. CIN was defined as an absolute increase in serum creatinine of 44.2 micromol/litre, a relative increase in creatinine of 25 %, or requirement for haemofiltration within 72 h of contrast administration.
RESULTS. 141 patients received intravenous contrast during the study period (72 male,69 female, median age 60). Of these, nine were excluded as they were either having renal replacement therapy at the time of contrast administration or they died within 24 h of contrast injection. The defined criteria for contrast nephropathy were met by 24 patients (18 %) in the contrast group and 13 patients (9 %) in the non-contrast group. This outcome was not of statistical significance (Chi^2 statistic: 3.52, $p = 0.06$). The differences in serum creatinine over 72 h were then compared between the two groups using Wilcoxon's sign rank test. No statistically significant difference was found between the contrast and non-contrast groups ($p = 0.45$, 95 % confidence interval −4.5 to 11.5).
CONCLUSIONS. This study did not demonstrate a statistically significant difference in renal function attributable to the use of intravenous contrast in the study population. This is likely due to the generally much higher prevalence of risk factors for acute kidney injury in the critical care population when compared to the general population. Withholding of intravenous contrast in the critical care population purely on the basis of renal function may therefore not be justified. Further larger trials in critical care patients are needed to confirm these findings.
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0143

TRAMADOL AS A CYTOCHROME P450 2D6 DRUG PROBE IN THE CRITICALLY ILL: PHARMACOLOGIC AND GENETIC EVIDENCE

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INTRODUCTION. We have demonstrated significant inhibition of hepatic drug metabolism by the enzymes Cytochrome P450 (CYP) 3A4 and 3A5 in critically ill patients with acute kidney injury (AKI). Midazolam was used as a probe drug for CYP3A4 and A5 and we found preliminary evidence that patients who had at least one *CYP3A5*1* (wildtype) allele may be protected from the inhibitory effect of AKI on hepatic drug metabolism (1,2). We are now investigating tramadol as a probe drug of CYP2D6, to test the hypothesis that CYP2D6 function is also inhibited by AKI in critical illness and to determine the influence of CYP2D6 phenotype on this relationship. We recently reported that a single timepoint tramadol concentration is a reliable surrogate for measurement of a full area under the concentration time curve after intravenous (IV) administration.
The 67 known functionally significant allelic variants of CYP2D6 are categorised into 4 clinical phenotypes, from poor to extensive metabolisers.
OBJECTIVES. In this preliminary study, we sought to determine whether tramadol metabolism reflects CYP2D6 function in critically adults, based on tramadol metabolite data and on newly available CYP2D6 genotype data.
METHODS. 10 mg tramadol was given IV to 10 critically ill patients in our hospital's critical care unit, and serum taken at 0.5, 1,2,3,4 and 8 h for determination of concentrations of tramadol ([Tramadol]) and its two main metabolites. Whole blood was collected for determination of CYP2D6 genotype.
Inclusion Criteria: Age > 18 yr, predicted ICU stay > 48 h.
Exclusion Criteria: Recent receipt of tramadol or major CYP2D6 inhibitors, hepatic failure, pregnancy/breastfeeding.
RESULTS. There was a strong correlation between area under the curve (AUC) of the [Tramadol]-time graph and $t = 4$ h [Tramadol], $p < 0.0001$, $r = 0.983$, when all genotypes were examined together. [Tramadol] at other time points correlated less strongly with AUC. However when analysed according to genotype, initial inspection of the results suggests a clinical effect of genotype on [Tramadol]. (Table 1). This is preliminary data and numbers are currently too small to test for significance, yet represent our ongoing research.

[Tramadol] and AUC according to CYP2D6 phenotype

Predicted CYP2D6 Phenotype (Based on genotype)	Mean [Tramadol]t = 4 h (ng/mL) and (range)	Mean AUC ([Tramadol]-time graph) (ng/h/mL)
Poor Metaboliser (n = 2)	34.7 (26.8–42.5)	269.4
Intermediate Metaboliser (n = 2)	33.3 (26.8, 39.8)	261.2
Int./Extensive Metaboliser (n = 2)	28.0 (26.8, 29.2)	206.9
Extensive Metaboliser (n = 4)	25.9 (18.7–35.7)	211.2

CONCLUSIONS. Single timepoint analysis of [Tramadol] 4 h post-IV injection, reliably predicts integral tramadol exposure in critically ill adults and may reflect CYP2D6 genotype and function, although this requires confirmation in the larger study of the influences and interactions of AKI and CYP genotype on hepatic drug metabolism, that is under way.
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GRANT ACKNOWLEDGMENT. The presenting author gratefully acknowledges the support of the ESICM (Basic Sciences Research Award 2011) and of the St George's Hospital Medical Charity.

0144

A PILOT STUDY TO ASSESS THE EFFICACY AND SAFETY OF CONTINUOUS RENAL REPLACEMENT THERAPY USING A COMMERCIAL CITRATE CONTAINING REPLACEMENT FLUID

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INTRODUCTION. Prismocitrate 10/2 is a diluted physiological replacement fluid containing of 10 mmol/L citrate and 2 mmol/L citric acid. It is used in conjunction with a calcium free dialysate Prism0 cal to achieve anticoagulation within the continuous renal replacement therapy (CRRT) circuit.
OBJECTIVES. To evaluate the efficacy and safety of a regional citrate anticoagulation protocol using Prismocitrate 10/2 in critically ill patients treated with continuous venovenous haemodiafiltration.
METHODS. Prismocitrate was infused into the prefilter port at a rate of 1,500 ml/h coupled with a blood flow rate of 120 ml/min delivering a citrate dose of 2.5 mmol citrate per litre of blood flow. Prism0 cal was used as a calcium free dialysate and the rate was titrated to give an ultrafiltration dose of 35 ml/kg/h. Blood ionized calcium (ICa) was kept at 1.0–1.2 mmol/l by infusing 10 % calcium chloride via a central venous catheter.
RESULTS. 18 CRRT sessions were performed in 15 patients with a median filter lifespan of 25.3 h (range 17.5–30.8). There were 4 episodes of filter clotting (22 %). For the remaining sessions, the reasons for stopping CRRT were treatment completion (28 %), worsening acidosis (17 %), need for surgical intervention (17 %), mechanical problem (11 %) and haemodynamic instability (6 %). The median transmembrane pressure at termination was 95 mmHg (range 81–120). The median prefilter ICa was 0.36 mmol/l (range 0.34–0.4).
Worsening metabolic acidosis was noted during the 2nd–4th sessions, despite improvement in the other biological parameters. It was not due to accumulation of metabolic acids, but was a result of inadequate bicarbonate. Theoretically Prismocitrate contains 10 mmol/l citrate which can be metabolized into 30 mmol bicarbonate. However citrate clearance through the filter can be up to 30 % [1], hence there is inadequate amount of citrate to produce enough bicarbonate for acid base control. From the fifth patient onwards, 40–60 ml 8.4 % sodium bicarbonate was added to each 5 litre bag of Prism0 cal, increasing bicarbonate concentration from a baseline of 32 mmol/l to 40–44 mmol/l. With the addition of sodium bicarbonate, metabolic acidosis could be corrected and we did not experience any problems with metabolic alkalosis or hypernatraemia. There were no bleeding complications related to citrate CRRT. Total calcium, ICa, total calcium to ICa ratio were maintained at acceptable ranges.
CONCLUSIONS. This study demonstrated a safe and efficient CRRT regimen using a physiological diluted commercial citrate solution and a calcium free dialysate. However, there was insufficient amount of buffer in the commercial solutions and supplemental sodium bicarbonate had to be added for effective acid base control.
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GRANT ACKNOWLEDGMENT. This work was supported by Gambro HK Ltd.

0145

ACUTE KIDNEY INJURY ASSOCIATED WITH ACETIC ACID POISONING. FIVE YEAR REVIEW

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INTRODUCTION. Acetic acid in concentration of 70 % is widely used in Russia for homemade vegetable preserves. Both intentional and accidental exposures often occur giving 5.9 % of hospitalized poisonings.

OBJECTIVE. Aim of the study was to evaluate clinical outcomes in acetic acid poisonings complicated by acute renal injury.
METHOD. A retrospective study of 352 acetic acid poisoned patients was provided in Sverdlovsk Regional Poisoning Treatment Center during the period of 2006–2010. The data from the charts were plotted into united SPSS database. Kidney damage was characterized with RIFLE scale [1]; Zargar's scale [2] was used for grading of digestive tract injures.
RESULTS. Kidney injury was found out in 128 cases (36.4 %) according to RIFLE scale. Risk stage was determined in 29 cases (23 %), Injure in 19 (15 %), Failure in 31 (24 %) and Lost in 49 (38 %). Clinical outcome was worse for patients even with the risk-stage comparing with none-kidney-damaged group, mortality rate was 5 and 31 %, $p < 0.0001$. The majority of patients who demonstrated renal failure (103/128, 80.5 %) had grade II-b and III digestive tract injury comparing with 35 % (79/224) in patients without kidney damage, $p < 0.0001$. Kidney damage graduated by RIFLE scale was a strong predictor of mortality in multivariate logistic analysis. Sixty one patients underwent hemodialysis because of acute renal failure. The outcomes were: death in 54 % of cases, digestive tract stricture formations in 13 % and full recovery in 33 % of cases. The average duration of the anuric period for survived patients was 19 ± 12 (range 2–55 days); the intermittent citrate hemodialysis was performed 2–31 times for each patient. We used anticoagulation with the solution of 4 % sodium citrate instead of heparin during hemodialysis in all cases. Nevertheless, 70.5 % of patients demonstrated acute bleeding on the 9th day of treatment. In accordance with forensic department data acute GI bleeding was the main cause of death in 64 % of cases. Other causes of death were GI perforation in 24 % and pancreatic necrosis in 15 % of cases.
CONCLUSION. Kidney damage associated with acetic acid poisoning together with severe digestive tract injury may be one of the key predictors of negative outcome.
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0146
TIME COURSE OF URINARY INDICES AFTER ICU ADMISSION MAY HELP IN DIFFERENTIATING TRANSIENT FROM PERSISTENT AKI

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INTRODUCTION. Performance of urinary indices, such as the fractional excretion of urea (FeUrea), for separating transient from persistent acute kidney injury (AKI) is poor in septic or in critically ill patients [1]. Primary objective of this study was to evaluate time course of urinary indices in critically-ill patients. Secondary objective was to evaluate performance of urinary indices' time course to differentiate patients with transient from patients with persistent AKI.
MATERIALS AND METHODS. Multicentre prospective cohort study conducted in six intensive care units (ICU). Consecutive adult patients were included in this study. Patients with evidence of obstructive renal failure were excluded. AKI was defined according the AKIN definition. Transient AKI was defined as AKI with a cause of renal hypoperfusion and recovery within 3 days. Recovery was defined as reversal of the oliguria, or >50 % decrease in serum creatinine or return of serum creatinine to the baseline value [1]. This abstract reports result of the interim analysis performed in January 2012. Final results will be presented at the congress. Results are reported as medians and interquartiles ranges [IQRs] or numbers (%). Time course of…
RESULTS. 111 patients were included at the interim analysis. Median age was 63 years [50–73] and 77 (69 %) were of male gender. Severity at ICU admission as assessed by SAPSII score was of 40 [32–50]. Main reason for ICU admission was an acute respiratory failure in 31 patients (28 %) and coma in 29 patients (26 %). Forty four patients (40 %) had a sepsis at ICU admission According to our definitions, 48 patients had no AKI (43 %), 36 patients (33 %) had transient AKI and 27 patients (24 %) had persistent AKI. Table 1 reports time course of FeUrea during the first 24 h following ICU admission. A significant increase in FeUrea was observed in patients with transient AKI [29 % (23–33) to 38 % (27–46); P = 0.01 (Friedman's test)]. No statistically significant changes were observed in patients without AKI or with persistent AKI (P = 0.09 and 0.25 respectively). No significant changes in fractional excretion of sodium (FeNa), urinary/plasma (U/P) urea ratio, U/P creatinine ratio or natriuresis were observed during the first 24 h following ICU admission.

Time course of FeUrea (%) during the 24 h foll

	H0	H6	H12	H24	P
No AKI	37 [27–46]	37 [26–47]	41 [29–50]	43 [35–48]	0.09
Transient AKI	29 [23–33]	33 [21–37]	37 [29–43]	38 [27–46]	0.01
Persistent AKI	32 [20–41]	33 [26–47]	37 [24–53]	41 [27–51]	0.25

CONCLUSION. Preliminary results of this study suggest that FeUrea may vary during the first 24 h following ICU admission in patients with transient AKI. FeUrea variations may help in differentiating transient from persistent AKI. Although no statistical difference were observed regarding time course of the remaining urinary indices, lack statistical power in this preliminary analysis preclude any firm conclusion.
Analysis of the 300 included patients is ongoing in way to evaluate time course of urinary indices and interest of time course variations to differentiate transient from persistent AKI.
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0147
RISK FACTORS IN THE DEVELOPMENT OF ACUTE RENAL FAILURE AFTER CARDIAC SURGERY

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INTRODUCTION. Acute Renal Failure (ARF) remains a frequent and serious complication of cardiac surgery. The incidence of ARF following cardiac surgery has been reported to vary between 1–30 %.
PURPOSE. The aim of the present study was to evaluate the determination of postoperative renal impairment with RİFFLE classification in cardiac surgical patients, and to determine the cause of risk factors and its association with mortality.
METHODS. From February 1st 2011 to September 31st 2011, one thousand five hundred and fifty consecutive adult patients who underwent coronary artery bypass grafting and/or valve operation were enrolled in this study. The preoperative, intraoperative, and postoperative data recorded was in the computer. According to the RIFLE classification (named by the severity of renal impairment: Risk, Injury, Failure, Loss, End-stage kidney disease) patients were divided into three levels based on plasma creatine level, urine output, meanwhile, APACHE IV score were also evaluated. The discrimination of death within 90 days after surgery was determined. The relationship between the variables and acute renal failure was assessed by multivariate logistic regression analysis.
RESULTS. Mean age was 66 years (range 28–88 years).According to the RIFLE criteria, 4.45 % of patients (69/1,550) had renal impairment after cardiac surgery and 3.09 % (48/1,550) developed ARF-requiring renal replacement therapy (ARF-R). Multivariate analysis found hypertension [odds ratio (OR) = 0.84, 95 % confidence interval (CI) 0.79 to 0.89, $P < 0.00001$], diabetes (OR = 5.55, 95 % CI 1.40 to 19.32, P = 0.01), packed red blood cells greater than 5 units [odds ratio (OR) = 2.34, 95 % confidence interval (CI) 1.79 to 4.89, $P < 0.00001$] to be independent predictors of ARF-R. The mortality for patients who developed ARF was 43.47 % (30/69) (p = 0.001). Mortality increased with each RIFLE stratification (RIFLE class 0 = 0 %, R = 2 %, I = 12 %, and F = 36 %).
CONCLUSIONS. Acute renal failure is one of the major complications following cardiac surgery, and it is associated with early mortality. The RIFLE classification is simple and analytical data suggests that RIFLE classification has a good discriminative power for predicting inpatient mortality of adult postoperative patients with ARF. The risk factors are determined and interventions to prevent or improve treatment of this condition are promptly started.
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0148
INCIDENCE AND PREVENTION OF CONTRAST INDUCED NEPHROPATHY (CIN) IN THE ICU: PREVENTIVE ADMINISTRATION OF NA^+ BICARBONATE IS NOT EFFECTIVE. SINGLE DOSE AMINO-GLYCOSIDE IS A MAJOR RISK FACTOR

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INTRODUCTION. IV administration of iodine-containing contrast media (CM) may be associated with the development of CIN. Little is known about the incidence and risk factors of CIN in ICU patients.
OBJECTIVES. To assess the incidence and risk factors of CIN in a general ICU population.
METHODS. ICU patients admitted between 2009–2011 who were administered CM for CT-imaging were retrospectively studied. The primary endpoint of this study was the incidence of CIN defined as a rise of 44 μmol/l or 25 % rise of baseline serum creatinine within 4 days of CM administration. Serum creatinine was measured daily from day −2 until day 0 before CT for assessing AKI and from index CT until day +4 for diagnosing CIN. Current guideline is to administer 3 ml/kg/h of a 90 ml Na^+ bicarbonate 8.4 % added to 500 ml glucose 5 % 1 h before contrast infusion and 1 ml/kg/h for 6 h after the contrast. A multivariate analysis including the variables diagnosis of sepsis, diabetes, Hb < 6 mmol/L, Na^+bicarbonate infusion, pre-existing AKI, vasopressor use, amino-glycosides and APACHE IV > 86 was performed to assess risk factors for the development of CIN.
RESULTS. Of 358 eligible patients 254 were analysed (56.2 % male, mean age 65.7 years). 104 patients were excluded because of RRT before index CT (76), death (15) or a second CT within 4 days after the index CT (13). According to the standard international definition 50 patients had AKI ≥ 1 before the index CT. Overall CIN occurred in 66/254 (26 %) patients. Patients without previous AKI (203) developed CIN in 35 (17 %). 27 (13.3 %) patients without pre-existent AKI were pre-treated with Na^+bicarbonate of whom 9 (33 %) developed CIN. Of the 50 patients with pre-existing AKI renal function deteriorated to CIN in 31 patients (62 %). In only 14 of these 50 patients (28 %) Na^+bicarbonate was administered. In 8/14 (57 %) CIN developed despite prophylaxis. RRT followed in 2/19 (5.1 %) who received prophylaxis compared with 14/199 (7.0 %) who did not (P = 1.00). Na^+bicarbonate infusion did not seem to be protective in preventing CIN or RRT in neither patients with or without pre-existing AKI. In a multivariate logistic regression model only pre-existing AKI (OR 9.1), amino-glycosides (OR 6.53) and APACHE IV (OR 2.0) were significantly associated with CIN. Remarkably, gentamycin was given as a single dose in 16 of 17 patients.
CONCLUSIONS. ICU patients have a high risk to develop CIN. The strongest risk factor for CIN is pre-existing AKI. Na + bicarbonate was not effective in preventing CIN or RRT in our patients, however, the number of treated patients was small. There was a striking relationship between the administration of (single-dose) amino-glycosides and the development of CIN, which has not been previously described. The current guidelines do not apply to ICU patients and cannot be generalized to the ICU patient population, probably because of the multiple hits determining impairment of renal function.

0149
ONE YEAR OUTCOME OF ACUTE KIDNEY INJURY IN CRITICALLY ILL SEPTIC PATIENTS ADMITTED TO MEDICAL INTENSIVE CARE UNIT

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INTRODUCTION. Acute kidney injury (AKI) is a common problem in intensive care unit (ICU) with reported incidences varying from 1.5 to 24 %. AKI is an independent predictor of mortality especially in those requiring renal replacement therapy (RRT). Among survivors up to 1/3 patients may require long term dialysis. The comprehensive outcome of AKI is related to both short and long term mortality and recovery of renal function.
However, there is a wide variability in the definition of AKI in clinical studies. To foster uniformity in both research and clinical practice, a new classification of AKI was introduced (risk, injury, failure, loss, and end-stage renal disease [RIFLE] classification) which was later modified by the acute kidney injury network (AKIN).
OBJECTIVE. To assess one year renal prognosis of critically ill patients admitted to medical ICU (MICU) with sepsis and AKI defined by RIFLE and AKIN criteria.
METHODS. Prospective observational study.
Critically ill adult (≥18 years) patients admitted to MICU with sepsis and AKI (by RIFLE and AKIN criteria) were enrolled. All patients with preexisting kidney injury/failure were excluded. Various demographic, clinical, physiological and laboratory parameters were noted on admission and at regular intervals (1, 3, 6 and 12 month) as per protocol. APACHE II on admission was recorded to assess severity of illness.

RESULTS. 117 patients (male 70 (59.8 %) have been recruited in this ongoing study from October 2010 till February 2012. Mean age and APACHE II score were 63 (±15.8) years and 28 (±9.1) respectively. 83 (70.9 %) of patients were in septic shock and 104 (88.9 %) were mechanically ventilated. All patients had AKI as per RIFLE and AKIN criteria. 29, 22 and 65 patients were in R,I and F categories respectively by RIFLE criteria while 32, 21, 64 patients were in AKIN stage 1, 2 and 3 respectively. Median creatinine was 168 µmol/L on day1 of AKI. 49 (44.9 %) of patients with AKI required some form of RRT during ICU stay but none required it at discharge from the ICU. 29 (24.8 %) patients died during their stay in ICU. Mortality was 32.4 % at one month post discharge and 34 % at 3, 6 and 12 months post ICU discharge.
CONCLUSION. AKI defined by the RIFLE and AKIN criteria in critically ill septic patients portends a grim prognosis with the high mortality even in post ICU period.
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GRANT ACKNOWLEDGMENT. This study is supported by National Kidney foundation(NKF) Grant, Singapore.

0150
COMPARING AKIN AND RIFLE CRITERIA IN DIAGNOSING ACUTE KIDNEY INJURY: A SERUM LACTATE HYPOTHESIS?

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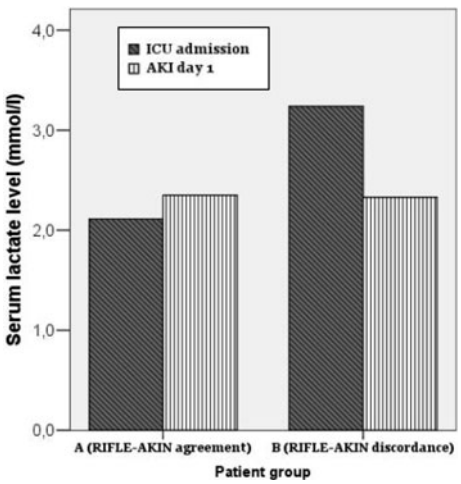
INTRODUCTION. The clinical accuracy of acute kidney injury (AKI) classifications (RIFLE and AKIN) has been widely discussed in the literature. In most published studies, a larger proportion of patients is diagnosed with AKI by AKIN than by RIFLE criteria.
OBJECTIVES. Our study assessed the clinical implications of AKIN and RIFLE disagreement in a prospective cohort of critically ill patients.
METHODS. The study included consecutive patients admitted in our 8-bed general ICU. All patients were prospectively followed with RIFLE and AKIN criteria. Patients with RIFLE-AKIN discordance (AKI diagnosed by only one of definitions) were compared with patients diagnosed with AKI by both definitions and with patients without AKI (not fulfilling either definition). Statistical analysis was performed with Mann–Whitney test, Kruskall–Wallis test and Fisher's exact test with significance level $\alpha = 0.05$.
RESULTS. Seventy seven consecutive patients (25 females, 52 males) were included in the study [mean age (±SD) 53.3 ± 20.7 years, APACHE II score at ICU admission 17.7 ± 6.0]. Significantly more patients were diagnosed as AKI by AKIN (51.9 %) than by RIFLE (39 %), $p < 0.001$. Both definitions predicted equally well the need for hemofiltration (AUCs: 0.803 for AKIN and 0.806 for RIFLE, p = NS). Thirty patients (39 %) were diagnosed as AKI by both AKIN and RIFLE (group A, agreement), ten patients (13 %) only by AKIN (group B, disagreement) and 37 patients had no AKI (group C). In group A, AKI was first detected earlier by AKIN than by RIFLE criteria (after 5.6 vs. 6.7 ICU days, respectively, $p = 0.015$). Interestingly, group B displayed significantly higher serum lactate levels at admission in the ICU compared with groups A and C (mean serum lactate levels 3.2 mmol/l vs. 2.1 mmol/l and 2.0 mmol/l, respectively, $p = 0.036$). Serum lactate levels at admission in the ICU and at AKI diagnosis in groups A and B are shown in the graph.



Serum lactate in patients with AKI

CONCLUSIONS. In our study, significantly more patients were diagnosed with AKI by AKIN than by RIFLE criteria. Patients with AKIN-RIFLE disagreement displayed significantly higher serum lactate levels at admission in the ICU compared with patients with AKI diagnosed by both definitions. A plausible explanation could be that hypoperfusion, as indicated by increased serum lactate levels, results in minimal renal dysfunction, which is assessed only by the more sensitive AKIN criteria and not by RIFLE. The clinical implications of this finding have to be further investigated.
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0151
INCIDENCE OF CONTRAST INDUCED NEPHROPATHY IN PATIENTS WITH ACUTE CARDIAC DISEASE

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INTRODUCTION. Contrast induced Nephropathy (CIN) is related with increased morbidity/mortality, longer hospital stay and higher economic cost.
OBJECTIVES. To describe the incidence of CIN related with intravenous contrast (IC), the associated risk factors,prophilaxis strategies and the use of hemofiltration therapy in patients admitted in a Cardiac Care Unit (CCU).
METHODS. We studied all patients admitted consecutively between November 2011 and March 2012 in a CCU of a tertiary hospital, undergoing procedures with IC (coronariography and/or CT). We defined CIN the rise of creatinine ≥0.5 mg/dl at 48 h after the procedure, ruling out other causes of renal failure. Demographic clinical variables are collected, those related with procedures (type and amount of contrast) and renal function (creatinine before the procedure, 48 h later and 7 days after procedures), nephrotoxic factors and the use of depuration extrarenal techniques. It was analized CIN incidence, associated risk factors and implementation of prophylaxis strategies, hydration and *N*-acetylcysteine in patients with risk factors and no contraindications, according to our prophylaxis protocol .
RESULTS. 148 patients. 78.4 % male, average age 64.4 ± 13.9 years old. 27.7 % are diabetic. 5.4 % had Creatinine ≥1.4 mg/dl and 18.4 % anemia. The most common cause of admission was the acute coronary syndrome with primary percutaneous coronary intervention (55.6 %). 26.4 % patients had hemodynamic instability and 20.3 % with objective data of heart failure. The average stay at CCU 6.2 ± 4.2 days. Hospital mortality was 10.8 %. An average isoosmolar contrast of 183 ± 91.7 cc (68.1 % ≥ 140 cc). Electively prevention was performed in 33.1 % of patients (8.5 % of those with Cr ≥ 1.4 and 44.7 % of diabetics). 8 patients (5.5 %) developed CIN (average creatinine increase of 1.04 ± 0.5 g/dl). 1 patient required renal replacement techniques. The presence of hypotension (13.2 % cases CIN vs 2.9 % no CIN), heart failure (17.2 % cases vs. 2.6 %), need of mechanical hemodynamic support (23.1 % cases vs. 3.1 %) and mortality (20 % cases vs. 3.8 %) were significantly higher in patients who developed kidney failure ($p < 0.05$).
CONCLUSIONS. 5.5 % of patients developed CIN. These patients had a higher mortality. The hemodynamic instability and heart failure were variables associated with CIN. In a higher percentage of patients with risk factors associated with CIN, emergency procedures and high volumes of contrast are required. In these patients prevention strategies should be optimized.
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0152
CYSTATINE-C AND NGAL FOR THE EVALUATION OF EARLY KIDNEY INJURY IN SEVERE SEPSIS

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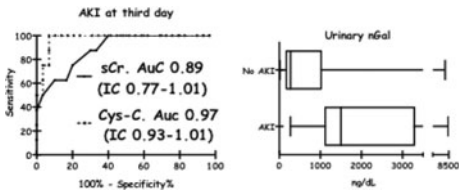
INTRODUCTION. Acute kidney Injury (AKI) is a frequent and serious complication of severe sepsis. Different criteria have been proposed for its definition including serial changes in serum creatinine (sCr) or the use of new biomarkers as Cystatine-C (Cys-C) or nGal. Urinary nGal seems a promising option for this population because serum nGal can be elevated in sepsis regardless of the presence of kidney injury.
OBJECTIVES. To evaluate the performance of serum Cys-C and urinary NGal for detection of AKI in the early stages of sepsis.
METHODS. One centre, prospective cohorts study. All septic patients admitted to our unit during the period of study were included in the analysis. We measured creatinine clearance (CrCl), sCr and serum Cys-C for the first 3 days after admission and urinary nGal the first day of ICU stay (in the same sample used for CrCl measure). Subjects with history record of chronic kidney disease were separated for this analysis. AKI was defined as a CrCl <60 mL/min/1.73m^2 and patients were classified following the AKIN system based in sCr plus urinary flow. This protocol was approved by the ethics committee of our Hospital.
RESULTS. We enrolled 48 patients, 64.6 % males, of 55.9 ± 16.3 years. APACHE II 23.9 ± 7.8 the day of admission; mortality 35 %. The first day 47.9 % patients fulfilled AKI definition (CrCrl < 60) and AKIN classification was: 27 % patients AKIN-0, 25 % AKIN-1, 29.2 % AKIN-2 and 18.8 % AKIN-3. Renal function recovery was significant at the third day, with 35.4 % patients remaining with AKI. AKIN classification at the third day was: 62.5 % AKIN-0, 12.5 % AKIN-1, 6.2 % AKIN-2 and 18.8 % AKIN-3. 18.8 % received CRRT these days. For those patients with AKI at the third day, first day sCr and Cys-C were elevated ($p < 0.01$) but none of these measures detected patients with renal recovery at the third day. Cys-C measured the first day predicted development of AKI with a sensitivity of 100 % and specificity of 93 % (for a threshold of 1.23 mgr/dL) and sCr showed a 87 % sensitivity and a 69 % specificity (threshold 1.45 mgr/dL). We sampled first day urinary nGal in 18 patients and detected very high levels with no relationship to AKI development (812 + −1,503 without AKI vs. 2,158 + −2,591 with AKI, p ns), to renal improvement or AKI status changes.



Left ROC curve for sCr and Cys-C. *Right* nGal

CONCLUSIONS. AKI is a frequent complication in the early stages of severe sepsis. Cystatine-C seems a good diagnostic tool and performs better than serum creatinine but we found (as has been described previously for serum nGal in sepsis) elevated concentration of urinary nGal not related to development of kidney injury or its evolution; so new studies are necessary to define a diagnostic threshold for urinary nGal in this specific population.

0153
A COMPARISON OF THE RIFLE AND AKIN CRITERIA FOR ACUTE KIDNEY INJURY IN CRITICALLY ILL PATIENTS

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INTRODUCTION. There has been lack of consensus regarding the degree of renal dysfunction considered for the diagnosis of acute kidney injury (AKI), this being responsible for a wide variation in its incidence in different ICU. In May 2004 The Acute Dialysis Quality Initiative Group published a consensus definition/classification system for acute kidney injury (AKI) termed the RIFLE criteria which were more consensual. The Acute

Kidney Injury Network (AKIN) group has recently proposed modifications to this system in which it is not necessary the baseline serum creatinine (Cr), being however required at least 2 of the Cr values obtained within 48 h. It is currently unknown whether there are advantages between these criteria.
OBJECTIVES. The aim of this study is related to the evaluation of the incidence of AKI, defined and stratified according to the RIFLE and AKIN classification and its impact on mortality.
METHODS. Prospective study conducted over a period of 10 months, in a polyvalent ICU. Demographic data, mortality rate, creatinine prior to admission, variability of the creatinine measurement in the current admission and its stratification for RIFLE and AKIN were collected. We excluded all patients with less than 5 days in this unit.
RESULTS. We enrolled 87 patients, 58.62 % male, most from emergency surgery (57.47 %), with a mean age of 67.61 ± 14.20 (71), an average length of stay 19.58 ± 16.13 (15) days and a mortality rate of 13.79 %.
In 2.30 % it was not possible to obtain baseline creatinine. In patients who are able to obtain baseline creatinine measurement (85) we observed, applying the criteria to RIFLE: 11 patients are in class A with a mortality of 27.27 %, 9 patients in class I with a mortality of 22.22 % and 8 patients in the class F with a mortality of 25 %. Applying the AKIN criteria we observed that 8 patients are in the stage 1 with a mortality of 37.5 %, 3 patient are in stage 2 with a mortality of 0 % and 10 patients are in stage 3, with a mortality of 30 %.
CONCLUSIONS. The incidence of abnormal renal function in critically ill patients is high and with a significant impact on mortality. Compared to the RIFLE criteria, the AKIN criteria do not materially improve the sensitivity and predictive ability of the definition and classification of AKI.
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0154
SIDE EFFECTS OF HYDROXYETHYL STARCH FORMULATIONS: PROBABLY NOT SO EQUAL AT ALL

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INTRODUCTION. Currently Hydroxyethyl starch colloids (HES) are of corn or potato origin (HESc and HESp), and in unbalanced (HESub) or balanced solution (HESb).
OBJECTIVES. Evaluate the difference in side effects between HESp and HESc, resp. HESub and HESb.
METHODS. Retrospective single center cohort study in the period Jan 2006–Jan 2011, in a 50 bed adult academic ICU. We evaluated 3 periods during which different HES formulations were used: Jan06–Oct08, HESc in an unbalanced solution (Voluven®), Oct08–Jan10, HESp in an unbalanced solution (Venohes®), and Jan10-Jan11 a balanced HESc solution (Volulyte®). We pooled these periods to evaluate HESc vs. HESp, and HESub vs. HESb. In addition, we evaluated patients who were administered >1,000 mL of HES. Patients <18 years were excluded, and only the first ICU episode was evaluated. Side effects recorded were acute kidney injury (AKI) (KDIGO definition), bilirubin (bili) increase, prothrombin time (PT) % decrease, and hyperchloremic metabolic acidosis. We used the ICU PDMS for data at time of ICU admission (Da), HES administration (D1), and D3, D5, D7 and D14.
RESULTS. 4,831 patients were treated with HES, of these 4,041 were included. HESc and HESp were used in 82 % and 18 % of patients. They had similar age (61 vs. 63 y, $p = 0.12$), gender (male 61 vs. 64 %, $p = 0.24$), bili (0.8 vs. 0.8 mg/dL), and pH (7.43 vs. 7.44). HESc patients had better coagulation and kidney function at Da (PT 70 vs. 68 %, $p = 0.03$, and Scr 0.93 vs. 1.03 mg/dL, $p < 0.001$), and received a higher volume (1,000 vs. 500 mL, $p = 0.007$). AKI was more prevalent in HESp patients (D3: 15.6 % vs. 20.7 %, $p = 0.02$, D5: 12.5 vs. 22.0 %, $p < 0.001$). This remained when corrected for age and Scr on Da (D3: OR = 1.39 ($p = 0.04$); D5: OR = 1.96 ($p < 0.001$)). HESp had more bili increase at D1, suggesting differences in baseline characteristics. We found no difference in PT % decrease between HESc and HESp.
More patients were treated with HESub (82.5 vs. 17.5 %). HESub and HESb had similar pH (7.43 vs. 7.43, $p = 0.09$), Cl (109 vs. 109 mmol/L, $p = 0.05$), and Scr (0.95 vs. 0.93, $p = 0.07$) at Da. A smaller volume was administered in HESub patients (852 vs. 1,000 mL, $p < 0.001$). HESub patients had a higher prevalence of Cl increase at D1; for patients treated with a high volume this was so at D1, D3 and D5. There was no difference in change of pH between HESub and HESb. We found no difference between HESub and HESb regarding AKI or PT % decrease.
CONCLUSIONS. We found that administration of potato based HES compared to corn based HES was associated with a higher prevalence of AKI even when corrected for age and Scr at time of ICU admission. There were no differences in effect on coagulation and bilirubin.
Unbalanced HES resulted in a greater prevalence of chloride increase, but only in patients who were administered a volume greater than 1,000 mL.

Impact of specific ICU interventions: 0155–0167

0155
OPTIMIZATION OF EMERGENCY MANAGEMENT IN PATIENTS WITH ACUTE CORONARY SYNDROMES IN BIG URBAN DISTRICT

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INTRODUCTION. According to the WHO the major cause of mortality are the ACS. Key aspects of controlling the ACS are the early diagnostics and reperfusion therapy, mainly PPCI.
OBJECTIVES. The goal of the study is to optimize the management of patients with ACS in big urban districts using simulation with generalized nets (GNs) model [1–2].
METHODS. The model evaluates how prehospital diagnosis (PHD) affects the time span from contacting an emergency team (ET) to performing PPCI with 3 groups of STEMI patients: the 1st consists of patients without PHD who have not been directed to a medical center for PPCI; the 2nd consists of patients with PHD, who have not been directed for PPCI; the 3rd are given PHD and directed for PPCI. The data, registered for the groups, correspond to the performed activities. Within the 1st group : Subgroup 1—transportation from the patient's address to a healthcare unit with the possibility of diagnosing and without a possibility of PPCI; transportation from the healthcare unit to a PPCI centre. The average distances and times in both cases are determined, as well as the average time spent in the first unit (for diagnosing) and the average time until PPCI in the second one; Subgroup 2—transportation to a healthcare centre for both diagnosing and PPCI. The average distance, average time for transportation and average time for diagnosing and PPCI are determined. Within the 2nd group the same parameters are determined as in Subgroup 1, and further is estimated the difference between the average times spent in the healthcare unit without PPCI possibility in both cases. Within the 3rd group the same parameters are determined as in Subgroup 2, and further is estimated the difference in the average times from the moment of reception in the healthcare centre to the moment of performing PPCI in both cases. GNs are extensions of the Petri nets and other modifications of theirs. Based on a GNs model, a simulation has been performed on the assumption that patients without a diagnosis are assigned ECG PHD in the ambulance (including a telemetric consultation with a cardiologist) and the patients are transported to a healthcare centre for PPCI.
RESULTS. In 70 % of the patients from 2nd and 3rd group the clinical recommendations for the time span from contacting the ET to performing PPCI have been kept under 120 min (the average time is respectively 50 and 76 min), while in 1st group this condition has been kept in only 30 % of the cases (the average time being 145 min). In the simulation, the average distances and times, obtained from the PHD patients, have been used. The results exhibit reduction of the average time span from contacting an ET to PPCI down to 84 min.
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0156
BENEFICIAL EFFECTS OF THE PRESCRIPTION OF FIXED DOSE COMBINATION OF BETA-BLOCKER AND DIURETIC IN ELDERLY PATIENTS WITH A HISTORY OF NON-ST-SEGMENT-ELEVATION ACUTE CORONARY SYNDROME

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INTRODUCTION AND OBJECTIVES. The use of fixed combinations is an increasingly common fact, offering numerous benefits. One of the most notable is the greater adherence to treatment, especially in elderly patients, where the degree of error in self-medication is more frequent. The aim of this study was to analyze the impact of the use of fixed dose combination of beta-blocker (BB) and diuretic on the prognosis of elderly patients discharged from hospital for an episode of non-ST-segment-elevation acute coronary syndrome (NSTEACS).
METHODS. Prospective analysis of all elderly patients (defined by age ≥75 years) consecutively discharged for an episode of NSTEACS, from July 2008 to December 2009. We studied clinical and epidemiological variables, establishing a prognostic analysis based on the use of fixed combination compared with conventional treatment. We completed a median follow up of 19.5 months in 100 % of cases.
RESULTS. We included 158 patients, 48.1 % women. The mean age was 79.7 ± 4.1 years. 67.7 % of patients were hypertensive, 44.3 % diabetic and 45.6 % dyslipidemic. They showed a Charlson comorbidity index 2.8 ± 2.1 and a TIMI Risk score of 3.4 ± 1.1. We found left ventricular systolic dysfunction in 35.1 % of cases. 38 patients (24.1 %) were treated with fixed combination of BB and diuretic, and had higher percentage of adherence to treatment compared with patients receiving conventional treatment (92.1 vs. 85 %, $p = 0.02$), lower cardiovascular death rate after long term-up follow-up (0 vs. 17.5 %, $p = 0.002$), admission for heart failure (HF) (2.6 vs. 23.3 %, $p = 0.002$) and major adverse cardiovascular events (MACE) (15.8 vs. 42.5 %, $p = 0.002$). There were no differences in admission rates for acute coronary syndrome (ACS) ($p = 0.09$). After adjustment, the use of fixed combination predicted lower risk of developing heart failure (OR 0.05, 95 % CI, 0.006 to 0.43) and MACE (OR 0.06, 95 % CI, 0.007 to 0.46).
CONCLUSIONS. The use of fixed combination of BB and diuretic in elderly patients and history of NSTEACS was associated with a more favourable prognosis. This seems justified by the greater adherence to treatment.

0157
A COMPARISON OF CLINICAL AND COST- EFFECTIVENESS OF PRE- VERSUS POSTOPERATIVE GOAL DIRECTED THERAPY

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INTRODUCTION. Goal directed therapy performed in the ICU, in the pre- as well as in the postoperative setting, has been shown to be associated with short and long term improvements in outcome after high-risk surgery. Despite these recognised benefits, the widespread implementation faces difficulties; not only related to personnel, logistic and infrastructural planning, but also to increased resource consumption and additional implementation costs.
OBJECTIVES. In this analysis, we want to analyse and compare the costs and cost-effectiveness of preoperative versus postoperative haemodynamic optimisation in high-risk surgical patients.
METHODS. We constructed a model to calculate the efficiency and costs for patients receiving goal directed therapy. Effectiveness data were derived from published studies on goal directed therapy in the pre- and postoperative setting. The analysis was performed from a funder and decision maker's perspective. In-hospital costs included resource consumption, clinical services, cost of medical and nursing staff as well as treatment costs for complication and length of stay in ICU, HDU and general ward (NHS reference costs). We estimated long-term survival using age and gender specific UK mortality tables from the National Centre of Health Statistics. Life expectancy of ICU survivors was adjusted for the increased risk of post-discharge mortality.
RESULTS. The average survival of a 65 year old patient after high-risk surgery was similar in the pre- and postoperative group (7.9 years versus 8.3 years) and significantly reduced in patients receiving standard care (5.4 years). The preoperative strategy had higher in-hospital treatment cost (pre-vs. postoperative GDT: £7,946.0 (95 % CI £5,194–10,364.1) vs. £6,188.6 (95 % CI £4,511.0–8,316.0), which was mainly due to additional costs related to preoperative ICU admissions. Main costs drivers were fixed costs for treatment of complications, which led to prolonged in-hospital stay. The calculated ICER (Incremental Cost-

Effectiveness Ratio) of postoperative versus preoperative GDT was negative (-£3,779/QALY gained), which means that postoperative approach dominated all other strategies in effectiveness (Quality adjusted life expectancy) and in cost-savings. In a multi-way sensitivity analyses, 97 % of the Monte Carlo simulations in the postoperative strategy had an ICER below the widely adopted threshold of £20,000/QALY.Cost-effectiveness increased with greater annual patient volume, decreased length of stay and lower rates of complications.
CONCLUSIONS. Pre- and postoperative optimisation is a cost-effective and cost-saving approach. Especially when applied in the ICU setting, GDT is associated with clinical and financial gains. Haemodynamic optimisation, and therefore avoidance of complications, significantly reduce costs per survivor and costs/QALY.

0158
EFFECTIVENESS OF INSPIRATORY PRESSURE-LIMITED APPROACH TO MECHANICAL VENTILATION IN SEPTIC PATIENTS

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INTRODUCTION. Severe sepsis is one of the most common causes of acute lung injury (ALI) and is associated with high mortality.
OBJECTIVES. The aim of the study was to see if a protective strategy based approach with a plateau pressure <30 cmH_2O was associated with lower mortality in septic patients with ALI in the Surviving Sepsis Campaign (SSC) international database.
METHODS. A retrospective analysis of an international multicentric database of 15,022 septic patients from the 165 ICUs was used.
RESULTS. Septic patients with ALI and mechanical ventilation ($n = 1,738$) had more accompanying organ dysfunction and a higher mortality rate (48.3 vs. 33.0 %; $p < 0.001$) than septic patients without ALI ($n = 13,284$). In patients with ALI and mechanical ventilation, the use of a inspiratory plateau pressures maintained < 30 cmH_2O was associated with lower mortality by Chi-square test (46.4 vs. 55.1 %; $p < 0.001$) and by Kaplan–Meier and log-rank test ($p < 0.001$). In the multivariable random-effects Cox regression, plateau pressure <30 cmH_2O was significantly associated with lower mortality (HR = 0.84, 95 % CI: 0.72–0.99, $p = 0.038$).
CONCLUSIONS. ALI in sepsis was associated with higher mortality, especially when an inspiratory pressure-limited mechanical ventilation approach was not implemented.
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0159
ASSESSMENT OF AUTOMATED BLOOD GAS ALERT SYSTEM (REAL TIME AUTOMATED PATIENT ALERT)

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INTRODUCTION. Metabolic acidosis and raised lactate are important markers of critical illness that may be overlooked by inexperienced clinical staff. We have adapted a locally developed automated alert system (RAPA, Real time Automated Patient Alert) to warn the patient at risk team of any ward patient with a significant acidaemia and/or raised lactate. All blood gas machines within the insitution and the patient administartion system are connected through an interface engine (Intersystems Ensemble). Ensemble analyses all results and any meeting preset criteria are passed to RAPA. RAPA has been set to automatically sends details of all non critical care patients with a pH less than 7.2 or a lactate of >4 mmol to the patient at risk team via a SMS text message.
OBJECTIVES. To assess the utility of RAPA in indentifying critically ill patients at an earlier stage to the patient at risk team
METHODS. For a 2 month period the acute care team members carried a mobile phone that received RAPA alerts for all non critical care patients. They were asked to review patients identified by RAPA as soon as practical and complete an assessment form to assess the systems usefulness.
RESULTS. A total of 62 RAPA alerts were generated during the assessment period of which 37 were reviewed by the patient at risk team. 29 alerts were triggered by the pH value, 23 by lactate and 10 by both parameters. 30 patients subsequently died (mortality 48 %) of whom 8 were admitted to the ICU (2 of whom died, mortality 25 %). Of the 37 patients reviewed by the patient at risk team, 25 had not previously been referred to the team by the normal early warning system. In 22 of the 37 patients reviewed, the patient at risk team considered that the RAPA had been useful in patient management.
CONCLUSIONS. A significant number of patients were identified with a marked acidosis and/or hyperlactataemia who had not been refered to the patient at risk team. These patients had a high mortality. An automated alert system for these abnormal blood gas values was found to be useful in identiying critically ill patients to the patient at risk team in addition to the standard vital signs track and trigger system.

0160
OUTBREAK OF CA-MRSA IN PATIENTS WITH NEURO-DEVELOPMENT DISORDERS REQUIRING ICU ADMISSION

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INTRODUCTION. CA-MRSA in Latin America has become an emergent microorganism causing severe infections requiring ICU admission. This epidemic outbreak is especially present in a group of patients bearing characteristics associated with hospital care.
OBJECTIVES. Description of the epidemiological characteristics related to genotyping, phenotyping, and management of a CA-MRSA outbreak in patients treated at an ICU in Bogota, Colombia.
METHODS. Case studies and controls.
RESULTS. Of 100 persons treated at a healthcare institution for neurodevelopmental diseases, 50 consulted to emergency departments between September 2008 and January 2009 with skin infections (n:15) arthritis (n:2) or pneumonia (n:1). In 15 of these patients CA-MRSA was isolated, 53 % (8) in blood. Identified through genotyping such as SSCmec Ivc clone USA300, with lukF-PV/tukS-PV genes seq, sek and bsaB. 100 % were PVL positive. 10 (73 %) patients evidenced neuropsychiatric alterations with behavioral trauma such as coprophagy, shared use of hygiene elements, and recurrent skin lesions. 1 with pneumonia and 2 with skin infections required ICU admission. CA-MRSA was not documented in cultures of physicians, nurses, and therapists in charge of patient care at the institute. Decolonization of patients with CA-MRSA was conducted with nasal Mupirocin and Chlorhexidine baths for 7 days, and contact isolation was instaured. Global mortality was 20 % being lowest in the group that received empirical treatment with Vancomycin, compared to those that used Oxacillin-Clindamycin (33.3 vs. 66.6 %).
CONCLUSIONS. USA300 is a potential cause of CA-MRSA outbreaks requiring ICU admission.
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0161
IMPLEMENTATION AND EVALUATION OF A COMMUNICATION PLAN IN AN INTENSIVE CARE UNIT

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INTRODUCTION. Team communication is critical in health care and defects in communication can have consequences for patients and their care teams. Safe and effective care requires clear communication among all health care team members.
OBJECTIVES. The aims of this study were to implement and evaluate a Communication Plan that was based on a daily goals worksheet and a daily Intensive Care Unit (ICU) team meeting.
METHODS. Prospective observational study. During one year period (January 11–January 12) a daily goals worksheet and a daily meeting were implemented in our ICU. We elaborated a daily goals worksheet to record: neurological, cardiovascular, respiratory and renal situation, sedation and pain control, nutrition, infectious disease, family communication, diagnostic tests or procedures, safety parameters and medication changes. We held a daily ICU team meeting to discuss patient's condition and events from the preceding hours, share perspectives, determine the specific goals for the day and the best practice safety measures and we elaborated a care plan. The patient's daily care plan was left in the bedside chart and acted as a quick reference for all caregivers throughout the day. We developed indicators of the compliance with the worksheets and meetings, and monitored them each 3 months. We designed a survey to evaluate ICU team′s perceptions of the usefulness and effectiveness of the Communication Plan.
RESULTS. A total of 300 patients were included and in all of them the daily goals worksheet was filled out and a plan of care was elaborated and discussed in a meeting. We analysed the results of the survey and all the members of the ICU team answered that the daily worksheets and meetings were useful to structure information sharing, increase awareness of daily goals and how to achieve them, make the daily care plan clear, standardize the delivery of care, reduce variability, avoid errors, promote adherence with evidence-based guidelines (catheter-related bloodstream infection, ventilator bundle, urinary tract infection) and improve team satisfaction.
CONCLUSIONS. The implementation of a Communication Plan has improved teamwork and has promoted higher quality and safer patient care in our ICU.
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0162
ACUTE BRAIN DYSFUNCTION IS A MAJOR PREDICTOR OF HOSPITAL MORTALITY IN MECHANICALLY VENTILATED CANCER PATIENTS

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INTRODUCTION. Acute brain dysfunction (ABD), delirium and coma, is a frequent source of morbidity in intensive care units (ICU). Despite the current knowledge on outcome predictors in critically ill cancer patients, little is known regarding ABD in this population.
OBJECTIVES. Our aim was to conduct a study to evaluate the frequency and clinical impact of delirium and coma in mechanically ventilated cancer patients
METHODS. The study was performed at the medical-surgical ICU of the National Cancer Institute, Rio de Janeiro, Brazil. We prospectively enrolled patients mechanically ventilated >48 h with a diagnosis of cancer. The presence of ABD was assessed daily during the first 14 days using the RASS and CAM-ICU. Demographic and laboratorial data were registered during ICU stay. All patients were followed until death or hospital discharge. Univariate and multivariate analysis were performed to evaluate factors associated with increased hospital mortality.
RESULTS. 170 patients were included. 73 % had solid tumors, age 65 [53–72 (median, interquartile range 25–75 %)] years. Sepsis was the main cause of ICU admission ($n = 108$, 63.5 %). SAPS II (54 [46–63]) and SOFA scores (7 [6–9]) were elevated. Sedatives were used in 99 % of the patients. Median duration of mechanical ventilation was 13 (6–21) days and ICU stay was 14 (7.5–22) days. ICU mortality was 54 % and hospital mortality was 66 %. Delirium and coma were diagnosed in 161 patients (95 %), 44 (25.8 %) presented coma during all the 14 days of clinical evaluation. Comparison of survivors and non-survivors was performed, and expected non-survivors had higher severity of illness (SAPSII, 56 (47–63) vs. 50 (43–60), $p = 0.01$) and a higher frequency of acute brain dysfunction (110 (97.3 %) vs. 51 (89.4 %), $p = 0.06$). Survivors had more coma-delirium free-days (4 (1.5–6) vs. 1 (0–2), $p < 0.001$). In multivariate analysis, after adjustment for organ failures and cancer-related factors, the only factors independently associated with hospital mortality were SAPS II (1.032 (1.003–1.063), $p = 0.028$) and coma-delirium free-days (0.771 (0.681–0.873), $P < 0.001$).
CONCLUSIONS. The frequency of acute brain dysfunction in mechanically ventilated cancer patients is extremely high and independently associated with increased hospital

mortality. Future should address the implementation of preventive measures as they may have a significant impact in the outcomes of these patients.
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0163
ICU STAFF LEVEL OF DEPRESSION DURING ECONOMIC CRISIS

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OBJECTIVES. The aim of our study was to record the occurrence of depression in ICU staff during economic crisis and to detect cause of the depression.
METHODS. During December 2011, the ICU both medical and nursing stuff asked for answering anonymously the Beck Depression Inventory (BDI)-II questionnaire, which is a 21 question multiple choice self report inventory. The BDI is widely used as an assessment tool by health care professionals, providing a quantitative assessment of the intensity of depression. The BDI-II version reflects better the depth of depression and it can monitor changes over time (past 2 weeks). It contains 21 questions, each answer being scoring on a scale value of 0 to 3 (total score 0 to 63). Cutoffs: 0–13: minimal, 14–19: mild, 20–28: moderate, 29–63: severe depression. Further more the BDI-II can be separated into two subscales, the affective (0 to 30) and the somatic (0 to 33). On top of the questionnaire the participants were asked to address the depression cause: economic crisis, job conditions or other.
RESULTS. From 17 stuff members, 10 answered the questionnaire (58.8 %) and included to our study. Mean BDI-II score value: 25.4. Sd: 17.9. Min: 7. Max: 52. Minimal depression: 3 (30 %), mild depression: 2 (20 %), moderate depression: 2 (20 %), severe depression: 3 (30 %). Affective subscale: Mean value: 9.9, Sd: 7.4, min: 2, max: 22. Somatic subscale: Mean Value: 15.5, Sd: 10.7, min: 3, max:31. We found a strong ($r^2 = 0.83$) positive ($r = 0.93$) statistical significant (p value < 0.0001) correlation between affective and somatic subscale values. Six participants answered that economic crisis was the cause of depression (60 %), three answered economic crisis in combination with job conditions (30 %) and one answered job conditions alone (10 %). In summary, the majority of the participants (9 to 10, 90 %) pointed the economic crisis as a cause of depression.
CONCLUSIONS. According to our data, depression is a common symptom in our ICU stuff, while 50 % of the participants suffered from moderate or severe depression. The main depression cause recorded was economic crisis, a variable that people can not affect on it Further more the two BDI-II subscales were strongly correlated, suggesting that the physical and the psychological aspects of depression are closely related. As a result, the depression due to economic crisis may have impact not only to stuff health but to stuff effectiveness as well.

0164
INVESTIGATION ON THE QUALITY OF MANAGEMENT FOR THE PATIENTS SUFFERED WITH POST CARDIAC ARREST SYNDROME

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INTRODUCTION. The quality of post resuscitation care has an important impact on patients' prognosis. The implementation of the PCAS patients' management was rarely reported. Therefore, this study investigates the situations of the main life parameters reaching satisfactory level after cardiopulmonary resuscitation.
OBJECTIVES. The aim of the present study is to investigate the quality of post resuscitation care (PRC) in the patients treated by mild hypothermia following cardio-pulmonary resuscitation (CPR) in order to evaluate the quality of PRC.
METHODS. This investigation is a retrospective cohort study by means of collecting the following parameters: mean arterial pressure (MAP), partial pressure of oxygen (PaO_2), partial pressure of carbon dioxide (PCO_2), blood glucose (BG) level and body core temperature (Tc) in the patients treated by mild hypothermia following CPR during first 72 h after admission in the Intensive Care Unit (ICU) of a teaching hospital during the period from January 1, 2005 to December 31, 2010. According to the criteria of parameters reaching satisfactory level, which are generally accepted in the literature, these parameters: MAP, PaO_2, PCO_2, BG and Tc were analyzed in order to find out how many percent these parameters would satisfy the criteria.
Results. (1) From the year 2005 to 2010, the average rates of parameter reaching criteria of MAP, PaO_2, PCO_2 and BG, were 72.14, 87.67, 38.33 and 65.55 % respectively. As temperature management is concerned, among the total 28 patients, only 21.43 % patients meet the standard mild hypothermia treatment according to the guideline. In addition, after therapeutic hypothermia, all patients had experienced at least one onset of temperature rebound (i.e. Tc > 37.5 °C) during the first 72 h in the ICU.
(2) While the rates of parameter reaching criteria of PaO_2 from the year of 2007 to 2010 were compared with that of year 2005, there were significant differences ($P < 0.05$); but, there were not any significant differences in other parameters.
CONCLUSIONS. The quality of post resuscitation care should be improved, especially for the management of PCO_2 and body core temperature.
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0165
THE USE OF INHALED NITRIC OXIDE IN A TERTIARY PAEDIATRIC INTENSIVE CARE UNIT (PICU)

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INTRODUCTION. Inhaled nitric oxide (iNO) is used in sick PICU patients to reduce pulmonary vascular resistance and improve ventilation perfusion mismatch.iNO is an expensive drug costing £40 an hour for the first 96 h (free thereafter). The total spend in this tertiary Children's Hospital in the UK was approx £240,000 per annum in 2010–11.
OBJECTIVES. This study investigates the use of iNO in a tertiary PICU (cardiac surgical and paediatric), specifically looking at evidence of objective assessment of the benefit of iNO; this is important to enable prompt weaning and cessation of treatment.
METHODS. All patients who received iNO were identified by the PICU technician responsible for iNO. Data was collected prospectively from the bedside (hours on iNO) and retrospectively from case notes and electronic patient records.
RESULTS. 107 patient episodes were analysed; 63 % were admitted for cardiac surgery and 66 % received iNO for <96 h. Detailed analysis focused on 52 patients over a 6 month period. The indication for iNO was documented in 75 % of cases and 48 % of these patients had an echocardiogram (echo) prior to commencing iNO. Of those in whom the indication was Pulmonary hypertension 65 % had an echo, 35 % had no echo. 52 % of these were cardiac surgical patients. In those in whom the indication was low oxygen saturations 36 % had an echo and 64 % no echo. Oxygen saturations and objective improvement measures were not routinely recorded in the patient's record pre/post iNO.
CONCLUSIONS. Patients on PICU receive iNO for a number of reasons; 63 % of our caseload were cardiac surgical patients. This study found the main indications for iNO were pulmonary hypertension (36 %) or low oxygen saturations (27 %). Despite this 48 % of patients did not have an echo and oxygen saturations were not documented pre/post iNO. In a time when cost saving is becoming increasingly important the use and effect of an expensive though potentially beneficial drug needs to be thoroughly assessed and documented to justify its continued use.

0166
SURVEILLANCE OF ICU-ACQUIRED INFECTION IN A TERTIARY HOSPITAL BY ANALYSIS OF A DATABASE BUILT THROUGH A WORKFLOW-INTEGRATED SOFTWARE APPLICATION

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INTRODUCTION. Surveillance of nosocomial infection is cardinal to support infection control in the Intensive Care Unit (ICU). Conventional, paper-based surveillance is laborious, costly and difficult to maintain on a continuous basis. Computerization of patient charts at the ICU has facilitated a buildup of databases which can be queried for various purposes, including surveillance of nosocomial infection. The software program COSARA has been designed to assist the ICU-physician in acquiring an overview of all infection-related patient data; by linking these data and filling in clinical evaluation during daily patient rounds, a database on nosocomial infection was built.
OBJECTIVES. We evaluated concordance between surveillance for ICU-acquired infection through analysis of the COSARA database and conventional paper-based surveillance (PBS) in a 36-bed medical and surgical tertiary ICU. We postulated that computer-assisted surveillance (CAS) presented a valid alternative to PBS.
METHODS. We compared both surveillance methods for the identification of ICU-acquired bloodstream infection (BSI), urinary tract infection (UTI) and respiratory tract infection (RTI) over a four-month period (November 1st 2011–Februari 29th 2012). PBS was done by an on-ward physician blinded for COSARA and using the CDC-NHSN definitions. The COSARA database was completed by on-ward physicians based on clinical judgment.
RESULTS. PBS identified 94 ICU-acquired infections in 876 ICU admissions (19 BSI, 15 UTI and 60 RTI), while CAS identified 97 infections (18 BSI, 15 UTI and 64 RTI). CAS agreed with PBS over 17 BSI (89 %), 12 UTI (80 %) and 44 RTI (73 %). Three and 4 infections were missed by PBS and CAS respectively, 4 and 10 infections were erroneously considered as ICU-acquired by PBS and CAS respectively. Discordance between PBS and CAS occurred for 23 episodes, due to inter-observer disagreement about probability (20 RTI, 1 UTI) and focus of infection (2 RTI). Of these, 14 infections (13 RTI, 1 UTI) were considered likely by on-ward physicians but did not meet CDC-NHSN criteria.
CONCLUSIONS. CAS for ICU-acquired infection has good agreement with PBS using CDC-NHSN criteria and can be used as a more convenient tool for nosocomial infection surveillance. Disagreement between both methods was largely due to inter-observer variability.

0167
NEGATIVE FLUID BALANCE 48 H AFTER ADMISSION IMPROVES SURVIVAL AT 28 DAYS IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Fluid infusion may be lifesaving in critically ill patients, but following initial resuscitation, positive fluid balance is associated with increased mortality.
OBJECTIVE. This study aimed to determine whether a negative fluid balance (≤500 mL) within first 48 h of admission in ICU is associated with improved survival at 28 days in a heterogeneous cohort of critically ill patients.
METHODS. We conducted a retrospective study in a 20-bed intensive care unit at a university-affiliated teaching hospital. Patients admitted for acute heart failure, those who required dialysis before admission and those who died within 24 h after admission were excluded. Demographic data, SAPS II and APACHE II were recorded at admission and SOFA, fluid balance, hemodynamic, respiratory and renal variables once per day. Variables were compared between survivors and nonsurvivors and between patients who did and those who did not achieve negative fluid balance by day 2 of admission. Multiple logistic regression was used to identify variables significantly associated with ICU mortality in the univariate analysis. Survival was assessed using Kaplan–Meier analysis.
RESULTS. We studied 87 patients: 53 males, mean age 58 ± 18 years, SAPS II 39.3 ± 15.8, APACHE II 15.9 ± 7.5, SOFA 5.0 ± 3.4, and ICU stay 10.3 ± 9.8 days. Main syndromic diagnosis at admission was septic shock (26), acute respiratory failure (19), trauma (13), neurocritical illness (14) and others (15). Overall mortality at ICU reached 20.7 % and survival at 28 days was 73.6 %. When patients were classified according to 28-day outcome, we observed statistically significant differences in negative fluid balance at 48 h ($p < 0.001$), SAPSII ($p < 0.001$), APACHEII ($p = 0.007$), age ($p = 0.046$) and incidence of acute kidney injury at admission ($p = 0.02$; defined as at least Risk in RIFLE criteria), but urinary output, hemodynamic and respiratory parameters did not differ. Multivariate analysis showed that negative fluid balance at 48 h was independently associated with improved survival: odds ratio = 7.9 ($p = 0.013$). Kaplan–Meier analysis showed that survival was significantly lower in patients without negative fluid balance at 48 h ($p = 0.015$).
CONCLUSIONS. Our findings show that negative fluid balance 48 h after admission may correlate with better outcome in a heterogeneous population of critically ill patients.
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0168

PROCALCITONIN (PROCT) INDUCES PRO-INFLAMMATORY MEDIATORS AND APOPTOSIS IN MESANGIAL CELLS (MCS) IN VITRO

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INTRODUCTION. ProCT is usually elevated in patients with systemic inflammation and sepsis. We have previously shown that neutralization of ProCT by an antiserum reactive to this prohormone ameliorates systemic and renal complications in septic animals. Our prior work indicates that ProCT act as a mediator in the pathogenesis of sepsis.
OBJECTIVE. The present study was designed to test the hypothesis that ProCT has a direct pro-inflammatory effect in MCs.
METHODS. Mouse MCs in vitro were exposed to several ProCT concentrations (0.5, 1.0, 2.5 and 5 ng/ml), and different time points (2, 4 and 6 h). Markers of inflammation were determined by real-time RT-PCR and PCR array. Apoptosis and cell viability were measured by a combined fluorescence/chemiluminescence assay. Structural changes were analyzed by immonufluorescence staining for smooth muscle alpha-actin and phalloidin.
RESULTS. Transcript levels of IL-6 and iNOS were significantly increased after 4 h incubation with ProCT at 2.5 ng/ml and 5 ng/ml (40-fold and 350-fold increase vs control, respectively; $p < 0.001$), while TNF-alpha increased at 6 h with 5 ng/ml (7-fold, $p < 0.001$ vs control). ProCT up-regulated inflammatory and pathway-related genes. Among them, the Wnt, p53, stress and Ca^{2+}/PKC pathways were significantly more affected by ProCT with most of the genes increasing 5–24 fold compared to control. Normally, MCs at rest display a typical stellate or spindle shape configuration with abundant parallel actin microfilament running throughout the cytoplasm. However, MCs exposed to ProCT (5 ng/ml) for 4 and 6 h lost their confluence and showed marked signs of cytoplasmic and nuclear shrinkage. ProCT also induced a disruption of the actin microfilament network, decreased cell viability by 36 % ($p < 0.001$), and stimulated apoptosis (2-fold increase vs control MCs, $p < 0.001$). At lower doses and time-points, ProCT did not have significant effects on MCs.
CONCLUSION. This study demonstrates for the first time a direct toxic effect of ProCT in MCs that is independent of bacterial endotoxemia and hemodynamic changes. Our work strongly suggests that ProCT plays an important role in contributing to the acute kidney injury often occurring in sepsis.

0169

PLATELET, BUT NOT SKELETAL MUSCLE, MITOCHONDRIAL FUNCTION IS ALTERED IN PATIENTS WITH SEPTIC SHOCK

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INTRODUCTION. The role of mitochondrial dysfunction in the pathogenesis of septic shock and the contribution of hypoperfusion to it are controversial. Most of clinical observations were made on skeletal muscle biopsies and produced variable results [1, 2]. Whether changes similar to those (eventually) occurring in skeletal muscle also occur in platelets, that can be obtained less invasively, remains unknown.
OBJECTIVES. 1. To further investigate mitochondrial function in skeletal muscle; 2. To verify whether mitochondrial function is similarly altered (or unaltered) in skeletal muscle and platelets of patients with septic shock.
METHODS. Twenty seven subjects with septic shock underwent a triceps brachii muscle biopsy within 24 h from admission to Intensive Care. At the same time, blood was taken and platelets isolated. The activities of complex I (CI) and IV (CIV), main components of the mitochondrial respiratory chain, and that of citrate synthase (CS), a marker of mitochondrial density, were measured on tissue homogenates using spectrophotometry. Seven non-septic subjects undergoing elective upper arm surgery acted as controls. Results are reported as medians [IQR]. Rank sum and Spearman rank tests were used for statistical analysis.
RESULTS. Complex I and IV (relative to citrate synthase) activities were normal (or even above normal) in skeletal muscle but abnormal in platelets of patients with septic shock.

Mitochondrial respiratory chain complex activities

	Septic shock (n = 27)	Control (n = 7)	p
Muscle CI/CS (%)	11 [9–12]	8 [6–9]	<0.01
Muscle CIV/CS (%)	47 [39–51]	41 [33–46]	0.37
Platelet CI/CS (%)	6 [5–9]	10 [9–10]	<0.05
Platelet CIV/CS (%)	17 [13–26]	34 [27–44]	<0.01

The association between skeletal muscle and platelet mitochondrial enzyme activities fwas either weak and negative (CI/CS: r −0.39, $p < 0.05$) or non significant (CIV/CS: r −0.15; $p = 0.40$).
CONCLUSIONS. During septic shock, the activity of the enzymes forming the mitochondrial respiratory chain is grossly preserved in triceps brachii muscle but clearly altered in platelets. This latter finding can be hardly explained by hypoperfusion since platelets are blood cells.
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0170

ROLE OF IL-10 IN INCREASED S100A8/A9 MRNA EXPRESSIONS DURING ENDOTOXIN-TOLERANCE

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INTRODUCTION. The traditional view of sepsis has been greatly challenged within the past few years and it is now becoming evident that the early pro-inflammatory phase of the disease is immediately followed by an anti-inflammatory response that rapidly results in an immunosuppressive state (Figure 1). Immunosuppression is believed to be responsible for the increased risk of nosocomial infections and mortality and is characterized by the development of endotoxin tolerance (ET, i.e. decreased response to a second endotoxin challenge). We recently showed that S100A8 and S100A9 mRNAs (Alarmins) were increased after septic shock and that delayed S100A9 mRNA increase predicted hospital-acquired infection in patients [1].
OBJECTIVES. To investigate the regulation of S100A8 and S100A9 mRNA expression in an ex vivo model of ET.
METHODS. ET can be reproduced ex vivo by priming healthy cells with low-dose endotoxin which induced a refractory state to a subsequent endotoxin challenge. Peripheral blood mononuclear cells were thus isolated from healthy volunteers and stimulated twice with LPS (2 ng/ml and 100 ng/ml, Figure 1). Extracellular IL-10 was blocked during LPS stimulations using anti-IL-10 antibody (100 ng/ml). TNFa, IL-10, S100A8 and S100A9 mRNAs expressions were measured using RT-qPCR.
RESULTS. Importantly, we observed that ET was associated with decreased TNFa and increased IL-10 mRNA expressions after two LPS challenges (primed cells) and most importantly with a significant increase of S100A8 and S100A9 mRNA levels (Table 1). As S100A8 and S100A9 mRNA expressions were correlated with IL-10 level, and as the literature suggested a role for this cytokine in the regulation of S100A8 and S100A9 expression after LPS stimulation, we blocked extracellular IL-10 effects in our model. Interestingly, S100A8 and S100A9 increase was significantly abrogated by IL-10 blockade after two LPS stimulations.
CONCLUSIONS. In this study, we observed that S100A8 and S100A9 mRNA expressions were significantly increased during endotoxin tolerance in association with usual monocyte dysfunctions observed in such ex vivo model. This reproduced ex vivo the observations we previously made in septic shock patients. Importantly, IL-10 blockade abrogated partially S100A8/A9 mRNA increase, suggesting a role for this cytokine in S100A8 and S100A9 mRNAs expression regulation in our model and more generally in septic shock patients.
REFERENCE(S). 1. Fontaine et al. Crit Care Med. 2011.
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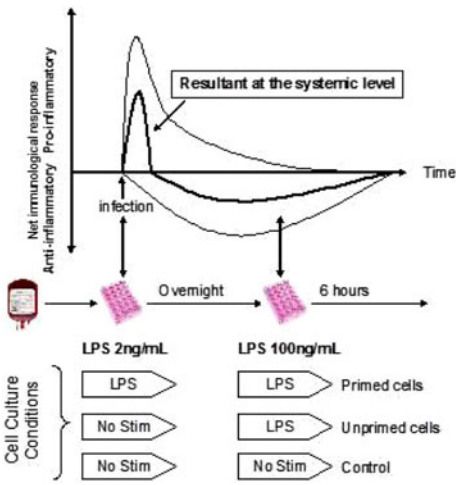

Figure 1

Table 1 mRNA expressions of TNF-a, IL-10, S100A8/A9 in our model of endotoxin tolerance

	Control	Unprimed	Primed	p
TNFα	1	188 (11)	1* (0.6)	*p < 0.01
IL-10	1	35 (30)	215* (105)	*p < 0.001
S10098	1	1.3 (0.3)	11* (10)	*p < 0.001
S100A9	1	1.2 (0.4)	24* (19)	*p < 0.01

Results are presented as mean ± SE of fold changes vs control. n = 10. Mann–Whitney *U* test

0171

THE GLUCOCORTICOID RECEPTOR EXPRESSION AND FUNCTION IS DECREASED DURING EXPERIMENTAL *STAPHYLOCOCCUS AUREUS* SEPSIS: A MECHANISM OF STEROID RESISTANCE?

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INTRODUCTION. Severe sepsis and septic shock represent leading causes of death in patients in the intensive care unit. The role of glucocorticoid treatment in patients with severe sepsis and septic shock remains controversial, with contradictory clinical outcomes from recent large multicenter clinical trials. The varying effects of glucocorticoid treatment in sepsis are poorly understood. We hypothesize that failure to respond to steroid therapy may be caused by decreased expression or function of glucocorticoid receptors (GR).

OBJECTIVES. In the present study, we used our well established mouse model of *S. aureus* sepsis to detect possible changes in the expression and function of GR in circulating leukocytes during the course of sepsis.

METHODS. Male C57BL/6J mice were intravenously inoculated with *S. aureus* and blood was collected after 24, 48, 72 and 96 h for flow cytometry. GR expression in different leukocyte subsets; T cells (CD4+ and CD8+), monocytes (Gr-1+, F4/80+) and neutrophils (Gr-1+, F4/80−), were quantified and GR function was assessed by the cells' ability to bind FITC-labeled dexamethasone in vitro. The expression and function of GR was also compared with healthy, uninfected mice.

RESULTS. During the first 48 h of *S. aureus* sepsis the GR expression in all cell types was essentially unaltered from the expression in healthy, uninfected mice. However, from 48 to 96 h, the GR expression was dramatically decreased in all cell subsets ($p < 0.03$) except for monocytes where the decrease was nearly significant ($p = 0.05$). The function of the GR as studied by in vitro dexamethasone binding capacity was significantly attenuated in CD8 lymphocytes ($p < 0.05$) but not in CD4 lymphocytes. In contrast, monocytes and neutrophils displayed significantly increased dexamethasone binding capacity during the first days of sepsis compared to control animals ($p < 0.01$), but also these cell types had significantly reduced binding capacity at 96 h compared to 48 and 72 h ($p < 0.04$).

CONCLUSIONS. Our study shows that prolonged sepsis is associated with decreased GR expression and function in vitro. This expands our understanding of the mechanisms underlying steroid resistance in sepsis, and raises the question whether analysis of GR expression and function in blood samples may be useful for prediction of positive steroid responses in septic patients.

0172

BACTERIAL CLEARANCE IN SEPTIC MICE IS MODULATED BY MCP-1/CCL2 AND NITRIC OXIDE

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INTRODUCTION. Survival during sepsis requires both swift control of infectious organisms and tight regulation of the associated inflammatory response. Bacterial clearance is one of the most important beneficial consequences of innate immune response. The immune/inflammatory responses triggered by factors related to the infectious agent are amplified by molecules of host origin including cytokines, chemokines, lipid mediators, and reactive oxygen species. Chemokines are important mediators controlling leukocyte trafficking and activation while reactive oxygen and nitrogen species are effectors in bacterial killing.

OBJECTIVE. The aim of this study was investigate the role of CCL2 and NO in clearance of bacteria after CLP model [1].

METHODS. In the present work we used in vivo and in vitro models of infections to study the role of MCP-1/CCL2 and NO in bacterial clearance in sepsis. Mice were subjected to CLP model. After 6 h, the numbers of CFU counts and measured of mediators were determined. To investigate the role of CCL2 in clearance of bacteria, the animals were treated with anti-CCL2 and 6 h after CLP the peritoneal fluid were collected.

RESULTS. Our results show that MCP-1/CCL2 and NO levels are increased in the peritoneal cavity of mice 6 h after sepsis induced by cecal ligation and puncture (CLP). Pretreatment with anti-MCP-1/CCL2 monoclonal antibodies increased the number of colony forming units (CFU) recovered in the peritoneal lavage fluid. Moreover, CFU counts were increased in the peritoneal fluid of CCR2−/− mice subjected to CLP. In vitro stimulation of peritoneal macrophages with recombinant MCP-1/CCL2 reduced CFU counts in the supernatant after challenge with *E. coli*. Conversely, treatment with anti-MCP-1/CCL2 increased CFU counts under the same experimental condition. Stimulation of cultured macrophages with MCP-1/CCL2 and IFN-g had a synergistic effect on NO production. Macrophages from CCL2−/− mice showed a consistent decrease in NO production as compared to wild type controls after stimulation with LPS + IFN-g. Finally, we showed incubation of macrophages with *E.coli* and the ERK inhibitor U0126 increased CFU numbers and decreased intracellular levels of NO.

CONCLUSION. In conclusion, we demonstrated for the first time that MCP-1/CCL2 has a crucial role in the clearance of bacteria by mechanisms involving increased expression of iNOS and production of NO by ERK signaling pathways.

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GRANT ACKNOWLEDGMENT. CNPq/PAPES/FAPERJ/FIOCRUZ.

0173

IDENTIFICATION OF VARIOUS ACTIVATION STATES OF MACROPHAGES BY MALDI-TOF MASS SPECTROMETRY

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INTRODUCTION. Matrix-assisted laser desorption/ionisation, time-of-flight mass spectrometry (MALDI-TOF MS) was applied for the analysis of microorganisms for their taxonomic characterization. This approach has been developed as a diagnostic tool readily available for routine: high-hroughput analysis of microbial isolates from clinical specimens by whole-cell mass spectrometry, i.e. the direct analysis of whole bacterial cell without a preceding fractionation or separation by chromatography or electrophoresis. We have previously shown that this technology can also discriminate various eukaryote cells, particularly immune blood cells [1].

OBJECTIVES. The purpose of this study is to assess the ability and accuracy of whole-cell MALDI-TOF MS to discriminate various activation states of a single cell type. Due to its known plasticity in response to its environment, we decided to study macrophages.

METHODS. Human Peripheral Blood Mononuclear Cells were isolated from blood samples after sedimentation through a Ficoll density cushion, and monocytes were purified by CD14+ magnetic cell sorting. Monocytes were differentiated into macrophages by incubation in RPMI 1,640 with 20 mM HEPES, 10 % human serum AB+, 2 mM L-glutamine, 100 IU/ml penicillin and 100 µg/ml streptomycin for 3 days, after which fetal calf serum was substituted for the human serum for 4 additional days. Macrophages were stimulated for 18 h with 20 ng/ml recombinant human cytokines (IFN-γ, TNF, IL-4, IL-10, TGF-β) or LPS (1 µg/mL) or heat inactivated bacteria (group B *Streptococci*, *Staphylococcus aureus*, *Coxiella burnetii*, *Orientia tsutsugamushi*, or bacille de Calmette et Guerin (BCG); 50 bacteria per cell). Stimulated or control cells were analyzed by MALDI-TOF MS (AutoFlex II/Bruker Daltonics). Raw data were normalized and analyzed with the R statistical software, the *MALDIquant* library and specific algorithms.

RESULTS. MALDI-TOF spectra from various samples were composed by a series of peaks from 2 to 16 kDa. The comparison of various spectra (based on common and specific peaks, and intensity variation of common peaks) discriminated M1 (IFN-γ stimulated) polarized macrophages from M2 (IL-4 stimulated) polarized macrophages. Moreover, the accuracy of whole-cell MALDI-TOF MS could discriminate cells stimulated with various M1 (IFN-γ, TNF, LPS) or M2 (IL-4, IL-10, TGF-β) agonists. Finally, specific fingerprints separated the bacterial-activated macrophages.

CONCLUSIONS. We showed for the first time that whole-cell MALDI-TOF MS identifies in a fast, easy and unexpensive manner, various activation states of a single cell type. The specific fingerprints we found may be useful for studying the activation of macrophages under pathological conditions. It opens the way to a new investigation tool to study inflammation at the bedside.

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0174

ORGAN-SPECIFIC ALTERATIONS IN MITOCHONDRIAL RESPIRATION IN A PORCINE MODEL OF SEPSIS-INDUCED MULTIPLE ORGAN FAILURE

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INTRODUCTION. Mitochondrial dysfunction has been proposed to influence organ function and outcome in sepsis.

OBJECTIVES. To compare mitochondrial respiration of vital organs between groups of animals representing two distinct ICU populations: septic shock with multiple organ failure, and surgery followed by short-term analgo-sedation and blood-pressure manipulation.

METHODS. In 16 anesthetized pigs, evolving septic shock after 12 h of fecal peritonitis was treated with norepinephrine or angiotensin II and fluids for 48 h. Healthy pigs ($n = 20$) were anesthetized, underwent laparotomy and were exposed to increasing doses of angiotensin II, enalapril or placebo during 5 h. Heart, kidney and liver were harvested at the end of the experiments, and mitochondria were isolated by tissue homogenization and differential centrifugation. Mitochondrial oxygen consumption was measured by high resolution respirometry (Oroboros Instruments, Innsbruck, Austria). The two groups were compared using Mann–Whitney U Test.

RESULTS. Mitochondrial respiration was not different between sub-groups of septic and healthy pigs receiving different vasoactive drugs; therefore data from subgroups were pooled (Table 1). Heart: Complex I respiratory control ratio (RCR) was higher in septic versus control animals. Kidney: Mitochondrial state 4 (Complex I and II) and state 3 (Complex I and IV) respiration was increased in septic versus control animals.
Liver: Mitochondrial state 3 (Complex IV) and state 4 (Complex II) respiration was higher in septic compared to control animals.

Table 1

	State 3	State 4	RCR
Heart complex I control vs. sepsis	1,452 (1,245–1,706) vs. 1,492 (1,361–1,641)	368 (344–477) vs. 354 (259–425)	3.6 (3.3–4.2) vs. 4.4 (3.8–5.5) $p = 0.008$
Kidney complex I control vs. sepsis	634 (456–883) vs. 1,161 (686–1,202) $p = 0.02$	144 (109–211) vs. 240 (170–311) $p = 0.005$	4.1 (3.3–5.5) vs. 3.8 (3.1–4.6)
Liver complex I control vs. sepsis	517 (392–819) vs. 906 (512–1,026)	124 (95–172) vs. 171 (127–196)	4.4 (3.6–5.6) vs. 4.7 (3.4–6.5)
Heart complex II control vs. sepsis	2,339 (2,095–2,639) vs. 2,202 (2,037–2,490)	877 (790–1078) vs. 729 (660–949)	2.6 (2.3–2.8) vs. 2.9 (2.5–3.2)
Kidney complex II control vs. sepsis	1,656 (1,441–2,000) vs. 2,018 (1,520–2,252)	323 (273–438) vs. 562 (430–654) $p = 0.001$	4.7 (4.1–5.5) vs. 3.8 (3.1–4.3) $p = 0.001$
Liver complex II control vs. sepsis	1,391 (1,081–1,766) vs. 1,255 (931–1,586)	214 (192–306) vs. 321 (232–344) $p = 0.01$	6.0 (5.2–6.7) vs. 4.3 (3.7–5.3) $p = 0.0001$
Heart complex IV control vs. sepsis	1,655 (1,542–2,298) vs. 2,048 (1,915–2,427)		
Kidney complex IV control vs. sepsis	619 (486–851) vs. 1,400 (953–1,570) $p < 0.0001$		
Liver complex IV control vs. sepsis	375 (274–564) vs. 673 (576–828) $p = 0.002$		

Mitochondrial oxygen consumption (pmol/(s*mg)) of control animals ($n = 20$) and septic animals ($n = 16$). Median (IQR).

CONCLUSIONS. Kidney and liver, but not heart mitochondrial state 3 and/or state 4 respiration were increased in septic in comparison with non-septic animals, with a net effect of reduced mitochondrial respiration efficiency. The effect of time of exposure to analgo-sedative drugs, and the effect of the measured mitochondrial respiration alterations on organ-specific oxygen transport and use should be assessed in further studies.

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0175
EXPRESSION OF MONOCYTE PHOSPHODIESTERASES AT THE ICU ADMISSION OF SEPTIC PATIENTS: AN MRNA STUDY

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INTRODUCTION. Monocytes play an important role in the pathophysiology of sepsis [1]. In vitro, monocytes stimulated by lipopolysaccharide show up-regulation of some phosphodiesterases (e.g. PDE 4B) [2] which are key enzymes in the intracellular signaling [3]. Inhibition of PDE decreases the inflammatory response in these models, partly through modulation of NF kappa-B pathway [4]. However, the expression pattern of monocyte PDEs during human sepsis is not well characterized.

OBJECTIVES. To study the mRNA expression of monocyte PDEs (PDE 3A, 3B, 4A, 4B, 4D, 5A and 7A) from septic patients.

METHODS. Following approval by the ethics committee and after informed consent, blood was collected from patients with severe sepsis or septic shock within 24 h after ICU admission. CD14+ monocytes were selectively isolated using immunomagnetic cell isolation after CD15+ cells removal. mRNA expression of PDE 3A, 3B, 4A, 4B, 4D, 5A and 7A was assessed by qRT-PCR using the delta-Cp method. Monocytes from healthy volunteers served as control. Expression ratios were compared using non parametric (Mann–Whitney) tests and correlations by a Spearman test.

RESULTS. We included 15 septic patients (severe sepsis: n = 9; septic shock: n = 6) and 16 healthy volunteers. mRNA expression of PDE 3B and PDE 4B was significantly decreased (both $p < 0.01$, Fig. 1)

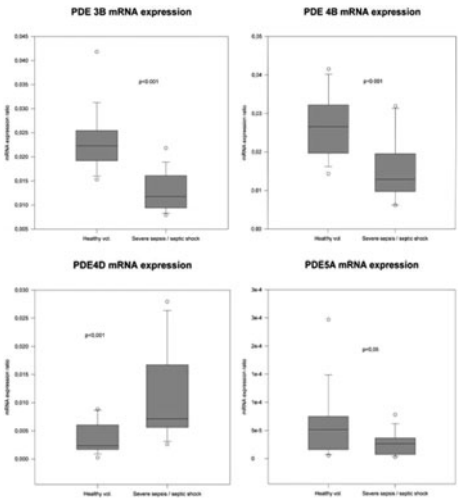

Fig. 1 PDE3B_4B_4D_5A

In septic patients compared to healthy volunteers, whereas PDE 4D was significantly increased in septic patients ($p < 0.01$, Fig. 1)

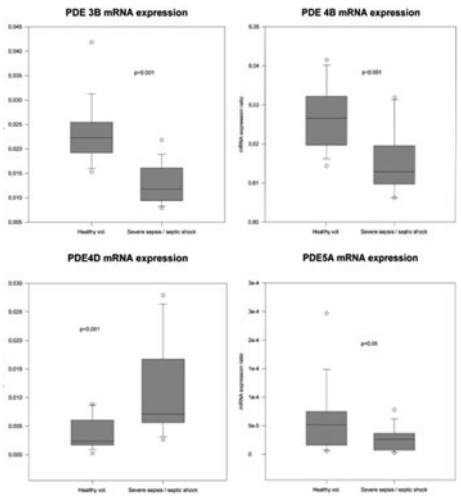

Fig. 2 PDE3B_4B_4D_5A

Expression of PDE 5A mRNA was decreased ($p = 0.05$, Fig. 1)

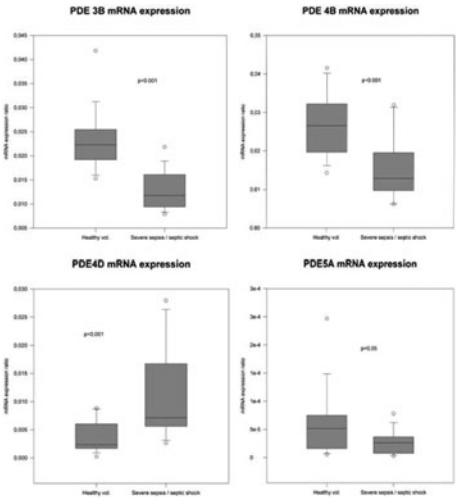

Fig. 3 PDE3B_4B_4D_5A

While expression of PDE 7A and PDE 3A mRNAs was unchanged (Fig. 2)

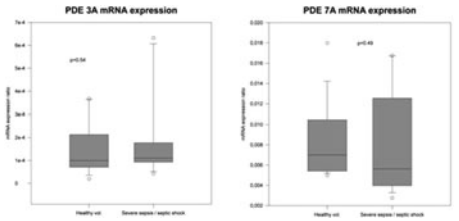

Fig. 4 PDE3A_7A

Significant correlations were found between PDE 4A and PDE 4B (R: 0.6, $p = 0.017$), PDE 4D and PDE 5A (R: 0.91, $p < 0.001$), PDE 4D and PDE 7A (R: 0.68, $p = 0.005$).

CONCLUSIONS. Phosphodiesterase mRNA expression pattern is altered in monocytes from septic patients already at time of ICU admission. Some changes (e.g. PDE 4B) are different from those described in pro-inflammatory in vitro models. Whether this correlates with protein activity and reflects complex immune changes encountered in sepsis requires further studies.

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0176
EARLY GENOMIC TSUNAMI IS OBSERVED AT THE ONSET OF SEPTIC SHOCK

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INTRODUCTION. The traditional view of sepsis has been greatly challenged within the past few years and it is now becoming evident that the early pro-inflammatory phase of the disease is associated with an anti-inflammatory response that rapidly results in an immunosuppressive state. However, it remains to be determined how these crucial events affect genomic expression after sepsis and how they impact the degree and the duration of the gene alterations.

OBJECTIVES. To further investigate the physiopathology of systemic immune response in severe ICU patients, we set out to study the genome wide expression patterns of blood leukocytes during the first 48 h after the onset of septic shock. We also intended to determine whether patterns of gene expression could be associated with two extremes of initial clinical severity using stratification based on SAPSII score.

METHODS. Twenty-eight patients from two ICU were enrolled at the onset of septic shock (initiation of catecholamines infusion). Blood samples were collected in PAXgene™ Blood RNA tubes at 0, 24 and 48 h after the onset of shock and profiled using Affymetrix® U133plus 2.0 microarrays. Gene expression profiles from septic shock patients were compared to healthy volunteers and between patients stratified on median SAPSII score.

RESULTS. Our data showed that more than 78 % of the genes were dysregulated during the first 48 h after septic shock compared to healthy volunteers. More than 65 % of these genes were common to the 3 time points (H0, H24 and H48) and were similarly up or down-regulated over the time course. Interestingly the number of down-regulated genes was

greater than the number of up-regulated ones. Most of the dysregulated pathways were not significantly different between the SAPSII-high and SAPSII-low groups of patients. However, and most importantly, the magnitude of the response and the duration of these alterations were found different between these two groups. Interestingly, the maximal difference in gene expression was observed at 48 h after the onset of shock (Table 1; Fig 1 below).

Table 1 IGSII-high and -low significant genes

	H0	*H24*	*H48*
IGSII-high			
Up	689	815	806
Down	963	1067	806
IGSII-low			
Up	850	722	681
Down	918	687	482

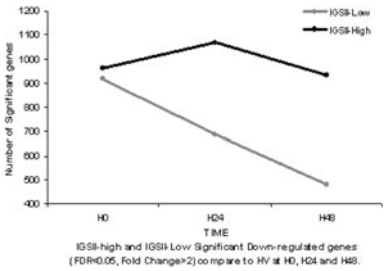

Fig. 1

CONCLUSIONS. Most transcriptomic changes occurred very early after the onset of septic shock. Consistent with recent data described in trauma patients [1], we observed that those changes, disturbing most biological functions, represent a genomic tsunami in septic shock patients occurring over the first 48 h after the onset of shock. Comparing SAPSII-high and SAPSII-low groups of patients, even if genomic patterns were similar, differences were observed in the degree and duration of the response. Interestingly, the largest differences were observed at 48 h suggesting that the SAPSII-low group had a better recovery than the SAPSII-high.

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GRANT ACKNOWLEDGMENT. Part of ADNA coordinated by Merieux Alliance and supported by the French public agency OSEO. GM, FV and AL are supported by funds from the Hospices Civils de Lyon.

0177

LOW IMMUNOGLOBULIN G LEVELS AT ADMISSION REDUCES THE ODDS FOR 28 DAY MORTALITY COMPARED TO NORMAL LEVELS: PROSPECTIVE COHORT STUDY IN SEVERE SEPSIS

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INTRODUCTION. Intravenous immunoglobulin (IVIg) is a potential adjunct for severe sepsis, however, mortality benefit in trials to date using different preparations and dosages have been conflicting [1]. Furthermore, these trials have used fixed dosing rather than individual titration based on a biomarker. Serum immunoglobulins (Ig) are considered as direct indicators of immune status and free light chain-lambda (FLC-λ) as indicator of ongoing Ig synthesis. We hypothesised that changes in serum Ig and FLC-λ would prognosticate for patients admitted to an intensive care unit (ICU) with severe sepsis, and could thus be useful surrogates for stratified IVIg therapy.

OBJECTIVES. In ICU admissions with severe sepsis, we evaluated trends and association between Ig and FLC-λ concentrations on 28 day mortality (D28-M).

METHODS. After informed consent, consecutive admissions to a general medical-surgical ICU meeting the severe sepsis definition were included. Ig (IgG, IgA and IgM) and FLC-λ were measured daily for 7 days following ICU admission. Using the lower limit of the normal range, hypo-IgG, hypo-IgM and hypo-IgA were defined as Day 1 serum levels below 6.5, 0.4 and 0.7 g/L, respectively. To evaluate the association with D28-M using logistic regression analysis, the lower limit of normal for IgG (6.5 g/L) and the upper limit of normal for FLC-λ (26.3 mg/L) were used as cut-offs to create binary variables. Unless specified, data are presented as median (IQR), odds ratio (OR; 95 % CI).

RESULTS. Thirty-one patients were enrolled. Their mean (SD) age and admission APACHE II scores were 67 (11.9) years and 20.6 (6.0). SOFA score on admission was 8 (4-12) and D28-M was 25.8 %. On admission, hypo-IgG,-IgM & -IgA were seen in 54.8, 35.5, and 16 % of the study cohort, respectively. Admission FLC-λ >26.3 mg/L were recorded in 42 % of patients suggesting Ig production. IgG and IgM did not change significantly between days 1 and 7 whereas IgA increased significantly from 1.8 (1.1, 2.4) to 2.4 (1.5, 3.4) g/L ($p = 0.008$). The OR for D28-M was lower in patients with Day 1 IgG levels <6.5 g/L [OR 0.18 (0.02–1.28); $p = 0.05$]. The OR for D28-M was higher in patients with Day 1 FLC-λ levels >26.3 mg/L [OR 19.8 (2.0–196.4); $p = 0.011$; Table 1). A significant linear trend was observed in the relationship between Day 1 IgG level and D28-M [OR 1.44 (1.03–2.01) per unit increase in IgG; $p = 0.03$].

CONCLUSIONS. Patients with IgG levels below the lower limit of normal had lower OR for D28-M compared to those with normal levels (lower by 80 %). Patients with supra-normal FLC levels had significantly higher OR for D28-M compared to those with normal FLC levels on day 1 (20 times higher). The biological relevance of these findings needs to be clarified further before embarking on further interventional trials of IVIg therapy.

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0178

NEURAMINIDASE MRNA EXPRESSION IS MODIFIED IN MONOCYTES FROM SEPTIC PATIENTS

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INTRODUCTION. Removal of sialic acid (SA), a carbohydrate of the monocyte membrane surface, enhances the monocyte response to bacterial lipopolysaccharide [1]. Several neuraminidases (NEU 1, 3, 4), the SA leaking enzymes, have been described in the monocyte, where NEU1 regulates the adhesion and intracellular signaling while NEU3 seems to be involved in cytokine production [1]. We previously reported an increased NEU activity in the sera of septic patients, but did not investigate the monocyte expression at the mRNA level [2].

OBJECTIVES. To study the monocyte mRNA expression of distinct NEU (NEU 1, 3, 4) from septic patients and correlate it to the monocytic expression of cytokines.

METHODS. Following approval by the ethics committee and after informed consent, blood was collected from ICU patients with severe sepsis or septic shock within 24 h after ICU admission. CD14+ monocytes were isolated by magnetic-activated cell sorting procedure. mRNA expression of NEU 1, 3 and 4 and also IL-10, IL-8 and TNF-alpha was assessed by qRT-PCR. Monocytes from healthy volunteers served as control. Differences were calculated by a Mann–Whitney test and correlations by a Spearman test. A p value <0.05 was considered statistically significant.

RESULTS. We included 15 septic patients (severe sepsis: $n = 9$; septic shock: $n = 6$) and 16 healthy volunteers. NEU 1 mRNA was higher in septic patients ($p = 0.007$, graph 1)

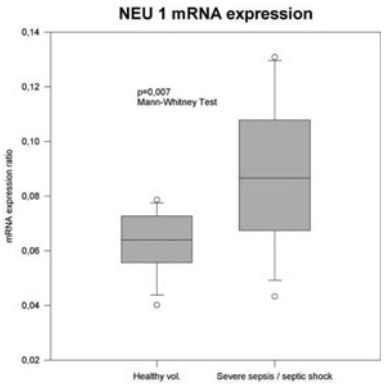

Fig. 1 Neu1

Compared to healthy volunteers, with a trend toward higher values in patients with septic shock compared to severe sepsis ($p = 0.052$). In contrast, mRNA for NEU 3 (graph 2)

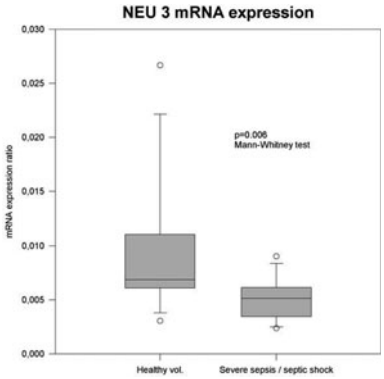

Fig. 2 Neu 3

and NEU 4 (graph 3)

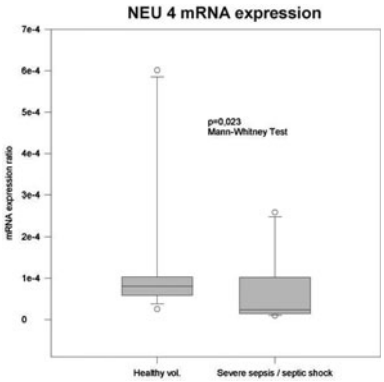

Fig. 3 Neu 4

were significantly decreased ($p = 0.006$ and 0.023 respectively). There was a negative correlation between NEU 1 and NEU 4 in septic patients (correlation coefficient: -0.757, $p < 0.001$). No significant correlation was found between cytokines and NEU mRNA expression.
CONCLUSIONS. Neuraminidase mRNA expression is modified in monocytes from septic patients already at time of ICU admission. Decreased mRNA expression of NEU 3 and its possible relevance on cytokine production need further investigations.
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GRANT ACKNOWLEDGMENT. Grant from the Fonds Erasme pour la Recherche Médicale.

0179
EARLY IMPORTANT ROLE OF B LYMPHOCYTES IN PATIENTS WITH SEPTIC SHOCK

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INTRODUCTION. Activation of B cells is classically considered only as a late adaptive immune response, but these lymphocytes can also contribute to acute inflammation response to invading pathogens.
OBJECTIVES. The aim of this study is to investigate the role of the different B lymphocyte subsets and to evaluate their prognostic value in patients with septic shock.
METHODS. In this prospective cohort study, B lymphocytes were analyzed on admission to the intensive care unit, and 3, 7, 14 and 28 days later.On admission to the intensive care unit and after informed consent was obtained, a blood sample was collected into sterilized, silicone-coated glass tubes. The blood samples were prepared within 1 h of sample collection for flow cytometry. B cells were phenotypically analyzed in PBMC by four-color flow cytometry in a FACScalibur cytometer using CellQuest-3.3 software (Becton–Dickinson, San Jose, CA, USA). B-cell phenotypes assessed were: CD19+CD69+; CD19+CD23+; CD19+CD5+; CD19+CD80; CD19+CD86+; CD19+CD40 and CD19+CD95+. Data are expressed as the mean ± SE mean. Differences between groups were analysed using the Mann–Whitney U test for non-parametric data and analysis of variance followed by Wilcoxon Signed Ranks tests were used for within group analyses. The reliability of the use of different phenotype markers concentrations to predict death due to septic shock was calculated by plotting receiver-operating characteristics (ROC) curves. The level of significance was set at $p < 0.05$.
RESULTS. Ninety-two patients with septic shock were evaluated, but forty fulfilled some exclusion criteria, so fifty-two patients were included. Thirty-six healthy volunteers matched for age and sex were used as controls. The patients developed lymphopenia and was maintained during 14 days of the follow-up. This lymphopenia did not affected CD69+, CD80+, CD86+ and CD95+ expression on B-cells. In patients with septic shock with fatal outcome, the percentage of CD19+CD23+ was lower along the 7 days of the follow-up than in survival patients. Moreover, the percentage of CD80+ and CD95+ expression on B-cells were higher in patients who died than in survivors. ROC curve analysis showed that CD19+CD23+ at ICU admission was better reliable indicator of mortality in septic shock than CD19+CD80+ or CD19+CD95+. A CD19+CD23+ value of 64.6 % allowed discrimination between survivors and nonsurvivors with a sensitivity of 90.9 % and a specificity of 80.0 % ($p = 0.0001$).
CONCLUSIONS. Survival and nonsurvival patients with septic shock have different patterns of involvement in circulating B lymphocyte compartment. A drop in circulating B-cells persists during the first 2 weeks of follow up and is independent of the outcome. Moreover, at ICU admission, high percentage of CD23+, CD80+ and CD95+ on B-cells was associated with increased mortality of patients who had septic shock.
GRANT ACKNOWLEDGMENT. Comunidad de Madrid (S-BIO-0189/2006), FIS (PI-08-1890) and SAF2011-29405.

0180
PLASMA FROM SEPTIC PATIENTS ENHANCES BACTERIAL PHAGOCYTOSIS BUT IMPAIRS CHEMOTAXIS BY NEUTROPHIL-LIKE HL-60 CELLS

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INTRODUCTION. Innate immune responses are altered during sepsis and the capacity of opsonins and mediators in septic plasma to influence phagocytosis and chemotaxis remains to be determined.
OBJECTIVE. We investigated the effects of plasma on phagocytosis and chemotaxis activities of neutrophil-like HL-60 cells. The assays were carried out with plasma from septic, non-infectious SIRS and non-SIRS patients.
METHODS. Plasma was obtained at the time of sepsis or SIRS diagnosis and on days 2,3,5,10,20 and 28. Phagocytosis tests were performed by adding plasma to neutrophil-like cells and *E. coli*. The phagocytic index (PI) was measured by flow cytometry after 20′ and 50′ incubation. The chemotaxis tests were performed in response to fMLP and IL-8 by incubating plasma and differentiated HL-60 cells. The migrating neutrophils were counted by using fluorometric microvolume assay technology.
RESULTS. 65 patients were included, sepsis ($n = 30$),non-infectious SIRS ($n = 24$) and non-SIRS ($n = 11$).The PI at 20′ and 50′ measured at inclusion was higher with septic plasma as compared to plasma from non-infectious SIRS and non-SIRS patients ($p = 0.009$, $p = 0.03$). This difference remained significant after 50′ with the plasma obtained on days 2 and 5 ($p = 0.02$, $p = 0.001$). In the subgroup analysis excluding non-SIRS controls, the PI was higher after 20′ in the septic group with plasma obtained at inclusion ($p = 0.01$). Moreover, PI increased during follow up and the difference between the PI measured at inclusion and on 28th day was significant for both incubation times ($p = 0.04$). For all included patients, 28-day mortality was higher in those with plasma at inclusion supporting higher opsonic activity after 20′ and 50′ ($p = 0.025$, $p = 0.015$). The chemotactic activity (CA) in response to fMLP and IL-8 measured at inclusion was reduced with septic plasma in comparison with non-infectious SIRS and non-SIRS groups ($p = 0.01$, $p = 0.0001$). Plasma from patients with sepsis decreased IL-8-dependent CA more than that from patients with SIRS, at inclusion, on days 2 and 3 ($p = 0.05$, $p = 0.06$, $p = 0.005$). The CA induced by IL-8 increased over the time, and the difference between the time of inclusion and the 28th day was significant ($p = 0.001$). For all collecting points, there was no difference in IL-8 plasma levels between septic and non-infectious SIRS groups. Finally, the 28-day mortality was higher in patients with plasma at inclusion supporting lower CA to IL-8 ($p = 0.005$).
CONCLUSIONS. Plasma from septic patients enhanced phagocytosis but inhibited chemotaxis of neutrophil-like cells as compared with plasma from SIRS and non-SIRS controls. However, the chemotactic activity to IL-8 partially recovered during follow up of septic survivors. Lastly, higher levels of bacterial phagocytosis and lower levels of chemotaxis to IL-8 were associated with higher hospital mortality and may therefore represent novel prognostic biomarkers in ICU patients.
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0181
IMMUNITY IN SEVERE SEPSIS

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INTRODUCTION. Immunity is an important factor in the evolution of septic patients. Known-previous factors and those revealed during the disease, belonging to the innate and adaptive immunity, can influence the prognosis of these patients.
OBJECTIVES. To study the history of immunosuppression and the changes in lymphocyte populations and cellular receptors involved in the immune response, during the evolution of septic patients admitted to the ICU and its ratio to mortality.
METHODS. Prospective observational study. We recruited patients admitted to ICU with a diagnosis of severe sepsis during a period of 6 months (February–July 2011). Epidemiological data were collected and also leukocytes, neutrophils, lymphocytes and monocytes' number were determinated, as well as lymphocyte subpopulations and the expression of HLA-DR on CD14+ cells at admission, at 48 h and at discharge from the ICU.
RESULTS. After implementation of the protocol, 52 patients were included, mean age 62 ± 17 years; mortality was 29 %. Apache II was 26 ± 8.6; mean stay in the ICU of 11.6 ± 11 days. The origin of sepsis was abdominal in a 42.3 %, followed by pulmonar (34 %). 16 patients had a history of immunosuppression (lymphoma, leukemia, chemotherapy, steroids, HIV). Mortality in this subgroup was 43.7 %, higher than the group without prior immunosuppression that was 22 %. The leucocytes count at admission was 14,984 ± 8,900 and the lymphocyte's was of 1,006 ± 757, with no differences between subgroups of survival. 14 patients had less than 500 cells and their mortality was 43 %, significantly higher than the 38 remaining patients in which was 23 %. CD4 lymphocytes represented the 40 % of lymphocytes, with no difference in mortality groups at admission or during the evolution. The CD4/CD8 ratio did not change significantly. The percentage of CD4 cells increased significantly at 48 h after admission (40.3 ± 13 %/47 % ± 11; $p = 0.001$) in the total group and in survivors. The CD56 decreased significantly at 48 h in the total group and in survivors (14 ± 8 %/9.7 ± 6 %; $P = 0.002$), CD19 lymphocytes did not change. The percentage of monocytes increased at 48 h in survivors (4.7 ± 3 %/7 ± 4 %, $P = 0.011$) and fell by half at the same time in those who died but without statistically significant (1,120 cells/570 cells) as well as the expression of HLA-DR (250 ± 240 MFI/130 ± 28 MFI). In survivors both, the number of monocytes and the expression of HLA-DR receptors, remained at normal levels observing a significant increase at discharge (201 ± 129 MFI/130 ± 28 MFI; $p = 0.032$).
CONCLUSIONS. A history of immunosuppressive disease or a severe lymphopenia is associated with a poor prognosis in septic patients. The good outcome is accompanied by progressive increase of CD4, decrease of CD56 and the increased in the percentage of monocytes as well as the maintenance of the immune function expressed by the persistence of the number of monocytes and the expression of HLA-DR.

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0182
EVALUATION OF THE EFFECT OF THREE DIFFERENT INOTROPIC SUPPORT STRATEGIES IN THE NORMAL AND STUNNED NEWBORN PIGLET HEART ON HEMODYNAMICS AND MYOCARDIAL METABOLISM

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INTRODUCTION. The myocardium of the newborn differs from the adult with regard to physiology, metabolism, and adrenoceptor density. A variety of inotropic strategies are used to treat low cardiac output in the newborn, all challenged by the low compliance of the myocardium and a high resting beta-adrenergic state.
OBJECTIVES. Aim of the present study was to evaluate the effect of three inotropic strategies on hemodynamics and metabolism in an in vivo neonatal piglet model with normal or stunned right ventricular myocardium.
METHODS. 60 Piglets were premedicated with midazolam and ketamine. Anesthesia was induced by intravenous midazolam and ketamine and maintained with sevoflurane, and fentanyl infusion. Animals had pressure–volume catheters inserted in both the right and left ventricle. Microdialysis catheters were inserted in the myocardium of the left and right ventricle, and metabolites were measured in the dialysate. In half of the animals stunning of the right ventricle was induced by 10 cycles of 3 min of ischemia induced by a tourniquet around the right coronary artery, followed by a 3 min of reperfusion. Animals followed a protocol with infusion for 3 h with either: dobutamin 8 μg/kg/min (DO); adrenaline 0.09 μg/kg/min and milrinone (loading dose of 50 μg/kg) 0.4 μg/kg/min (MA); dopamine 6 μg/kg/min and milrinone (loading dose of 50 μg/kg) 0.4 μg/kg/min (MD) or isotonic saline 2 ml/h. Afterwards animals were euthanised and biopsies were taken from the myocardium in order to determine glycogen and lactate concentrations.
RESULTS. In the normal functioning hearts, heart rate increased significantly in all intervention groups, but no significant change was observed in CO. Contractility (dP/dt max) was significantly increased in all groups, and diastolic function (dP/dt min) was significantly improved by DO and MA. The lactate concentration increased significantly in both RV and LV microdialysate samples, myocardial biopsies and plasma in the MA treated

animals. Blood glucose increased significantly in the MA group, and glycogen content was lowest in the myocardial biopsies from MA treated animals, although numbers did not reach statistical significance. In the animals with stunned right ventricle we found marked increase in lactate and decrease in pH after ischemia–reperfusion. After 180 min of treatment contractility and diastolic function was significantly higher in MA and MD groups than DO. Blood lactate levels were significantly higher in the MA group, compared to all other groups.
CONCLUSIONS. In the normal myocardium the three inotropic strategies were comparable with respect to effect on hemodynamics. With stunned myocardium, MA and MD groups improved systolic and diastolic function compared to DO treatment.
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0183
MODULATION OF THE SYSTEMIC INFLAMMATORY RESPONSE IN CRITICAL ILL CHILDREN AFTER PARENTERAL GLUTAMINE SUPPLEMENTATION. PRELIMINARY RESULTS

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INTRODUCTION. In critical patients there is a Glutamine (Gln) deficit. Gln acts as a source of energy and intervenes in the cellular and tissue protection activating the Heat Shock Proteins expression, and modifying the interleukines (IL). It has been proved that a Gln supplement stimulates the bacteria death and diminishes the cytotoxic response.
OBJECTIVES. To determine if there are differences in the inflammatory response in seriously ill patients who received glutamine-supplemented nutrition with regard to those who received standard nutrition. To evaluate the morbidity and mortality differences.
METHODS. Prospective, interventional, double blind, randomized and stratified clinical trial. Study duration: July 2010–March 2012.
Inclusion: Patients at PICU between 1 month and 14 years, who require parenteral nutrition and with one of these diagnosis: systemic/local infection, major abdominal surgery, multiple injured patients. Exclusion: patient with prior illnesses and patients coming from other centers with more than 48 h clinical evolution.
Interventions: Group 1: Parenteral nutrition (Aminopaed® or Vamin®) with Gln perfusion (Dipeptiven®).
Group 2: Standard parenteral nutrition (Aminopaed® or Vamin®) without Gln. It was necessary to include 73 experimental units in each group (statistical validation).
Variables: age; sex; PRISM-II score at admission;diagnosis at admission; laboratory data (at 0 h, and every 48 h until 5th day): pro-inflammatory IL (IL-6) anti-inflammatory IL (IL-10), HSP-70, CD4, CD8 and CD4/CD8; evolution:nosocomial infection, inotropic and mechanical ventilation requirement, multiorganic failure, length of stay at PICU and at general hospitalization, survival.
RESULTS. There were randomized 97 patients, but only data of the 61 finalized cases are described (28 in group 1). Thirty-two patients were less of 2 years old (52.4 %); 36 males (59 %). There weren't statistical differences between group 1 and 2 with respect to: age, gender, inclusion criteria, inotropic requirements, or mechanical ventilation. In the experimental Group it was observed a greater diminution of mean IL-6 levels, between the day 0 and day 5 (from 298.05 pg/ml to 15.40 in group 1 vs. 177.40 to 28.43 in group 2; $p = 0.1$). It was also registered a lower diminution of mean levels of IL-10 between the day 0 and 5 (from 61.06 pg/ml to 30.25 vs. 62.05 to 7.38, $p = 0.09$), without statistical differences. It was detected a statistical trend to a greater diminution of HSP70 levels in Group 1 respect to Group 2 between day 0 and 5 (from 3.40 to 1.43 pg/ml vs. 1.27 a 5.99; $p = 0.065$).
CONCLUSIONS. Gln supplementation seems to modulate the inflammatory response: promoving the pro-inflammatory IL diminution and maintaining higher the anti-inflammatory one.
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0184
PROGNOSIS VALUE OF ADRENOMEDULLIN IN SERIOUS BACTERIAL INFECTION IN CHILDREN ADMITTED AT PEDIATRIC INTENSIVE CARE UNIT

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INTRODUCTION. Adrenomedullin (ADM) is a biomarker which seems to be useful in the diagnosis of bacterial infection, in order to determine the patient prognosis (morbidity and mortality). There is a few literature regarding this topic in pediatrics.
OBJECTIVES. To describe Adrenomedullin levels (ADM) in patients with suspected invasive bacterial infection (IBI) admitted at Paediatric Intensive Care Unit (PICU) from a tertiary hospital. To compare the ADM levels with clinical scores of severity, in order to determine the ADM value in patients prognosis (morbidity and mortality). To compare the ADM results with procalcitonin (PCT) and C Reactive Protein (CRP).
METHODS. Prospective and observational study (July 2010–July 2011). Inclusion criteria: Patients admitted at PICU due to a communitary IBI or nosocomial IBI during the admission. Exclusion criteria: post-cardiopulmonary bypass, chronic pulmonary disease, immunodeficiency.The following data is analyzed: age; gender; pathology at admission; Pediatric Risk Score Mortality III (PRISM); mechanical ventilation and inotropic drugs requirement; and levels of CRP, PCT and ADM at the moment that IBI was suspected.
RESULTS. Ninety-nine patients were recruited and ADM was determined in 95 of these cases, 59 were males (62.1 %). The mean age was 2.1 ± 3.3 years (range 9 days–13 years). 83 patients (87.3 %) were diagnosed of communitary IBI at PICU admission and 12 were diagnosed of nosocomial IBI during the PICU stay. 42 patients were diagnosed of sepsis (44.2 %), 18 (18.9 %) of pneumonia and 12 (12.6 %) of bronquiolitis complicated with IBI. Mechanical ventilation was required in 65 children (68.4 %) and 48 (50.5 %) needed inotropic treatment. Ten patients died (10.5 %). The mean level of ADM was 19.33 ± 3.6 nmol/L (range 0.36–19.69), of CRP 84 ± 106 mg/L (range 20–424) and for PCT was 34.9 ± 73.6 ng/ml (range 0.1–503). Mean levels of ADM were significantly higher in patients who required inotropic treatment ($p = 0.000$) and in cases with mechanical ventilation ($p = 0.035$). Mean ADM levels and mean PRISM III score at admission moment were significantly higher in patients who died when compared to survivors, $p = 0.025$ and $p = 0.000$, respectively. There was a statistically significant correlation between those levels and the PRISM III punctuation, R 0.592, $p < 0.01$. A statistically significant correlation between mean values of ADM and PCT (R 0.594, $p = 0.000$) was demonstrated. This was not the case between ADM and CRP. Roc curve regarding mortality was significantly better for ADM than for PCT and CRP, $p = 0.06$.
CONCLUSIONS. ADM is a biomaker which seems to be useful to predict the morbidity and mortality of patients with IBI.
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0185
OUTCOMES ANALYSIS OF CHILDREN WITH SEVERE ADENOVIRAL RESPIRATORY INFECTION

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INTRODUCTION. In the United States, viral respiratory infections are a leading cause of illness and hospitalization in infants and young children. Children with severe viral respiratory illness often require admission to the intensive care unit (ICU). Recent evidence suggests that up to 10 % of cases of severe viral respiratory infections in children are caused by adenovirus [1]. There is a paucity of outcomes data for children with severe adenoviral respiratory infection. Recently, expanded respiratory viral polymerase chain reaction (RV-PCR) testing has increased our ability to survey for adenovirus.
OBJECTIVES. To investigate the impact of adenovirus on morbidity and mortality outcomes in children with severe viral respiratory infection.
METHODS. We performed a retrospective cohort study identifying all patients admitted to the ICU, either pediatric ICU or cardiac ICU, at a large urban academic tertiary care children's hospital with adenoviral respiratory infection confirmed by RV-PCR between January 2011 and January 2012. Review of the patient chart was conducted to capture demographic, clinical and microbiological data. Patients with chronic medical conditions associated with an increased risk of complications from viral illness were identified. Hospital-acquired adenoviral infection was defined as positive specimens obtained after the first 96 h of hospital admission [1]. The primary outcome of interest was mortality.
RESULTS. There were 89 patients included in the analysis. The median age of patients was 22 months, 39 % of patients were female, 16 % had hospital-acquired infection and 39 % had a chronic medical condition. Median hospital and ICU lengths of stay were 8 and 4 days, respectively. Respiratory failure, acute respiratory distress syndrome, multi-organ dysfunction syndrome, extracorporeal life support and mortality occurred in 47, 9, 16, 3 and 7 % of patients, respectively. Logistic regression analysis demonstrated that patients with hospital-acquired infection had a 6.5 times greater odds of mortality ($p = 0.03$).
CONCLUSIONS. Our results suggest that there is substantial morbidity and mortality associated with severe viral respiratory infection due to adenovirus in children. Hospital acquisition of adenoviral respiratory infection was associated with increased mortality. The burden of illness from adenovirus on the ICU in terms of resource utilization is considerable.
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0186
COST ATTRIBUTABLE TO VENTILATOR-ASSOCIATED PNEUMONIAE IN PEDIATRIC CRITICAL CARE

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INTRODUCTION. Ventilator-associated pneumoniae (VAP) is known as a potentially cause of morbidity and mortality in the pediatric intensive care unit (PICU). From 2006 to 2008 we conducted a prospective interventional study to reduce VAP. Rates decreased from 28.3 in 2006 to 10.6/1000 ventilation-days, $p = 0.005$ and to 7.3/1000 ventilation-days $p < 0.001$ in 2007 and 2008.
OBJECTIVES. To evaluate the cost attributable to VAP in PICU and to calculate the cost-effectiveness of a quality improvement intervention focused on decrease VAP.
METHODS. Retrospective match (1:1) case–control study conducted to evaluate the cost attributable to VAP in a fourteen-bed PICU. During 2006, 27 episodes of VAP were diagnosed. Patients with more than one VAP episode were excluded (6 episodes in 2 patients) and 2 episodes were excluded (inability to match). A total of 19 cases were matched to 19 control patients by age, sex, severity of illness, primary diagnoses, underlying illness and duration of mechanical ventilation. Length of stay (LOS) and mortality were recorded. Costs were calculated using the ICU and ward LOS and the daily cost in PICU and in ward (data from the Hospital's Economical Service).To quantify the benefit of reducing VAP rate, we calculated the expected number of VAP in 2007 and 2008, assuming the same density incidence rate than in 2006, The number of prevented VAP episodes are the difference between the expected VAP infections and the actual observed. The cost of the intervention was estimated in 8000€ including material (cuffed endotracheal tubes, closed suction systems, oral care) and personnel (educational meetings for PICU intensivist and nurses) Statistical analysis: paired t-student test was used to compare continuous variables and McNemar test was used to compare categorical variables.
RESULTS. The mean PICU LOS was 18.63 ± 13.62 for cases and 9.32 ± 7.39 days for controls p 0.018; the mean Hospital LOS was higher in cases respect to controls (38.68 ± 25.8 days versus 21.74 ± 14.51 $p = 0.011$). Regarding mortality: 7 VAP patients died (36.8 %) in front of 2 patients in the control group (10.5 %) $p = 0.013$. The mean cost was 38.375.79 ± 23.073.14€ for VAP cases and 21.068.42 ± 14.293.27€ for controls $p = 0.011$. The increasing cost attributable to VAP was 17.307€.The expected VAP episodes in 2007 were 31.89 and the real number of episodes were 12, thus, 19.9 episodes were prevented, and 344,409.3 € were saved. The expected VAP episodes in 2008 were 31 and

the real number of VAP were 10, thus, 21 VAP episodes were prevented and 363,447 € were saved.
CONCLUSIONS. VAP has attributable morbid-mortality and cost in children. An intervention focused on decrease VAP was cost-effective.
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0187
UTILIZATION OF INO USING A NOVEL VENTILATOR CIRCUIT CONNECTOR UNDER SIMULATED NEONATAL MECHANICAL VENTILATION CONDITIONS AN IN VITRO STUDY

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INTRODUCTION. Persistent pulmonary hypertension of the newborn (PPHN) is treated with inhaled nitric oxide (iNO) [1]. Currently, a common practice is introduction of iNO into the inspiratory arm of the circuit-standard of care (SoC) [2], a practice that potentially leads to NO dilution, gas loses and potential environmental contamination. A novel ventilator circuit connector (NVCC, AFECTAIR®, Discovery Laboratories, Inc., Warrington, PA, USA) has been developed [3] to simplify the delivery of aerosols to patients receiving ventilatory support. We hypothesized that use of the NVCC for iNO delivery would substantially reduce NO consumption during simulated clinical conditions.
OBJECTIVES. To compare the NVCC with the SoC in the delivery of iNO under simulated neonatal ventilator conditions.
METHODS. A pediatric/neonatal test system was assembled utilizing a Babylog® VN-500, used with 30 breaths per minute and various inspiratory pressures, test lung, and ASL-5000 lung simulator. For SoC measurements, using a standard wye connector, the iNO was delivered per the manufacturer's instructions [4]. With the NVCC, iNO was administered by introducing the NO via a non-corrugated tube attached directly to the NVCC. Nitric oxide concentrations were measured with a NOxBOX®+ analyzer at the patient interface for both study groups. The iNO flow was recorded by the Electronic Nitric Oxide flow controller and was titrated to achieve a concentration of 20 ppm delivered at the patient interface.
RESULTS. Compared with SoC, there was a 2–3 fold decrease in NO flow requirements to achieve desired iNO concentration with the NVCC. The delivery of O_2 was not different between the study conditions. NO_2 levels were slightly higher for the NVCC group, but never higher than 1.13 ppm.
CONCLUSIONS. The NVCC significantly decreased the NO flow required for targeted delivery of 20 ppm under pressure control mode. The NVCC allows for simplified therapeutic gas delivery with reduced NO utilization. These results warrant further study of NVCC on compatibility assessment with various modes of ventilation and delivery of other medical gases.
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0188
ACUTE NEUROLOGIC INJURY IN NEONATES SUPPORTED WITH EXTRACORPOREAL MEMBRANE OXYGENATION: AN ANALYSIS OF ELSO REGISTRY DATA

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INTRODUCTION. Brain injury during early development is a significant contributor to mortality and long-term morbidity [1]. The incidence and risk factors for developing acute neurologic injury (ANI) during extracorporeal membrane oxygenation (ECMO) in children have been extensively studied [2]. Although the reported incidences of intracranial hemorrhage (ICH) associated with ECMO in neonates varies from 9.9 to 31 % (3), nonetheless an accurate assessment of the epidemiology and predictors of brain lesions in the neonatal population is lacking.
OBJECTIVES. To describe factors associated with ANI in neonates undergoing ECMO.
METHODS. Retrospective cohort study using multi-institutional data reported to the ELSO registry on neonates supported with ECMO during 2005–2010. We defined ANI as the occurrence of brain death, seizures, cerebral infarction, or ICH identified by ultrasound or computerized tomography imaging.
RESULTS. Of 7,405 patients, 1412(20 %) had ANI. Brain death occurred in 58 (1 %), seizures in 476 (7 %) and cerebral infarction/ICH in 1,076 (15 %). In a multivariable logistic regression model, higher pre-ECMO blood pH [odds ratio (OR) 0.3, 95 % confidence interval (CI) 0.2–0.4] decreased the odds of ANI. Demographic and pre-ECMO factors including birth weight (BW) <3 kg (OR 1.3; 95 % CI 1.1–1.5) compared to BW >3.5 kg, very preterm [<34 weeks gestational age (GA); OR 1.5, 95 % CI 1.1–2.0] and preterm delivery (34–36 weeks GA; OR 1.4, 95 % CI 1.1–1.7) compared to term delivery (39–40 weeks GA), need for cardiopulmonary resuscitation prior to ECMO (OR 1.7, 95 % CI 1.5–2.0), pre-ECMO bicarbonate replacement (OR 1.3, 95 % CI 1.2–1.5), multiple ECMO runs (OR 2.4, 95 % CI 1.6–2.6) and venoarterial ECMO (OR 1.7, 95 % CI 1.4–2.0) compared to venovenous ECMO were associated with increased odds of ANI. Patients with ANI during ECMO had a higher incidence of non-neurological ECMO complications including circuit thrombosis, bleeding, renal failure and nosocomial infection. The in-hospital mortality rate in patients with ANI was 62 %.
CONCLUSIONS. ANI is a frequent complication and is associated with high mortality. Lower GA, BW <3 kg, higher illness severity prior to ECMO and the use of venoarterial ECMO increase the odds of ANI during ECMO. Patient selection and timing of ECMO deployment may significantly influence the occurrence of ANI in neonates supported with ECMO and should be targeted as areas of improvement to help reduce ECMO related ANI.
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0189
ANEMIA AMONG PEDIATRIC CRITICAL CARE SURVIVORS-PREVALENCE AND RESOLUTION

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INTRODUCTION. Data from studies conducted in critically ill adults and children suggest that sub-normal levels of hemoglobin (Hgb) are well tolerated by the critically ill and that a restrictive transfusion practice improves patient outcomes.
OBJECTIVES. To determine the incidence of anemia among pediatric critical care survivors in the era of a restrictive transfusion strategy and to determine whether it resolves within 4–6 months of discharge.
METHODS. A prospective study was conducted between September 2009 and November 2010 in two stages. The first stage was to establish the prevalence of anemia among patients at time of discharge from the pediatric critical care unit (PCCU). The second stage was to establish the rate of resolution of anemia and consisted of follow up of those patients in whom anemia had been identified and were available for follow up in our institution. All patients aged 1 month to 18 years, admitted for >24 h to the PCCU, were eligible for inclusion. Enrolled patients were screened for anemia upon discharge. Anemic patients available for follow up were seen between 4 and 6 months after discharge.
RESULTS. During the study period, 779 patients were admitted to the PCCU. Of the 384 (50.5 %) patients eligible, 74 patients (19.3 %) [median age 2.3 years (IQR 0.64–13.5)] received 109 packed red blood cell transfusions, with a mean pre-transfusion Hgb of 7.3 ± 1.1 g dl^{-1}. Forty one percent (45/109) of the transfusions occurred below the Hgb threshold of 7.0 g dl^{-1}. Of the enrolled study patients, 94 (24.5 %) had anemia upon discharge. Patients with anemia were older [median 8.0 years (IQR 1.0–14.4) vs. 3.2 years (IQR 0.65–9.9) ($p < 0.001$)], and had higher PeLOD [median 11 (IQR 10–12) vs. 1.5 (1–4) ($p < 0.001$)] and PRISM [median 5 (IQR 2–11) vs. 3 (IQR 0–6) ($p < 0.001$)] scores. Anemia was normochromic and normocytic in all patients. 28 out of 31 patients available for follow up completed the study. All patients spontaneously recovered to normal Hgb within 4–6 months. Eight of 28 (28.6 %) patients recovered to normal Hgb levels while still in hospital, after a median period of 18.5 days (IQR 14.0–23.5) post discharge from the PCCU (rate of recovery 18.6 ± 7.3 g dL^{-1} per week). Ferritin levels (54 ± 29.1 µg L^{-1}) and MCV were also normal (84.5 ± 5.5 fL) at the 6 month follow up visit.
CONCLUSIONS. Anemia among PCCU survivors is relatively uncommon when compared to adults and spontaneously resolves within 4–6 months of discharge. The rate of Hgb improvement suggest a normal erythropoietic response. Further studies are required to elucidate its etiology.

0190
ORGANIZATION AND TRAINING OF THE ACUTE CARE OF CRITICALLY ILL CHILDREN IN GENERAL HOSPITALS IN THE SOUTHEAST NETHERLANDS; WE CAN DO BETTER

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INTRODUCTION. Due to the limited number of admissions of critically ill children at general hospitals proper organization and training are of great importance to optimize this care. Since a Dutch national guideline for the organization and training of this care is lacking, it is unknown whether this care is well organized in Dutch general hospitals.
OBJECTIVES. To obtain insight in the current organization of the acute care of critically ill children in general hospitals in the southeast Netherlands, the training of physicians in the pBLS (pediatric BLS) and APLS (pediatric ALS), and the presence of medication and materials for the acute care.
METHODS. Hard-copy questionnaires were sent to all pediatricians, anesthetists, intensivists and emergency physicians in these hospitals. Site visits were performed to interview the responsible pediatrician and check the presence of medication and materials.
RESULTS. Out of 195 questionnaires sent 49.7 % was suitable for analysis. In 7 hospitals verbal working agreements in the acute care exist. Of all specialists 21 % is not aware of the existence of these working agreements. One hospital had written protocols regarding the organization of the acute care. Of all specialists 61 % assumes that their hospital has a written organizational protocol, although in 2/3 of these cases there was no such protocol. There was a multidisciplinary committee in 2 hospitals. Having a committee provides greater satisfaction concerning the organization. Training in pBLS and APLS is given on a regular base in 8 out of 9 hospitals. In 3 hospitals the pediatricians attend these trainings. Of all physicians 58 % does not appear APLS-certified. In 3 out of 9 hospitals materials for pediatric resuscitation were complete. In the remaining hospitals laryngeal mask airways (LMA) and/or PEEP valves were missing.
CONCLUSIONS. In general hospitals in southeast Netherlands both the organization and training of the acute care of children deserve attention. There is confusion and ignorance about the organization; committees and protocols are lacking. The worrisome large number of untrained physicians in APLS must be reduced to guarantee optimal quality of acute care. Most of the materials for the acute care of children are present, except for LMA and/or PEEP valves. The results of this study suggest that the acute care of children might be improved by multidisciplinary committees involved with the organization, training and materials. National guidelines are necessary to extort these improvements.
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0191
MANUAL CUFF PALPATION TEST IN CHILDREN

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INTRODUCTION. The use of cuffed tracheal tube in younger children has become common. New formula for insertion depth of the endotracheal tube, reported by Lau in 2006 [1], is calculated by age or body weight. It could overestimate the insertion depth in children with congenital heart disease, because they are smaller than children without it. Manual cuff palpation test (ballottement) is an old technique, but is not common practice in pediatric population.

OBJECTIVES. To evaluate whether manual cuff palpation test would provide appropriate tube placement compared with the formula.

METHODS. From January 2011 through March 2012, total 19 patients with congenital heart disease who had taken elective cardiac catheterization were enrolled. The study was approved by the Shizuoka Children's Hospital and Yokohama-City University Institutional Review Board. Selecting the size of endotracheal tube was determined by the anesthesiologist and not predetermined by the study protocol. Following rapid induction and muscle relaxation, cuffed tracheal tube was intubated. After trachea was intubated, patient's head was placed in a neutral position, and insertion depth of the tube was adjusted by manual cuff palpation test to place the cuff 1 cm above the suprasternal notch. The procedures were done by a single anesthesiologist. Correct placement was defined as the tip of the endotracheal tube below upper edge of second thoracic vertebra and 1 cm above the carina, which was measured by X-ray fluoroscopy. Data were prospectively collected; age, body height, body weight, internal diameter of the tracheal tube, insertion depth. Final insertion depth was compared with the tube length calculated by the formula.

RESULTS. The average age was 24.0 ± 20 months, and male was 42 %. A total of 14 (74 %) were correctly placed, 3 (15 %) were found to be deep, and 2 (11 %) were found to be above the upper edge of second thoracic vertebra. All the tubes were placed between thoracic inlet and carina. If the practitioner had placed the tube based on the formula, 10 (53 %) would have been correctly placed, 7 (36 %) too deep, which included 2 cases of unilateral intubation. 2 (11 %) would have been too shallow.

There was no significant difference in accuracy between the two methods (74 vs. 53 %, $P = 0.17$, Chi square test).

CONCLUSIONS. The formula could overestimate the insertion depth in younger children and infant with congenital heart disease, resulting in bronchial intubation. Manual cuff palpation test is reliable technique to provide appropriate tube placement.

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0192
EVALUATION OF CORTISOL LEVEL AS PROGNOSTIC FACTOR IN PEDIATRIC PATIENTS WITH ACUTE SHOCK IN A SINGLE CENTER

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INTRODUCTION. The hypothalamic–pituitary–adrenal (HPA) axis is a very important determinant of host response to stress. The HPA axis dysfunction can be a contributing factor to hypotension and shock in critically ill children and adults. But there are various definitions of HPA axis dysfunction in critically ill children and little is known about the relation with cortisol level and prognosis.

OBJECTIVES. We aimed to describe the serum cortisol level following a short corticotropin stimulation test to evaluate the adrenal response in children with acute shock. And we tried to determine the relationship with prognosis and cortisol level and estimate the value of cortisol level as a prognostic factor in children with acute shock.

METHODS. A retrospective observational study was conducted in pediatric patients who underwent a short corticotropin stimulation test for acute shock admitted to Pediatric Intensive Care Unit between January 2005 and May 2011. A short corticotrophin stimulation test (1 mcg) was performed, and cortisol levels were measured at baseline (T0) and 30 (T30) and 60 (T60) minutes afterward.

RESULTS. A total of 96 consecutive patients were enrolled, mean age was 6.8 ± 6.24 years, and the 28-day mortality rate was 37.5 %. Hemato-oncology patients had majority of total patients (n = 26; 27 %) and the most common cause of shock was sepsis (n = 67; 69.8 %). There was significant difference in Pediatric Risk of Mortality (PRISM) III score, length of stay in ICU, vasoactive inotropic score, number of organ failure, PaO_2/FiO_2 ratio, and cortisol level at T0 between survivors and non-survivors ($p < 0.05$). Area under the ROC curve of cortisol level at T0 was 0.804, the highest threshold value to predict the prognosis was 20 μg/dl, and patients with cortisol level at T0 above 20 μg/dl showed the significant high mortality compared with patients with cortisol level at T0 below 20 μg/dl ($p < 0.05$). ΔMax (defined as the difference between T0 and the highest value between T30 and T60) appeared no significant difference between survivors and non-survivors, and area under the ROC curve of ΔMax was below 0.6. Mortality was no different between patients received hydrocortisone therapy and not received it (37.8 vs. 37.3 %, $p = 0.998$).

CONCLUSIONS. Our results suggest that cortisol level at T0 has a good prognostic value and could be helpful in identifying patients at high risk for death. But ΔMax and hydrocortisone therapy showed no relationship with outcome, so we think that it is necessary to conduct further evaluation.

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0193
STANDARD DEEP HYPOTHERMIC CIRCULATORY ARREST FOR PEDIATRIC CARDIAC SURGERY IS NOT A RISK FACTOR OF ACUTE KIDNEY INJURY ASSESSED BY NEW BIOMARKERS

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INTRODUCTION. Acute kidney injury (AKI) that occurs after pediatric cardiac surgery may be associated with poor outcomes. New biomarkers may be helpful in prediction or early identification of AKI, potentially increasing opportunities for choosing optimal method of therapy and cardiopulmonary bypass.

OBJECTIVES. In our study we compared the effect of deep hypothermic and circulatory arrest (DHCA) and hypothermic continuous cardiopulmonary bypass (CPB) on AKI appearance and values of selected biomarkers in pediatric patients undergoing cardiac surgery.

METHODS. AKI was diagnosed according to the RIFLE classification system. We prospectively investigated the temporal pattern and predictive value of urinary biomarkers neutrophil gelatinase-associated lipocalin (NGAL), interleukin (IL)-6, IL-8, IL-18 preoperatively and 2, 6, 12, 18, 24 h postoperatively in urine in 47 children who underwent cardiac surgery. In twenty five of them deep hypothermic circulatory arrest (DHCA) was employed with mean arrest time of 35.8 min. In 16 patients hypoplastic left heart syndrome was underlying diagnosis. Control group consisted of 22 children who were operated on using CPB.

RESULTS. AKI was diagnosed in 44 % of patients from DHCA group and 41 % from control group ($p = 0.48$). Total mortality rate was 4 % and was not directly connected with renal insufficiency. Maximal NGAL level was observed 2 h after operation in both groups, with only tendency to reach higher values in DHCA group ($p = 0.33$). Similarly, maximal level of IL-6 and IL-8 were reached 2 h after operations, however, all measured values did not differ significantly between groups. IL-18 level reached maximal values 18 and 24, significantly higher in DHCA group (respectively, $p = 0.003$ and $p = 0.01$). The IL-18 and NGAL appeared to be the most powerful independent predictors of AKI in both groups. Hypoplastic left heart syndrome as a diagnosis was not a risk factor of AKI and death.

CONCLUSIONS. The technique of deep hypothermia and circulatory arrest is not crucial in development of acute kidney injury in postoperative period in children with congenital heart defects.

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0194
STEP-SPECIALIZED PEDIATRIC EMERGENCY TEAM FOR INTERHOSPITAL TRANSPORT OF CRITICALLY ILL CHILDREN

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INTRODUCTION. Specialized transport teams play a key role in quality transport of critically ill children (PST). In Portugal, the first team for critical pediatric secondary transport (STEP) began operating in 2004 in the Central Region, soon to be followed by the North and South regions.

OBJECTIVES. To present data on the 7 year experience of STEP.

METHODS. Retrospective analysis of all paediatric critical transferrals from 2005 to 2011. Data was collected from the hospital database.

RESULTS. IT was requested 650 times and 640 children were transported (8 died before team arrival and 2 did not meet criteria for transport); median age was 11 months and 55 % were infants. The main diagnostic groups were: cardiac disease 136 (21 %), surgery 111 (17 %), respiratory failure 103 (16 %) and trauma 66 (10 %). Half of IT was requested by health services of our city (Paediatric Hospital 28 %; Adult Care Centre (20 %) and 40 % was requested by Referring Hospitals (RH). The main destinations were Paediatric Hospital (433–68 %), mainly PICU (84 %); diagnostic exams centres (108–17 %) and NICUs (32–5 %). Most children were stable or improved during transport (95 %); instability was observed in 3 % and less than 1 % worsened their condition. There was no mortality during IT. During transport 83 % of children required procedures/therapies. The main procedures performed by transport practitioners were: vascular cannulation (86 %), mechanical ventilation (38 %), sedative (17 %) and inotropic agents (8 %) administration.

CONCLUSIONS. PST has provided a safe and early care of critical ill children at RH. Their stabilization before reaching a Tertiary Paediatric Facility has been associated with better outcome.

0195
FEASIBILITY OF TRANS-THORACIC ECHOCARDIOGRAPHIC ASSESSMENT TO DETERMINE FLUID RESPONSIVENESS IN CHILDREN WITH SEPTIC SHOCK

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OBJECTIVES. To evaluate the degree of IVC diameter variability in predicting the fluid responsiveness [1, 2] (defined as increment in stroke index ≥15 %) in spontaneously breathing and mechanically ventilated children with septic shock after initial fluid resuscitation with 20 ml/kg of crystalloid (0.9 % saline).

Study design: Prospective clinical pilot study

Study period: July 2010 to December 2011

Study setting: Pediatric emergency and intensive care units of Advanced Pediatrics Centre at PGIMER, India.

SUBJECTS. Forty-one children with septic shock were prospectively enrolled. Patients with clinical evidence of increased intra-abdominal pressure, previously diagnosed congenital or acquired heart disease, asthma, post-operative cardiac patients, and those on high frequency ventilation were excluded from the study.

METHODOLOGY. 166 episodes of "Preload Responsiveness Check" were echocardiographically evaluated in 41 patients. IVC diameter variability [(maximum IVC diameter − minimum IVC diameter)/maximum IVC diameter], stroke index calculation and ejection fraction estimation were done at two stages (before preload administration T0 and immediately after preload T1) in each episode. Adequate sedation was ensured before each echocardiographic assessment.

RESULTS. Of 166 episodes of "Preload Responsiveness Check" in the 41 enrolled patients (25 girls; 16-boys), 120 (74 %) were fluid responsive and 46 (36 %) were non-responsive. The decrease in the heart rate with preload was significant in the responsive as compared to the non-responsive group (24 ± 9 vs. 4 ± 7; $p = 0.001$). However CVP at T0 had a poor correlation ($r = 0.130$; $p = 0.11$) with stroke index increment. IVC diameter variability at T0 correlated significantly (Spearman's rho = 0.39; $p = 0.001$) with stroke index increment following preload. AUC of ROC for IVC diameter variability was 0.754 (0.655–0.852). The best cut off value of 14 % IVC diameter variability had 84.4 % sensitivity and 65.9 % specificity to positively predict the fluid responsiveness.

CONCLUSIONS. Conventional method of preload assessment i.e. CVP was unable to predict preload responsiveness in both ventilated and spontaneously breathing patients. IVC diameter variability had a significant correlation with stroke index increment after preload. But as an isolated parameter, single point of time IVC diameter variability measurement (IVC variability of 14 %) showed only moderate discriminative value in predicting fluid responsiveness.

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Improving ICU care & organisation: 0196–0209

0196

AN EVALUATION OF CRITICAL CARE REFERRALS USING LEVELS OF CRITICAL CARE AND A MODIFIED SBAR COMMUNICATION TOOL

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INTRODUCTION. In the United Kingdom, Critical Care referrals are generally made to the critical care resident doctor and the decision to admit the patient is made by the Critical Care Consultant. The role of the Critical Care Unit and the indications for admission are poorly taught to medical students in the United Kingdom despite this importance when they qualify as doctors.

Optimising Critical Care Referrals facilitates risk stratification and patient optimisation. The criteria for intensive care admission has previously been studied, however, to our knowledge, there has not been a suggested tool used for referral to Critical Care. The situation, background, assessment, recommendation (SBAR), a standardised communication tool, has been recommended by the Institute for Innovation and Improvement (National Health Service). SBAR and its modified versions have been shown to improve the content, clarity and speed of information delivery in medical care.

A baseline evaluation was conducted to look at whether the referrals were appropriately made and whether the patients were appropriate for Critical Care referral.

OBJECTIVES. To perform a baseline assessment of Critical Care Unit Referrals in a District General Hospital in the United Kingdom.

METHODS. 42 Critical Care Referrals were evaluated in a district general hospital in London, United Kingdom with a 520 bed capacity. We assessed every referral by using the Levels of Critical Care (Intensive Care Society) and a SBAR tool which we modified for critical care referrals.

RESULTS. 49 % of the referrals were made by the medical team, followed by the surgical team (24 %), Emergency Department (18 %), and Anaesthetic Department (9 %). Only 32 % of patient referrals were admitted. There was a general discrepancy in the quality of referrals. Vital information was missing in the referrals, the commonest being respiratory rate which was only reported in 41 % of referrals. Only 41 % of patients achieved level 2 or level 3 status and the commonest cause of refusal to critical care admission was that the patients did not require this (level 1 care). 27 % of patients had an irreversible medical condition, most notably, 42 % of the irreversible conditions were advanced malignancy.

CONCLUSIONS. There is a lack of understanding about the Critical Care Unit's role and indications for Critical Care admission. Referrals are therefore unsystematic, resulting in high failure rates of admission. Teaching doctors about the Levels of Critical Care, simulation training, the introduction of a modified SBAR tool and a standardised referral pathway could optimise the critical care referral system in a district general hospital setting.

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0197

CAN WE YET ASSESS THE QUALITY OF DNAR (DO NOT ATTEMPT RESUSCITATION) ORDERS INSTITUTED BY AN ESTABLISHED MEDICAL EMERGENCY TEAM AT A DISTRICT GENERAL HOSPITAL IN UNITED KINGDOM? AN OBSERVATIONAL STUDY

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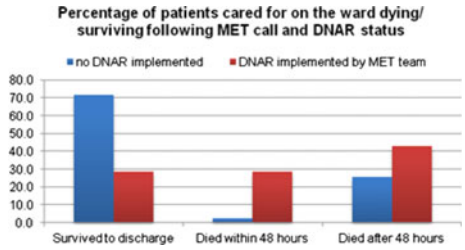
INTRODUCTION. An established Medical Emergency Team (MET) has been set up in our 770 bed hospital in 2008. A previous analysis of 880 patients showed a reduction of cardiac arrests by 40 %. The cost of this has been 2–4 h per call of senior staff man-hours. It has been recognized that implementing do not attempt resuscitation (DNAR) orders forms a significant part of this work.

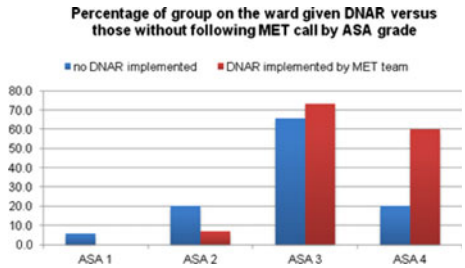
OBJECTIVES. (1) Compare current patients' outcomes following MET calls in a now established team, with those in 2008. (2) Assess outcomes following placement of DNAR orders and their appropriateness following MET calls.

METHODS. Data was collected prospectively from the Critical Care Outreach database/case notes (MedICUs-Outreach, Mela Solutions Ltd UK) and then outcomes retrospectively from trust databases (Oasis) and Intensive Care National Audit and Research Centre (ICNARC) data. A selection of MET calls over a 3 month period was analysed versus 2008 data collected in a previous study.

RESULTS. In 2011 there were 929 MET calls, with an average of 13 cardiac arrest calls per month. Overall patient outcome found 37 died, 102 went to HDU/ITU; 752 remained on the ward and 261 had a DNAR order implemented (28 %). A sample of 78 MET calls over 3 months showed 2 died, 7 were transferred to HDU/ITU (86 % survived vs. 61 % in 2008) and 69 remained on the wards. For patients remaining on the ward, 21 (30 %) had a DNAR implemented. Graph 1 demonstrates 72 % of those without a DNAR survived, compared with 52 % in 2008. The American Society of Anaesthesiologists (ASA) grades were higher in the group receiving DNAR with 71 % dying as outcome, shown in graph 2, versus 80 % in 2008. In the current study group of those patients with DNAR placements by the MET, a higher proportion died within 48 h (29 %), a surrogate marker of appropriate DNAR decision.



Graph 1



Graph 2

CONCLUSIONS. The criteria to trigger a MET assessment allows early recognition of abnormal physiology and enables escalation of care or DNAR implementation with consequent reduction in cardiac arrest calls. The identification of patients for early high dependency care is thought to increase their chance of survival. While the identification of patients in whom further escalation of care is appropriate, we have noticed the implementation of DNAR orders forms a significant part of the MET work. The high proportion of patients who died within 48 h suggests implementation is appropriate. The frequency of inappropriate MET calls suggests parent teams need education to either consider escalation or implement DNAR orders earlier to reduce MET workload. Based on the results of this study we provide continued education to parent teams regarding appropriate versus inappropriate MET calls.

0198

THE CHALLENGES OF OFF-SERVICE PATIENTS: EXPLORING PATTERNS OF UTILIZATION OF CRITICAL CARE RESPONSE TEAMS (CCRT)

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INTRODUCTION. Off-service patients are those cared for outside of their admitting service's ward. Such patients have an increased likelihood of requiring a CCRT consult due to increasingly specialized healthcare providers' knowledge gaps of early warning signs of deterioration in patient status than if the patient was admitted to their usual specialty ward.

OBJECTIVES. To determine the frequency and timing of CCRT consults on off-service patients, the underlying reasons, the challenges and knowledge gaps of nurses and other healthcare team members in identifying early warning signs of deterioration in patient status when less familiar with admitting disease processes, treatment plans and course of illness.

METHODS. Retrospective data collected from January 1st, 2011 to December 31st, 2011 with data exported from Critical Care Response Team log books and Critical Care Information System (CCIS) from a tertiary care academic hospital in Toronto Canada. Simple statistics used to describe off service patients demographics, frequency of cardio-respiratory arrests, their incidence of CCRT consults, reasons for consultation, and patient outcomes including LOS data morbidity and mortality. Data analysis will further describe the relationships between time of admission, LOS on off service ward prior to consult, between calling criteria and specialty wards; and whether relationships between off service status and CCRT initiated goals of care discussions between CCRT consultation and LOS off service wards exists.

RESULTS. There were a total of 1998 patients admitted off-service during 2011. LOS off service ranged from 0 to 20 days. There were 718 CCRT new consults during 2011. Ten percent of these (75 patients) were off-service consults or 3.75 % of off service patients required consultation. Thirty-one consult patients were off-serviced to medicine wards mostly from oncology, transplant and general surgery. Thirty-eight consults were off-serviced to surgical wards most admitted to ENT/plastic and thoracic surgery wards. Preliminary data analysis reveals reasons for consult most commonly included desaturation/shortness of breath/tachypnea accounted (52 %), hypotension/hypertension (24 %), Timing of consults in terms of LOS off service and delays in consults once calling criteria met will be described.

CONCLUSIONS. This study is the first to identify the challenges of such practices for front line clinicians and to describe the new role and new needs of CCRT in filling the previously unanticipated gaps in order to maintain high quality of care for severely ill patients.

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0199

USE OF HIGH-FIDELITY SIMULATION TRAINING TO IMPROVE DELIVERY OF HIGH QUALITY BLS BY FIRST RESPONDERS

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INTRODUCTION. Better assessment of effective Basic Life Support (BLS) knowledge translation to first responders will facilitate dissemination of the BLS training and retraining programs to additional medical facilities and laypersons.

OBJECTIVES. The primary objective of this project was to improve first responder's response to in-hospital cardiac arrests immediately following simulation training as well as at 3, 6, and 12 month intervals post training.

METHODS. Participants undertook a 2 h in-class didactic simulation training session that was team-based and used unit-specific equipment and policies. BLS knowledge and skills were assessed after training with a multiple-choice quiz and simulated evaluation of the quality of BLS response by first responders. Participants were recalled for retention analysis at 3, 6 and 12 months.

RESULTS. First responders were evaluated for baseline knowledge, and retention of BLS skills at 3 and 6 months after initial training. At baseline, participants ($n = 480$) scored 94.95 ± 7.21 % on the MCQ, and demonstrated effective CPR at a mean compression depth of 2.28 ± 0.58 inches and a mean compression rate of 104.08 ± 11.29 per min. At 3 months, participants ($n = 16$) scored 94.38 ± 6.02 % on the MCQ, with mean compression depth of 2.42 ± 0.67 inches and mean compression rate of 103.99 ± 13.30 per min. At 6 months, participants ($n = 15$) scored 98.21 ± 2.49 % on the MCQ, with mean compression depth of 2.73 ± 0.60 inches and mean compression rate of 87.50 ± 10.33 per min. Preliminary results suggest BLS skills up to 6 months of retention testing are preserved relative to baseline. Retention analysis at 12 months is pending.

CONCLUSIONS. Summative findings from this study are being used to modify the BLS training and retraining programs, in addition to helping design a multimedia web-based learning module.

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0200

A PROSPECTIVE AUDIT: CENTRAL VENOUS CANNULATION-TECHNIQUES AND COMPLICATIONS AT SULTAN QABOOS UNIVERSITY HOSPITAL, MUSCAT, OMAN

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INTRODUCTION. Central venous cannulation is a commonly performed intensive care procedure which facilitates haemodynamic monitoring, delivering fluids, medications and total parental nutritional. Both landmark and ultrasound guidance techniques are used to localize the central veins for the insertion of central venous catheters. However, NICE guidelines published in 2002 strongly recommend ultrasound guidance for central vascular access procedures. This audit is designed to review practice of central venous cannulation in a tertiary care hospital.

OBJECTIVES. To determine the methodology of central venous cannulation by various anaesthetists in the intensive care unit and operating rooms and to correlate the complications associated with insertion technique and performers experience level.

METHODS. We collected audit forms duly filled in by anaesthetists who performed the procedure for a period from Apr 2011 to Aug 2011. Incomplete forms were excluded. We analyzed the data for insertion techniques, anaesthetist experience, number of attempts, success rates and complications.

RESULTS. A total of 128 audit forms were analyzed. 8 were incomplete, hence excluded from the study. 19 % of performers were resident trainees, 50 % were specialist anaesthesiologists with 5-10 years experience and 31 % were consultants with more than 10y experience. 68 % of the performers preferred ultrasound as the technique of guidance. In 65 % of the cases right internal jugular vein was cannulated. First pass success rate using ultrasound guidance was higher than landmark technique (Fig. 1)

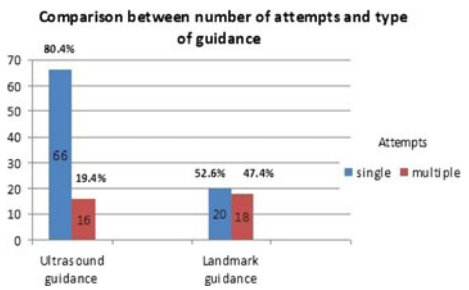

Fig. 1 Comparison

We also analyzed the data for number of attempts and performer experience (Fig. 2)

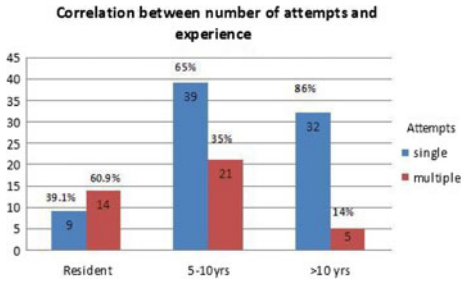

Fig. 2 Correlation

Complications like inadvertent arterial puncture, haematoma, bleeding, failed cannulation and cardiac arrests were recorded (Fig. 3).

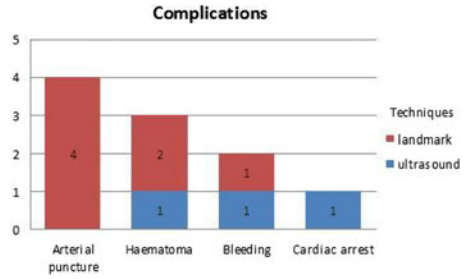

Fig. 3 Complications

CONCLUSIONS. We conclude from our audit that both ultrasound and landmark techniques of central venous cannulation are in vogue in our department with preference to former. Apparently ultrasound guidance is associated with higher success rate and lower complications. We also recommend mandatory inclusion of NICE guidelines for central venous cannulation in our hospital protocol.

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0201

INTRODUCTION OF A SEPSIS SCREENING TOOL AND CARE BUNDLE USING A MOULAGE-BASED TRAINING PROGRAM TO IMPROVE RECOGNITION AND MANAGEMENT OF SEVERE SEPSIS

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INTRODUCTION. A recent multi-centre study demonstrated mortality reductions with the use of a care bundle approach based upon the Surviving Sepsis Campaign (SSC) guidelines [1]. Whilst a care bundle approach can assist in the management of severe sepsis, there has been less focus on developing structured recognition tools and training in their use to assist in the early recognition and management of severe sepsis.

OBJECTIVES. To evaluate whether scenario based training, using a moulage format, can improve the adoption of a sepsis screening tool and care bundle by frontline staff.

METHODS. A sepsis screening tool and sepsis care bundle ('sepsis tools') were developed and training given to junior medical staff [Foundation Year (FY) and Core Medical Trainees(CMT)] as well as nursing staff in key ward areas. The 2-h training sessions used a mixed lecture and moulage format. Following the training period and launch of the 'sepsis tools', we performed a snapshot audit ($n = 22$) of the management of severe sepsis on the wards, using a convenience sample of ward patients referred to the Critical Care Outreach Team. This data was compared to a similar audit of the management of sepsis conducted in 2009 (prior to introduction of the tools).

N.B. We now aim for basic management actions to be implemented within 1 h of severe sepsis recognition. Our 2009 audit assessed compliance within a 6 h timeframe (1 h for blood cultures and antibiotics in severe sepsis) in line with the original SSC guidelines.

RESULTS. In total 40 medical and 50 nursing staff were trained. Seventy-three percent of FY doctors, 46 % of CMTs and 58 % of nursing staff had received previous formal sepsis training. Qualitative data indicated a positive staff response to our training with 89 % completely or strongly agreeing (6 or 7 on a 7-point scale) that it had improved their confidence in recognising and managing severe sepsis.

Re-audit data (see Fig. 1) demonstrated some improvement across all recommended severe sepsis management activities. However, despite improvements, there was still poor compliance (<60 %) with the guidelines in taking blood cultures and administering antibiotics within 1 h of the onset of severe sepsis.

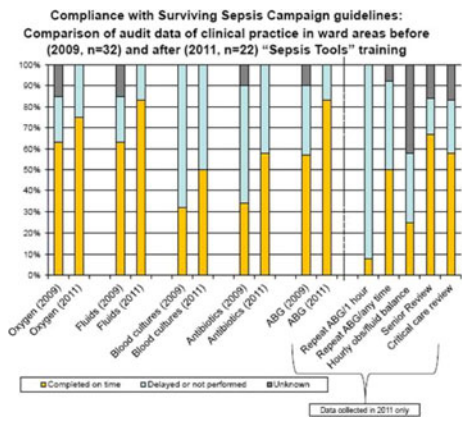

Fig. 1 Sepsis Care Audit: Comparison of 2009 and 2011 data

CONCLUSIONS. Targeted lecture and moulage-based training is highly rated by staff and can be delivered in a low cost format. Our data demonstrates, an improvement in compliance with recommended severe sepsis management following this training approach.

Although no causal relationship can be established, it is encouraging that our latest data indicates that not only are more patients with severe sepsis managed appropriately but that this management is being implemented within a shorter timeframe.
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0202
USEFULNESS OF AUTOPSY STUDIES IN ICU

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OBJECTIVES. To compare pre-and postmortem diagnostics of our patients and to determine the proportion of discrepancies and their clinical implications.
METHODS. Retrospective study of all patients that undergoing autopsy studies at the ICU of the Hospital Complex of A Coruña (40-bed ICU) during a period of 5 years. We analyzed a total of 136 patients, collecting data about the ICU stay, the reason for admission, the cause of death (clinical judgment) and the pathological findings. We compared the major diagnoses, and we classified errors in class I or II according to Goldman criteria. These results were analyzed using SPSS 17.0.
RESULTS. We collected 136 patients, 87 men and 49 women, mean age 62 ± 12 years and an average stay of 4 ± 12.5 days. 89 % were admitted for medical disease (30.9 % with respiratory failure, 43.4 % with shock and 14.7 % with coma) and the remaining 11 % after cardiac surgery (2.2 % heart transplants). The cause of death was: infectious disease (57.4 %clinical judgment vs. 47.8 % at necropsy study), vascular disorders (11 vs. 13.2 %), heart diseases(19.9 vs. 21.3 %), cardiac graft failure (3.7 vs. 3.7 %), systemic diseases (2.9 vs. 3.7 %), non-judicial neurocritical pathology (2.2 vs. 2.2 %), and tumors (2.2 vs. 5.1 %). The autopsy showed relevant findings in 20.5 % of patients (17.6 % type I error and 2.9 % type II error), with a success rate of 78.7 %. We include a case in which the autopsy was unable to clarify the baseline condition or the cause of death of the patient.
CONCLUSIONS. In our study we present a success rate (78.7 %) similar to others reported in the literature, although the clinicopathological discrepancies that would mean a change in treatment (type I error) are greater. We consider that autopsies remain an important tool in quality control in the management of critical patients.

0203
IMPLEMENTING THE LIVERPOOL CARE PATHWAY FOR THE DYING PATIENT ACROSS A REGIONAL CRITICAL CARE NETWORK

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INTRODUCTION. A pilot project is progressing on 11 intensive care units within the Cheshire and Merseyside Critical Care Network (CMCCN) to implement the recently developed Liverpool Care Pathway for the Dying Patient in Intensive Care Version 12 (LCP ICU V12). The project is co-ordinated by the Marie Curie Palliative Care Institute Liverpool (MCPCIL), funded by Merseyside and Cheshire Cancer Network (MCCN) on the behalf of the CMCCN.
OBJECTIVES. To identify and support Key Champions in 11 ICU′s within the CMCCN to provide focused education and training to staff within each participating site to promote the delivery of high quality care in the last hours or days of life. To support Key Champions to implement LCP ICU V12 into the 11 participating sites to support care in the last hours or days of life. Evaluate the outcomes of the implementation by auditing LCP ICU's used in those sites during the implementation period. To develop a mechanism for ongoing audit and benchmarking across the CMCCN (and beyond) to promote the sustainability of the delivery of high quality care into the future.
METHOD OF EVALUATION: Pre implementation scoping: A study specific questionnaire was developed to collect pertinent organisational data to provide a meaningful context for the patient level data (audit of completed LCP ICU′s in each site).
Audit of completed LCP ICU's used in each site during the implementation phase to evaluate care delivered to patients in the last hours or days of life and to their relatives/carers. Data will be analysed descriptively for each goal of care from which a CMCCN wide benchmark will be constructed against which each site will be able to compare their individual performance on each goal.
Undertake post benchmark workshop to allow personnel from each site to consider their relative performance, identify key areas for improvement in end of life care and to develop specific action plans to underpin improvements.
RESULTS AND CONCLUSIONS. The implementation period lasted a maximum of 6 months in each participating site. 10 out of 11 sites successfully implemented LCP ICU V12. Data around the total number of LCP ICU's used within each site and the percentage these represent in the total number of deaths will be available in May 2012.
The results from the benchmark will be presented and discussed for each goal and recommendations made for improving care into the future.
Findings from all facets of data collected will also assist with the development of guidelines to enhance quality improvement, develop education and training materials and amend the LCP ICU for national and international dissemination.

0204
CHEST PAIN UNITS. ARE THEY USEFUL TODAY?

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INTRODUCTION AND AIMS. Chest pain requires early risk stratification given the potentially fatal outcome that can lead. The aim of our study was to analyze the usefulness of chest pain unit (CPU) through a critical analysis of the results obtained since its inauguration.
MATERIALS AND METHODS. Prospective analysis of all patients consecutively referred to the CPU, in the period June 2009–October 2011. We studied several prognostic variables, completing follow-up with a median of 8 months.
RESULTS. We included 837 patients, 58.4 % men, mean age 59.58 ± 13.36 years. Echocardiographic studies were performed 599 (71.6 % of cases), 452 cardiac treadmill tests (54 % of cases), with 62 positive result, 25 high risk response (Duke treadmill score ≤−11). It was indicated 141 (16.8 %) myocardial perfusion studies, showing inducible ischemia in 35, 11 pharmacological stress echocardiographic and 14 coronary CT angiography, 5 of them pathological. 67 % of patients were discharged on the first visit, while 35 patients (4.2 %) were admitted to hospital for early coronary angiography study. Other 68 angiographic studies were indicated on an outpatient basis. Of the 103 cardiac catheterizations performed, 80 (77.7 %) had significant angiographic disease (6 left main coronary artery lesions, 44 anterior descending, 33 circumflex and 38 right coronary artery). Multivessel coronary artery disease showed 33.3 % of the studies. 59 (73.7 %) patients with coronary heart disease were subsidiary to receive any coronary revascularization procedure (15 surgical and 45 percutaneous). After completing the medium-term follow-up, 25 patients (3 %) were admitted to hospital by an episode of acute coronary syndrome, and 3 patients required admission for heart failure. There were no deaths.
CONCLUSIONS. Chest Pain Units allow us to establish the prognostic stratification of patients presenting to the emergency hospital department with chest pain clinic, avoiding the development of complications related to acute coronary event, sometimes fatal. According to the results presented, these units are shown unquestionably effective.

0205
BENEFICIAL EFFECTS OF THEPRESCRIPTION OF IVABRADINE IN PATIENTS WITH CHEST PAIN AND ANGIOGRAPHICALLY NORMAL CORONARY ARTERIES

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INTRODUCTION AND OBJECTIVES. Chest pain with angiographically normal coronary arteries is a frequent entity, especially among women; its etiology has been linked to impairment of coronary microcirculation. It is associated with an excellent prognosis, although it is a frequent reason for emergency assistance because of repeated episodes of angina pectoris. Our objective was to compare the clinical response to a treatment based on ivabradine (the first selective sinus node I_f channel inhibitor) compared to a conventional anti-ischemic therapy.
MATERIALS AND METHODS. Prospective study of all patients consecutively reviewed in the cardiology consultation with the diagnosis of chest pain and normal coronary arteries, between the period of June 2009 and December 2010. We analyzed clinical and epidemiological characteristics, treatment prescribed, angina functional class before and after treatment, and percentage of attendances at the Emergency Room for chest pain. All patients had a minimum follow-up of 1 year.
RESULTS. We included 48 patients, 50 % male, with a mean age of 63.3 ± 9.2 years. A group of 19 patients (39.6 %) were treated with Ivabradine, and were compared with another group of 29 patients (60.4 %) that received conventional therapy. There were no differences in baseline characteristics between both groups. After follow up, patients treated with Ivabradine showed an improvement in angina functional class [15 patients (78.9 %) vs. 17 (58.6 %), p = 0.08]; this group of patients had less need of attendance at the Emergency Room for news episodes of angina [1 (5.3 %) vs. 10 (34.5 %), p = 0.02]. After multivariate analysis, including betablocker agents, treatment with Ivabradine was associated with lower risk of emergency assistance to an episode of chest pain (OR 0.02, 95 % CI 0.01–0.50).
CONCLUSIONS. Patients diagnosed with chest pain and normal coronary arteries treated with Ivabradine compared with conventional therapy showed clinical improvement with respect to angina functional class and less need of Emergency Assistance.

0206
PROFESSIONAL PROFILE OF FEMALE DOCTORS WORKING AT CHILEAN INTENSIVE CARE UNITS

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INTRODUCTION. The increased number of beds in the Intensive Care Units (ICU's) in Chile, has led to the needing of covering those work places with doctors of several specialties that are able for the treatment of critically ill patients; thus, women have become in a considerable number of doctors who work at this units, transforming themselves into an essential part in the most demanding areas of the medicine.
OBJECTIVES. The aim of this study was to determine the epidemiological profile of female doctors that work at ICU's in Chile; knowing their capacitation, workload and professional projection at ICU's within 5 years.
METHODS. Descriptive study in which we conducted a survey to all doctors working at different ICU's of Santiago in august 2011.
RESULTS. Of 444 doctors working at ICU's, 222 (50 %) are specialized on Intensive Care Medicine; of them, only 63 were women, being 92 % chilean and singles in a 46 %. The mean age was 35 years old for women and 38 for men. Most of female doctors were working at ICU's since less than three years and only 69 % refers that will be working at an ICU in five more years.
CONCLUSIONS. Almost one-third of doctors at ICU's are women, being an important piece of this units. Most of them want to be working at this places within the next 5 years.

0207
PRE-ICU UNDERSTANDING OF SODIUM AND WATER PHYSIOLOGY AND MANAGEMENT OF DYSNATREMIA ARE SUBOPTIMAL

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INTRODUCTION. Hypo- and hypernatremia are common electrolyte disorders in hospital medicine. If improperly managed, they have significant morbidity and even mortality. While ICU clinicians often see the most serious dysnatremia patients in a hospital, effective pre-ICU management of these disorders could minimise the requirement of intensive care therapy for patients with these common but life-threatening disorders.

STUDY OBJECTIVES. To determine pre-ICU clinician understanding of fundamentals of osmolality, tonicity, water physiology and principles and practice of basic fluid management, fundamentals of dysnatremia and management of hypo- and hypernatremia, we conducted a voluntary survey among in a cohort of 150 pre-ICU clinicians attending a clinical course in acute care medicine (ACM course-focussed on the pre–ICU care of the acutely ill) (http://www.easternhealth.org.au/media/events/acm/aspx).
METHODS. 112/150 registrants voluntarily completed the 28-question single page survey. The doctors were all at least 3 years out of medical school and 35 % had completed the specialist qualifications in internal medicine, emergency medicine or anaesthesiology. All of the respondents were practising clinicians in the Australian and New Zealand medical system. The survey questions explored the basics of sodium and water physiology, the fundamentals of osmolality, tonicity and dysnatremia, the physiology underpinning the management of common dysnatremic disorders and common clinical scenario of disorders of water balance and hypo- and hypernatremia were explored.
RESULTS. The results of the survey from 112 respondents is shown in the following table.

Table 1 Sodium and sater survey

Number	Question ideation	Correct answer %	Wrong answer %
1	Sodium and potassium contribute to tonicity and osmolality	74	26
2	Urea contributes to both tonicity and osmolality	53	47
3	Hypertonicity always implies hyperosmolality	23	77
4	5 % dextrose solution is isotonic ex vivo	42	58
5	5 % dextrose solution is hypotonic in vivo	75	25
6	Hypernatremia cannot occur with increased total body water	66	34
7	Hyponatremic Seizure mandates Hypertonic Saline Therapy	40	60
8	4 % dextrose + 0.18 % saline is hypotonic in vivo	64	36
9	Dysnatremia should never be corrected by more than 12 mmol/L per day	25	75

CONCLUSION. Pre-ICU clinician understanding of water physiology is sub-optimal. Basic physiological principles such as osmolality and tonicity are poorly understood. Basic physiological tenets about commonly used intravenous fluids is also poorly comprehended. Medical registrars and consultant physicians have a generally poor concept of fluid physiology, electrolyte disorder and the fundamentals of optimal management of these common but life-threatening disorders.

0208
INFLUENCE OF LIBERALIZATION OF ICU VISITING POLICES ON BURNOUT OF DOCTORS AND NURSES

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INTRODUCTION. The staff working in ICU have a complex and stressful job and are at risk of burnout (BO) [1]. It has been conjectured that liberalization of visiting policies could increase stress among ICU staff members (especially among nurses) [2, 3]. However, no previous study has investigated the impact on ICU doctors and nurses of liberalization of visiting.
OBJECTIVES. To survey the incidence of burnout syndrome among ICU staff before and after the implementation of a partial liberalization of visiting policies in ICU.
METHODS. We administered the Italian version of Maslach Burnout Inventory (a 22-item self-completed questionnaire) to nurses and doctors at 8 Italian ICUs that were about to increase daily visiting time from 1 to 2 h to at least 8 h. The ICU staff were asked to fill in the same questionnaire 6 months (T1) and 1 year (T2) after implementation of the new policy.
RESULTS. The response rate was 89 % (230/258) at baseline, 77 % both at T1 and T2 (199/258). A high level of burnout was identified in 37.3 % of participants at baseline, 40.2 % at T1 and 42.7 % at T2. All three phases of the study showed a predominance of high burnout level among nurses compared with doctors (baseline: 40 vs. 32.5 %; T1 44.8 vs. 31.9 %; T2: 45.6 vs. 37.5 %).
CONCLUSIONS. These findings suggest that liberalization of visiting policies can induce a small but not negligible increase of burnout syndrome among ICU physicians and nurses. This may be a sign of the burden for staff members of learning to work under the eyes of family membersIn preparing for and assisting the 'opening' of ICUs it is important also to be aware of this aspect and to offer nurses and physicians appropriate support.
REFERENCES. 1. Embriaco N, et al. Curr Opin Crit Care. 2007;13:482–88. 2. Marco L, et al. Nurs Crit Care. 2006;11:33–41. 3. Berti D, et al. Intensive Care Med. 2007;33:1060–5.
GRANT ACKNOWLEDGMENT. The study was supported by Associazione per il Bambino Nefropatico (Milan, Italy).

0209
ASSESSMENT OF NEED FOR TRAINING OF JUNIOR DOCTORS IN INTRA HOSPITAL TRANSFER OF ACUTELY ILL PATIENTS

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INTRODUCTION. Junior doctors are key providers of care to sick patient.
Most acutely ill and critically ill patients are transferred within hospital-for investigations or treatment or from ED to the wards.
Transfers involve risk of morbidity and mortality.
Managing these risks specifically is not always a part of junior doctor training.
OBJECTIVES. To explore the need for formal training of Junior doctors for Intra hospital transfer of acutely ill patients.
METHODS. Questionnaire circulated amongst Foundation Year 1/2, Core Anaesthetic Trainees.
Questions related to:
Training in anaesthesia/ITU, life support training.
Training in patient transfers.
Experience in patient transfers.
Confidence in patient transfers.
Need for training in patient transfers.
RESULTS. No doctors in their foundation years had any form of training in transfer of patients within hospitals. Of the doctors in specialist training only 2 had received training in patient transfers, only one of which had been assessed. No doctors had attended a formal transfer course. 100 % of FY&CT doctors that responded felt they required formal training in patient transfers.
RECOMMENDATIONS. Organising a transfer course targeted for intra-hospital transfer of ill patients.
Pilot training scheme to be performed with Foundation Year1/2 doctors.
Teaching should be in the form of simulation scenarios for transfer.
Auditing effect of teaching on confidence and competence of doctors in patient transfers.
REFERENCES. 1. Royal College of Anaesthetists Specialist Trainee 1/2 Competency Training document. 2. Cook CJ, Allan C. Are trainees equipped to transfer critically ill patients? JICS. 2008;9:145–7.

EUROPEAN CRITICAL CARE RESEARCH NETWORK ECCRN
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Pneumonia revisited: 0210–0223

0210
PROGNOSTIC BIOMARKERS IN SEVERE COMMUNITY-ACQUIRED PNEUMONIA (SCAP) PATIENTS ADMITTED TO THE ICU

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INTRODUCTION. Measurement of prohormones representing different pathophysiological pathways could enhance risk stratification in SCAP patients.
OBJECTIVES. The aim of the present study was to investigate procalcitonin (PCT), adrenomedullin (AMD), copeptin (CP),B-type *natriuretic peptide* (BNP-32) levels in ICU SCAP patients and their relationship with in-hospital outcomes [in-hospital mortality (IHM), length of in-hospital stay (LOS), duration of ICU stay], disease specific complications, need for invasive mechanical ventilation (IMV) and vasopressor support (VS).
METHODS. 20 ICU patients with proven SCAP CURB-65 class 3, 4 were enrolled to the study. Serum PCT, AMD, CP and BNP-32 values were measured within the first 24 h after admission.
RESULTS. Increasing CAP severity was associated with increased PCT values ($r = 0.74$; $p = 0.05$). PCT in CURB-65 3 and 4 class patients was 0.73 (0.56; 5.8) versus 5.94 (4.6; 37.1) ng/ml, respectively ($p = 0.03$). CP levels on admission appeared to be higher in CURB-65 4th class patients vs the 3rd class patients—74.8 (55.06; 90) versus 47.6 (24.5; 59.8) pg/ml, respectively ($p = 0.03$). PCT values demonstrated statistically significant correlation with IHM ($r = 0.74$; $p = 0.005$) and were higher in non-survivors than those in survivors (median) (5.94 vs. 0.73 ng/ml, $p = 0.01$, respectively). PCT and CP values on admission correlated with need for VS ($r = 0.74$; $p = 0.0005$ and $r = 0.54$; $p = 0.02$, respectively) and showed higher concentrations in patients requiring VS compared with those with stable haemodynamics (102 vs. 0.73 ng/ml, $p = 0.01$) and (74.8 vs. 47.6 pg/ml, $p = 0.03$), respectively. AMD levels on ICU admission were associated with need for IMV ($r = 0.47$; $p = 0.04$). BNP-32 values correlated with LOS ($r = 0.56$; $p = 0.02$), PCT—with duration of ICU stay ($r = 0.81$; $p = 0.001$).
CONCLUSIONS. PCT and CP showed the best performance as the prognostic biomarkers in SCAP patients
GRANT ACKNOWLEDGMENT. We disclose any relationship with manufacturers or providers of any commercial products or services relevant to this research.

0211
REDUCTION OF VENTILATOR ASSOCIATED PNEUMONIA (VAP) THROUGH REPOSITIONING IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Theoretically repositioning of critically ill patients on mechanical ventilation (MV) may reduce the rate of pneumonia, through its effect on drainage of airway secretions and atelectasis.
OBJECTIVES. In the context of PUPPAS clinical trial we analyze the effect of rate of adherence to repositioning protocol on the incidence of VAP in patients with mechanical ventilation (MV).
METHODS. Post hoc analysis of the results of a randomized, controlled, unblinded clinical trial held in a single center from February 2009 to January 2011. 330 (165 patients per group) patients with ≥24 MV were assigned to control (repositioning every 4 h) or intervention group (repositioning every 2 h). The secondary outcome variable was incidence of VAP according to clinical and microbiological criteria. The covariates studied were known risk factors of pneumonia and the rate of adherence to repositioning protocol measured as the fraction of time being mobilized of the total ICU length of stay. Bivariate and multivariate Cox regression were used.
RESULTS. The incidence of microbiologically confirmed VAP was 35 of 330 (10.6 %) without differences between groupos: 15 of 164 (9.1 %) in control group and 20 of 165 (11.6 %) in interventional group (non-adjusted HR 1.44, 95 % CI 0.72–2.89, p = 0, 30). Multivariate analysis demonstrated that the rate of adherence to repositioning protocol decreases the frequency of VAP (HR 0.97, 0.95–0.99, P = 0.01). Other factors included in the explanatory model were group (adjusted HR 1.47, 0.69–3.10, P = 0.31), APACHE II, tracheostomy, reintubation, surgery and severe airway obstruction.
CONCLUSIONS. The the rate of adherence to repositioning protocol is associated with lower incidence of VAP, so that well-implemented repositioning itself constitute a protective factor.
REFERENCE. ClinicalTrials.gov, NC 00847665.
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0212

FIBEROPTIC BRONCHOSCOPY IN INTENSIVE CARE UNIT: ANALYSIS OF 276 PROCEDURES. A REPORT OF 8 YEARS OF EXPERIENCE

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INTRODUCTION. Flexible bronchoscopy is a common diagnostic and therapeutic tool for patients admitted in ICU. It is considered a safe and useful procedure for the management of several pulmonary disorders in mechanically ventilated patients.

OBJECTIVES. To analyze the clinical role of flexible bronchoscopy in an intensive care unit (ICU) and to describe the main indications, clinical results and complications associated with the procedure in critically ill patients.

METHODS. Retrospective study performed in a 17 beds medical/surgical ICU of a community hospital. Consecutive patients underwent flexible bronchoscopy during their stay in the ICU were reviewed. Time of study was 8 years. Indications and complications derived from the procedure were analyzed. Age, diagnosis, APACHE II at admission in ICU, invasive mechanical ventilation requirement, time of mechanical ventilation, ICU length of stay, radiological pattern, cultures results and mortality were collected. Statistical analysis: Data were analyzed by SPSS 18.

RESULTS. 276 fibrobronchoscopies were analyzed. Most of the procedures were performed in mechanically ventilated patients, 251 (90.9 %). Mean age was 57.1 ± 16.4 years. APACHE II at admission was 18.3 ± 7.1. ICU length of stay was 16.1 ± 11.8 days and in ventilated patients mean time of mechanical ventilation was 12.8 ± 9.8 days. Bilateral infiltrate was the most common radiological infiltrate (44.2 %), 31.5 % showed unilateral infiltrate and 15.2 % atelectasis, 9.1 % had not radiological alterations. The most frequent indication for fibrobronchoscopy was diagnostic, due to initial suspicion of pneumonia, 200 procedures (72.4 %), with a positive culture in 49 % of BAL samples, they were performed in different kind of pneumonia, main indication was for ventilator associated pneumonia (VAP), 117 (58.5 %) procedures, for severe community acquired pneumonia BAL was indicated in 47 cases (23.5 %) and 36 bronchoscopies (18 %) were performed for pneumonia in immunocompromised patients. The most frequent therapeutic indication was for resolution of atelectasis, 36 procedures (13 %). Other indications were for the diagnosis and treatment of pulmonary haemorrhage (4.7 %), lung cancer suspicion (2.9 %), aspiration of secretions (2.2 %), interstitial pneumonia study (1.8 %), control of percutaneous tracheotomy (1.8 %) and difficult airway management (0.7 %). No neumothorax were described related with the procedure, transitory hypoxaemia was the commonest complication, (8 %). Others complications were were supraventricular tachycardia (4.3 %), and slight bleeding of the bronchial mucous membrane (3.6 %).

CONCLUSIONS. Microbiological diagnosis of pneumonia and resolution of atelectasis are the most frequent indications for fibrobronchoscopy in mechanically ventilated patients. Fibrobronchoscopy is a safe and useful procedure for several pulmonary disorders in critically ill patients.

0213

A STRATEGY BASED ON GALACTOMANN ANTIGEN DETECTION AND PCR FOR INVASIVE ASPERGILLOSIS FOLLOWING INFLUENZA A (H1N1) PNEUMONIA

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OBJECTIVES. To report the incidence of secondary acquired invasive aspergillosis (IA) during the course of severe pneumonia A(H1N1).

METHODS. During the 2009–2010 winter in France, all adult patients hospitalized in our medical ICU and mechanically ventilated for severe influenza A (H1N1) related pneumonia were tested for IA with serum and broncho-alveolar lavage (BAL) galactomannan antigen detection. Serum samples were performed at admission and repeated twice a week. BAL was performed at admission and was repeated in case of ventilator-acquired pneumonia suspicion. For diagnosis of IPA, we followed the criteria published by the EORTC/IFICG[1]. We considered as probable IPA cases, mycological evidence such as fungi culture, positivity of galactomannan antigen (one index >1 or two >0.5) or positivity of PCR for Aspergillus sp. Diagnosis of proven IPA was based on culture or PCR on lung biopsy. Only patients in whom IPA was proven or probable were considered.

RESULTS. During the studying period, seventeen patients were ventilated for severe pneumonia A (H1N1). Five of them had mycological evidence of IA during their ICU stay. Hospital mortality were similar in the group of secondary IA following pneumonia A(H1N1) (20 %) and in the group of pneumonia A(H1N1) alone (50 %, $p = 0.3$). Duration of mechanical ventilation were significantly higher in the group of secondary IA following pneumonia A(H1N1) median (IQR) 60 days (42–139) vs. 20 days (8–42) in the group of pneumonia A(H1N1) alone, $p < 0.01$.

CONCLUSIONS. We report a 29 % incidence of invasive pulmonary aspergillosis through a strategy of routine screening for invasive aspergillosis in a cohort of 17 consecutively non neutropenic patients admitted to the ICU for severe influenza A (H1N1) pneumonia and mechanically ventilated.

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0214

VENTILATOR ASSOCIATED PNEUMONIA (VAP) EPIDEMIOLOGY IN ICU BEFORE THE IMPLANTATION OF ZERO PNEUMONIA PROTOCOL

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OBJECTIVES. Knowing demographic features, prevalence, risk factors and VAP rate in a medical-surgery ICU from a third level hospital before VAP prevention protocol implantation, zero pneumonia.

METHODS. Prospective study of 10 years of evolution (2001–2011) with a data collection period of 3 consecutive months/year (April–June): ENVIN-Helics Study (Nosocomial Infection Surveillance National Study). All patients >18 years admitted in a 13 bed polyvalent ICU were included. Following variables were analyzed: age, gender, risk factors, APACHE II at admittance, incidence density (VAP/1,000 ICU stay days and VAP/1,000 MV days) and microorganisms involved. ICU stay and mortality were calculated. Similarly VAP percentage was compared in two periods: <or equal 7 and >7 days after admission and the microorganisms more frequently involved in them. VAP was defined as compatible clinical picture plus new and persistent radiological infiltrated or extension of a previous infiltrated and clinical deterioration. Pertinent microbiological samples were taken. Results were presented as percentage or average and standard deviation. Statistical analysis was made through X^2.

RESULTS. In 1436 admitted patients, a 4.94 % (71 patients) presented 76 VAP episodes. MV was necessary in 621 patients (43.25 %), of which 12.2 % presented at least 1 pneumonia episode. 73.97 % were men; average age was 59.2 ± 15.01 years. Average stay was 27.39 ± 17,62 days. Admission APACHE II was 19.52 ± 7.91. Artificial airway in 94.5 % and in 2 cases only NIMV was used. Incidence density was 6.87 pneumonias per 1000 ICU stay days and 19.84 pneumonias per 1,000 MV days. The most frequently isolated microorganism was *A. baumanii* (20 %), followed by *P. aeruginosa* (17.33 %), *S. aureus* meticilin resistant (14.67 %) and S. aureus meticilin sensitive (6 %). If we analize VAPs related to the days following since the admission it is observed that this were more frequent since the 7th admission day (45.33 vs. 54.66 %) and that involved microorganisms were similar to the ones already described and between periods, with the exception of *S. aureus* meticilin resistant (8.82 vs. 19.51 %) and the *Aspergillus* spp. which was only isolated in the 2nd period (7.32 %). Mortality among VAP patients was 44.59 % against ICU general mortality which was 15.02 % ($p < 0.001$). Patients between the ages of 40–59 years presented a higher APACHE II (17.1) although VAP incidence (6.42) and mortality (33 %) was lower than patients between the ages of 60–69 and 70–74 years corresponding the higher incidence to the last group (7.64) and the higher mortality to the second group (53.85 %).

CONCLUSIONS. VAP is an infrequent entity in patients under MV admitted in our ICU although it causes an important mortality, being this mortality higher in older patients.

0215

INCREASED MORTALITY IN NON-AIDS PATIENTS WITH SEVERE PNEUMOCYSTIS PNEUMONIA RECEIVING HIGH DOSE ADJUNCTIVE STEROIDS

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INTRODUCTION. Over the last three decades, there have been an increased number of non-AIDS patients at risk for Pneumocystis Pneumonia (recipients of BMT or solid organ transplantation, hematology patients with lymphoproliferative disorders or cancer patients receiving long term steroids or targeted therapies). Unlike AIDS-related PCP, benefits from high dose steroids in HIV negative with severely hypoxemic patients have never been demonstrated. The aim of this study was to evaluate potential benefits from high doses steroids in HIV negative patients with PCP.

OBJECTIVES. The aim of this study was to evaluate potential benefits from high doses steroids in HIV negative patients with PCP.

METHODS. Over the study period, 139 patients with non-AIDS related PCP were managed at our center. Median age was 48 (40–60) years, SAPS2 was 32 (23–43), PaO_2/FiO_2 was 156 (90–263). Underlying diseases were hematological malignancies (n = 55, 39.6 %), cancer (n = 11, 7.9 %) or patients receiving immunosuppressive agents, including transplantation of solid organs (n = 73, 52.2 %). Half the patients (n = 74) were receiving steroids before ICU admission. During the ICU stay, 74 (53.9 %) patients needed mechanical ventilation (including non invasive ventilation, n = 25, 18 %), and 41 (29.4 %) vasopressors. ICU mortality was 26 % (36 deaths). Among the 139 patients, 72 (51.8 %) patients received HDS, 35 (25 %) LDS and 32 (23 %) patients were in the NSS group. By multivariate analysis, independent predictors of hospital mortality were SAPS2 score at ICU admission [1.04/point (1.01–1.08), $p = 0.01$], hematological malignancies [4.06 (1.19–13.09), $p = 0.03$], vasopressor use [20.31 (6.45–63.9), $p < 0.001$] and HDS [9.33 (1.97–44.3), $p = 0.02$]. Strikingly, HDS was not related to hospital acquired infection by multivariate analysis.

RESULTS. During this period, 139 patients were included in the study. Median age was 48 (40–60) years, SAPS2 was 32 (23–43). Underlying disease were haematological disease (n = 55, 39.6 %), cancer or immunologic disease (n = 84, 60.4 %). 74 (53.9 %) patients took steroids before ICU admission. During ICU stay, 74 (53.9 %) patients need mechanical ventilation, 41 (29.4 %) patients had shock and 36 (25.8 %) patients died. HDS group was 72 (51.8 %) patients, LDS group was 35 (25 %) patients and NS was 32 (23 %) patients. In multivariate analysis, mortality was related to SAPS2 score (1.04 [1.01-1.08], $p = 0.01$), haematological disease [4.06 (1.19–13.09), $p = 0.03$], shock [20.31 (6.45–63.9), $p < 0.001$] and HDS versus LDS [9.33 (1.97–44.3), $p = 0.02$]. HDS was not related to hospital acquired infection in multivariate analysis ($p = 0.46$).

CONCLUSIONS. This retrospective study suggests that adjunctive HDS increases mortality in non-AIDS related PCP. This effect was not related to higher rate of infection. Prospective evaluation is warranted.

0216

CONTINUOUS INFUSION OF PIPERACILLIN TAZOBACTAM IN *PSEUDOMONAS AERUGINOSA* INFECTION: A PROPENSITY SCORE MATCHED MULTICENTER COHORT STUDY

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INTRODUCTION. Pharmacokinetic studies of B-lactam antibiotics have shown that prolonging the infusion time maximizes time of free drug concentration above bacteria minimal inhibitory concentration ($fT > MIC$) [1], especially in patients without renal failure or high bacteria MIC. It is unclear, however, if this approach can improve patient outcomes. Several trials comparing clinical outcomes of extended or continuous infusion of β-lactams with intermittent dosing have been completed, with conflicting results [2, 3, 4].

OBJECTIVES. In clinical practice continuous or extended infusion of piperacillin/tazobactam is often recommended. Therefore, we intended to analyse if this may lead to a clinical benefit for the treatment of documented *Pseudomonas aeruginosa* sepsis in critically ill patients.

METHODS. A retrospective multicenter cohort study was performed in seven intensive care units (ICU). Critically ill adult patients with documented sepsis due to *Pseudomonas aeruginosa* treated with piperacillin/tazobactam between 2006 and 2010 were included. Patients were matched according to whether they receive continuous or conventional intermittent dosing of piperacillin/tazobactam, using a propensity score to adjust for confounding variables (5). The primary end-point was 28-day mortality. Secondary endpoints were in-hospital mortality and length of stay (LOS).

RESULTS. A total of 218 patients were included. According to the propensity score 94 patients were successfully matched. This method allowed for a well balanced cohort. The 28-day mortality rate was 19.15 and 38.3 % in continuous and intermittent dosing groups, respectively (Mcnemar test, p = 0.15) (Table 1).

Table 1 28 day and in-hospital mortality

	Intermittent infusion dosing (n = 47)	Continuous infusion (n = 47)	p
28 day mortality (%)	19.15	38.3	0.15
In-hospital mortality (%)	30	46.8	0.29

The in-hospital mortality was also not significantly different (30 vs. 46.8 %, p = 0.29). Hospital LOS was similar in both groups (Table 2).

Table 2 Hospital length of stay

	Intermittent dosing (n = 47)	Continuous infusion (n = 47)	p
Hospital lenght of stay (days)	54.55	46.42	0.5

CONCLUSIONS. The clinical efficacy of piperacillin/tazobactam in continuous infusion was equally effective to intermittent dosing.

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0217
COST EFFECTIVENESS ANALYSIS OF SDD AND SOD USE IN DUTCH ICUS

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INTRODUCTION. Selective Digestive Decontamination (SDD) and Selective Oropharyngeal Decontamination (SOD) are prophylactic antibiotic regimens used in Intensive Care Units (ICU). In a Dutch 13-center cluster-randomized trial in 5,939 patients both SDD and SOD significantly reduced day-28 mortality as compared to standard care (SC) (NEJM 2009;360:20).

OBJECTIVES. We determined costs and benefits of SDD, SOD and SC from a healthcare perspective using data from the Dutch multi-centre trial.

METHODS. Costs were determined by days in ICU, days on mechanical ventilation, antibiotic use, microbiology (surveillance and clinical cultures) and costs of selective decontamination (€0.83 and €9.95/day for SOD and SDD), based upon the Dutch guidelines for cost research 2010 and expressed in Euros for the year 2009. Benefits were based on day-28 survival. Cost per life year gained (LYG) and incremental cost effectiveness ratio (ICER) [i.e., the ratio of changes in costs and effects per LYG for SDD (or SDD) compared to SC] were calculated. The effects of recent changes in costs of amphotericin B (part of SDD and SOD) was investigated through sensitivity analysis.

RESULTS. In all, 2,045, 1,904, and 1,990 patients received SDD, SOD and SC, respectively. Total costs per patient were €48,767 for SC (range: 3,015–586,014), €47,596 for SDD (range: 2,872–831,188) and €46,970 for SOD (range: 3,054–429,251). During SOD and SDD, LYG were 0.71 and 0.53, respectively, as compared to SC, yielding an ICER €-2,535 and €-2,225 per LYG, for SOD and SDD, respectively, as compared to SC. The differences in costs were mainly due to differences in length of ICU-stay as length of ICU-stay was highest during SC. During SDD the microbiology costs and costs for study medication and antibiotics were highest as compared to SOD and SC. Because of changed costs of Amphotericine B, daily costs of SOD has increased from €0.83 to approximately €40 and of SDD from €9.95 to approximately €400. With these prices the ICER of SOD increased to €-2,322 per LYG (+180) and to €680 per LYG (+2,905) for SDD.

CONCLUSIONS. At the time of the Dutch multi-centre trial both SOD and SDD were cost saving as compared to SC. With current prices of SDD and SOD, both SOD and SDD remain cost-effective (based on a cost-effectiveness threshold of €20,000 per LYG for preventive measures), but only SOD would remain cost-saving.

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0218
PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONIA BY EARLY TRACHEOSTOMY IN PATIENTS WITH TRAUMA: PROPENSITY SCORE MATCHING ANALYSIS

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INTRODUCTION. In trauma patients requiring long-term mechanical ventilation (MV), tracheostomy is the most common means of airway management. However, solid evidence on the timing of tracheostomy is lacking. Furthermore, there is a lack of data on the efficacy of early tracheostomy (ET) for preventing ventilator-associated pneumonia (VAP); such data is currently limited to shortening of MV duration and length of intensive care unit (ICU) stay. The purpose of this study was to examine the effectiveness of ET (within 5 days after the start of MV) compared with non-ET including late tracheostomy (LT) for reducing the incidence of VAP.

METHODS. We retrospectively analyzed patients with trauma who were ventilated for more than 48 h between April 2006 and June 2011. Exclusion criteria were age <18 years, burn, and do not resuscitate order. VAP was diagnosed according to CDC criteria. Matching based on propensity score was performed to equalize potential prognostic factors in the ET and non-ET groups and to formulate a balanced 1:1 matched cohort study.

RESULTS. A total of 262 trauma patients were included (ET: 82 cases; LT: 59 cases; extubation success: 105 cases). Victims of blunt trauma accounted for 90.1 % of the sample population. Patient median age was 52 (IQR: 34–67) years, median injury severity score was 29 (22–32), and hospital mortality rate was 11.1 %. ET and non-ET groups were matched for patient characteristics, comorbidity, and physiological variables in a 1:1 propensity-matched analysis (ET: 54; non-ET: 54). The C statistic of the propensity score was 0.847. The incidence of VAP was significantly lower in the ET group than in the non-ET group (ET: 16.7 %; non-ET: 42.6 %; P < 0.01). In particular, this difference was apparent for late-onset (>5 days) VAP (P = 0.01). The duration of MV and length of ICU stay were shorter in the ET group than in the non-ET group (median: 11 vs. 14.5; 9 vs. 12, respectively; P < 0.01). After risk adjustment, the odds ratio of ET for VAP was 0.32 (95 % CI: 0.11–0.88; P = 0.02).

CONCLUSIONS. Early tracheostomy within 5 days can reduce the development of VAP in patients with trauma.

0219
PLASMA UBIQUINONE LEVELS ARE UNAFFECETED BY SIMVASTATIN IN ACUTE LUNG INJURY

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INTRODUCTION. Statins are HMG-CoA reductase inhibitors and have a potential role in the treatment of acute lung injury (ALI) and sepsis. The exact mechanism behind this therapeutic action is unknown but is thought to involve a decrease in the synthesis of non-sterol isoprenoids [1]. Through the same mechanism the synthesis of ubiquinone, a vital antioxidant and component of the mitochondrial respiratory chain, may also become impaired. This is more probable if statin levels are raised, as frequently happens in critical illness. Statin induced ubiquinone depletion has also been implicated in impaired cardiac function and myopathy in both animals and patients. It is therefore important to exclude ubiquinone depletion and its sequelae as a potential consequence of statin therapy in the critically ill.

OBJECTIVES. To assess the impact of statin therapy on plasma ubiquinone levels in patients with ALI.

METHODS. Plasma samples were obtained from patients with ALI enrolled into the HARP trial (a double-blind randomized placebo controlled trial of simvastatin, 80 mg daily, in ALI [2]), at baseline, day 3 and 7. Ubiquinone levels were determined by HPLC and ratioed to total cholesterol, the major ubiquinone carrier within blood.

RESULTS. Plasma was obtained from 53 patients, although not all time points have a complete data-set (Table 1). Median (standard error) concentration of ubiquinone (μmol/l), total cholesterol (mmol/l) and the ratio of ubiquinone to total cholesterol are shown in Table 1. There is no statistical difference between the statin and the placebo treated groups at all time points (ANOVA).

Table 1 Ubiquinone and total cholesterol concentrations

	Baseline	Day 3	Day 7
Placebo: (ubiquinone)	546 (79) n = 28	754 (115) n = 19	970 (155) n = 16
Placebo: (total cholesterol)	2.59 (0.19) n = 23	2.68 (0.17) n = 29	2.8 (0.21) n = 22
Placebo: (ubiquinone):(total cholesterol)	155 (63) n = 21	276 (51) n = 18	388 (64) n = 14
Simvastatin: (ubiquinone)	596 (89) n = 25	695 (94) n = 17	597 (93) n = 17
Simvastatin: (total cholesterol)	2.2 (0.17) n = 28	2.0 (0.19) n = 25	1.8 (0.2) n = 23
Simvastatin: (ubiquinone): (total cholesterol)	230 (35) n = 23	300 (51) n = 15	260 (62) n = 15

There is a non-significant trend to increasing ubiquinone levels in the placebo group over time. No difference in ubiquinone levels were seen between survivors and non-survivors or with paired data alone, nor was there any correlation with length of ICU stay or duration of ventilation.

CONCLUSIONS. This is one of the first studies to demonstrate that 80 mg simvastatin daily in patients with ALI does not have a significant impact on plasma ubiquinone levels. Though this is reassuring further work will need to be done to address whether plasma levels reflect tissue levels.

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0220
VENTILATOR-ASSOCIATED PNEUMONIA IN CARDIAC INTENSIVE CARE UNITS: A SURVEY OF UK PRACTICE

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INTRODUCTION. Ventilator-associated pneumonia (VAP) is a healthcare-associated infection (HAI) with significant morbidity and mortality. Yet, there is no consensus on the diagnostic criteria for diagnosing VAP leading to considerable variations in the reported incidence amongst general intensive care units (GICU) [1]. There is considerably less data available on the incidence of VAPs in Cardiac Intensive Care Units (CICU) [2].

OBJECTIVES. We surveyed all CICUs in the UK to establish views/current practice in diagnosing VAP and compared them to the results of a recent survey of UK GICUs on the same area [3].

METHODS. Thirty-eight CICUs were identified in the UK and an electronic survey was produced and distributed by the Association of Cardiac Anaesthetist (ACTA) linkmen. Responses were further encouraged via the Cardiothoracic Intensivists in ACTA (CIA) linkmen. The survey comprised of questions covering the units current practice in diagnosing VAP as well as measures used to reduce the incidence of VAP.

RESULTS. A total of 22 responses were analysed giving a response rate of 57.9 %. The majority of respondents did not formally track their incidences of VAP (78 %) although 86 % had a ventilator care bundle and audited unit compliance with the bundle. A formal

scoring system was used to diagnose VAP in the minority of units (22 %) with the majority preferring a combination of various clinical and laboratory criteria. The recommendations in the Department of Health High Impact Intervention 5 were widely adopted. Other interventions such as selective decontamination of the digestive tract (SDDT) and polyurethane tubes were less widespread.
CONCLUSIONS. Our survey highlighted significant difference in diagnostic and management strategies in CICUs compared to that of GICUs in the UK. Although the vast majority on CICUs had implemented a ventilator care bundle and audited compliance, only a handful formally tracked their VAP rates. This could be due to the fact that the use of formal scoring systems to diagnose VAP was limited. The Clinical Pulmonary Infection Score was widely utilised in UK GICUs. Although there is strong evidence for the efficacy of SDDT in the reduction of VAP, this practice was least likely to be adopted in both GICUs and CICUs. The variation in practice between the two types of ICUs may be due to factors such as different patient population groups and average duration of mechanical ventilation.
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0221
RISK FACTORS FOR THE DEVELOPMENT OF VENTILATOR ASSOCIATED PNEUMONIA AFTER CARDIAC SURGERY

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INTRODUCTION. Ventilator associated pneumonia (VAP) is the most frequent post-operative infection in cardiac surgery and is associated with increased costs, hospital length of stay, and mortality. To identify patients at risk for pneumonia after heart surgery is important to apply prevention measures such us lung protective ventilation strategies, continuous aspiration of subglottic secretions, antibiotic prophylaxis strategies, less invasive surgical techniques such as percutaneous valve replacement.
OBJECTIVES. The aim of this study was to identify pre-operative, intra-operative and post-operative risk factors for VAP in a large population of adult patients undergoing major heart surgery.
METHODS. Demographics, comorbidities, clinical and microbiological data of all patients undergoing cardiac surgery from 2003 to 2009 were prospectively recorded in an university hospital 12 beds cardiac surgical intensive care unit. VAP was diagnosed on clinical, radiological and microbiological grounds. A logistic regression analysis was conducted to identify risk factors for VAP.
RESULTS. 7351 consecutive patients who underwent cardiac surgery were included in the analysis. VAP was diagnosed in 196 patients (2.7 %). Most frequently isolated pathogens were Pseudomonas (19.9 %), Staphylococcus species (16.8 %), Enterobacter (7.7 %), E.Coli (7.7 %), Candida sp. (6.6 %). Patients with post-operative pneumonia had a higher hospital mortality (24.0 vs. 1.6 %, $p < 0.001$), longer ICU length of stay (14 days, IQR 9–26, vs 1 days, IQR 1–3; $p < 0.001$) and hospital length of stay (25 days, IQR 14–40 vs. 6 days, IQR 4–8; $p < 0.001$). Pre-operative risk factors identified by logistic regression were COPD, age >70, pre-operative creatinine levels >1.4 mg/dL, pre-operative left ventricle ejection fraction (LVEF) <40 %, and previous cardiac surgery. Intra-operative risk factors were emergency surgery, transfusion of blood products, need for inotropes and/or intra-aortic balloon pump. Post-operative risk factors were neurologic disorders and acute kidney injury.
CONCLUSIONS. Patients who develop lung infections after cardiac surgery still have a high mortality. Pre-operative, intra-operative and post-operative risk factors should be considered for implementation of preventing measures in these patients.

0222
IMPACT OF APPLYING VENTILATOR CARE BUNDLE ON VENTILATOR ASSOCIATED PNEUMONIA INCIDENCE RATE. DOES IT WORK IN DEVELOPING COUNTRIES?

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INTRODUCTION. Ventilator associated pneumonia (VAP) is known to increase the duration of mechanical ventilation, mortality, length of stay and also costs of care, applying ventilator care bundle (VCB) which is a group of five evidence-based procedures, that when clustered together and implemented as an 'all or nothing' strategy, may result in substantial clinical outcome improvement.
OBJECTIVES. Cross-sectional study to determine the usefulness of the use of Ventilator care bundle on the incidence of VAP.
METHODS. This prospective observational study was conducted on adult surgical intensive care unit (ICU) patients at tertiary care university hospital (kasr Al Aini hospital) from September 2011 until March 2012. Application of a ventilator care bundle consisted of: semi-recumbent positioning, oral care, daily sedation vacation and readiness for weaning, ulcer prophylaxis, and deep vein thrombosis prophylaxis. The study was performed as a pre-/post test design and consisted of three phases: the first phase was description of the current state: between September and November 2011, Then Training of staff in charge of mechanically ventilated patients for a month, and lastly control of performance during the period between January and march 2012.
RESULTS. 98 patients were enrolled in the study. Prior to institution of bundle, VAP was seen at a rate of 83, 38.7, 42 cases/1000 ventilator days during October, November, and December. The rate of VAP decreased to 20, 10, and 7.5 cases/1,000 ventilator days during the last 3 months. Compliance with the VAP bundle increased over the study period from 60 to 90 %.
CONCLUSIONS. Application of a ventilator care bundle in low facility hospital is very effective tool in reduction of the incidence of ventilator-associated pneumonia.

0223
EFFECT OF CYTOMEGALOVIRUS AND HERPES SIMPLEX VIRUS ON THE PROGNOSIS OF MECHANICALLY VENTILATED PATIENTS SUSPECTED TO HAVE VENTILATOR-ASSOCIATED PNEUMONIA

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INTRODUCTION. Cytomegalovirus (CMV) and herpes simplex virus (HSV) are common viruses that can affect critically ill patients who are not immunocompromised.
OBJECTIVES. The aim of this study was to determine whether the identification of CMV and/or HSV in mechanically ventilated critically ill patients suspected of having pneumonia was associated with an increased mortality.
METHODS. Prospective epidemiological study in a medical intensive care unit of a tertiary medical center inclunding 93 patients with suspected pneumonia. Patients with suspected pneumonia had bronchoalveolar lavage and blood samples taken to confirm the diagnosis. Antigenemia was used to detect CMV in the blood. Bronchoalveolar lavage samples were submitted to testing using quantitative real-time Polymerase Chain Reaction.
RESULTS. We identified 22 patients with a CMV infection, 26 patients with an HSV infection and 45 patients without CMV or HSV infection (control group). Mortality at day 60 was higher in patients with a CMV infection than in patients from the control group (55 vs. 20 %, $P < 0.01$). Mortality at day 60 was not significantly increased in the group with HSV infection. Ventilator free days, duration of ICU stay and ICU mortality were significantly higher in patients with CMV infections when compared to patients from the control group.
CONCLUSIONS. In critically ill patients, a CMV infection is associated with an increased mortality. Further interventional studies are needed to evaluate whether treatment could improve the prognosis.
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Technology for ventilatory support: 0224–0237

0224
CHANGES IN SKELETAL MUSCLE NADH REDOX STATE, TISSUE OXYGENATION AND MICROVASCULAR BLOOD FLOW DURING GRADED HYPOXIA

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INTRODUCTION. The reduced form of nicotine adenine dinucleotide hydride (NADH) provides electrons to the mitochondrial electron transport chain (ETC.). A rise in the NADH:NAD + ratio (redox state) occurs with a downstream block in the ETC., e.g. due to insufficient oxygen provision (hypoxia). This can be tracked non-invasively by following changes in NADH fluorescence intensity, and may be used to indicate the degree by which tissue perfusion is being compromised.
OBJECTIVES. To assess temporal changes in NADH fluorescence intensity, microvascular blood flow and tissue oxygen tension in skeletal muscle during graded hypoxia, with concurrent measures of global tissue perfusion and haemodynamics.
METHODS. Anaesthetised, spontaneously breathing male Wistar rats ($n = 4$) underwent left common carotid and right jugular venous cannulation and tracheostomy. Changes in mitochondrial NADH at the surface of the left gracilis muscle were assessed by fluorescence intensity (MitoViewer, Prizmatix, Israel). Tissue PO_2 and microvascular blood flow were determined using a combined fibreoptic sensor utilizing fluorescence quenching and laser Doppler flowmetry (Oxylite, Oxford Optronix, UK) placed into the right gracilis muscle. The level of inspired oxygen was changed at 20-min intervals in the following order: 21 % O_2–16 –21–11–21–6–21 %. Echocardiography was performed at 15 min after each change in FiO_2, followed by blood withdrawal for blood gas analysis. Statistical analysis was by 1-way RM- ANOVA with post hoc Dunnett's test. Data are expressed as mean ± SEM.
RESULTS. Despite significant hypotension while breathing 11 and 6 % O_2, cardiac output and microvascular flow remained constant (Fig. 1). Arterial PO_2 and tissue PO_2 followed the same pattern with increasing levels of hypoxaemia, with a return to baseline during normoxia. Lactate, base deficit and mitochondrial NADH fluorescence did not increase significantly until the inspired O_2 fell to 6 %.

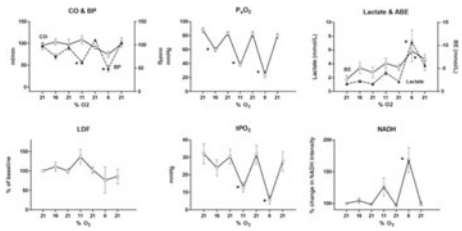

Fig. 1

tPO_2, muscle tissue PO_2; CO, Cardiac Output; BP, blood pressure; ABE, arterial base excess; LDF, laser Doppler flow. *$p < 0.05$ versus baseline.
CONCLUSIONS. In this model, despite maintenance of cardiac output and muscle microcirculatory perfusion with increasing hypoxaemia, significant changes in NADH fluorescence, lactate and base excess only occurred during short-term extreme hypoxia (6 % O_2). This multimodal approach provides novel information regarding end-points of resuscitation and tissue oxygenation, and may have potential utility with specific therapies e.g. permissive hypoxaemia.

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0225
INFLUENCE OF BODY DIMENSIONS IN THE ANALYSIS OF PULMONARY PULSATILITY BY ELECTRICAL IMPEDANCE TOMOGRAPHY

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INTRODUCTION. Electrical impedance tomography (EIT) is a non-invasive diagnostic and monitoring tool that allows evaluation of impedance variations related to intra-thoracic changes in both blood and air content. Impedance changes associated with the cardiac systole can be estimated by EIT (pulmonary pulsatility, DZp), which purportedly represents the impedance variation associated with the right ventricle stroke volume (SV). We hypothesized that the pulmonary pulsatility is also affected by body dimensions.
OBJECTIVES. Our purpose was to evaluate if body dimensions (weight and length) influence the correlation between DZp and SV.
METHODS. Six Agroceres pigs, with a median weight of 45 kg (range 27–60 kg) and median length of 110 cm (range 100–126 cm) were instrumented with pulmonary artery and arterial catheters, and mechanically ventilated with tidal volume (V_T) 10 mL/Kg and PEEP of 10 cmH_2O. An EIT belt with 32 equidistant electrodes was placed around the circumference of the thorax just below the level of the axilla. To compare DZp with SV, four or more hemodynamic conditions were evaluated: baseline, hemorrhage (removal of 30 % of the estimated volemia) and successive volume challenges (500 mL of Ringer lactate's solution) until the animal ceased to increase the cardiac output by more than 15 % compared to the previous condition. During each hemodynamic condition, with all other ventilator parameters kept constant, two different tidal volumes were applied (V_T 6 mL/kg and V_T 10 mL/kg with a variable dead space to keep the end-tidal CO_2 constant). To extract the pulsatility signal from the raw signal (ventilation and pulsatility combined), we used electrocardiography-gating. A region of interest (ROI) which included both lungs was selected for measurement of the DZp. We explored the relationship between DZp and SV with hierarchical regression analysis using as predictors dummy variables for each experiment, interactions between dummies and SV, as well as weight, length, and body surface area.
RESULTS. The correlation between DZp and SV was poor ($R^2 = 0.27$), but improved significantly after the addition of the dummy variables and interactions terms ($R^2 = 0.76$ and 0.86, respectively), indicating a strong correlation between DZp and SV within each experiment. Subsequent analyses demonstrated that weight and length accounted partially for the between-experiments variability in the correlation of DZp and SV ($R^2 = 0.64$ and 0.71, respectively).
CONCLUSIONS. Our results are compatible with a strong within-experiment but weak between-experiment correlation of DZp and SV. The correlation between-experiments improved significantly after taking into account the body dimensions, suggesting that body weight and length be considered in EIT estimates of SV.
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0226
COMPARISON OF TWO METHODS FOR ANALYSIS OF PULMONARY PULSATILITY BY ELECTRICAL IMPEDANCE TOMOGRAPHY: APNEA AND ELECTROCARDIOGRAPHY-GATING

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INTRODUCTION. Electrical impedance tomography (EIT) is a non-invasive diagnostic and monitoring tool that allows evaluation of impedance variations related to intra-thoracic changes in both blood and air content. The raw impedance signal is composed of impedance changes associated with the movement of air (ventilation) and with the cardiac systole (pulmonary pulsatility, DZp). The separation of the ventilation and DZp components of the raw impedance signal can be done by different techniques. The simplest method consists of a breath hold (apnea), which eliminates the ventilation component of the impedance changes. This method is limited in that the apnea itself can induce changes in DZp. Retrospective electrocardiographic (ECG) gating, in which impedance-gated data are retrospectively assigned to a cardiac cycle phase, offers the possibility to separate the DZp component of the raw signal during ongoing ventilation.
OBJECTIVES. Our aim was to compare two different methods, apnea and ECG-gating, for analysis of DZp and correlate both with the right ventricle stroke volume corrected by weight (SV).
METHODS. Six Agroceres pigs, with a median weight of 45 kg (range 27–60 kg) and median length of 110 cm (range 100–126 cm) were instrumented with pulmonary artery and arterial catheters, and mechanically ventilated with tidal volume (V_T) 10 mL/kg and PEEP of 10 cmH_2O. An EIT belt with 32 equidistant electrodes was placed around the circumference of the thorax just below the level of the axilla. To compare DZp with SV, four or more hemodynamic conditions were evaluated: baseline, hemorrhage (removal of 30 % of the estimated volemia) and successive volume challenges (500 mL of Ringer lactate's solution) until the animal ceased to increase the cardiac output by more than 15 % compared to the previous condition. During each hemodynamic condition, with all other ventilator parameters kept constant, two different tidal volumes were applied (V_T 6 mL/kg and V_T 10 mL/kg with a variable dead space to keep the end-tidal CO_2 constant). DZp was computed for each condition using the ECG-gating technique or during a 30-s apnea. A region of interest (ROI) which included both lungs was selected for measurement of DZp. We used the Pearson correlation test to evaluate the correlation between both techniques and between DZp and SV.
We found a strong correlation between DZp acquired with ECG-gating and during apnea (ρ 0.93). The correlation between DZp and SV was ρ 0.82 for the ECG-gating technique and ρ 0.72 for the apnea technique.
CONCLUSION. We found that both, ECG-gating and apnea methods, can be used for determination of DZp. Given that it does not require a breath hold, ECG-gating offers the advantage of allowing continuous monitoring of DZp.
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0227
A PRELIMINARY STUDY ASSESSING THE ACOUSTICAL ENVIRONMENT OF AN INTENSIVE CARE UNIT

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INTRODUCTION. Noise is generated in an ICU by a variety of sources including care, conversation and supportive equipment. Of these, staff conversation and equipment alarms are cited as the most disturbing [1]. This noise is frequently implicated in causing sleep disturbance and may have deleterious effects on patient recovery and staff wellbeing alike.
OBJECTIVES. To gather initial acoustical data to inform the future deployment of an in situ distributed noise monitoring system.
METHODS. Eleven sets of 30 min recordings were collected from eight areas of the ICU, using a Norsonic 121 sound level meter and a ½″ microphone (Norsonic, type 1201/30323). The microphone was mounted on extensible tripod and protected from air conditioning influence using a 6 cm windscreen. The instrument was programmed to acquire FAST-averaged, A weighted sound pressure levels in 1/3 octaves (35 bands between 8 Hz and 20 kHz). Results were analysed in 15 min time periods.
RESULTS. There was consistency of sound pressure levels across the eight bed spaces surveyed. However, these data show a potentially critical situation, as both equivalent continuous (L_{Aeq}) and background sound pressure levels (L_{90}) were significantly higher than the values recommended by the World Health Organization in 1999, with peak sound pressure levels (L_{Amax}) greater than 80 dB in the all of bed spaces in the open unit. In the single patient room, peak levels reached 80 dB, but equivalent continuous and background levels were lower than the open unit.

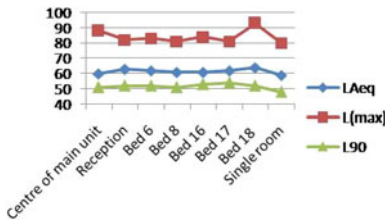

Fig. 1 Sound pressure levels in ICU

CONCLUSIONS. These results indicate a noisier environment than recommended, but are consistent with previous studies in ICU. Future studies will investigate the accuracy of the measurements and inform our configuration of a distributed noise monitoring system.
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GRANT ACKNOWLEDGMENT. The authors acknowledge funding from the National Physical Laboratory Strategic Research Program and St George's Hospital NHS Trust Special Trustees.

0228
MONITORING OF THE WEANING PROCESS IN PATIENTS WITH SUCCESSFUL OUTCOME AFTER MECHANICAL VENTILATION

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INTRODUCTION. Mechanical ventilator support (MSV) is a life-saving measure applied to about 90 % of patients in intensive care units. Weaning from MSV is difficult in 30 % of the cases [1–3].
OBJECTIVES. Specific features of pressure and volume signals acquired at different procedures during the process of MSV stopping are measured aiming to identify the typical ranges for patients susceptible to weaning success.
METHODS. Data are collected by AVEA ventilator system (Cardinal Health, USA). Considering the weaning success at 12th hour, 12 patients are eligible for the study. Different signal features are measured at 5 procedures:
Procedure1: End-expiratory occlusion of the airways during controlled mechanical ventilation (CMV) of sedated patient to evaluate spontaneous breathing efforts from the airway pressure (Paw) by the maximal inspiratory pressure (MIP), the mean amplitude, duration and slope of the negative swings during inspiration attempts (DPpeak, Ti, Slope);
Procedure2: Series of ventilations with different tidal volumes (Vt) in sedated-paralyzed patient to evaluate on Paw the work of breathing (WOB) to overcome: the intrinsic positive end-expiratory pressure (WOBpeep); the elastic (WOBe), viscoelastic (WOBve) and resistive (WOBr) properties of the respiratory system;
Procedure3: Pressure support ventilation (PSV) at zero back-up pressure to evaluate Paw at 100 ms of airways occlusion (P0.1);
Procedure4: PSV with decreasing support levels of Paw (Psup) in 1–4 steps to evaluate P0.1 and MIP during 20 s of PSV interruption (mean value for several interruptions at a constant Psup level);
Procedure5: Spontaneous breathing trial with Psup = 8 cmH2O to evaluate MIP as above.
RESULTS. All measurements are presented as mean ± standard deviation. Procedure1: MIP = 3.8 ± 0.7 cmH2O, DPpeak = 1.9 ± 0.8 cmH2O, Ti = 1.2 ± 0.4 s, Slope = 1.8 ± 1 cmH2O/s; Procedure2: WOBpeep = 1696 ± 646 mL.cmH2O, WOBe = 3998 ± 1754 mL.cmH2O, WOBve = 950 ± 1003 mL.cmH2O, WOBr = 3531 ± 1020 mL.cmH2O; Procedure3: P0.1 = -2.4 ± 1.6 cmH2O; Procedure4: Psup = 19.3 ± 4 cmH2O (levels 1-4), MIP = -11.1 ± 9.3 cmH2O (levels 1-4), P0.1 = 0.4 ± 1.7 cmH2O (level 1). Procedure5: Psup = 9.1 ± 0.5 cmH2O, MIP = -17.7 ± 10.5 cmH2O.
CONCLUSIONS. The reported ranges of measurements on Vt, Paw signals for assessment of the patient status during 5 procedures of the weaning process show the response of patients who are ready for MSV stopping. These features could support objective criteria for prediction of positive outcome.
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2010;35(1):88–94. 3. Tobin M. Principles and practice of mechanical ventilation. Tobin MJ, editors. New York: McGraw Hill, Inc; 2006.
GRANT ACKNOWLEDGMENT. This study has been supported by the Bulgarian National Science Fund grant DTK 02/48.

0229
TIDAL VOLUME DELIVERY FROM ICU VENTILATORS IN BTPS CONDITION. A BENCH MODEL

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INTRODUCTION. Significant differences in delivered tidal volumes (VT) as compared to preset VT were found among ICU ventilators in a bench study done in ATPD condition [1]. Extrapolation to BTPS condition extended these differences.
OBJECTIVES. To assess the delivery of VT in true BTPS conditions in a specific bench model.
METHODS. Six ICU ventilators, two with built-in expiratory filter (Avea, PB 840) and 4 without (Engström, Evita XL, Evita V500, Servo-i) were set in volume controlled, BTPS condition and heated humidifier on. They were connected to a lung model (compliance 16 ml cmH_2O^{-1} and resistance 20 cm $H_2O.L^{-1}.s$) placed inside a neonatal incubator. The temperature was targeted at 37 °C in both heated humidifier and incubator. The set-up was run for 24 h. At the end of the period, delivered VT was measured at four VTs (300, 400, 500 and 800 ml) by using Fleish 4 pneumotachograph. Ratio of delivered to set VT was computed.
RESULTS. In BTPS condition, delivered VT averaged 96 ± 3 % for Avea, 100 ± 7 % for PB 840, 90 ± 2 % for Evita XL, 100 ± 7 % for Evita V500, 105 ± 2 % for Servo-i, and 108 ± 4 % for Engström ($P < 0.0001$) (Fig. 1). *$p < 0.05$ versus Avea and **$p < 0.05$ versus PB 840.

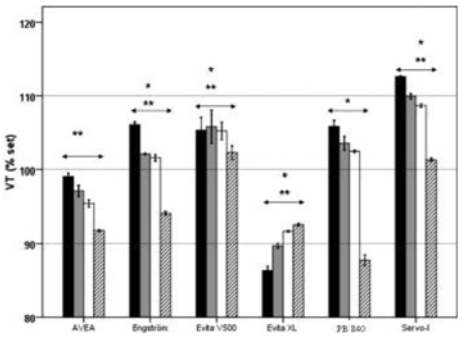

Fig. 1

CONCLUSIONS. In actual BTPS conditions simulated on the bench, VT differed substantially across ICU ventilators.
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0230
IMPLICATIONS OF HEART AND LUNG INTERACTIONS DURING THE FIRST 3 MINUTES OF APNEA TESTING IN CPAP

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INTRODUCTION. Since the circulatory and pulmonary systems are both driven by pressure and share space in the torax, it is inevitable their interaction.This is of extreme importance to the intensivist.
OBJECTIVES. To assess the haemodynamic effects that take place in the first 3 min of an apnea testing in continuous positive airway pressure (CPAP) by an arterial pulse contour waveform analysis and transpulmonary thermodilution catheter.
METHODS. Prospective study in a 24 beds intensive care unit of an university hospital. The haemodynamic monitoring was performed in all the patients using a femoral artery catheter PICCOplus (Pulsion Medical Systems, Munich, Germany). All of them were mechanically ventilated by intermittent positive pressure ventilation IPPV (Dräger Evita® XL) with a tidal volume between 6 and 8 ml/kg. Before the test was started they were preoxigenated for 15 min with 100 % FIO2 and the arterial catheter calibrated by transpulmonary thermodilution with three boluses. They were changed from IPPV to CPAP with 8 cm of H2O and a trigger of -0.3 l/min. The haemodynamic values at the beginning of the test (T0) and 3 min later (T3) were collected. Neither fluids intake nor vasoactive drugs where changed during the procedure.
RESULTS. In T0 75.47 % of the patients received vasoactive drugs, 58.5 % noradrenaline, mean dose 0.61 mg/kg/min (SD 1.75), 20.75 % dobutamine, mean dose 5.17 mg/kg/min (SD 3.24), and both 13.46 %. Fluids balance in the last 24 h was 925.97 ml (DE 2046.08). The mean tidal volume was 571.74 (SD 64.40 ml), and weight adjusted 7.34 ml/kg (SD 1.43). Other haemodynamic values in T0: global end-diastolic volume index (GEDVI) 689.16 ml/m2 (DE 197.65), extra-lung water index (ELWI) 8.89 ml/kg (SD 2.78 ml/kg). The cardiac index (pCCI)and cardiac output (pCCO) variation in T0-T3 interval were both significative ($p = 0.020$) and ($p = 0.029$) respectively. Systolic volume variation (SVV) fall in a 4.95 % and it was also significative ($p < 0.001$). The indexed systemic vascular resistance (ISVR) change in T0–T3 interval was mild. The haemodynamic variations in T0-3 did not depend on neither the presence nor associations between the vasoactive drugs on T0.

Table 1 Haemodynamic values in T0, T3 and T0–T3 intervals

	T0	T3	T0-3
pCCI (L/min/m^2)	3.05 (0.87)	3.28 (1.09)	−0.23 (0.66)
pCCO	5.68 (1.80)	6.13 (2.14)	−0.45 (1.19)
ISVR (din/seg/cm^5/m^2)	2,305.56 (846.47)	2283.60 (794.56)	22.26 (487.21)
SVV	11.98 (7.76)	7.18 (6.46	4.95 (6.47)
SVI	35.67 (12.25)	36.45 (14.54)	−1.60 (6.33)
HR	88.18 (21.77)	90.79 (19.46	−2.44 (9.60)
SBP	126.52 (23.28)	132.62 (28.35)	−5.88 (29.48)
MBP	87.68 (16.9)	92.19 (23.78)	−4.54 (22.00)
Lactate	13.18 (9.92)	12.67 (9.76)	0.65 (1.07)

CONCLUSIONS. As intrathoracic pressure fall with the change from IPPV to CPAP, a concomitant fall in SVV happens. In spite of the ISVR fall, the pCCI and pCCO increased during the first 3 min of the test.
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0231
PERFORMANCE OF AN ICU VENTILATOR AND TWO TURBIN-BASED VENTILATORS DEDICATED TO NON INVASIVE VENTILATION (NIV) IN SIMULATED HIGH INSPIRATORY EFFORT AND RATE: A NIV BENCH-STUDY

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INTRODUCTION. The role of turbine-based NIV ventilators (TBV) versus ICU ventilators with NIV mode activated (ICUV) to deliver NIV in case of severe respiratory failure remains debated.
OBJECTIVES. To compare the response time and pressurization capacity of TBV and ICUV during simulated NIV with normal and increased respiratory demand, in condition of normal and obstructive respiratory mechanics.
METHODS. In a two-chamber lung model, a ventilator simulated normal (P0.1 = 2 mbar, respiratory rate RR = 15/min) or increased (P0.1 = 6 mbar, RR = 25/min) respiratory demand. NIV was simulated by connecting the lung model (compliance 100 ml/mbar; resistance 5 or 20 l/mbar) to a dummy head equipped with a naso-buccal mask. Connections allowed intentional leaks (29 ± 5 % of insufflated volume). Ventilators to test: Servo-i (Maquet), V60 and Vision (Philips Respironics) were connected via a standard circuit to the mask. Applied pressure support levels (PSL) were 7 mbar for normal and 14 mbar for increased demand. Airway pressure and flow were measured in the ventilator circuit and in the simulated airway. Ventilator performance was assessed by determining trigger delay (Td, ms), pressure time product at 300 ms (PTP300, mbar s) and inspiratory tidal volume (VT, ml) and compared by three-way ANOVA for the effect of inspiratory effort, resistance and the ventilator. Differences between ventilators for each condition were tested by one-way ANOVA and contrast (JMP 8.0.1, $p < 0.05$).
RESULTS. Inspiratory demand and resistance had a significant effect throughout all comparisons. Ventilator data figure in Table 1 (normal demand) and 2 (increased demand): (a) different from Servo-i, (b) different from V60.

Table 1 Ventilator data (normal demand)

P0.1/RR/PSL	Resistance (l/mbar)	Ventilator	Td (ms)	PTP300 (mbar s)	VT (ml)
2/15/7	5	Servo-i	108 ± 9	0.44 ± 0.04	508 ± 2
2/15/7	5	V60	58 ± 9[a]	0.28 ± 0.06[a]	631 ± 3[a]
2/15/7	5	Vision	81 ± 16[a,b]	0.24 ± 0.03[a]	637 ± 5[a,b]
2/15/7	20	Servo-i	124 ± 10	0.53 ± 0.06	478 ± 6
2/15/7	20	V60	65 ± 10[a]	0.76 ± 0.05[a]	571 ± 5[a]
2/15/7	20	Vision	68 ± 7[a]	0.49 ± 0.05[b]	597 ± 7[a,b]

Table 2 Ventilator data (increased demand)

P0.1/RR/PSL	Resistance [l/mbar]	Ventilator	Td [ms]	PTP300 [mbar *s]	VT [ml]
6/25/14	5	Servo-i	74 ± 2	1.26 ± 0.02	811 ± 3
6/25/14	5	V60	85 ± 8 [a]	0.77 ± 0.24 [a]	818 ± 10
6/25/14	5	Vision	101 ± 11 [a,b]	0.93 ± 0.12 [a,b]	801 ± 21 [b]
6/25/14	20	Servo-i	89 ± 6	1.49 ± 0.07	532 ± 11
6/25/14	20	V60	115 ± 8 [a]	0.30 ± 0.05 [a]	510 ± 13 [a]
6/25/14	20	Vision	134 ± 10 [a,b]	0.93 ± 0.08 [a,b]	499 ± 9 [a,b]

CONCLUSION. In this NIV bench study, with leaks, trigger delay was shorter for TBV with normal respiratory demand. By contrast, it was shorter for ICUV when respiratory demand was high. ICUV afforded better pressurization (PTP 300) with increased demand and PSL, particularly with increased resistance. TBV provided a higher inspiratory VT (i.e., downstream from the leaks) with normal demand, and a significantly (although minimally) lower VT with increased demand and PSL.

0232
UTILIZATION OF A CLOSED LOOP DEVICE TO TITRATE OXYGEN FLOW (FREEO$_2$) IN COPD EXACERBATION. A RANDOMIZED CONTROLLED PILOT STUDY

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INTRODUCTION. We developed an innovative device (FREEO$_2$) that automatically adjusts the oxygen flow (in order to reduce hyperoxia and hypoxemia) and allows remote monitoring. We tested the feasibility of using such device in the clinical practice in patients with COPD exacerbation.

OBJECTIVES. The main objective of the study is to evaluate if this system can be used in daily practice and to assess if accepted by the healthcare team. The secondary objectives are to evaluate if oxygenation is adequately maintained with this device used during several days.

METHODS. We conducted a randomized controlled study comparing usual oxygen administration and FREEO$_2$ (automated adjustment and remote monitoring) at the at pulmonology department in patients hospitalized for an exacerbation of COPD requiring oxygen therapy with moderate oxygen flow rates. We evaluate this objective by daily administrations of a visual analogue scale Lickert type to determine the perception of this new tool by nurses and physicians. Patients in both groups had continuous monitoring of SpO2, respiratory rate, heart rate and EtCO2. We evaluated for all patients (1) the time in the target zone as defined by the physician in charge for each patient ± 2 (2) the time with desaturation (SpO2 below 85 %) and (iii) the time with hyperoxia (SpO2 > 5 % above the target).

RESULTS. We plan to include 25 patients in each group, we present here the results concerning 14 patients included (8 FREEO$_2$ and 6 usual oxygen administration). The technical setting of the study is available on the following link: http://www.youtube.com/watch?v=JmGy8–gRt0. Mean patient's age was 73 ± 9 with mean FEV1 of 720 ± 330 ml and mean initial oxygen flow was 3.1 ± 2.3 L/min. The oxygen adjustment was quoted by the nurses at 8.6 ± 1.8 and 9.5 ± 0.9 on a lickert scale (1 = very bad to 10 = very good), in the FREEO$_2$ group and in the Manual group respectively (P = NS). The oxygen adjustment was quoted by the physicians at 7.5 ± 2.5 and 4.2 ± 3.9 ($p < 0.05$). The % of time within the SpO$_2$ target was 86.1 ± 9.3 with FREEO$_2$ versus 65.3 ± 13.3 with usual adjustment ($p < 0.05$). The % of time with desaturation was 0.2 ± 0.2 versus 1.9 ± 1.8 ($p < 0.05$) and the % of time with hyperoxia was 0.8 ± 0.9 versus 13.4 ± 3.3 ($p < 0.05$). The following figure shows example of 30 min tracings with constant oxygen flow at 1 L/min (upper panel) and with FREEO$_2$ (with SpO$_2$ target set at 91 %) (lower panel).

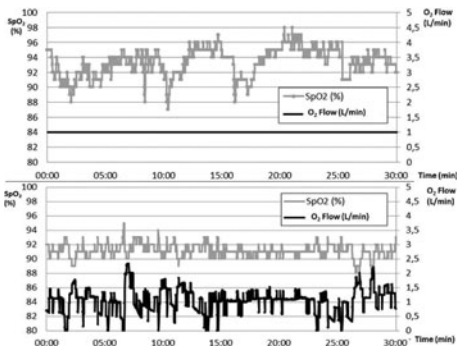

Fig. 2 Examples of tracings with constant flow and FREEO$_2$

CONCLUSIONS. In these preliminary results, the FREEO$_2$ system was well accepted by the nurses and the physicians of a pulmonology department in COPD patients requiring oxygen therapy during an exacerbation. The system maintained the SpO2 target better than did the manual adjustment and reduced both desaturations and hyperoxia. The clinical usefulness and the impact on important outcome parameters of such system remains to be demonstrated.

GRANT ACKNOWLEDGMENT. Fonds de Recherche en Santé du Québec, Fondation Canadienne pour l'Innovation (Fond des Leaders).

0233
BENEFITS OF HIGH FLOW NASAL OXYGEN CANNULA THERAPY AFTER ENDOTRACHEAL EXTUBATION

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INTRODUCTION. Oxygen delivery via a face mask is routinely used after endotracheal extubation, but this method may be inadequate in some patients especially if they require high flow rate of gases. High flow nasal oxygen cannula (HFNC) is a new technological device to supply high flow rate of gases and it may reduce dyspnea and work of breathing in extubated patients. But the evidence for using HFNC in this patient group is limited.

OBJECTIVES. To compare the benefits of HFNC with conventional oxygen face mask in extubated patients in terms of dyspnea, physiologic variables, and patient discomfort.

METHODS. Randomized cross-over study was conducted in mechanically ventilated patients for more than 24 h, who were ready for extubation. After extubation, the patients were divided into *Protocol A*—applied HFNC for 30 min, and then followed by conventional oxygen face mask for another 30 min, or *Protocol B*—applied conventional face mask before, and then followed by HFNC in the same period of duration. Dyspnea and patient discomfort were assessed by visual analog scale. Respiratory rate, oxygen saturation, blood pressure, and heart rate were recorded at immediately after apply each intervention, 5, 10, 15, and 30 min.

RESULTS. Seventeen patients were studied (9 patients in protocol A, and 8 patients in protocol B). The baseline characteristics and hemodynamic parameters before endotracheal extubation were not different in each protocol. COPD with exacerbation and pneumonia are common causes of acute respiratory failure. At the end of study, HFNC group was less dyspnea ($p = 0.04$), lower respiratory rate ($p = 0.009$), and lower heart rate ($p = 0.006$) when compared with conventional oxygen face mask. Most of them (88.2 %) preferred HFNC than conventional face mask.

CONCLUSIONS. HFNC is a better method for extubated patients in improving dyspnea, respiratory rate, and heart rate when compared with conventional oxygen face mask and this device may have an important role after endotracheal extubation.

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0234
IN VITRO EVALUATION OF SIX DIFFERENT HEAT MOISTURE EXCHANGERS FOR SPONTANEOUSLY BREATHING TRACHEOSTOMIZED PATIENTS

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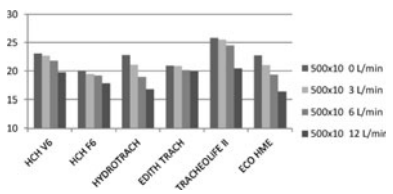
INTRODUCTION. Heat wire humidifiers (HMEs) are useful in chronically tracheostomized patients who breath spontaneously because heating and humidifying inspiratory flow improves lower airways function, viscosity of secretions, also reducing bacterial colonization. All HMEs for spontaneously breathing tracheostomized patients have the possibility to administer an additional O_2 flow in order to increase FiO_2 delivered to the patient.

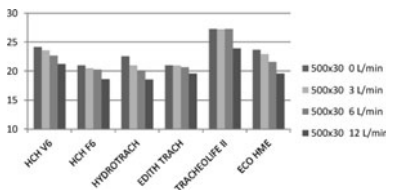
OBJECTIVES. The aim of the study was to test the efficiency of six different HMEs (HCH-V6, Medival; HCH-F6, Medival; Hydro-trach, Intersurgical Ltd; Edith Trach, GE Healthcare; Tracheolife II, Mallinckrodt DAR; ECO, Air Safety Limited) for sponteously breathing tracheostomized patients in a normothermic patient model at different minute ventilation (V_E) and oxygen flow.

METHODS. We tested the efficiency of HMEs using an in vitro lung model at two different V_E (5 and 15 L/min) and four different levels of O_2 flow (0,3,6 and 12 L/min). Wet and dry temperature of the inspiratory flow was measured and then relative and absolute humidity was calculated. We also evaluated the efficiency of each HMEs at 0, 12 and 24 h. Resistance of each HMEs was measured at the beginning and after 24 h.

RESULTS. Tracheolife II had higher gas temperature and absolute humidity in all conditions. All devices suffered a loss of efficiency at the lower V_E. The loss of efficiency detected in all HMEs was inversely proportional to the increase of O_2 flow. No significant changes in efficiency were detected during the 24 h working. No difference of resistance at 0 and 24 h was detected.



Graph 1



Graph 2

CONCLUSIONS. This study shows that efficiency of these HMEs is significantly affected by O_2 supplementation and is better at higher V_E.

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0235
EXTRACORPOREAL CARBON DIOXIDE REMOVAL: A NEW LOW FLOW VENO-VENOUS DEVICE IN LUNG TRANSPLANTATION

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INTRODUCTION. Ventilation-refractory hypercapnia may frequently occur in patients undergoing lung transplantation, during the surgical procedure because of one lung ventilation, or in the post-operative period in case of primary lung dysfunction (PGD). When conventional therapies like ventilatory support, administration of inhaled nitric oxide (iNO) and intravenous prostacyclins are inadequate, additional extracorporeal gas exchange could be necessary to recover lung function. ProLung is a new veno-venous low-flow extracorporeal device to remove carbon dioxide in patients with respiratory acidosis.

METHODS. On March and April 2012, a 27-year-old woman and a 28-year-old men underwent double sequential lung transplantation, both affected by cystic fibrosis. The first patient developed ventilation-refractory hypercapnia during the one lung ventilation in the operatory theatre; the men developed severe PGD in the postoperative period. The treatments already included ventilatory and hemodynamic support, iNO, and prostaglandine E1, but when partial pressure of CO_2 reached values greater than 90 mmHg with pH <7.2 we started treatment with ProLung to remove CO_2, using a central double lumen catheter. Hemodynamic and respiratory parameters were assessed at baseline and during the treatment.
RESULTS. During the study we assisted to the hemodynamic parameters improvement with artery pressure increase, reduction in pulmonary and systemic resistances and progressive increase in cardiac index. pH values got gradually normal and partial pressure of CO2 reduced. At the same time ventilatory support was reduced, thereby mitigating biotrauma, barotraumas and the risk of volutrauma. In the case of PGD, the ProLung was useful for the weaning from mechanical ventilation, too.
CONCLUSIONS. Pro-Lung did not need a specialized staff and no adverse events occurred during the treatment. Thanks to its low invasivity and the absence of hemodynamic effects, in our initial experience, the use of ProLung may be an important aid for patients with mild hypoxia, but severe respiratory acidosis, in association with conventional therapy during the perioperative period in lung transplantation. Furthermore it could be an useful device for the earlier weaning from mechanical ventilation, reducing the serious risk of lung infection in lung transplanted patients.

0236
CLOSE-LOOP OXYGEN TITRATION SYSTEM (FREEO$_2$) DURING NONINVASIVE VENTILATION AND CPAP IN HEALTHY SUBJECT WITH INDUCED HYPOXEMIA

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INTRODUCTION. We have developed a new system that titrate oxygen flow to maintain a stable SpO_2 (FREEO_2). Preliminary studies were conducted in spontaneously breathing patients. In this study we have evaluated the FREEO_2 system during noninvasive ventilation and CPAP.
OBJECTIVES. To evaluate if automated adjustment of oxygen during NIV is efficient and safe in a dynamic situation with variations of SpO_2. To evaluate the potential for workload reduction in comparison with manual adjustment.
METHODS. We performed a randomized controlled study, in healthy subjects with induced hypoxemia (breathing a mixture of air + nitrogen) during 3 situations: NIV (PSV/PEEP 7/3 cmH_2O), CPAP (5 cmH_2O) and spontaneous breathing without support. Three hypoxic challenges of 5 min (FiO2 8, 11 and 14 %) were conducted. For each condition, we compared automatic oxygen titration (FreeO_2) and manual oxygen titration by an experienced respiratory therapist. The target for SpO_2 range was 92–96 %.
RESULTS. The main results for % time in different SpO_2 ranges are displayed in the Fig. 1. The second figure shows the workload (number and duration of interventions to titrate oxygen flow) in the manual group.

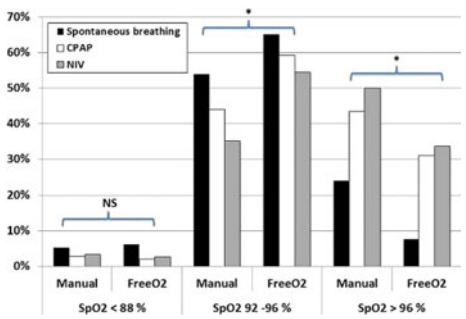

Fig. 1 % of time in different SpO2 range

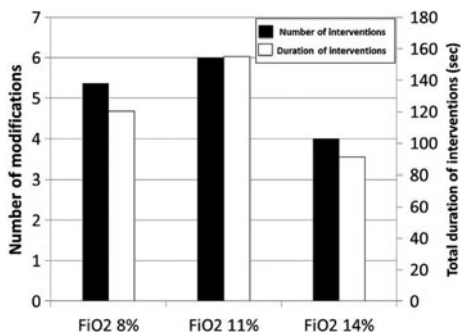

Fig. 2 Workload in the manual condition

CONCLUSIONS. FreeO_2 can safely be used for oxygen administration during NIV or CPAP. The performances to maintain the SpO_2 target for FreeO_2 were equivalent or slightly better than during manual titration in the setting of this study protocol. FreeO_2 may allow decreasing the workload of hospital staff for adjustment of oxygen flow during NIV or CPAP.
GRANT ACKNOWLEDGMENT. Fonds de Recherche en Santé du Québec, Fondation Canadienne pour l'Innovation (Fond des Leaders).

0237
PLASMAPHERESIS: A REVIEW OF OUR PRACTICE WITH AN UNUSUAL TECHNIQUE IN ICU

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INTRODUCTION. Therapeutic Plasma Exchange (TPE) or plasmapheresis is an extracorporeal blood purification technique designed for the removal of large-molecular weight substances such as pathogenic auto antibodies, immune complexes, cryoglobulins, myeloma light chains, endotoxins, and cholesterol-containing lipoproteins. Since its introduction in clinical practice to treat Goodpasture disease in the 70 s, TPE indications have been changing. Since 1985, the American Medical Association (AMA) Council on Scientific Affairs have been reviewing the available data for the efficacy of plasma exchange and assigned each potential indication into 4 categories, according scientific evidence (from category I - indicated to category IV-no evidence to perform).
OBJECTIVES. The authors present a retrospective study where they analyze all TPE procedures that took place in a single hospital from 2007 to 2012. There were analyzed patient characteristics', indications for TPE, technical prescription parameters, complications and outcomes.
METHODS. Patients were admitted in Intensive Care Unit and in Hemodialysis Unit.
RESULTS. There were performed a total of 111 sessions in 18 patients. Sixty-one percent were male. The mean age was 49 years old. The patients were stratified by AMA categories and the characteristics and outcomes were compared. Sixty-eight percent of the patients performed TPE for a category I indication. The mean age of the patients that performed TPE in category I was higher (52.6 years) compared to the mean age in category IV (39.7 years). Half of the patients performed TPE for neurological reasons, 33 % performed TPE for hematological reasons and 17 % performed TPE for a Goodpasture Syndrome. In 61 % of the sessions, albumin was the replacement fluid used, in 28 % fresh frozen plasma (FFP) was used, and in 11 % an association of both was used. The mean replacement volume used was 2,814 (900–4,000) ml. A mean of 6.2 (4–12) sessions were performed and in 61 % of the cases in alternate-day exchanges. Only 83 % of the patients have completed the treatment. The total complications' rates related with the technique were 11 %, and they were minor complications. Eighty percent of the patients presented clinical improvement, although all of them also performed the conventional therapy of the disease. The hospital mortality rate was 16.7 % and the same percentage of patients became dependent on dialysis. Two patients presented recurrence of the disease. The mortality rate at 28 days and 6 months was 0 %.
CONCLUSIONS. Although guidelines are useful to help us in rare conditions, clinical evaluation is essential to choose therapies. It is particularly relevant when the situation is infrequent and life threatening and when it involves the management of not well studied techniques. That's why more studies are required to conclude about TPE indications. Our revision led us to the institution of a new protocol about this treatment concerning to the prescription of TPE.

Improving communication in the ICU: 0238–0251

0238
A SURVEY OF INTENSIVE CARE UNIT DISCHARGE COMMUNICATION PRACTICES IN THE UNITED KINGDOM

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INTRODUCTION. Effective communication between medical teams is important in the safe delivery of healthcare [1]. Patients discharged from Intensive Care Units (ICUs) often have complex medical problems, necessitating high quality discharge communication between ICU and receiving ward teams.
OBJECTIVES. To explore current UK trends in ICU discharge communication practices.
METHODS. An online questionnaire was constructed using Google Docs (Google Inc., Mountain View, CA, USA) and approved by the UK Intensive Care Society (ICS) before being publicised to ICS members via e-mail and the 'Linkman Scheme'. Responses were collected from 1 Dec 2011 to 1 Mar 2012. To avoid duplicate responses from a single ICU, we asked that respondents state their hospital affiliation.
RESULTS. Clinicians from 60 separate ICUs responded: 55 from England, 4 from Scotland and 1 from the Channel Islands. The ICUs were located in district general hospitals (71.7 %) and teaching hospitals/regional tertiary referral centres (28.3 %).
Discharge Letters: 57 of the 60 responding ICUs (95.0 %) produce a structured discharge letter summarising care given (Table 1).

Table 1 Discharge letter content

The letter includes a plan for:	Number of responses (%), n = 57
Further treatment	50 (87.7 %)
Recommended further investigations	47 (82.5 %)
Agreed limitations to treatment	46 (80.7 %)
Monitoring goals on the ward	41 (71.9 %)

Verbal handover: 78.3 % of surveyed ICUs conduct verbal handover via telephone, while 16.7 % give face-to-face handovers to receiving doctors. In person nurse-to-nurse handover occurs in 60.7 % of ICUs. 3.3 % of ICUs use other methods, including written proformas and the "SBAR" communication tool.
Post-discharge Review and Critical Care Outreach Service: ICU doctors routinely review patients in only 3 (5.0 %) of the surveyed units. 52 (86.7 %) of the surveyed ICUs have a Critical Care Outreach Team (CCOT), of these, 49 (94.2 %) routinely review patients on the wards at least once following discharge. 32.7 % of CCOTs are available 24-h-a-day 7-days-a-week for support.
Information given to Patients, Relatives and General Practitioners (GPs): 36.7 % of units forward a discharge letter to the patients' GP. 58.3 % of units do not formally give discharge information to patients or relatives. If information is given, it is verbal (21.7 %) or a separate written document distinct from the discharge letter (15.0 %) (Table 2).

Table 2 Information given to patients/relatives

Form of information given on discharge from ICU	Number of responses (%), n = 60
No formal information given	35 (58.3 %)
Patients/relatives given a verbal summary	13 (21.7 %)
Patients/relatives given a copy of the discharge letter	0 (0.0 %)
Patients/relatives given another form of written documentation	9 (15.0 %)

CONCLUSIONS. Most ICUs in the UK provide both verbal and written information for ward teams. The vast majority of units issue discharge letters to receiving doctors. We note the lack of information given to patients and their relatives, especially as patients are now routinely copied into other medical correspondence. Interestingly, only a minority of ICUs send a letter to the patientś GP, who could benefit from knowledge of such a care episode. CCOT provides most of the routine follow-up for patients following ICU discharge.
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GRANT ACKNOWLEDGMENT. Conducted without funding.

0239
IMPROVING COMMUNICATION IN A NEURO-TRAUMA CRITICAL CARE UNIT

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INTRODUCTION. The importance of clear communication among healthcare professionals is well recognised. Failure in communication can lead to patient harm and increase the length of stay in hospital [1]. In the critical care setting, patient care is dependent on collaboration between the multidisciplinary team; these discussions define the patients' 'daily goals' and guide clinicians' actions. However, these goals are not always explicitly documented. Evidence suggests that poor documentation impairs understanding of shared goals between doctors and nurses [2]. The implementation of a daily goals sheet has been shown to improve collaboration between team members by establishing a mutual understanding of the plan of care and results in increased quality of care [1, 3, 4].
OBJECTIVES. We aimed to determine whether implementing a daily goals sheet would improve understanding of patient goals in our critical care unit.
METHODS. The study setting was a 22 bed neuro-trauma critical care unit. We undertook a descriptive correlational study of common goals verbally stated and documented during ICU ward rounds. 25 patients were sampled prior to the redesign of the daily chart to incorporate a daily goals section and 35 patients following the implementation of the daily goals concept. The bedside nurses' understanding of patient goals following the ward rounds were noted for all patients prior to and following the introduction of the daily goals sheet.
RESULTS. 209 goals were recorded before and 348 goals after implementation of the daily goals sheet. Documentation of verbally stated goals remained the same, whilst the number of goals recalled by nursing staff significantly increased from 53 to 75 %. Nurse-recalled goals improved across all categories including a 34 % improvement in GI/nutrition goals and a 28 % improvement in cardiovascular goals.
CONCLUSIONS. Our results suggest daily goals sheets have improved nurses' understanding of each patient's daily plan and are a useful communication tool in the ICU setting. Further research should ascertain if these results translate into a significant reduction in adverse outcomes and if the same tool can be used to improve communication with other disciplines.
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0240
FULL DISCLOSURE AFTER A LETHAL, PREVENTABLE MEDICATION ERROR

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INTRODUCTION. There is increased attention for full disclosure after adverse events. Revealing a medical or nursing error to a patient or his relatives is often difficult. Feelings of shame, guilt, incompetence and possible legal consequences make caregivers extremely reluctant to disclose the occurrence of an error [1]. Caregivers who express personal regret and apologize may strengthen the caregiver-patient relationship. Patients and their relatives appreciate the honesty and are often able to forgive [2].
On the 29th of December 2010 a lethal error occurred at our ICU.
One of the ICU nurses accidentally administers an oral drug into a CVC IV system. The patient went into an irreversible CPR setting and died after 40 min of resuscitation.
METHODS. VUmc implemented and promotes full disclosure for all VUmc professionals. There is a clear guideline available [3]. If needed support is given to individual caregivers or wards in which the full disclosure guideline is leading.
RESULTS. Directly after the incident the family was informed by telephone and within 3 h the error was disclosed. The involved nurse participated during the conversation with family members. The nurse apologized and admitted making a mistake. During the following months several meetings took place with the family. Three of the meetings were at the home of the deceased's partner. The family was given full disclosure of all the data and analysis and received all written communication between our ICU, the Dutch Healthcare Inspectorate and the Department of Justice. The family was also informed concerning temporally and final improvement measures. The deceased's partner made a financial claim of € 5.000 which was paid instantly. The VUmc ward of Psychology supported the deceased's partner for 6 months.
Despite the deepest possible grief, the family experienced satisfaction with overall delivered care and the disclosure after the incident. There was no sanction for the involved nurse. The nurse had minimal absence after the incident and is still functioning as an ICU nurse. VUmc board and ICU management actively supported family and nurse.
CONCLUSIONS. Complete, consistent and comprehensive information should be given after a medical or nursing error. Honesty and transparency should be the cornerstone in behavioural elements for caregivers. After a lethal error on our ICU we performed a full disclosure strategy and sustained this strategy during the following 10 months of the process. Our experience supports the evidence that full disclosure can have positive effects on healing and satisfaction of care and the potential height of financial claims.
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0241
A QUALITATIVE STUDY OF THE HEALTHCARE WORKERS' EXPERIENCE OF THE ICU DIARIES

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INTRODUCTION. The objective of the study was to assess the experience, burden and opinion of healthcare workers in using ICU diaries.
METHODS. We performed a descriptive, single center, qualitative study using in-depth semi-structured interview techniques in a medical-surgical intensive care unit (ICU) in a 460-bed tertiary hospital. 23 nurses, 6 physicians, 4 residents and 4 nursing assistants participated in the study. They were interviewed at the end of 6 months of using an ICU diary according to an interview guide which was created by two physicians and three ICU nurses. All interviews were audio-recorded with healthcare workerś permission, transcribed verbatim and analyzed using IPA (Interpretative Phenomonological Analysis). Individual transcripts were read thoroughly and repeatedly, and then coded to identify initial themes. This was close to being a free textual analysis. Recurrent themes were then identified across the transcripts and were found to reflect a shared understanding of the phenomena in question among participants. This stage involved a more analytical ordering, as researchers tried to make sense of the connections between various themes, some of which tended to overlap. The process was dynamic and cyclic, with each transcript leading to the collection of further data and to their subsequent analysis. The aim was to recognize ways in which narratives from the participants could be similar but also different. Researchers were in fact disciplined to discern returning patterns while also integrating new emerging issues, so as to take into account convergences and divergences in the data. The last stage involved the production of a coherent ordered table of the themes.
RESULTS. From the phenomonological analysis, we found two axes of experience: writing and reading in the diaries. Studying these axes shed light on 4 main themes related to healthcare workers experience: the suffering of the families, the diary as a source of information for families with the difficulties to deliver bad news in writing, the search for the appropriate balance in the relationship between the patient and his relatives, and the diary as a tool for the patient to reconstruct the process of his illness.
CONCLUSIONS. The healthcare workers thought that the diary had a beneficial effect in the face of the suffering of families and in piecing together the ICU story of the patient. However, they reported that the amount of intense emotion arising out of knowing so much of the personal lives of the patients and their families was difficult to handle. This fear of close involvement may lead to difficulties in working. We are favorable to the use of ICU diaries, but the role of emotion in the patient-family relationship through the experience of writing and reading the diaries deserves more attention, particularly in its relation to inexperienced ICU workers.
GRANT ACKNOWLEDGMENT. This study was supported by the French Society for Critical Care (SRLF).

0242
A SURVEY OF ICU MEDICAL STAFF ON INTERDISCIPLINARY COMMUNICATION ABOUT END-OF-LIFE CARE AND BURNOUT

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INTRODUCTION. Care of ICU patients at the end-of-life (EOL) is distressing for physicians and nurses. Risk for burnout may be aggravated by poor interdisciplinary communication.
OBJECTIVES. To correlate measures of burnout with nurses' and physicians' perceptions about communication.
METHODS. Participants: All working ICU physicians and examined nurses. ICU characteristics: 72 surgical, neurological and cardiological ICU beds. Survey: self-developed items [1–5] and the revised German version of the Maslach Burnout Inventory (MBI, 21-item questionnaire with 3 subscales describing emotional exhaustion, depersonalisation and (lack of) personal accomplishment).
RESULTS. 174 of 284 staff members responded (61 %), 73 % nurses and 27 % physicians. 75 % of nurses and 37 % of physicians were female. Age distribution was similar, but nurses had more years' ICU experience than physicians ($p = 0.01$).
Median MBI subscale scores were similar; 31 % of nurses and 21 % of physicians were at risk for MBI using a cut-off ≥ 4 over all subscales [6]. A third of staff (34 % nurses, 35 % physicians) felt unsure about EOL decisions. However, fewer nurses than physicians were satisfied with EOL decisions and communications (83 vs. 43 and 70 vs. 26 %, respectively, both $p < 0.001$). Nurses were significantly more often uncertain about their role in EOL-decision-making and communication, received less information and rated the quality of

interdisciplinary collaboration lower than physicians. 97 % nurses and 96 % physicians wished for SOPs concerning EOL-decision-making.
Regressional analysis, controlling for the effect of strain by general workload, revealed that emotional exhaustion was predicted by strain experienced in the EOL context which was itself predicted by uncertainty of one's role and perceived poor communication skills.
CONCLUSIONS. A recent single-center survey from France which compared ICU nurses and physicians [7] also found that more nurses than physicians had high MBI scores. Similar discrepancies between nurses' and physicians' evaluations of EOL decision-making were described in a German ICU survey [1]. Emotional burden in the end-of-life context may be lessened by improvements in role definition, participation and communication skills.
Trial registration: NCT01247792 clinicaltrials.gov.
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0243
SATISFACTION AND EMOTIONAL BURDEN OF RELATIVES ON THE ICU

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INTRODUCTION. Family members of critically ill patients are partners in multiprofessional decision-making and care but often feel uninformed and disenfranchised. Relatives of patients who die on the ICU suffer from emotional strain [1].
OBJECTIVES.
(1) Assessment of satisfaction of visiting family members and
(2) assessment of psychological burden in relatives of patients with severe sepsis and end-of-life decisions.
METHODS/SETTING. A university hospital with 72 surgical, neurological and medical ICU beds.
(1) From April until November 2011, visiting relatives of ICU patients staying >24 h were invited to fill out the validated German version of the Family Satisfaction in the ICU Questionnaire (FS-ICU) [2].
(2) Relatives of prospectively identified patients with severe sepsis who had received end-of-life therapy decisions were invited after 90 days to participate in a telephone interview including the Impact of Event Scale (IES), Hospital Anxiety and Depression Scale (HADS) and self-developed items on satisfaction with communication in the end-of-life (EOL) context [1]. Survey period was February 2011 until March 2012.
RESULTS. (1) The analysis of returned FS-ICU questionnaires confirmed that hand-out strategies had been successful to predominantly address relatives of long-staying patients (median ICU LOS 6.01 days vs. 1.03 days). The final sample contained 216 questionnaires (28 % response rate). Overall satisfaction of relatives was high (median 80 points on a 100 point scale, IQR 68–90). Items which offer most opportunity for improvement included "meeting emotional needs of relatives", "consistency of information" and "ICU atmosphere".
(2) 79 relatives of sepsis patients for whom therapy was limited at the end of life completed the 90-day follow-up interview. Posttraumatic stress symptoms (IES scale >32) were present in 52 %, anxiety and depression (HADS depression/anxiety score >7) were present in 46 and 35 %, respectively. Overall satisfaction with EOL communication was high.
CONCLUSIONS. Relatives of ICU patients were very satisfied with care and decision-making. Results were similar to a recent Swiss ICU survey [2]. Relatives of patients with severe sepsis showed less severe emotional strain than expected from the control arm (N = 52) of a French multicenter trial which found that a communication strategy lessened the emotional burden of relatives of ICU patients [1].
Trial registration: NCT01247792 clinicaltrials.gov.
REFERENCE. 1. Lautrette et al. NEJM. 2007. 2. Stricker et al. ICM. 2009.
GRANT ACKNOWLEDGMENT. Grant no. 01 E0 1002, BMBF (German Federal Ministry for Education and Research).

0244
PRACTICES OF RELATIONSHIP BETWEEN MEDICAL STAFF AND ICU PATIENTS' RELATIVES AND ETHICAL DECISIONS IN 66 SOUTHERN FRENCH INTENSIVE CARE UNITS: A ONE-DAY SURVEY

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INTRODUCTION. Since two French specific laws passed in 2002 and 2005 and the implementation of guidelines about End-of-Life (EoL) decisions, few studies reported information about EoL practices in French intensive care units (ICUs).
OBJECTIVES. The aim of this study was to evaluate the compliance with recommendations concerning the relationship between medical staff and ICU patients' relatives and about ethical decisions.
METHODS. This prospective observational study was a 1-day audit conducted from january to may 2009 in sixty-six Southern French ICUs.
RESULTS. 625 patients were included [median age: 63 (52–76) years, median SAPS II: 46 (34–58)]. The mean ICU length of stay was 18 ± 27 days. The written designation of a surrogate decision-maker (named person-of-trust in the French law) was reported for 87 (15 %) patients whereas 471 (81 %) patients had a referral relative identified. The patient's general practitioner was identified for 392 (63 %) patients and advanced directives were completed for only 4 % of patients. An EoL decision-making process was implemented for 210 (34 %) patients using an interdisciplinary approach for 99 (47 %) patients and was recorded in the medical chart for 63 (64 %) cases. Families were informed about medical decisions in 58 % cases, this proportion was higher (87 %) if a decision to forego life-sustaining therapy (DFLST) was made. Decisions to forego life support consisted in withholding treatments for 72 (94 %) patients and in withdrawal treatments for 5 (6 %) patients. In the multivariate stepwise logistic regression, four variables were independently associated with a DFLST: pre-existing dependence on others ($p < 0.0001$), advanced directives ($p = 0.01$), age ($p = 0.008$) and severity assessed by SAPS 2 score ($p = 0.009$).
CONCLUSIONS. The major finding of our study is the gap between the widely published and approved EoL recommendations made by scientific societies and the daily practices of Southern French ICUs. Health care teams involved in patient care before ICU admission don't seem to take into account the 2005 French law and its philosophy. They do not routinely identify official surrogate and do not anticipate EoL decisions. Information about EOL decisions is mostly shared with families even though documentation in the medical chart is still not sufficient. EoL practices have not really changed, in particular, withdrawal of treatment remains an uncommon decision for French intensivists.
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0245
COMMUNICATION WITH RELATIVES—IS IT TIME WE SET STANDARDS?

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INTRODUCTION. An essential part of critical care practice is to inform family and carers of significant developments and possible outcomes. There is a UK legal requirement, to consider the views of those close to the incapacitated patient regarding patient preferences, [2] but there is no professional standard against which these consultations are judged [1]. A European survey was conducted to discover what patients and relatives judged to be desirable characteristics of intensivists, and ranked communication as the second most desirable skill set [3]. We therefore determined the frequency and type of relative communication on our unit with a view to developing standards for communication regarding significant events in a patient's stay.
OBJECTIVES. To establish the frequency and nature of current communication practice with patient relatives in a large UK teaching hospital critical care unit.
METHODS. Retrospective review of all admissions (396 patients), spanning a 6 month period (Aug-Dec 2011), to the unit. All entries regarding any communication were scrutinised using comprehensive computerised patient records.
RESULTS. 396 patients were admitted, and all records reviewed. Communication entries regarding significant decisions/events during the patient's stay, and whether these topics were discussed within 24 h of the event occurring, were noted. These results revealed the following:

Table 1 Events discussed

Event	Percentage of patients (%)
Admission	43
Death or treatment withdrawal	92
Imposition of treatment limits	79
Tracheostomy insertion	55
Intubation	62
Patient surgery	65

We noted the seniority of the communicator, revealing the following:

Table 2 Seniority of communication lead

Communication lead	Percentage of communication sessions
Nurse	12 %
Senior House Officer	3 %
Junior Speciality Registrar	21 %
Senior Speciality Registrar	22 %
Consultant	42 %

It was also noted when and who performed the communicating.
Day (0800–1800) − 55 %
Night (1800–0800) − 45 %
A significant proportion of night discussions were regarding the reasons for admission, whereas those during the day revealed a more even spread of topics, e.g. updates and important events.

Table 3 Night communication session lead

Communication lead	Percentage of communication sessions (%)
Junior Speciality Registrar	31
Senior Speciality Registrar	52
Consultant	17

CONCLUSIONS. This review reveals that we failed to discuss significant events/decisions with all families, therefore not taking into consideration or aiming to discover what the patient's previous wishes are. The General Medical Council specifically states that these views should be considered [2]. The events chosen were felt to represent important points within a patient's stay and encompassed those with associated significant morbidity and mortality. Although no standards exist for the timing and contents of communication sessions, this review highlights the need for ones to be set. We should be aiming to discuss with all families significant events i.e. admission, withdrawal, death, tracheostomy, intubation and surgery within 24 h of the events. Wherever possible we should be discussing these situations during daytime hours when there is increased availability of both manpower and seniority of staff.
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0246
DIFFERENCES AMONG ICU DOCTORS AND NURSES FACING END-OF-LIFE DECISIONS ON PORTUGUESE ICU (RESULTS FROM THE DEFIVUCI STUDY)

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INTRODUCTION. Science and technological evolution have made possible to sustain, artificially, life in patients with previously fatal diseases. However, ICU team is daily faced with the appropriateness of those treatments, considering that in some of those patients, "there is a moment", after which there is no hope for recovering. In that "moment" end-of-life decisions (ELD) are needed to preserve dignity and prevent unnecessary suffering.
OBJECTIVE. Analyse and describe individual sentiments and perspectives of medical doctors and nurses facing end-of-life decisions on their own ICU.
METHODS. Medical doctors and nurses of ten Portuguese ICU have in the end-of-life decisions in intensive care units study (DEFiVUCI). Their individual perspective facing the excessive or the appropriateness of intervention with very severe patients in ICU patients was evaluated through a questionnaire with 20 questions organized according a 5 categories Likert's scale. Questionnaire was based on literature data, reviewed by three experienced ICU Directors and tested for comprehensiveness with ten ICU doctors and nurses, not involved in participants ICU. The questionnaire was personally delivered to participants by a local investigator. Results were anonymously sent back by mail through a pre-paid subscript.
RESULTS. 325 questionnaires have been delivered and 76 % received. Responders were 71 doctors and 176 nurses. 39 % working <5 years in Intensive Care, 25 % 5–10 years, 32 % 10–20 years and 4 % > 20 years. When faced with ELD 35 % of doctors and 38 % of nurses considered that in theirs ICU treatment were "excessively prolonged always or frequently", 75 % of doctors felt involved always or frequently in ELD but only 17 % ($p = 0{,}001$)of nurses felt so, and mentioned that they felt uncomfortable when involved no ELD. Considering consensus on decision 88 % of doctors and only 53 % ($p = 0{,}001$) nurses said yes, but 93 and 81 %, respectively, agreed with the decision. Concerning suffering on the dying process 79 % doctors and 57 % said that patients rarely or never expressed suffering, and 97 and 94 %, respectively, mentioned that proper medicines were given for patients relieve. 80 and 88 % said that the study was important, but only 49 % doctors and 38 % nurses felt that reality in their ICU was going to change and 87 % doctors and 91 % of nurses felt that they need specific training on ELD.
CONCLUSIONS. This study documents a reality similar to others described in countries with similar cultural and organizational background, precise and specific problems have been identified supporting and demanding organizational and educational interventions in response to ICU medical and nurses expressed needs.

0247
"REST IN PEACE": FORMALISING THE PROCESS OF CONFIRMING DEATH

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INTRODUCTION. In February 2012, the National Patient Safety Agency released a signal alerting doctors to the (unnecessary) distress experienced by families given an incorrect diagnosis of death after failed attempts at cardiopulmonary resuscitation. This highlights the importance of accurate death confirmation: to allow the public a measure of confidence in the medical profession and to help avoid incidences of the 'Lazarus phenomenon' (Return of spontaneous circulation after the confirmation of death).
Clinicians are expected to perform the certification of an in-hospital death to the standard outlined in the guidelines set out by the Academy of Royal Medical Colleges 'Code of practice for the diagnosis and confirmation of death' [1].
Following anecdotal evidence suggesting wide discrepancies in training and execution of death certification, we report on the results of a multidisciplinary, multi-departmental audit cycle conducted over an 8 month period, to assess the current standard of death certification amongst clinicians in our institution.
OBJECTIVES. (1) To compare the clinical diagnosis and documentation of death in our institution to a national standard [1]. (2) To evaluate the training doctors receive in confirming death by means of a clinician survey. (3) To assess the impact of introducing a proforma on the quality of documentation of death.
METHODS. The first part of the audit was conducted in three different units and retrospectively reviewed a total of 45 case notes looking at: measures used to confirm death; legibility of death confirmation; and the inclusion of all information required to process a death. The results of this were used to create a proforma for the certification of death. The impact of the proforma was then prospectively audited in the general intensive care unit.
RESULTS. The initial audit demonstrated that no documentation of death met the audit standard and that this was true across the full range of clinician grades. The proforma designed in response to this has since been trialled in the general intensive care unit. Re-audit has demonstrated that this addresses the issues raised in the initial audit resulting in complete documentation of death.
CONCLUSIONS. The accurate certification of death is important because:
1. It avoids a delay in releasing the deceased's body for burial;
2 It provides some defence in the (rare) incident of the 'Lazarus phenomenon' and;
3. because it represents the final duty of the clinician for their patient.
This audit has resulted in introduction of a trust proforma for death certification due to be rolled out through the trust. Audit of this intervention suggests that it addresses both the clinical and administrational elements of confirming in-hospital patient death.
REFERENCE. 1. A Code of Practice for the Diagnosis and Confirmation of Death, Academy of Medical Royal Colleges, 2008. http://aomrc.org.uk/publications/reports-guidance.html. Accessed October 2011.

0248
SOCIO-POLITICAL BACKGROUND FOR ORGAN DONATION IN 4TH MILITARY HOSPITAL IN WROCLAW

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INTRODUCTION. Socio-political background and personal involvement play very important part in organ donation.
OBJECTIVES. Our objective was to show the influence of political press conferences ("Doctor G." case) and influence of the military prosecution investigating organ trafficking on number of donors and organ harvesting in 4th Military Hospital. Those two situations took place in first 6 months of 2007. Military police investigation specifically concerned 4th Military Hospital in Wroclaw and personnel working there, but press conference had nationwide consequences.
METHODS. 2 periods of organ donation were compared in one hospital i.e. 2003–2006 and 2007–2010. Following variables were analysed: mean annual organ donations, mean age, single organ harvesting, multiple organ harvesting, no harvesting, family refusal, other causes of no harvesting.
RESULTS. Results are presented in table below.

Table 1 Results of the study

	2003–2006	2007–2010	p
Mean anual organ donation	19.75	5	<0.05
Single organ harvesting	4.5 (22.8 %)	0	<0.05
Multiple organ harvesting	7.5 (38 %)	4,6 (75 %)	<0.05
No harvesting	7.75 (39 %)	1,5 (25 %)	ns
Family refusal	0.8 (12.5 %)	2,75 (26,6 %)	<0.05

CONCLUSIONS. (1). Due to ill-considered political actions there was a dramatic decrease in organ donations from the deceased in Poland in 2007. (2) There was a higher percentage of family refusals. (3) Paradoxically, the number of multiple organ harvesting increased.
REFERENCES. 1. Organs Tissues Cells. 2006;9(1):03. 2. Organs Tissues Cells. 2007;10(3):11. 3. Organs Tissues Cells. 2008;11(1):03.
GRANT ACKNOWLEDGMENT. Team of ICU

0249
ATTITUDES TOWARDS DOCUMENTATION OF TREATMENT LIMITATIONS IN A UK INTENSIVE CARE UNIT

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INTRODUCTION. Decisions regarding treatment limitations on ICU patients can form an important part of their management plan as continuing and escalating invasive treatment can often be inappropriate, undignified and simply serve to prolong death. There are many ethical issues surrounding such decisions so effective communication to enable consistency of approach is paramount.
Currently we don't use a standard form to document treatment or resuscitation limits in our ICU. The hospital-wide DNAR form has been deemed inappropriate for ICU use as issues around resuscitation status in our patients are often too dynamic. Any limitations to treatment are simply documented in the patient́s notes. This is contrary to the recommendations of the UK Resuscitation Council [1], though is in line with General Medical Council guidance [2].
OBJECTIVES. The aim was to ascertain the use of treatment limitation forms across UK ICUs to see if our practice is usual and to canvas our own ICU staff to determine local feelings. Ultimately we would determine if our protocols should be updated.
METHODS. 50 staff members were asked their views regarding our documentation of resuscitation and treatment limits using a simple 10 point questionnaire. Simultaneously a structured telephone survey of 22 hospitals in the UK was conducted to ascertain what other units did. The sister in charge was spoken to at each unit to ensure consistency.
RESULTS. The most striking result was that 74 % of our staff were unhappy with our current system and felt that hospital DNAR forms should be used. Notably, the opinions of the consultants differed widely from the rest of the team (Table 1).

Table 1 Opinion on DNAR form by grade

Grade of staff member	Number (%) who felt DNAR form should be used
B and 5 nurse	16 (94 %)
Band 6+ nurse	7 (78 %)
Doctor—training grade	13 (76 %)
Doctor—consultant	1 (13 %)

86 % of staff welcomed the idea of a customised ICU limitations form, those against it also felt any kind of DNAR form was inappropriate. Reasons included a worry over focussing on limitations not treatment and that patients are reviewed so regularly it would not be necessary. The advocates felt it would improve clarity and even shorten ward rounds.
The phone survey showed 64 % of ICUs used the hospital-wide DNAR form. Of the 36 % that did not use the form, 50 % had an ICU specific combined resuscitation and limitations form. Of the remainder, two had computerised notes where treatment decisions were documented and only our ICU plus 1 other unit used just the patients' handwritten notes.
CONCLUSIONS. Our practice of not having a specific form for resuscitation status is unusual amongst UK ICUs, but more importantly the general feeling amongst staff on our unit is that current documentation is inadequate and the evidence of earlier decisions can be difficult to locate in an emergency. Effective communication of such important matters is vital and in view of this and our findings we will develop and trial a single form for treatment limitations to satisfy the specific needs of the ICU population.
REFERENCES. 1. http://www.resus.org.uk/pages/dnarrstd.htm. 2. http://www.gmc-uk.org/guidance/ethical_guidance/end_of_life_care.asp.

0250
UTILITY OF WEBCAM FACIAL FEATURE TRACKING AND KINECT™ SENSOR ARM MOVEMENT TRACKING AS HANDS-FREE TEXT COMMUNICATORS FOR PATIENTS IN CRITICAL CARE UNIT WHO CANNOT OTHERWISE COMMUNICATE

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INTRODUCTION. Patients recovering from critical illness especially those who develop critical illness related neuropathy and myopathy, or burns to face, arms and hands are often unable to communicate by writing, speech (due to tracheostomy) or lip reading [1]. This can be quite frustrating to the patient at their inability to convey their messages and is often a source of distress for family members of critically ill patients. In the same token, the nursing staff might feel unable to help the patients they care for, and this can be significant source of dissatisfaction. Various communication tools have been used in critical care including 'magic slates', writing tablets and other hi-tech equipment with different degrees of satisfaction.

OBJECTIVES. We have evaluated two low cost text-communication devices based around a laptop webcam and a laser/optical gaming system sensor and open-source software.
METHODS. Two methods were used to control an on-screen cursor to create text via an on-screen keyboard:
(1) Webcam-based facial feature tracking (Headmouse, Neural Information Processing Group, Eotvos University, Hungary).
(2) Arm movement by laser/camera gaming sensor (Kinect™, Microsoft Corp, Redmond, WA) and modified movement tracking software[2]. In a pilot study, 6 volunteers each communicated 3 standard messages by each methods in random sequence (Fig. 1). Speed and accuracy were assessed.

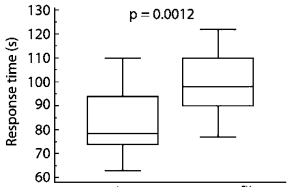
Fig. 1 KinectTM sensor (right) tracks arm movements (left)

RESULTS. Four minor typographical errors occurred with each device, however, all messages were comprehensible. Both data sets were normally distributed with similar variances (K–S & F tests). A 2-tailed independent sample *t* test showed that face-tracking was significantly faster than arm tracking ($t = 3.535$; $p = 0.0012$) (Fig. 2)

a) Number and type of errors for each method

Test sentence	Headmouse	Kinect™
"Can I have suction please?"		"prlease"
"Can I have my position changed?"	"change ed"	"change ed"
"I am feeling too hot"	"to o" "to" "I an feel"	"to o" "to"
n	4	4

b) Response time for each method



	Headmouse	Kinect™
Mean (SD)	83.4 (14.4)	99.6 (13.1)
Range	63 - 110	77 - 122
n	18	18

Fig. 2 Headmouse versus KinectTM

CONCLUSIONS. Both devices may be useful communication aids in patients in general and burns critical care unit, and have different advantages depending on the nature of the patientś injuries.
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0251
COMMUNICATION RELATED TO END OF LIFE CARE DURING SHIFT HANDOVERS IN ICUS IN ISRAEL, THE UK AND AUSTRALIA

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INTRODUCTION. Nurses participate in a tradition of intra-professional communication, the handover or shift report. Handover can be seen as a point of vulnerability in the process of care where information can get lost, omitted or garbled, leaving patients at risk. There is little literature pertaining to ICU handover associated with end of life care. If communication related to end of life can be improved, then quality of end of life care will follow.
OBJECTIVES. (1) To measure the quality of ICU nurse handover related to end of life care. (2) To compare ICU handover content between Israel, the UK and Australia.
METHODS. A validated end of life care communication tool [1] was used to measure three aspects of nurse-to-nurse handover: end of life wishes; family needs and communication with family members. Observers rated each item on a yes/no basis.
RESULTS. The tool was used to rate handover with a total of 140 patients in the three countries. The majority of handovers included no communication about end of life wishes (82 %) or family needs (75 %) with just under half discussing communication with the family (49 %). There were significant differences in handover content and processes by unit and by country.
CONCLUSIONS. It is possible to measure the quality of ICU nurse to nurse communication related to end of life care; however, it would be of value to compare findings with family member satisfaction with end of life care. ICU handover is an essential component of end of life care communication.
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Non-invasive ventilation: Indications & limits: 0252–0265

0252
INCREASED USE OF NON-INVASIVE VENTILATION AND CHANGES IN INDICATIONS AMONG FRENCH ICUS: THE 2011 OVNI STUDY

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INTRODUCTION. 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 that NIV was increasingly used. However, while its benefit was clear for acute on chronic respiratory failure (ACRF) and cardiogenic pulmonary edema (CPE), it was not so obvious in patients with "de novo" ARF.
OBJECTIVES. We performed a new survey to reevaluate NIV clinical practice.
METHODS. Over a 2 months period, a prospective survey was performed in 61 ICUs. 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.
METHODS. During the study period, 2445 patients received any kind of mechanical ventilation. Overall, 31 % of all patients received NIV versus 23 % in 2002 and 16 % in 1997 ($p < 0.001$). This new increase in NIV use was mostly explained by an increase in post-extubation NIV (25 % of all NIVs and 12 % of all intubations). Indeed, NIV was first attempted in 23 % of all patients, which is similar to 2002. The conditions precipitating ARF and the respective incidences of NIV were: ACRF in 19 % (NIV 68 %), coma in 31 % (NIV 1 %), CPE in 8 % (NIV 53 %), and hypoxemic ARF in 41 % (NIV 16 %). Compared to 2002 and 1997, NIV use was stable in ACRF, increased in CPE (respectively, 37 and 27 % in 2002 and 1997, $p < 0.007$) and decreased in "de novo" ARF (respectively, 29 and 16 %). The NIV success rate was 68 %, which is a significant increase compared to 2002 (56 %, $p < 0.05$). The success rate tended to increase for each cause of ARF indications (75 vs. 69 % in ACRF, 51 vs. 41 % "de novo" IRA and 70 vs. 59 % in CPE), but none of these changes was individually statistically significant. However, NIV success rate was significantly lower in "de novo" IRA than in other causes ($p < 0.05$).
CONCLUSIONS. Compared to 2002,
(1) overall, NIV use increased among French ICUs during the last 9 years, mainly due to a dramatic augmentation of post-extubation NIV,
(2) however, the use of NIV a first line treatment remained stable in ARF,
(3) the use of NIV decreased in "de novo" ARF but increased in CPE,
(4) the NIV success rate seemed to increase.
GRANT ACKNOWLEDGMENT. Direction de la Recherche Clinique, Société de Réanimation de Langue Française.

0253
PREDICTIVE FACTORS FOR NONINVASIVE VENTILATION FAILURE IN HYPERCAPNIC ACUTE RESPIRATORY FAILURE

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INTRODUCTION. Non-invasive ventilation (NIV) is the first line treatment in patients with hypercapnic acute respiratory failure (HARF). Beneficial effects of NIV were showed by our group more than 20 years ago [1, 2]. In our unit, an observational cohort study found that increase in use of NIV in acute-on-chronic respiratory failure (AOCRF) was associated with a concomitant decrease in mortality and ICU-acquired infections rates[3]. Despite the widely use of NIV, the rate of NIV failure remains around 25–30 % in patients with AOCRF.
OBJECTIVES. Our objective is first to evaluate the rate of NIV failure in an expert unit and second to identify early predictive factors for NIV failure.
METHODS. We conducted a retrospective observational cohort study using prospectively collected data over a 3-year period (2008–2011). Patients admitted for HARF were systematically treated using NIV according to our team protocol with an adjustment of ventilatory parameters by the nurse to a target expiratory tidal volume and an algorithm in case of leakage. Our criteria for endotracheal intubation were delayed: hypercapnic coma with inability to maintain NIV or persistent hypercapnic coma under NIV, and persistent hypotension despite fluid resuscitation.
RESULTS. During the study period, 499 of 1191 patients admitted for acute respiratory failure were treated by NIV. Among them, 269 patients (age 71 ± 14 years, SAPS II 36 ± 14) received NIV for HARF including 157 with AOCRF and 112 without history of chronic respiratory failure: cardiogenic pulmonary oedema (n = 74), pneumonia (n = 28), drug intoxication (n = 5) and neuromuscular disease (n = 5). The rate of NIV failure (intubation or death) was 18 % and only 14 % in case of AOCRF without « do not

intubate » order. Altered level of consciousness was the only factor of NIV failure at admission whereas the respiratory rate and blood gases had no influence on the outcome. After initiation of NIV, persistent altered level of consciousness, lower expiratory tidal volume, lower pH and PaO_2/FiO_2 ratio and important leaks were predictive factors for NIV failure. The presence of shock, coma (Glasgow <8) or severe hypoxemia (PaO_2/FiO_2 <200 mmHg) during the first 24 h was associated with a high risk for NIV failure. However, more than 40 % of the comatose patients succeeded NIV without need of intubation.
CONCLUSIONS. In an expert team, intubation rate could be reduced below 15 % in patients with AOCRF treated by NIV. Although respiratory pattern and blood gases at admission had no influence on outcome, tidal volume, level of consciousness, pH and oxygenation after initiation of NIV were predictive factors for NIV failure.
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0254

THE EFFECT OF HIGH FLOW CONDITIONED OXYGEN THERAPY ON PREVENTION OF POST-EXTUBATION FAILURE IN A NON-SELECTED POPULATION OF CRITICALLY ILL PATIENTS. A PRELIMINARY CASE–CONTROL STUDY

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OBJECTIVES. To determine whether the use of nasal high flow conditioned oxygen therapy (HFO), immediately after planned extubation reduces reintubation rate in a non-selected population of critically ill patients.
METHODS. Single center, 1:1 case–control study. Prospectively recorded cases were compared with consecutive historical controls, matched for age, time under mechanical ventilation (MV), admission APACHE II and risk of reintubation (RISK), defined as the presence of any of the following: >65 years, heart failure indicating intubation, moderate COPD, APACHE II >12 the extubation day, BMI >30, inadequate respiratory secretions management, difficult or prolonged weaning, >2 comorbidities or airway obstruction. Control patients received conventional oxygen therapy through nasal cannula or facial mask, whereas case patients received oxygen through nasal cannula, titrated to the maximum tolerated flow and warmed up to 31 °C. We screened all intubated patients, and excluded accidental extubations, self-extubated and tracheostomized patients. Patients were reintubated when fulfilling predefined criteria.
RESULTS. We analyzed 190 patients (95 cases and controls). The flow used (after 12 h post-extubation) was 35 (30–40) lpm. The reintubation rate was 7.4 % (7) and 14.7 % (14), respectively ($p = 0.1$). The matching variables were, respectively: age (years) 63.5 ± 15.7 and 64.4 ± 14 ($p = 0.8$); MV (days) 9 (6–14) and 10 (7–14) ($p = .9$); APACHE II (points) 15 (11–18) and 14 (11–18) ($p = 0.8$); High RISK 61 % (58) and 60 % (57) ($p = 0.7$). Other baseline characteristics with univariate analysis were respectively: Cardiac disease 20 % (19) and 22 % (21) ($p = 0.6$); COPD 34.7 % (33) and 29.5 % (28) ($p = 0.4$); male gender 63 % (60) and 67 % (64) ($p = 0.2$); BMI 27.5 ± 7.3 and 26 ± 4.5 ($p = 0.3$); Medical diagnosis 63.2 % (60) and 64.2 % (61) ($p = 0.5$); Surgical diagnosis 35.8 % (34) and 34.7 % (33) ($p = 0.6$); oxygen concentration (12 h) 25 % (21–35) and 40 % (30–40) (0.04). Patients tolerating >35 lpm, had an increased reintubation rate (Fisher test $p = 0.04$). The multivariate analysis selected the FiO_2 after 12 h of extubation as the only independently related variable (OR 7.5; 95 % CI 1.8–38.2, $p = 0.006$); HFO therapy (OR 2; 95 %CI .17–1.3, $p = 0.15$); RISK (OR 0.04; 95 % CI 0.35–3.7, $p = 0.82$).
CONCLUSIONS. Under the conditions of our protocol, the use of HFO has a trend toward a reduced reintubation rate but significantly reduces FiO2. A randomized study with an appropriate n, is necessary. An early prediction of failure is possible using the FiO2 with our flow titration protocol.

0255

THE NONINVASIVE VENTILATION IN THE TREATMENT OF ARF IN PATIENTS WITH SEVERE COMMUNITY-ACQUIRED PNEUMONIA

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INTRODUCTION. The noninvasive ventilation for the treatment of hypoxemic respiratory failure has been increasingly used. Avoid intubation of patients with ARF in severe community pneumonia can reduce length of stay in ICU and mortality.
OBJECTIVES. The objective of this study was to determine the outcome of the application of NIV in patients with severe community-acquired pneumonia in the ICU.
METHODS. Between March 2010 and September 2011 were prospectively evaluated the results of application of NIV for ARF in patients with severe community-acquired pneumonia in the ICU. The non-invasive ventilation was used as first line treatment to avoid intubation. Patients who required intubation were defined with NIV failure. We evaluated variables such as age, gender, score APACHE II, arterial blood gases, Glasgow Coma Scale, length of stay in ICU, length of stay in hospital, time of application and mortality rate.
RESULTS. 208 patients were admitted with respiratory failure and indication for NIV. 52 patients had severe community-acquired pneumonia ARF requiring NIV this group it was possible to avoid intubation donates 53.84 %. Among the variables evaluated no difference between the groups failure and success, except in mortality in the failure group was 70.83 % versus 28.57 % of the successful group ($p = 0.005$). There was no difference in mortality between those who failed the first 2 h of NIV versus those who failed after 02 h of NIV. The main causes of failure of NIV were the maintenance of respiratory distress (50 %) and refractory hypoxemia (41.66 %).

Table 1 Results of application of NIV for ARF in patients

	Required intubation (n = 24)	Avoided intubation (n = 28)	p value
Gender	Male: 14 (58.33 %) female: 10 (41.66 %)	Male: 15 (53.57 %) female: 13 (46.42 %)	
Age (years)	69.36 ± 11.78	71.23 ± 16.21	0.58
APACHE II	14.38 ± 8.87	15.68 ± 8.81	0.66
Glasgow Coma Scale	13.88 ± 1.48	14.18 ± 1.51	0.27
Length of stay in ICU (days)	20.96 ± 12.21	16.43 ± 10.19	0.16
Length of stay in hospital (days)	24.46 ± 14.31	24.29 ± 16.00	0.98
Time of application (h)	5.55 ± 7.90	8.39 ± 9.92	0.28
Rate mortality (%)	17 (70.83 %)	08 (28.57 %)	0.005

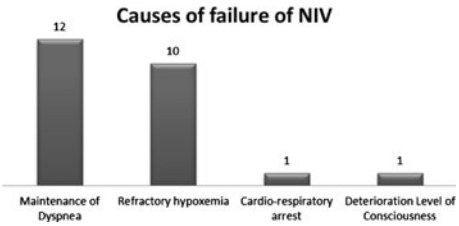

Fig. 1 Cause of failure NIV

CONCLUSIONS. NIV can be an alternative in the treatment of hypoxic respiratory failure in patients with severe community-acquired pneumonia, however the mortality appears to be very high when the patient needs invasive ventilation, so it is necessary to define criteria for interruption.
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0256

ACUTE RESPIRATORY DISTRESS SYNDROME IN PATIENTS WITH HEMATOLOGIC MALIGNANCIES

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INTRODUCTION. Acute hypoxemic respiratory failure, is the leading cause of admission to intensive care unit (ICU) in critically ill patients with hematologic malignancies [1]. Clinical course and prognosis might vary considerably when these patients admitted with acute hypoxemic respiratory failure, meet the criteria of acute respiratory distress syndrome (ARDS). Several previous reports refer to acute hypoxemic respiratory failure in critically ill patients with hematologic malignancies [2], whereas there is limited specific data regarding the clinical characteristics and outcome of ARDS in patients with hematologic malignancies.
OBJECTIVES. We investigated the clinical course and mortality of ARDS in patients with hematologic malignancies.
METHODS. Sixty-eight patients with hematologic malignancies and ARDS admitted to medical ICU of a university hospital were analyzed in the study.
RESULTS. The most common etiology of ARDS was pneumonia. The ratio of partial pressure of oxygen in arterial blood to fractional concentration of inspired oxygen (PO2/FiO2) was 104 (74-165). Ten patients (15 %) received noninvasive mechanical ventilation (NIV), 21(31 %) received invasive mechanical ventilation (MV) and 36(53 %) received both NIV and invasive MV. ICU mortality was 77 % in the cohort. Non of the variables regarding the underlying hematologic disease was associated with mortality. Presence of two or more organ failures was the only independent risk factor for high mortality ($p = 0.045$), whereas use of NIV was associated with low mortality ($p = 0.001$). The Kaplan–Meier curve of mortality, with respect to type of MV support, demonstrated that NIV was associated with the lowest mortality ($p < 0.001$).
CONCLUSION. The mortality of ARDS in critically ill patients with hematologic malignancies is quite high. Presence of multiorgan failure is independently associated with high mortality whereas use of NIV is independently associated with low mortality.
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0257

EFFECTIVENESS OF NON-INVASIVE VENTILATION IN THE TREATMENT OF SEVERE PNEUMONIA. DIFFERENCES BETWEEN THE COMMUNITY-ACQUIRED PNEUMONIA AND NOSOCOMIAL PNEUMONIA

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INTRODUCTION. The use of noninvasive ventilation (NIV) is discussed in patients with severe community-acquired pneumonia (CAP), but its use is even more controversial when the source is nosocomial (NN), where even its use could be related to an increase mortality [1].

OBJECTIVE. To compare the effectiveness of NIV in patients with CAP and NN.

MATERIALS AND METHODS. Prospective study of all patients admitted to the ICU for a period of 14 years, diagnosed with pneumonia and requiring NIV. The diagnosis of nosocomial pneumonia was conducted in patients admitted more than 48 h in the hospital. Excluding pulmonary infection in immunodepressed patients. The indication for NIV was PaO_2/FiO_2 <250 and respiratory rate ≥30. NIV success was defined as avoidance of intubation and discharge alive to a medical ward. Results are expressed as mean ± standard deviation and absolute and relative frequencies. Comparisons between variables were made using Student t and Pearson Chi^2 tests. Multivariate analysis was performed using logistic regression for predictors of NIV success and hospital mortality.

RESULTS. We analyzed 296 patients, 244 with NAC and 52 with NN. 98.6 % of patients were ventilated in BiPAP mode. Among patients with CAP and NN, there were no differences in age (65 ± 17 and 69 ± 17, p: 0.094), SAPS II (44 ± 14 and 46 ± 14, p:0.519), PaO2/FiO2 (basal: 132 ± 36 and 140 ± 40, p: 0.163, and 1 h of NIV: 162 ± 41 and 162 ± 41, p:0.977) and respiratory rate (baseline: 35 ± 6 and 36 ± 4, p:0.287, and when NIV: 31 ± 5 and 32 ± 5, p:0.151). There were no differences in the radiographic presentation uni-or multilobar (p: 0.641) or single-lung or bilateral (p: 0.903). Do-not-intubate order was less frequent in NAC (16.8 % and 30.8 %, respectively, p: 0.020). The success of NIV was achieved in 58.6 % of CAP and 48.1 % of NN (p: 0.164), with hospital mortality: 28 and 40.4 % (p: 0.074). Predictors by multivariate analysis of success of NIV were: IRA "de novo" (OR: 0.35, CI-95 %: 0.14–0.86), SAPS II (OR: 0.92, CI-95 %: 0.88–0.95), empyema (OR: 0.14, CI-95 %:0.02–0.73), maximum SOFA (OR: 0.67, CI-95 %: 0.58–0.78) and increased radiographic infiltrate in 24 h (OR: 0.05; CI-95 %: 0.02–0.11). Predictors of death in hospital: Failure of NIV (OR: 9.46, CI-95 %: 2.89–30.94), age (OR: 1.04, CI-95 %: 1.01–1.08), do-not-intubated order (OR: 6.61, CI-95 %: 2.19–19.95) and maximum SOFA (OR: 1.37, CI-95 %: 1.21–1.55).

CONCLUSIONS. Nosocomial pneumonia with respiratory failure may be treated initially with noninvasive ventilation with a moderate success rate. However, this condition has a higher mortality in relation to organ dysfunction and higher rate of do-not-intubate order.

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0258

RISK FACTORS FOR FAILURE OF NON-INVASIVE VENTILATION IN THE TREATMENT OF RESPIRATORY FAILURE EXACERBATIONS IN OBESITY HIPOVENTILATION SYNDROME

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INTRODUCTION. Obesity-hypoventilation syndrome (OHS) is a common condition characterized by chronic respiratory failure with acute exacerbations related to different causes. Even without evidence for its use [1], the NIV is applied in these patients with similar criteria to patients with exacerbated Chronic Obstructive Pulmonary Disease.

OBJECTIVES. To analyze the utility of noninvasive ventilation (NIV) in the treatment of patients with SOH and analyze risk factors for failure of it.

MATERIALS AND METHODS. We included prospectively patients admitted to ICU with OHS requiring NIV. The indication was PaO_2/FiO_2 <250, respiratory rate ≥26, arterial pH <7.35 and $PaCO_2$ >45 or use of accessory muscles. NIV success is defined as avoidance of intubation and discharge live plant. Results are expressed as mean ± standard deviation and absolute and relative frequencies. Results are expressed as mean ± standard deviation and absolute and relative frequencies. Comparisons between variables were made using Student t and Pearson Chi^2 tests. Multivariate analysis was performed using logistic regression for predictors of NIV success.

RESULTS. We analyzed 175 patients, 136 (78 %) women. Age: 74 ± 11, body mass index: 41.6 ± 5.6 and SAPS II: 40 ± 11. All patients received BiPAP mode (initial IPAP: 16 ± 3 cmH_2O, initial EPAP: 6 ± 1 cmH_2O). 50 patients had do-not-intubate order (28.6 %) and 27 (15.4 %) were hypercapnic coma at ICU admission. Evolution of respiratory parameters at baseline and at 1 h with NIV: pH: 7.22 ± 0.07 and 7.27 ± 0.07 ($p < 0.001$), $PaCO_2$: 84 ± 18 and 75 ± 18 ($p < 0.001$), respiratory rate 30 ± 9 and 27 ± 5 ($p < 0.001$) and PaO_2/FiO_2 171 ± 39 and 196 ± 42 ($p < 0.001$). Glasgow Coma Score at the start of NIV and 1 h VNI was 12.4 ± 3.1 and 13.9 ± 2.2 ($p < 0.001$). The duration of NIV was 42 ± 26 h. The NIV related complications occurred in 75 patients (42.9 %), being the most common skin breakdown (36 %). NIV success: 93.7 %, ICU mortality: 1.1 % and hospital mortality: 5.7 %. Variables, in the multivariate analysis, associated with NIV success were: NIV hours (OR: 0.97, CI-95 %: 0.96–0.99, p: 0.035), PaO_2/FiO_2 at NIV 1 h (OR: 1.01, CI-95 %:1.00–1.02, p: 0.023) and $PaCO_2$ at NIV 1 h (OR: 0.91, CI-95 %: 0.87–0.95, $p < 0.001$).

CONCLUSIONS. Patients with Obesity Hypoventilation Syndrome can be treated with NIV with a high success rate. The improvement in gas exchange and rapid normalization of the parameters are factors that prevent endotracheal intubation.

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0259

A DIAPHRAGM SONOGRAPHY STUDY OF ALTERATIONS IN BREATHING PATTERN INDUCED BY SWITCH FROM NASAL TO ORAL BREATHING

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INTRODUCTION. Changes in the breathing pattern induced by upper airway devices have been reported with various levels of disagreement on the degree of alteration and the mechanisms of stimulation. It has been reported [1] that the application of a nose clip (NC) may induce alterations in the breathing pattern by reducing respiratory rate (RR) and increasing tidal volume.

OBJECTIVES. This study, by using M-mode sonography, aims to examine the alterations in diaphragmatic excursion, the speed of diaphragmatic contraction and RR induced by nose clipping in spontaneous breathing patients through an orotracheal tube and immediately after extubation.

METHODS. 31 postoperative patients were studied, while breathing spontaneously on T-piece (TP) and immediately after extubation [mouth breathing (MB)]. A 3 MHz ultrasound linear probe was used to observe the diaphragm. The ultrasound transducer was placed in the line of the right intercostal space between anteroaxillary and midaxillary lines. In both conditions (TP and MB), measurements were made before and after the application of a NC. The diaphragmatic excursion (displacement), the velocity of the diaphragmatic contraction (slope), the expiratory time (T_e) and the total inspiratory time (T_{tot}) were measured sonographically. Paired *t* test or ANOVA were used for statistical analysis when appropriate.

RESULTS. The employment of a NC increased the diaphragmatic excursion while the patient was breathing through an orotracheal tube (from 2.24 to 2.53 cm, $p < 0,002$), with no significant change in T_e (from 1.8 to 1.7 s), T_{tot} (2.71 to 2.77 s) and in contraction velocity (2.56 to 2.53 cm/s), suggesting a increase in tidal volume with no change in the RR. After extubation the diaphragmatic excursion returned close to "TP-nose open" values (2.27 cm). The application of a NC after extubation induced de novo an increase in the diaphragmatic excursion, however, without reaching statistical significance (from 2.24 to 2.3 cm) and without significant changes in diaphragmatic slope or RR. Intra-observer variability was higher than 18 %.

CONCLUSIONS. The application of a nose clip induces by itself significant changes in the breathing pattern. During mandatory oral breathing (NC), tidal volume increases independently to the presence of an orotracheal tube. The fact that we did not observe a decrease in RR and a significant increase in diaphragmatic excursion during oral breathing after extubation seems to be related to the poor reproducibility of the method.

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0260

AVOIDING INVASIVE MECHANICAL VENTILATION BY EXTRACORPOREAL CARBON DIOXIDE REMOVAL IN PATIENTS FAILING NONINVASIVE VENTILATION

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INTRODUCTION. In patients with acute hypercapnic respiratory failure, noninvasive ventilation (NIV) is a well-established means to support the failing ventilatory pump and to avoid intubation and invasive mechanical ventilation (MV) [1]. However, this approach often fails for a variety of reasons. Intubation is then often followed by prolonged invasive MV and analgosedation, which in turn can further contribute to morbidity and mortality [2−5].

OBJECTIVE. To evaluate whether extracorporeal carbon dioxide removal by means of a pumpless extracorporeal lung assist (PECLA) device may be an effective and safe alternative to invasive MV in patients with chronic pulmonary disease and acute hypercapnic ventilatory failure refractory to NIV.

METHODS. Multicenter, retrospective, case matched study. 21 PECLA patients were compared to 21 matched controls with NIV failure and conventional invasive MV regarding survival and procedural outcomes. Matching criteria were underlying main diagnosis, age, Simplified Acute Physiology Score II and pH on ICU admission.

RESULTS. Of the 21 patients treated with PECLA, 19 (90 %) did not require intubation. Median $PaCO_2$ levels and pH in arterial blood prior to PECLA were 84.0 mmHg (54-131) and 7.28 (7.10–7.41), respectively. Within 24 h, median $PaCO_2$ levels and pH had significantly improved to 52.1 (33–70; $P < 0.001$) and 7.44 (7.27–7.56; $P < 0.001$), respectively. Two major and seven minor bleeding complications related to the device occurred. Further complications were one pseudoaneurysm and one heparin-induced thrombocytopenia type II. There was a trend to a shorter median hospital length of stay in the PECLA group (23 vs. 42 days, adjusted $p = 0.056$). No group difference in 28-day (24 vs. 19 %) and 6-month mortality (33 vs. 33 %) were observed.

CONCLUSIONS. In patients with chronic pulmonary disease and acute hypercapnic ventilatory failure refractory to NIV the application of extracorporeal carbon dioxide removal obviated intubation and invasive MV in most cases and reduced hospital length of stay. Compared to conventional MV, survival rates were similar.

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0261

MONITORING OF NONINVASIVE VENTILATION BY THE SOFTWARE OF THE VENTILATORS IN THE ICU PATIENTS WITH HYPERCAPNIC RESPIRATORY FAILURE

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INTRODUCTION. When NIV is initiated, the ventilator settings are determined empirically based on a clinical evaluation and blood gas values. However, NIV is predominantly applied during sleep and to assess overnight patient machine syncrony and efficacy of ventilation, more specific and sophisticated monitoring is required. The effectiveness of NIV might therefore be more correctly assessed not only by daytime but also overnight monitorization. Current bilevel positive-pressure ventilators provide physicians with software

that records items important for patient monitoring, such as compliance, tidal volume (V T), apnea indexes (AI), and leaks.
OBJECTIVES. In this study we investigated that if the analysis of the patients data recorded by the ventilators' software during daytime and overnight has any effect on noninvasive ventilation effectiveness in hypercapnic respiratory failure in the ICU.
METHODS. Mean tidal volume, leak, inspiratory pressures, respiratory rates, apnea indexes and periodical breathing were examined and respiratory settings(modes, pressures, and volumes) were adjusted according to these results. Trilogy 100 Respironics machines and directview software were used fort his aim.
RESULTS. Fifty-two hypercapnic patients with mean age of 66 ± 13 years, APACHE II scores 17 ± 6 and BMI 32 ± 9 kg/m2were included in the study. 62 % of them had COPD and 52 % had sleep and obesity related diseases and respiratory failure. 67 % of the patients had leaks more than 25 L/min and 64 % had apnea index more than 5/h. 62 percent of the patients had also periodical breathing. 52 % of the patients had tidal volume lower than 400 ml and in 54 % of the patients mode switched to AVAPS (average volume assured pressure support) to reach adequate tidal volume. Changing mode from pressure support(S) to pressure control(ST), increasing expiratory positive airway pressure (EPAP) according to AIs and increasing inspiratory positive airway pressure (IPAP) levels were decreased mean PaCO2 level mean 9 ± 5 mmHg, 10 ± 6 mmHg and $PaCO_2$ 11 ± 5 mmHg, respectively. Decreasing AIs with increasing EPAP levels were significantly and higly correlated with more $PaCO_2$ decrease than 5 mmHg (r. 0.6, p:0.03).
CONCLUSIONS. These results suggest that daily analysis of the patients data recorded by the ventilators' software may give useful clues about the patients' problem and lead more effective noninvasive ventilation. The acquisition of specific skills in this field should be encouraged.
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0262
BRONCHOSCOPIC INTUBATION DURING NON-INVASIVE VENTILATION FOR REFRACTORY HYPOXEMIC RESPIRATORY FAILURE

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INTRODUCTION. Patients with hypoxemic respiratory failure who deteriorate despite non-invasive positive pressure ventilation (NIPPV) have a high risk of death during endotracheal intubation [1]. Maintaining NIPPV during intubation may prevent decruitment and deoxygenation.
OBJECTIVES. To evaluate the feasibility of bronchoscopic guided orotracheal intubation during nasal NIPPV for hypoxemic respiratory failure.
METHODS. The study was approved by Institutional Review Board. We retrospectively identified 10 non-consecutive patients with NIPPV failure who required endotracheal intubation based on clinical criteria. The full facemask was switched to a Respironics Contour Deluxe™ nasal mask and a Respironics ventilator with Spontaneous/Timed mode and FiO_2 1.0. While in the semi-recumbent position, the oropharynx was anesthetized with 200 mg of 4 % lidocaine administered by mucosal atomization. An oral airway (Berman) was covered with 5 % lidocaine ointment and placed in the oropharynx. A 9 or 10 cm intubating airway (Williams) was placed in the oropharynx. Systemic sedation was administered at the discretion of the treating physician. Neuromuscular blockade was not used. A lubricated 7.0-8.0 mm endotracheal tube was placed in the Williams airway. A lubricated flexible bronchoscope was placed through the endotracheal tube and into the distal trachea. The endotracheal tube was then placed into the trachea using the bronchoscope as a stylet. During passage the endotracheal tube was rotated 90° counter-clockwise to avoid impingement of the leading edge of the endotracheal tube bevel by the arytenoid cartilage. The bronchoscope was withdrawn slowly to visualize the tip of the endotracheal tube in the trachea.

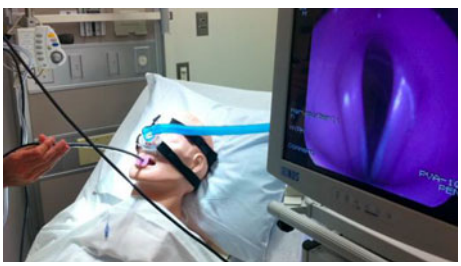

Fig. 1 Intubation technique

RESULTS. 10 patients with respiratory failure and a mean Acute Physiology and Chronic Health Evaluation II score 27.4. The most common etiology was infection in an immunocompromised host. Mean body mass index was 27. Patients were treated with NIPPV and FiO_2 (>70 %) for at least 0.5 h before the decision to proceed with endotracheal intubation has been made. Prior to intubation, average arterial blood hemoglobin oxygen saturation was 93 %. Hypotension (43 %) was the most frequent complication. Mean decrease in oxygen saturation of hemoglobin during the procedure was 3.8. One patient had supraventricular tachycardia.
CONCLUSIONS. This method of intubation combines bronchoscopic guidance with the benefits of continuous positive pressure ventilation. A prospective trial is necessary to determine the best intubation method for NIPPV failure.
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0263
EXTERNAL NASAL DILATOR STRIP IMPROVE OXYGENATION IN INTENSIVE CARE PATIENTS

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INTRODUCTION. Breath Right ™ (BR) external nasal dilator strip (GlaxoSmithKline, Brentford, UK) is adhesive band containing two plastic bars providing a spring action. It can dilate the nasal cavity and reduce nasal airflow resistance. There have been some reports of the usefulness of BR strip in the area of otorhinolaryngology [1]. However, there have been no reports of its application in intensive care.
OBJECTIVES. The purpose of this study was to evaluate the effect of the BR strip on gas exchange in intensive care patients.
METHODS. Thirty adult patients who were administered oxygen with oxygen mask in the intensive care unit were studied. Patients were excluded if they used nasal gastric tube or/and nasal airway. Also, the cases BR strip was out of place and the patients who requested to remove BR strip were excluded. Oxygen mask or venturi mask was used for oxygen administration. The oxygen flow rate and FiO2 were kept constant during the study period (4 h). Supine or semi sitting position was fixed during the study. Arterial blood gas (ABG) was measured at four points; before wearing BR strip (ABG 1), 1 h after wearing BR strip (ABG 2), 2 h after wearing BR strip (ABG 3) and 1 h after removing BR strip (ABG 4). PaO_2 and $PaCO_2$ at ABG 2, 3 and 4 were compared with those at ABG 1. Results are presented as mean ± SD (mmHg). A paired Student's *t* test was used for statistical analysis. Statistical significance was taken as $P < 0.05$.

Table 1 Change of ABG (n = 30, mean ± SD)

	ABG 1	ABG 2	ABG 3	ABG 4
PaO_2 (mmHg)	92.4 ± 21.2	106.2 ± 24.5 *	108.8 ± 26.9*	102.5 ± 27.2*
$PaCO_2$ (mmHg)	40.1 ± 6.5	40.0 ± 7.0	39.6 ± 6.0	40.3 ± 6.4

RESULTS. Results of the study were shown in the Table 1 (* = $P < 0.05$, vs. ABG 1). PaO_2 values at ABG 2, 3 and 4 were higher than that at ABG 1. $PaCO_2$ did not change during the study period.
CONCLUSIONS. Breath Right™ strip improved oxygenation in the intensive care patients who were administered oxygen with oxygen mask.
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0264
EFFECTS OF UPPER AIRWAY OBSTRUCTION ON RESPIRATORY MECHANICS IN A VARIABLE COMPLIANCE MODEL

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INTRODUCTION. Upper airway obstruction is caused by an intrinsic or extrinsic neck mass and vocal cord paralysis. A recognized hazard of prolonged endotracheal intubation is progressive airway occlusion resulting from deposition of secretions. If the obstruction persists, it may be life threatening condition. However, early diagnosis of partial airway obstruction is very difficult because patients are asymptomatic and do not have lesions with abnormal radiological characteristics.
OBJECTIVES. The aim of the present study is to find the most sensitive respiratory factor reflect the airway obstruction.
METHODS. In the test lung model, lung compliances were set to normal (25 ml/cmH_2O; control, C25 group) and to levels seen in chronic obstructive pulmonary disease (40 ml/cmH_2O; C40 group), and acute respiratory distress syndrome (20 ml/cmH_2O; C20 group and 15 ml/cmH_2O; C15 group). The tidal volume as 600 ml, respiratory rate as 10 bpm, inspiratory pause as 1 s and limit of peak inspiratory pressure as 70 cmH_2O. A ventilator (Dräger Fabius GS, Germany) was attached to a test lung, and a series of endotracheal tubes (ETTs) ranging in size from 7.5 to 2.5 mm in inner diameter (ID) of the connector were used to simulate progressive occlusion.
RESULTS. Progressive ETT occlusion induced an increase in the peak inspiratory pressure. In the C40 group, the inspiratory pause pressure spontaneously increased on repeated ventilation. Auto-PEEP (positive end-expiratory pressure) was observed under the condition of high compliance and occlusion. Dynamic compliance decreased at an ID of 5.5 mm in all groups. Respiratory resistance was inversely proportional to the ID of the connector.

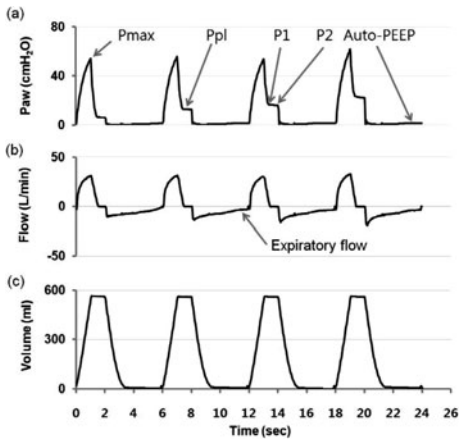

Fig. 1

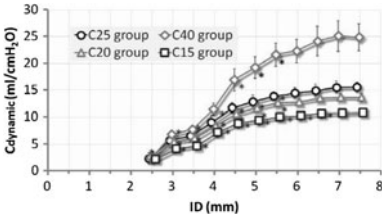

Fig. 2

CONCLUSIONS. Progressive ETT occlusion did not reduce the delivered tidal volumes until occlusion was nearly complete (ID, 2.5 mm). However, dynamic compliance and resistance were significantly changed.
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0265
IMPACT OF POST-OPERATIVE HYPOXIA AND CPAP USE IN PATIENTS AFTER MAJOR ABDOMINAL SURGERY IN THE CRITICAL CARE UNIT OF A UK TEACHING HOSPITAL

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INTRODUCTION. Hypoxaemia occurs in 30–50 % patients following abdominal surgery. Respiratory failure requiring intubation occurs in 8–10 % and increases morbidity, mortality and length of stay (LOS) in critical care and hospital [1]. Early use of continuous positive airways pressure (CPAP) in hypoxaemic patients has been demonstrated to reduce these problems [2].
OBJECTIVES. To determine incidence of post-operative hypoxaemia and CPAP use and correlate this with LOS, intubation and infection rates in our unit.
METHODS. Retrospective data was collected from all patients admitted to Critical Care (CC) after major abdominal surgery between 2010 and 2011, including: age, hypoxia rates (PaO_2/FiO_2 ratios <40 kPa on 2 consecutive occasions), infection rates, re-intubation rates, CPAP use and LOS in CC and in hospital.
RESULTS. Three hundred and 20 patients were identified with 78 were excluded due to incomplete data. Median age was 69 years (range of 24 -95). In total, 99 (41 %) were hypoxic post operatively; a total of 32 patients (13 %) received CPAP. The average PaO_2/FiO_2 ratio triggering CPAP commencement was 26 kPa (range 9–58 kPa, median 24 kPa). Overall there was 0 % CC mortality and 2.9 % hospital mortality.
Presence of hypoxaemia post-operatively was associated with increased median CC LOS, median hospital LOS, increased incidence of pneumonia (9 vs. 2.8 %) and re-intubation when compared to the non-hypoxic group. There was a trend towards higher mortality in hypoxaemic patients (4 vs. 2 %). Seven patients died, of which 57 % were hypoxic and 75 % received CPAP.14 patients developed pneumonia and of those 71 % were hypoxic and 64 % received CPAP. Of all the hypoxic patients only 28 % received CPAP. All five patients that were re-intubated were hypoxic and 3 had preceding CPAP. Median CC and hospital LOS were 1 day (range 0.4–25 days) and 12 days (4–252 days), respectively for non hypoxic patients, compared to 2.25 days (0.75–19 days) and 13 days (1–168 days) in hypoxic patients.
CONCLUSIONS. In this series, post-operative hypoxia is common after abdominal surgery. Hypoxia is associated with a trend towards higher infection rates, critical care and hospital LOS and mortality. CPAP was commenced at very low PaO_2/FiO_2 ratios in our unit and a significant number of hypoxic patients did not receive CPAP. Further work is warranted to determine the impact of earlier prophylactic CPAP on hypoxaemia and its complications in patients after major abdominal surgery.
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Bedside assessment of haemodynamics: 0266–0278

0266
DIASTOLIC LEFT VENTRICULAR FUNCTION BY ECHOCARDIOGRAPHY IN PATIENTS WITH SHOCK: TIME COURSE AND IMPLICATIONS FOR MORTALITY

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INTRODUCTION. Assessing left ventricular (LV) diastolic function is difficult in the critically ill and not well investigated. Serial transthoracic echocardiography (TTE) measurements may offer new insights regarding LV diastolic function in these patients.
OBJECTIVES. The purpose of this study was to investigate the time course of LV diastolic function parameters in patients with SIRS and shock, and to identify differences between survivors and non-survivors of 28-day mortality.
METHODS. Prospective, observational, cohort study of 44 patients. TTE examinations and measurements of hemodynamic parameters were assessed daily for a total of 7 days. LV diastolic function was measured by transmitral pulsed Doppler (E, A, E/A), tissue Doppler indices (É, á, E/é), deceleration time (DT) and left atrial volume (La volume). Heart rate (HR), mean arterial pressure (MAP), systemic vascular resistance index (SVRI), continuous cardiac index (CCI) and norepinephrine dose was assessed. Sequential Organ Failure Assessment (SOFA) scores were calculated. Kruskall Wallis for difference over time and median for day 1–7 was calculated.
RESULTS. Over the 7-day observation period E and A increased significantly ($p < 0.05$) in all patients ($n = 44$) but there was no significant change in anyone of the other diastolic LV function parameters. MAP and CCI increased and norepinephrine dose decreased significantly as did SOFA score ($p < 0.05$). In non-survivors ($n = 13$) the overall level (median day 1–7) of E/é, E, E/A and SOFA was significantly higher and median A and á lower than in survivors (Table 1).
CONCLUSIONS. Most LV diastolic function parameters remained unchanged over the 7-day observation period despite improved critical illness and hemodynamics. The overall level of the majority of LV diastolic function parameters was significantly altered in non-survivors compared to survivors, emphasizing the importance of LV diastolic function and filling pressures for mortality.
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GRANT ACKNOWLEDGMENT. Supported by grants from the Scandinavian Society of Anaesthesiology and Intensive Care and the Region Skane County Council Sweden

Table 1

Variable	Survivors (n = 31)	Non-survivors (n = 13)	p
E (cm/s)	95 (79.8–115.5)	114 (103.5–127.5)	0.004
A (cm/s)	69 (65.5–91.5)	61 (54.0–79.0)	0.040
E/A	1.2 (0.9–1.4)	1.9 (1.5–2.2)	0.002
DT (s)	165 (143–190)	160 (155–180)	ns
é (cm/s)	9.1 (8.3–10.5)	9.4 (6.3–11.8)	ns
á (cm/s)	9.7 (8.0–12.0)	7.1 (6.2–8.0)	0.011
E/é	10 (7.9–12.7)	12.4 (9.8–18.0)	0.021
La volume (ml/m^2)	26.0 (22.9–30.3)	28.0 (24–39)	ns
SOFA	7 (5–9)	9 (7–14)	0.038

0267
CAN I PREDICT CARDIAC INDEX USING CENTRAL VENOUS OXYGEN SATURATION IN PATIENTS WITH SEPTIC SHOCK?

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INTRODUCTION. Sepsis-induced cardiac dysfunction is a frequent and severe complication of septic shock [1]. The transpulmonary thermodilution monitor and the pulmonary artery catheter (PAC) can be used to alert clinicians or to monitor the effects of inotropic therapy. PAC usage has been shown unrelated to outcome in critically ill patients [2], whereas implementation of treatment strategies that incorporate central venous oxygen saturation ($ScvO_2$) monitoring have achieved a significant reduction in mortality [3].
OBJECTIVES. The aim of the study was (1) to determine whether $ScvO_2$ value in critically ill septic shock patients was able to predict the presence of a relevant hypodynamic component associated with distributive shock; (2) to define if a $ScvO_2$ >70 % would predict a cardiac index (CI) >3.0 $lt/min/mt^2$.
METHODS. We conducted a prospective observational study in a 12-bed Intensive Care Unit (ICU) of a university hospital. Patients with septic shock, who were undergoing insertion of a PAC for CI measurement, were recruited. Following parameters were collected: SOFA score, infection focus. Paired measurements of CI and $ScvO_2$ as well as doses of vasopressors, capillary refill time, differential temperature, mean arterial pressure (MAP), and lactate were obtained once the clinician performed the first hemodynamic assessment with PAC. Relation between different parameters were assessed with Spearman rho and linear regression; $p < 0.05$ was considered significant.
RESULTS. We included 15 consecutive patients with septic shock and median SOFA score of 10 (IQR 9–13). Baseline $ScvO_2$ was 81.4 % (72.4–82.3) and the first CI measured was 4.2 $l/min/m^2$ (3.7–5.6). Of all patients who initially had a $ScvO_2$ >70 %, none presented a CI less than 3.0 $l/min/m^2$ at the time of the first hemodynamic assessment. On the other hand, from the 2 patients having a $ScvO_2$ <70 %, none of them presented a CI > 3.0 $l/min/m^2$. There was a significant correlation between a $ScvO_2$ >70 % and a CI >3.0 $l/min/m^2$ ($\rho = 0.784$, $p < 0.001$). No correlations were found between doses of vasopressors, capillary refill time, infection focus, differential temperature or lactate and cardiac index.
CONCLUSIONS. A $ScvO_2$ >70 % predicts a CI higher than 3.0 $l/min/m^2$ in most cases of patients in septic shock, independent from dose of vasopressors, focus and other clinical perfusion parameters. This finding might allow avoiding the use of PAC in septic shock patients with $ScvO_2$ >70 %, thus optimizing time, the use of PAC, and focusing on downstream targets.
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0268
ACCURACY OF RESPIRATORY VARIATIONS OF R-WAVE AMPLITUDE IN LEAD II TO PREDICT FLUID RESPONSIVENESS IN CRITICALLY ILL PATIENTS

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INTRODUCTION. In ICU, fluid loading is the first line therapy for patients in shock. However, it could be useless or even harmful for patients who did not increase their stroke volume after the fluid loading. Thus, it is important to have reliable and if possible non invasive tools to predict fluid responsiveness. Many studies, on humans and animals, have suggested that R-wave amplitude of the electrocardiogram (ECG) is correlated to central volemia. We have demonstrated in a previous study that respiratory changes of R-wave amplitude (ΔR), particularly in lead II, are correlated to stroke volume respiratory variations.
OBJECTIVES. The aim of this study was to investigate whether ΔR in lead II was able to predict fluid responsiveness in critical ill patients with shock.
METHODS. We prospectively included 31 patients with shock under mechanical ventilation and deep sedation. Exclusion criteria were non sinus rhythm, spontaneous breathing, tidal volume lower than 7 ml/kg. For each patient, two operators simultaneously and blindly realized an ECG and a transthoracic echocardiography. We recorded hemodynamic parameters and echocardiographic data for stroke volume (SV) calculation. A fluid infusion was then performed (500 mL of colloid in 30 min) and after all the measurements were recorded again. The ECG were analysed off-line posteriorly by using computer software and ΔR was calculated as follow: $\Delta R\ (\%) = 100 \times (R_{max}–R_{min})/((R_{max} + R_{min})/2)$. Patients were considered as responders (R) after fluid challenge if they increase their SV by at least 15 %, others are non responders (NR). A non parametric Mann–Whitney test was used to compare the two groups. A receiver operating characteristic (ROC) curve evaluated the ability of ΔR to predict positive fluid responsiveness. A p value <0.05 was considered as significant.
RESULTS. The median age was 61 (49–73) years and the median SAPS II was 51 [35-68]. Of the 31 patients, 28 (90 %) had norepinephrine. ΔR in lead II in NR group was significantly lower than in R group 8 % (7–15) versus 17 % (13–21; $p = 0.004$). The area under the ROC curve (AUC) which evaluated the ability of ΔR in leads II to predict an increase of

15 % of VES was 0,81 [0,62-0,93];p = 0.001. A ΔR in leads II before fluid challenge of 9 % predicts an increase of SV by at least 15 % with a sensitivity of 93 % (61–100), a specificity of 65 % (38–85), a positive predicting value of 68 % (43–87), a negative predicting value of 92 % (60–100) and a best positive likelihood ratio of 2.63 (1.8–3.8).

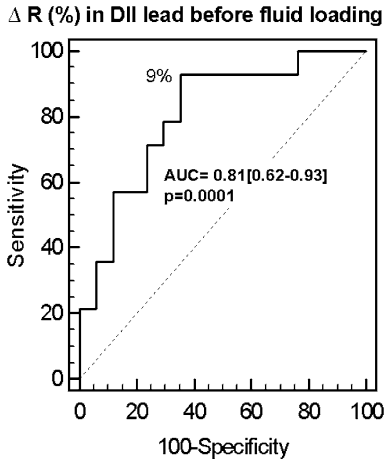

Fig. 1 ROC curve

CONCLUSIONS. Respiratory changes in DII ECG lead R-wave amplitude appear to be an interesting non invasive method to predict fluid responsiveness in patients with shock and under mechanical ventilation.

0269

NON-INVASIVE DETERMINATION OF STROKE VOLUME CHANGES IN RESPONSE TO PASSIVE LEG RAISING MANEUVER. ECHOCARDIOGRAPHY VERSUS NICOM®. PRELIMINARY RESULTS

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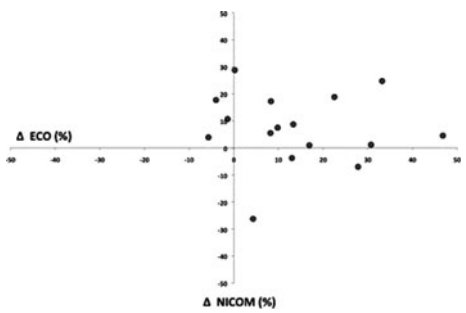
[1]Hospital Parc Taulí, Critical Area, Sabadell, Spain

INTRODUCTION. The use of noninvasive techniques for hemodynamic monitoring in critically ill patients is essential to assess cardiovascular performance such as predicting the response to volume administration, minimizing the risks related to invasive methods. The NICOM System, based on bio-reactance, detects wave changes in frequency and amplitude generated by an alternating low voltage passing through the patients chest, and requires only four electrodes. The system derives a noninvasive estimation of stroke volume (SV). However, it has not yet been validated for predicting SV response to fluid loading.

OBJECTIVES. To compare two non-invasive measurements of stroke volume (SV) changes: the NICOM System (Nic), and echocardiography (Echo), a technique already validated for that purpose in critically ill patients.

METHODS. Prospective study in adult patients admitted to a medical-surgical Critical Area, during 3 months. Patients unable to perform the passive-leg raising maneuver (PLR) were excluded. This maneuver was used to induce changes in SV. SV was measured at baseline (B1) and during the PLR, and its changes computed. In addition the following data were collected: age, sex, reason of admission, APACHE II, use of vasoactive drugs and heart rate. To avoid interobserver differences all echocardiographic measurements were performed by a single operator with extensive experience. Statistical analysis was performed using Pearson correlation and Bland–Altman analysis. $P < 0.05$ was considered significant.

RESULTS. We studied 19 patients (15 men and 4 women) with a mean age of 58 years. Three patients were excluded due to technical problems. No significant correlations were found in SV measured with the NICOM vs echocardiography at baseline [SV(B1)Nic vs. SV(B1)Eco: r = 0.2 (p = 0.4) bias +23 ± 55 ml] nor during PLR [SV(PLR)Nic vs SV(PLR)Eco: r = 0.2 (p = 0.2) bias +27.5 ± 68.4 ml]. We did not observe a significant correlation in the increase of SV between B1 and PLR (ΔSV) measured with the two systems (see graph), r = 0.5 (p = 0.8) bias −6.91 ± 40.9 %.



Graphic 1

CONCLUSIONS. Our preliminary data does not suggest a significant correlation between measurements of SV obtained using ecocardiography and NICOM. Further studies are necessary to determine the reliability of the NICOM system in assessing dynamic changes in stroke volume.

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0270

PREVALENCE OF GLOBAL LEFT VENTRICULAR MECHANICAL DYSSYNCHRONY AS MEASURED BY TOTAL-ISOVOLUMIC TIME IN PATIENTS ON THE CARDIOTHORACIC INTENSIVE CARE

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INTRODUCTION. Global left ventricular mechanical dyssynchrony (GLVMD) is uncoordinated ventricular wall motion that reduces the extent of intrinsic energy transfer from the myocardium to the circulation. Its functional consequences are significant impairment of maximal cardiac function, causing a fall in the peak rates of LV pressure rise and fall, which prolongs the total isovolumic time (tIVT). The latter is the time in the cardiac cycle when the ventricle is neither ejecting nor filling, also called wasted time [1]. A tIVT of greater than 14 s/min is used to define GLVMD. By minimizing tIVT, stroke volume can be increased without increasing myocardial oxygen consumption.

OBJECTIVES. The prevalence of GLVMD in patients on the cardio-thoracic ICU (cICU) is unknown. The aim of this study was to investigate the prevalence of GLVMD as measured by the tIVT on the cICU.

METHODS. Patients on cICU underwent either trans-thoracic/oesophageal 2D Doppler echocardiography. The LV ejection fraction (LVEF) was obtained using the Bi-plane Simpson's. Transaortic flow velocity was obtained. The LV ejection time (ET) was measured as the interval between the onset of forward aortic flow to the onset of the aortic valve closure artifact. Transmitral Doppler flow velocities were recorded. The LV filling time (FT) was measured from the onset of the Early (E) wave to the end of the atrial (A) wave. Total LV ejection and filling periods were derived as the product of the corresponding time interval and heart rate (HR) and expressed in seconds per minute (s/min). The tIVT was calculated as [60 − (total ET + total FT)] in s/min and tIVT of >14 s/min was used to define GLVMD. Characteristics of patients with GLVMD were compared to those without GLVMD. Data is presented as mean ± SD or median (inter-quartile range). A $P < 0.05$ was deemed statistically significant.

RESULTS. A total of 40 patients were studied (mean age 69 ± 19 years, 40 % female, LVEF 43 ± 12 %, 30 had cardiothoracic surgery. Mean HR was 91 ± 14 beats per minute (bpm), 4 had left bundle branch block, 17 were paced (epicardial) and 33 were mechanically ventilated. 25 were on vasopressors and 17 on inotropes. The prevalence on GLVMD was 23 % (9/40). There were no significant differences between patients with GLVMD and those without GLVMD with respect to LVEF (42 ± 16 vs. 43 ± 11 %; 0.88), HR (88 ± 20 vs. 91 ± 12 bpm; P = 0.65), QRS duration [124 (74–166) vs. 87 (79–103) ms; p = 0.33], percentage paced (66 vs. 35 %; p = 0.22), atrial fibrillation (55 vs. 19 %; p = 0.09); ischemic heart disease (33 vs. 22 %; p = 0.81), length of ICU stay (21 ± 13 vs. 18 ± 15 days; p = 0.57) or APACHE II scores [11 (9–14) vs. 11 (8–13); P = 0.87].

CONCLUSIONS. A significant proportion (23 %) of patients on cICU have evidence of GLVMD, suggesting a significant degree of wasted time in cardiac cycle with reduced cardiac function. Therapies targeting shortening of tIVT may increase cardiac function.

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0271

ASSESSMENT OF PLEURA- AND PERICARDIAL EFFUSION AFTER OPEN HEART SURGERY USING FOCUS ASSESSED TRANSTHORACIC ECHOCARDIOGRAPHY

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INTRODUCTION. Pericardial effusions (PE) and pleural effusions (PLE) following open heart surgery are common complications. PE can lead to life-threatening cardiac tamponade and PLE may severely impair respiratory and circulatory function. PE and PLE show substantial variation in incidence throughout the western world; this may in part be due to time-consuming and cumbersome diagnostic procedures.

Point-of-care ultrasound protocols such as Focus Assessed Transthoracic Echocardiography (FATE) [1] combines features from cardiology and radiology and constitutes a non-invasive evaluation of the cardiopulmonary status. FATE has proved feasible in a mixed intensive care population, and in one-day surgery patients, but it has never been used in the assessment of PE and PLE in postoperative cardiac surgery patients [1–2]. Point-of-care ultrasound helps noncardiologist to diagnose critically ill patients in a swift and non-invasive way [3].

OBJECTIVES. The aim of the study was to quantify the incidence of PE and PLE in postoperative open heart surgery patients. A secondary endpoint was to examine if FATE is feasible with regard to time consumption and image quality in postoperative open heart surgery patients.

METHOD. The study was approved by the regional ethical committee. Patients scheduled for open heart surgery were eligible for inclusion. Baseline evaluation including FATE examination, an interview about activities of daily living and dyspnea was performed 1 day prior to surgery. FATE examinations and interviews were repeated on the 4th and 30th postoperative day. All visible amounts of PE and PLE were classified as positive findings.

RESULTS. Preliminary data is available for 40 patients. 68.6 % of the patients had PLE on the 4th postoperative and 35.4 % had PLE 30 days after surgery. The corresponding figures for PE were 14.3 % on the 4th day and 29.4 % on the 30th day. Data on activities of daily living and dyspnea are still pending.

CONCLUSION. Preliminary results indicate a very high incidence of PE and PLE following open heart surgery compared to previous studies. Data on feasibility with regard to time consumption and image quality are not yet available. Point-of-care ultrasound seems to be able to illuminate issues concerning postoperative PE and PLE.

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0272

INITIAL CLINICAL EXPERIENCE WITH A NOVEL, MINIATURIZED TRANSOESOPHAGEAL ECHOCARDIOGRAPHY PROBE

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INTRODUCTION. In the ventilated unstable ICU patient, transoesophageal echocardiography (TOE) offers point-of-care haemodynamic assessment in clinical situations where the limitations of available monitors (pulmonary artery catheters and pulse pressure analysis) are apparent. Interval monitoring with a conventional multiplane TOE probe is effective, but not commonly used, as it is known to be associated with complications. A recently introduced, miniaturized (5.5 mm), disposable TOE probe with approval for an insertion time of up to 72 h (ClariTEE™, ImaCor Inc., Garden City, New York, USA) has the potential for providing continuous qualitative and quantitative cardiac assessment and early reports of its clinical performance have been promising.
OBJECTIVES. We report our first experience using the ClariTEE™ TOE probe in a mixed population of ventilated critically ill patients.
METHODS. This is a prospective quality review study. The criteria for ClariTEE™ probe insertion was haemodynamic instability in a ventilated critically ill patient where additional information to available monitoring was required for at least a 24 h period. The investigators consisted of a group of consultant level (n = 5) and senior trainee level (n = 2) intensivists. All investigators underwent a 3 day simulator-based training programme. To standardize image acquisition, three primary views were obtained: (1) mid-oesophageal four-chamber, (2) transgastric short axis 3. superior vena cava short axis. An additional modified four chamber view was used to assess right ventricular function in a proportion of patients. All study images, haemodynamic variables, therapeutic interventions and ventilator settings were recorded digitally. All study images and interventions were reviewed by a senior investigator accredited in echocardiography. Echocardiographic findings, i.e. left ventricular filling and function, right ventricular function and fluid responsiveness were documented.
RESULTS. 104 TOE studies were performed in 27 critically ill patients (age 71 years, 14 female), consisting of patients post cardiac surgery (n = 15) and a mixed general intensive care population (n = 12). Probe insertion was graded as easy in all patients and there were no complications associated with continuous use. All primary views were obtained in 25 (92.6 %) patients, additional RV assessment was performed in 23 (85.2 %) patients (Table 1). TOE assessment resulted in changes in management in 24 (88.9 %) patients and improved haemodynamic conditions in 22 (81.5 %) patients (Table 2).

Table 1 Patient and study characteristics

	Cardiac surgical ICU	General ICU
	n = 15	n = 12
Age	75	66.8
Female	8 (53.3 %)	6 (50 %)
Probe insertion time	27.9	25.1
No. of studies	66	38
Full TOE exam	14 (93.3 %)	11 (91.7 %)
Continuous TOE monitoring	14 (93.3 %)	10 (83.3 %)
Involvement of ICU trainee	10 (66.7 %)	4 (33.3 %)

Table 2 Impact of TOE findings

	Cardiac surgical ICU (n = 15)	General ICU (n = 12)
Changes in inotropes based on TOE	13 (86.7 %)	6 (50 %)
Changes in fluids based on TOE	13 (86.7 %)	7 (58.3 %)
Overall changes in therapy	14 (93.3 %)	8 (66.7 %)
RV impairment diagnosed	13 (86.7 %)	10 (83.3 %)
Improved haemodynamics	14 (93.3 %)	8 (66.7 %)

CONCLUSIONS. Continuous haemodynamic monitoring with the ClariTEE™ TOE probe can be successfully performed after a training period by a group of intensivists with mixed level of experience in TOE. Continuous TOE monitoring provided additional haemodynamic information in the majority of cases, resulting in a change of therapy and improved haemodynamic parameters.

0273

PREDICTION OF CARDIAC INDEX (CI) BY BODY SURFACE TEMPERATURES MEASURED WITH TEMPERATURE PROBES AND NON-CONTACT INFRARED THERMOMETER

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INTRODUCTION. Cardiac Index (CI) is a cornerstone of goal-directed therapy. However, most of the techniques based on indicator dilution and/or pulse contour analysis require central venous and/or arterial catheters. This precludes preclinical and early ED-use. Several surrogate markers have been suggested to estimate CI including $S_{cv}O_2$, central venous-arterial CO_2 difference (CVACO2D) as well as body surface temperatures.
OBJECTIVES. It was the aim of our prospective study to evaluate the predictive capabilities of CVACO2D, $S_{cv}O_2$, surface temperatures and lactate regarding CI.
METHODS. In 65 patients (46 m; 19f) with PiCCO-monitoring, pre-thermodilution (TPTD) values of surface temperatures of great toe, finger, forearm and forehead using temperature probes (Exacon; TP) as well as infrared non-contact thermometer (Thermofocus; Tecnimed (TF)), ear temperature (Braun ThermoScan PC 200), $S_{cv}O_2$, lactate and CVACO2D were measured immediately before PiCCO-TPTD providing CI. Statistics: Spearman correlation, multiple regression and ROC-analysis. SPSS 19.0.
RESULTS. Thermodilution-derived CI significantly ($p < 0.001$ except as indicated) correlated to ear temperature ($r = 0.446$) as well as to TF- and TP-derived surface temperatures of forehead ($r = 0.527$ for TF; $r = 0.482$ for TP), middle forearm ($r = 0.424$; $r = 0.444$), distal forearm ($r = 0.417$; $r = 0.499$), proximal 3rd finger ($r = 0.396$; $r = 0.343$), distal 3rd finger ($r = 0.277$; $r = 0.324$) and great toe ($r = 0.451$; $r = 0.508$). All differences of these parameters to body core temperature were significantly ($p < 0.001$) associated to CI with r-coefficients slightly inferior to absolute surface temperatures. $S_{cv}O_2$ ($r = 0.585$; $p < 0.001$) also significantly correlated to CI. SCVACO2D ($r = -0.219$; $p = 0.08$), lactate ($r = 0.033$; $p = 0.798$), capillary refill time ($r = -0.213$; $p = 0.102$) and pulse pressure ($r = 0.104$; $p = 0,407$) did not correlate to CI. Multiple regression analysis including age, gender, height, weight and surface temperatures demonstrated independent association of CI to age ($p < 0.001$) and to surface temperatures on forehead, forearm, great toe ($p < 0.001$ for all measurements and for TP as well as for TF). The best correlation ($R = 0.666$) was found for a model including age and forearm temperature (TP).
ROC-analysis demonstrated high predictive capabilities regarding "CI < 2.5L/min m^2" for temperature of forehead (TF) (AUC 0.836; $p = 0.004$), great toe (TP) (0.802; $p = 0.010$), forearm (TP) (0.735; $p = 0.045$) and $S_{cv}O_2$ (0.747; $p = 0.035$). Similarly, "CI > 5L/min m^2" was predicted by temperature of forehead (TF) (AUC 0.799; $p = 0.001$), great toe (TP) (0.729; $p = 0.008$), distal forearm (TP) (0.806; $p < 0.001$) and $S_{cv}O_2$ (AUC 0.767; $p = 0.002$). A model including age and forearm temperature (TP) provided AUCs of 0.830 ($p < 0.005$) and 0.893 ($p < 0.001$) for these thresholds of CI.
CONCLUSIONS.
1. Body surface temperatures are useful to estimate CI.
2. Non-contact infrared thermometers and temperature probes provide similar prediction.

0274

TEI INDEX AND ENDOMYOCARDIAL LONGITUDINAL STRAIN VALUE IN ACUTE PATIENTS WITH MYOCARDIAL INFARCTION OR PERICARDIAL DISEASE

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INTRODUCTION. The differential diagnosis between pericarditis and acute myocardial infarction (AMI) is sometimes difficult, usually requiring coronary angiography.
OBJECTIVES. The objective of this study was to evaluate the performance of the Tei index and the left longitudinal strain on the differential diagnosis.
METHODS. Cohort prospective observational study. We have included acute patients with differential diagnosis between AMI and pericardial disease. We have excluded patients with systolic or diastolic dysfunction (regional or segmental), or those whose final diagnosis is not made by coronary angiography or cardiac resonance. It will assess the performance of Tei index and left longitudinal strain as the final diagnosis. We include a control group to consider the normal measures of left Tei index and longitudinal strain.
RESULTS. 82 patients were included (33 with pericardial disease, 30 group control, see Table 1).

Table 1

Groups	#	Median	Standard desviation	Significance
Left Tei index (pericardial disease)	33	0.377	0.078	<0.001
Left Tei index (AMI)	49	0.801	0.197	<0.001
Left Tei index (control group)	30	0.280	0.122	<0.001
Longitudinal Strain (pericardial desease)	33	−15.387	6.211	0.0001
Longitudinal strain (AMI)	49	−11.759	1.480	0.0001
Longitudinal strain (control group)	30	−17.800	6.21	0.0001
Age (pericardial desease)	33	29.871	11.221	<0.001
Age (AMI)	49	44.500	4.855	<0.001
Age (control group)	30	24.120	6.182	<0.001

The left Tei index was higher in AMI than in pericardial disease and control group. The longitudinal strain was lower in AMI than in pericardial disease and control group. A value of longitudinal endomyocardial strain ≤(−15.5) has a sensitivity of 97.62 % and a value ≤(−10.94) presents a specificity of 96.77 % for AMI. A left Tei index value ≥0.625 has a sensitivity of 90.47 % for the diagnosis of AMI, and a value ≥0.52 has a specificity of 96.77 %. (See Fig. 1).

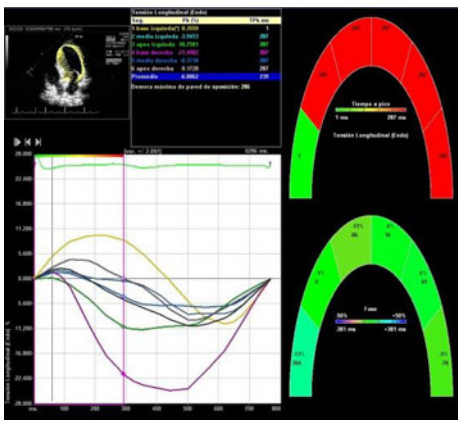

Fig. 1 Longitudinal speckle tracking in an AMI patient

CONCLUSIONS. When we have a diagnostic doubt between pericardial disease and AMI with a normal global systolic and diastolic function, the value of Tei index and longitudinal strain under close to normal values could strongly suggest the diagnosis of acute pericarditis.
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0275
HEMODYNAMIC ASSESSMENT IN THE ACUTE PHASE OF SEPTIC SHOCK—DO THE RIVERS CRITERIA LAST LONGER THAN SIX HOURS?

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INTRODUCTION. Early aggressive hemodynamic resuscitation is a cornerstone in the management of severe sepsis and septic shock. Guidelines recommend central venous pressure (cvp), mean arterial blood pressure (RR_{mean}), central venous oxygen saturation ($ScvO_2$) and hematocrit (hct) be followed for a minimum of 6 h after initial hemodynamic support as proposed by Riveŕs protocol of early goal directed therapy (EGDT). Whether one of these or all of these parameters are crucial is not known nor is the impact of cardiac dysfunction (lvef) or myocardial ischemia (TnI). Furthermore, it is unknown if there is a benefit of survival following the Riveŕs protocol of early goal directed therapy for more than 6 h.

OBJECTIVES. The aim of this study was to identify prognostic hemodynamic factors playing a role in survival in patients with septic shock treated for 28 days according to Riveŕs EGDT protocol.

METHODS. Prospective observational study, 9-bed conservative intensive care unit, university hospital. 52 consecutive pt with septic shock as defined in the actual guidelines. Differences in 28 day-mortality. Assessment of cvp (mmHg), RRmean (mmHg), $ScvO_2$ (%), hct (%), lvef (%) and TnI (ng/ml), normal range <0.015 ng/ml, on day 1 and day 7, and 28 day-mortality. Transthoracic echocardiography was performed in each subject.

RESULTS. 52 pt, mean age 71.4 years ± 8.5, 31 males (59.6 %), 33 pt with known coronary artery disease (63.5 %), mean APACHE II-score 37.9 ± 7.6. 47 (90.4 %) mechanically ventilated pt. 28 pt died within 28 days (53.8 %). Echocardiography in 45 pt (86.5 %). Mean cvp 9.59 ± 4.53, RR_{mean} 64.72 ± 14.76, $ScvO_2$ 65.5 ± 11.29, hct 31.23 ± 5.57, TnI 3.39 ± 10.28, lvef 43.66 ± 13.46. The influence of initially on day 1 reduced hemodynamics regarding 28 day-mortality was as follows: 21 pt (40 %) with cvp <8 vs. 31 pt (60 %) with cvp >8 (p = ns), 28 pt (53 %) with RR_{mean} <65 versus 24 pt (47 %) with RR_{mean} >65 (p = 0,01), 25 pt (61 %) with $ScvO_2$ <70 versus 27 pt (48 %) with $ScvO_2$ >70 % (p = ns), 22 pt (42 %) with a hct <30 versus 30 pt (52 %) with a hct >30 (p = ns), 33 pt (63 %) with TnI >0.015 versus 19 pt (37 %) with TnI <0.015 (p = ns), 16 pt (30 %) with LVEF <40 versus 36 pt (70 %) with lvef >40 (p = ns).

CONCLUSIONS. In patients with septic shock early assessment of hemodynamic parameters is essential for an aggressive hemodynamic resuscitation. Mean arterial blood pressure reduced at ICU admission was the only hemodynamic parameter associated with an increased 28 day-mortality rate. Furthermore, an initially reduced $ScvO_2$ <70 %, hct or cvp had no impact as a prognostic hemodynamic factor in regard to longterm-survival. Thus, River's criteria of EGDT may achieve an increased survival when initiated within the first 6 h of treatment, but the prognostic significance except for mean arterial blood pressure is poor.

0276
ASSESSMENT OF LEFT VENTRICULAR PERFORMANCE IN PATIENTS WITH COPD

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INTRODUCTION. The comparison of pulse contour analysis for assessment of cardiac output (CO) with other techniques of left ventricular (LV) functions assessment has not been assessed before in patients with Chronic Obstructive Pulmonary Disease (COPD), as cardiovascular diseases is the commonest cause of mortality in these patients.

OBJECTIVES. To assess LV performance and CO in patients with COPD by the use of pulse contour analysis, echocardiography and thallium study and correlate data obtained by each study to each other.

METHODS. Thirty COPD patients admitted to the ICU were subjected to conservative therapy and assessment of LV functions, including: CO, mean arterial pressure MAP, stroke volume SV, ejection fraction EF% and diastolic function by the three equipments mentioned.

RESULTS. It was found that ten patients 33 % had MAP below normal and eighteen patients 60 % had low CO as measured by the Vigileo monitor. It was found that CO and SV by Vigileo monitor and echocardiography are highly correlated, (p value = 0.001), diastolic dysfunction was present in 63 % of patients, while 43 % of them were found to have dilated left ventricle with low EF %. A high statistically significant relation was present between patients with pulmonary hypertension and low MAP (p value was 0.0001), and those with diastolic dysfunction (p value was 0.035); as well the relation between low CO patients and having dilated RV was statistically highly significant (p value was 0.0001).

CONCLUSIONS. It can be concluded that monitoring of CO, MAP and assessment of systo-diastolic function of LV are important issue in patients with COPD which can be easily measured by Vigileo monitor and echocardiography.

0277
GOAL-DIRECTED HAEMODYNAMIC THERAPY IN CARDIAC SURGICAL PATIENTS: SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

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INTRODUCTION. Operative and postoperative mortality after cardiac surgery have decreased throughout the last decades although postoperative morbidity has been increasing mainly because sicker, older and higher-risk patients have been treated. Up to 10 % of cardiac surgical patients experience a complicated postoperative period, with prolonged ICU stay and poor long-term outcome [1]. Complications after major surgery are undesirable and potentially avoidable. However, although some evidence suggest that perioperative monitoring and pre-emptively manipulation of haemodynamics reduces surgical mortality and morbidity [2], no clear data are available in cardiac surgical patients, and no systematic review-meta-analysis to study the effect on mortality, morbidity and length of stay has been published.

OBJECTIVES. The objective of this review is to perform a meta-analysis on the effects of perioperative goal-directed hemodynamic therapy (GDT) on mortality, morbidity and length of hospital stay in cardiac surgical patients.

METHODS. A systematic literature review using MEDLINE, EMBASE and the Cochrane Controlled Clinical Trial register was conducted. Additional sources were sought from experts and industry representatives. Inclusion criteria include: randomized controlled trials, mortality reported as an outcome, pre-emptive haemodynamic intervention and cardiac surgical population. Identified studies that fulfilled the entry criteria were examined in full and subjected to quantifiable analysis, subgroup analysis and sensitivity analysis where possible. Data synthesis was obtained by using odds ratio (OR) with 95 % confidence interval (CI) by random-effects model.

RESULTS. From 4980 potential studies, only four studies met all the inclusion criteria (659 patients). The quantitative analysis showed that the use of GDT reduced surgical complications rate in 55.5 % (OR 0.36 [0.15, 0.84]; $p = 0{,}02$) and hospital length of stay in 2.45 days, which is the 24 % of average length of stay [OR −2.21 (−3.84, ,0.57); $p = 0.008$] when compared with control group. There was no significant reduction of mortality.

CONCLUSIONS. The use of pre-emptive GDT in cardiac surgical patients reduces morbidity and hospital length of stay.

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0278
ULTRASONOGRAPHIC INVESTIGATION OF THE EFFECT OF POSITIVE END EXPIRATORY PRESSURE (PEEP) ON THE CROSS-SECTIONAL AREA (CSA) OF THE FEMORAL VEIN IN ADULT PATIENTS WITH MECHANICAL VENTILATION

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INTRODUCTION. Femoral veins are commonly used as a safe alternative route for central venous cannulation. Several manoeuvres are used to increase the cross-sectional area of the vein.

OBJECTIVES. In this study, we assessed the effect of positive end-expiratory pressure (PEEP) on the cross-sectional area of femoral veins, using ultrasound in adult patients with mechanical ventilation.

METHODS. Using ultrasound, the cross-sectional areas of both femoral veins were measured in 57 anaesthetised adult patients in the supine position without PEEP (control) and in the supine position with PEEP of 10 cm H_2O. Mean arterial pressure and heart rate were recorded before and after the application of PEEP at 10 cm H_2O.

RESULTS. The application of 10 cm H_2O PEEP significantly increased the cross-sectional area of the right femoral vein by 47.6 % and the left femoral vein by 48.4 %. Mean arterial pressure decreased by 2.6 mmHg (95 % CI, 1.3–3.9; $P < 0.01$), whereas no significant change in heart rate was observed ($P > 0.05$).

CONCLUSIONS. Femoral vein cannulation is augmented with the application of 10 cm H_2O PEEP in adult patients with mechanical ventilation.

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ICU infections: Biomarkers & antimicrobial treatment 1: 0279–0292

0279
LIPOPROTEIN PATTERNS RELATED TO NEUTROPHIL CD64-EXPRESSION AND METABOLIC INDICES IN SEVERE SEPSIS AND NON-INFECTIOUS SIRS IN CHILDREN

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INTRODUCTION. Lipoproteins were shown to neutralize LPS and to exert direct anti-inflammatory actions. Neutrophil CD64-expression (nCD64)was shown to be an early inflammatory sign. It is not known whether acute lipoprotein alterations differ between infectious and non-infectious systemic inflammatory response syndrome (SIRS) and if they are related to nCD64 or other metabolic indices in critically ill children.

OBJECTIVES. To examine whether plasma concentrations of high (HDL) or low-density-lipoproteins (LDL) are related to nCD64, triglycerides, glucose, severity of illness (PRISM, PELOD), length of stay (LOS) or mechanical ventilation (LOMV), and mortality in children with sepsis (S) and severe sepsis/septic shock (SS) compared to those with trauma (T) or healthy controls (C).

METHODS. Forty-eight children were classified into a group of 12 healthy controls and 3 groups of SS, S, T (12 each) with systemic inflammatory response syndrome (SIRS). All patients were on isocaloric- isonitrogenous enteral nutrition. Blood samples for plasma lipoproteins, triglycerides, cholesterol, glucose, nCD64-expression and acute phase proteins were collected on days 1, 2, and 3 after admission. The Kruskal–Wallis test was used to calculate differences among groups.

RESULTS. Only 2 children died in T. First day HDL was found to be significantly lower in SS and Scompared to C (29.5 ± 2.7, 27.3 ± 4.2 vs. 58.8 ± 5.8 mg/dl, $p < 0.001$) as wasLDL (33.4 ± 5.8, 66.2 ± 9 vs. 98.1 ± 6.5 mg/dl, $p < 0.001$) and cholesterol (100.6 ± 9, 125.2 ± 16, vs. 171.3 ± 7 mg/dl, $p < 0.001$). Opposite trends followed triglycerides (209 ± 61, 151.7 ± 25, vs. 71.8 ± 10 mg/dl, $p = 0.007$) and glucose (117 ± 8, 115 ± 12, vs. 83 ± 3 mg/dl, $p = 0.002$). All 3 days HDL and triglycerides differed between S or SS and T ($p < 0.04$); LDL days 1, 2 were lower in SS compared to T ($p < 0.03$). In none of the SIRS groups metabolic indices differed between days 1, 2 or 3. Cholesterol, HDL, and LDL were negatively related with nCD64, PCT, CPR, glucose, LOS, and LOMV ($p < 0.05$) but not with severity of illness. Glucose was positively related to the LOS and PELOD ($p < 0.05$) and triglycerides with CRP ($p < 0.05$).

CONCLUSIONS. Lipoproteins and cholesterol are markedly reduced in severe sepsis, but not in trauma, and are inversely related to nCD64-expression, acute phase proteins, glucose, LOS, and LOMV. Triglycerides increase with severity of sepsis and glucose with severity of illness. The meaning of the acute phase opposite metabolic derangementsin severe sepsis in children should be further examined in larger multicenter studies.

0280
ENDOCARDITIS AT ICU: COULD WE PREDICT MORTALITY?

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OBJECTIVES. To make an evaluation of the prognosis of patients with infective endocarditis (IE) that will require surgery, at the first moment, when disease is diagnosticated.
METHODS. Retrospective study of all patients in a tertiary hospital from Spain during 5 years, with a diagnosis of IE (Duke criteria modified), which required surgery. We analized demographic data, clinical evolution and therapeutic complications. Univariate analysis: Chi-square and Studenťs t test; multivariate: logistic regression. Significance: $p < 0.05$. SPSS17.0.
RESULTS. We collected 73 patients, 79.5 % men, mean age 65.3 years. 82 % positive blood cultures. 54.8 % cases were admitted to the ICU for postoperative monitoring, although 41.4 % required admission prior. In 35 % of cases surgery was urgent. 56 % patients had postoperative shock, requiring vasoactive support during 3.4 ± 7.6 days (SD). The average time of mechanical ventilation (MV) was 5.16 ± 9.4 days (SD). 58.9 % suffered acute renal failure (ARF) post-surgery, and requiring extra-renal clearance techniques (ERCT) 39.7 %. In-hospital mortality was 31.5 %. We conducted univariate analysis with respect to mortality, and the following conditions had statistical significance: old age ($p = 0.03$), previous heart disease ($p = 0.03$), debut with general syndrome ($p = 0.02$), distal embolism ($p = 0.05$), multiorgan failure pre-surgery ($p = 0.02$), urgent surgery ($p = 0.01$), postoperative shock ($p < 0.00$), post-operative ARF ($p < 0.00$), postoperative ERCT ($p < 0.00$), time of catecholamines ($p < 0.00$) and time of VMI ($p < 0.00$). In the multivariate analysis, remained associated with mortality, the need of ERCT ($p < 0.00$, OR 0.02, CI 0.002–0.21) and the presence of previous heart disease ($p = 0.04$, OR 0.152, CI 0.24–0,95).
CONCLUSIONS. In our serie of surgery IE, the need for urgent surgery, the shock, the use of ERCT and the presence of previous heart disease were associated with higher mortality. We did not find association with the causative agent.

0281
INFECTIONS IN MECHANICALLY VENTILATED PATIENTS IN CANADIAN INTENSIVE CARE UNITS

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INTRODUCTION. Infections and their sequelae are associated with substantial morbidity and mortality in the intensive care unit (ICU). Due to illness severity and uncertainty as to the diagnosis of infection, ICU patients are often exposed to prolonged courses of broad spectrum antimicrobials which may promote the development of antibiotic-resistant pathogens. Although there are multicenter data on infections in ICU patients in the United States and Europe, little is known about critically ill patients in Canada.
OBJECTIVES. To determine the prevalence and outcomes of infections along with antibiotic utilization in mechanically ventilated (MV) patients in Canadian ICUs.
METHODS. Secondary analysis of a prospective knowledge translation study implementing guidelines for ventilator associated pneumonia in 10 ICUs across Canada, between June 2007 and December 2009. Patients were included if they were adults (age > 16) and MV for at least 48 h. There were no exclusion criteria. Demographic, microbiologic, therapeutic, and outcome data were collected; APACHE II was measured on admission and SOFA at 48 h. Infections were characterized as prevalent (culture positive <48 h after ICU admission) or ICU acquired (cultures positive ≥48 h after ICU admission).
RESULTS. Of the 1,200 enrolled patients, characteristics were (mean ± SD): age (59.6 ± 17.3), 61.2 % male, APACHE II (23.3 ± 7.5), 48 h SOFA (3.8 ± 3.0) and 73.6 % had a medical admission diagnosis. One or more positive cultures occurred in 758 (63.2 %) patients; 215 (17.9 %) were prevalent, 315 (26.3 %) were ICU-acquired and 228 (19.0 %) were both. Respiratory (50.3 %), bloodstream (23.8 %), and urinary infections (19.9 %) accounted for 94.1 % of all infections. Of 3206 positive cultures, 49.5 % were gram positive, 31.1 % were gram negative, 18.1 % were fungal and 1.3 % were viral. At least 1 antibiotic was received by 1139 (94.9 %) patients during their ICU stay with 3.2 ± 1.9 distinct antibiotic prescriptions per patient and a mean duration of 5.1 ± 6.8 days; 6.2 % were antifungal agents. In spite of similar baseline characteristics, patients with positive cultures had higher 48 h SOFA scores (4.0 ± 3.1 vs. 3.2 ± 2.9, $p < 0.001$), longer duration of MV [median days (IQR), 10.7 (5.8, 44.9) vs. 5.9 (3.5, 12.6), $p < 0.0001$] and hospital stay [median days (IQR), 66.8 (28.0, und.) vs. 37.2 (17.1, und.), $p < 0.0001$]. Hospital mortality was highest in those with ICU-acquired positive cultures, compared to prevalent or no positive cultures (38.7 vs. 35.8 vs. 31.0 %, respectively, $p = 0.02$). The odds ratio for hospital mortality in patients with ICU-acquired positive cultures was 1.47 (1.02, 2.11, $p = 0.04$) compared to those with no positive cultures.
CONCLUSIONS. Infections occur commonly in patients in Canadian ICUs and are associated with increased morbidity and mortality. Antibiotic utilization is nearly ubiquitous and out of proportion to culture data; the factors driving this require further study.

0282
IMMUNOPHENOTYPIC ANALYSIS AND FUNCTIONAL CHANGES IN SEPTIC ICU PATIENTS: DIAGNOSTIC ACCURACY AND PROGNOSTIC VALUE

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INTRODUCTION. Septic syndrome in ICU represents a major clinical problem with high attributed mortality. Scientific evidence suggests that septic patients often present severely immune responses, from serious hyperinflammation to profound immunoparalysis. Recent data indicate that immune cells are involved in the pathogenesis of septic shock, however, little is known about their phenotypic and functional changes and their diagnostic and prognostic accuracy in septic patients.
OBJECTIVES. To determine phenotypic differences and functional changes of immune cell subpopulations, with their kinetics and b) identify the diagnostic and prognostic value of these changes, in severe sepsis.
METHODS. Patients with a new fever in the ICU (after the first 48 h) were included. Patients under 18 years and those with immunodeficiency were excluded. Blood was collected at the onset of fever (D1) and at Days 3 (D3) and 5 (D5). Measurements included: a) changes of CD3/4, CD3/4/45RA, CD3/4/45RO, CD3/8 CD3/8/45RA, CD3/8/45RO CD3/4/DR and CD3/8/DR) b) kinetics of CD14brightCD16neg, CD14brightCD16pos, CD14dimCD16pos, CD14brightCD16negDR + and CD14brightCD16posDR + c) comparison with PCT/CRP and d) clinical data and severity scores. Diagnostic value for severe sepsis and prognostic value for sepsis attributed mortality were calculated, using univariate analysis with t-test and χ^2-test and binary logistic regression ($P < 0.05$ was considered statistically significant).
RESULTS. Among 51 patients included in the study, 38 had an infection, 23 had severe sepsis and 7 died due to sepsis. Non-statistically important change was recorded in non-survivors: constant increase (D1-3-5) for CD3/8/45RO, CD3/4/45RA and CD14brightCD16posDR+, initial increase (D1-3) and subsequent decrease (D3-5) for CD14brightCD16pos, initial increase (D1-3) and subsequent stabilization (D3-5) for CD14brightCD16negDR+, CD3/4 and CD14brightCD16neg, initial decrease (D1-3) and subsequent stabilization (D3–5) for CD3/8 and CD3/8/45RA, initial decrease (D1-3) and subsequent increase for CD3/4/DR and CD3/8/DR. In univariate analysis, reliable predictors for severe sepsis were CD14brightCD16negDR+ ($p = 0.01$), age ($p = 0.01$), ODIN ($p = 0.023$), SOFA ($p < 0.01$) and PCT ($p = 0.01$) and in multivariate, SOFA (OR = 1.51, CI 95 %:1.145-1.99, $p = 0.004$). In univariate analysis, accurate predictors for death were CD14brightCD16neg ($p = 0.0024$), CRP ($p = 0.021$), APACHE ($p = 0.034$), SAPS ($p = 0.001$), SOFA ($p = 0.014$) and ODIN ($p = 0.003$) and in multivariate, CRP (OR = 1.25, CI 95 %: 1.06–1.47, $p = 0.007$) and ODIN (OR = 11.4, CI 95 %: 2.12–61.2, $p = 0.005$).
CONCLUSIONS. A severe redistribution of immune cell subsets and variations over time were observed in severe sepsis. Neither diagnostic accuracy for severe sepsis nor prognostic values for death attributed to sepsis was identified. However, kinetic patterns of anosologic markers were seriously disturbed in non-survivors, indicating a potential interest for further investigation.

0283
RELATIONSHIP BETWEEN POLYMORPHONUCLEAR LEUKOCYTE (PMN) COUNT IN BRONCHOALVEOLAR LAVAGE FLUID (BALF) AND FUNGUS CONTENT IN GRAM'S STAIN AND FUNGUS CONTENT IN FINAL MICROBIOLOGICAL REPORT

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INTRODUCTION. BALF cytology has been established as a reliable technique for the diagnosis of pulmonary infection. Significantly higher neutrophil count in BALF is considered to be good predictor of bacterial infection.
OBJECTIVES. To see relationship between PMN count in BALF and fungus content in Grańs stain and fungus content in final microbiological report.
METHODS. Eighty samples of BALF obtained from a total of 48 patients (22 female and 26 male) were analyzed retrospectively. Fifteen of them were hospitalized in the surgical intensive care unit, and the rest of them in the department of medicine, mostly in the intensive care unit (25) or on various medical wards (8). There were 18 organ transplant recipients. BALF sample was collected repeatedly in some patients. The relationship between PMN count in BALF and fungus content in Grańs stain and fungus content in final microbiological report were analyzed.
RESULTS. On the total number of samples, we found statistically significant difference in PMN count depending on fungus content ($p = 0.015$), which means that more PMNs were found in direct sample and at the same time higher fungus content was also found in direct Gram's stain. We did not find statistically significant difference in PMN count in relation to fungus content in final microbiological report ($p = 0.214$).
CONCLUSIONS. PMN count in direct microbiological samples of BALF was statistically significant regarding the presence of fungus, but we did not find correlation between PMN count in direct microbiological sample with fungus content in the final microbiological report.
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0284
ANTIBIOTIC DEESCALATION DURING THERAPY OF POSTOPERATIVE PERITONITIS

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INTRODUCTION. The guidelines for an appropriate use of antibiotic therapy recommend deescalation (D) as soon as identification and susceptibility testing are available. Few studies have addressed this issue in ICU patients (pts) on specific infections except in pneumonia.
OBJECTIVES. To analyze the frequency and practice of D in a cohort of postoperative peritonitis (POP) in a single centre.
METHODS. Between 2000 and 2008, all POP pts admitted in ICU were analysed : demographic data, SAPS II and SOFA scores, susceptibility of the cultured pathogens,

multidrug resistant (MDR) strains, nature and changes of empiric antibiotic therapy (EAT) and proportions of D. Mortality and morbidity data (duration of antibiotic therapy, reoperation, duration of mechanical ventilation and ICU stay) were analysed in view of changes of EAT and D. Results are presented in mean ± SD and proportions, comparison were made by Student and Chi2 tests.
RESULTS. 183 pts (57 % male, 58 ± 17 year old, SAPS II 47 ± 17, SOFA 8 ± 4) were studied. POP was due to a polymicrobial infection in 83 % of the pts, with MDR strains in 35 % of the cases. EAT was a monotherapy in 23 % of the cases. Adequacy of EAT was achieved in 69 % of the pts. The most frequently used drugs for EAT were piperacillin/tazobactam (ptz) (n = 113, 62 %), aminoglycosides (AG) (n = 90, 49 %), vancomycin (n = 69, 38 %), fluconazole (n = 62, 34 %) and imipenem (n = 49, 27 %). Changes of EAT were made in 148 (81 %) pts with D in 102 (56 %) pts. The most frequent changes were interruption of ptz (n = 72, 39 %), imipenem (n = 21, 12 %) and AG (n = 69, 38 %). Severity (SAPS II and SOFA) was similar in both groups of pts having or not D (47 ± 15 vs. 48 ± 20 and 8 ± 3 vs. 8 ± 4, respectively). In pts who had D, frequency of MDR strains was lower (21 % pts vs. 53 %, $p < 0.0001$) and adequacy of EAT higher (85 vs. 48 %, $p < 0.0001$). Durations of antibiotic therapy, of mechanical ventilation, and of ICU stay, and frequency of reoperation were similar in pts who had D or not. A more favorable outcome and a lower ICU mortality rate were observed in case of D (58 vs. 43 %, $p < 0.05$; 23 vs. 40 %, $p < 0.05$, respectively).
CONCLUSIONS. Similarly to what was reported in other types of ICU infections such as pneumonia, D in case of POP is limited by the frequency of MDR strains. The lower mortality rate observed in case of D could be linked to a higher adequacy of EAT and a lower proportion of MDR strains while morbidity criteria did not seem to be influenced by D.
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0285
CORRELATION BETWEEN CARBAPENEM USE DENSITY AND THE INCIDENCE OF IMIPENEM AND MEROPENEM RESISTANT GRAM NEGATIVE ORGANISMS IN A MEDICAL INTENSIVE CARE UNIT

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INTRODUCTION. Carbapenem resistant gram negative bacteria (GNB) is a leading problem in intensive care units (ICUs) as there is a dearth of novel antibiotics directed against these organisms. So, optimum use of carbapenems is the need of the time.
OBJECTIVES. To investigate and find out a statistical relationship between the use of carbapenems and their resistance in GNB.
METHODS. This prospective observational study was conducted over a period of 2 ½ years (January 2009 to June 2011) in adult medical ICUs of a tertiary care hospital. The antimicrobial use density (AUD) of four carbapenems [imipenem/cilastatin (IPM/CS), meropenem (MEPM), ertapenem (ERTM) and doripenem (DRPM)] was examined every 6 months over this period. AUD was calculated using the daily drug defined (DDD/100 patient days) doses methodology developed by the World Health Organisation. Antimicrobial resistance(%) in *Pseudomonas aeruginosa* (PA), *Acinetobacter baumannii* (AB) and Enterobacteriaceae (Ent) (*E. coli*, *Klebsiella pneumoniae*, *Citrobacter* and *Enterobacter* species) for IPM/CS and MEPM were determined. Identification and susceptibility testings were performed by the VITEK 2 compact (bioMerieux) A minimum inhibitory concentration of IPM/CS or MEPM of ≤4 mg/L was considered to be sensitive. Correlation between AUD of carbapenems and IPM/CS and MEPM resistance of PA, AB and Ent were determined using pearson correlation coefficient (r). p value <0.05 was considered significant.
RESULTS. AUD of carbapenems [IPM/CS (r 0.61; p 0.23); MEPM (r 0.48; p 0.38); ERTM (r 0.14; p 0.81)] showed a fluctuating trend over the study period. Only DRPM showed a significant increase (r 0.92; p 0.009) in use. A significant correlation was seen between MEPM resistance and IPM/CS resistance in PA (r 0.98; p 0.0001) and Ent (r 0.95; p 0.002). There was a correlation between IPM/CS resistance and total AUD of MEPM (r 0.80 and 0.72), DRPM (r 0.83 and 0.49) and ERTM (r 0.45 and 0.50) in PA and Ent. Furthermore, a similar correlation was seen between MEPM resistance and total AUD of MEPM (r 0.77 and 0.81), DRPM (r 0.85 and 0.31) and ERTM (r 0.43 and 0.71) in PA and Ent. A negative correlation was seen between AUD of IPM/CS and resistance of IPM/CS (r −0.47, −0.19 and −0.71) and MEPM (r −0.46, −0.19 and −0.49) in PA, AB and Ent, respectively. A statistically significant correlation was seen between the use of DRPM and resistance of IPM/CS (r 0.83; p 0.04) and MEPM (r 0.85; p = 0.03) in PA and between use of MEPM and MEPM resistance in Ent (r 0.85; p = 0.03).
CONCLUSIONS. These results suggest that justifiably curtailing the use of DRPM may help curb the emergence not only of MEPM-resistant strains but also IPM/CS-resistant strains of *Pseudomonas aeruginosa*. Also, limiting the use of MEPM can result in a decrease in MEPM resistant strains of enterobacteriaceae.

0286
AN EPIDEMIOLOGICAL SURVEY OF HIV TESTING IN A LARGE UNIVERSITY HOSPITAL INTENSIVE CARE DEPARTMENT

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INTRODUCTION. The number of people infected with the human immunodeficiency virus (HIV) continues to rise in Europe [1]. In the UK 24 % of those infected with HIV remain undiagnosed. There is a growing trend in Europe to expand HIV testing in health care settings.
OBJECTIVES. To examine all HIV tests sent over a 12 month period from a large teaching hospital's general intensive care units (GICUs) and assess if present indications for testing meet national guidelines (NG).
METHOD. The laboratory database was interrogated for all tests performed in 2010 from the GICUs. The result of each test was recorded. Medical records were scrutinised for every patient tested for HIV and the reason for testing was recorded. The patients were placed into three groups: "Y"-criteria for testing in the national guidelines were identified. "P"-did not meet national guideline criteria for testing but were tested on reasonable clinical suspicion. "N"-had no clinical indication to test for HIV.
RESULTS. In 2010, there was 1053 admissions to the GICUs. 49 (4.6 %) patients were tested for HIV. 4 tests were positive. Of the 49 tests sent, 36 (74 %) met NG criteria for testing (Y-group). 6 (12 %) had no clear reason to justify an HIV test (N-group) and 7 (14 %) justified a test on clinical suspicion in the absence of UK testing criteria (P-group). In the Y-group the most common reasons to test were for pneumonia (16 %), Intravenous drug users (14 %), Haemodialysis (14 %) and PCP(8 %). In the P-group testing was performed due to complex disease patterns or prolonged illnesses without response to treatment. The median time from admission to testing was 2.6, 5.5 and 2.4 days for the "N", "P" and "Y" groups, respectively.
CONCLUSION. In 2010 a small proportion of patients were tested for HIV in GICUs. Testing was ad hoc. For example, Only 8 patients with pneumonia were tested for HIV despite 164 pneumonias been admitted over this time. Although well publicised indications for testing such as PCP, IV drug users and haemodialysis form a majority of patients in the Y-group the national guidelines state over 40 illnesses for which an HIV test is indicated. Only 9 criteria for testing were identified in our study. We have demonstrated a low rate of HIV testing when guidelines are not employed within an ICU. This study supports a need for increased HIV testing and adoption of existing national guidelines would broaden the range of illnesses tested for HIV. Universal testing of all patients should be considered to provide a gold standard of care and this possibility has been supported elsewhere [2].
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0287
TIGECYCLINE USE IN CRITICALLY ILL PATIENTS. DO WE NEED HIGHER DOSES?

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INTRODUCTION. The spread of multi-drug resistant (MDR) germs causing severe infections in ICU patients(pts) leads physicians to increase the use of tigecycline (TGC) in critically ill patients. However, optimal doses level have not been clearly established.
OBJECTIVES. Describe the clinical profile of patients receiving TGC in ICU and evaluate the impact of high-dose TGC use upon microbiological and clinical outcome.
METHODS. All patients admitted to the 18 bed ICU of our University Hospital between 1th of June 2009 and 31th of December 2011, treated with TGC for a MDR documented infection, were enrolled.
RESULTS. During the study period, among 1784 admissions, 103 pts received TGC: 81 of them were affected by a MDR documented infection (pneumonia 63 %; primary bacteraemia 31 %; others 6 %). *Klebsiella pneumonia* (39 %) and *Acinetobacter baumannii* (37 %) were the pathogens most frequently identified. Median duration of TGC therapy was 8 days (5–12). Sixty-three pts received concomitant active antibiotics (colistin, 51 %). The rate of empirical inappropriate antibiotic therapy was 52 %. Forty-five patients were treated with standard TCG doses (50 mg every 12 h; SD group) and 36 with high TGC doses (≥150 mg daily every 8–12 h, HD group). Comparing SD group with HD group there were not statistically significant differences regarding median SAPSIIscore [50 (37–58) vs. 46 (35–58)] and SOFA score values [7 (5–9) vs. 8 (6–10)], the rate of septic shock (7 vs. 19 %) and ARDS (36 vs. 52 %). HD TGC was more frequently used for treating pneumonia (78 vs. 51 %; p = 0.02) and against germs sharing TGC MIC values ≥1 mcg/mL (74 vs. 29 %; $p < 0.01$). Given the high rate of carbapenem resistant respiratory germs in our unit, in almost half of patients affected by nosocomial pneumonia, HD TGC therapy was started empirically. The difference in the microbiological eradication rate between the two groups resulted significantly higher in HD one (65 vs. 33 %; p = 0.03, respectively).Although not statistically significant, overall ICU mortality rate was lower and end-of therapy clinical cure was higher in HD group than in SD group (47 vs. 64 %, p = 0.18; 58 vs. 38 %, p = 0.1; respectively).There were not differences in the rate of adverse events between the two groups with the exception of higher amylase levels in HD TGC treated pts (33 vs. 9 %; p = 0.01).
CONCLUSIONS. Despite numerous doubts have been raised regarding the clinical efficacy of TGC for the treatment of severe infections, this molecule represents one of the few therapeutic options for the treatment of some Gram-negative MDR pathogens in ICU. In critically ill patients, HD TGC may be preferred to SD since possibly improving microbiological and clinical outcome without relevant increased toxicity. Large randomized controlled trials and pharmacokinetic studies are urgently needed in order to clear this still unsolved issue.
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0288
ANALYSIS OF ALL BACTEREMIA EPISODES CAUSED BY CARBAPENEMASE—PRODUCING KLEBSIELLA IN AN INTENSIVE CARE UNIT (ICU)

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INTRODUCTION. *Klebsiella pneumoniae* isolates producing carbapenemases (KPCs) have been widely disseminated. In Greek hospitals the dissemination of these isolates has created many therapeutic problems and is sometimes responsible for an elevation in morbidity and mortality in ICU patients.
OBJECTIVES. The aim of the present study was to record epidemiology, management and outcomes of all bacteremias due to KPC, in the ICU of a tertiary teaching hospital.
METHODS. This is a clinical and microbiological retrospective study conducted in a tertiary care teaching hospital with a 24-bed multivalent ICU in a 3 year period. Between November 2008 and November 2011 all adult patients with blood stream infections caused by carbapenem producing *Klebsiella pneumoniae* acquired during their hospitalization in our ICU were included in the study. Special forms were completed for each patient including demographic information, comorbidities, Apache II severity score, colonization data, management and outcome as well as microbiological data.
RESULTS. During the study period a total of 920 patients (pts) were hospitalized in the ICU. Twenty -three patients presented with a bacteremia caused by KPC, among them six

were women (26 %). The mean age of patients was 61.3 (range 15–84). One pt was taking corticosteroids, ten were suffering from diabetes mellitus, five had cancer. The cause of admission was surgical in two cases. Source of infection was attributed to the lung in 12 pts, the central venous catheter (two) and urinary tract (two cases). The rest was ascribed to intra-abdominal sepsis except for one patient whose bacteremia was considered primary. Fourteen episodes were presented with circulatory failure. Median Apache II score on admission was 17 (range 6–24) and on the day of bacteremia it was 19 (range 5-34). Colonization preceded the bacteremia episode on 21 occasions (91 %). Average days of ICU hospitalization before the occurence of bacteremia were 27 (2–14). Thirteen pts had already received colistin. Appropriate therapy was given to 18 pts. Eleven pts received monotherapy. In nine patients the appropriate treatment begun on days 1–3. Resistance of isolates to colistin was present in five pts (22 %). Overall mortality was 66 % and attributed mortality was 47 %. Five pts who died because of the infection had received monotherapy.
CONCLUSIONS. In accordance with previous studies, bloodstream infections caused by KPC bacteremias in the ICU are a significant cause of death since the appropriate treatment has not been established. A combined therapy is probably recommended. Infection control measures are also of significant importance in order to diminish the transmission of these difficult to treat infections.
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0289
COMPLEX METHODS OF EXTRACORPOREAL THERAPY IN PATIENTS WITH SEVERE SEPSIS AFTER CARDIAC SURGERY

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INTRODUCTION. In recent years, there has been a shift toward broader use of extracorporeal blood purification methods, where a special role has been attributed to selective LPS-adsorption with its ability to influence the etiological factor of the SIRS by elimination of circulating endotoxin from the blood. Alongside with this, new high-cutoff membranes have been developed that are being integrated into clinical practice allowing removal of middle-molecular-weight substances. Thus, there appears an opportunity to influence the sepsis development mechanism both from the etiological (endotoxin concentration decrease) and pathogenic side.
OBJECTIVES. To evaluate the effectiveness of combining the selective LPS-adsorption method and new filtration technologies with the use of high-cutoff membranes in the complex severe sepsis treatment of patients after cardiovascular surgeries.
METHODS. The investigation includes 20 patients with severe sepsis who in the postoperative period received standard conservative intensive care combined with extracorporeal blood purification methods. The hybrid extracorporeal therapy was presented by: 2 LPS-adsorption procedures (Toraymyxin-PMX-F, Japan) followed by 2 successive hemodialysis procedures with the use of high-cutoff membranes (EMiC2, Fresenius). Duration of the LPS-adsorption comprised 180 min, that of the hemodialysis—360 min. The intensive care complex included inotropes and vasopressors use, de-escalation antibacterial therapy. Condition severity score as represented by the APACHE II and SOFA scales comprised 30 and 13, respectively. All patients revealed clinical signs of severe sepsis, gram-negative bacterial infection (bacteriological study of blood), laboratory signs of severe sepsis (high PCT, EAA, LAL-assay levels), cytokinemia (TNF-a, IL-1b, IL-6, IL-10).
RESULTS. Conduction of the procedures caused no complications or adverse effects in any of the patients. In the process of treatment in all patients of the study improvement in hemodynamic parameters was observed, such as MAP increase by 26.4 % from the initial level alongside with the reduced inotropic support requirement (adrenaline dose decrease by 28.57 %), as well as oxygenation index increase by 38.53 %, positive X-ray pattern dynamics, leukocytosis lowering by 16.47 %, body temperature decrease. Results of laboratory analysis showed a reduction of endotoxin activity by 18.62 % from the initial level together with lowering of PCT concentrations by 82.3 %. A decrease of TNF-α by 48.7 %, IL-1β by 63.42 %, IL-6 by 44.68 % and IL-10 by 21.58 % was documented, as well as an improvement of immune homeostasis index. 28-day survival in the observed group of patients reached 55, 5 %.
CONCLUSIONS. The results obtained in the present study prove the effectiveness complex methods of extracorporeal therapy based on the combination of the selective hemoadsorption method and hemodialysis with the use of high-cutoff membranes.

0290
TIME LAG ANALYSIS TO IDENTIFY A RELATIONSHIP BETWEEN COLISTIN CONSUMPTION AND RESISTANCE IN GRAM NEGATIVE BACTERIA IN A TERTIARY CARE HOSPITAL

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INTRODUCTION. Many studies have proved that relationship between any antibiotic consumption and selection of resistance strains of bacteria is temporal in nature. Little data exists which evaluates this temporal relationship between colistin consumption and development of resistance.
OBJECTIVES. To evaluate the temporal relationship between colistin consumption and its resistance in gram negative bacteria simultaneously as well as at a time lag of 6 months.
METHODS. This retrospective study was conducted in our hospital over a period of 2 ½ years (January 2009–July 2011), which was divided into 5 six monthly time periods. Colistin use was calculated as Daily drug defined doses (DDD) per 100 patient days. Data for the following organisms were taken: *Pseudomonas aeruginosa*, *Acinetobacter baumannii* and Enterobacteriaceae (includes E coli, Klebsiella pneumoniae, Citrobacter species and *Enterobacter* species). Identification and antimicrobial susceptibility testing were performed by Vitek 2 Compact (bioMerieux). Colistin resistant organisms on Vitek2 were further confirmed by E test. Resistance to colistin was defined as MIC >2 mg/L for enterobacteriaecae (EUCAST) and *Pseudomonas aeruginosa*, *Acinetobacter baumannii* (CLSI). Relationship analysis was done using Pearson coefficient correlation at a time lag of 0 (lag^0) and 6 months (lag^6).
RESULTS. A total of 1483 isolates were collected from the hospital during the study period, of which 264 were *Pseudomonas aeruginosa*, 344 were *Acinetobacter baumannii* and 875 were Enterobacteriaceae. During the study period, antimicrobial usage for Colistin (DDD per 100 patient days 1.15,1.35,0.94,2.32,2.13) increased over the first two time periods i.e. January-June 2009 to July–December 2009, with a slight decrease in January-June 2010. During the first two time periods (Jan–Dec 2009), all isolates were sensitive to colistin. During January-June 2010, July–December 2010 and January-June 2011, respective resistance (%) was 2.1, 6.2, 8.95 ($r^2 = 0.57$) for *Pseudomonas aeruginosa*; 1.06, 1.4, 1.33 ($r^2 = 0.83$) for *Acinetobacter baumannii*; and 6.08, 9.25, 4.29 ($r^2 = 0.497$) for Enterobacteriaceae. Although, we observed a positive correlation between the use of colistin and resistance to colistin in *Pseudomonas aeruginosa* ($r = 0.84$, 0.62 at lag^0 and lag^6), Acinetobacter baumannii ($r = 0.63$. 0.31 at lag^0 and lag^6) and Enterobacteriaceae ($r = 0.54$ at lag^0), a statistically significant corelation was observed only in *Pseudomonas aeruginosa* ($p = 0.042$) at time lag^0.
CONCLUSIONS. Although we could not identify the temporal relationship in our study (may be due to short time period), the emergence of colistin resistance seems to be associated with use in our hospital. So, indiscriminate use of colistin should be contained to stop the emergence of colistin resistant strains.

0291
MORTALITY OF *ACINETOBACTER BAUMANNII* BACTEREMIA IN AN INTENSIVE CARE UNIT. THE ROLE OF INADEQUATE EMPIRICAL ANTIBIOTIC TREATMENT AND MUTIRESISTANCE

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INTRODUCTION. There has been an increasing incidence of carbapenem-resistant *Acinetobacter baumannii* infections in recent years, however, their role in mortality rates remains unclear.
OBJECTIVES. The aims of this study were to determine the prevalence and clinical features of *Acinetobacter baumannii* bacteremia (ABB) in an ICU, to know their prognosis and the influence on clinical outcomes of multiresistance and inadequate empirical antibiotic treatment (IEAT), and finally to define the factors independently associated to hospitality and related mortality in critically ill patients with ABB.
METHODS. From 1996 to 2011, 824 patients with a significant bacteremia were prospectively evaluated in an ICU of a university hospital. Multi-drug resistant *Acinetobacter baumannii* was defined as the laboratory documentation of strains which were not susceptible to two or more routinely tested antimicrobial agents. Clinical and microbiological variables were studied. A multivariate analysis was performed to determine the factors independently associated to hospitality and related to bacteremia mortality in critically ill patients with ABB.
RESULTS. One hundred and seventy-eight (21.6 %) of 824 bacteremias were ABB. Multiresistance was present in 73.5 % of episodes. The incidence of inadequate empirical antibiotic treatment was 43.3 %.The global and related mortality rate for ABB was 56.2 % and 18 %. In an univariate analysis both IEAT (23.3 vs. 4.9 %; $p = 0.0001$) and multiresistance(17.5 vs. 0 %, $p = 0.002$) showed statistically significant higher rates of related mortality to infection but not hospitality mortality rates. Multivariate analysis confirmed IEAT (OR 9.79, 95 % CI 2.87–33.4) and APACHE II at the onset of bacteremia (OR 1.16, 95 % CI 1.06–1.27) as independently factors associated with related to infection mortality, but no multiresistance. On the other hand, APACHE II at admission (OR 1.06; 95 % CI 1.01 - 1.12), the presence of septic shock (OR 3.69; 95 % CI 1.62–8.39) and chronic renal failure (OR 11.7; 95 % CI 1.2–114.9) were independent predictors of hospitality mortality in ICU-ABB. Neither IEAT nor multiresistance showed any impact whereas active smoking was a protective factor (OR 0.37; 95 % CI 0.16–0.87).
CONCLUSIONS. The prevalence of ABB is very high among critically ill patients aand shows high mortality rates. Higher related to bacteremia mortality rates were associated with the severity of the clinical presentation of the episode and with IEAT, but not with multiresistance itself. Both IEAT and multiresistance have no impact on global hospitality mortality in ICU-ABB patients.
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0292
OUTCOMES FOR VERY ELDERLY PATIENTS ADMITTED TO INTENSIVE CARE UNITS WITH COMMUNITY ACQUIRED PNEUMONIA: A SINGLE CENTRE EXPERIENCE

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INTRODUCTION. Changes in the current population demographic in the UK and much of Europe has resulted in a significant increase in the number of older patients being admitted to Intensive Care Units (ICU) with acute illness, acute respiratory failure secondary to pneumonia in particular, requiring supportive therapy. This trend is expected to continue as the population aged over 85 is projected to double over the next 20 years [1].
OBJECTIVES. We sought to specifically assess outcome in this group admitted with a diagnosis of Community Acquired Pneumonia (CAP) to ICU at the Royal Free Hospital, a large teaching hospital in central London.
METHODS. A retrospective review of the ICU database, followed by a case-notes review of the patients admitted between the period of April 2005 and December 2011 was performed. CAP was defined by the presence of pulmonary symptoms at presentation and development of pulmonary infiltrates within 48 h of admission to the hospital. Data were collected for ICU and in-hospital mortalities and lengths of stay (LOS), severity of acute physiological deterioration using Acute Physiology and Chronic Health Evaluation (APACHE II), Sequential Organ Failure Assessment (SOFA), and the need for invasive mechanical ventilation (IMV) and renal replacement therapy (RRT).
RESULTS. Of the 519 patients over the age of 80 admitted to ICU during the study period, 64 (12 %) had a diagnosis of pneumonia; 27 (5 %) of which were Community Acquired. The ICU and the in-hospital mortalities in patients with CAP ($n = 27$) were 67 and 70 %, respectively, and the corresponding mean (range) LOS 21 (1–76) and 40 days (2–76). Median ICU LOS was significantly longer in the survivors (17 vs. 3 days, $p = 0.007$), although the longest stay of 76 days was in a non-survivor) The median number of organ failures was 3 and the mean SOFA score 8 (2–14), with no significant difference observed in the number of organ failure or the SOFA score in survivors and non-survivors. Similarly, the APACHE II scores in the survivors and non-survivors were statistically non significant (23 vs. 22; $p = 0.7$) Only 1 survivor did not require IMV at all. 58 % of non-survivors received IMV (3 had documented decisions that they were not for IMV) No survivor needed RRT. 4 (25 %) non-survivors received RRT, a further 4 had a documented decision that they were not for RRT.

CONCLUSIONS. Community acquired pneumonia accounts for a minority (5 %) of patients over the age of 80 admitted to Intensive Care Unit, and portends high mortality, and prolonged ICU and hospital lengths of stay. This has huge resource implication. Further work is needed to evaluate the effect of clinical decision making with regard to admission and withdrawal or limitation of therapy in these patients. Indicators of severity of acute illness including the need for IMV and RRT do not predict outcome.
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Intensive care in specific patient populations: 0293–0306

0293
MATERNAL ADMISSIONS TO CRITICAL CARE - A 3 YEAR REVIEW

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INTRODUCTION. Maternal mortality rate is used to evaluate the quality of maternal care. With low maternal mortality in the developed world, morbidity is often a better index in auditing maternal services. One indicator of maternal morbidity is transfer to a critical care unit. We carried out a retrospective review of pregnancy related admissions to critical care unit over a three year period from January 2007 to December 2009.
OBJECTIVES. We aimed to identify the frequency, causes and outcomes of pregnancy related admissions to the CCU over a 3 year period in our trust.
METHODS. We collected the data using ICNARC database and cross verified the same with the trust database and the medical case notes. Data collected included maternal age, diagnosis, reason for admission to CCU, level of care on CCU, number of ventilated days, length of stay and outcomes in the CCU.
RESULTS. 27 patients were admitted to CCU over the 3 year period. The mean age at admission was 29 years (range19-38). The average length of stay was 4.25 days (1–27 days). 16 patients needed ventilation as part of their management. The mean number of ventilated days was 1.7. There were 2 deaths in the group of patients admitted to CCU. 11 patients are classed as currently pregnant and 16 patients are classed as recently pregnant (ICNARC classification).
DISCUSSION. The frequency of maternal admissions averaged at 2.4 per 1000 deliveries. The two deaths represent 7.4 % of the total maternal admissions. The maternal mortality rate in our trust over the study period is 18 per 100,000 maternities. This is higher than the national average UK mortality rate (11.39 per 100,000 maternities). One of the deaths is a coincidental death due to brain stem stroke. Second death is a direct maternal death secondary to post partum haemorrhage. 9 of the 27 patients admitted to CCU represent immigrant population, and both deaths are in the immigrant population. It reinforces the CEMACH report (Saving mothers lives 2010) that immigrant population is an independent risk factor. Contrary to other published studies, the most common cause for CCU admission in our trust is respiratory causes followed by Sepsis, Haemorrhage and Eclampsia. Out of the five patients admitted to CCU for respiratory problems, only one was due to post operative respiratory failure. In the other four patients, the respiratory problem was unrelated to the pregnancy.
CONCLUSIONS. 1. The rate of admission is comparable to UK national standards and other studies 2. Mortality rate is higher than the national MMR 3. Causes of admission are comparable to national studies but frequency is varied. 4. Immigrant population is at higher risk in keeping with CEMACH report
REFERENCE. 1. http://www.rcoa.co.uk/docs/Prov_Eq_Mat_and_CritCare.pdf 2. http://oaa-anaes.ac.uk/assets/_managed/editor/File/Reports/ICNARC_obs_report_Oct2009.pdf

0294
EPIDEMIOLOGY OF HIV-INFECTED PATIENTS ADMITTED TO AN INTENSIVE CARE UNIT: A 20-YEAR STUDY

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INTRODUCTION. Antiretroviral therapy has increased the life expectancy of patients who are infected with the human immunodeficiency virus (HIV) and has reduced the incidence of illnesses associated with AIDS. Therefore, HIV/AIDS has been transformed from a uniformly fatal disease to a chronic disease. As a result, intensive care for persons with HIV/AIDS is appropriate for most patients. Over the past decades a new clinical spectrum of intensive care for persons with HIV/AIDS has emerged.
METHODS. Retrospective study of all HIV-infected patients admitted between 1991 and 2011 in the Infectious Diseases Intensive Care Unit (ID-ICU) of Hospital de São João concerning demographic characteristics, clinical history, risk factor for HIV infection, CD4 lymphocyte count and outcome.
RESULTS. During the 20-year-study period there were 311 admissions. Four patients were admitted to ID-ICU twice during the same hospitalization. The median age was 38 years (*v*: 0–83), 229 patients (73.6 %) were men and 6 patients were under 10 years. The risk for HIV transmission was intravenous drug use in 172 patients (55.3 %), sexual in 114 (36.6 %), mother to child in 8 (2.6 %), transfusional in 3 (1 %) and unknown in 14 patients (4.5 %). HIV-1 was identified in 97.4 %.

Table 1 Diagnosis of 311 adimitions to ID-ICU

Admission diagnosis	Number (%) of admissions
Respiratory failure	173 (55.6)
Neurological disease	58 (18.6)
Sepsis	46 (14.8)
Postoperative care	16 (5.1)
Post cardiorespiratory arrest	5 (1.6)
Trauma	4 (1.3)
Metabolic disturbance	4 (1.3)
Drug overdose	2 (0.6)
Miscellaneous	3 (1)

In 79 patients (25.4 %) HIV infection was diagnosed on ID-ICU admission and in 62 of those (78.5 %) the diagnosis of AIDS was simultaneously established. The mean SAPS II was 49 (± 18). The median time of length of stay in ID-ICU was 7 days (*v*: 1–134). ID-ICU mortality was of 130 patients (41.8 %) and hospital mortality was of 154 patients (49.5 %). The causes of death on ID-ICU were: respiratory failure in 60 (46.1 %), sepsis in 32 (24.6 %), neurological disease in 18 (13.8 %), miscellaneous in 11 (8.5 %), hepatic failure in 3 (2.3 %), gastrointestinal bleeding in 3 (2.3 %) and trauma in 1 (0.8 %).57 patients (36 %) are regularly followed in our outpatient HIV clinic with a mean CD4 count of 420 cells/mm^3 and 40 patients (70 %) have undetectable HIV viral load.
CONCLUSIONS. In our cohort, respiratory failure was the most common indication for ICU admission among HIV infected patients followed by sepsis and neurological disease. The hospital mortality of HIV-infected patients who are admitted in ICU was mainly associated with respiratory failure.
Up to 25.4 % of the patients with HIV infection were unaware of their status at the time of ICU admission and the diagnosis was made in an advanced state of immunosuppression in 78.5 % of them.

0295
CATHETER-RELATED BACTEREMIA IN A BURN CENTER INTENSIVE CARE UNIT

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INTRODUCTION. Burn patients exhibit a higher bacteremia incidence, whether catheter-related or not. Burns induce a break in the skin barrier and ischemia or tissue necrosis promote colonization and proliferation of microorganisms in these immunocompromised patients. These nosocomial infections worsen the prognosis and lengthen the duration of hospitalization. They also induce a significant additional cost. Indeed, catheter-related bloodstream infections (CRBSI), with an incidence of 1.23/1,000 catheter-days, increase the length of stay averaged 4.5 days.
OBJECTIVES. To assess the incidence of bacteremia in our burn Intensive Care Unit (ICU) (inter regional burn center of Mediterranée), and compare these data to the annual health-care related infections report published by the CCLIN (organism evaluating the health-care associated infections in ICUs in France).
METHODS. We retrospectively included 68 patients admitted to our burn ICU in 2010. Demographic, clinical, biological and bacteriological data were collected and compared to similar data in the CCLIN report of the same year (16,558 patients). The observed differences were called statistically significant for a p value <0.05, computed with Wilcoxon test (quantitative data) and Fisher exact test (qualitative data).
RESULTS. The incidence of bacteremia was six times higher in burn patients (26.5/100 patients *vs.* 4.3/100 patients in the CCLIN, $p < 0.05$). The median time was 29 days (± 12.6 days) *vs* 16.9 (± 16.2 days), $p < 0.05$). The reported incidence of bacteremia to the length of stay was 13.4/1,000 days of ICU, against 3.8/1,000 days in the report of CCLIN. Origin of these bacteremias was unknown (56 %), of cutaneous origin (22 %) and related to catheters (11 %). In 2010, 420 central venous catheters (CVC) were used, 6.2 CVC/patient (against 1.2 for the CCLIN). Mortality was similar in both populations (16 vs. 18.8 % for the CCLIN) but the length of stay was higher in burn patients (48 ± 23.6 vs. 12 ± 15.4 days).
CONCLUSIONS. In this preliminary study, we report a higher incidence of bacteremia in the burn center ICU, as compared to the CCLIN report in 2010, which is consistent with literature data. The proximity of CVC with burned areas is a risk factor for colonization or contamination and CRBSI. This preliminary study support the establishment of an intervention to reduce this high incidence of bacteremia. Based on these data, we designed a prospective randomized single-blind study to evaluate the benefit of antiseptic-impregnated CVC.

0296
AN EPIDEMIOLOGIC STUDY OF BURN PATIENTS ADMITTED IN A BURN INTENSIVE CARE UNIT

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INTRODUCTION. Burn injuries remain a significant problem with a high associated morbidity and mortality, long average stays and high costs.
OBJETIVES: The purpose of our study is to analyze the epidemiology of burn patients admitted to a Critical Burns Unit at a University Hospital in Madrid.
METHODS. We performed a prospective and observational study regarding the characteristics (medical history; toxic habits; mechanism of burn; location and presence or absence of inhalation syndrome); the severity scores (ABSI, SOFA at admission, and next 3 days); and the complications (shock, mechanical ventilation; renal failure; ARDS), inpatients with burn injuries admitted in our Burns Intensive Care Unit from October 2008 to December 2011.
RESULTS. During this period 362 patients were admitted to our unit, 271 were men (74.9 %) and 91 were women (25.1 %). The mean age was 46.96 ± 18.99 years, the total body surface area average was 20.95 ± 18.99. With an ABSI score of 6.52 ± 2.51, average length of stay 17.79 ± 19.19, and the percentage of mortality was 13.5 %.
Of the 362 patients 9.1 % associated trauma, 45.3 % suffered a preexisting illness (18.5 % arterial hypertension; 7.5 % Diabetes Mellitus; 6.9 % COPD; 8.5 % psychiatric disorders and 6.3 % neurological). Habits like smoking and alcoholism were detected in 9.6 and 6.6 %, respectively.
The mechanism was flame in 70.2 %; scald in 9.9 %, flash 8.01 %; electrical 5.8 %; contact 1.9 %; chemical burn 1.7 %. Of the patients admitted 23.2 % presented inhalation; and subglottic injuries were confirmed with fiber bronchoscope in a 3.6 %.
The most frequent location was the upper limbs in 265 patients (73.2 %), followed by head and neck (54.7 %), lower limbs (46.7 %), thorax (47.2 %), back (14.1 %) and buttock (7.7 %).
The most frequent complication was shock which was present in 125 patients (34,5 %), renal failure (16 %) and ARDS (10.5 %). 19 patients required CVVH (5.2 %).171 patients needed mechanical ventilation (47.2 %), and 49 tracheostomy (13.5 %). The average days for mechanical ventilation were 16.36 ± 19.32, for shock 15.80 ± 17.54, for ARDS 12.1 ± 13.35 and for CVVH 4.07 ± 3.55. SOFA score increased between the first day of admission, and the third day: At admission 2.49 ± 2.73; first day 3.31 ± 3.05; second day 3.78 ± 3.22; and the third day 4.09 ± 3.30.

CONCLUSION. In our study the most common burns were caused by flame, in the upper limbs, head and neck. The most common complication was shock, an almost 50 % of the patients admitted required mechanical ventilation nevertheless only 13.5 % needed a tracheostomy.

0297
TOO OLD FOR INTENSIVE CARE? DO PATIENTS AGED 80 YEARS OR MORE HAVE A WORSE OUTCOME THAN THE GENERAL POPULATION DURING OR FOLLOWING INTENSIVE CARE ADMISSION?

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INTRODUCTION. Admission to the Intensive Care Unit (ICU) requires assessment, not only of the presenting pathology and its reversibility, but also of the patienťs premorbid status. Advanced age is not necessarily a contraindication for invasive monitoring or organ support. However, intensivists may be more reluctant to admit elderly patients to the ICU as evidence suggests that this group has an increased likelihood of suffering a poor outcome.[1]
OBJECTIVES. To establish what proportion of patients admitted to one District General Hospital ICU are aged 80 years or more. To ascertain the characteristics of this particular subset and compare their mortality as a group to that of the general ICU population.
METHODS. The study was set in a District General Hospital mixed medical and surgical ICU/HDU (intensive care/high dependency unit). The ICNARC (Intensive Care National Audit and Research Centre) database was consulted retrospectively. Data was reviewed to identify characteristics and outcomes for all patients admitted during a 24 month period. A subset of patients aged 80 years or more was reviewed and its mortality data was compared to that of the entire group. Outcomes included improvement or death in ICU, and survival or death in hospital following discharge from ICU.
RESULTS. 1263 patients were admitted during the study period (665 male, 598 female). 202 (16 %) of these were aged 80 years or more (94 male, 108 female). 16 % of the total population, and 22.5 % of those aged 80 years or more, died in ICU. 23.5 % of the total population died before leaving hospital compared with 36.1 % of the elderly patients. The majority of elderly patients admitted during the study period had a surgical diagnosis (78 %). Of the elderly medical admissions, 47.7 % survived to hospital discharge, compared with 68.4 % of elderly surgical admissions.
CONCLUSIONS. This study suggests that patients aged 80 years or more have an increased mortality both in ICU and on the ward following discharge. Elderly patients were more likely to be admitted to ICU with a surgical problem rather than a medical pathology. Those with a surgical diagnosis also had a relatively superior outcome and an increased chance of surviving to hospital discharge than those with a medical problem. This study is limited by selection bias as, in this District General Hospital, all patients undergoing emergency laparotomy are admitted to ICU post-operatively. This group may, therefore, be less systemically unwell than the medical patients. Data obtained in this study suggests that elderly patients have a higher mortality during and following admission to the ICU as compared to the general ICU population.
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0298
THE IMPACT OF AGE ON OUTCOME AFTER MAJOR SURGICAL PROCEDURES

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INTRODUCTION. The mean age of intensive care unit (ICU) patients is increasing, but the impact of age on outcomes is unclear.
OBJECTIVES. We investigated the effect of age on outcome in a large cohort of surgical ICU patients and assessed possible risk factors for poor outcome in different age groups.
METHODS. In this retrospective analysis of prospectively collected data, all adult (> 18 years old) patients admitted to our 50-bed surgical ICU between January 1, 2004 and January 31, 2009 were included. Patients were classified into five subgroups according to age [18–50 (reference category), 51–65, 66–75, 76–85, >85 years old).
RESULTS. A total of 11,537 patients were admitted to our surgical ICU during the study period. Severity scores and the incidence of diabetes mellitus, chronic renal failure, and heart failure on admission to the ICU increased steadily among the age categories.. Overall ICU and hospital mortality rates were 4.4 and 8.7 %, respectively, and increased with age with an exponential increase in patients >65 years old. Patients >85 years old had ICU and hospital mortality rates of 12.4 and 28.2 %, respectively. In a multivariate logistic regression analysis with hospital death as the dependent variable, age was an independent risk factor for in-hospital death (odds ratio = 1.04, 95 % CI 1.03–1.04, per year, $p < 0.001$). In an analysis of subgroups according to the surgical procedures performed prior to ICU admission, age between 51 and 65 years was independently associated with a higher risk of death in patients undergoing cardiothoracic surgery compared to the reference group; however, age >85 years was not. In neurosurgical patients and those undergoing gastrointestinal surgery, the risk of death increased steadily with increasing age. Gastrointestinal surgery was independently associated with a higher risk of in-hospital mortality in all age categories, whereas neurosurgery was associated with a higher risk of in-hospital death only in patients >65 years old.
CONCLUSIONS. Mortality rates increase with age with an exponential increase in patients >65 years old. Age is an independent risk factor for in-hospital death, irrespective of the type of surgical intervention.

0299
SURVIVAL AND FUNCTIONAL AUTOMONY AT 6 MONTH OF PATIENTS OLDER THAN 75 YEARS ADMITTED TO ICU

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INTRODUCTION. The number of elderly patients admitted to Intensive Care Units (ICUs) is increasing as population wordwide is aging [1, 2]. Recent studies show that the functional automony is not as bad as expected despite the high mortality [3, 4].
OBJECTIVES. In patients older than 75 years admitted to an ICU, to assess survival and functional autonomy at hospital discharge, and at 3 and 6 months after ICU discharge.
METHODS. Prospective observational cohort study conducted in a Medical and Surgical ICU over a period of 18 months. We included patients older than 75 years admited sequentially to ICU for critical illness. We exclude those with uncomplicated acute coronary syndrome or programed pacemaker implantation, due the short ICU stay.
At ICU admission we made a functional assessment by Barthel index[5] and social support. During ICU stay we recorded patient characteristics and demographics, clinical and laboratory data during ICU stay, major organ system dysfunction, need of vasoactive support and mechanical ventilation, severity of illness by APACHE II score, and ICU and hospital mortality. Prior to discharge an new functional assessment was done by Barthel index[5] and interview the patient or family to determine their fate (home, rest home, ect.).
3 and 6 months after ICU discharge, patients or family members were contacted by telephone to obtain follow-up information
RESULTS. 139 patients older than 75 years were included in our study. Mean age was 80 (78-84) years. ICU mortality was 34.53 %, hospital mortality was 46.76 %. Mean Barthel index at hospital discharge was 80 (45–100).At ICU admission only 10.48 % of patients had not full autonomy (defined as Barthel index <60), at hospital discharge 33.33 %. 26.98 % of full autonomy patients (defined as Barthel index >60) on admission become dependent on discharge, with a drop >20 points in Bartell index in 31.12 % of them. 73.6 % of patients lived at their home on admission, but only 59.02 % returns there after hospital discharge. Mortality rate at 3 months was 51.09 %. Survival have a mean Barthel index of 90 (70–100) and remain at their home 59,61 % of them. 11.45 % of patients without full autonomy at discharge recovered it, with an increase >20 points in Barthel index in 13.20 % of them. At 6 month mean Barthel index was 95 (70–100) and 61.11 % lived at their home. 13.21 % of patients dependent at 3 months have recovered full autonomy at 6 months.
83.33 % of patients with full autonomy at hospital discharge continue to be at 6 months.
CONCLUSIONS. In-hospital mortality of patients over 75 years admitted to ICU is high. Survivors of ICU admission have good recovery and functional status at 6 months of ICU discharge.
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0300
CHARACTERISTICS AND PROGNOSIS OF ELDERLY PATIENTS ADMITTED TO THE INTENSIVE CARE UNIT

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OBJECTIVES. We describe a series of geriatric patients over 80 years old admitted to the ICU of a hospital in 3 rd level, we compared clinical characteristics and analyze mortality.
METHODS. Retrospective observational study for 1 year (2010), admitted 250 patients over 80 years old, excluded 62 for channeling central line and studied 188. Recorded sex, age, hospital stay, admission diagnosis, APACHE II, ICU mortality and its causes. Mechanical ventilation and need for tracheostomy. Vasoactive drugs, renal failure, CRRT. Medical history and polypharmacy.
We applied SPSS for descriptive and inferential statistics, including logistic regression for ICU mortality.
RESULTS. Mean age was 83.4 ± 2.7 years, 52 % male, 48 % female. Average stay 3.3 ± 4.3 days. APACHE II on admission 14 ± 4. Medical history: 79 % hypertension, ischemic heart disease 40 %, 33 % cardiac heart failure and diabetes 34 %. COPD 19 %. Polypharmacy (>5 drugs) 69 %. Admission diagnoses: bradyarrhythmias 22 %, 21 % myocardial infarction, unstable angina, 6 %, 7.4 % postoperative cardiac surgery and postoperative diverse: digestive surgery, thoracic and neurosurgery 15 %, 11 % angioplasty and TAVI. Trauma 4.3 %. Respiratory failure 3 %. Sepsis 2.7 %. Ischemic and hemorrhagic stroke(1 and 1.6 %). Mechanical ventilation (MV) 71 (38 %), 10 prolonged ventilation (14 %, and total 4.4 %). Percutaneous tracheostomy in 8 of them. Hemodynamics: 54 % did not require vasoactives. NTG (17 %) and noradrenaline (14 %) the most common. Acute renal failure: 25 % and renal replacement therapy only 2 patients, 4 % of the ARF. Nutrition: oral 69 %, enteral 12 %. ICU mortality: 18.6 % (n = 35), causes: refractory shock and asystole (32 % each one), severe brain damage 18 % and multiorgan failure (14 %). Limitation of therapeutic effort, 3.6 %. For statistical analysis, we grouped the diagnoses in four groups according to frequency: rhythm disorders, heart disease, postoperative and rest. Mortality by diagnosis: ischemic heart disease 28.6 %, rhythm disorders 11.4 %, postoperative 14.3 % and 45.7 % the rest. Regarding to MV, 71 needed and 26 died (36.6 %), 117 who were not ventilated, only 9 died (7.7 %), Chi-square 24, $p < 0.001$. For patients requiring MV, 61 was not prolonged, and died 19 (31 %) and the 10 that was prolonged, died 7 (70 %). Chi-sq: 5.58, $p < 0.018$. Mortality in the ICU, according to multiple logistic regression, is associated with need for MV (OR 38.8) and the reason for admission, where the OR of postoperative (reference) 1, those admitted for rhythm disorders OR8.4, ischemic heart disease 27.7 and the rest 2.9. There was no statistically significant relationship with age or sex.
CONCLUSIONS. In our series, patients older than 80 are admitted to the ICU, mainly from ischemic heart disease, rhythm disorders and postoperative different. Mortality was associated with mechanical ventilation and admission diagnosis. The small number of prolonged mechanical ventilation reflects a limitation of treatment in patients who are complicated.

0301
OCTAGENERIANS ON THE ICU: ARE WE DOING IT RIGHT?

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INTRODUCTION. There is an increased pressure on the ICUs to admit patients with extremes of age as the population ages. Recent epidemiological studies suggest that despite appropriate treatment, octogenarians face significantly worse short-term prognosis compared to younger patients.
OBJECTIVES. We have reviewed the outcome and resource utilisation of patients aged 80 or over, who were admitted to the ICU/HDU over a two year period.
METHODS. Retrospective analysis of prospectively collected data. As we have reviewed our practice this study was classified as audit. We have collected the following information: age, sex, APACHE II score on admission, admission diagnosis, operative status, length of

stay, length of mechanical ventilation, inotropic support and renal replacement therapy, incidence of bacteraemia, ICU and hospital mortality on patients who aged 80 or over from January 2009 to December 2010. Data was collected from WardWatcher and the electronic patient information system (ICIP, Philips). For statistical analysis Mann–Whitney U and Chi-square tests were used.
RESULTS. 145 of 1265 (11.4 %) admitted patients were over 80 years of age. 21 out of the 145 patients were admitted after elective surgery. Average APACHE II scores were not significantly different compared to the younger cohort: 15.4 ± 2.3 vs. 14.5 ± 2.5, respectively. However, ICU mortality was significantly higher 25.5 vs. 12 % $p < 0.05$. Mortality after elective surgery was 9.5 vs. 1.5 % in the octogenarian and younger groups, respectively. However, the excess mortality was mostly attributed to those patients who received mechanical ventilation during their stay ($n = 79$). These patients had an ICU mortality of 29 % and hospital mortality of 51 % despite relatively APACHE II scores. All of the patients who have left ICU but died on the ward had treatment limitation and DNAR order in place at the time of ICU discharge. Ventilated patients, regardless of the outcome, had significantly higher resource utilisation, longer ICU stay and higher incidence of bacteraemia compared to non-ventilated patients.
CONCLUSIONS. Despite similar acute physiological derangement, octogenarians face much worse outcomes compared to younger patients when admitted to the ICU. Our audit supportsOverall, our results are in line with the recently published data. The need for mechanical ventilation carries a hospital mortality of ~50 % and this highlights the need for clear communication and the appropriate management of expectation of the outcome for the referring and the ICU team. The fact that all patients who subsequently died on the ward after ICU discharge had agreed treatment limitations and DNAR order in place is reassuring.

0302
ACUTE RESPIRATORY FAILURE IN NEUTROPENIC PATIENTS

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INTRODUCTION. Acute respiratory failure is the leading cause of ICU admission in cancer patients. Only few studies aimed, however, to evaluate prognosis of neutropenic patients admitted to the ICU at the onset of an acute respiratory failure.
OBJECTIVES. To describe prognosis and to identify early predictive factors of hospital mortality in critically ill cancer patients presenting ARF during chemotherapy-induced neutropenia.
METHODS. Retrospective analysis of prospectively collected data extracted from two recent prospective multicenter studies aiming in evaluating diagnosis strategies in critically-ill cancer patients [1, 2]. Were included neutropenic adult patients admitted to the ICU for an acute respiratory failure. Results are reported as medians (interquartile range, IQR) or numbers (%). Conditional logistic regression analyses were performed to identify variables significantly associated hospital mortality.
RESULTS. 123 patients were included in this study. 78 patients were of male gender (64 %), median age was of 57 years (44–62)] and median LOD score at ICU admission was 6 (4–9). 107 patients (87 %) had hematological malignancies (acute leukemia and high grade non-Hodgkin's lymphoma accounting for 56 % of the included patients). Twenty-four patients (20 %) underwent allogeneic stem-cell throughout ICU stay, 81 patients (66 %) required non invasive mechanical ventilation and 69 required conventional mechanical ventilation (56 %). Vasopressors were needed in 62 (50 %) patients and renal replacement therapy in 32 patients (26 %).71 patients (58 %) had a documented infection at ICU admission, including 41 patients (33 %) with bacterial infection and fourteen patients (11 %) with invasive pulmonary aspergillosis. Nineteen patients (15 %) had no definite diagnosis to explain their respiratory failure. ICU and Hospital mortality were of 42 and 77 %, respectively. Hospital mortality was independently associated with the need for conventional mechanical (OR, 7.73; 95 %CI 2.52–23.69). In this model, two factors were found to protect from hospital mortality: ICU admission for an acute respiratory failure during neutropenia recovery (OR, 0.23; 95 %CI, 0.07–0.73) and use of steroids before ICU admission (OR, 0.35; 95 %CI, 0.11–0.95).
CONCLUSIONS. In this study, invasive mechanical ventilation was associated with hospital mortality whereas an ICU admission around the neutropenia recovery period and the use of corticosteroid prior ICU admission were independently associated with hospital survival. Our study underlines high post-ICU mortality in the studied population. Additional studies are needed in way to explain this finding.
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0303
SHORT AND LONG TERM OUTCOME OF HEMATOPOIETIC STEM CELL TRANSPLANTATION (HSCT) RECIPIENTS ADMITTED TO THE ICU

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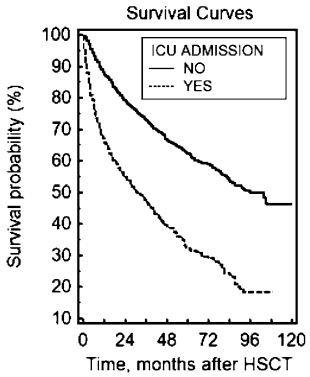
INTRODUCTION. Hematopoietic stem cell transplantation (HSCT) is performed globally to treat hematologic malignancies and selected solid tumors. Approximately 15.7 % of HSCT recipients are admitted to the intensive care unit (ICU) with short-term mortality rate of 65 % and 6–12 month mortality of 74 %. There is scarcity of data describing long term outcome of HSCT recipients admitted to the ICU.
OBJECTIVES. The goal of this study is to describe the impact of ICU admission on the outcome of patients who underwent HSCT at our tertiary care institution.
METHODS. We performed a retrospective cohort study of all adults who received HSCT from 2003-2010. Baseline data collected included race, age at HSCT, gender, disease status category (early, intermediate, advanced), transplant type (autologous, allogeneic), stem cell source (bone marrow, peripheral blood), conditioning regimen (myeloablative, non-myeloablative, reduced intensity conditioning [RIC]), total body irradiation (TBI) conditioning, Cytomegalovirus (CMV) serology, Karnofsky score, ICU admission and mortality status. We used Student's t, Mann–Whitney U, and Chi-squared tests to determine risk factors associated with mortality by univariate analysis. We compared the long term outcome of HSCT recipients admitted and not admitted to the ICU using Kaplan–Meier survival analysis. Cox multiple regression analysis including factors associated with mortality at a p value of 0.1 or lower by univariate analysis was performed. Odds ratio (OR) and the 95 % confidence interval (CI) were calculated. P values <0.05 were considered statistically significant.
RESULTS. Of 2405 adults who received HSCT, 591 (24.6 %) were admitted to ICU and 1001 (41.6 %) were deceased. Median survival time was 31 months for patients admitted to the ICU compared to 96 months for those not admitted (Figure 1). Factors associated with mortality at a p value of 0.1 or lower by univariate analyses were White race, male gender, disease status category at transplantation, allogeneic transplantation, TBI, conditioning regimen, Karnofsky score, and ICU admission. Cox regression analysis showed the independent risk factors associated with mortality were advanced disease status at transplantation ($p < 0.000$; OR, 95 % CI = 1.417, 1.186-1.693), conditioning regimen ($p = 0.040$; OR, 95 % CI = 0.514, 0.273–0.971), Karnofsky score ($p = 0.000$; OR, 95 % CI = 0.989, 0.985–0.994), and ICU admission ($p = 0.000$; OR, 95 % CI = 2.361, 2.070–2.693).



Kaplan–Meier
Fig. 1 Survival probability after HSCT for those admitted to the ICU vs. no ICU admission

CONCLUSIONS. ICU admission of HSCT recipients is associated with higher short and long term mortality. Other prognostic factors associated with increased mortality are disease status at transplantation, conditioning regimen, and lower Karnofsky score.
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0304
CHARACTERISTICS AND OUTCOMES OF LONG STAY (>16 DAYS) CANCER PATIENTS IN THE INTENSIVE CARE UNIT

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INTRODUCTION. The prolonged intensive care unit (ICU) support of critically ill cancer patients is often questioned with clinicians and hospital managers frequently taking a nihilistic view. Yet, outcomes for critically ill cancer patients have improved over the last decade due to modern intensive chemotherapeutic regimes with less organ related toxicity, and better ICU care, and so are these assumptions for long stay critically ill cancer patients justified? The implications of prolonged ICU stay in terms of mortality, morbidity and cost have been reported for general ICU admissions [1], but no studies have specifically looked at critically ill cancer patients.
OBJECTIVES. The aims of this study were to describe the characteristics of long stay (> 16 days) cancer patients in ICU and to determine their 6- and 12-month mortality.
METHODS. Retrospective data was collected from 203 long stay (>16 days) patients admitted to a specialist cancer ICU during the period January 2006–2012. Data collected included demographics, cancer diagnosis, co-morbidities, reason for hospital and ICU admission, reason for prolonged ICU stay and finally ICU, in-hospital, 6-month and 1-year mortality.
RESULTS. Long stay patients accounted for 3.4 % of all ICU patients. Baseline demographics of long stay ICU cancer patients were: mean age 60 (SD15), 35.4 % female, and mean APACHE II score 19.6 (SD7). Surgical patients accounted for 50.7 % admissions. Primary cancer diagnoses were oesophago-gastric (57 patients; 28.1 %), leukaemia (42 patients; 20.7 %), colorectal (15 patients; 7.4 %) and lymphoma (15 patients; 7.4 %). Reasons for prolonged ICU stay were respiratory failure (66 patients; 32.5 %), sepsis (37 patients; 18.2 %) and post-operative complications (34 patients; 16.7 %). ICU, in-hospital, 6-month and 1 year mortality among all long stay cancer ICU patients (medical and surgical) were 26.6, 32.5, 40.8 and 49.5 %, respectively. One-year mortality for long stay medical cancer patients was 57.4 % compared to 40.9 % for surgical admissions. Of the 90 deaths occurring within the first year, 58.9 % died in ICU, 15.6 % died on the ward, 12.2 % died at home and 3.3 % died in a hospice. Mean time to death from discharge from hospital was 274 days.
CONCLUSIONS. We report survival outcomes in long-stay (>16 days) cancer ICU patients. Half of all long-stay ICU patients survive 1-year or more. Our data suggest that continued ICU support in long stay (>16 days) critically ill cancer patients is justified.
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0305
PATIENTS WITH HAEMATOLOGICAL MALIGNANCY REQUIRING INTENSIVE CARE TREATMENT: A 5 YEAR REVIEW

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INTRODUCTION. Patients with haematological malignancy requiring admission to the Intensive Care Unit (ICU) are often perceived to have a very poor outcome. This assumption

is not borne out in the current literature with a recent meta-analysis suggesting fairly favourable outcomes in certain subsets of patients [1].
With advancement in treatment for acute leukaemias, there is an increasing incidence of patients requiring ICU treatment. In one study, 1 in 7 of all patients receiving chemotherapy for AML required admission to ICU [2]. Common reasons for ICU admission are respiratory failure (most common), bleeding, sepsis, acute renal failure and following cardiac arrest [2]. Causes of respiratory failure include infection, cardiogenic pulmonary oedema, ATRA syndrome, alveolar haemorrhage and pneumothorax.[3]
OBJECTIVES. To review the demographics and outcomes of patients with haematological malignancy admitted to ICU and compare the outcome data with published mortality/survival rates.
METHODS. The admissions and outcomes of all patients with haematological malignancy admitted to the ICU at Aintree Hospital (a 19-bed combined level 2 and 3 teaching hospital unit) over a 5 year period were reviewed.
RESULTS. 44 admission episodes occurred over this eriod. 24 patients had a haematological diagnosis of AML (including 3 with APML), 8 had non-Hodgkin's lymphoma and 4 had multiple myeloma. Other diagnoses included Hodgkin's lymphoma, plasma cell leukaemia, CLL and ALL.
Sepsis was the most common ICU diagnosis: 18 patients (41 %) had neutropenic sepsis, 9 (20 %) had venous catheter related sepsis and 11 (25 %) had sepsis of unknown origin. Pneumonia (both community and hospital acquired) was diagnosed in 14 patients (32 %). Overall, the ICU-survival rate was 52 %. Of the 23 patients discharged from ICU, 7 died on the ward or were readmitted to ICU and 16 survived to hospital discharge giving a hospital survival rate of 36 %. The overall six-month survival rate was 23 %. 86 % of patients requiring invasive ventilation died on the ITU as did 100 % of patients requiring renal replacement therapy.
CONCLUSIONS. The results from our institution are comparable with those published in a recent meta-analysis which reviewed data published in 76 trials and found an overall ICU survival of 54.5 %, a hospital survival of 42.8 % and six-month survival of 21.9 % [1].
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0306
EVALUATION OF ONCOLOGICY PATIENTS ADMITTED TO AN INTENSIVE CARE UNIT

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INTRODUCTION. The intensification of oncologic therapy and the growing life expectancy of cancer patients was associated with the increase of critical illness in these patients, usually deeply immunocompromised. In recent decades their prognosis in intensive care has improved significantly.
OBJECTIVES. Of cancer patients admitted to a Polyvalent Intensive Care Unit (ICU) from January 2006 to December 2010.
METHODS. A retrospective study, performed in a university hospital's Polyvalent ICU. Comparison between cancer and non cancer patients was performed.
RESULTS. During the study period,1353 patients were admitted to the ICU, 154 (11 %) of whom were cancer patients (age 71.9 years, 63 % men). Solid cancers (74 %) were: gastrointestinal (GI) (n = 47), lungs (n = 19), breast (n = 17), genitourinary male (n = 8). The main reason for admission was respiratory failure (38.3 %, 68.4 % in lung cancer patients). Surgery was the main ICU admission in 36.2 % of GI cancer. The hematological malignancy corresponded to 24 % (18.9 % febrile neutropenia). Comparing cancer patients with overall population, we found no significant differences in gender, age, average length of stay [7.1 vs 8.9 days ($p = 0.059$)] or severity scores (APACHEII: 23.89 ± 7.9 vs. 23.40 ± 8.7 and SAPSII: 51.18 ± 18.2 vs. 4,828 ± 17.8). More cancer patients were admitted from operating theatre (15.6 vs. 6.1 %, $p < 0.001$). Mortality rate in the ICU was higher in the cancer patients (40.9 vs. 31.0 %, $p < 0.05$).
CONCLUSIONS. The mortality of cancer patients admitted to ICU is higher than in the general population. However, more than 50 % are discharged alive.
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Evaluating systemic & micro circulation: 0307–0319

0307
TITRATING MEAN ARTERIAL PRESSURE IN CONSIDERATION OF INTERINDIVIDUAL EFFECT IMPROVES MICROCIRCULATION IN PATIENTS WITH SEPTIC SHOCK

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INTRODUCTION. Improving microcirculation has been associated with survival in septic shock patients.However, whether a higher MAP should be targeted is a matter of debate.
OBJECTIVES. Our goal was to assess the effects of mean arterial pressure (MAP) titration to usual level by norepinephrine (NE) on microcirculation in septic shock patients.
METHODS. This was a single centre prospective study conducted in the intensive care unit of a tertiary care teaching hospital. Twenty patients in septic shock for less than 24 h despite fluid resuscitation were enrolled. All patients were required NE to maintain a MAP of 65 mmHg and then titrated to an MAP to usual level acquired from previous medical records. In addition to hemodynamic and metabolic variables, sublingual microcirculation was evaluated by sidestream dark field (SDF) imaging.
RESULTS. Increasing MAP by augmenting NE dose was associated with an increase in cardiac output (from 5.4 to 6.4 l/min, $p = 0.002$), total peripheral resistance index (from 1,587 to 1,890 dyn s m^2 cm^{-5}, $p = 0.004$) and central venous oxygen saturation (from 81 to 83 %, $p < 0.000$). Blood lactate remained stable. Although the small and total vascular density was not significantly altered, proportion of perfused vessel, perfused vessel density all showed a significant increase and little interindividual variability appeared. Small microvascular flow index augmented significantly (from 2.49 to 2.84, $p = 0.007$), total microvascular flow index increased (from 2.73 to 3.07, $p = 0.002$) significantly as well.
CONCLUSIONS. In this prospective interventional study, increasing MAP from 65 mmHg to usual level in consideration of interindividual effect with adjused doses of NE can result in improved microcirculatory function.
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0308
TRANSPULMONARY THERMODILUTION (TPTD) MEASUREMENTS WITH FEMORAL INDICATOR INJECTION: IS THERE A DIFFERENCE TO MEASUREMENTS WITH JUGULAR INJECTION? A STUDY IN 43 PATIENTS EQUIPPED WITH A FEMORAL AND A JUGULAR CENTRAL VENOUS CATHETER AT DIFFERENT TIME POINTS

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INTRODUCTION. Measurement of cardiac index (CI), global end-diastolic volume index (GEDVI) and extra vascular lung water index (EVLWI) using TPTD is preferably performed by indicator injection in the V. cava superior via the jugular or subclavian vein. If this injection site is not accessible indicator injection via the femoral vein is a feasible alternative. Two recent studies revealed significant overestimation of GEDVI in case of femoral injection ($GEDVI_{fem}$) as the additional volume of the V. cava inferior participates in indicator dilution. One of these studies provided a correction formula for $GEDVI_{fem}$ based on data from 24 patients (1). However, this study has not been validated in a larger collective.
OBJECTIVES. Therefore, we studied the effect of femoral injection site and the correction formula ($GEDVI_{fem\ corrected}$) in a data base including 1587 TPTDs in 43 patients (22 females; 21 males) who were successively equipped with jugular and femoral venous access at different time points during their stay on our ICU.
METHODS. Comparison of means of $GEDVI_{fem}$ and of $GEDVI_{fem\ corrected}$ to means of $GEDVI_{jug}$ (Wilcoxon-test for unpaired samples) for each patient. Prediction of „ CI ≤2.5 L/min/m^2“ and „CI >5 L/min/m^2“by $GEDVI_{fem}$ and $GEDVI_{fem\ corrected}$ in the subgroup of femoral TPTDs alone.
RESULTS. The mean age of the patients was 64.29 ± 8.60 years, APACHE II (23.10 ± 7.39), TISS (20.80 ± 5.95), SAPS (41.66 ± 9.29). The patients had femoral and jugular venous access for 417 and 1170 TPTDs, respectively. TPTD-derived means of CI (4.23 ± 1.20 vs. 3.99 ± 1.14 L/min/m^2; $p = 0.77$), stroke volume index (SVI) (45.16 ± 13.92 vs. 41.32 ± 12.86 mL/m^2; $p = 0.61$) and EVLWI (12.95 ± 5.36 vs. 11.25 ± 3.59 mL/kg; $p = 0.18$) were not significantly different between femoral and jugular TPTD. By contrast, GEDVI was significantly higher in TPTD via femoral than via jugular access (1006.72 ± 215.63 vs. 817.17 ± 147.97 mL/m^2; $p = 0.005$). Using the correction formula the mean absolute bias of 189.56 ± 39.88 mL/m^2 was significantly reduced by 71.69 % to 53.47 ± 32.02 mL/m^2 ($p < 0.001$). Multiple regression analysis regarding GEDVI including age, gender, APACHE II, TISS, SAPS, central venous pressure (CVP), and CI demonstrated that femoral TPTD was independently associated with GEDVI ($p < 0.001$). ROC-Analysis regarding the prediction of „ CI ≤ 2.5 L/min/m^2“and „ CI > 5 L/min/m^2“showed larger AUCs for $GEDVI_{fem\ corrected}$ than for $GEDVI_{fem}$ (0.811 vs. 0.741 and 0.673 vs. 0.575).
CONCLUSIONS.
1. GEDVI is significantly and independently related to the TPTD indicator injection site.
2. Use of a correction formula for femoral access improves accuracy of $GEDVI_{fem}$ compared to $GEDVI_{jug}$.
3. $GEDVI_{fem\ corrected}$ predicts the upper and lower limits of CI more accurately than $GEDVI_{fem}$.
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0309
THE RELATIONSHIP BETWEEN ECHOCARDIOGRAPHIC INDICES AND EXTRAVASCULAR LUNG WATER DURING SPONTANEOUS BREATHING TRIALS

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INTRODUCTION. Spontaneous breathing trials (SBT) during weaning from mechanical ventilation may induce acute changes in extra-vascular lung water (EVLW) that may play a role in difficult or unsuccessful weaning.
OBJECTIVES. To assess the relationship between Doppler Echocardiography (DE) indices and acute alterations in EVLW during SBT in critical care patients.
METHODS. 14 patients (63.25 ± 14.6 years-old) who fulfilled predetermined criteria for weaning underwent DE and hemodynamic assessment before and at the end of a 2-h SBT

(pre-SBT/end-SBT, respectively). At pre-SBT, left ventricular (LV) systolic function was assessed by calculating LV ejection fraction (EF), and RV function by measuring RV fractional area change (RVFAC) and RV end-diastolic/LV end-diastolic area ratio (RVEDA/LVEDA). Tissue Doppler Imaging (TDI) signals at the lateral mitral/tricuspid annuli were recorded to detect acute changes in LV/RV function during SBT. "Conventional" mitral inflow analysis and TDI-derived mitral annular velocity Em were used to assess SBT-induced alterations in LV diastolic function/filling pressures. PiCCOplus^{TM}system (Pulsion Medical Systems, Munich, Germany) was applied in order to automatically quantify acute alterations of both static volumetric preload variables in SBT.
RESULTS. During SBT, changes (%Δ) in E/Em ratio was marginally positively associated with EVLWI increase (P = 0.048). %ΔE/Em ratio was also associated with increased RV systolic reserve [RV Δ%Sm, r = 0.62, P = 0.042); the latter was positively associated with %ΔEVLWI (r = 0.86, P = 0.002). A decrease in E-wave deceleration time (≥5 ms) predicted an EVLW increase: AUC, sensitivity (%), specificity (%) were 0.93, 75 and 100, respectively.
CONCLUSIONS. Impaired LV diastolic reserve and increased RV systolic reserve may play a role in the development of weaning induced pulmonary edema during SBT.

0310
DIASTOLIC DYSFUNCTION IS AN INDEPENDENT FACTOR OF WEANING FAILURE

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INTRODUCTION. Patients failing to wean from mechanical ventilator represent a clinical problem in an Intensive Care Unit (ICU). Cardiac dysfunction prior to, or identified during the critical illness may contribute to weaning failure.
OBJECTIVES. To investigate whether left ventricular (LV) diastolic dysfunction is related to weaning failure from mechanical ventilation (MV).
METHODS. Thirty-four consecutive ICU patients (age: 55.4 ± 19.6 years), who underwent a 2-h spontaneous breathing trial (SBT) via T-piece, were included. Respiratory, hemodynamic and gas exchange variables were recorded on MV and during the SBT. Cardiac biomarkers [blood B-natriuretic peptide (BNP) and troponin I] were measured on MV and at the end of SBT. In the presence of signs of SBT failure, all measurements were done just before reconnection to the ventilator. Transthoracic echocardiography (TTE) was performed on MV, before the start of SBT. The grading of LV diastolic function was assessed by measurements of maximal velocities of mitral E and A waves, deceleration time of E wave, and maximal velocity of E′ wave. Weaning success was defined as the ability of the patients to tolerate spontaneous breathing for more than 48 h. Values of TTE parameters were compared between patients who were weaned and those who failed.
RESULTS. Twenty-two patients were successfully weaned; the remaining 12 failed. Grade 0, 1, 2, and 3 of diastolic function was present in 13, 12, 5 and 4 patients, respectively. LV diastolic dysfunction was statistically significant correlated with weaning failure (p < 0.001). On MV blood BNP values were significantly lower in patients who weaned compared to those who were not (361.4 ± 523.2 vs. 642.7 ± 382.3 pg/ml, respectively, p = 0.008). At the end of SBT there was a significant increase in BNP values in patients who failed (from 642.7 ± 382.3 to 744.7 ± 495.9 pg/ml), whereas no change was found in patients who succeeded (from 361.4 ± 523.2 to 315.6 ± 404.8 pg/dl), p = 0.047. The respiratory frequency to tidal volume ratio at the 2nd minute of SBT was higher in weaning failure vs. weaning success (102 ± 55 vs. 62 ± 23), p = 0.016).
CONCLUSIONS. LV diastolic dysfunction is a predictor of weaning failure. Therefore, echocardiographic examination before attempting weaning could be useful to identify patients at risk of cardiac-related weaning failure.

0311
HYPOXIA INDUCIBLE FACTOR (*HIF1A*) GENE EXPRESSION IN HUMAN SHOCK STATES

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INTRODUCTION. Hypoxia-induced factor-1 (HIF1) controls the expression of genes involved in the cellular response to hypoxia. No information is available on its expression in critically ill patients. Thus, we designed the first clinical study in order to evaluate the role of *HIF1α* as a prognosis marker in patients with shock.
OBJECTIVES. The primary objective was to assess *HIF1α* as a prognostic marker in shock. Secondary objectives were to evaluate the role of *HIF1α* as a diagnostic and follow-up marker. Patient survival was evaluated at day 28.
METHODS. Fifty consecutive adult patients with shock and 11 healthy volunteers were prospectively included. Informed consent was collected at admission by a next-of-kin. RNA was extracted from whole blood samples and expression of *HIF1α* was assessed over the first four hours of shock by RT-PCR. Demographic, clinical and biological variables were collected prospectively. The observed differences were called significant if the *p* value was below 0.05. *P* values were computed with Wilcoxon rank sum test for quantitative parameters [expressed as median (IQR)], and with Fisher exact test for qualitative ones [expressed as absolute count (percentage)].
RESULTS. The causes of shock were sepsis (78 %), hemorrhage (18 %), and cardiac dysfunction (4 %). The *HIF1α* expression was higher in the shock patients than in the healthy volunteers [121 (72–168) vs. 48 (38–54) normalized copies, $p < 0.01$], whatever the measured isoforms. It was similar in non-survivors and survivors [108 (range 84–183) vs. 121 (range 72–185) normalized copies, $p = 0.92$], and did not significantly change within the first hours of shock.
CONCLUSIONS. The present study is the first to demonstrate the increased expression of *HIF1α* in patients with shock state. Further studies are needed to clarify the potential association with outcome. Our findings reinforce the value of monitoring plasma lactate levels to guide the treatment of shock.

0312
POSTOPERATIVE CENTRAL VENOUS OXYGEN SATURATION AND LACTATE LEVELS IN CARDIAC SURGERY PATIENTS: A PROSPECTIVE OBSERVATIONAL STUDY

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INTRODUCTION. Central ($ScVO_2$) and mixed venous oxygen saturation (SvO2) and blood lactate are useful measurement tools for evaluating the degree of hypoperfusion in patients with different disease processes.
OBJECTIVES. The aim of this study was to analyze the relation of outcome with post-operative values of lactate and $ScVO_2$ in cardiac surgery patients.
METHODS. Design: prospective, observational study. Settings: A 16-bed heart surgery intensive care unit (ICU) in a tertiary university hospital. Patients: heart surgery patients. Interventions: none. Complications include development of renal dysfunction or failure; prolonged ventilation; cardiogenic shock; cardiac arrest; heart failure, or acute respiratory distress syndrome, respiratory failure, sepsis, or an infection.
RESULTS. Total number of patients included in the study was 54 (41 males, 13 females), average age of 61.7 ± 9.7 years old. Twenty-six postoperative complications were recorded in 20 patients. Patients with complications had significantly longer hospital length of stay (LOS) (7.7 ± 2.3 vs 9.7 ± 3.5 days, p = 0.0169), ICU LOS (38.5 ± 24.7 vs 79.0 ± 68.4 h, p = 0.0028) and higher lactate values at 8 h after surgery (1.2 ± 0.6 vs 2.7 ± 1.9 mmol/l, p = 0.0001). These patients also exhibited numerically higher lactate values on ICU arrival (2.8 ± 1.0 vs 3.4 ± 1.2 mmol/l, p = 0.0634), lower ScVO2 on ICU arrival (71.7 ± 8.1 vs 70.4 ± 8.1, p = 0.5907) and $ScVO_2$ 8 h after ICU admission (66.0 ± 12.6 vs. 62.0 ± 13.5, p = 0.8506) and had longer times on mechanical ventilation (13.9 vs. 14.4 h, p = 0.669), although none proved to be statistically significant. Lactate on ICU arrival and 8 h after surgery, hospital LOS and ICU LOS positively correlated with postoperative complications.
CONCLUSIONS. In the present trial, it was confirmed the use of lactate as a prognostic tool. The development of complications was associated with significantly longer ICU LOS, hospital LOS, and a numerically lower average ScVO2. The small size of the study population was a limitation. Further studies are necessary to assess the utility of ScvO2 and lactate to guide hemodynamic optimization and the impact it has on morbidity and mortality in patients after cardiac surgery.
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0313
RISK AND PROTECTIVE FACTORS FOR DEVELOPMENT OF HYPOXIC HEPATITIS AND JAUNDICE IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Hypoxic hepatitis (HH) is observed in 10 % of patients at the medical intensive care unit (ICU). Approximately half of the patients with HH die at the ICU.
OBJECTIVES. Prospective assessment of risk factors for development of HH in 3 medical ICUs at the Medical University Vienna.
METHODS. We analyzed prospectively predefined risk factors for development of HH and jaundice, respectively, in 851 critically ill patients admitted to the ICU. HH was defined according to well established criteria.[1] Jaundice was defined as bilirubin > 3 mg/dL. Patients were followed for 1 year.
RESULTS. Of 851 patients, 60 % were male. Median age was 63 years (IQR 50–73). Median SAPS2 score was 46 (IQR 32–62), median SOFA score was 8 (IQR 5–-11). 20 % suffered from cardiogenic shock, 20 % had septic shock. 87 patients developed HH during the course of the ICU stay (10 %). Multivariate logistic regression analysis revealed that higher SAPS2 score on admission (p < 0.01), presence of cardiogenic shock (p < 0.01), presence of septic shock (p < 0.01) and chronic alcohol abuse (p < 0.01) were independent risk factors for development of HH. In contrast, pretreatment with statins was the only independent protective factor on development of HH (p < 0.05). Jaundice occurred in 20 % of the critically ill patients. Statin therapy prior to admission was a protective factor on presence of jaundice on admission at the ICU in univariate analysis (OR 0.36, 95 % CI 0.16–0.80). Multivariate logistic regression analysis identified age (p < 0.01), septic shock (p < 0.05) and liver cirrhosis (p < 0.01) as independent risk factors for jaundice on ICU admission and septic shock (p < 0.05), HH (p < 0.01), transfusion of more than 4 blood preservations (p < 0.01) and parenteral nutrition (p < 0.01) as independent risk factors for new onset of jaundice during the course of the ICU stay. 28 day, 90 day and 1 year mortality rate were 57, 67 and 73 % in patients with HH and 42, 55 and 61 % in patients with jaundice, respectively.
CONCLUSIONS. Apart from cardiogenic and septic shock, alcohol abuse is an independent risk factor for occurrence of HH. Statin pretreatment reduces the risk of new onset of HH. Apart from septic shock, transfusions and parenteral nutrition, HH is an independent risk factor for new onset of jaundice.
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0314
TRANSPULMONARY THERMODILUTION (TPTD) WITH ROOM-TEMPERATURE INJECTATES: A COMPARISON TO ICED INJECTATE IN 402 TPTDS USING THE PICCO-DEVICE

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INTRODUCTION. Accurate measurement of Cardiac index (CI), global end-diastolic volume index (GEDVI) and extrvascular lung-water index (EVLWI) are cornerstones of

goal-directed therapy in critically ill. Use of ice-cold saline is assumed to provide best accuracy of transpulmonary thermodilution (TPTD). However, use of room-temperature injectate might facilitate TPTD outside the ICU (OR) and is encouraged by the manufacturers of both commercially available devices. Nevertheless, this suggestion -so far- is substantiated by few data.
OBJECTIVES. Therefore, it was the aim of our study to compare CI, GEDVI and EVLWI derived from iced saline (4 °C) injectate to values derived from TPDT using room temperature injectate (21 °C).
METHODS. In 43 patients 402 sets with four 15 ml TPTDs (twice with 21° and subsequently twice with 4° saline) were obtained using the PiCCO-device (Pulsion Medical Systems, Munich). Statistics: SPSS 19.
RESULTS. Patients characteristics: 13 female, 30male, APACHE-II 17 ± 5, 74 ± 16 kg, 170 ± 9 cm. Mean values of CI (4.69 ± 1.61 vs. 4.53 ± 1.53L/min m^2; $p < 0.001$), GEDVI (984 ± 294 vs. 953 ± 269 ml/m^2; $p < 0.001$) and EVLWI (14.4 ± 7.8 vs. 13.8 ± 7.3 ml/kg; $p < 0.001$) were significantly higher when measured at room temperature compared to measurements with cold saline. Mean bias and percentage errors were 0.15 ± 0.60L/min m^2 and 25.5 %, 31 ± 144 ml/m^2 and 29.9 % and 0.6 ± 2.1 ml/kg and 29.9 % for EVLWI, respectively. In general 1st measurements resulted in higher values than the second measurements using the injectate of the same temperature: CI_{warm}: 4.75 ± 1.66 vs. 4.63 ± 1.1.65 L/min*m^2; $p < 0.001$; CI_{cold}: 4.58 ± 1.57 vs. 4.52 ± 1.53; $p = 0.004$. $GEDVI_{warm}$: 1001 ± 318 vs. 967 ± 305; $p < 0.001$. $GEDVI_{cold}$ 964 ± 280 vs. 946 ± 285 ml/m^2; $p < 0.001$. $EVLWI_{cold}$ 14.0 ± 7.4 vs. 13.7 ± 7.4 ml/kg; $p = 0.02$. Only for $ELWI_{warm}$ there was no significant difference for 1st and 2nd measurement (14.3 ± 7.9 vs. 14.5 ± 7.9 ml/kg; $p = 0.18$). Consequently, means of 1 st warm and 1st cold measurement were significantly higher than means of 2nd measurements for CI (4.66 ± 1.57 vs. 4.57 ± 1.55; $p < 0.001$) and GEDVI (982 ± 284 vs. 955 ± 275; $p < 0.001$). Increases in 2 % (CI) and 2.8 % (GEDVI) for the 1s measurements are in accordance with the volume of the CVC middle (distal) lumen provided by the manufacturer (0.37 ml) resulting in an indicator loss of 0.37 ml/15 ml (2.5 %) within the catheter for the 1st measurement resulting in an overestimation of volumetric parameters of similar extent.
CONCLUSIONS. Use of room temperature injectate for TPTD results in slight, but significant overestimation of CI, GEDVI and EVLWI with percentage errors slightly below 30 %. Furthermore our data suggest, that also loss of indicator within the catheter results in a slight, but significant overestimation of 1st measurements of CI and GEDVI.

0315
HYPOTHERMIA AMELIORATES GASTRIC MUCOSAL MICROVASCULAR OXYGENATION DURING HYPOXIA

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INTRODUCTION. Hypothermia is known to improve tissue function in a variety of organs even during additional challenges like hypoxia [1]. During hypoxia gastric mucosal microvascular oxygenation (μHbO_2) is reduced [2]. Still, it is unknown whether hypothermia likewise improves μHbO_2 during hypoxia.
OBJECTIVES. To evaluate the effect of hypothermia on μHbO_2 during hypoxia and to evaluate the potential role of K^+_{ATP} channels as mediator, known to be involved in vasoregulation during hypoxia [3].
METHODS. The effects of hypoxia ($F_iO_2 = 0.12$ for 15 min) on μHbO_2 during normothermia (37.5 °C, blood temperature) and mild hypothermia (34 °C) were studied in repetitive experiments on five dogs anaesthetized with sevoflurane. In an additional series during hypothermia, glibenclamide (0.2 mg/kg over 10 min) or levosimendan (20 µg/kg over 15 min, followed by continuous infusion of 0.25 µg/kg/min) were administered prior to hypoxia. Systemic haemodynamics, gastric mucosal microvascular oxygenation (reflectance spectrophotometry) and blood temperature were recorded continuously. Arterial blood was sampled intermittently for blood gas analysis and calculation of systemic oxygen delivery (DO_2). Data are presented as mean ± SEM, Wilcoxon signed-rank test, $p < 0.05$.
RESULTS. Hypoxia during normothermia reduced μHbO_2 by 27 ± 3 percentage points (pp). During hypothermia reduction was attenuated to 16 ± 3 pp. Additional administration of glibenclamide or levosimendan during hypothermia did not change μHbO_2 compared to hypothermia alone. Hypoxia reduced DO_2 by -4 ± 0.6 ml/kg/min during normothermia but only by −2 ± 0.3 during hypothermia.
CONCLUSIONS. Hypothermia ameliorates μHbO_2 during hypoxia. This effect is related to an increased DO_2 during hypothermia. Neither glibenclamide nor levosimendan influence this effect.
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0316
USE OF BIOMARKERS IN ACUTE PERICARDITIS

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INTRODUCTION AND OBJECTIVES. Cardiac troponin T (Tp-T) has shown its prognostic value in cardiovascular disease, although there are few studies that evaluate is used in acute pericarditis. Our objective was to investigate the clinical and prognostic value of these markers in acute pericarditis of viral or idiopathic.
METHODS. 107 patients admitted to our hospital for acute pericarditis between January 2001 and September 2011, excluding the postinfarction pericarditis. Patients were divided according to their number of Tp-T pericarditis (TP-T <0.1 ng/ml) and myopericarditis (Tp-T >0.1 ng/ml).
RESULTS. Of the 107 patients (94 % male) with median age 33 years (from 14 to 83 years), there were 65 and 42 myopericarditis pericarditis. The following characteristics were associated with high-T Tp: younger age ($p < 0.001$), abnormal ECG ($p = 0.05$) and fever > 38 ° C ($p = 0.03$). During a mean followup of 50 months, found a complication rate similar in both groups: recurrent pericarditis (19 vs. 11 %, $p = 0.23$), blocked (5 % vs. 2 %, $p = 0.56$). There was only one hospital death in the group of myopericarditis (0 vs. 2 %, $p = 0.62$), no cases of constrictive pericarditis or residual ventricular dysfunction.
CONCLUSIONS. In acute pericarditis, elevated Tp-T is a common finding and is most commonly associated with young age, electrocardiographic abnormalities and fever. However, unlike the acute coronary syndrome, the Tp-T in acute pericarditis is an adverse prognostic factor.

0317
TERLIPRESSIN VERSUS NOREPINEPHRINE FOR TREATMENT OF VASODILATORY HYPOTENSION: A META-ANALYSIS OF RANDOMIZED CONTROLLED STUDIES

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INTRODUCTION. Vasodilatory hypotension is typical of many critical settings, such as septic shock and hepatorenal syndrome. Norepinephrine is commonly used as first choice vasopressor to treat refractory hypotension in these patients. Terlipressin, a synthetic, long acting vasopressin analogue, can be administered as alternative or last resort vasoconstrictor in these settings. There is no evidence based medicine to indicate which vasopressor is better in term of reduced mortality, increase in arterial blood pressure or improvement in renal function.
OBJECTIVES. We performed a meta-analysis of all published randomized controlled trials to evaluate the effects of terlipressin versus norepinephrine on overall survival, mean arterial blood pressure and serum creatinine.
METHODS. Scopus, PubMed and Embase were searched for pertinent studies. Inclusion criteria were random allocation to treatment and comparison of terlipressin versus norepinephrine in any clinical setting. Exclusion criteria were: duplicate publications and non-adult studies.
RESULTS. We analyzed data from 198 patients in 7 randomized controlled studies. No difference in mortality was found: overall mortality rate was 24.1 % (20/83) among terlipressin treated patients and 27.2 % (22/81) among norepinephrine treated patients (OR = 0.5 [95 % CI 0.22; 1.15], $p = 0.1$). No difference was found in mean arterial pressure rising [WMD = 0.17 mmHg, (−0.14; 0.49), $p = 0.3$] and serum creatinine variation (WMD = −0.32 mg/dl, (−1.14; 0.50), $p = 0.4$).
CONCLUSIONS. According to this meta-analysis of randomized controlled studies, terlipressin does not reduce mortality and has no beneficial effects on arterial blood pressure or serum creatinine when compared with norepinephrine. Its use as an alternative to norepinephrine should be investigated with larger randomized controlled trials to evaluate possible benefits.
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0318
CLINICAL AND ELECTROCARDIOGRAPHY MARKERS OF RIGHT VENTRICLE STRAIN AND EARLY ADVERSE OUTCOME IN PATIENTS WITH PULMONARY EMBOLISM: RESULTS OF SINGLE CENTRE PROSPECTIVE STUDY

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INTRODUCTION. Right ventricular dysfunction (RVD) is central hemodynamic event in acute pulmonary embolism (PE), and represents independent prognostic factor of adverse event. Some studies suggest that ECG derived RV strain pattern might be of a prognostic value in PE pts. The aim of present study was to evaluate prognostic value of clinical and ECG signs associated with early adverse outcome of PE pts.
METHODS. A prospective study was conducted at the Sisters of Mercy University Hospital Intensive Care Unit, Zagreb, Croatia, during 2010. Main outcome measure was in-hospital death. The secondary outcome measure was the proportion of PE pts divided into three severity groups, PE clinical signs and ECG findings of RV strain. Multivariate logistic regression analysis was performed to estimate factors independently associated with death.
RESULTS. The study population included 104 ICU pts with confirmed diagnosis of PE. Mean age of the pts was 68.7 ± 13.4 years with female predominance (63.5 %). Pts were divided into three severity groups: high-risk (n = 33; 31.7 %), intermediate- (n = 51; 49.1 %) and low-risk (n = 20; 19.2 %). In analyzed co-morbidities and risk factors for PE there was significantly higher number of pts with high-risk PE in none-surgical pts ($P = 0.007$). The duration of symptoms before admittance to the hospital was shorter in high-risk PE group ($P = 0.023$). Higher respiratory rate was recorded in high- and intermediate-risk PE ($P = 0.011$), as well as the chest pain, tachycardia, hypotension, syncope, distended neck veins, and tricuspidal regurgitation ($P = 0.030$; $P = 0.002$; $P < 0.001$; $P < 0.001$; $P = 0.002$; $P = 0.030$, respectively). Syncope, hypotension, protodyastolic gallop and distended neck veins were more frequently recorded in the PE non-survivors ($P = 0.045$; $P < 0.001$; $P = 0.009$; $P = 0.016$, respectively). The most frequent PE ECG signs were sinus tachycardia (48 pts, 46.1 %), and $S_1Q_3T_3$ pattern (58 pts, 55.8 %), while RBBB occurred in 17 (16.4 %) pts. Higher number of sinus tachycardia and RBBB pts were recorded in the high- and intermediate-risk PE groups ($P < 0.001$ both). In three consecutive ECGs there was decrease in occurrence of sinus tachycardia, and supraventricular tachyarrhythmias ($P < 0.001$; $P = 0.014$, respectively) and increase in inverted T waves ($P < 0.001$). Two factors were independently associated with death during the episode of PE: appearance of RBBB (OR 111.36, 95 % CI 12.74–973.21, $p < 0.001$) and the presence of the distended neck veins (OR 15.36, 95 %CI 1.81–130.51, $p = 0.012$).
CONCLUSIONS. Clinical signs and ECG changes representing RV strain might be useful in detection of pts with PE who are in increased risk of PE related complications and adverse outcome. Among these, according to the present study RBBB and distended neck veins were independent risk factors for in-hospital death.
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0319

SERUM LACTATE AS A PREDICTOR FOR LIFE-THREATENING PNEUMATOSIS INTESTINALIS: RETROSPECTIVE STUDY OF 60 PATIENTS

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INTRODUCTION. Pneumatosis intestinalis (PI) is the result of gas infiltration into the bowel wall. PI can be categorized into two groups: benign and life-threatening PI[1)]. Since benign PI also demonstrates Portal vein gas (PV gas) and Free air, ruling out life-threatening PI is difficult especially when PI presents without evidence of bowel ischemia on CT. There is much debate over which factors are useful for ruling out life-threatening PI from others.

OBJECTIVES. The purpose of this study was to detect the factors for ruling out life-threatening PI.

METHODS. In a retrospective chart review from January 2006 to May 2011, we reviewed all PI patients without evidence of bowel ischemia on CT in a 1,151-bed community teaching hospital.

RESULTS. A total of 60 patients were included. 3 patients were excluded for missing data. Included patients has a median age of 76 (66–83), male sex were 36 (63 %). Patients who have any of PI risk factors (bowel obstruction, COPD, DM, steroid, chemotherapy collagen disease) were 53 (91 %). 8 (13.3 %) patients were benign PI, 49 (86.7 %) were life-threatening one. Univariate analysis showed persistent abdominal pain, serum lactate level >2.0 mmol/L, portal vein gas being the independent predictor for death. In multivariate logistic regression analysis, only lactate remained with an odds ratio of 53.8 (95 % CI 3.2–908.6). The sensitivity and specificity of serum lactate level >2.0 mmol/L for the detection of Life-threatening PI were 87.5 and 97.9 %, respectively.

CONCLUSIONS. Serum lactate level >2.0 mmol/L are useful in ruling out life-threatening PI. We recommend close observation of PI patients using lactate monitoring.

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Physiotherapy in the ICU: 0320–0332

0320

IMPACT OF AN AEROBIC REHABILITATION PROGRAMME ON FITNESS AND QOL IN ICU SURVIVORS: AN EXPLORATORY TRIAL (PIX STUDY)

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INTRODUCTION. Survival following critical illness leads to impaired physical reserve and a reduced health related quality of life (HRQOL). Cardio-respiratory deconditioning, anxiety and depression and posttraumatic stress all significantly contribute. Physical recovery may exceed 12 months following hospital discharge.

The effectiveness of improving fitness and HRQOL utilising self-directed home-based exercise interventions has shown limited benefit. However, no studies we could identify have examined the efficacy of a supervised in-hospital exercise programme following critical illness.

OBJECTIVES. To assess the impact of an 8-week in hospital supervised exercise programme on fitness and HRQOL in survivors of emergency intensive care unit (ICU) admission.

METHODS. Exploratory interventional randomised controlled trial. Adult survivors of ICU admission (sepsis or trauma) who required ≥3 days of invasive ventilation were randomly allocated to receive an 8-week in-hospital supervised exercise intervention (exercise group) or no exercise (control group). In-hospital exercise sessions were supervised cycle-based, twice weekly of 40 min duration at moderate intensity. An additional weekly 40-min walk was undertaken.

Assessments of fitness (using Cardiopulmonary exercise testing) and HRQOL [SF-36—physical function subscale (PF) and mental health subscale (MH)] were carried out at baseline, week 9 (following 8-week intervention or control) and week 26. The primary outcome measures were changes in fitness and HRQOL at week 9.

RESULTS. Fifty-nine patients were recruited. No study-related serious adverse events occurred. Baseline characteristics were similar between groups. Participant exercise session compliance: 77 % attended >50 % sessions; 62 % attended >75 % sessions; 38 % attended all sessions.

Table 1 Pooled effects adjusted for baseline value

Primary outcome	Time point (week)	Control	Intervention	Difference (90 % confidence interval)
AT ($mlO_2\ kg^{-1}\ min^{-1}$)	9	10.4 (baseline 10.4)	12.4 (baseline 10.4)	2.0 (1.0–2.9)
	26	11.9	12.3	0.40 (−1.2–2.0)
SF-36 PF	9	41.0	42.0	1.0 (−3,5–5.5)
	26	46.7	45.6	−1.1 (−5.8–3.6)
SF-36 MH	9	48.2	49.2	1.0 (−3.2–5.2)
	26	46.2	51.2	5.0 (0.1–9.9)

Fitness and HRQOL changes are shown in Table 1. Objective fitness increased at week 9 in the exercise group by a clinically and statistically significant amount. A NNT of 5 is needed to attain this improvement. Fitness improvements were similar in both groups at week 26. There was no difference in HRQOL markers at week 9. By week 26, mental wellbeing was significantly better in the exercise group.

CONCLUSIONS. The 8-week exercise intervention resulted in clinically and statistically significant improvements in fitness at 9 weeks not achieved until 26 weeks in the control group.

The level of fitness improvement achieved by week 9 would allow patients to return to routine activities of daily living at an earlier stage of recovery.

A NNT of 5 would represent an excellent return if reproduced on a larger scale.

This is the first study we could identify to show positive objective fitness improvements in tandem with improvements in HRQOL. This may be due to the supervised nature of the intervention in contrast to previous studies employing self-directed rehabilitation.

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0321

SAFETY AND EFFICACY OF WHOLE-BODY-VIBRATION IN CRITICALLY ILL PATIENTS

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INTRODUCTION. ICU acquired weakness and muscle wasting in critically ill patients is a common and significant complication affecting the course of critical illness. Whole-body-vibration (WBV) is known as affective muscle training and may be an option in diminishing muscle wasting. Especially patients being immobilized by sedation, not available for active physiotherapy, may benefit. Until now WBV was not investigated in ICU Setting.

OBJECTIVES. Investigating safety and efficacy of WBV in critically ill patients. Besides safety aspects we investigated the effects of WBV in ICU patients to vital signs and hemodynamic parameters as far as energy enhancement.

METHODS. We investigated 19 mechanically ventilated, immobilized, ICU patients, twice within seven days. Passive range of motion was performed prior to protocol-based WBV therapy which was held in supine position for 15 min. For vibration we used two different devices (Promedi, Vibrosphere®, n = 13 and Galileo, home-ICU®, 24 Hz, n = 6). For 90 min, vital signs and hemodynamic parameters were continuously recorded. Indirect calorimetry was performed and several blood gas analysis were obtained. We did comparative analysis of the phases before (PRE), during (INT) and 60 min after (POST) WBV therapy with non-parametric tests. Median (25/75 percentiles). Ethics vote (Charité EA1/017/11).

RESULTS. No application had to be interrupted. We did not observe any adverse event. WBV significantly increased energy expenditure.

Vital signs and hemodynamic parameters

	Number	PRE	INT	POST	p (a)	p (b)
Heartrate/min	30	76 (71/85)	79 (71/86)	76 (68/85)	0.102	0.285
MAP (mmHg)	27	78 (69/96)	84 (70/95)	84 (71/97)	0.648	0.933
Cardiac output (l/n)	24	7.1 (6.3/9.8)	6.9 (6.1/9.1)	6.8 (6.2/9.4)	0.212	0.249
ICP (mmHg)	12	12 (9/16)	11 (9/12)	11 (10/14)	0.859	0.959
Indirect calorimetry for energy expenditure						
EE (kcal/days)	30	2,090 (1,980/2,330)	2,235 (1,935/2,535)	2,130 (1,740/2,240)	0.039	0.999
VO_2 (ml/min)	30	317 (279/345)	344 (277/388)	318 (258/346)	0.069	0.934
VCO_2 (ml/min)	30	215 (193/241)	235 (201/270)	209 (189/230)	0.007	0.112
Blood gas analysis						
pCO_2 (mmHg)	33	39.8 (37.1/41.7)	39.3 (36.4/41.5)	40.0 (37.3/42.2)	0.114	0.036
pO_2 (mmHg)	33	106 (91/125)	110 (84/132)	105 (95/127)	0.508	0.474
Potassium (mmol/min)	33	4.2 (4.0/4.4)	4.2 (4.0/4.3)	4.2 (4.0/4.3)	0.195	0.472

CONCLUSIONS. Vital signs and hemodynamic parameters remained stable with only minor changes resulting from intervention. In our study WBV was safe and increased whole body metabolic rate in ICU patients. We conclude that WBV is applicable safely to ICU patients. In immobilized critically ill patients muscle activation reflected by increased energy expenditure may diminish muscle wasting. Further investigation should concentrate on patients maintenance of muscle mass and force by using WBV.

0322

THE RELATIONSHIP BETWEEN MUSCLE WEAKNESS AND POSTOPERATIVE CATABOLISM AFTER CORONARY ARTERY BYPASS GRAFT SURGERY

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INTRODUCTION. Systemic muscle weakness is common in patients undergoing cardiac surgery, and is associated with pulmonary complications and delayed functional recovery after surgery. Elevation of inflammatory cytokine production after surgery enhances systemic catabolic states, and leads to muscle proteolysis. These observations suggest that muscle weakness after surgery may be affected by muscle proteolysis via postoperative hypercatabolism, but the interrelationships of these factors remain unclear. We postulated that postoperative muscle weakness may be associated with urinary 3-methylhistidine (3-MH) excretion, which is well known as a marker of skeletal muscle proteolysis, and elevation of inflammatory cytokine production.

OBJECTIVES. This study was performed to investigate whether postoperative muscle weakness was correlated with urinary 3-MH concentration and production of inflammatory cytokines in patients undergoing coronary artery bypass graft (CABG) surgery.

METHODS. Thirty-seven consecutive patients undergoing elective CABG (7 women, age 69.5 ± 7.5 years) participated in this study. Exclusion criteria were mechanical ventilation beyond 24 h after surgery, reoperation, history of cerebrovascular accident, pulmonary complication, renal failure, and hepatic dysfunction before surgery. Grip strength (GS), maximum inspiratory pressure (MIP), maximum expiratory pressure (MEP), and knee-extensor strength (KES) were measured before surgery and on postoperative days (POD) 7 and 14. We analysed mean change (D) in muscle strength and 24-h urinary 3-MH excretion during 3 days after surgery, serum levels of interleukin (IL)-6, cortisol, growth hormone (GH), insulin-like growth factor (IGF)-1, branched chain amino acids (BCAAs), and aromatic amino acids (AAAs) before and after surgery in the patients.

RESULTS. Significant elevations in DIL-6 and cortisol and declines in IGF-1/GH and BCAAs/AAAs were observed ($P < 0.05$). MIP, MEP, GS, and KES were significantly decreased after surgery ($P < 0.05$), and these changes showed similar trends. There were significant correlations between 3-MH and muscle weakness at POD14 (*vs.* DMIP, r = 0.40, $P < 0.05$; *vs.* DMEP, r = 0.438, $P < 0.01$; *vs.* DGS, r = 0.466, $P < 0.01$; *vs.* DKES, r = 0.469, $P < 0.05$), and DIL-6 (r = 0.34, $P < 0.05$).

CONCLUSIONS. The results of the present study suggested that postoperative muscle weakness may be caused due not only to muscular immobilisation but also to postoperative muscle proteolysis after surgery. Construction of interventions based on the mechanism of

postoperative muscle protein metabolism may be necessary to prevent muscle weakness immediately after cardiac surgery.
Clinical approach to countermeasure this possible mechanism will be necessary to prevent muscle weakness after cardiac surgery.

0323
THE INCIDENCE OF SHOULDER DYSFUNCTION IN ICU SURVIVORS

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INTRODUCTION. Advances in many aspects of critical care medicine are resulting in increasing survival rates for this patient population [1]. Associated with this increase in survival has been a wide range of long-lasting impairments affecting quality of life and functional status of the survivors [2].Following recommendations made in the NICE guidelines [3] a physiotherapy rehabilitation programme for Intensive Care Unit (ICU) survivors was started at the John Radcliffe Hospital in Oxford. As part of this programme patients underwent a full musculoskeletal assessment to identify any specific impairments resulting from a period of critical illness.
OBJECTIVES. To identify the incidence of shoulder dysfunction amongst ICU survivors.
METHODS. Shoulder dysfunction was defined as shoulder pain and/or loss of range of movement (ROM) at the shoulder that was not present prior to admission to ICU.All patients that attended the Post-ICU physiotherapy rehabilitation programme over 1 year were reviewed. Inclusion criteria for entry to the rehabilitation programme were as follows: ICU length of stay (LOS) >3 days, non-palliative diagnosis, significant weakness on ICU (as defined by the physiotherapist),no specific neurological weakness (at the physiotherapists discretion). All patients were assessed within 2 weeks of discharge from hospital.
RESULTS. Twenty patients were assessed over a period of 1 year. Sixteen were identified with shoulder dysfunction. Ten of those patients had a combination of pain and loss of ROM. Both sets of patients were of a similar age however both the hospital and ICU length of stays (LOS) were greater in the shoulder dysfunction group. The number of patients who received mechanical ventilation were also greater in the shoulder dysfunction group. There were a higher number of patients with unilateral shoulder dysfunction (11) compared with bilateral (5), with 64 % of unilateral shoulder dysfunction presenting in the dominant limb.
CONCLUSIONS. There was a high incidence of shoulder dysfunction (80 %) on assessment of ICU survivors presenting to post-ICU physiotherapy rehabilitation. Patients with shoulder dysfunction had a longer ICU and hospital LOS than those without. There may also be a link with mechanical ventilation as 94 % of patients with shoulder dysfunction had a period of mechanical ventilation. Shoulder dysfunction may be prevalent in ICU survivors but a study of a larger population is needed to further investigate this.
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0324
THE FEASIBILITY OF MEASURING OXYGEN CONSUMPTION DURING REHABILITATION OF MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. Recent data have highlighted severe cardiovascular deconditioning in critically ill patients [1]. However, little is known about the physiological load imposed on mechanically ventilated (MV) patients participating in rehabilitation. This presents a challenge to those prescribing exercise programs as the current one-size-fits-all approach may lead to overtraining of some patients and undertraining of others. We therefore undertook a pilot study to inform a broader research program aiming to establish the feasibility of measuring exercise intensity and capacity of MV patients in order to optimise the exercise load imposed on individuals.
OBJECTIVES. To establish the feasibility of oxygen consumption (VO_2) measurement during rehabilitation in mechanically ventilated patients.
METHODS. Six MV patients were recruited between December 2011 and March 2012. Consent or surrogate approval was obtained if patients had been ventilated >7 days, had a tracheostomy in situ and would normally participate in a rehabilitation program. VO_2 and heart rate (HR) were measured continuously before, during and following the rehabilitation session. This involved sitting over the edge of the bed, possibly standing and then returning to bed. VO_2 was measured by the Medgraphics Ultima (MGU), a breath-by breath gas exchange analysis system previously validated in MV patients [2]. HR was continuously recorded using a Polar heart rate monitor.
RESULTS. All patients demonstrated a marked increase in VO_2 (Figs. 1, 2) and HR during rehabilitation. Sitting over the edge of the bed and standing involved an average increase in VO_2 of 57 % (range 26–96 %) and 55 % (range 50–61 %), respectively. The mean increase in HR whist sitting over the edge of the bed and standing was 14 bpm (range 10–27) and 23 bpm (19–29), respectively. Three patients were receiving either digoxin or B-blockade.

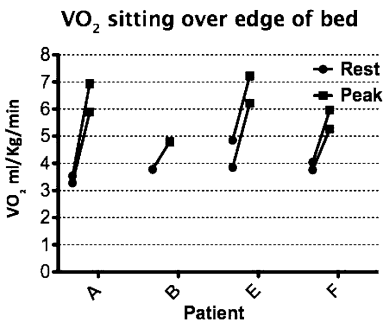

Fig. 1 Mean VO_2 at rest and peak VO_2 sitting

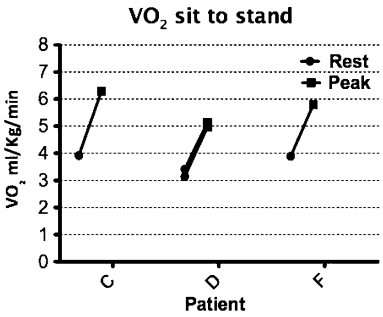

Fig. 2 Mean VO_2 at rest and peak VO_2 standing

CONCLUSIONS. It is feasible to measure VO_2 during normal rehabilitation sessions. We have demonstrated a considerable increase in oxygen consumption with relatively low levels of functional activity in MV patients. With further investigation breath-by breath gas exchange analysis may be a potential method to quantify intervention workload and individualise exercise programs for ICU patients.
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0325
IS THE FUNCTIONAL INDEPENDENCE MEASURE (FIM) A USEFUL OUTCOME MEASURE IN CRITICAL CARE REHABILITATION?

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INTRODUCTION. A robust method to quantify physical function would enable clinicians to monitor progress and treatment efficacy during rehabilitation. Currently no generic functional assessment tool is used throughout UK intensive care units (ICUs), as the sensitivity and validity of these instruments has not yet been established [1, 2]. The FIM is used predominantly for patients with neurological injuries but has been used in some ICU studies both in Europe and North America [3].
OBJECTIVES. The objectives of this prospective study were to assess the sensitivity of the FIM during critical care rehabilitation in our 20-bed cardiothoracic adult ICU and to establish whether the FIM correlates with changes in muscle power and grip strength.
METHODS. The therapy team underwent a teaching session on the FIM prior to commencing the study. Between January and March 2012 all consecutive patients admitted on the ICU who were mechanically ventilated for >10 days and able to start active rehabilitation were assessed using the FIM; Oxford muscle scale and grip strength (Jamar Dynamometer). These scores were repeated every 2 weeks and prior to hospital discharge.
RESULTS. A total of 17 patients (10 male) were assessed at the start of active rehabilitation. A positive correlation between the total FIM score and both upper limb strength ($p = 0.04$) and total muscle strength ($p = 0.002$) was shown (Pearson's test). Using Spearman rank correlation, due to non-parametric data, a statistically significant correlation ($p = 0.004$) between the FIM and grip strength was also shown. In 9 patients reviewed on discharge/transfer from the Royal Brompton Hospital the FIM showed a significant improvement ($p = 0.009$) following rehabilitation.
CONCLUSIONS. The FIM was sensitive to change in the ICU population in our tertiary cardiothoracic centre. The FIM may be a useful outcome measure in this specialist patient population and could be used throughout the continuum of rehabilitation. More research with larger sample sizes is required to investigate these findings further.
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0326
PHYSIOTHERAPY RESOURCE NEEDS OF SEVERE RESPIRATORY FAILURE PATIENTS

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INTRODUCTION. Severe respiratory failure (SRF) associated with Influenza A (H1N1) during winter 2010/11 led to increased demand for extra corporeal membrane oxygenation (ECMO) and High Frequency Oscillatory Ventilation (HFOV) services across the UK. Patients requiring advanced ventilatory support (AVS) provide unique challenges to the delivery of physiotherapy due to their severity of illness. There is limited published literature describing physiotherapeutic strategies during AVS [1]. Over the past year in the UK services have been commissioned to provide AVS.
OBJECTIVES. To describe the clinical and resource demands for physiotherapy of patients with SRF who required AVS in order to inform future clinical strategies and service/workforce planning.

METHODS. A retrospective case note review was undertaken for all patients who received ECMO and/or HFOV from 25/12/10 to 25/2/11. This project was registered in line with our institution's clinical assurance processes as a service evaluation. All patient information was anonymised, therefore consent was waived. Data regarding physiotherapy activity during patients' intensive care unit (ICU) stay was collected including frequency, type and duration of interventions, staff grade delivering the interventions and whether or not the patient was receiving ECMO or HFOV at the time of intervention. Intervention activity was categorised as respiratory, rehabilitative or indirect (management and treatment planning with MDT).
RESULTS. Thirteen patients received ECMO and/or HFOV. A total of 519 physiotherapy interventions were delivered to these patients whilst on ICU. Median time for direct and indirect interventions was 60 and 10 min respectively. The median grade of physiotherapist required to treat patients during AVS was Band 7, compared with Band 6 when not receiving AVS. Patients receiving AVS required respiratory interventions and interventions aimed at maintaining musculoskeletal integrity. After AVS, there was a shift towards active rehabilitation on ICU. Patients requiring ECMO received more physiotherapy input compared with those requiring HFOV (a mean of 30 vs. 19 h, respectively). This was attributable to longer and more frequent respiratory interventions during ECMO. Patients with SRF requiring either ECMO or HFOV received a mean of 24 h of physiotherapy input during their ICU stay. This equates to an estimated cost of £550 (£685 ECMO, £434 HFOV) per patient for physiotherapy intervention.
CONCLUSIONS. Patients with SRF had specific physiotherapy needs, delivered by highly specialised, experienced physiotherapists. Patients receiving ECMO required greater physiotherapy resource than those receiving HFOV. Physiotherapy resource requirements and associated costs should be included in the future planning and development of advanced ventilation services.
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0327
LONG-TERM PHYSICAL FUNCTIONING CAN BE PREDICTED 3 MONTHS AFTER DISCHARGE FROM THE INTENSIVE CARE UNIT

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INTRODUCTION. Follow-up studies show that patients who stayed in intensive care units (ICU) encounter long-lasting restrictions in physical functioning.[1-4] In the absence of clinical predictors for physical recovery, it is not possible to identify patients who are at risk for lasting physical limitations and who are most in need of rehabilitative care after discharge from the hospital.[3-4]
OBJECTIVE. To describe the 1 year course of physical recovery after discharge from the ICU and to determine whether pre- and post-ICU physical functioning has predictive value for physical functioning 1 year after discharge from ICU.
METHODS AND DESIGN. Prospective, observational cohort study with 4 measurement moments during 1-year of follow-up after ICU-discharge. SETTING: a combined medical and surgical ICU in an university hospital. PARTICIPANTS: 38 consecutive adult ICU patients who were ventilated >48 h. INTERVENTIONS: None.MAIN OUTCOME MEASURES: The physical functioning (PF) dimension of the Medical Outcomes Study Short Form 36 and walking capacity (2 min walking test). ANALYSIS: the relationship between PF before ICU admission, age, gender, severity of illness on ICU admission, duration of mechanical ventilation, walking capacity 3-7 days after ICU discharge and PF after 3 months as independent variables and PF at 12 months as dependent was assessed with multivariable regression analysis.
RESULTS. SF-36 physical functioning (PF) improved during the first year, but 12 months after ICU discharge PF was lower than before ICU-admission. PF before ICU admission and after 3 months were associated with PF at 12 months. Multivariate regression analysis showed that PF after 3 months and PF before ICU admission were independently associated with PF after 12 months ($R^2 = 0.71$, $p < 0.001$). Analysis of sub-groups of patients with good and poor PF prior to ICU admission showed a different course of recovery after ICU discharge. LIMITATIONS: Potential limitations of this study are the relatively small sample size and the lack of information on other factors that may influence recovery.
CONCLUSION. In the majority of ICU survivors one year after ICU discharge, recovery of physical functioning is incomplete compared to pre-ICU status. Patients at risk for poor physical recovery can be identified 3 months after ICU discharge based on SF-36 PF prior to ICU admission and 3 months after discharge.
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0328
THE FEASIBILITY OF THE SIX MINUTE WALK TEST AND BARTHELL INDEX TO MEASURE THE EFFECT OF A PHYSIOTHERAPY SERVICE MODEL IN AN INTENSIVE CARE UNIT

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INTRODUCTION. The measurement of patients' functional outcome at discharge from a surgical intensive care unit (ICU) is not standardized. This complicates the comparison of different physiotherapy service models on patient outcome.
OBJECTIVES. Determine the feasibility of using the 6 min walk test (6MWT) and Barthel Index (BI) when comparing physiotherapy service models.
METHODS. All patients admitted to a level three surgical unit consecutively over a 3 month period were allocated to usual- or protocol-care based on unit admission date. All patients were screened within 48 h of unit discharge for functional testing based on a priori defined criteria, by research therapists blind to intervention. ATS guidelines[1] were followed in the completion of the 6MWT. The interpretation of BI information was standardized a priori.
RESULTS. Due to a priori defined eligibility criteria the BI could be administered in 47 % (90/193) and the 6MWT in 30 % (57/193) of the sample. Patients were similar at baseline.

Baseline comparison of patients eligible for funct

	Usual-care (n = 44)	Protocol-care (n = 46)
AGE ± SD	49.11 ± 16.73	55.36 ± 16.26
APACHE ± SD	9.20 ± 4.89	9.63 ± 6.32
ICU length of stay (h) ± SD	72.84 ± 36.89	81.40 ± 65.11
VEntilation time (h) ± SD	22.37 ± 31.69	25.71 ± 57.32
Gender: male %	26 (59 %)	29 (63 %)
Elective surgery	30 (68 %)	33 (72 %)
Emergency surgery	5 (11 %)	6 (13 %)
Trauma	7 (15 %)	6 (13 %)

A third of the patients who participated in the 6MWT (17/57) needed to stop at least once during the 6 min. The reasons cited most often included pain (8); tired legs (8) and dyspnea (4). All patients successfully completed the 6MWT. Large variations in the walking distances were noted with similar data patterns in both groups.

Descriptive statistics of 6 min walk distance

	Usual-care (n = 29)	Protocol-care (n = 28)
Mean 6 min walk distance ± SD (m)	250.37 ± 126.97	234.32 ± 131.07
Median ± interquartile range (m)	227 ± 168	211.5 ± 214.5
Range minimum:maximum (m)	10:538	12:528
95 % confidence interval	202.08–299.68	184.49–285.14
Mean heart rate at baseline ± SD	85.76 ± 15.53	84.26 ± 19.40
Heart rate after completion of test ± SD	94.04 ± 18.70	93.37 ± 21.25
Mean oxygen saturation at baseline ± SD	95.46 ± 4.75	95.21 ± 2.92
Mean oxygen saturation after completion ± SD	94.81 ± 7.67	96.21 ± 3.13

There was a tendency for a greater proportion of protocol-care patients to reach independence in the transfers ($p = 0.7$) and mobility ($p = 0.09$) categories of the BI. Patients' perception of their functional ability when measured by the BI was moderately correlated with their functional capacity when measured by 6MWT ($r = 0.61$ $r2 = 0.36$ $p < 0.001$).
CONCLUSIONS. The 6MWT and BI can safely be administered in patients within 48 h of discharge from a surgical ICU when adhering to clearly defined eligibility criteria. However, it is not feasible to use these functional tests to measure the effect of a physiotherapy service model in ICU, as less than half of the sample was eligible for testing. Development of a surgical ICU specific functional measure which measures both functional ability and functional capacity is needed.
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0329
IS THE MANCHESTER MOBILITY SCORE A USEFUL TOOL FOR COMPARISON OF CRITICAL CARE REHABILITATION BETWEEN TRUSTS

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INTRODUCTION. Early rehabilitation within critical care has been shown to be effective in reducing both ICU and hospital length of stay (LOS) [3]. At present, the definition of early is not clearly defined, making it difficult to benchmark and compare rehabilitation practice between organisations. The Manchester mobility score [1] was initially developed as a method of tracking rehabilitation within critical care, but it is hypothesised that results may allow comparison of the level of rehabilitation and its effects between trusts.
OBJECTIVES. The aim of this study is to compare the rehabilitation service at UHB with previously published results from CMFT [2].
METHODS. Data was collected for all patients admitted to critical care >5 days and surviving to critical care discharge between November 2010 and February 2011 at a large acute NHS Trust. Patients were given daily Manchester Mobility scores to track rehabilitation progress. The level achieved on critical care discharge was then documented to obtain a mean level of rehabilitation for this patient group and the subsequent hospital LOS. Data was then compared to previously published results from Central Manchester Foundation trust who are acknowledged to have a well developed critical care rehabilitation pathway.
RESULTS. 49 patients were eligible for inclusion in the study, the results of which are demonstrated in table 1. Patients staying for >5 days in critical care at UHB had a lower mean MMS (3.9) in comparison to patients at CMFT (4.4). Patients at CMFT were observed to have a slightly higher mean ICU LOS, although despite this had similar post ICU LOS to those patients at UHB (21.2 vs. 21.3 days, respectively).

Table 1

	n	APACHE II	Mean MMS	Mean ICU LOS	Mean post ICU LOS
CMFT	36	19.2	4.4	11.9	21.2
UHB	49		3.9	10.4	21.3

CONCLUSIONS. The Manchester Mobility Score appeared to be a useful tool in benchmarking the level of rehabilitation between trusts and the subsequent outcomes in terms of LOS. However, care needs to be taken with regards to patient level of care and illness severity to ensure appropriate comparison. In this instance patients at CMFT appeared to have a higher level of mobility than patients at UHB, despite the fact they were assessed earlier in their admission (i.e. at Level 3 discharge compared to level 2 discharge at UHB). This would suggest the gap between services is likely to be higher than those observed as patients at CMFT may have achieved even higher levels of mobility at the point of discharge from level 2 care.
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0330

EPIDEMIOLOGY AND EARLY DIAGNOSIS OF HETEROTOPIC OSSIFICATION IN CRITICAL ILL PATIENTS. PRELIMINARY DATA

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INTRODUCTION. Heterotopic ossification (HO), especially acquired neurogenic HO, is a well-recognized condition in intensive care unit (ICU) with significant consequences on patients mobility and morbidity as well as time of hospitalization and cost. Early diagnosis and prevention of HO as well as evaluation of risk factors for HO have been previously studied. Thus the aim of the study is to explore ways of early diagnosis and prevention of HO.
OBJECTIVES. To assess the role of joint mobility, pain and ultrasonography in early diagnosis in critical ill patients in a general ICU.
METHODS. Eighty-five consecutive patients underwent clinical and laboratory screenings for NHO upon admission and discharge. Every patient received weekly assessment of passive ROM (pROM) of hip, knee, shoulder and elbow joints with a goniometry by a team of dedicated physiotherapists. The pain during joint mobilization was evaluated by Behavioral Pain and Visual Analogue Scales. An ultrasonography was performed in any clinically suspected patient. Confirmation of NHO diagnosis was performed by means of ultrasonography and radiography.
RESULTS. Forty patients (26 men and 14 women; age 56.25 ± 14.55 years, length of stay in ICU 23.35 ± 15.95 days) were eligible for the study (i.e., below age 75 years old, length of stay in ICU at least 5 days, etc.). Twelve, 8 and 5 patients had a score of 15, 8, and 3 in GCS, respectively. Twenty out of 40 patients expired. From the remaining 20 patients (14 men and 6 women; age 51.95 ± 16.05 year; length of stay in ICU 20.05 ± 13.9 days), 6 and 5 patients had a score of 8 and 15 of GCS, respectively. The incidence of NHO was 2 out of 20 cases (10 %) with acquired brain injury. NHO was located in the hip joint in one case and in the hip and elbow joints in the second case. The mean time of NHO diagnosis following their admission day in ICU was 10 ± 4 weeks. The mean percentage reduction in pROM was for the hip −3.96 ± 8.93 %, knee −0.17 ± 0.77 %, shoulder −1.36 ± 4.25 % and elbow joints −1.36 ± 3.00 %, respectively. The mean percentage increase of pain in hip, knee, shoulder and elbow joints was 28.45 ± 54.10 %, 6.93 ± 15.88 %, 6.65 ± 12.49 % and 6.56 ± 15.97 %, respectively. Finally, the pROM of hip and elbow was significantly decreased ($t = -1.98$ and $t = -2.03$, $p < 0.05$, respectively), while pain in hip and shoulder was significantly increased ($t = 2.23$ and $t = 2.26$, $p < 0.05$, respectively).
CONCLUSIONS. Heterotopic ossification is a common complication in the critically ill. Systematic clinical evaluation and utilization of ultrasonography may be a way for its early detection.

0331

THE EVALUATION OF EARLY-ONSET ELECTRIC STIMULATION OF THE QUADRICEPS MUSCLE AFTER CARDIAC SURGERY IS LIMITED BY A SHORT LENGTH OF STAY AT THE INTENSIVE CARE UNIT

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INTRODUCTION. It is known that patients in the intensive care unit show a loss of muscle mass. This deficit is related with catabolism and a prolonged recovery. Neuromuscular electric stimulation is effective in enhancing strength and endurance in immobilized patients, but stimulation from first day after surgery is very rare and not evaluated with a large patient population.
OBJECTIVES. The aim of this study is to evaluate the effects of early neuromuscular electric stimulation of the quadriceps femoris muscle on the length of stay and the SOFA score at the cardiothoracic intensive care unit (ICU).
METHODS. Stratified randomized controlled blind trial, designed for 80 patients. Inclusion criteria: length of stay at the ICU directly after cardiac surgery > 48 h. After enrolment in the study, intensive care unit patients (main diagnoses: valvular aortic stenosis, coronary heart disease) were stratified (based on their SAPS II) into 4 groups (1. 0-20, 2. 21-26, 3. 27-35, 4. 36-163). All groups were randomized to a stimulation group or a sham-stimulation group. Neuromuscular electric stimulation was applied to the quadriceps femoris muscle of both thighs twice a day for a maximum of 14 days, starting on the first day after surgery (session time 30 min, 30 min break, 7 days/week). The SOFA score was calculated every day.
RESULTS. After 18 months of recruitment 32 patients out of 111 patients eligible for the study are enrolled in an interims-analysis. 16 of them received electric stimulation and 16 sham-stimulation. No parameter shows a significant change between the electric stimulation group and the sham-stimulation group. Median length of stay is with 4 days below the 7 days expected to identify the treatment-associated effect.

Results

	Electric stimulation	Sham-stimulation	p-value
Length of stay (median, range)	4.0 (63.0)	4.0 (19.0)	n.s.
Δ SOFA day 1 after surgery to exit ICU (mean, SD)	3.9 (2.8)	3.2 (3.7)	n.s.
SOFA max (mean, SD)	7.6 (2.9)	5.9 (3.2)	n.s.
ICU day with SOFA max (mean, SD)	1.4 (0.8)	1.4 (0.9)	n.s.

CONCLUSIONS. The evaluation of our results shows the limitation to recruit an adequate number of ICU-patients staying long enough in the ICU to investigate the effect of early onset of electric stimulation of the quadriceps femoris muscle after cardiac surgery.
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0332

IS REHABILITATION AFTER IMPLANTATION OF LEFT VENTRICULAR DEVICES (LVAD) AFFECTED BY THE SEVERITY OF PREOPERATIVE HEART FAILURE?

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INTRODUCTION. The cardiothoracic unit in our centre has participated in an LVAD programme since 2009. Rehabilitation in hospital aims to achieve independent mobility and a gradual increase in exercise capacity. Guidelines in the immediate post-operative period are lacking.
OBJECTIVES. To assess the effect of pre-LVAD heart failure on rehabilitation milestones post-operatively.
METHODS. Between January 2009 and October 2011, 69 patients recieved implants with 50 surviving to discharge. Median age was 46 years (range 17–66). Physiotherapy data for 40 patients was available. The number of days to various milestones was noted and any relationship to severity of heart failure assessed. Intermacs scores as a measure of heart failure were documented.
RESULTS. There was no significant difference between the 41 male and 9 female patients for any variables measured. Those with the severest heart failure were significantly younger.

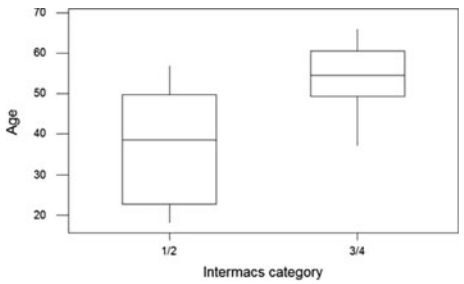

Fig. 1 Age

Time to independent mobility and total length of stay were not adversely affected by Intermac scores. Those with more severe heart failure exercised significantly later on the static bike ($p = 0.04$, U-test).

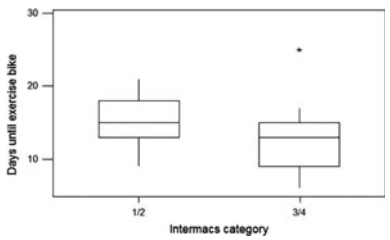

Fig. 2 Time to static bike

CONCLUSIONS. Heart failure scores pre-implantation do not have a significant effect on rehabilitation milestones. Therefore, all LVAD patients should be mobilised and exercised as early as possible.
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Postoperative management of cardio-surgical patients: 0333–0346

0333

HIGH TIDAL VOLUMES IN WOMEN AND OBESE PATIENTS AFTER CARDIAC SURGERY. SIZE DOES MATTER!

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INTRODUCTION. We recently showed that utilization of high tidal volume is a risk factor for organ dysfunction in mechanically ventilated patients after cardiac surgery. Female gender as well as BMI above 30 kg/m^2 were risk factors for receiving high tidal volumes.
OBJECTIVES. To evaluate the impact of high tidal volumes after cardiac surgery on outcomes in these specific populations and to evaluate the impact of patient's height.
METHODS. We performed secondary analysis in a cohort of 3,434 consecutive patients who underwent cardiac surgery in a Canadian university hospital. We compared data of women vs. men and data of patients with BMI >30 kg/m^2 (obese patients) and BMI <30 kg/m^2. We analyzed the tidal volume delivered on arrival at the intensive care unit (ICU): (1) low: below 10 ml/kg, (2) traditional: 10–12 ml/kg, and (3) high: above 12 ml/kg of predicted body weight. We also analyzed outcome data (ICU/hospital length of stay, ICU/hospital mortality) and evaluated risk factors for poor outcome.
RESULTS. We present here preliminary analysis. 2495 men and 939 women were included in the analysis. Mean age was 64 ± 11 years in men and 67 ± 12 years in women ($P < 0.0001$), mean height was 170 ± 7 cm in men and 156 ± 7 cm in women ($P < 0.0001$). Mean tidal volume were 722 ± 93 ml in men and 602 ± 93 ml in women ($P < 0.0001$). However, low tidal volumes (<10 ml/kg of PBW) were used in

24.8 % of men and 11.3 % of women while high tidal volumes (>12 ml/kg of PBW) were used in 25.2 % of men and 54.7 % of women (P < 0.0001). ICU and hospital length of stay and mortality were increased in women.
For the obese population, 961 obese patients were compared to 2473 non obese patients. Mean age was 64 ± 10 years in obese patients and 67 ± 12 years in non-obese patients (P < 0.0001), mean height was 165 ± 5 cm in obese patients and 166 ± 9 cm in non-obese patients. Mean tidal volume were 748 ± 101 ml in obese and 665 ± 100 ml in non-obese patients (P < 0.0001). Low tidal volumes (<10 ml/kg of PBW) were used in 6.8 % of obese and 26.7 % of non-obese while high tidal volumes (>12 ml/kg of PBW) were used in 61.0 % of obese and 22.5 % of non-obese patients (P < 0.0001). Outcomes were comparable for obese and non obese patients, except for a slightly increased hospital length of stay in obese patients (9.3 ± 11.7 vs. 8.1 ± 7.0 days, P = 0.0002).
The figure below shows the tidal volume delivered for several ranges of height expressed in cm (<140 (n = 7), 140-149 (n = 148), 150-159 (n = 661), 160-169 (n = 1289), 170–179 (n = 1122), >180 (n = 207).

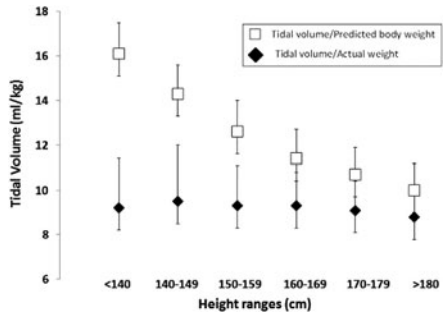

Fig. 1 Tidal volumes for different patient's heights

CONCLUSIONS. In our preliminary analysis, women and obese patients received more frequently tidal volumes above 12 ml/kg PBW. Outcomes after cardiac surgery was worse for women in comparison with men but mostly similar between obese and non obese patients. The potential role of tidal volumes to explain these results is currently examined.
GRANT ACKNOWLEDGMENT. Fonds de Recherche en Santé du Québec, Fondation Canadienne pour l'Innovation (Fond des Leaders).

0334
MONTORING OF REVERSAL OF PROPHYLACTIC AND THERAPEUTIC RIVAROXABAN ANTICOAGULATION WITH PCC AND RFVIIA

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INTRODUCTION. Rivaroxaban (Xarelto®, BayerHealthCare, Leverkusen, Germany) has been approved for thromboprophylaxis in patients with knee or hip replacement and anticoagulation in patients with atrial fibrillation [1, 2]. Anticoagulant therapy increases the risk of bleeding, especially in emergency surgery. The availability of a potent antidote is essential to prevent excessive blood loss [3].
OBJECTIVES. Our study investigated the effect of prothrombin complex concentrate (PCC) and recombinant activated FVII (rFVIIa) to reverse prophylactic and therapeutic rivaroxaban levels in vitro.
METHODS. 10 healthy volunteers donated 50 mL of peripheral venous blood sampled in citrate tubes. These blood samples were spiked with prophylactic and therapeutic doses of rivaroxaban and with different dose of coagulation factors: 50 IU/kg bodyweight (BW) PCC (Octaplex®) and 90 µg/kg BW recombinant activated Factor VII (rFVIIa). Prothrombin (PT) ratio, activated partial thromboplastin time (aPTT) and thromboelastometry (coagulation time, ExTEM®, CT_{ExTEM}) were measured at baseline and after addition of rivaroxaban and reversal agents. The measured data were analyzed with the Wilcoxon rank sum test, p < 0.01 was assumed significant.
RESULTS. Baseline: PT ratio 105 % (95–117), aPTT 36 s (33–37), CT 60 s (55–65); $Riva_{proph}$: PT ratio 65 % (59–71) p 0.005, aPTT 45 s (41–52) p0.005, CT 92 s (84–98) p0.005; $Riva_{ther}$:, PT ratio 43 % (39–48) p0.005, aPTT 49 s (46–55) p 0.005, CT 136 (119–162) p 0.005; PCC: $Riva_{proph}$ +50 IU/kg: PT ratio 97 % (87–100) p0.012, aPTT 51 s (48–67) p0.007, CT 97 s (87–100) p 0.352; $Riva_{ther}$ +50 IU/kg PCC: PT ratio 54 % (37–60) p 0.053, aPTT 59 s (55–131) p 0.005, CT 127 s (119–134) p 0.889; rFVIIa: $Riva_{proph}$ +90 µg/kg: PT ratio 79 % (72–144) p 0.005, aPTT 48 s (43–63) p0.005, CT 56 s (44–95) p0.012; $Riva_{ther}$ +90 µg/kg rFVIIa: PT ratio 44 % (37–79) p 0.047, aPTT 56 s (46–73) p 0.007, CT 64 s (57–70) p 0.005.
CONCLUSIONS. PCC and rFVIIa shortened the PT ratio, the aPTT and the CT_{ExTEM} almost to baseline values and seem appropriate for reversal of rivaroxaban anticoagulation in vitro.
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0335
APROTININ VERSUS TRANEXAMIC ACID IN CARDIAC SURGERY

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Table 1 Baseline characteristics of study patients

Age	Male sex	EuroSCORE	Diabetes	Hypertension	Smoker	Dyslipidemia	Myocardial infarction	Antiplatelet therapy	Anticoagulant therapy
63.3 ± 14.2	65.5 %	4.6 ± 2.6	33 %	53.2 %	47.3 %	40.4 %	22.2 %	96 (47.3 %)	46 (22.7 %)
Valve surgery	Coronary surgery	Combined coronary and valve surgery	Perioperative myocardial infarction	Postoperative heart failure	Prolonged mechanical ventilation	Postoperative infection	High postoperative bleeding	Postoperative cardiac tamponade	Rethorakotomy for bleeding
40.9 %	40.4 %	11.8 %	7.4 %	6.4 %	8.4 %	7 (3.4 %)	10 (4.9 %)	3 (1.5 %)	6 (2.9 %)

Global mortality in ICU was 17 (8.4 %) and length of stay in ICU was 17 (8.4 %). We can compare variables between the two groups in Tables 2 and 3.

Table 2 Comparison of variables between two groups

Variables	Anticoagulation therapy	Antiplatelet therapy	Valvular surgery	Coronary surgery	Perioperative myocardial infarction	Postoperative heart failure	Combined surgery	Duration CPB (cardiopulmonar bypass) (min)	Postoperative infection	Aortic crossclamp time (min)	Prolonged mechanical ventilation	Total drainage loss (mL)	Postoperative renal failure	Total packed cells transfusion (ml)
AG (n = 98)	20.9 %	48.4 %	40.8 %	40.8 %	8.2 %	5.1 %	11.2 %	106.5 ± 41.9	1 %	79.7 ± 31,3	6.1 %	366.5 ± 229.8	6.1 %	108.2 ± 260.4
TAG (n = 105)	26.7 %	51.5 %	41 %	40 %	6.7 %	7.6 %	12.4 %	116.9 ± 46.2	5.7 %	77.3 ± 31.1	10.5 %	533.3 ± 599.1	8.6 %	310.2 ± 815.2
p	0.343	0.665	0.624	0.906	0.684	0.464	0.799	0.108	0.067	0.155	0.263	0.011	0.505	0.021

Table 3 Comparison of variables (continuation)

Variables	Bleeding complication	Rethorakotomy for bleeding	Cardiac tamponade	Neurologic complication
AG	7.6 %	0 %	2 %	2 %
TAG	2 %	5.7 %	1 %	2.9 %
p	0.066	0.030	0.521	0.708

INTRODUCTION. Postoperative bleeding is a serious complication in patients undergoing cardiac surgery using cardiopulmonary bypass (CSBP). Aprotinin (A), an effective drug in limiting blood loss in this kind of patients, was withdrawn in Europe because of the BART study which showed higher morbidity and mortality using this drug than other lysine analogues. Despite this controversy still exits.
OBJECTIVES. Given the restrictions placed on A in 2007, we have since been using tranexamic acid (TA) in all of our cardiac surgical patients. This has provided us the opportunity to compare A with TA. Based in our observation, our hypothesis is that A has a better risk–benefit profile in CSBP.
METHODS. Observational retrospective study. All patients undergoing CSBP were recorded since March-07 to April-08 and included in two groups: aprotinin group (AG) in the last 6 months, and tranexamic acid group (TAG) in the first 6 months of their use. We included epidemiological, demographical and clinical data, postsurgical complications, morbidity and mortality rate in ICU and length of stay in ICU.
RESULTS. We recorded 203 patients. The AG had 98 patients and TAG consisted of 105 patients. Some baseline characteristics and postoperative morbidity of the global sample can be seen in Table 1.
Other data: age in AG 63.5 versus 63.2 years in TAG (p 0.948); male sex 69.4 % in AG vs 61.9 % in TAG(p 0.262); EuroSCORE 4.4 ± 2.6 in AG versus 5 ± 2.6 in TAG(p 0.086); preoperative haemoglobin in AG 13 ± 1.9 versus 12.7 ± 1.8 in ATG (p 0.220); AG platelets 215.5 ± 68.5 versus TAG platelets 214.2 ± 78.2 (p 0.732);activated partial thromboplastin time in AG 27.4 ± 6.6 versus 28.5 ± 5.4; length of stay in ICU in AG 3.8 ± 2.3 versus 4.9 ± 7.6 in TAG (p 0.204); mortality in ICU in AG 4.1 versus 12.4 % in TAG(X2 4.55; p 0.033). Mortality was not associated with TA (OR 2.537; IC (0.767–8.387). Red blood cell transfusion depends on the treatment with A or TA ($p = 0.036$), coefficient B 179,139 ± 84,738, constant 108,247 ± 60,521. TA resulted in the greatest number of transfusions (310.20 ± 815.202 cc versus 108.25 ± 260.47 cc in AG).
CONCLUSION. In our two homogeneous groups of patients (AG and TAG), treatment with TA led to more bleeding complications, more transfusions and greater number of reoperations for bleeding than the treatment with A. We can not appreciate more morbidity in AG. Nevertheless, the kind of our study and the insufficient sample size precludes drawing general conclusions and it has to be extended and compared with actual results in order to eliminate as many possible confounding factors.
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0336

PERIOPERATIVE COAGULATION PROFILE EVALUATED WITH TEG® IN PATIENTS UNDERGOING CRANIOTOMY FOR PRIMARY BRAIN TUMOR REMOVAL

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INTRODUCTION. Patients undergoing surgery for brain tumor removal are prone to hemorrhagic and thrombotic complications in perioperative period. Thromboelastography (TEG®) allows point of care evaluation of coagulation dynamic.
OBJECTIVES. Compare coagulation profile before, during and after surgery and observe if intraoperative changes continue in perioperative period. Observe which anamnestic or intraoperative variables are related to TEG® parameters modification.
METHODS. 45 patients (23 M; age 42 ± 12 y; weight 70 ± 13 kg) were enrolled. Pre and postoperative Ht,Hb,PT,PTT and platelet count were obtained. Samples from radial artery were collected at three surgical times: after anesthesia induction, before headrest positioning; at closing of dura mater, after tumor excision; -at admission in Neurointensive Care Unit (within one hour after end of surgery). 0.36 ml of native blood were analyzed at 37 °C within 3 min. TEG® variables (R time,K time,α angle, MA) during time were analyzed. Dichotomised categorical variables analyzed were: sex, age 65+, extra/intraaxial lesion; surgical time until complete tumor excision >180 min, colloids administration, blood transfusion, plasma transfusion.
RESULTS. All 4 TEG variables changed during time (ANOVA for repeated measures; $p < 0.001$); post hoc analysis showed for all TEG® variables a difference between pre and intraoperative and post and intraoperative values, with a trend toward hypercoagulation (Fig. 1). Postoperative Ht and platelet count were lower compared to preoperative (Student's T test for paired data, $p < 0.001$). Preop R, K, MA showed a trend toward hypercoagulation in females; preop R was higher in patients older than 65 y (Student's T test for unpaired data, $p < 0.05$). None of the patients had thrombotic or hemorrhagic complications.
CONCLUSIONS. A trend toward intraoperative hypercoagulation was found; within 1 h from the end of the surgery coagulation profile was indistinguishable from baseline, with lower Ht and platelet count. Possible factors involved in intraoperative relative hypercoagulation are tissue factor release from brain tissue; tissue plasminogen activator release from neoplastic cells; aspecific coagulation cascade activation due to surgical stress. A limit of this study was not considering tumor volume. More studies are warranted to understand differences between neurosurgery for brain tumor removal and other major surgeries; and to understand possible clinical implications on developing postoperative thrombotic or hemorrhagic complications.

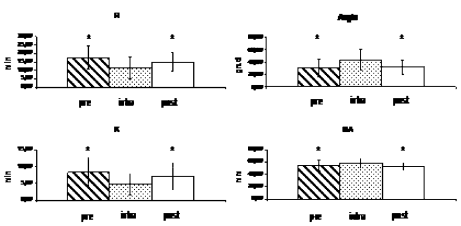

Fig. 1

0337

EVALUATION OF SILENT PULMONARY EMBOLISM IN INTENSIVE CARE UNIT

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INTRODUCTION. Pulmonary embolism (PE) is a frequent and serious complication in Intensive Care Unit (ICU) patients (with an associated mortality estimated at 30 %). The absence of clinical signs in ICU patients and advances in Computed Tomography (CT) imaging lead to more silent pulmonary embolism diagnosis.
OBJECTIVES. We conducted a retrospective study to clarify the incidence, associated morbidity and management of silent pulmonary embolism.
METHODS. Patients admitted to the ICU of a university hospital between 01-01-2010 and 05-31-2011 were retrospectively included in the study. All patients in whom chest CT was performed during this period were evaluated. The chest CT were reviewed by a senior radiologist for the diagnosis of PE. Depending on the indication of CT, patients with PE were classified as "silent PE (SiPE)" or "suspected PE (SuPE)". The demographic, clinical and biological parameters were collected. Results were statistically significant for $p < 0.05$, computed with the Wilcoxon test for quantitative data (median [IQR]) and Fisher exact test for qualitative data [absolute counts (percentage)].
RESULTS. During this period, 1,409 patients, of whom 366 had a chest CT, were admitted to the ICU. Two hundred patients were included in the study (severe trauma patients with a single CT at admission were excluded). The median SAPS II score was 40 (29–52). The chest CT were performed to investigate the etiology of severe sepsis (n = 65, 33 %), acute respiratory distress (n = 43, 22 %), of PE (n = 35, 17 %), or as a second-look assessment in severe trauma (n = 21, 11 %). Twenty-seven PE (13 %) were diagnosed including 18 (8.5 %) siPE. Nine cases of PE (25.7 %) were confirmed on the 35 CT performed for this indication. Mortality was similar in silent and suspected PE (SiPE: 6 (33 %) *vs*. SuPE: 4 (44 %) deaths; NS). However, SiPE were associated with a significant increase in the length of ICU stay [SiPE: 23 days (17–47) vs. SuPE: 17 days (10–20), $p < 0.05$]. Risk factors for PE were related to venous stasis and the presence of central venous catheters. The Wells score was greater than or equal to 7 (high probability) in seven of SiPE (61 %) and nine of SuPE (100 %). The therapeutic management was similar in both groups.
CONCLUSIONS. Our study showed a higher incidence of silent PE (1.6 %) than of suspected PE (0.6 %) in ICU. This difference may be due to the absence of systematic risk assessment of PE when performing a chest CT. These SiPE had a similar mortality than SuPE, but were associated to an increased length of ICU stay.

0338

THE IMPACT OF CRITICAL CARE NURSE TRAINING ON THROMBOELASTOGRAPHY USAGE TO GUIDE PERIOPERATIVE BLOOD COMPONENT TRANSFUSION IN A CARDIOTHORACIC CRITICAL CARE UNIT

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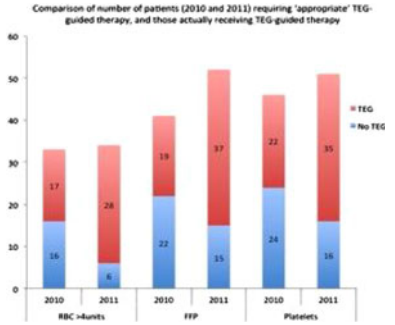
INTRODUCTION. Thromboelastography (TEG) is a Point-of-Care method of testing coagulation that has perioperative applications in cardiac, trauma and liver surgery. Using transfusion algorithms, TEG has been shown to reduced blood component requirements [1, 2]. The alternative is to administer blood components empirically or to wait for the results of formal laboratory coagulation tests which can have clinical consequences in patients who have significant post-operative blood loss in critical care. TEG allows clinicians to ascertain early whether bleeding is due to either coagulopathy or has a surgical cause. Use and interpretation of TEG, however can be complex and is dependent on training. An initial audit in 2010 looking to assess frequency of TEG measurements by critical care nurses showed poor 'appropriate' TEG usage (<50 %), pre-defined as red blood cell (RBC) transfusion (>4 U) and/or Fresh Frozen Plasma (FFP) and/or Platelets transfusion.
OBJECTIVES. Our objective was to measure the effect of developing cascade training of cardiac critical care nurses to initiate and carry out TEG on patients admitted to critical care who bleed significantly during the first few hours following cardiac surgery.
METHODS. Following the results of the initial audit in 2010, cascade nurse training was established commencing with critical care nurse 'TEG Superusers'. Nursing staff were encouraged to keep logbooks of the TEGs they performed to validate results obtained. Once confident in TEG management, training was cascaded to other nurses in the Superuser's team. A re-audit was performed to establish the frequency of appropriate TEG usage in 2011 using the same definition of 'appropriate' usage as in the previous audit.
RESULTS. Thirty three of our 105 nurses have now been trained in TEG usage. Demographics, operation type and surgical complexity were similar during both audit periods. TEG-guided management in patients receiving significant RBC transfusion increased from 52 % (17/33) to 82 % (28/34). TEG-guided FFP and Platelet transfusion also increased from 46 % (19/41) to 71 % (37/52) and 48 % (22/46) to 69 % (35/51), respectively.



Graph 1

CONCLUSIONS. Critical care nurse training in TEG has increased TEG-guided management of post-operative cardiac surgical bleeding on our unit. An appropriately trained

TEG operator is now present on our unit all times. Clinicians now have better information to decide on the most appropriate management of the bleeding patient. Similar nurse training schemes in units managing liver and trauma patients can potentially increase TEG-guided management.

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0339

THE OBESITY PARADOX OF MORTALITY IN CARDIAC SURGERY. REALLY, DOES OBESITY INCREASES THE RISK? ANALYSIS ARIAM REGISTRY OF CARDIAC SURGERY

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INTRODUCTION. Obesity is a disease that affects a large part of the population and has been associated with worse outcomes after cardiac surgery.

OBJECTIVES. The aim of our study is to evaluate the consequences of obesity in patients undergoing cardiac surgery, in relation to postoperative complications and mortality.

METHODS. We designed a prospective observational multicenter study of patients undergoing cardiac surgery in 12 hospitals in Andalusia, from March of 2008 until March of the 2011 included in the ARIAM registry of adult cardiac surgery. Obesity was defined as a BMI >30. We recorded clinical and demographic data, surgery data, as well as severity scales, complications occurred in ICU and mortality at hospital discharge. Data were expressed as mean ± standard deviation (SD) for continuous variables or median and interquartile range in skew variables. Qualitative variables were expressed as absolute number and percentage. We used Students *'t* test for comparisons of two means, Chi squared test was used to compare proportions. $p < 0.05$ was considered significant. Logistic regression was used for multivariate analysis.

RESULTS. The study included 4548 patients, mean age 63 years ± 12 years and BMI 25.9 ± 9.3. 31.8 % were considered obese. In 400 patients were not available the information necessary for calculating the body mass index. The severity of patients evaluated with the Euroscore 5.86 + 3.20 and the SAPS 3 40.58 + 11.14 points. No differences were found between the type of surgery to obese and nonobese patients ($p = 0.135$), or cardiopulmonary bypass times ($p = 0.4$) or need of IABP ($p = 0.9$). 33 % of obese patients suffered at least one complication during their ICU stay, while in the patient group with less weight, was 35.8 % ($p = 0.07$). Obese were less often reoperated ($p = 0.003$) and had lower rate of prolonged mechanical ventilation ($p = 0.03$). 31 patients died during surgery (0.7 %), 350 ICU (7.7 %) and 102 out of ICU (2.2 %), and overall hospital mortality of 9.9 %. No differences in-hospital mortality in the obese group (10.5 %) compared to non-obese (11.7 %). In the subgroup analysis according to the classification of the World Health Organization, we found higher mortality in patients with BMI <18.5 (30.8 %) and those with BMI >40 (17.3 %), while the rest were 10.8 %, $p = 0.002$. Multivariate analysis didn't showed increased mortality of obese patients (BMI > 30) OR 0.94 (0.74–1.21), in equality of surgical risk assessed by the EuroSCORE.

CONCLUSIONS. Our study shows that obese patients undergoing cardiac surgery have a higher age, more comorbidities, and have a mortality similar to non-obese.

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0340

THE INCREASED RISK OF CARDIAC SURGERY IN ELDERLY PATIENTS. CAN BENEFIT THE OCTOGENARIANS? THE PERIOPERATORY MORTALITY AND POSTOPERATIVE COMPLICATIONS. ANALYSIS ARIAM REGISTRY OF CARDIAC SURGERY

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INTRODUCTION. Patients older than 80 years represent a psychological barrier that identifies a high-risk population for surgery, specially for cardiac surgery.

OBJECTIVES. To analyze the short-term postoperative outcomes of cardiac surgery in patients with 80 or more years in the autonomous community of Andalusia.

METHODS. Observational, prospective, multicenter study of patients included in ARIAM registry of Andalusian community from March 2008 to March 2011. We analyzed clinical variables, the surgical procedure, postoperative complications and mortality, comparing the group of octogenarian patients with younger age. Qualitative variables are shown as percentage and quantitative as mean and standard deviation. We used Chi square test or Student *t* as necessary and logistic regressions was used for multivariate analysis.

RESULTS. We analyzed 4548 patients, 162 of them octogenarians (3.6 %). Octogenarian patients had worse functional status (New York Heart Association III/IV 49.7 % vs. 36.1 %, $p = 0.001$) and underwent more valve replacement (77.2 %) or combined (13 %) compared to bypass surgery. The extracorporeal circulation time was lower in octogenarians 84.23 ± 55.01 min, for 47.40 ± 111.32 min ($p = 0.0001$).There was no difference in overall complication rates between groups ($p = 0.15$), although octogenarians had higher prolonged mechanical ventilation ($p = 0.04$) and cardiac arrests ($p = 0.01$). Mortality in the octogenarians was 1.2 % during surgery, 11.7 % at ICU discharge and 16.3 % at hospital discharge. After adjustment with multiple logistic regression, mortality was significantly higher in octogenarians ($p = 0.0006$. OR 2.48 95 % CI 1.47–4.17).

CONCLUSIONS. Age over 80 years is an independent risk factor for hospital mortality adjusted for EuroSCORE, functional status according to the New York Heart Association and extracorporeal circulation time. These patients require more prolonged mechanical ventilation, and have more cardiac arrests, both associated with high mortality, despite a less aggressive surgery as evidenced by a shorter duration of cardiopulmonary bypass time.

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0341

REASONS OF THE POSTOPERATIVE ENCEPHALOPATHY IN CARDIOSURGERY

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INTRODUCTION. Cerebral complications increase hospital and ICU stay, extend the period of the rehabilitation, increase the risk of mortality and are the main reason of disability after cardiac-surgery.

OBJECTIVES. To investigate the causes of postoperative encephalopathy (PEP) in cardiac surgery with with cardiopulmonary bypass (CPB).

METHODS. 548 patients (418 men, 130 women), 59 ± 0,4 years, class NYHA 3 ± 0.01, who underwent on-pump cardiac surgery in 2008–2012 (duration 98.7 ± 1.4 min, myocardial ischemia 62.3 ± 1.1 min). We analyzed the postoperative period, divided patients into 2 groups (gr.). The 1st gr. with an appearance of encephalopathy (PEP) (n = 59) and the 2nd gr. without PEP (n = 489). All patients got the standard monitoring of the haemodynamics, of the depth of anesthesia, of the cerebral oxygenation (CO). We analyzed the data of the perioperative period. The differences and correlations we considered significant at $p < 0.05$ and $p < 0.01$.

RESULTS. The patients of the1st gr. were older than the patients of the 2nd gr. (62 ± 1.2; 59 ± 0.4; $p = 0.009$). They had also a smaller body surface area (1.87 ± 0.02; 1.97 ± 0.01; $p = 0.00003$). In the 1st gr. there were more female (37.3 ± 6.4; 22.1 ± 1.9 %; $p < 0.05$). The patients of the 1st gr. had initially lower levels of Hb (135 ± 2.03; 142.7 ± 0.71; $p = 0.003$), of general protein (73 ± 0.93; 74.9 ± 0.3; $p = 0.026$), higher level of creatinine (104.7 ± 3.3; 96.3 ± 1.06; $p = 0.019$) and urea (7.5 ± 0.4; 6.5 ± 0.1; $p = 0.019$). In the 1st gr. were revealed more frequent stenoses of the BCA (more than 50 %)—28.8 ± 5.95 and 15.3 ± 1.63 % ($p < 0.05$) and the presence EP in the anamnesis 38.9 ± 6.4; 19.4 ± 1.8 % ($p < 0.05$). In the 1st gr. the preoperative values of CO were lower (64 ± 1.4; 69.9 ± 0.38; $p = 0.0002$). For the patients of the 1st gr. the reason for the surgery was more often a combined pathology of the valves (33.9 ± 6.2; 9.2 ± 1.3 %; $p < 0.05$) and more rare a coronary heart disease (44 ± 6.5; 73.7 ± 2 %; $p < 0.05$). It was showed differences in the groups in the values of Hb, Ht, CO, oxygen delivery and consumption (DO2, VO2), cardiac index (CI) 2.3 ± 0.5; 2.5 ± 0.03 ($p = 0.0008$) (before CPB), APm, PCO_2a, PO_2a, heart rate (92.7 ± 1.5; 88.2 ± 0.5; $p = 0.007$) and the frequency of the indication of adrenaline (33.9 ± 6.2; 20.5 ± 1.8 %; $p < 0.05$) (after CPB). The duration of MLV and the stay in ICU ($p = 0.003$) were significantly longer for the 1st gr.

CONCLUSIONS. 1. It was found out that for the patients with EP the following initial conditions were more frequent: a combined pathology of the valves, the female gender, stenosis of the BCA, the presence of EP in the anamnesis, an older age, a higher level of creatinine and urea, a smaller body-surface area, a lower level of Hb, of general protein and of the initial indicators of CO. 2. During the surgery for this group of patients is necessary to avoid a hemodilution, a decrease of CI, DO2, APm, hypocapnia, tachycardia. 3. PEP extends the time of MLV and stay in ICU.

0342

IMC IS AN INDEPENDENT PREDICTOR FACTOR OF COMPLICATIONS AFTER CARDIOVASCULAR SURGERY

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INTRODUCTION. Nutritional status has been shown important as a predictor factor of general postoperative morbidity.

OBJECTIVES. To describe nutritional status and BMI, and assess the effects of it on morbidity and mortality in patients undergoing cardiac surgery.

METHODS. Prospective observational cohort study of 124 patients between November of 2007 and February of 2008. We excluded for analysis all the patients younger than 18, inmunocompromised and emergency surgery. Relationships with mortality and complications were evaluated for the following variables: age, gender, lifestyle risk factors and pre-existing comorbidities (cardiac failure, diabetes, dyslipemia, hypertension, kidney failure, NYHA classification), pharmacological treatments, Parsonet score, Euroscore, type of surgery (valves or coronary), time of ischemia and time of extracorporeal circulation. Nutritional status was defined in function of albumin, prealbumin, transferrin, lymphocytes levels and BMI. The time of monitoring was 90 days. Discrete variables were expressed as counts (%) and continuous variables as mean and standard deviation (SD). Multiple logistic regression was used to assess the casual relationship between the variables and an increase in complications after cardiovascular surgery. Cox proportional-hazards regression analysis was used to assess the impact of independent variables on mortality across the time. Data analysis was realized using SPPS for Windows 15.0.0 (SPSS, Chicago, IL).

RESULTS. A total of 124 patients were included. The 48.4 % were women. The mean age was 65 ± 11 years. Frequencies of comorbidities and pharmacological treatment were: hypertension 61 %, chronic kidney failure 8 %, diabetes 25 %, dislipemia 40.5 %, bbloquers 39.5 %, statins 40.3 %, ACE 46.8 %, Parsonet 16.8 ± 9.7 points. 36 patients with BMI >30 kg/m^2, and only 1 patient less than 18.5 kg/m^2. Multiple logistic regression analysis found that high BMI increases the risk of sepsis (OR 2.65; CI 1.11–6.34; $p = 0.02$), ARF (OR 3.33; CI 1.10–10.05; $p = 0.032$), ICU readmission (OR 4.13; CI 1.20–14.20; $p = 0.03$) and healing disorders (OR 5.97; CI 1.40–25.41; $p = 0.016$). As well increased the risk of needing non invasive mechanical ventilation, bleeding, ARDS and surgical wound infection, but without statistical significance. Cox regression analysis identified that high BMI does not increase the risk of death (HR 1.001; CI 0.88–1.13; $p = 0.98$).

CONCLUSIONS. BMI higher than 30 kg/m^2 resulted as independent risk factor for increased sepsis, ARF, ICU readmission and healing disorders. BMI isn't an independent risk factor of increased mortality in these patients.

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0343
COGNITIVE DYSFUNCTION AFTER CARDIAC ANAESTHESIA IS ASSOCIATED WITH PROLONGED HOSPITAL STAY

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INTRODUCTION. Discharge from the ICU after cardiac surgery is mainly based on physiological parameters such as cardiac function, circulation, respiratory parameters and levels of sedation. Objective scoring systems may be used to establish the eligible time for discharge [1]. Although changes in cognitive function is known after major surgery the general psychological state or cognitive function is normally not part of standard evaluation before discharge from the ICU unless the patient is delirious or obviously having related problems.

OBJECTIVES. An on-going study evaluating cognitive dysfunction after on-pump cardiac surgery and possible associations to perioperative haemodynamic parameters, type of anaesthetics (Remifentanil vs. Sufentanil) and eligible time to ICU discharge [1]. The primary hypotheses are that cognitive dysfunction increases length of hospital stay and that length of stay in ICU and quality of recovery may influence the cognitive function postoperatively.

METHODS. Sixty patients scheduled for elective coronary artery bypass grafting ± aortic valve replacement will be included in the study after written informed consent (Helsinki II declaration). Cognitive dysfunction and geriatric depression tests are evaluated preoperatively and on the 1st, 4th and 30th postoperative day. Perioperative haemodynamic parameters are collected together with a postoperative objective ICU discharge score (IDS) [1] to evaluate eligible time of discharge and quality of recovery.

RESULTS. Interim analysis (15 patients) showed that cognitive function was statistical significantly deteriorated on 1st and 4th postoperative day. Values (mean and range) decreased from 45.1 (40–50) preoperatively to 40.1 (32–47) and 41.5 (28–49) on 1st and 4th postoperative day respectively ($p = 0.004$ and $p = 0.045$, respectively, by independent samples t test). No difference was seen in average values on day 30. However 2 patients (13.3 %) were still 20 % below pre-operative values. Age and operation type did not show any impact on neither preoperative values nor following evaluations. There was no significantly change in the depression test from preoperatively to day 30. The average eligible time to ICU discharge was 13.9 h (range 7.4–21.1 h) and a slight negative, none significant correlation was seen between decreased cognitive function on day 1 and IDS. No patients showed severe perioperative haemodynamic problems. We found a negative correlation (−0.51, $P = 0.049$) between diminished cognitive function and length of hospital stay.

Cognitive and depression tests, mean (range)

Test	Preoperative	Day 1	Day 4	Day 30
Cognitive function test	45.1 (40–50)	40.1 (32–47)*	41.5 (28–49)!	45.1 (40–50)
Depression test	4.0 (1–16)			3.9 (1–10)

CONCLUSIONS. The study showed that deterioration in cognitive function is correlated to the length of stay in hospital. Interventions improving the postoperative cognitive function may be valuable both for patients and hospital economics.

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0344
MECHANICAL VENTILATION IN CARDIAC SURGERY: BENEFIT OF OPEN LUNG APPROACH AND CONTINUED VENTILATION DURING CARDIOPULMONARY BYPASS

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INTRODUCTION. The incidence of postoperative pulmonary disfunction (PPD) after cardiac surgery remains unacceptably high. The mechanisms involved in its development include two fundamental causes: the trauma of the surgical procedure and the insult of mechanical ventilation of the lung in an inflammatory environment. Pulmonary inflammation is aggravated by suboptimal mechanical ventilation of the lung.

OBJECTIVES. To evaluate whether Open Lung Approach (OLA) strategy with low tidal volumes and recruitment maneuvers plus low-frequency ventilation during cardiopulmonary bypass reduce the incidence of postoperative pulmonary disorders after cardiac surgery.

METHODS. Prospective randomized study of 12 patients scheduled for cardiac surgery in a tertiary university hospital between August 2011 and April 2012. Patients were randomized for standard ventilation (SV) or interventional group (IG). IG: OLA strategy early in the procedure (after the orotracheal intubation) with low tidal volumes (tidal volume 6 ml/kg, PEEP 8–14 cmH_2O) and recruitment maneuvers (40 cmH_2O airway pressure for 10 s administered immediately after surgery). During extracorporeal circulation (ECC), low frequency ventilation (5/min) were administered. Hemodynamic data (PICCO®) and arterial blood gases were also collected through the study.

RESULTS. The hemodynamic parameters were similar in the 2 groups. After cardiopulmonary bypass, IG showed significantly better oxygen tensión (PaO_2/FiO_2 Torr (SV: 164 ± 17, IG: 342 ± 26) and compliance mL/cmH_2O (SV: 34 ± 2, IG: 46 ± 2).

CONCLUSIONS. With the combination of these ventilatory strategies, we have observed considerable progress in gas exchange parameters and compliance. This is accomplished without any adverse hemodynamic effects. The provisional results of this work in progress are suggestive that open lung approach and continued ventilation during bypass may reduce lung injury after cardiac surgery.

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0345
REDUCING THE LEVEL OF POSTOPERATIVE THROMBOTIC COMPLICATIONS BY USING THE COMBINATION OF LOW MOLECULAR WEIGHT HEPARIN AND EPIDURAL ANESTHESIA AT THE PATIENTS AFTER TOTAL HYSTERECTOMY

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INTRODUCTION. Each year in the world the cancer of reproductive system is diagnosed in more than 600,000 women. In 8–35 % of patients with cancer of reproductive system pulmonary embolism was the cause of death, and at 43 %—the background for other fatal complications.

OBJECTIVES AND METHODS. The results of surgical treatment of 79 patients after hysterectomy under prolonged epidural anesthesia during the period from 2009 to 2011 entered the study. Condition of hemostasis was monitored by 12 standard biochemical tests, as well as the new instrumental method—haemoviscoelastography preoperatively, intraoperatively and every day during 10 days after surgery. Prevention of thrombotic in group 1 (37 patients), conducted by bemiparin 3500: the first injection 12 h before surgery, then at 6 h after the operation in the future once a day for 10 days, group 2 (42 patients) received heparin 5000 U: the first injection 6 h before surgery, then 6 h after the operation, then 4 times per day for 10 days.

RESULTS. All included in the study patients before the surgery has detected hypercoagulation and inhibition of fibrinolysis: increasing of MA (maximum density of the clot, fibrin-platelet constant of the blood) to 20.7 % ($p < 0.001$), ICD (the intensity of coagulation drive (the intensity of clot formation)) to 15.6 %; reduction of IRCL—the intensity of the retraction and clot lysis to 13.6 % ($p < 0.05$) in both groups compared to normal rates. At 1st day after surgery in patients treated by bemiparin (group 1) declines MA, ICD—the intensity of coagulation drive to 12.7 ($p < 0.05$) and 9.6 % ($p < 0.001$), respectively, and IRCL increase by 4.6 % ($p < 0.05$) compared with preoperative. In group 2, there was a similar picture: the reduction of MA and ICD to 10.3 ($p < 0.001$) and 6.6 % ($p < 0.05$), respectively, and IRCL increase by 4.4 % ($p < 0.001$). At 5th day condition of hemostasis in both groups came almost to the same value—a moderate hypocoagulation, normal activity of fibrinolysis. At 7th days of postoperative period, thrombotic complications developed in 1 patient of 1st group (2.70 %). In the 2nd group, complications developed in 4 (9.52 %) patients: in 3 cases—deep venous thrombosis and in 1 case—coagulopathic bleeding.

CONCLUSIONS. Using combination of bemiparin and epidural anaesthesia reduces the level of postoperative thrombotic complications, such as deep venous thrombosis, massive bleedings at the patients after total hysterectomy. Using haemoviscoelastography enables quickly identify disorders of hemostasis in patients after hysterectomy before, during and after the surgery.

0346
PROLONGED QT INTERVAL AS A PREDICTOR OF MORTALITY IN ST-ELEVATION MYOCARDIAL INFARCTION

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OBJECTIVE. To analyze the relation between a prolonged QT interval and mortality in patients with ST-elevation myocardial infarction (STEMI).

METHODS. Data were collected for patients admitted to Carlos Haya hospital, Malaga, Spain due to STEMI between 01/01/08 and 31/12/10. Patients with extra-hospital cardiac arrest were excluded. A nested cohort case–control study was done with 524 patients included. The cases (38 patients) comprised those patients who died and the controls (81 patients) were composed of a random sample of those who survived (1 in every 6). Data were recorded on age, sex, Killip class on admission, TIMI, APACHE II and mortality in the ICU and in the hospital. We also recorded the ECG on admission to the hospital and on admission to the ICU. A prolonged QTc (corrected) interval was considered to be ≥0.45 s in men and ≥0.47 s in women. The data were collected from the UCI-CX computer program. Statistical analyses were done with the Student t test, Chi-square test and logistic regression.

RESULTS. A first ECG was obtained in 34 of the 38 patients who died and 70 of the 81 who survived. Of the 38 (7.25 %) patients who died in the hospital, 34 (6.5 %) died in the ICU. The QT interval was 0.40 ± 0.05 s, the heart rate 78 ± 21 and the QTc interval 0.44 ± 0.04 s. The QTc was higher than the normal values in 38 of the 104 patients in whom it was studied (31.9 %). The QTc interval was prolonged in 18 of the 34 patients (52.9 %) who died and in 12 of the controls (17.1 %) ($p < 0.001$). The calculation of the values for the whole sample was weighted according to the sampling fraction. After weighting, the age was 65.2 ± 13.5 years, 75.6 ± 8.2 in those who died and 64.4 ± 13.5 in those who survived ($p < 0.001$). The mortality in the women, who comprised 21 %, was 12.7 %, and in the 79 % who were men it was 5.8 % ($p < 0.001$). The APACHE II was 10.96 ± 4.35 in the overall study population, 7.37 ± 2.95 in those who died and 3.6 ± 2.3 in those who survived. The differences for the TIMI and the APACHE were significant. After the weighting, in the 454 patients in whom the ECG was recorded the QT values were 0.402 ± 0.05 s, HR 73 ± 19 bpm, and QTc 0.433 ± 0.33 s. The QTc was 0.457 ± 0.44 s in the 34 who died and 0.431 ± 0.031 s in the 420 who survived ($p < 0.001$). Mortality in the patients with prolonged QTc (19.8 %, $n = 90$) was 20.9 % ($n = 18$), and 4.4 % ($n = 16$) in those with a normal QTc (80.2 %, $n = 364$) ($p < 0.001$). The discrimination of the variable abnormal QTc on hospital admission with respect to hospital mortality, assessed with the area under the ROC curve, was 0.68 (0.56–0.79).

CONCLUSIONS. A prolonged QT interval in patients with STEMI, evaluated on hospital admission, was related with hospital mortality, with a moderate discriminating capacity.

Evaluation of sepsis biomarkers: 0347–0360

0347
MICROPARTICLES EXPRESSION IN THE EARLY PHASE OF SHOCK

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INTRODUCTION. The microparticles are membrane nanofragments (0.05–1 μm) released after cell activation. They transmit various intercellular messages and are involved in the pathophysiology of many diseases, such as severe sepsis. They express various proteins and lipids on their surface (mostly phosphatidylserine (PhtdSer) which has a fundamental role in coagulation) that help to determine their cellular origin.

OBJECTIVES. The primary objective was to assess the diagnostic capacity of the microparticles in shock. The secondary objectives were to assess their expression in shock as well as their prognostic value.

METHODS. Eleven healthy volunteers and 48 patients in shock were prospectively included after informed consent was signed by a next of kin. The microparticles were measured (number per ml) within 6 h of shock diagnosis from a blood sample collected on

citrated tube. After centrifugation, the microparticles were assayed by flow cytometry using monoclonal antibodies or annexin V (which links PhdtSer). The observed differences were called statistically significant for a p value <0.05, computed with Wilcoxon test (quantitative data) and Fisher exact test (qualitative data).

RESULTS. The expression of leukocyte-derived microparticles (CD11b + CD66b +) was increased in patients in shock, as compared to healthy volunteers (34 [16–103] vs. 4 [0–7], $p = 1.5 \times 10^{-5}$). The expression of platelet—(CD41 +, CD41 + Annv +) and erythrocyte—(CD235a Annv + +) derived microparticles was significantly increased in patients who died (Fig. 1). The expression of erythrocyte—(CD235a +) and endothelial—(CD41 + CD31 +) derived microparticles was correlated with the severity of shock, assessed by the admission SOFA score.

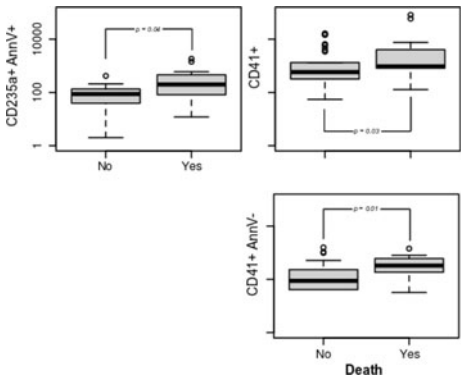

Fig. 1

CONCLUSIONS. Microparticles are involved in inflammation and coagulation; they are therefore interesting biomarkers in shock. This is the first study to evaluate the early expression (during the first 6 h) of microparticles in patients with shock. The results of our study open interesting perspectives in terms of diagnosis, but also to explore new pathophysiological mechanisms of shock, including septic shock.

0348

C-REACTIVE PROTEIN (CRP) IS AS USEFUL AS PROCALCITONIN (PCT) TO REDUCE ANTIBIOTIC EXPOSURE IN CRITICALLY-ILL PATIENTS WITH SEPSIS: A RANDOMIZED CLINICAL TRIAL

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INTRODUCTION. Guidance with procalcitonin has been proved to safely short the duration of the antibiotic therapy in sepsis. C-reactive protein has not been tested in this context.

OBJECTIVES. We sought to evaluate if CRP was as useful as PCT to guide antibiotic therapy in intensive care patients with severe sepsis or septic shock.

METHODS. Randomized clinical trial (NCT00934011) conducted at a University Hospital, in Brazil. Thirty-nine in PCR group and forty-one patients in the PCT group were included. Main endpoints were "duration of antibiotic therapy" for the first episode of infection, "total days under antibiotic therapy" and "antibiotic-free days per 1000 days alive" during follow up. Secondary endpoint was "all-cause 28-day mortality". Patients were followed up for 28 days, or until death, if it occurred in the interim.

RESULTS. The mean age was 59.8 (SD: 16.1) years, and 47 (58.8 %) patients were male. Overall, 46 of 80 (57.5 %) patients had septic shock. Median Apache II and SOFA score, both measured on inclusion, were 20.5 (4–43) points and 7 (2–16) points, respectively, and no difference was observed among the two groups. Median CRP levels on inclusion were similar for patients of the PCT group (185.8; 30.5–408.1 mg/dL) and those of the CRP group (182.9; 32.2–458.7 mg/dL), $p = 0.911$. Even though the median PCT levels at inclusion were higher among patients of the PCT groups, the difference did not reach statistical significance (6.69; 0.15–407.9 ng/dL vs. 2.9; 0.05–64.5 ng/dL; $p = 0.316$). The mean duration of antibiotic therapy for the first episode of infection was 7.1 ± 3.6 days in the CRP group, as compared to 8.0 ± 3.6 days in the PCT group, $p = 0.585$. In the analysis adjusted for severity (SOFA score, Apache II or SAPS 3), the HR for duration of antibiotic therapy was 1.37 (95 % CI: 0.24–1.33). The mean of total days under antibiotic therapy was higher in patients of the PCT group than in those of the CRP group (13.5 ± 6.8 vs. 11.6 ± 7.0 days, $p = 0.226$). Finally, the number of antibiotic-free days per 1000 days alive was similar among the two groups (311.4 ± 249.7 in the CRP group vs. 334.0 ± 2517 in the PCT group; $p = 0.688$). Protocol overruling occurred in only 7 (8 %) patients. Seventeen (43.6 %) patients died during the hospitalization in the CRP group against 18 (43.9 %) patients in the PCT group ($p = 1.00$).

CONCLUSION. In this study, we found that CRP might be as useful as PCT to guide antibiotic use in septic patients, with no harm.

GRANT ACKNOWLEDGMENT. This study was partially supported by FAPEMIG.

0349

ENDOTOXIN ACTIVITY IN SEPSIS AND SEPTIC SHOCK

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INTRODUCTION. Despite advances in critical care medicine, sepsis continues to have a high mortality [1]. The identification of modifiable factors which influence outcome in a favorable way is a great challenge. One such candidate is bacterial endotoxin, a phospholipid membrane-bound lipopolysaccharide (LPS) component mainly found in the outer membrane of gram-negative bacteria. When released after destruction of the bacteria, it leads to massive, unspecific activation of the host immune system [2]. Previous data suggests that high endotoxin activity (EA) is related to worse outcome [3]. It remains controversial if the removal of circulating endotoxin has a beneficial effect on mortality in sepsis [4].

OBJECTIVES. Our aim is to assess and monitor EA in patients with severe sepsis and septic shock. Our hypothesis is that the incidence of high EA (EA > 0.6) is low, and that EA is equivalent to Simplified Acute Physiology Score 2 (SAPS2) and Sequential Organ Failure Assessment (SOFA) score in predicting mortality.

METHODS. Patients treated at the Medical ICU at the University Hospital of Zurich from 09-2011 to 04-2012 with severe sepsis or septic shock were included. The highest EA level within the first 24 h after ICU admission, followed by EA at 48 and 72 h, were noted alongside physiological parameters and inflammatory markers. All patients received standard care according to the surviving sepsis guidelines [1]. EA was measured using the EAA™ Endotoxin Activity Assay. We present our preliminary results.

RESULTS. 44 patients were included in the study. Mean (±SD) SAPS2 was 59 ± 23, SOFA at ICU admission 13 ± 5. EA measured within the first 24 h was 0.52 ± 0.23, with no significant differences for gram status and infection focus. The most prevalent infection focus was pulmonary, followed by soft tissue and bones, and abdominal. 16 (35 %) patients presented with an EA >0.6 within the first 24 h. In these patients, compared to those with an EA <0.6, the fall in EA over the first 72 h was significantly larger (0.17 ± 0.22 vs. 0 ± 0.13, $p = 0.037$, CI 0.01–0.29). Overall ICU mortality was 23 %. EA measured within the first 24 h was significantly higher in ICU non-survivors versus survivors (0.47 ± 0.20 vs. 0.69 ± 0.27, $p = 0.018$, CI 0.24–0.37). Receiver Operating Characteristic (ROC) analysis for ICU mortality yields an AUC of 0.75 (CI 0.57–0.93) for EA measured within the first 24 h, 0.81 (CI 0.67–0.96) for SAPS2 and 0.86 (CI 0.73–0.98) for SOFA at ICU admission.

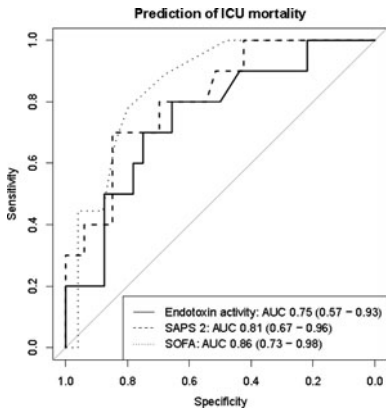

Fig. 1: Prediction of ICU mortality

EA measured within the first 24 h does correlate weakly with SAPS2 ($r = 0.30$, $p = 0.05$), SOFA at ICU admission ($r = 0.34$, $p = 0.06$) and IL-6 ($r = 0.37$, $p = 0.02$).

CONCLUSIONS. In unselected septic patients variability of EA at ICU admission is high and independent of bacterial strain. Incidence of EA >0.6 measured within the first 24 h is low, but predicts poor outcome. Measurement of EA is warranted because it does not correlate well with SAPS2, SOFA and IL-6.

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0350

METABONOMIC STUDY ON PATIENTS DIAGNOSED WITH SEVERE SEPSIS AND SEPTIC SHOCK IN THE INTENSIVE UNIT

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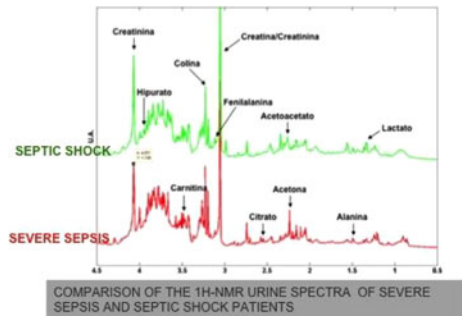
INTRODUCTION. Metabonomics has been proved to be an effective tool for the discovery of diagnostic and prognostic biomarkers. The use of 1H NMR to study the metabolic characteristics of the urine in patients with septic could be a good way to find potential biomarkers for sepsis prognosis.

OBJECTIVES. Obtaining a molecular NMR metabolic profile on ICU patients with severe sepsis (SE) and septic shock (SS) with a potential diagnostic and predictive value.

METHODS. The study was conducted on patients admitted to the ICU of the Clinic Hospital of Valencia. NMR was used to analyze the urine of 45 patients (27 with SE and 18 SS) on admission. 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 with SE and SS on the day of admission.



Comparison of the 1H-NMR urine spectra

These differences include, among others, the relative levels of citrate (SE 29 ± 16, SS 17 ± 11, p value 0.008), phenylalanine (78 ± SE 35, SS 46 ± 28, p value 0.003), carnitine (37 ± SE 23, SS 79 ± 60) and hippurate (SE 41 ± 20, SS 64 ± 27 p value 0.002). Some metabolites detected correlated with patient survival Note the trimethylamine (exitus

40 ± 40, not to death: 20 ± 10, p value 0.004) and an unassigned signal (3.40 ppm resonance frequency, death 46 ± 20, 111 ± exitus no 90, p value 0.0003).
CONCLUSIONS. The metabolic profile of urine from ICU patients with sepsis shows metabolic differences associated with septic shock and a possible predictive value for survival.
REFERENCE(S). 1. Zhong-ying L, Ping-bo X, Shi-kai Y, et al. A metabonomic approach to early prognostic evaluation of experimental sepsis by 1H NMR and pattern recognition. NMR Biomed. 2009;22:601–8. 2. Izquierdo-García JL, Nin N, Ruíz-Cabello J, et al. A metabolomic approach for diagnosis of experimental sepsis. Intensive Care Med. 2011;37:2023–32.

0351
MR-PROADRENOMEDULLIN AS PROGNOSTIC BIOMARKER IN SEVERE SEPSIS AND SEPTIC SHOCK

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INTRODUCTION. Adrenomedullin has been considered a possible biomarker in septic patients [1]. Unfortunately it is difficult to determine it in plasma due to the quick clearance and high protein binding. However, it's possible to measure the more stable mid-regional proadrenomedullin (MR-proADM) in patients with sepsis.
OBJECTIVES. The primary end-point was to analyze the prognostic value of MR-proADM in 28-day mortality in septic patients. Secondary end-point was to evaluate the first 24 h kinetics of MR-proADM.
METHODS. Prospective, observational study with patients admitted in the ICU diagnosed of severe sepsis or septic shock. A database was created with clinical, laboratory and microbiological data with usual biomarkers (systematic blood analyses at 0, 6, 24 and 72 h) and MR-proADM on admission and after 24 h. MR-proADM was detected in EDTA plasma after centrifugation within the first 2 h and frozen at −80 °C. The analysis was performed with a new sandwich immunoassay (MR-proADM, BRAHMS®, Hennigsdorf, Germany). Continuous variables were expressed as mean (±SD) or median (IQR). Student's *t* or *U* of Mann–Whitney or Kruskal–Wallis tests were used for comparisons. Chi-squared or Fisher's exact test were used for comparisons of categorical data. We performed Kaplan–Meier survival curves representing 28-day mortality between groups and were compared by using a log-rank test. Statistical significance was established at p value <0.05. All analyses were conducted by using SPSS® v12.0.
RESULTS. A total of 42 patients were included in the analysis. Clinical data were: men, 64 %. Age: 61.8 ± 15.9 years. Septic shock was predominant (69 %).The most frequent infectious focus was abdominal (48 %) followed by respiratory (17 %). APACHE II: 19.6 ± 7.1; SAPS II 44.6 ± 16.0 and SOFA 7.1 ± 3.3. The 28-day mortality was 35.7 %, all of them in septic shock group. Mean initial MR-proADM was 4.95 nmol/L (range 0.55–22.0) and after 24 h 4.63 nmol/L (range 0.4–18.0), no significant differences. Significant differences were observed in MR-proADM determinations between non survivors (higher levels) versus survivors, both at admission ($p = 0.002$) and after 24 h ($p = 0.003$) (Fig. 1). A cut-off point of 4 nmol/L of the initial MR-proADM was established, so studying significant differences in survival curves. A higher and significant 28 day-mortality was observed in patients with initial MR-proADM ≥4 nmol/L ($p = 0.005$) (Fig. 2).

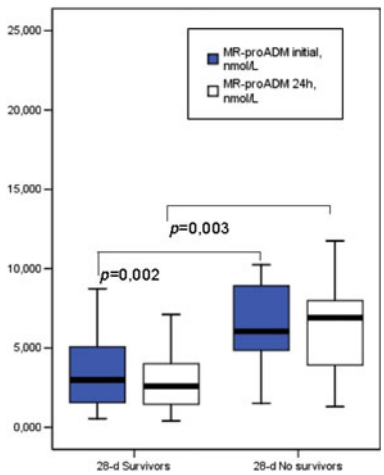

Fig. 1: 28-day Mortality

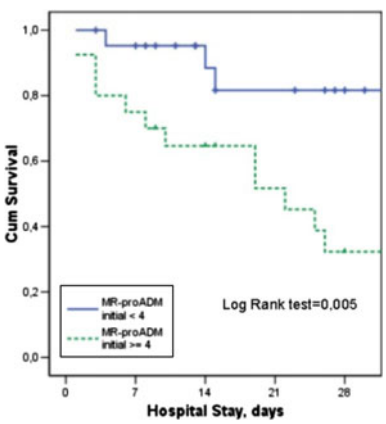

Fig. 2: MR-proADM initial and Survival

CONCLUSIONS. MR-proADM is an initial prognostic biomarker that allows predicting 28 day-mortality in septic patients. Therefore, an initial cut-off point ≥4 nmol/L is associated with a higher mortality. On the other hand, we have not found differences between initial and 24 h MR-proADM determinations.
REFERENCE(S). 1. Christ-Crain M, et al. Mid-regional pro-adrenomedullin as a prognostic marker in sepsis. Crit Care. 2005;9:816–24.
GRANT ACKNOWLEGMENT. This work was supported in part by BRAHMS®.

0352
DIAGNOSTIC AND PREDICTIVE VALUE OF PRESEPSIN (SCD14-ST) IN THE TIME COURSE OF SEPSIS

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INTRODUCTION. Sepsis represents a complex systemic inflammatory response to an infection. The soluble CD14 subtype (sCD14-ST) is cleaved from the monocyte/macrophage specific CD14 receptor complex after binding with lipopolysaccharides (LPS) and LPS binding protein (LPB) during systemic infections.
OBJECTIVES. This study evaluates the diagnostic and predictive value of this subtype sCD14-ST—the so called presepsin—during the time course of patients suffering from sepsis.
METHODS. 26 patients presenting to the intensive care unit (ICU) with proven criteria of SIRS (systemic inflammatory-response syndrome), sepsis, severe sepsis and septic shock were evaluated. Septic patients were included in the study according to the criteria of the ACCP/SCCM consensus statement and were followed up to 30 days. Blood samples for measurement of presepsin were collected on day 1, 3 and 8 after the clinical onset of sepsis. Presepsin was measured by the PATHFAST® immunoassay analytical system (PROGEN Biotechnik GmbH, Germany). The study was carried out according to the principles of the declaration of Helsinki and was approved by the local ethics committee (clinicaltrials.gov identifier: NCT01535534).
RESULTS. Presepsin levels at day 1 were highest in patients with septic shock (n = 11, median = 2931 pg/ml), followed by patients with severe sepsis (n = 9, median = 1475 pg/ml) and patients with SIRS/Sepsis (n = 6, median = 332 pg/ml) (test for linear trend p = 0.007). Presepsin levels of patients with severe sepsis and septic shock (n = 20) decreased from day 1 (median = 2393 pg/ml) to day 3 (median = 2120 pg/ml) by 11 % and to day 8 (median = 1563 pg/ml) by 35 % during intensive care treatment. Presepsin levels measured at day 1 were significantly higher in non-survivors of severe sepsis and septic shock (non-survivors, n = 6, median = 4215 pg/ml) compared to survivors (survivors, n = 18, median = 1311 pg/ml; p = 0.02) during the 30 days follow-up. In patients surviving septic shock (n = 6) presepsin levels decreased from day 1 (median = 2396 pg/ml) to day 3 (median = 2120 pg/ml) by 12 % and to day 8 (median = 1359 pg/ml) by 43 % during intensive care treatment.
CONCLUSIONS. Presepsin levels measured at the beginning of the time course of sepsis were able to differentiate patients suffering from SIRS/Sepsis, severe sepsis and septic shock. Presepsin levels decreased in patients with severe sepsis or septic shock during 8 days of intensive care treatment. Presepsin levels might predict short-term 30-day mortality in patients with severe sepsis or septic shock.

0353
PROGNOSTIC VALUE OF SUPAR IN SEVERE SEPSIS AND SEPTIC SHOCK PATIENTS

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INTRODUCTION. Early identification of high risk septic patients is a key point for reducing mortality. Biomarkers are promising tools to achieve this objective and probably improve their management and survival rate.
OBJECTIVES. To compare the prognostic value of suPAR, procalcitonin (PCT), C-reactive protein (CRP) and proadrenomedullin (proADM) in severe sepsis and septic shock patients admitted to the ICU.
METHODS. This was a single-centre prospective observational study of patients admitted to the medical-surgical ICU of an urban tertiary care teaching hospital with severe sepsis/septic shock. Patients were recruited from June 2010 to June 2011. PCT and CRP levels were determined on ICU admission and simultaneously venous blood samples were obtained for suPAR and proADM measurement and collected in tubes containing EDTA. After centrifugation, these were kept frozen at −80 °C until assayed.
RESULTS. We analysed prospectively 137 patients, 41 (30 %) with severe sepsis and 96 (70 %) with septic shock. 90 (65.7 %) were male and the mean age, Apache II and SOFA scores were 62.6 ± 15.9 years, 20.8 ± 7.1 and 8.8 ± 2.9, respectively. The mortality rate was 21.9 % in the ICU and 29.9 % in the hospital. The median values of the different biomarkers were suPAR 11.7 (7.7–17.7) ng/ml, PCT 13.7 (2.8–39.2) ng/ml, CRP 21.5 (11.8–29.5) mg/dl and proADM 3.7 (1.8–7.5) nmol/L. None of the biomarkers could discriminate between severe sepsis and septic shock patients: suPAR [11.6 (5.6–15.5) ng/ml vs. 11.8 (8.2–18.1) ng/ml; p = 0.12], PCT [18.0 (3.2–43.5) ng/ml vs. 11.3 (2.6–35.3) ng/ml; $p = 0.34$], CRP [18.0 (7.9–25.5) mg/dl vs. 22.7 (14.4–31.2) mg/dl; p = 0.07] and proADM [3.7 (1.6–7.1) nmol/L vs. 3.8 (1.8–7.9) nmol/L; p = 0.55]. Positive correlation of suPAR levels with Apache II score (r = 0.303, $P = 0.001$) and SOFA score (r = 0.440, $P < 0.001$) was observed. suPAR was the only biomarker which levels on ICU admission were significantly higher in hospital non survivors than in survivors [15.2 (10.3–20.2) ng/ml vs. 10.7 (6.7–15.9) ng/ml; p = 0.002]. The receiver-operating characteristic curve (Fig. 1) for suPAR yielded an AUC of 0.67, higher than the AUC for proADM, PCT and CRP (0.62, 0.44 and 0.50, respectively) referred to hospital mortality. The best cut-off value was 9.5 ng/ml (95 % CI 0.60–0.76, sensitivity 86 %, specificity 45 %) for predicting hospital mortality.
CONCLUSIONS. In our study, suPAR levels correlated well with severity of illness and death. Our data suggest that this biomarker could potentially be clinically useful to predict prognosis in these patients and detect those who will benefit from more intense monitoring and treatment.

0354
VASPIN SERUM LEVELS IN PATIENTS WITH SEPSIS

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INTRODUCTION. Vaspin (visceral adipose tissue-derived serine protease inhibitor) was first described in 2005 by Hida et al. [1] as an insulin-sensitizing adipose tissue hormone. Its antiinflammatory function was shown in 2011 by Yamawaki [2] and Auguet et al. [3]. No studies have been conducted to examine a potential involvement of Vaspin in sepsis.
OBJECTIVES. Since it is known that sepsis changes expression of adipokines and with respect to the afore-mentioned properties of Vaspin our aim was to find out if serum levels of novel antiinflammatory adipocytokine Vaspin differ in septic patients from those of otherwisely severely ill patients.
METHODS. 27 patients in intensive care fulfilling the ACCP/SCCM criteria for sepsis, severe sepsis or septic shock were prospectively included in our pilot study, the control group consisted of 25 critically ill patients receiving intensive care after trauma or major surgery. Additionally, 19 healthy volunteers have also been included. Blood samples were collected on the day of diagnosis and serum was obtained by centrifugation. Samples were stored at −80 °C until analysis. Serum levels were measured in duplicates using enzyme-linked immunosorbent assays, samples were diluted 1:5. For statistical analysis mean levels were compared using Welch′s *t* test.
RESULTS. The mean Vaspin level in septic patients was 0.632 ng/ml (SD 1.48), mean Vaspin level in surgical control group patients was 0.147 ng/ml (SD 0.27) and 0.276 ng/ml (SD 0.33) among the healthy volunteers. Welch′s Two Sample *t* test showed no significant difference between septic and control group ($p = 0.10$) or septic group and healthy volunteers ($p = 0.27$).
CONCLUSION. Auguet et al. [3], comparing obese and lean patients, did not see a difference in circulating Vaspin, however they described a strong inverse correlation between Vaspin and proinflammatory IL6. Our septic patients′ mean Vaspin serum level was more than four-fould as high as the mean surgical control group level. Although we could not find a statistically significant difference, possibly due to sample size, we think that further investigation may help to better understand the pro- and antiinflammatory processes involved in sepsis.
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0355
DOES THROMBOSPONDIN-1 EXPRESSION IN CIRCULATING MONONUCLEAR CELLS HAVE A PROGNOSTIC INTEREST DURING HUMAN SEPTIC SHOCK?

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INTRODUCTION. In a previous genomic profiling (HU 133 2.0 Plus Chip, Affymetrix) of peripheral blood mononuclear cells (PBMC) from septic shock patients, the expression of 8 genes had a significant variation in relation with day 28 mortality. Among them, thrombospondin-1 (THBS-1) level was lower in patients who died. Platelets and phagocytes are source of THBS-1, which acts on inflammation regulation and resolution steps such as apoptosis induction, and activation of phagocytosis and TGFb1 [1].
OBJECTIVES. To confirm on a larger cohort, by quantitative PCR (qRT-PCR), the results obtained in the pangenomic study, and to analyze THBS-1 gene expression in association with clinical severity.
METHODS. THBS-1 gene expression (GenExprTHBS-1, Applied Biosystems) in PBMC was analyzed by qRT-PCR (expression level relative to control total RNA containing THBS-1, Stratagene Agilent, treated with similar amplification process) in 98 patients with septic shock defined as the occurrence of at least 2 organ failures, at D0 and D1. 95 samples were available at D0 and 88 at D1. Analysis was performed in relation with a 28-days clinical follow-up. Non parametric statistical tests, results in median (interquartile).
RESULTS. SAPS II median was 59 (18), SOFA at D0 was 11 (3), 10 (5) at D1, 3 (4) at D7, 0 (3.5) at D28. Twenty five patients died before J7 (26 %) and 36 (37 %) before D28.
At D0, GenExprTHBS-1 in patients was low (0.280 (0.485)), in comparison with control GenExprTHBS-1. At D0, GenExprTHBS-1 was associated with initial severity (SAPS II > or < 59, $p = 0.0024$) but not with SOFA level. Patients who showed a poor evolution (positive SOFA gradient J7-J0) or died before D7 had higher GenExprTHBS-1 at D0 compared to patients who improved (0.290 (1.200) versus 0.190 (0.278), $p = 0.0259$ Mann–Whitney). Among the 62 surviving patients, 7 had a GenExprTHBS-1 follow-up until D28 that showed a restoration along time and a strong increased at D28 (D28: 8.830 (13.047), $p = 0.0129$, Friedman).
CONCLUSIONS. THBS-1 expression at D0 was higher when evolution during the first week was deleterious. This qRT-PCR analysis on 95 samples do not confirm the previous pangenomic chip analysis on a smaller cohort ($n = 44$) that observed an association between THBS-1 expression decrease and prognosis. This raises questions about results validity in chip analysis, compared to qRT-PCR.
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0356
NEW DIAGNOSTIC STRATEGY OF SEPSIS INDUCED DISSEMINATED INTRAVASCULAR COAGULATION

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INTRODUCTION. Inflammation and coagulation are interrelated pathophysiologic processes that considerably affect each other. And various biomarkers such as proinflammatory cytokines, chemokines, adhesion molecules, tissue factor expression, platelet and endothelial activation are closely concerned with the complex interactions between inflammatory response and coagulopathy. However, there are different diagnostic criteria in sepsis and disseminated intravascular coagulation (DIC).
OBJECTIVES. The aims of this study were to establish the diagnostic criteria of sepsis induced DIC.
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 for measuring the markers were collected at the time of admission. Eighty two patients were enrolled for this prospective study from June 2010 to June 2011.
RESULTS. Forty two patients (51.2 %; 42/82) were sepsis, severe sepsis or septic shock at the time of registration. In the receiver operating characteristics (ROC) analysis, the area under the curve (AUC) to distinguish sepsis was the highest for Procalcitonin (PCT) (0.91) followed by Presepsin® (0.89), IL-6 (0.89), and CRP (0.84) as inflammatory biomarkers ($p < 0.0001$). Additionally, the AUC to distinguish sepsis was the highest for Protein C (PC) (0.83) followed by Thrombomodulin (TM) (0.81), Antithrombin (AT) (0.81) as coagulation biomarkers ($p < 0.0001$). Logistic regression analysis that included PCT, Presepsin®, IL-6, and CRP as inflammatory biomarkers identified only Presepsin® level as independent predictor of the Japanese Association for Acute Medicine (JAAM) DIC and the optimal cut-off value was 899 pg/ml, and that included PC, TM, and AT as coagulation biomarkers that PC was only a predictor of JAAM DIC and the optimal cut-off value was 55 %. On the other hand, the optimal cut-off value of sepsis in Presepsin® and PC were 647 pg/ml and 47 % respectively. In the ROC analysis using both of Presepsin® and PC, the AUC to distinguish sepsis and JAAM DIC were 0.911 and 0.913, respectively.
CONCLUSIONS. From these results, we defined the new diagnostic criteria of septic DIC which named Sepsis Associated Coagulopathy(SAC) as follow; Presepsin® level >900 pg/ml and PC <45 %. We strongly believe that this diagnostic criteria is very simply and useful.

0357
C-REACTIVE PROTEIN PROVIDES AN ESTIMATE OF EXCRETION OF URINARY UREA NITROGEN

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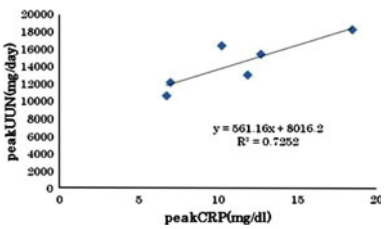
INTRODUCTION. Protein catabolism is enhanced mainly by skeletal muscle protein degradation in invasive diseases [1]. Nitrogen balance is important in nutritional intervention in seriously ill patients. However, pooling of urine and measurement of daily urinary urea nitrogen (UUN) are required to ensure this balance, and this is not a simple procedure. Inflammatory cytokines produced in invasive diseases also enhance production of acute-phase proteins such as C-reactive protein (CRP), the level of which can be measured more easily.
OBJECTIVES. The goal of the study was to examine whether daily UUN can be estimated from the CRP level.
METHODS. The subjects were 6 patients who underwent bloodless aortic arch replacement in our hospital from January 2011 to January 2012. Daily changes in CRP and UUN were collected from patient records. The maximum CRP level from the operation day until 3 days postoperatively was defined as peak CRP, and the first peak of daily UUN as daily peak UUN. The relationship between the two peaks and the difference in timing of peak CRP and daily peak UUN were examined.
RESULTS. In the 6 subjects, CRP peak was 11.16 ± 4.33 mg/dL and daily peak UUN was 14279 ± 2853 mg/day. There was a positive correlation between peak CRP and daily peak UUN ($R^2 = 0.72$). Daily peak UUN occurred at 2 ± 1.7 days after peak CRP.



The relationship between peak CRP and peak UUN

CONCLUSIONS. Our results suggest that daily UUN is likely to occur approximately 2 days after peak CRP is reached postoperatively in patients with invasive disease. Thus, protein given for nutritional intervention can be administered in regulated amounts on the day of peak CRP and thereafter.
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0358
THE LECTIN PATHWAY OF THE COMPLEMENT SYSTEM IN CRITICALLY ILL CHILDREN

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INTRODUCTION. Mannose-binding lectin (MBL), the ficolins (M-, H- and L-ficolin) and their MBL-associated serine proteases (MASPs) initiate inflammation through the lectin pathway of complement activation. Deficiency of some of these components may be clinically undetectable in the healthy host, but increased susceptibility to secondary infections or complications has been shown for deficiencies in e.g. pediatric cancer patients. Data on the levels of these proteins in critically ill children are scarce. Such patients face substantial infectious, physical and metabolic stress, which is in part induced by the underlying pathology or trauma, but can be aggravated by excessive inflammation.
OBJECTIVES. In the present study, we measured the upon-admission serum levels of different proteins of the lectin pathway in a large cohort of critically ill children to assess association with baseline characteristics, ICU-related complications (infection), and predictive power towards ICU length of stay and ICU mortality. We hypothesized that baseline deficiencies in these proteins would be associated with infectious complications and poor outcome.
METHODS. This is a pre-planned secondary analysis of a previous prospective, randomized clinical trial including 700 critically ill children admitted to our University Hospital

Pediatric ICU [1] and 130 healthy controls. Patients received conventional glucose management (insulin administered when blood glucose exceeded 215 mg/dL) or intensive insulin therapy with continuous insulin infusion to achieve age-adjusted normal fasting blood glucose-levels. We measured MBL, MASP-1, MASP-2, MASP-3, MAp44, and M- and H-ficolin.
RESULTS. Baseline levels of MASP-1, MASP-2, MASP-3 and MAp44 were significantly lower and those of M-ficolin higher in critically ill patients compared to healthy controls. MBL and H-ficolin levels were comparable in both groups. In patients, all proteins increased with age, except for MASP-1. A history of malignancy was associated with significantly higher baseline MASP-2 and H-ficolin levels. Low baseline MASP-3, but none of the other proteins, was independently associated with subsequent acquisition of infection and prolonged stay in ICU. Variation in baseline levels of MASP-3 was determined by age, weight and severity of underlying pathology. None of the proteins was associated with mortality.
CONCLUSIONS. Low baseline MASP-3 at admission is associated with disease severity, subsequent acquisition of infection and prolonged stay in ICU in critically ill children.
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GRANT ACKNOWLEDGMENT. Doctoral Fellowship of the Clinical Research Fund of the University Hospitals Leuven (CI), funding from Danish Council for Independent Research and Novo Nordic Foundation (ST), Research Financing by the Methusalem Program/Flemish Government (GvdB).

0359
SYSTEMIC INFLAMMATORY MARKERS AND CARDIAC TROPONIN IN ACUTE MYOCARDIAL INFARCTION

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INTRODUCTION. Vascular inflammation plays a central role in atherosclerotic plaque dynamics and a variety of inflammatory markers are known to be involved. Many have yet to prove their clinical usefulness. Cardiac troponins are proven important diagnostic and prognostic markers in the acute coronary syndrome context.
OBJECTIVES. To study the relationship between the inflammatory molecules: interleukin-6 (IL-6) and matrix metalloproteinase-3 (MMP-3) with cardiac troponin I (cTnI) in patients admitted for acute myocardial infarction (AMI).
METHODS. We prospectively studied 57 patients admitted for AMI, without known trauma or infection in the month before enrollment. A peripheral venous sample was taken at admission to the Coronary Care Unit and the following were studied: high sensitivity IL-6 (hs-IL-6, pg/dL) and high sensitivity MMP-3 (hs-MMP-3, pg/mL). The routine plasma values of cTnI were valued at admission and 6-9 h post admission. IL-6-hs and MMP3-hs were correlated with cTnI admission and 6–9 h post admission values.
RESULTS. Admission cTnI correlated to hs-IL-6, but not to hs-MMP-3 (IL6-hs: $r = 0.63$, $p < 0.0001$; MMP3-hs: $r = 0.2$, $p = 0.1$); cTnI 6-9 h post admission correlated to both inflammatory molecules (hs-IL-6: $r = 0.6$, $p < 0.0001$; hs-MMP-3: $r = 0.5$, $p < 0.0001$—see graph).
CONCLUSIONS. We conclude that, in the studied AMI population, hs-IL-6 is related to the admission and later values of cTnI. Hs-MMP-3 seems to be related to the later cTnI values.
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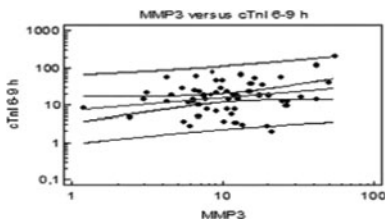
GRANT ACKNOWLEDGMENT. This work was possible through a research grant from Astra-Zeneca.



Metalloproteinase 3 and cardiac troponin I

0360
EVALUATION OF SERUM CRP VALUES IN DIFFERENT STAGES OF SEPSIS

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INTRODUCTION. Sepsis is an inflammatory reaction that is carried out by endogeneous mediators and it affects all organs and systems. The appearance of some clinical signs in the late stage of sepsis leads to focusing on biochemical parameters. C-reactive protein (CRP) is an acute phase protein that is produced in the liver as a response to tissue injury or immune mediator release. Trauma, surgery, autoimmune diseases, cancer and chronic inflammatory diseases can increase CRP level.
OBJECTIVES. We aimed to evaluate the importance of CRP levels in diagnosis of sepsis, and the changes of CRP at different severity stages of sepsis retrospectively.
METHODS. 485 patients, which were hospitalized less than 30 days at ICU were analysed. CRP levels before sepsis diagnosis and at the first day of different stages of sepsis were recorded. Among all patients, only patients having 2 corresponding CRP levels at different stages of sepsis included and classified into 6 groups. The groups were set to evaluate the changes in CRP levels in transition to different stages of sepsis. Within each group, CRP levels of the same individuals at different stages of sepsis are given (no sepsis, sepsis, severe sepsis, septic shock).
RESULTS. In our study, CRP levels was found elevated in transition to a more severe stage of sepsis. The change in multiples in Groups 1, 2 and 3 was higher than the other groups but significant only when compared with Group 6 (Table 1).

Table 1 The change in CRP levels at stages of sepsis

	CRP (mg/dl) (median; min–max)	Multiples of change (median; min–max)
Group 1 (n = 28)	No sepsis 5.23; 0.14–17.60 sepsis 12.37; 1.80–23.40*	2,23; 1.04–75.29#
Group 2 (n = 17)	No sepsis 5.41; 0.13–17.60 severe sepsis 15.93; 1.10–41.86*	3.62; 1.08–117.43#
Group 3 (n = 7)	No sepsis 4.30; 2.04–14.30 septic shock 18.83; 14.80–27.17*	4.23; 1.43–9.23#
Group 4 (n = 26)	Sepsis 8.06; 0.27–33.30 severe sepsis 16.44; 4.94–41.86*	2.04; 0.75–21.78
Group 5 (n = 9)	Sepsis 8.98; 2.28–25.46 septic shock 18.83; 7.67–36.12*	1.78; 0.94–8.26
Group 6 (n = 66)	Severe sepsis 11.34; 1.27–33.30 septic shock 20.11; 5.11–46.20*	1.69; 0.71–13.46

* $p < 0.001$ when compared within group

#$p < 0.05$ when compared with Group 6

CONCLUSIONS. In our study group, CRP is seen as a reliable prognostic inflammatory parameter in sepsis. In addition, it shows the increase in severity during transition into different stages of sepsis perfectly.

Organ dysfunction in sepsis: 0361–0374

0361
CONNECTION BETWEEN MYOCARDIAL OEDEMA, INFLAMMATION AND FUNCTION DURING SEPSIS: ROLE OF ALPHA1 AMP-ACTIVATED PROTEIN KINASE

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INTRODUCTION. Induced capillary leakage contributes to organ dysfunction during sepsis. However, the contribution of cardiac oedema to sepsis-induced left ventricular dysfunction remains to be clarified. In addition, signalling pathways controlling the sepsis-induced myocardial oedema has not been identified.
OBJECTIVES. Since AMP-activated protein kinase (AMPK) has been shown to control endothelial cytoskeleton and to display anti-inflammatory effects, we postulated that APMK-activation influenced vascular permeability and inflammation during sepsis even in the heart and could modulate cardiac function.
METHODS. Sepsis was triggered by injection of a sub-lethal dose of lipopolysaccharide (LPS, 10 mg kg^{-1}) inducing systolic left ventricular dysfunction. Wild-type (WT) mice were compared to α1-AMPK knock-out (α1KO). In vivo vascular permeability was evaluated by dye extravasation. Left ventricular (LV) mass, oedema and function were studied by echocardiography and magnetic resonance imaging (MRI). Lung neutrophil deposition and myeloperoxydase activity were quantified. Cytokines expressions were measured in heart tissue by RT-qPCR. Plasmatic cytokines were measured by cytometric bead array.
RESULTS. LPS injection resulted in an increased systemic inflammatory cytokines production (TNFα, IL1β, IL6, CXCL1, RANTES) whereas no difference was observed between WT and α1KO mice. Similarly, acute lung injury after LPS (characterized by neutrophil accumulation and myeloperoxidase activity in the lung) did no differ between WT and α1KO animals.
By contrast, α1KO exhibited a dramatic increase in the LPS-induced vascular hyperpermeability as well as LPS-induced cytokines expression (TNFα, IL1β, IL6, CXCL1-2) in the heart. Echocardiography revealed an increase in LV mass 24 h after LPS injection in α1KO. MRI definitely demonstrated that increased LV mass corresponded to exaggerated LV wall oedema.
LPS injection induced a transient decrease in LV systolic function as assessed by ejection fraction (EF) which mainly occurred after 6 h. Despite the more pronounced wall oedema in α1KO, no difference in systolic function could be detected between WT and α1KO at 6 and 24 h after LPS.
CONCLUSIONS. Our results showed for the first time a signalling pathway controlling LV wall oedema during sepsis. AMPK exerts a protective action against myocardial inflammation and oedema induced by LPS. Interestingly, exaggerated LV wall oedema and inflammation is not associated with aggravated systolic dysfunction. However, it could contribute to diastolic dysfunction observed in septic patients.
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0362
PHOSPHODIESTERASE-4-INHIBITION TO ATTENUATE HEPATOCELLULAR INJURY DURING SYSTEMIC INFLAMMATION IN RATS

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INTRODUCTION. Systemic inflammation, as well as consecutive multiple organ failure remain unsolved therapeutic challenges in critical care medicine. In previous experiments application of phosphodiesterase-IV-inhibitors (PD-4-I) led to stabilisation of the

endothelial barrier (EB) and consecutive prevention of capillary leakage in lipopolysaccharide(LPS)-induced severe systemic inflammation [1]. Compared to LPS-treated animals, application of PD-IV-I showed higher serum glucose levels (52.3 vs. 25.4 mg/dl) in the latter experiments. Since the liver is a complex organ with various functions including regulation of energy and glucose metabolism, we hypothesized that our PD-4-I treatment also improved sinusoidal blood flow and thus augmented liver function.
OBJECTIVES. To study the effect of systemic PD-4-I administration on sinusoidal rheology and hepatocytic integrity in LPS-induced systemic inflammation.
METHODS. After animal care committee approval, 16 male SD rats were randomized into three groups: Control (C; n = 5), LPS (n = 6), LPS + PD-4-I (n = 5). Animals were prepared with mechanical ventilation, continuous invasive central venous- and arterial blood pressure measurements. Systemic hyperinflammation was induced by i.v. application of LPS. For hemodynamic stabilization 1 ml of SterfundinIso was given when MAP < 60 mmHg. PD-4-I was administered at 90, 150 and 210 min. For intravital investigation of liver microcirculation and integrity the liver was placed onto an inverted fluorescence microscope after 210 min. Microcirculation was examined using i.v. administration of Fluorescein sodium and FITC-albumin, and cell vitality was quantified utilizing an intra-arterial bolus of prodidium iodide (PI) vital dye. Statistic was performed by One way Anova followed post hoc Duncan or Kruskal–Wallis test; level of significance at $p < 0.05$; values expressed as mean ± SEM.

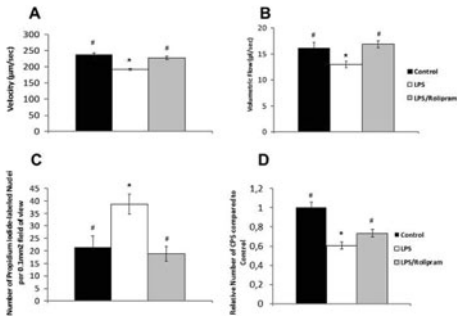

Fig. 1
RESULTS. No significant difference was detected in macrocirculation between LPS and LPS + PD-IV-I groups at the end point of the experiments. However, sinusoidal microcirculation was significantly improved in PD-4-I-treated animals compared to LPS alone. No significant difference was observed between C and LPS + PD-4-I group (see Fig. 1). As revealed by 27.2 ± 2 vs. 22.5 ± 1 perfused sinusoids per 0.1 mm^2 functional capillary density was also significantly improved in PD-4-I-treated animals when compared to LPS, but remained significantly below C (37.1 ± 1 perfused sinusoids/0.1 mm^2). Accordingly, LPS-treated animals displayed significantly more dead or dying hepatocytes (38.8 ± 4) compared to C (21.5 ± 4) and LPS + PD-4-I (18.9 ± 3/0.1 mm^2).
CONCLUSIONS. Our data support the hypothesis that systemic PD-4-I application stabilizes endothelial barrier properties and additionally ameliorates hepatic microcirculation and diminishes liver injury as revealed by the number of vital hepatocytes.
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GRANT ACKNOWLEDGMENT. Deutsche Forschungsgemeinde (DFG): SCHL1962/2-1.

0363
ACCELERATED AEROBIC GLYCOLYSIS—THE HALLMARK OF SEPSIS ASSOCIATED MYOCARDIAL DYSFUNCTION?

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INTRODUCTION. Myocardial dysfunction is known to occur during severe sepsis and systemic inflammation and the mechanisms for which are not well characterised. It is unknown whether septic shock produces specific changes in myocardial energy metabolism that are not seen in other types of shock.
OBJECTIVES. The aim of the study was to compare the metabolic changes in the myocardium using microdialysis (MD) in porcine models of shock resulting from endotoxaemia and haemorrhage.
METHODS. 27 female pigs, weighing 32–41 kg was used in the study, randomized to 3 groups: control (C) n = 9, endotoxaemic shock (S) n = 9 and hemorrhagic shock (H) n = 9. Interstitial myocardial pyruvate, lactate and glucose were measured using microdialysis (MD). Skeletal muscle MD was also performed in all 3 groups for comparison. Pulse-induced contour cardiac output (PiCCO) and pulmonary artery catheters were used for hemodynamic monitoring. Epicardial echocardiography was performed for systolic/diastolic measurements, hemodynamics and visual assessment of contractility.
RESULTS. There were no statistically significant differences in hemodynamics or diastolic cardiac function between the endotoxin and hemorrhage groups. Systolic function was more significantly impaired in the endotoxin group ($p < 0.05$). Marked decreases in myocardial glucose were observed in the endotoxin group (median 0.75 mmol/L, IQR: 0.48–1.19, $p = 0.05$), whereas they remained relatively stable in the hemorrhage group (median 2.59 mmol/L, IQR: 2.23–3.62, $p > 0.05$). Increases in myocardial pyruvate were seen in all animals, and very high concentrations were observed in the endotoxin group (Median 214 mmol/L, IQR: 197–296, $p = 0.05$). Despite increases in interstitial lactate and the presence of shock, there was no evidence of myocardial anaerobic metabolism, with normal LP ratios seen in all animals. Similar trends were observed in the MD data from the skeletal muscle across all groups.
CONCLUSIONS. The decrease in myocardial glucose, increase in pyruvate and an absence of demonstrable biochemical ischemia raise the possibility of an accelerated aerobic glycolytic process during endotoxaemic shock. Increased myocardial pyruvate observed in the haemorrhage group in the absence of a decrement in glucose may indicate differential use of energy substrate during endotoxaemic and haemorrhagic shock states. The metabolic patterns in the myocardium during endotoxaemic shock are distinct and differ significantly from those seen during haemorrhagic shock.
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0364
SEPSIS DECREASES STROKE VOLUME YET INCREASES EX VIVO CARDIOMYOCYTE OXYGEN CONSUMPTION

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INTRODUCTION. Among other mechanisms, mitochondrial dysfunction has been implicated in sepsis-associated myocardial dysfunction [1]. To our knowledge, no studies have been performed to date on functional measures of mitochondrial activity such as oxygen consumption in freshly isolated cardiomyocytes.
OBJECTIVES. To measure temporal changes in oxygen consumption in freshly isolated cardiomyocytes taken from a clinically relevant rodent sepsis model.
METHODS. Male Wistar rats (approx. 300 g weight) were instrumented under isoflurane anaesthesia with tunnelled internal jugular and carotid artery catheters and then connected to a tethered swivel to allow free movement within their cage. They were randomized to receive an intra-peritoneal injection of faecal slurry (3 µl slurry/g) or saline with continuous i.v. fluid resuscitation commencing 2 h after. Non-instrumented (naïve) animals were used as a further control group. At 6 or 24 h post-insult, animals were anaesthetised and transthoracic echocardiography performed to measure stroke volume (SV) and heart rate. The heart was then excised and ventricular cardiomyocytes isolated by a standard enzymatic technique. Freshly isolated cells were plated onto a laminin layer and oxygen consumption rate measured in a population of resting pure rod shape cardiomyocytes by indicator-dependent fluorescence quenching, using the Seahorse Bioscience Extracellular Flux Analyser [2].After baseline measurements they were stimulated with isoprenaline and then uncoupled with FCCP. Data are presented as mean ± SEM.
RESULTS. No differences were seen at 6 h in SV or oxygen consumption. Three animals died before 24 h. In survivors at this 24 h timepoint, septic animals had a decreased SV [0.13 ± 0.04 vs. 0.27 ± 0.02 ml, $p < 0.05$] compared to sham-operated controls. However, there was an increase in basal and isoprenaline-stimulated oxygen consumption in isolated cardiomyocytes but a trend towards a fall in maximal respiratory capacity (Table 1). Statistics were performed using SPSS 15.0.

Table 1 Echocardiography and oxygen consumption

	Naïve (n = 5)	Sham 6 h (n = 4)	Sepsis 6 h (n = 4)	Sham 24 h (n = 5)	Sepsis 24 h (n = 5)
Stroke volume (ml)	0.27 ± 0.01	0.22 ± 0.02	0.18 ± 0.02	0.27 ± 0.02	0.13 ± 0.04[a]
Heart rate (bpm)	421 ± 8	441 ± 38	478 ± 12	405 ± 10	407 ± 40
Baseline OCR (nmolO2/min/cell)	0.33 ± 0.03	0.29 ± 0.04	0.28 ± 0.03	0.28 ± 0.04	0.47 ± 0.06[a,b]
Isoprenaline OCR (nmolO2/min/cell) (%vs. baseline)	0.39 ± 0.04[c,d] (112 ± 2)	0.44 ± 0.07[c,d] (149 ± 11)	0.42 ± 0.04 c,d (142 ± 7)	0.37 ± 0.05[c,d] (134 ± 5)	0.69 ± 0.08[a,b,c,d] (150 ± 7)
FCCP OCR (nmolO2/min/cell) (%vs. baseline)	1.42 ± 0.28 (471 ± 126)	1.17 ± 0.09 (489 ± 72)	1.25 ± 0.16 (455 ± 55)	1.25 ± 0.12 (482 ± 72)	1.42 ± 0.19 (339 ± 46)

FCCP Carbonyl cyanide 4-(trifluoromethoxy)phenylhydrazone, *OCR* oxygen consumption rate

[a]$p < 0.05$ vs. same time sham

[b]$p < 0.05$ vs. same insult 6 h

[c]$p < 0.05$ vs. vehicle

[d]$p < 0.05$ vs. baseline

CONCLUSIONS. In a fluid-resuscitated clinically relevant rodent peritonitis model, 24-h sepsis was associated with a decrease in stroke volume but an increase in ex vivo oxygen consumption. Further work is needed to determine whether this disparity is real or methodological, for example, due to displacement of nitric oxide from mitochondria in a room air environment.
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0365
$P2X_7$ RECEPTOR AND SEPSIS- INDUCED ACUTE TUBULAR INJURY

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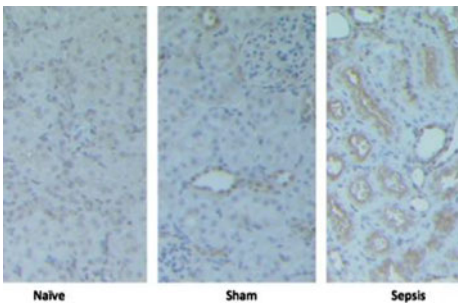
INTRODUCTION. The $P2X_7$ purinoreceptor ($P2X_7R$) plays a key role in pro-inflammatory cytokine release (IL-1ß and IL-18) and cell apoptosis. Constitutive $P2X_7R$ expression in the kidney is minimal. However, $P2X_7R$ was upregulated in a model of autoimmune glomerulonephritis (GN), where it was localized mainly to glomeruli; selective $P2X_7R$ receptor antagonism was protective (1).
OBJECTIVES. We aimed to determine the pattern of renal $P2X_7R$ expression in a rat model of sepsis- induced acute kidney injury (AKI).

METHODS. Tunnelled central venous and arterial lines were inserted into male Wistar rats under isoflurane anaesthesia. Twenty-four hours later, sepsis was induced by intraperitoneal injection of faecal slurry. Fluid resuscitation was commenced at 2 h post-slurry. Some animals were sacrificed at 6 h with kidneys taken for histological section. Primary antibodies to the $P2X_7R$ used for staining were obtained from ABCAM (UK). Comparison was made against sham-operated controls and naïve animals. Statistics were performed using ANOVA and post hoc Tukey's test.
RESULTS. In this septic model, plasma urea [median (range)] rose from 3.7 (2.9–7.3) to 6.6 (2.7–12.4) mmol/l ($p < 0.05$). Immunohistochemistry demonstrated widespread upregulation of $P2X_7R$ in tubules in the septic rat kidneys but only mild sporadic tubular staining in sham-operated animals and none in naïve rats. $P2X_7R$ expression was localized to areas of tubular damage (shedding of apoptotic tubular cells) (Fig. 1).



Immunohistochemistry for P2X7R (stained brown)

CONCLUSIONS. In this rat model of sepsis, there is early histological evidence of acute tubular injury. Coexistence of tubular injury and $P2X_7R$ upregulation suggests that $P2X_7R$ is implicated in the pathophysiology of sepsis-induced AKI. Further work is required to determine the functional significance of tubular $P2X_7R$, and the potential benefit of P2X7 receptor antagonism, in sepsis- induced AKI.
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GRANT ACKNOWLEDGMENT. NA currently has a Wellcome Trust Training Fellowship to investigate the role of the $P2X_7R$ in sepsis-induced AKI.

0366

N-ACETYLCYSTEINE EARLY TREATMENT DURING FECAL PERITONITIS PREVENTS KIDNEY CORTICAL MITOCHONDRIAL DYSFUNCTION, BUT IS NOT ASSOCIATED WITH LESS SEPSIS-INDUCED ACUTE KIDNEY INJURY

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INTRODUCTION. Sepsis-induced acute kidney injury (AKI) is an early and the most frequent organ dysfunction during sepsis and is associated with increased mortality. Mitochondrial dysfunction (MD), defined as the inability of the cells to efficiently use the available oxygen, may participate as a pathogenic mechanism of AKI.
OBJECTIVES. To test if,
(1) kidney MD occurs during sepsis-induced AKI,
(2) kidney MD can be prevented with parenteral *N*-Acetylcysteine (NAC), and.
(3) MD is related to kidney dysfunction.
METHODS. 12 anaesthetized pigs were invasively monitored (systemic and kidney flows and pressures) and randomized to controls (C), fecal peritonitis (FP) and FP + NAC for 18 h. Animals were mechanically ventilated, volume resuscitated to keep a MAP above 60 mmHg, and treated with antibiotics. NAC was continuously infused 2 h after sepsis induction in FP + NAC animals. Plasma and urine samples were taken every 6-h and renal cortical tissue samples at the end for mitochondrial analysis (high resolution respirometry). Changes over time were assessed by Friedman test in each group separately. End-values were compared with Kruskal–Wallis.
RESULTS. Septic animals received more volume than control animals (C: 7.7 ± 0.9; FP: 11.2 ± 1.2; FP + NAC: 11.6 ± 1.1 ml/kg/h; $p = 0.02$), but end experiment pulmonary capillary pressures were similar between the groups (C: 13 ± 3; FP: 14 ± 4; FP + NAC: 15 ± 2 mmHg; $p = 0.4$). MAP remained stable and above 60 mmHg in all animals (C: 103 ± 23–103 ± 20 mmHg, $p = 0.112$; FP: 80 ± 8–70 ± 10 mmHg, $p = 0.1$; FP + NAC: 85 ± 16–68 ± 7 mmHg, $p = 0.18$), but was lower in septic animals at the end ($p < 0.05$). Kidney DO_2 was stable in all groups (C: 0.46 ± 0.16–0.37 ± 0.22 ml/min/kg, $p = 0.1$; FP: 0.31 ± 0.16–0.27 ± 0.1 ml/min/kg, $p = 0.9$; FP + NAC: 0.35 ± 0.1–0.27 ± 0.12 ml/min/kg, $p = 0,27$) and end values were similar ($p = 0.2$). Also kidney VO_2 was not different between the groups ($P = 0.2$). Plasma creatinine levels increased only in both septic groups (C: 1 ± 0.4–1.1 ± 0.3 mg/dl, $p = 0.5$; FP: 1.1 ± 0.4–1.6 ± 0.5 mg/dl, $p = 0.32$; FP + NAC: 1.1 ± 0.3–2.1 ± 0.5 mg/dl; $p = 0.02$), but urine output was constant during the experiment and without differences between the groups ($p > 0.05$ for all). In both septic groups kidney lactate uptake became negative at the end (lactate producers) (C: 0.9 ± 0.8–0.5 ± 0.2 µmol/min/kg, $p = 0.8$; FP: 1.3 ± 0.8 to −0.2 ± 0.5 µmol/min/kg, $p = 0.1$; FP + NAC: 0.6 ± 0.3 to −0.6 ± 0.6 µmol/min/kg; $p = 0.1$), accordingly, end values were lower in septic animals ($p < 0.05$). In comparison with controls, kidney mitochondrial maximal complex I + II oxygen consumption was lower in FP animals (C: 951 ± 121 vs. FP: 770 ± 120 pmol/(s*mg); $p < 0.05$), but was preserved in FP + NAC (905 ± 140 pmol/(s*mg); $p = 0.7$).
CONCLUSIONS. Kidney cortical MD is present during sepsis and can be prevented with early antioxidant treatment. Nevertheless, NAC treatment was not able to prevent sepsis-induced AKI.
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0367

MODULATION OF EXPRESSION AND FUNCTION OF ION CHANNELS IN ATRIAL MYOCYTE FROM SEPTIC GUINEA PIG

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INTRODUCTION. Systemic inflammatory response syndrome (SIRS) including sepsis sometimes associates with tachyarrhythmia such as supraventricular tachycardia and atrial fibrillation [1]. And, these complications are frequently intractable to drug treatment in the clinical practice.
OBJECTIVES. Septic modulation of ion channels in atrial myocyte could play a role in the onset of tachyarrhythmia.
METHODS. Septic model animal was made by intraperitoneal lipopolysaccharide (LPS, 300 µg/kg) in male Hartley guinea pigs. After 10 h of injection, guinea pigs were anesthetized and hearts were excised. Single atrial cells were prepared enzymatically by Langendorff method. Whole cell current clamp was used to monitor action potential. Whole cell voltage clamp was used to monitor ion cannel currents. Western blot, RT-PCR, and immunohistochemical staining were also examined.
RESULTS. In electrophysiological monitoring, current clamp experiment showed that action potential duration was significantly shortened in septic condition. And, this was associated with the reduction of L-type Ca^{2+} current and an increase of delayed rectifier K^+ current. We also observed reduced expression of Ca^{2+} channel subunits and increase of K^+ channel subunits. Furthermore, iNOS synthase in atrial tissues was up regulated, and atrial nitric oxide production evidently increased in immunohistochemical staining. As for voltage dependent Na^+ channel, channel current nor the expression of channels were not affected in septic condition.
CONCLUSIONS. In atrial myocytes from septic model of guinea pig, duration of action potential was significantly shortened. This may be the result of the nitration of the ion channels that would alter channel functions rather than the changes in atrial expression of the channels. The reduction of action potential duration could play a role for the development of atrial tachyarrhythmia in SIRS and sepsis.
REFERENCE(S). 1. Crit Care 2002;6:500–8.
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0368

GENETIC PREDISPOSITION TO ACUTE KIDNEY INJURY INDUCED BY SEVERE SEPSIS AND SEPTIC SHOCK

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INTRODUCTION. Acute kidney injury (AKI) is a frequent and severe complication of severe sepsis and septic shock (SEP). The individual susceptibility to this complication may be determined by genetic factors.
OBJECTIVE. To demonstrate that polymorphisms of genes related to the inflammatory response and renal blow flood regulation are associated to an increased risk of AKI in patients with SEP.
METHODS. We studied consecutive patients admitted to the intensive care unit (ICU) from July 2005 to July 2008, with ≥18 years of age and the diagnosis of SEP. Exclusion criteria were second admission to the ICU and history of chronic renal disease (preexisting serum creatinine ≥1.40 mg/dl or chronic dialysis). This study was approved by the local Ethics Committee. Severe sepsis and septic shock were defined according to the ACCP-SCCM. Patients were assigned their worst RIFLE category according to either the serum creatinine concentration (the maximum value over a given period of time) or the urine output criteria. AKI was defined as the risk, injury and failure categories as per the RIFLE classification. Genomic DNA was extracted from a whole blood sample obtained on the first day of ICU admission. Angiotensin converting enzyme (ACE) insertion/deletion (I/D) polymorphism was determined by PCR amplification method as previously described (1). Single nucleotide polymorphisms (SNPs) of tumor necrosis factor α −376, −308 and −238; interleukin 8 −251; vascular endothelial growth factor (VEGF) +405 and +936; and pre-B cell colony enhancing factor (PBEF) −1001 were identified using TaqMan® SNP genotyping Assay. We conducted a multivariate logistic regression analysis to prove the association of the genetic polymorphisms with the susceptibility of AKI.
RESULTS. Sixty five of the 139 recruited patients presented AKI. As compared with patients without AKI, patients who developed AKI were older, had a higher prevalence of arterial hypertension, were more often in septic shock at ICU admission, presented a higher SAPS II score, had received larger amount of intravenous fluids during the first hours of ICU admission and had a higher proportion of VEGF +936 CC and PBEF −1001 GG genotypes. In multivariate analysis VEGF +936 CC (odds ratio 3.41, 95 % confidence interval 1.19–9.79) was independently associated to AKI.
CONCLUSIONS. This is the first study demonstrating an association between the VEGF +936 CC genotype and the risk to develop AKI in patients with severe sepsis or septic shock.
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0369

QUINIDINE PROTECTS THE GUT FROM PLATELET ACTIVATING FACTOR-INDUCED MICROCIRCULATORY DYSFUNCTION AND ORGAN FAILURE

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INTRODUCTION. Platelet activating factor (PAF) induces vascular barrier breakdown and intestinal failure which contribute to the development of sepsis. Arachidonic acid metabolites are generally suggested to play a crucial role in the PAF-mediated injury, however, our recent data indicate that other mediators, e.g. cAMP, are more relevant for preservation of intestinal microcirculation [1].
METHODS. An isolated model of the rat small bowel [2] was used. The fluid shifts within the vascular, luminal and lymphatic compartments of the organ were measured continuously. The transfer of vascular dextran and the resorption of galactose derived from luminal lactose were recorded every 15 min. The following groups were studied: (1) PAF (n = 5), (2) PAF + dexamethasone (n = 5), (3) PAF + PAF antagonist (ABT491) (n = 4), (4) PAF + thromboxane (SQ29548) and leukotriene (MK571) antagonist (n = 6), (5) PAF + inhibitors of cyclooxygenase (ASA) and lipoxygenase (AA861) (n = 5), (6) PAF + quinidine (n = 8), (7) PAF + hypocalcemia (n = 3). All receptor antagonists and enzyme inhibitors were administered continuously 15 min before the end of a 60 min equilibration period. PAF was applied as a bolus.
RESULTS. PAF led to a vascular fluid loss and a volume shift into the lumen and the lymphatics. The respective volume changes are given as mean ± SD in ml/10 min for all groups in the sequence: vascular loss; shift to lumen; shift to lymphatics (1) 17.4 ± 3.5; 11.3 ± 1.7; 3.9 ± 1.0, (2) 15.2 ± 1.9; 9.2 ± 1.8; 4.2 ± 1.0, (3) 0.2 ± 0.6; 0 ± 0.4; −0.2 ± 0.2, (4) 11.4 ± 2.8; 7.6 ± 1.7; 2.9 ± 1.6, (5) 14.6 ± 3.0; 8.3 ± 1.4; 3.5 ± 0.6, (6) 1.3 ± 0.5; −0.3 ± 0.6; −0.1 ± 0.2, (7) 6.9 ± 4.5; 6.4 ± 1.8; 3.0 ± 0.8. The transfer of dextran to the lumen and the lymphatics showed a similar pattern. Galactose resorption was diminished 15 min after PAF administration in all but the groups (3) and (6). In summary, the effects of PAF were hardly affected by targeting arachidonic acid metabolites (groups 2, 4 and 5) while the PAF antagonist and quinidine were highly effective (groups 3 and 6). Hypocalcemia protected the intestine in part.
CONCLUSIONS. We suggest that quinidine may act in the gut via a calcium-dependent mechanism, probably by calcium-activated ion channels, and by at least one additional pathway, which is not linked to intracellular calcium or mediators derived from arachidonic acid.
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0370

AMELIORATION OF ACUTE LIVER INJURY THROUGH THE SUPPRESSION OF UPREGULATED LEVELS OF ENDOTHELIN-1 AND TNF-*A* IN A RAT MODEL OF ENDOTOXEMIA WITH THE BLOCKADE OF PROTEASE ACTIVATED RECEPTOR-2 (PAR2)

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INTRODUCTION. Septic shock is the leading cause of patient mortality in intensive care units. The liver can be injured and its functions altered by activation of coagulation, vasoactive-peptide and inflammatory processes in sepsis. Endothelin (ET)-1, a potent vasoconstrictor, is implicated in the pathogenesis of a number of diseases.
OBJECTIVES. We examined the time-dependent alterations of ET-1, NO and inflammatory cytokine, such as TNF-α in liver tissue in a septic rat model. In the second part of this study, we investigated whether the blockade of PAR-2 could have any effect on the altered plasma and hepatic TNF levels as well as hepatic ET-1 level with the features of acute liver injury in LPS-induced endotoxemic models.
METHODS. Wistar rats at age 10 wks were administered with LPS (15 mg/kg) and then sacrificed at 1, 3, 6 and 10 h. In a separate series of experiments, we treated some LPS-administered rats with PAR-2 blocking peptide for different time points as stated above and then investigated some important parameters of sepsis.
RESULTS. (Part 1): 1. Administration of LPS resulted in increases in the plasma levels of TNF-α, and ET-1. Hepatic tissue TNF-a was peaked (4.5-fold) at 1 h of sepsis. 2. Time-dependently, the features of acute liver injury, hepatocytic necrosis were seen in LPS administered rats. 3. Plasma bilirubin, GOT and GPT levels were also significantly changed with the time of sepsis. 4. A 28-fold increase in ET-1 level was observed in liver tissue at 10 h after LPS administration while a peak increase of 14-fold ET-1 mRNA level was seen at 1 h after LPS administration in liver tissue.
(Part 2): Protease-activated receptors (PARs) connect coagulation proteases to cellular responses and represent one mechanism by which coagulation might affect inflammation. Of the 4 mammalian PARs, PAR2 can be activated by coagulation proteases VIIa and Xa but not thrombin. Interestingly, PAR2 blocking peptide improved the status of liver injury morphologically with a normalization of plasma GOT and GPT levels, and this improvement of liver injury was associated with suppression of TNF-α elevation, and normalization of ET-1 at both systemic and hepatic levels.
CONCLUSIONS. The present findings suggest that there might be a loss of balance between ET-1 and inflammatory cytokine in septic liver in different time points, which could contribute to the pathogenesis of acute liver injury in endotoxemia. And blockade of PAR-2 for 3 h seems to be beneficial to reverse the acute liver injury in endotoxemia.
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0371

DO SOLUBLE LEVELS OF ENDOTHELIAL ADHESION MOLECULES REFLECT ENDOTHELIAL ACTIVATION?

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INTRODUCTION. Endothelial activation is a pivotal event in the development and escalation of sepsis into severe sepsis and ultimately septic shock. A central part of endothelial activation is the TNF-α induced up-regulation of endothelial cellular adhesion molecules (CAMs) CD31 (PECAM-1), CD54 (ICAM-1), CD62E (E-Selectin) and CD106 (VCAM-1). These CAMs are also found in a soluble (sCAMs) form (sCD31, sCD54, sCD62E, and sCD106). It has been shown that sCAMs correlate with disease severity. However, it has not been shown to what extent sCAMs reflect the endothelial surface expression of CAMs. If sCAMs reflect surface-bound CAMs, sCAMs may hold significant potential as markers of endothelial activation.
OBJECTIVES. To examine if sCAMs correlate with surface-bound CAMs in a dose-dependent and time-dependent manner during activation.
METHODS. Human umbilical vein endothelial cells (HUVECs) were cultured in vitro with various concentrations of TNF-α (0, 0.625, 1.25, 2.5, 5 and 10 ng/ml) for 8 h and at a fixed concentration of 2.5 ng/ml TNF-α for various time periods (0, 1, 2, 4, 8, 16, and 24 h). Levels of soluble and surface-bound CD31, CD54, CD62E and CD106 were measured in the cell media and on HUVECs using flow cytometry. CD31 was used as a marker of endothelial cells.
RESULTS. TNF-a increased soluble and surface-bound CAMs expression in a dose-dependent manner and we found a significant correlation between sCAMs and CAMs: CD31 and sCD31 (Spearman′s rho = 0.49, p = 0.039), CD54 and sCD54 (Spearman′s rho = 0.75, p < 0.001), CD106 and sCD106 (Spearman′s rho = 0.94, p < 0.001) and CD62E and sCD62E (Spearman′s rho = 0.65, p = 0.003). We also found that TNF-a increased soluble and surface-bound CAMs expression in a time-dependent manner and found the following correlations between sCAMs and CAMs: CD31 and sCD31 (Spearman′s rho = −0.18, p = 0.437), CD54 and sCD54 (Spearman′s rho = 0.90, p < 0.001), CD106 and sCD106 (Spearman′s rho = 0.81, p < 0.001) and CD62E and sCD62E (Spearman′s rho = 0.62, p = 0.003).
CONCLUSIONS. The use of sCAMs as markers of endothelial activation is supported by this in vitro study. Particularly the use of sCD54, sCD106 and sCD62E as markers of endothelial activation seems promising—and should be implemented in future clinical studies of endothelial activation in critical ill patients.

0372

TREND ANALYSIS OF URINE BIOCHEMISTRY PATTERN IN PATIENTS WITH SEVERE SEPSIS OR SEPTIC SHOCK

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INTRODUCTION. Although many physicians to distinguish pre-renal forms from intra renal forms of AKI use urine biochemistry profile, its accuracy has been recently challenged. Sepsis is the leading cause of AKI in ICU patients. However, detailed description of electrolytes urine excretion has been scarcely reported during the course of sepsis.
OBJECTIVES. The goal of this study was to describe the evolution of urine biochemistry patterns and to determine their association with sustained or transient AKI during the course of sepsis.
METHODS. Single-center retrospective study. Patients admitted with severe sepsis or septic shock between 2006 and 2010 were included. Patients with chronic renal failure were excluded. AKI was defined as AKIN stage ≥1. Transient AKI was defined as reversal of AKI by day 5. The Following parameters were calculated on a daily basis until day 5: urine Na+/K+ (Na/K u), creatinine Urine/creatinine Plasma (U/P creat), excretion fraction of Na + (FeNa+), excretion fraction of urea (FeUrea). Results expressed in median (IQR) or %, non parametric tests, p < 0.05 considered as significant.
RESULTS. 160 patients were screened. 85(53 %) patients had AKI on admission, including 40 (25 %) with transient AKI. 19 (11.8 %) died during the first 5 days. Characterisitics of patients with AKI on admission: diabetes (16 %), hypertension (47 %), cancer (23 %), contrast media within 24 h (55 %), vancomycine (34 %). Origin of sepsis: abdominal (58 %), lung (28 %), urine (9 %), soft tissues (8 %). SAPS2 50(44-61), mechanical ventilation (81 %).

Table 1 Urine biochemistry during the first 5 da

	Admission	D1	D2	D3	D4	D5	p value
Na/K U, sustained AKI	0.73 [0.39–1.28]	0.86 [0.44–2.37]	1.5 [0.47–2.1]	1.74 [0.71–5.33]	1.62 [0.7–3.44]	1.8 [0.46–4.07]	0.07
Na/K U, transient AKI	0.71 [0.35–1.66]	0.77 [0.41–1.22]	0.88 [0.47–2.1]	1.45 [0.63–2.59]	1.55 [0.63–2.9]	1.75 [0.73–4.6]	
U/P créat, sustained AKI	34 [24–55]	31 [22–66]	23 [12–44]	17 [11–39]	22 [11–55]	22 [13–51]	0.25
U/P créat, transient AKI	49.3 [23–88]	60 [43–90]	58 [37–111]	67 [44–101]	77 [44–125]	79 [37–125]	
FeNa, sustained AKI	0.74 [0.24–1.03]	1.02 [0.25–2.1]	1.4 [0.48–3.6]	2.62 [0.73–5.4]	1.23 [0.189–4.5]	1.81 [0.27–5.3]	<0.001
FeNa, transient AKI	0.39 [0.17–1.24]	0.47 [0.23–1.12]	0.58 [0.28–1.3]	0.52 [0.15–1.07]	0.59 [0.34–2.05]	0.77 [0.34–2.05]	
FeUrea, sustained AKI	26.2 [16.9–35]	28 [16.7–37]	30.5 [27–38]	36 [27–45]	34 [19–42]	41 [27–45]	0.01
FeUrea, transient AKI	25 [17.8–34.2]	29 [21.5–37]	33 [28–41]	39 [32–48]	41 [30–49]	51 [34–56]	

CONCLUSIONS. Urine biochemistry on admission could not predict the rapid reversibility of AKI in severe septic patients. However, trends patterns of urine biochemistry significantly differed between groups, especially FeNa and FeUrea. Therefore, the trend of urine chemistry pattern rather than a single timepoint measurement should be considered to predict the reversibility of AKI in septic ICU patients.

0373

ZONULIN—A NOVEL MARKER OF GUT WALL INTEGRITY DURING SEPSIS

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INTRODUCTION. Zonulin is an eukaryotic protein structurally similar to *Vibrio cholerae*'s zonula occludens toxin. It plays an important role in the opening of small intestine tight junctions [1]. The loss of gut wall integrity during sepsis might be pivotal and has been

described in various experimental as well as human studies [2]. Increased levels of zonulin could be demonstrated in diseases associated with increased intestinal inflammation, such as celiac disease and type 1 diabetes [3]. We therefore investigated the role of zonulin as a non-invasive marker of gut wall integrity.
OBJECTIVE. Investigation of serum levels of zonulin in patients with sepsis.
METHODS. Serum level of zonulin was measured in 25 patients with sepsis, severe sepsis or septic shock according to *ACCP*/SCCM criteria at the first day of diagnosed sepsis. 22 patients admitted to the ICU who underwent surgery and 20 healthy probands served as control. Serum levels were determined by using commercially available ELISA kit. Data are given as mean ± SEM.
RESULTS. A significant increase of zonulin serum level was found in the sepsis group: 7.45 ± 1.22 ng/ml, as compared to the healthy controls: 4.17 ± 0.44 ng/ml ($p = 0.017$), but not as compared to post-surgical controls: 6.86 ± 1.62 ng/ml ($p = 0.772$).
CONCLUSIONS. Disruption of the gut wall integrity may be detrimental in sepsis. Our data provide evidence for a defective tight junction regulation in the small intestine during sepsis. Zonulin may be a useful marker for the assessment of preserved or disrupted gut wall integrity in sepsis.
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0374

EFFECTS OF TNF*A* ON MUSCLE MEMBRANE EXCITABILITY: A MODELIZATION OF IONS CURRENTS AND MUSCLE ACTION POTENTIAL

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INTRODUCTION. We have shown in a preceding report that the physiopathology of critical illness polyneuromyopathy involved TNFα, a key mediator of sepsis [1]. Its effects could be explained by a decreased membrane excitability which is clinically observed mainly in limbs and diaphragm [2]. This decrease in muscle membrane excitability could be related to its effects on resting membrane potential and ions currents and then action potential (AP) triggering.
OBJECTIVES. To check this hypothesis, we have developed a model of muscle action potential based upon the formulation of Adrian and Peachey [3], derived from the classical Hodgkin and Huxley model.
METHODS. We have optimized our model by introducing our previously obtained experimental data of sodium and potassium currents including conductances, time constants and half-activation and inactivation potentials recorded from isolated fibres from rat *peroneus longus.* We also added the equations corresponding to other currents involved in the action potential and especially the sodium/potassium pump one. The model implementation was carried out with Excel®. Then, these different parameters were modified to correspond to our experimental values recorded in TNFα treated fibres.
RESULTS. The simulated AP fitted well onto the AP recorded in isolated muscle fibre. Our model reproduced quite well the decrease in sodium current, the increase in resting potential and confirmed that TNFa induced an increase in AP triggering threshold (Fig. 1).

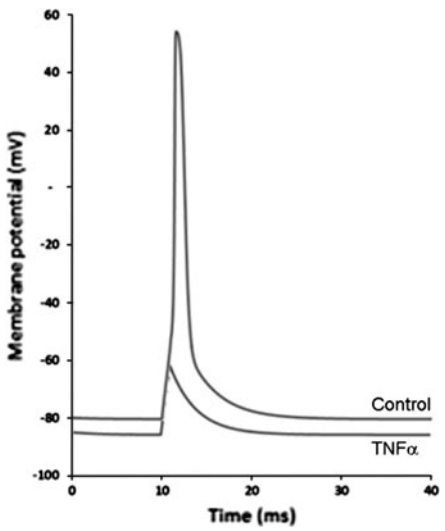

Fig. 1 Simulated AP in control and TNFα conditions

CONCLUSIONS. No muscle AP simulation model previously published could fit onto experimentally recorded currents. The model we proposed allow to reproduce the recorded currents in control and in TNFα treated fibres but also the decrease in membrane excitability induced by TNFα. In addition, the increase in resting potential induced by TNFα via sodium/potassium pump stimulation appears to be crucial in the decrease of the membrane excitability.
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GRANT ACKNOWLEDGMENT. This work was supported by french ministry of research.

Outcome from intensive care: 0375–0387

0375

A POPULATION-BASED STUDY OF ACUTE NEUROMUSCULAR RESPIRATORY FAILURE IN NORTHERN IRELAND: AETIOLOGY AND OUTCOME

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INTRODUCTION. Acute neuromuscular respiratory failure (NMRF) is a life-threatening feature of various neurological conditions. Due to prolonged ventilator dependence and ICU stay, the impression of outcome in this patient group is guarded. Population-based data on the frequency, outcome and spectrum of aetiology is limited [1].
OBJECTIVES. In this population-based study we sought to establish a true picture of the spectrum of causes and outcome of acute neuromuscular respiratory failure requiring ICU admission.
METHODS. Regional ICU databases were searched for patients admitted with acute NMRF from 1/1/2000 to 31/12/2010. Demographics, diagnosis, length of ICU stay, follow up and outcome (modified Rankin Score: mRS) were recorded. A comparison dataset of all non-NMRF Neurology patients admitted to ICU was obtained.
RESULTS. 55 acute NMRF patients were identified over 11 years; age 17–88 (median 63 years), M:F ratio 1:1.5. IR: 2.8 (0.8, 4.8) cases per million person-years; MR: 0.3 (0, 2.2) deaths per million person-years. Final diagnosis was inflammatory neuropathy (36 cases), myasthenia gravis (10), rhabdomyolysis (1) and motor neuron disease (5). Three cases were undiagnosed. Follow up ranged from 0 to 7 years (median 500.5 days); long term mRS: 1 (range 0–6). 74.5 % (41 cases) were independent at last follow up, mRS <4. Dependence was more likely in MND and undiagnosed cases (p: 0.05). Multiple regression analysis revealed no influence of age (p: 0.06), sex (p: 0.39), symptom duration (p: 0.07), length of ICU stay (p: 0.19) or need for invasive ventilatory support (p: 0.63) on likelihood of long-term dependence. NMRF patients were older ($p < 0.0001$), had longer ICU stay (p: 0.02) but significantly better outcome ($p < 0.0001$) than 93 non-NMRF neurology patients requiring ICU admission whose RR of long term dependence: 2.0 (1.5, 2.7) and RR death in hospital: 1.1 (1.0, 1.3) was higher.
CONCLUSIONS. This work provides the first population-based data on acute NMRF and highlights the potential for favourable outcome in cases with inflammatory aetiology in particular.
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GRANT ACKNOWLEDGMENT. NAD.

0376

HEALTH RELATED QUALITY OF LIFE 6 MONTHS AFTER DISCHARGE FROM INTENSIVE CARE UNIT: A COHORT STUDY

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OBJECTIVES. The measurement of health related quality of life (HRQOL) is important to examine effectiveness of health interventions. We have studied the HRQOL 6 months after hospital discharge in patients requiring mechanical ventilation (MV).
METHODS. Cohort study in a medical-surgical ICU for a period of 1 year (July 2010–June 2011). The enrolled patients were those requiring MV ≥24 h at ICU. The main variable was the HRQOL of surviving patients before their admission in ICU and 6 months after hospital discharge. We assessed quality of life by means of EuroQol-5D (EQ-5D). Each dimension of the test was defined as: unlimited (value 1) or limited (includes values 2 and 3). Other variables studied were APACHE II score, sex, age, surgery, MV duration, hospital stay and mortality (ICU, hospital, 6 months). Statistical analysis: descriptive with McNemar test, *t* Student paired samples, and multivariate with logistic regression.
RESULTS. A total of 305 patients were studied. ICU, hospital and at 6 months mortality were 36, 41 and 43 %, respectively. ICU survivors population consisted of 118 patients, aged 62 ± 14 years, APACHE II score 24 ± 8, duration MV 10 ± 13 days, ICU and hospital stay 16 ± 18 and 25 ± 23 days, respectively. Descriptive analysis of the pre-ICU EQ-5D: mobility (75 vs. 25 %), self-care (79 vs. 21 %), usual activities (62 vs. 38 %), pain/discomfort (54 vs. 46 %) anxiety/depression (71 vs. 29 %). Descriptive analysis of at 6 months EQ-5D: mobility (without/with: 62 vs. 38 %), self-care (74 vs. 26 %), usual activities (33 vs. 67 %), pain/discomfort (51 vs. 49 %) anxiety/depression (57 vs. 43 %). ICU survivors, 44 % (52 of 118), did not have any restrictions upon admission (EQ-5D: 11111), and drops to 28 % (12 of 33) at 6 months ($p = 0.005$). Logistic regression analysis shows that the limitation in dimension of mobility is associated with female gender (OR 2.56; CI 95 % 1.05–6.22; $p = 0.038$), age (OR 1.04; CI 95 % 1.009–1.073; $p = 0.013$) and APACHE II score (OR 1.11; CI 95 % 1.01–1.21; $p = 0.024$).
CONCLUSION. Only a third of the survivors and one tenth of all patients admitted at ICU requiring MV experienced excellent HRQOL after 6 months of hospital discharge.

0377

EPIDEMIOLOGY OF FUNGAL INFECTIONS IN A GATROENTEROLOGY AND LIVER TRANSPLANT INTENSIVE CARE UNIT (ICU): AN INDIAN EXPERIENCE

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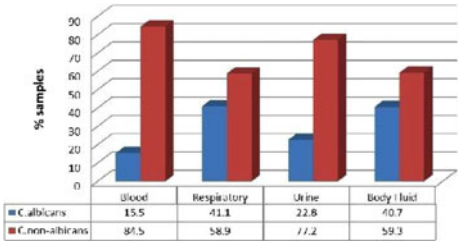
INTRODUCTION. Fungal infections are becoming an increasing cause of health-related infections and have been associated with an increasing morbidity and mortality. The increase in complex surgical procedures, potent immunosuppression in solid organ transplant recipients, invasive monitoring lines, use of broad spectrum antibiotics and extremes of age requiring treatment in ICU are responsible for rise in invasive fungal infections. The rising trend of non-albicans species and its differing sensitivity pattern to routine anti-fungal agents are a concern and resulting in increasing mortality among ICU patients.
OBJECTIVES. We wanted to look at the epidemiology of candida infections in our ICU and also the sensitivity pattern of various isolated species.
METHODS. We conducted a retrospective data analysis of all cultures that were sent for patients admitted in gastroenterology and Liver Transplant ICU of a tertiary care hospital between July 2010 to March 2012. The candida species infections isolated were divided into albicans and non-albicans species and their sensitivity pattern was also evaluated.

RESULTS. Total of 7462 samples were analysed out of which 1922 were blood samples, 2010 were respiratory secretion samples, 1600 were urine samples and 1930 were body fluid samples. Candida was isolated in 216 samples with candida albicans species in 70 samples (32.4 %) and non-albicans species in 146 samples (67.6 %). Among all candida infections, candida albicans was the predominant infection present in 70 samples (32.4 %), followed by candida tropicalis present in 58 samples (26.8 %) and candida haemulonii in 35 samples (16.2 %). Other candida non-albicans species were present in small sporadic numbers. Candida was isolated in 84 (38.8 %) blood samples, 78 (36.1 %) respiratory secretions, 22 (10.1 %) urine samples and 32 (14.8 %) body fluid samples. Candida non-albicans species were predominant infection in all body sites with 71 (84.5 %) blood samples predominantly candida tropicalis, 46 (58.9 %) respiratory secretions predominantly candida haemulonii, 17 (77.2 %) urine samples predominantly candida tropicalis and 19 (59.3 %) body fluid samples predominantly candida tropicallis.



% of various samples

Candida albicans species showed excellent sensitivity to all azoles, amphotericin B and echinocandins whereas non-albicans species had varied sensitivity patterns depending on the species isolated. Candida hemulonii, krusei and rugosa showed 100 % resistance to fluconazole and amphotericin B with good sensitivity to voriconazole and echinocandins.
CONCLUSIONS. The identification and rising prevalence of non-albicans species is a worldwide concern as they show resistance to the commonly used antifungal agents and have resulted in increasing mortality in ICU patients.

0378
"CASE MIX" CHANGES IN A MEDICAL INTENSIVE CARE UNIT AFTER A GEOGRAPHICAL TRANSFER OF A THIRD LEVEL, UNIVERSITY HOSPITAL

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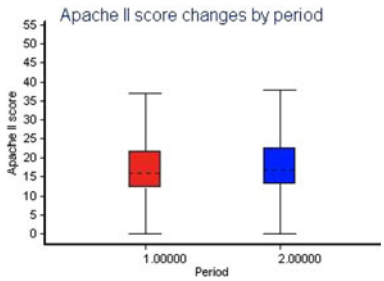
INTRODUCTION. Information about big hospital geographical transfer is scarce in the medical literature. On February 20th of 2011 our Hospital (in fact, a big university complex) was transferred from their previous location in the North-Center of our city towards a new Southern peripheral, geographical location. This transfer has been done without any changes in assisted population nor nursing or medical staff.
OBJECTIVES. Our aim is to analyze possible changes in the main characteristics of our "Case Mix" (Origin, previous quality of life and NYHA score, main diagnostic groups, severity scores, and in ICU, in hospital mortality).
METHODS. A number of 2,774 cases (63 % males; mean age 61 years) were admitted in our medical ICU during the study period (1 year before and after the transfer). We have compared both groups (previous and before) by using simple statistical contrasts (Chi square and Oneway analysis of variance). Bonferroni's correction, if appropriate, was done to overcome the problem of multiple contrasts. *Minitab* and *Statbas* statistical packets were used.
RESULTS. No differences between both groups were founded in demographic data, Knaus score and NYHA status. Regarding their origin, we have founded more patients admitted from other hospital centers (20 vs. 29 %; $p < 0.001$). Apache II score increase from 17.24 to 19.08 ($p < 0.001$) and a slight increase change in Saps 3 score was founded too (52.29 to 53.75; $p < 0.01$). In spite of these increases in severity indexes and their associated mortality, our in ICU mortality remains lower (15.5–15.6 %) whereas observed in hospital mortality decreased (22.37–19.88; $p < 0.001$). An increase in our neurologic patients has been the most consistent change regarding diagnostic groups.



CONCLUSIONS. According to the previous data our ICU seems to perform better in the new location with a decrease in Standardized Mortality Rate. On the other hand we are admitting more patients transferred from other hospitals.

0379
EPIDEMIOLOGY OF ACUTE RESPIRATORY INSUFFICIENCY IN CRITICAL CARE (ERICC TRIAL): A PROSPECTIVE, MULTICENTER, OBSERVATIONAL STUDY IN BRAZILIAN ICUS

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INTRODUCTION. Acute respiratory failure (ARF) severe enough to require mechanical ventilation (MV) is the most common organ failure in general intensive care units (ICUs). Despite the importance of this dysfunction, no epidemiological multicenter study was previously done to evaluate the epidemiology of this condition in Brazilian ICUs.
OBJECTIVES. Our purpose in this prospective multicenter cohort study was to evaluate the incidence, treatment and mortality of ARF in Brazilian ICUs.
METHODS. Adult patients in 44 ICUs were screened for use of invasive or noninvasive ventilatory (NIV) support during an 8-week period. Patients needing ventilatory support for more than 24 h were included and defined as ARF patients. Risk factors for ARF and details of prior chronic health status were assessed. Ventilatory and concomitant treatments were evaluated and recorded daily during the first 3 days of ICU stay. ICU and hospital mortalities were assessed. Data are shown as percentage or median [P25, P75] as indicated. A stepwise binary logistic regression was built in order to verify variables associated with hospital mortality.
RESULTS. A total of 773 patients were studied. The mean age was 59 ± 21 yo, 56 % were male, 28 % were surgical, the BMI was 26 ± 11 and the Charlson index was 0 in 41 %, 2 in 34 % and >2 in 25 % of the patients. The main reasons for intensive care unit admission were pneumonia (27 %), polytraumatism (12 %) and non-pulmonary sepsis (9 %). Sixty-four percent of the patients needed vasopressors and 19 % needed renal replacement therapy (RRT). Conventional mechanical ventilation was used in 81 % of the patients and 19 % used intermittent NIV. The pre-ICU hospital LOS was 1[0, 3] days, the ICU-LOS was 10[6, 18] days and the hospital-LOS was 20[11, 34] days. ICU and hospital mortality were 34 and 42 %, respectively. In the multivariate analysis, age (odds ratio [OR], 1.019; 95 % confidence interval [CI] 1.01–1.03), SAPS3 (OR, 1.02; 95 % CI, 1.01–1.04), Charlson index >2 (OR, 2.01; 95 % CI 1.27–3.16), need for vasopressors (OR, 1.96; 95 % CI 1.36–2.81), need for RRT (OR, 2.25; 95 % CI, 1.47–3.44) and failure of NIV (OR, 3.07; 95 % CI, 1.30–7.24) were associated with increased hospital mortality.
CONCLUSIONS. Acute respiratory failure in Brazilian ICUs is related to significant mortality rates. The presence of previous comorbidities, the disease severity and the unsuccessful use of NIV are associated with increased hospital mortality.
GRANT ACKNOWLEDGMENT. Research and Education Institute, Hospital Sírio-Libanês.

0380
DIARRHOEA IS ASSOCIATED WITH ADVERSE OUTCOMES IN CRITICAL CARE

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INTRODUCTION. Diarrhoea is common in Intensive Care Unit (ICU) patients, with a reported prevalence of 15–38 % [1]. Many factors may cause diarrhoea, including *Clostridium difficile*, drugs (e.g. laxatives, antibiotics) and enteral feeds. Diarrhoea increases nursing workload, impacts on patient dignity, increases costs, and exacerbates morbidity through dermal injury, impaired enteral uptake and subsequent fluid imbalance.
OBJECTIVES. To identify the prevalence, aetiology and clinical impact of diarrhoea on our ICU.
METHODS. A retrospective observational study of all ICU patients treated in a 35-bed tertiary ICU from 01/01/2006 to 30/09/2011 was performed. ICU patients from whom stool samples had been sent for microbiological analysis (including microscopy, *C. difficile* assays and virology) were assumed to have suffered diarrhoea. Stool sample results were compiled with patient demographics, ICU length of stay (LOS) and ICU mortality data.
RESULTS. Of 11294 patients (mean age ± SD 58.0 ± 18.5 years, 54.9 % male) treated on our ICU, 1464 (13.0 %) patients had stool samples sent. 139 patients (9.5 %) had positive stool samples: 8 out of 1393 (0.6 %) patients with stool cultures sent, 119 out of 1278 (9.3 %) patients with *C. difficile* antigen or toxin samples sent, and 13 out of 296 (4.3 %) patients with stool virology samples sent had a positive sample. The prevalence of *C. difficile* (119/11294) and Norovirus (11/11294) was 1.1 and 0.1 % respectively. When compared to patients without diarrhoea, sufferers were older (59.4 ± 18.2 vs. 57.8 ± 18.5 years, $p = 0.002$) and predominantly from medical admissions (63.6 vs. 29.4 %, $p < 0.0001$). Sufferers experienced longer ICU LOS (15.5 ± 18.9 vs. 3.0 ± 5.0 days, $p < 0.0001$) and greater ICU mortality (20.6 vs. 8.4 %, $p < 0.0001$) during the study period.
CONCLUSIONS. Diarrhoea was common on our ICU, with a prevalence of 13 %. It was associated with statistically increased ICU LOS and ICU mortality, although a causal link remains to be established. A low yield of stool investigations and low prevalence of *C. difficile* and Norovirus suggest that other non-infective causes of diarrhoea need excluding. Further research is required to establish the prevalence and pathogenesis of diarrhoea on UK ICUs, in order to develop evidence-based management plans for reducing incidence of ICU diarrhoea, and its clinical and financial impact.
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0381
SATISFACTION LEVEL OF PATIENTS AFTER ICU DISCHARGE

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OBJECTIVES. To evaluate patients' satisfaction level after ICU discharge. To know whether patients would accept another ICU admission if necessary.
METHODS. Prospective, observational, unicentric and cohort trial. We included all the admitted patients consecutively in a polyvalent ICU, in an academical hospital, during 20 months. We defined two cohorts: young cohort (YC) including patients <65 yo and elderly cohort (EC) including patients ≥65 years. We collected epidemiological and clinical data during admission period and satisfaction level 6 months after ICU discharge, using a telephonic satisfaction test including two closed-ended questions. We performed a descriptive analysis of baseline characteristics of both cohorts and a comparative analysis between both cohorts. $p < 0.05$ was considered statistically significant.
RESULTS. We included 466 patients (208 YC/258 EC), mean age 50 ± 11 yo (YC) and 75 ± 6 yo (EC). Both cohorts were similar in severity of illness at admission (APACHE II modified by age 10.8 points YC/10.9 points EC; p ns), quality of life prior to admission (PAECC score 3.1 YC/4.4 EC; p ns), source of admission and length of ICU stay (13.5 days YC/15.4 days EC; p ns). The satisfaction test was answered by 330 patients 6 months after ICU discharge (159 YC/171 EC). 103 patients died during inhospital stay (ICU/ward) or during follow-up period (28 YC/75 EC) and 33 patients were lost during follow-up (21YC/12EC). Satisfaction level after ICU discharge was high in both cohorts (85 % YC/87 % EC; p ns). Most of patients would accept another ICU admission if necessary (94 % YC/91 % EC: p ns).

CONCLUSIONS. Most of survivor patients after ICU discharge didn't remember that period as a bad experience. They would accept another ICU admission, independently of age, if necessary.

0382
SURVIVING SEPSIS CAMPAIGN GUIDELINES AND MORTALITY

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INTRODUCTION. Surviving Sepsis campaign (SSC) Guidelines formed part of a plan to reduce severe sepsis mortality by 25 % in 2009.

OBJECTIVES. To analyze the *health-care* activities according to the 2008 Surviving Sepsis Campaign (SSC) guidelines in patients with severe sepsis or septic shock admitted in Intensive Care Unit (ICU), and relating them to mortality.

METHODS. From October 2008 until May 2010, a prospective cohort study study of 150 patients >17 years without *limitation* of *therapeutic effort*, was developed. We considered a 6-h resuscitation bundle and the management bundle within 24 h. 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 lactate measurement was made in appropriate time window in 91 % (n = 136). The blood culture was extracted in 32.67 % (n = 49) and antibiotherapy was indicated in 84 % (n = 126) before the 60 min from the beginning of severe sepsis. The infectious focus was drained within time windows in 66.7 % (n = 26), the *hypovolemia* has resolved in 84 % (n = 126) and 57.4 % (n = 74) received vasopressors in the first hour. Targeting *fluid therapy* was fulfilled in 80 % (n = 120), with correct interval of time in 66 % (n = 99). The measurement of the central or mixed venous saturation was fulfilled in a 68 % (n = 102), with smaller mortality in the group (47 %, n = 71) that was monitored in the correct window of time (7.7 vs. 23.1 %) and with scores >70 % or >65 %. The management bundle within 24 h with low-dose steroids if Septic Shock did not respond to fluid and vasopressors (n = 95) fulfilled in 87 % (n = 83); 83 % (n = 124) maintain glucose values ≤150 mg/dl without detected of hypoglycemia (<60 mg/dl); 31 patients received activated drotrecogin alfa with more than two organ *dysfunction* and clinical evaluation of high risk of death, although just 87.4 % received within the first 24 h. Finally, the 78 % (n = 70) of the patients received protective mechanical ventilation (total = 90) and showed significant lower mortality (25.7 vs. 50 %; Chi Square = 4.281; p = 0.03. The 13.3 % (n = 20) of our patients completed all resuscitation bundle and 16.6 % (n = 25) all the management bundle, these patients showed significant lower mortality, 5 vs. 25 %, p = 0.03 and 4 vs. 26 %, p = 0.008 (Chi Square).

CONCLUSIONS. It is necessary to realize the resuscitation bundle within the first 6 h and the management bundle within 24 h recommended by SSC Guidelines; when they are 100 % complimented the patient mortality is significantly reduced.

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0383
IMPACT OF COMPUTERIZED MEWS ON ADULT HOSPITALIZED PATIENT CARE

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INTRODUCTION. Serious deterioration of hospitalized patients can be prevented by recognizing early warning signs of clinical abnormalities and responding appropriately. Patient safety depends on the decision of nurse to call for skilled assistance and start appropriate interventions. Infrequent and incomplete recording of vital signs and misinterpretation of clinical data can associated with the inability to recognize the clinical urgency and a possibly avoidable serious adverse event. Most of the currently available computerized systems are capable of not only collecting the data and documenting the clinical course but, in same instances, they are making suggestions regarding patient management.

OBJECTIVES. Purpose of the project is to improve patient care in the hospitals of the Health System of Florence, Italy (5 hospitals, 1600 beds) through an early identification and rapid assessment on behalf of patients experiencing near or actual medical emergencies, by implementing a computerized patient data collection system (Modified Early Warning Score-MEWS) and providing a better quality of data collected directly from bedside.

METHODS. A focus group was formed to evaluate the work flow impact and educational needs. The electronic documentation system has been revised to capture the MEWS data and automatically convert the physiological data collected into a score and a "warning alert message" in the nurse electronic health record. Nursing staff members collected data while performing routine duties and were educated about the purpose of the MEWS and the interventional flow chart. A pilot study started in our hospital (200 beds total) from December 2010 to November 2011. Data collected with computerized MEWS have been compared to manual record of MEWS collected in a previous experience.

RESULTS. Data were received on 1843 MEWS electronic recorded in surgery wards (Sw) and 2305 in medical wards (Mw). Of these, MEWS 3 (closer observation) were 13.4 % in Sw vs 23.6 % in Mw, MEWS 4 (call doctor on duty) were 6 versus 8.3 % and MEWS 5 (call critical care service) were 3.3 versus 5.7 %. Nurse adherence to the flow chart was 45.9 % in Sw versus 31.8 % in Mw for MEWS 3, 39.4 versus 44.8 % for MEWS 4, 35.1 versus 26.7 % for MEWS 5.

CONCLUSIONS. Implementing electronic MEWS has improved to recognized a change in the patient status and therefore the initation of medical consultation and treatment according to the flow chart. The computerized system helps the nurse staff to instantaneously integrate and analyze the data collected to provide the appropriate response reducing human errors. It also collects more data-items compared to the manual record increasing the quality of the captured data. Instead of written data collection sheet, data are stored into databases. All the data can be easily reviewed for process evaluation, clinical audit and educational purposes. All these features make computerized MEWS an excellent source for analyses on critical events and incidents.

0384
OUTCOME OF COMPLEX MULTI-SYSTEM DISORDER PATIENTS REQUIRING MULTIPLE ORGAN SUPPORT WITH A PROLONGED ICU LENGTH OF STAY

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INTRODUCTION. Advanced multiple organ support and prolonged ICU stay is associated with higher mortality [1], leading to prognostic pessimism and reticence to provide higher support for some patients [2]. Treatment modalities/options for advanced disease states, inc cancer and transplantation have grown rapidly. Complex sub-specialty patients (i.e. tertiary centre managed care) with advanced disease (ASA 4) are showing evidence of improved survival [3–4], especially when managed on high volume ICUs [5]. Analysis of near real time data collated for the ICNARC Case Mix Programme in a 20 bed Intensivist run tertiary (sub-specialist quaternary) University General ICU (inc transplant (multi-visceral and liver), hepatology, respiratory, haem-oncology (post stem cell transplant) and multiple body cavity surgical patients) is presented.

OBJECTIVES. To assess survival outcomes in patients with advanced complex disease requiring multiple organ support and prolonged ICU stay.

METHODS. As a participating unit in the ICNARC CMP, demographic, clinical and biochemical data of all patients admitted to the ICU in 2010–2011 was collected contemporaneously. This was retrospectively analysed to ascertain characteristics of the patient cohort, degree of illness, burden of organ support, ICU length of stay (LoS) and both ICU and in-hospital mortality.

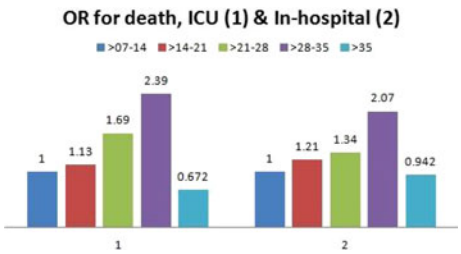
RESULTS. A total of 1823 admissions; 1675 patients with 148 readmissions, mean age 59 (16–92), 57 % (1004) males and APACHE II mean 18, median 17 (3–37). ICU LoS mean 6.4, median 4.4 days (0.2–120), with 24.2 % (441) and 12.9 % (236) stays longer than 7 and 14 days respectively. The number of organs supported, exc GI/liver support, shows a mean of 2 with median of 2 (1–4). Breakdown of organ support and ICU/in-hospital mortality versus ICU length of stay is shown below. ICU and in-hospital crude mortality 13.4 and 21.6 %, with an o*dds ratio (OR) for death >35 d for ICU and hospital, 0.67 and 0.94, respectively.* ICNARC score SMR 0.78.

LoS versus number of organs supported

Length of stay (days)	1 organ support	2 organ support	3 organ support	4 organ support
Up to 7	217	784	307	74
>07–14	3	112	81	9
>14–21	0	49	45	5
>21–28	0	23	32	6
>28–35	0	11	18	2
>35	0	16	24	5

LoS versus ICU and hospital outcome

Length of stay, days	Total no. of admissions	ICU deaths, no. of patients	ICU deaths, as % of all admissions	ICU deaths, % of LoS sub-group	Odds ratio ICU mortality (95 % CI)	In-hospital deaths, no. of patients	In-hospital deaths, as % of all admissions	In-hospital deaths, as % of LoS sub-group	Odds ratio, in-hospital mortality (95 % CI)
>07–14	205	26	1.4	12.7	1.0 (0.56, 1.79)	43	2.4	20.9	1.0 (0.62, 1.61)
>14–21	99	14	0.7	14.1	1.13 (0.56, 2.28)	24	1.3	24.2	1.21 (0.68, 2.13)
>21–28	61	12	0.7	19.7	1.69 (0.79, 3.58)	16	0.8	26.2	1.34 (0.69, 2.60)
>28–35	31	8	0.4	25.8	2.39 (0.97, 5.9)	11	0.6	35.5	2.07 (0.92, 4.65)
>35	45	4	0.2	8.8	0.672 (0.22, 2.03)	9	0.5	20.0	0.942 (0.42, 2.10)



Odds ratio for death ICU and In-hospital versus LoS

CONCLUSIONS. Despite high organ support need in complex multi-system impairment patients, prolonged ICU care was associated with *lower ICU and in-hospital mortality*. Maximal sub-group mortality is seen in the 28–35 d group, with a significant reduction in OR for death in >35 d group. Requirement for higher organ support is associated with relatively longer ICU LoS, with highest organ support days per patient seen in the >35 d sub-group. Potential better survival prospects in this sub-group of patients in the setting of rapidly improving pre-ICU and ICU care would suggest existing mortality data to be questionable, and may benefit from further work to better prognosticate outcome. In the context of evolving centralised specialist ICU care, this may have a tangible impact on ICU patient selection and planning for ICU care provision in the future.

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0385
AGE IMPACT IN MORTALITY AND QUALITY OF LIFE 6 MONTHS AFTER ICU DISCHARGE

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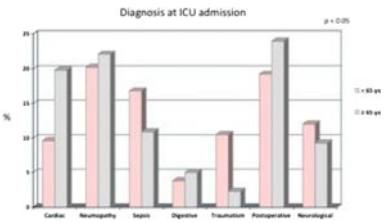
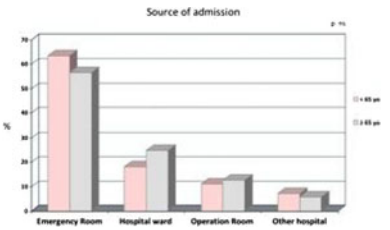
OBJECTIVES. To evaluate the effect of age in mortality and quality of life 6 months after ICU discharge.
METHODS. Prospective, observational, unicentric and cohort trial. We included all the patients consecutively admitted in a polyvalent ICU, in an academical hospital, during 20 months. We defined two cohorts: young cohort (YC) patients <65 yo and elderly cohort (EC) patients ≥65yo. We collected epidemiological and clinical data (comorbidity Charlson index, diagnosis at admission, origin, APACHE II modified by age, quality of life prior to admission measured by PAECC score, quality of life 6 months after ICU discharge, intensity of treatment, limitation of therapeutic effort during ICU stay (LTE) as not increase in therapeutic measures, length of ICU and inhospital stay and ICU, inhospital and 6 months after ICU discharge mortality. Both cohorts were compared using logistic regression, adjusted by confounding variables.
RESULTS. We included 466 patients (208 YC/258 EC), mean age 50 ± 11yo (YC) and 75 ± 6yo (EC), APACHE II modified 10.8 points YC/10.9 points EC; p ns, comorbidity Charlson index 1.4 YC/2.5EC; p ns, baseline functionalism (Barthel index) 96.6 ± 10.4 points YC/94.7 ± 11.4 EC; p 0.063, and quality of life prior to admission 3.1 ± 3.9 points YC/4.4 ± 4.2 points EC; p 0.055. There was statistically significant differences in the diagnosis at admission but not in the source of admission (annex I and II). There were no statistically significant differences in the intensity of treatment (annex III), but there were differences in the LTE (7.7 % YC/15.5 % EC; $p < 0.05$). The length of stay were similar in both cohorts (ICU 13.4 ± 17.1 days YC/15.4 ± 19.7 EC; p ns; inhospital 34.8 ± 41.5 YC/38.7 ± 39.3; p ns). Mortality was higher in EC (ICU 5.3 % YC/11.6 %; $p < 0.05$; inhospital 10.1 % YC/19.4 % EC; $p < 0.05$; 6 months after ICU discharge 4.3 % YC/14.5 % EC; $p < 0.05$). The quality of life 6 months after ICU discharge showed the same worsening (5.8 ± 5.5 YC/6.5 ± 5.8 EC; p ns). APACHE II modified (OR 1.1; $p < 0.05$) and the LTE (OR 24.2; $p < 0.05$) were independently associated with a high mortality. EC trended toward an increased mortality (OR 2.1; p 0.09). There were no association between comorbidity and mortality, neither between a worse quality of life prior to admission and mortality.



Annex I



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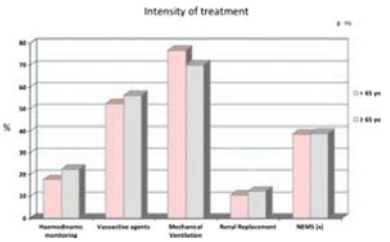

Annex III

CONCLUSIONS. Elderly patients admitted in our ICU have different diagnosis at admission compared with young patients. Elderly patients have more comorbidity and trend toward to have a worse quality of life prior to admission and functional status. Otherwise, they have the same severity of illness at admission. Comorbidity and quality of life prior to admission are not associated with a worse prognosis. Although elderly patients trend toward a high mortality, the severity of illness at admission and the limitation of therapeutic effort during ICU admission are independently associated with mortality. Quality of life 6 months after ICU discharge shows the same worsening independently of age.

0386
DIC (DISSEMINATED INTRAVASCULAR COAGULATION) STATUS ON ADMISSION TO ICU RELATES WITH THE MORTALITY IN CRITICALLY ILL PATIENTS

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INTRODUCTION. DIC (disseminated intravascular coagulation) is a critical complication for patients in ICU, regardless of the underlying their disease. And it is occurred by delayed resuscitation from shock which leads to endothelial cell injury and a procoagulant state [1]. In our previous study, DIC status caused fourfold ICU death and related to the severity of the etiologies were shown [2].
OBJECTIVES. Our hypothesis is DIC status on admission to ICU relates to long-term outcomes for critically ill patients.
METHODS. From January to December 2009, all adult patients admitted to our ICU were included in this study. Patients with hemorrhagic shock were excluded. Patients were diagnosed with DIC status on admission using the criteria by the Subcommittee on Disseminated Intravascular Coagulation of *the International Society of Thrombosis and Haemostasis* [based on platelet count, FDP, PT, and fibrinogen concentration] and a score was caluculated [3]. The primary outcomes were 14, 28, 60 and 90-day mortality. The independent variables were age, gender, primary diagnosis, SOFA score and DIC score on admission. The multivariable Cox regression model was used for analysis.
RESULTS. Of total four hundred and eighty patients (292 men, 188 women; age range 18–101 years), there were 82 trauma patients, 338 non-septic patients and 60 septic patients. The mortality ratio at 14, 28, 60 and 90-day from ICU admission were 23.3, 25.4, 26.4 and 26.7 %, respectively. DIC score statistically significantly associated with 14, 28, 60 and 90-day mortality (hazard ratio [HR] 1.16; 95 % confidence interval [CI] 1.05–1.29, HR 1.15; CI 1.04–1.27, HR 1.15; CI 1.04–1.27, HR 1.14; CI 1.03–1.26, $p < 0.05$, respectively). SOFA score had also statistically association with those mortalities (HR 1.21; CI 1.15–1.28, HR 1.22; CI 1.16–1.28, HR 1.21; CI 1.15–1.27, HR 1.22; CI 1.16–1.29, $p < 0.05$, respectively). Age was statistically associated with the mortality (HR 1.01; CI 1.0–1.02, HR 1.01; CI 1.0–1.02, HR 1.01; CI 1.0–1.03, HR 1.01, CI; 1.0–1.02, $p < 0.05$, respectively). There were no statistically significant associations between gender or primary diagnosis and mortality.
CONCLUSIONS. The severity of primary diseases on admission to ICU had related with the short-term and long-term mortality in critically ill patients. Moreover, DIC score on admission had also associations with not only the short-term but long-term outcomes.
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0387
EPIDEMIOLOGY AND OUTCOME OF THE SEPTIC PATIENTS IN A GENERAL INTENSIVE CARE UNIT

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INTRODUTION. Sepsis remains a major cause of morbidity and mortality in hospitalized patient. This disease accounts for 2 % of hospital admissions; roughly 9 % of the patients with sepsis progress to severe sepsis, and 3 % of those with severe sepsis experience septic shock, which accounts for 10 % of admissions to intensive care units (ICU) [1].
OBJECTIVES. Evaluate the epidemiology and outcome of septic patients identifying the factors correlated with mortality.
METHODS. Observational retrospective cohort study. We enrolled 173 (23.5 %) septic patients from 736 patients admitted in the ICU from January 2010 to December 2011. Criteria were based on the American College of Chest Physicians/Society of Critical Care Medicine Consensus Conference definition [2].
RESULTS. In the septic population 4 % had sepsis, 55.5 % severe sepsis and 40.5 % septic shock. Mean age was 63 years (21–87); 69.9 % male; 64.2 % nonsurgical; mean length of stay 8.3 (1–64) days. Pathogens were isolated in 42.2 % (73) patients, being 13.2 % (23) Gram-negative bacteria, 16.8 % (29) Gram-positive bacteria and 4.9 % (8) fungus. The lung was the most common site of infection (39.9 %), followed by abdomen (38.7 %). All patients were mechanically ventilated, 35.8 % submitted to minimal invasive monitoring and 8.6 % with a pulmonary catheter. Renal replacement therapy was used in 26 % of the patients. Most common organ dysfunctions were respiratory (93 %) and cardiovascular (76 %). Mean SAPS II 46.4 ± 20.1, SAPS 3 70.3 ± 17.3 and Charlson score 3.8 ± 4.6. There was no statistical correlation between co-morbidities and outcome (Mann–Whitney test). Mortality rates were: total (38) 21.9 %; severe sepsis (7) 18.4 %; septic shock (31) 81.5 %. Comparing deceased and survived patients (Wilcoxon test) we found statistical significance for SOFA score ($p < 0.0001$), SAPS II ($p < 0.0001$) and SAPS 3 ($p < 0.0001$). The most predictive factors for mortality [Quantile Regression and Receiver Operating Characteristics (ROC) curves with the area under the curve (AUC)] were: renal (ROC 0.76), cardiovascular (ROC 0.74) and respiratory (ROC 0.72) SOFA scores; SAPS II (ROC 0.81) and SAPS 3 (ROC 0.81).
CONCLUSIONS. Sepsis is usual in the ICU and dispends large amounts of resources, having high mortality rates. In this study the most powerful discriminative factors were SOFA, SAPS II and SAPS 3 scores. Septic shock was the most significant cause of mortality in the study population and, in an unexpected way, we did not find any influence of the co-morbidities.
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Haemorrhagic stroke: Interventions & markers: 0388–0401

0388
HIGH SENSITIVE TROPONIN-T (HS-TNT) AND BRAIN NATRIURETIC PEPTIDE (BNP) IN PATIENTS WITH SUBARACHNOIDAL HAEMORRHAGE (SAH)

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INTRODUCTION. BNP is released from the heart in patients with systolic or diastolic heart failure. In patients with SAH, myocardial injury and cardiac dysfunction are common findings. Troponin I and BNP are described to be elevated in these patients. There is a controversy whether, or not, elevated plasma BNP levels are associated with the development of heart failure in SAH patients [1–3].
OBJECTIVES. Serum markers of myocardial injury (hs-TnT) and function (NT-proBNP) and their association to the development of heart failure were studied in the early phase after SAH. Our hypothesis was that elevated levels of BNP are associated with the development of heart failure.
METHODS. In this prospective, observational singel-center study all consecutive patients admitted to the ICU/NICU with SAH <48 h were included. Blood samples were collected the

first 3 days after admittance according to a study protocol. The cut-off level for the diagnosis of heart failure was ≥900 ng/L (high NT-proBNP group). Hunt-Hess score and other medical data were recorded. Patients with clinically heart failure requiring inotropic support (dopamine, dobutamine or milrinone), undervent transthoracic echocardiography (TTE).
RESULTS. Clinical characteristics are shown in Table 1. 20 patients have been included during the first 2 months of the study. 45 % of all patients had elevated hs-TnT (>14 ng/L) and 65 % had elevated NT-proBNP (>900 ng/l). In the high NT-proBNP group, the incidences of myocardial injury and systolic dysfunction (LVEF < 50 %) and the need for inotropic therapy were higher compared to the low NT-proBNP group. The three patients with LVEF < 50 % had the highest peak levels of NT-proBNP (11200, 17900 and 20200 ng/L, respectively). One of these patients developed apical ballooning (Takotsubo cardiomyopathy) and another severe regional wall abnormalities.
CONCLUSIONS. These preliminary data, suggest that the incidence of myocardial injury after SAH is high. Furthermore, a substantial portion of patients develops serum marker evidence of systolic/diastolic dysfunction. In this group of patients, the incidence of heart failure requiring inotropic therapy is high. We conclude that high plasma levels of natriuretic peptides after SAH are associated with clinically important myocardial dysfunction.
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GRANT ACKNOWLEDGMENT. Department of Anaesthesiology and Intensive Care, Sahlgrenska University Hospital and Sahlgrenska Academy, University of Gothenburg, Sweden.

Table 1

	NT-proBNP < 900 ng/L (n = 7)	NT-proBNP ≥ 900 ng/L (n = 13)	*p* value
No. of females n, (%)	3 (43)	8 (62)	0.423
Age	51 ± 12	57 ± 17	0.320
Hunt-Hess score 4 or 5 n, (%)	1 (14)	3 (23)	0.639
Peak hs-TnT (ng/L)	9.8 ± 8,6	172 ± 231	0.026*
hs-TnT > 14 ng/L n, (%)	2 (29)	8 (62)	0.160
Peak NT-proBNP (ng/L)	425 ± 209	5661 ± 6788	0.020*
Inotropic support n, (%)	0 (0)	5 (39)	0.058
Incidence of LVEF <50 % n, (%)	0 (0)	3 (23)	0.168

0389
ANALYSIS OF CYTOKINE PROFILE, HEME METABOLISM AND OXIDATIVE STRESS AFTER HEMORRHAGIC STROKE

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INTRODUCTION. Intracerebral hemorrhage (ICH) is a deadly disease, accounting for about 15 % of deaths from stroke. Local and systemic inflammatory response and toxic hemoglobin metabolism byproducts formation seems to have a causal role in neuronal death and ICH prognosis [1].
OBJECTIVES. To evaluate dynamic cytokine profile, hemoglobin degradation products and oxidative stress and its relationship to brain injury severity and prognosis.
METHODS. This was a prospective cohort study conducted in three tertiary hospitals. All ICH patients with hemoventricle and external ventricular device (EVD) inserted who were admitted to the neurocriticalcare unit between 2008 and 2011 were included. We collected blood and cerebrospinal fluid (CSF) from the EVD on days 1, 2, 3, 5 and 7 after ICH for measurement of C-reactive protein, cytokines, iron, heme, hemoglobin, cytometry, hemopexin, haptoglobin, enolase and s100-B concentration. A multiplex analysis was performed to evaluate levels of 17 cytokines (IL-1 beta, IL-2, IL-4, IL-5, IL-6, IL-7, IL-8, IL-10, IL-12, IL-13, IL-17, interferon-gamma, granulocyte colony-stimulating factor [G-CSF], granulocyte–macrophage colony-stimulating factor, monocyte chemoattractant protein [MCP]-1, macrophage inflammatory protein-1 and tumour necrosis factor-alpha). CT scans were evaluated for hematoma and hemoventricle volume. Primary outcome was death in 7 days. This study was approved by the ethics committee of all participating institutions. Informed consent were signed by all study participants or their relatives.
RESULTS. Fifteen patients were included. Median age was 59 years (55–65), 6 patients (40 %) were male. Median Glasgow Coma Scale was 7 (6–9), APACHE II was 22 (15–25) and SAPS III was 43 (32–53). Five patients had hemorrhagic stroke and 10, subarachnoid haemorrhage. Overall mortality in 7 days was 60 % (9 patients) and in 28 days was 66.6 % (10 patients). Median hematoma volume was 10.53 ml (5.42–31.75) and hemoventricle volume was 8.86 (0–27.08). There was no difference between C-reactive protein and coagulation parameters insurvivors compared to non-survivors. Plasmatic iron concentration are higher in non-survivors than in survivors (496.04×58.5 mg/dl $p = 0.05$) 24 h after the event and CSF cytometry and lymphocyte count is increased in non-survivors than in survivors (WBC count: 247.5×3 cells/mm^3 $p = 0.01$ and lymphocyte count: 179×5 cells/mm^3 $p = 0.01$) on day 3 after event.
CONCLUSIONS. Cell and lymphocyte count in CSF are higher 72 h after the event in non-survivors of ICH. This may indicate an early exacerbated inflammatory response which may lead to death. The significance of higher plasmatic iron concentration in non-survivors is still uncertain.
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GRANT ACKNOWLEDGMENT. FAPERJ.

0390
HYDROXYETHYLSTARCH 130/0.4/9:1 EFFECTS ON CEREBRAL BLOOD FLOW AND METABOLISM IN PATIENTS WITH VASOSPASM DUE TO ANEURISMAL SUBARACHNOID HEMORRHAGE

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INTRODUCTION. The effects of colloid solutions on cerebral blood flow (CBF) and metabolism in patients (pts) with vasospasm due to aneurismal subarachnoid hemorrhage (SAH) are still unknown.
OBJECTIVES. To investigate CBF and brain metabolism dynamics during 6 % hydroxyethylstarch (HES) 130/0.4/9:1 infusion in patients with vasospasm due to aneurismal SAH.
METHODS. Seven pts with vasospasm (1–7 days after cerebral vasospasm onset) after SAH due to anterior circle of Willis aneurysm rupture (2–14 days after aneurysm rupture) were enrolled in the study (age 51 ± 7; male/female, 2/5; GCS, 9–14). Massive basal subarachnoid hemorrhage was revealed on CT scans in all pts (Fisher II–IV). Aneurysm clipping was performed in all pts. Transcranial dopplerography was used to reveal vasospasm. Cerebral blood flow velocity in involved medial cerebral artery at the beginning of the investigation was 213 ± 28 cm/s. Cerebral microdialysis, monitoring of intracranial pressure (ICP), cerebral perfusion pressure (CPP) were used in all pts. Cerebral blood flow measurement ("Hemedex", USA) was used in 4 pts, brain oxygen tension ($PbrO_2$)—in 3 pts. Microdialysis catheters, cerebral blood flow and $PbrO_2$ probes were placed into brain tissue perfused by involved artery. 6 % HES 130/0.4/9:1 500 ml (6–8 ml/kg of body weight) was infused for normovolemic pts during 60 min. We analyzed 20 episodes of HES infusion. Intacranial pressure, CPP, $PbrO_2$, CBF, arterial oxygen tension (PaO_2), arterial carbon dioxide tension ($PaCO_2$), PaO_2/FiO_2 ratio, lactate/pyruvate (L/P) ratio in brain interstitial fluid we measured before and after HES infusion.
RESULTS. ICP, $PbrO_2$, FiO_2, PaO_2, $PaCO_2$, PaO_2/FiO_2 were stable during the study. L/P ratio in brain interstitial fluid did not change during the investigation. We revealed upward trend of CBF from 43 (41; 73) ml/100 g/min up to 62 (55; 85) ml/100 g/min (n = 7). Cerebral blood flow increased in 5 of 7 episodes of HES infusion (from 42 (40; 80) ml/100 g/min to 72 (62; 98) ml/100 g/min (by 71 %) ($p < 0.05$)). Downtrend of L/P ratio was also revealed [before HES infusion 29.7 (27.4; 40.5); after, 26.7 (26.4; 27.3)]. Cerebral blood flow decreased in 2 of 7 episodes of HES infusion [from 55 (49; 60) ml/100 g/min to 40 (36; 44) ml/100 g/min (by 27 %)] and was accompanied by CPP decrease from 104 ± 16 to 84 ± 16 mmHg (by 19 %). Cerebral oxygenation ($PbrO_2$) and metabolism (L/P ratio) remained unchanged in spite of CBF decrease.
CONCLUSIONS. We revealed that 6 % HES130/0.4/9:1 infusion could be accompanied by cerebral blood flow increase and aerobic brain metabolism improvement in majority of patients with vasospasm due to aneurismal subarachnoid hemorrhage.

0391
INTRA-ARTERIAL NIMODIPINE FOR THE TREATMENT OF CEREBRAL VASOSPASM IN PATIENTS WITH NON TRAUMATIC SUBARACHNOID HEMORRHAGE: ANGIOGRAPHIC AND CLINICAL RESULTS

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INTRODUCTION. Cerebral vasospasm and delayed cerebral ischemia (DCI) account for the majority of morbidity and mortality for patients with subarachnoid haemorrhage (SAH). Medical management of cerebral vasospasm has been reported conflicting results. Endovascular therapy provides another avenue for patients who have vasospasm refractory to aggressive medical management.
OBJECTIVES. The aim of this study was to analyse the characteristics of patients with non traumatic SAH who develops symptomatic vasospasm and to evaluate the results of endovascular treatment (angiographic, clinical and sonographic results).
METHODS. Prospective observational study. Patients with SAH between January 2007 and December 2010 that develops symptomatic cerebral vasospasm or patients nor clinically valuable with transcranial Doppler (TCD) velocities of middle cerebral artery (MCA) >120 cm/s were studied and considered eligible for angiography after exclusion of other causes of deterioration. If cerebral vasospasm was confirmed in the angiography patients were treated with intra-arterial nimodipine. We analysed epidemiological variables, SAH severity, type of aneurysm treatment, complications and clinical outcome (Glasgow outcome scale at 3 months). Related to endovascular treatment, immediate vessel calibre modifications, short-term clinical efficacy and TCD velocities changes were assessed. We also analyse the long-term efficacy by evaluate the development of cerebral infarction or DCI in these patients.
RESULTS. Of the 77 patients with SAH, 17 (22 %) met the criteria for endovascular treatment. The mean age was 53.8 ± 11.5 years. Aneurysms were observed in 13 p (76 %) and were treated with coiling in 7 p (54 %) and clipping in 6 p (46 %). The onset of vasospasm was detected at 7.7 ± 5.2 days with a mean duration of 3.8 ± 2.6 days. Vasospasm was diffused in 9 patients (53 %) and isolated in 8 p (47 %). Overall the number of treatments amounted to 43 intra-arterial nimodipine applications (range 1–6 per patient), the average dose per session was 4.5 mg (range 1.2–6 mg). No complications related to endovascular treatment were detected. Analysis to determine the effects of endovascular treatment shows: in 12 p (71 %) positive angiographic response was detected, in 7 p (42 %) neurological condition clearly improved, 5 p (29 %) were considered as refractory vasospasm (treatment failure) and 5 p were not clinically assessable but TCD velocities dropped >20 %. Ischemic lesions related to cerebral vasospasm were documented in 7 p (41 %), in other 5 p (30 %) ischemia detected on CT was secondary to other causes. A total of 9 p (53 %) developed DCI. A good favourable outcome (GOS 4–5) at 3 months was present in 9 p (53 %) and only 1 p (6 %) died.
CONCLUSIONS. In our series of non traumatic SAH with cerebral vasospasm the treatment with endovascular techniques (intra-arterial nimodipine) is safe and has a positive angiographic, clinical and sonographic response in most patients.

0392
EFFICACY OF STELLATE GANGLION BLOCK IN TREATING POSTOPERATIVE CEREBRAL VASOSPASM FOLLOWING ANEURYSMAL CLIPPING

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INTRODUCTION. Cerebral vasospasm is the leading cause of death and disability in patients with aneurysmal subarachnoid hemorrhage (SAH).As early intervention may improve the outcome, prompt diagnosis and treatment of vasospasm is essential. Stellate ganglion block is effective modality in relieving vasospasm as cerebral vasculature is densely supplied with noradrenergic fibres originating from cervical gangia.
OBJECTIVES. To assess the efficacy and safety of stellate ganglion block in relieving cerebral vasospasm following aneurysmal SAH.

METHODS. 30 patients in age group of 18–65 years were randomly assigned in double blind fashion to receive stellate ganglion block with 10 mls of 0.5 % bupivacaine(group S) or with 10 mls of 0.9 % normal saline(group C); after confirming vasospasm clinically and by using transcranial Doppler (TCD) w.r.t MCA, ICA and ACA velocities along with Lindegaard ratio following aneurysmal clipping. All patients received triple H therapy.The primary endpoint was 20 % reduction in MCA velocity and/or decrease in Lindegaard ratio to <3.
RESULTS. MCA velocities were found to be decreased significantly in group S over period of 24 h when compared to controls (group C) (110.07 ± 8.23 vs. 132.13 ± 8.08; $p < 0.001$). Same trend was observed with Lindegaard ratio (2.62 ± 0.22 vs. 3.16 ± 0.20; $p < 0.001$). However, same was not true with ACA and ipsilateral extracranial ICA velocities. The study also confirmed the negative correlation between preoperative GCS score and HHS value [$r = -0.499$; $p < 0.01$); while positive correlation was established between HHS value and baseline MCA velocities ($r = 0.492$; $p < 0.01$).
CONCLUSIONS. Stellate ganglion block was shown to reduce MCA velocities and Lindegaard ratio significantly in patients who developed vasospasm following aneurismal clipping. It is simple, non-expensive and without any major side-effects. Preoperative HHS scale can be a good predictor for development of postoperative vasospasm in patients with SAH. Transcranial Doppler, although not much sensitive, is simple, easily reproducible and accurate at experienced hands in diagnosing the vasospasm and monitoring the trend of effect of any intervention undertaken to treat the vasospasm.
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0393
EFFECTS OF SYSTEMIC ADMINISTRATION OF TETANUS TOXIN ON CELL PROLIFERATION AND NEUROBLAST DIFFERENTIATION IN THE MOUSE HIPPOCAMPAL DENTATE GYRUS

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INTRODUCTION. Tetanus toxin (TeT), an exotoxin, has been used to cause tetanus in mammalian brains, and it can develop spatial learning deceits.
OBJECTIVES. In the present study, we investigated the effect of TeT on cell proliferation and neuroblast differentiation using specific markers: 5-bromo-2′-deoxyuridine (BrdU) as an exogenous marker for cell proliferation, Ki-67 as an endogenous marker for cell proliferation and doublecortin (DCX) as a marker for neuroblasts in the mouse hippocampal dentate gyrus (DG) after TeT treatment.
METHODS. Mice were intraperitoneally administered 2.5 and 10 ng/kg TeT and sacrificed 15 days after the treatment.
RESULTS. In both the TeT-treated groups, no neuronal death occurred in any layers of the DG using neuronal nuclei (NeuN, a neuron nuclei maker) and Fluoro-Jade B (F-J B, a high affinity fluorescent marker for the localization of neuronal degeneration). In the 2.5 ng/kg TeT-treated-group, the mean number of BrdU, Ki-67 and DCX immunoreactive cells, respectively, was apparently decreased compared to the control-group, and the mean number of each in the 10 ng/kg TeT-treated-group was much more decreased. In addition, processes of DCX-immunoreactive cells, which projected into the molecular layer, were short compared to those in the control-group.
CONCLUSIONS. In brief, our present results show that 10 ng/kg TeT treatment apparently decreased cell proliferation and neuroblast differentiation in the mouse hippocampal DG without the loss of adult neurons.

0394
EVALUATION OF SURGICAL INTERVENTION IN PATIENTS WITH INTRAVENTRICULAR EXTENSION OF SUPRATENTORIAL INTRACEREBRAL HEMORRHAGE

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OBJECTIVES. To evaluate the usefulness of surgical intervention in patients admitted to the ICU with intraventricular extension of supratentorial intracerebral haemorrhage.
METHODS. The study included patients admitted with spontaneous brain hemorrhage to Carlos Haya Hospital, Malaga between 2006 and 2011, to the Neurotraumatological Hospital, Jaen from February 2011 and the Virgen de las Nieves Hospital, Granada from October 2009, both to January 2012. A cohort study was undertaken, analyzing age, Glasgow score, APACHE II, whether the hemorrhage was open to the ventricles, whether a intraventricular drainage was placed, and whether the patient underwent surgery (haematoma evacuation), as well as hospital mortality. Analyses were done with Student t test, Chi-square, and logistic regression.
RESULTS. The study involved 216 patients, 98 in Malaga, 39 in Jaen, and 77 in Granada. Their age was 59 ± 14.60 years, their Glasgow coma scale score on admission 8.26 ± 4.13, 59.8 % had intraventricular hemorrhage, and the severity according to the APACHE II was 20.89 ± 7.59. Hospital mortality was 51.9 %. Those patients who died in the hospital were older (63.95 ± 12.04 vs. 53.68 ± 15.28 years; $p < 0.001$), had a worse Glasgow score on admission (6.62 ± 3.72 vs. 10.03 ± 3.89; $p < 0.001$) and higher APACHE II (24.12 ± 6.65 vs. 17.46 ± 7.02; $P = 0.001$). Surgery was undertaken in 71 patients, with 38 % mortality; mortality in the 145 who did not undergo surgery was 58.6 % ($p = 0.004$).Of 85 patients with no intraventricular hemorrhage surgery was undertaken in 34, with a mortality of 44.1 %; in the 51 who did not undergo surgery mortality was 43.1 % ($P = 0.929$). Of 131 patients with intraventricular hemorrhage who underwent surgery, 37 died (32.4 %) and in the 94 who did not undergo surgery mortality was 67 % ($p < 0.001$). The 131 patients with intraventricular hemorrhage were 59.72 ± 14.48 years of age, had a Glasgow score on admission of 7.85 ± 3.94 years and their APACHE II was 21.21 ± 7.52; drainage was placed in 31 of these patients, but there was no significant association with mortality ($p = 0.053$). In the 131 patients with intraventricular hemorrhage logistic regression analysis showed significant relations between hospital mortality and Glasgow score on ICU admission (OR: 0.816; 0.733–0.908) and between hospital mortality and surgery (OR: 0.294; 0.124–0.6295).
CONCLUSIONS. These data suggest a lower mortality in patients admitted to the ICU with spontaneous intraventricular extension of intracerebral hemorrhage who undergo surgery with haematoma evacuation. This lower mortality was not seen in the patients without intraventricular hemorrhage.

0395
RISK FACTORS ASSOCIATED TO MORBID-MORTALITY IN ICU PATIENTS WITH SUBARACHNOID HEMORRHAGE

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INTRODUCTION. Subarachnoid hemorrhage (SHA) has a high morbid-mortality in ICU patients and it is important to delimitate risk factors associated to clinical outcomes.
OBJECTIVES. To identify risk factors associated to morbid-mortality in ICU patients admitted with SHA secondary to aneurysm rupture.
METHODS. Longitudinal, prospective study in a neurocritical ICU for adult patients performed from January 2007 up to October 2011. Morbi-mortality was considered when GCS at hospital discharge was less than 14 or patient death. 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 (SD) when data followed a normal distribution, or as medians and interquartile (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 37 out of 144 studied patients had morbid-mortality and 25 of them died. The variables that showed statistical significance in the univariate analysis were initial GCS, Apache II on the first 24 h after admission, Fisher scale grade, intraparenquimal hematoma presence, intracranial hypertension presence, external ventricular drain requirement, and rebleeding. Variables independently associated to the morbid-mortality were initial GCS per unit OR: 0.74 (CI 95 %:0.64; 0.85); $p < 0.001$; endovascular treatment OR: 0.32 (CI 95 %:0.11; 0.95); $p = 0.031$; rebleeding OR: 39 (CI 95 %:2.7;548); $p = 0.001$ and Fisher scale grade per unit OR: 3.10 (CI 95 %:1.08; 8.85); $p = 0.035$.
CONCLUSIONS. The risk factors independently associated to a greater or lower risk of hospital morbid-mortality were initial GCS and particularly the rebleeding and endovascular treatment and the Fisher scale grade, respectively.

0396
ACUTE NEUROPHYSIOLOGIC PREDICTORS OF EARLY AND LATE NEUROLOGIC OUTCOMES IN BRAIN INJURED PATIENTS: ASSESSING THE RELIABILITY OF ELECTROENCEPHALOGRAPHY AND EVENT-RELATED POTENTIALS

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INTRODUCTION. Electroencephalography (EEG) and Event-related potentials (ERPs) techniques have been already proposed as interesting and reliable tools in the diagnosis of different comatose states and in the prognosis of brain injured patients since the acute phase of Intensive Care admission. On one hand, EEG is an important source of information about the neuronal activity at rest its power spectra mapping provides useful notes about the function of neural networks during recovery.On the other hand, ERPs are able to investigate higher order networks responsible for cognitive processes. Nevertheless, the current lack of understanding of their predictive power is significantly limiting their clinical use.
OBJECTIVES. This pilot study evaluates the diagnostic and prognostic capabilities of a pool of neurophysiologic tests in a population of acute brain injured patients aiming to detect different acute neural responses responsible for early and late neurologic recovery.
METHODS. A prospective study was performed in acute brain injured patients admitted to our ICU from January to November 2011. 24 patients were finally included (8 head trauma, 3 cerebral anoxia, 9 cerebral hemorrhage, 1 ischemic stroke, 3 cerebral infections), all of them were comatose for more than 24 h and had a motor response lower than 5 according to Glasgow Coma Scale.
A prior history of neurologic problems, hypnotic agent or muscle-blocker agent therapy at the time of recording and suppressed EEG suspected to be related to brain death were considered as exclusion criteria. Median age was 63 years. Electrophysiologic examinations were recorded bedside as soon as patients were free of sedative drugs effects. 19 electrodes were placed (International 10–20 system, EBNeuro, Florence)(ref A1 and A2,impedance <5 kΩ,filter 0.4–70 Hz,sampling frequency 512 Hz,rec time 15 min). EEG post-processing included grouping electrodes in 4 brain areas (ANT-POST, RIGHT-LEFT), evaluation of power spectra and non-linear parameters (Zero Crossing, Fractal Dimension and Beta coefficient). ERPs were recorded during an auditory oddball paradigm (standard tone 750 Hz, target tone 1000 Hz, 130 dB, ratio 15 %, rec 2 s, bandpass 1–50 Hz in Fz, Czand Pz, test repeated to obtain 30 sweeps). Amplitude and latency of identified ERP components (MMN, N100, P300) were measured and compared to 10 healthy controls. Patients' outcome was classified 1 and 6 months later as Minimally Conscious State, Persistent Vegetative State and deceased according to Coma Recovery Scale-Revised.

RESULTS.

1-month outcome, stepwise multiple regression

Variables	Rsq (adj) %	p
AREA P3 Fz	58.6	0.016
δ band PW POST	82	0.031
θ band PW RIGHT	92.7	0.045
ZC RIGHT	99.6	0.004
γ band PW ANT	99.9	0.037
N2P3 f Amp Fz	100	0.028

6-months outcome, stepwise multiple regression

Variables	Rsq (adj) %	p
Lat P3 Cz	67.6	0.008
Lat N1 Fz	90.5	0.011
N2P3 r Amp Fz	99	0.002
Beta coeff POST	99.7	0.05
Area P3 Cz	99.9	0.012
N20 Amp C4	100	0.011

CONCLUSIONS. Our results demonstrate two different sets of parameter predictive of early and late neurologic outcome. In fact early recovery is mostly predicted by resting EEG parameters (power spectra and non linear) while late outcome relates almost entirely on ERPs spectra (first 3 variables, Table 2) indicating that investigation of higher-order networks functions is of fundamental value in predicting the recovery of consciousness.

0397

PROPHYLACTIC MAGNESIUM FOR IMPROVING NEUROLOGICAL OUTCOME AFTER ANEURYSMAL SUBARACHNOID HEMORRHAGE: SYSTEMATIC REVIEW AND META-ANALYSIS

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OBJECTIVE. Neurological disability is common following aneurysmal subarachnoid hemorrhage (aSAH). Our objective was to systematically review the prophylactic use of magnesium to improve neurological outcomes in patients with aSAH.

METHODS. We searched MEDLINE, EMBASE, CINAHL, and CENTRAL to December 2011 for randomized and quasi-randomized controlled trials of intravenous magnesium given before the occurrence of radiologic vasospasm or delayed cerebral ischemia (DCI) compared to any control group in adults after aSAH. Two reviewers independently extracted data on study population, interventions, and outcomes (good neurological outcome [primary outcome], cerebral infarction, DCI, mortality, and adverse events). Analyses used random-effects models.

RESULTS. Of 644 citations, 11 trials (N = 1167) met selection criteria. Meta-analyses showed that magnesium did not increase the probability of good neurological outcome (RR 1.06, 95 % CI 0.98–1.16; p = 0.14; N = 1085) or decrease the risks of cerebral infarction (RR 0.69 [0.46–1.05]; p = 0.08; N = 572) or mortality (RR 0.90 [0.67–1.23]; p = 0.52; N = 862). Magnesium did reduce the risk of DCI (RR 0.73 [0.56–0.96]; p = 0.02; N = 1095). Data on adverse events were sparse.

CONCLUSIONS. Despite decreasing the incidence of DCI in patients with aSAH, prophylactic intravenous magnesium does not improve neurological outcome or decrease cerebral infarction or mortality.

0398

ASSOCIATION OF FLUID BALANCE AND DELAYED CEREBRAL ISCHEMIA AFTER ANEURYSMAL SUBARACHNOID HEMORRHAGE

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INTRODUCTION. Effective prophylaxis of delayed cerebral ischemia (DCI) after aneurysmal subarachnoid hemorrhage (SAH) is still limited. Because of the association of hypovolemia with DCI most clinicians give relatively high amounts of fluid. Maintenance of a daily positive fluid balance is often used as a surrogate for normovolemia, but whether this results in less DCI is unclear.

OBJECTIVES. The aim of this study is to investigate in SAH patients the association between fluid balance in the first 48 h after admission and DCI.

METHODS. In a retrospective study we included patients with aneurysmal SAH admitted to an academic hospital in The Netherlands (n = 162). Patients were consecutively admitted at the ICU between 2007 and 2011 within 48 h after ictus. Patients who died within 48 h were excluded. DCI was defined according to recently proposed criteria [1]. Daily fluid intake, -loss (diuresis) and fluid balances were calculated 0–48 h after admission. Associations with DCI were assessed with Kaplan–Meier curves. We used known prognostic variables for DCI (Hijdra score, loss of consciousness at ictus [LOC], treatment [coiling, clipping or no treatment] and Glasgow Coma Scale on admission) in Cox proportional hazard regression to assess the association with DCI. Mechanical ventilation and mean arterial blood pressure (MAP)were considered possible confounders for fluid handling and were included in the adjusted analysis.

RESULTS. Mean age of the patients was 55 ± 13 years and 61 % was female. 44 % of patients developed DCI. Subjects with missing data were excluded (n = 17); their baseline characteristics (Hijdra score, GCS and LOC) did not differ. High fluid intake (dichotomized by median [4474 ml]) and high mean MAP (median 96 mmHg) 0–24 h after admission were associated with the occurrence of DCI (logrank test, $p < 0.05$ and $p = 0.034$). Fluid balance 0–24 h (dichotomized by median of 1564 ml) was not associated with DCI (logrank, $p = 0.84$). High diuresis 0–24 h, and high cumulative fluid intake and diuresis 0–48 h showed the same trend towards an association with DCI ($p > 0.05$). In the adjusted analysis (n = 145) LOC at ictus (HR 3.0, 95 % CI 1.7-5.5, $p < 0.001$), treatment (HR 1.6, 95 % CI 1.2–2.2, $p = 0.002$), high fluid intake (0–24 h; HR 2.0, 95 % CI 1.1–3.6, $p = 0.015$) and high mean MAP (0–24 h; HR 2.3, 95 % CI 1.4–3.9, $p = 0.001$) were associated with DCI.

CONCLUSIONS. Fluid balance does not help to identify patients at risk for DCI after SAH in an early phase. However, high fluid intake, probably related to increased diuresis, and higher MAP within the first 24 h after admission, are independently associated with DCI. These findings may point to a common pathophysiological mechanism behind early increases in diuresis and blood pressure in relation to risk of DCI.

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0399

MULTIMODAL NEUROMONITORING PROGNOSTIC SIGNIFICANCE IN THE PATIENTS WITH INTRACRANIAL HEMORRHAGE

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INTRODUCTION. Poor outcome risk factors early detection an actual goal of patients with intracranial hemorrhage (ICH) treatment.

OBJECTIVES. To assess the multimodal neuromonitoring (MN) prognostic significance of the indicators in patients with ICH.

METHODS. 26 patients with ICH and GCS 6-13 enrolled in the study (age 45.7 ± 14.9 years; male/female 14/12). Seven patients (27 %) had severe traumatic brain injury (TBI), 19 (73 %)—cerebral aneurism rupture. ICP, CPP, PaO_2, $PaCO_2$, glucose arterial levels (Glu (A)), PaO_2/FiO_2 ratio were investigated in all patients. Cerebral metabolism measured by brain microdialysis: (glucose concentration (Glu (I)), lactate/pyruvate ratio) determined in 25 patients, $PbrO_2$—in 14 patients. Ten patients (38 %) recovered with good neurological outcome, 2 (8 %),developed vegetative state (VS), 14 (54 %), died. We carried out the comparative analysis of MN parameters in 1–2 days after MN start in patients with different outcomes.

RESULTS. ICP and CPP in the recovered, VS and dead patients were not significantly different: ICP, 12 (9.15) (n = 141), 16 (12.4; 22.5) (n = 39) and 13 (9; 18.6) (n = 200) mmHg respectively; CPP, 93 (86,100) (n = 141), 86.7 (73.8; 104.8) (n = 39) and 86 (77.101) (n = 200) mmHg, respectively. In comparison to the recovered patients, the VS and dead patients had the lower levels of Glu (I) (1.7 (1; 2.8) (n = 104), 0,6 (0.32; 0.7) (n = 38) ($p < 0.05$) and 1,5 (0.7; 2.7) (n = 176) ($p < 0.05$) moll/l, respectively) and the PaO_2/FiO_2 ratio (391 (327; 447) (n = 80), 344 (278; 374) (n = 37) ($p < 0.05$) and 318 (270; 374) (n = 121) ($p < 0.05$), respectively) and higher levels of the lactate/pyruvate ratio (21 (16.2; 27.6) (n = 99), 169 (24.22; 232.7) (n = 38) ($p < 0.05$) and 40.5 (28.8; 58) (n = 173) ($p < 0.05$), respectively). In comparison to the recovered and dead patients, the VS patients had the lower levels of $PbrO_2$ (29.4 (22.4; 48.9) (n = 83), 29.4 (20.7; 42.8) (n = 40) ($p < 0.05$) and 21 (15.1; 27.8) (n = 27) ($p < 0.05$) mmHg, respectively), $PaCO_2$ (34 (30.2; 36.4) (n = 80), 33 (30; 36.9) (n = 127) ($p < 0.05$) and 30.6 (28.9; 32.1) (n = 37) ($p < 0.05$) mmHg, respectively) and Glu (A) (7.4 (5.8; 9.2) (n = 62), 7.8 (6.6; 9.8) (n = 176) ($p < 0.05$) and 6.3 (5.6; 7.4) (n = 36) ($p < 0.05$) mmol/l respectively).

CONCLUSIONS. The lactate/pyruvate ratio increase and the Glu (I), Glu (A), $PbrO_2$, $PaCO_2$ and PaO_2/FiO_2 decrease in the acute period of ICH are the risk factors for the poor outcomes of patients with ICH.

0400

IMPACT ON FUNCTIONAL OUTCOME AND QUALITY OF LIFE AT 6 AND 12 MONTHS AFTER SPONTANEOUS SUBARACHNOID HEMORRHAGE

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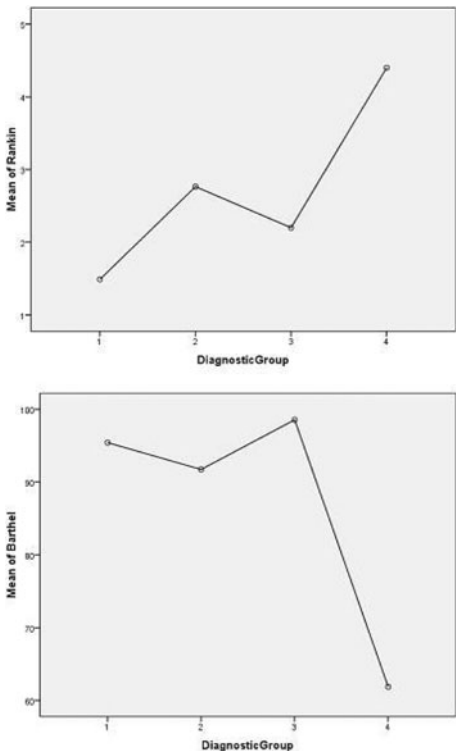
INTRODUCTION. Subarachnoid hemorrhage (SAH) is a medical emergency in all patients and has considerable morbidity and mortality. Identification of prognostic factors and reliable prognosis for patients with aneurysmal SAH is of much importance.

OBJECTIVES. The purpose of this study was to determine the risk factors, main complications and the outcome at 6 and 12 months of spontaneous SAH due to ruptured intracranial aneurysms.

METHODS. We performed a prospective study of 116 patients with aneurysmal spontaneous SAH admitted to our centre from May 2007 to December 2010. Diagnosis of SAH was done by CT and ethiological diagnosis by brain angiography. We paid attention to previous pathological history and clinical and radiological characteristics at admission. The severity was measured by the Hunt-Hess, WFNS, GRAEB and Fisher scales. The 6 and 12 months outcome was assessed by the Glasgow Outcome Scale (GOS) and modified Rankin scale. The basic activities of daily living were evaluated with the Barthel Index. Moreover, patients were asked about their subsequent incorporation to their previous occupation. We divided our population into four groups depending on the location of the bleeding: Group 1, subarachnoid space; group 2, subarachnoid and intraventricular; group 3, subarachnoid and intraparenchymal; group 4, subarachnoid, intraventricular and intraparenchymal bleeding.

RESULTS. During the period of study a total of 116 patients have been included. The mean age of patients was 54 years with a prevalence of 57.8 % in women, being arterial hypertension and smoking history the main factors of related risk. The angiography was performed in 92.2 % of the patients. The treatment was endovascular in 78.4 and 8.6 % was clipping. Group 2 and 4 presented poor clinical grade at admission and were associated with higher punctuation in the APACHE II and SOFA scales ($p < 0.05$). At 6 and 12 months group 2 and 4 patients had a severe disability and functional dependence to perform instrumental and basic activities of daily living, as well as increased mortality ($p < 0.05$). There is 24 % mortality in the series. Only 38.6 % of patients were able to return to their previous occupation 6 months after the initial bleeding, whereas 52.5 % at 12 months were working.

Demographic characteristics	N
Age (mean ± SD) years old	54 ± 13
Background [n, (%)]	
Hypertension	46 (39.7)
Smoking	45 (38.8)
Diabetes	5 (4.3)
Dyslipedemia	27 (23.3)
Angiography [N (%)]	107 (92.2)
Endovascular treatment [N (%)]	91 (78.4)
Surgical treatment (clipping) [N (%)]	10 (8.6)



Rankin scale and Barthel Index at 12 months

CONCLUSIONS. Spontaneous SAH continues to be a disease with high morbidity and mortality. Intraventricular haemorraghe accompanying SAH is related to unfavorable outcome and less ability to perform instrumental and basic activities of daily living, as well as the inability to return to previous occupation before the SAH.

0401

BRAIN INJURY BIOMARKERS AND INFLAMMATORY MARKERS IN SPONTANEOUS SUBARACHNOID HAEMORRHAGE'S MORTALITY

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OBJECTIVES. We aimed to evaluate the utility of systematic measurement of brain injury biomarkers (BIM) and inflammatory markers (IM) to predict the mortality in patients with spontaneous subarachnoid haemorrhage (SAH).

METHODS. Adult patients admitted in ICU with SAH were included. We determine clinical and laboratory variables. Serum levels of BIM, *matrix metalloproteinses* (MMP-9), *D-dimer* (DD), *B-type natriuretic peptide* (BNP) and S-100β protein and IM, *plasma fibrinogen*, *C- reactive protein* (CRP) and *ferritin*, were measured the first 3 days. We determine the ROC curve and the best cut point through Younden Index.

RESULTS. 24 patients were included; Mortality 20.8 %. Median age 53 years. Serum levels of DD al 48 h and CRP at 3th day correlated with mortality. DD 48 h AUC ROC 0.73 ($p < 0.05$; 95 % CI: 0.452–1); with cut point 2090 ng/ml the values for mortality: sensibility (SE) 0.8; specificity (SP) 0.8; positive predictive value (PPV) 0.57 and positive likelihood ratio (PLR) 3.8. CRP 72 h, AUC 0.86 ($p < 0.02$; 95 % CI: 0.683–1); cut point 58.4 mg/L: SE 0,8; SP 0.8; PPV 0.92 and PLR 3.8.

CONCLUSIONS. D-Dimer is a later marker in SAH and CRP at 3th day improved mortality prediction showing a high sensibility and specificity (80 %) to predict mortality in patients with SAH with a high positive predictive value.

Outcome prediction after cardiac arrest: 0402–0415

0402

DIAGNOSIS PERFORMANCE OF HIGH SENSITIVITY TROPONIN ASSAY IN OUT-OF-HOSPITAL CARDIAC ARREST PATIENTS WITH SUSPECTED RECENT CORONARY OCCLUSION

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INTRODUCTION. Early identification of the cause of out-of-hospital cardiac arrest (OHCA) is of paramount importance in the management of post-cardiac arrest syndrome. As clinical examination and ECG are poorly discriminative, broad use of coronary angiography is advocated to confirm or rule out coronary etiology. New cardiac biomarkers could be helpful to select patients who would benefit of immediate percutaneous coronary intervention (PCI) and avoid useless invasive procedures.

OBJECTIVES. We aimed at determining if high-sensitive cardiac troponin T (HsTnT) was useful to diagnose the coronary cause of OHCA.

METHODS. In our centre, our strategy is to admit OHCA patients without an obvious extracardiac cause directly to the cardiac catheterization laboratory, regardless of electrocardiographic findings. An immediate coronary angiogram is performed using standard techniques and if indicated, a PCI is attempted. The primary outcome of this study was the detection of a recent coronary occlusion, considered as the cause of cardiac arrest and requiring an immediate PCI. HsTnT measurements were compared between patients with coronary or non-coronary etiology, and were analyzed to assess the optimum cut-off for identifying a recent coronary occlusion. We also performed a logistic regression to determine early predictive factors of a recent coronary occlusion (including HsTnT) and their respective contribution.

RESULTS. 269 OHCA patients (male 76.6 %, over 65 years 34.9 %) were included between 2006 and 2010. A shockable cardiac rhythm was initially recordable in 67.7 % of the cohort. Mean no flow and low flow durations were 4.6 ± 5.0 and 23.4 ± 62.2 min, respectively. ST-segment elevation was present on the first ECG in 56 patients (20.8 %). All patients underwent coronary angiography; at least one recent coronary artery occlusion was found in 131 (48.7 %) patients. In-ICU mortality rate was 58.6 %. HsTnT was significantly higher in patients with recent coronary artery occlusion than in patients without recent coronary occlusion (4344 ± 3487 vs. 2572 ± 2417, $p < 0.0001$).

Sensibility and Specificity of HsTnT in CA

	HsTnT > 4300 pg/ml	HsTnT > 575 pg/ml	HsTnT > 80 pg/ml
n	44	135	235
Sensibility	28.6 %	65.4 %	95.5 %
Specificity	95.7 %	65.5 %	15.1 %
Predictive positive value	86.4 %	64.4 %	51.8 %
Predictive negative value	58.3 %	66.4 %	77.8 %

In multivariate analysis, active tabagism (OR = 2.95 [95 % CI 1.43–6.10], $p = 0.003$), initial shockable rhythm (OR = 3.51 [95 % CI 1.60–7.68], $p = 0.002$), ST-segment elevation (OR = 4.49 [95 % CI 1.72–11.72], $p = 0.002$), external defibrillation (OR = 2.66 [95 % CI 1.24–5.71], $p = 0.012$) and a HsTnT > 4300 pg/ml (OR = 7.47 [95 % CI 2.17–25.73], $p = 0.001$) were independent predictors of a recent coronary occlusion.

CONCLUSIONS. After OHCA, HsTnT is significantly higher in patients with recent coronary occlusion, but sensibility and specificity of this biomarker seem poor to early discriminate coronary and non-coronary OHCA patients. Thus we believe that HsTnT measurement should not be involved in the decision of performing or not an immediate coronary angiography after OHCA.

0403

COPEPTIN LEVEL AT ADMISSION PREDICTS OUTCOMES IN OUT-OF-HOSPITAL CARDIAC ARREST SURVIVORS

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INTRODUCTION. Prognostic stratification in cardiac arrest survivors is fundamental for selection of the most appropriate therapeutic strategy in cardiac arrest survivors. Current evidence on prognostic markers in cardiac arrest survivors is, however, still insufficient and the data on prognostic value of C-terminal provasopressin (copeptin) in these patients are lacking.

OBJECTIVES. To determine the prognostic value of copeptin in out-of-hospital cardiac arrest survivors.

METHODS. Out-of-hospital cardiac arrest survivors admitted to cardiology intensive care unit from June 2010 to December 2011 were eligible for enrolment. All patients were treated by endovascular hypothermia, patients with ST-elevation myocardial infarction underwent direct parcutaneous coronary intervention. Copeptin levels were measured in blood samples taken at admission using commercially available immunoassay. Neurological outcome was assessed at 30 days according to Cerebral Performance Category (CPC): CPC 1, no neurological deficit; CPC 2, mild to moderate dysfunction; CPC 3, severe dysfunction; CPC 4, coma; CPC 5, death.

RESULTS. Forty consecutive patients (mean age 58 years) were included in the study, the majority of whom (32 of 40) were males. Nineteen patients in our group survived with good neurological outcome (CPC 1), nine patients survived with mild-to-moderate dysfunction (CPC 2), severe neurological dysfunction (CPC 3–4) experienced three survivors, and nine patients died (CPC 5). Copeptin levels were significantly lower in patients with CPC 1 as compared with CPC 2 or CPC 3–5 (74.3 ± 14.4, 219.8 ± 33.9, and 302.7 ± 52.1 pmol/L, respectively; $P < 0.0001$). ROC analysis has determine cut-off copeptin value for good neurological outcomes (CPC 1) <201.9 pmol/L (94.7 % sensitivity, 71.4 % specificity) and cut-off value for death (CPC 5) >229.1 pmol/L (77.8 % sensitivity, 83.9 % specificity). Copeptin levels significantly correlated with the peak level of neuron-specific enolase ($r = 0.80$, $P < 0.0001$).

CONCLUSIONS. Our data indicate that copeptin is a promising marker of neurological outcomes in out-of-hospital cardiac arrest survivors with significant prognostic value already at the time of hospital admission.
GRANT ACKNOWLEDGMENT. Study was supported by the grant from the Czech Ministry of Health, Nr. 12153.

0404
HEPARIN BINDING PROTEIN AS AN INDICATOR OF CRITICAL ILLNESS AND PREDICTOR OF OUTCOME IN CARDIAC ARREST

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INTRODUCTION. Survivors of cardiac arrest (CA) suffer from a systemic inflammatory response syndrome, known as the post-cardiac arrest syndrome. Approximately half of CA-patients in the ICU regain consciousness. Prognostication of outcome in comatose patients receiving hypothermia remains difficult due to sedation and a lack of reliable prognostic markers. Heparin-binding protein (HBP), an antimicrobial protein stored in neutrophil granules, is a potent inducer of vascular permeability and a biomarker for severe infections and shock [1]. We investigated HBP in patients with return of spontanous circulation after CA.
OBJECTIVES. The aim of this study was to investigate plasma levels of HBP in patients treated with induced hypothermia after CA, and to study their correlation to severity of critical illness, development of infections and long-term outcome.
METHODS. Eighty-three consecutive patients with CA of mixed origin were included, all were treated with hypothermia. Blood samples were collected at 2, 6, 12, 24, 36, 48, 72 h and analysed with an ELISA for HBP. Outcomes were dichotomised to either good or poor. A Cerebral Performance Category scale (CPC) of 1 or 2 at 6 months was considered a good outcome, a CPC of 3 or lower, a poor outcome. Infections (pneumonia, sepsis) were considered present at the discretion of the treating physician. Lactate at 24 h, SOFA-scores day 1 and APACHE II were retrieved from medical records. Receiver operator characteristics and area under the curve (AUC) for HBP were calculated. The Mann–Whitney test was used for statistical analysis, with the addition of Bonferonni corrections. $p < 0.05$ was considered significant.
RESULTS. Forty-two patients had good outcomes and forty-one had poor outcomes. Plasma levels of HBP were significantly higher at 6 and 12 h among patients with a poor outcome (Fig), with AUC values of 070 and 0.71, respectively. Patients with an elevated lactate (>2.5) on day 1, high APACHE-II scores (>30), and high SOFA scores (>10) had increased HBP-levels, that reached significance at 6 h. There was no correlation between HBP and the incidence of infections.
CONCLUSIONS. Heparin Binding Protein is an early indicator of severity of critical illness after CA. Early HBP-elevations (6 and 12 h) correlated well with neurological outcome at 6 months. HBP's temporal profile seems to point towards a role in the pathogenesis of endothelial leakage and shock.
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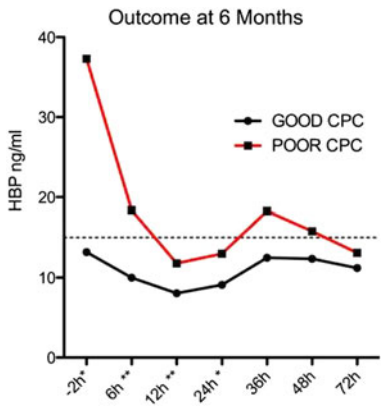

Fig.: Time plot of median HB*P* values at 2–72 h after cardiac arrest.A Cerebral Performance Category (CPC) of 1–2 was considered good and a CPC 3–5, poor. Ticked line represents suggested cut-off value for HBP in septic shock [1]. * Mann–Whitney tests significant. ** $p < 0.05$ after Bonferonni corrections

0405
WHICH IS A BETTER PREDICTOR OF SURVIVAL FOLLOWING CARDIAC ARREST—AGE OF THE PATIENT OR FIRST DOCUMENTED RHYTHM?

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INTRODUCTION. Survival outcomes with different predictors of survival after cardiac arrest have been studied in past and many factors like first documented cardiac rhythm, age of the patient, sex of the patient, time taken for reversal of spontaneous circulation have been established as the predictors of survival, but without any uniformity in data.
OBJECTIVE. Our objective was to investigate which is a better predictor of survival to hospital discharge following cardiac arrest—age of the patient or first documented rhythm?
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). Age of the patient and first documented rhythm was noted. Good outcome measure was taken as survival to hospital discharge. The association of age and first documented rhythm with good outcome was quantified by logistic regression analysis.
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 in age group ≥60 years. As regards the first documented rhythm at the time of cardiac arrest, 168 patients (56.5 %) had shockable rhythm (ventricular tachycardia/ventricular fibrillation), while 129 patients (43.5 %) had non shockable rhythm (pulseless electrical activity/asystole). 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, 33/168(19.6 %) patients with shockable rhythm and 15/129(11.6 %) patients with non shockable rhythm. When patients of age <60 and ≥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; $p < 0.0001$]. We also observed increased odds of survival to hospital discharge when first documented rhythm was shockable rhythm rather than non shockable rhythm [OR 1.85; 95 % CI 0.96–3.59; $p = 0.656$] but this increase was not statistically significant at the 5 % level.
CONCLUSION. Though shockable rhythm as the first documented rhythm, and a lesser age, both are associated with better odds of survival to hospital discharge after cardiac arrest; still age <60 years is a much better and statistically highly significant predictor of survival than the type of first documented rhythm.
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0406
PROCALCITONIN IN CARDIAC ARREST—AN INDICATOR OF SEVERITY OF ILLNESS AND A PREDICTOR OF OUTCOME

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INTRODUCTION. Survivors of cardiac arrest (CA) suffer from a systemic inflammatory response syndrome, known as the post-cardiac arrest syndrome. Moreover, severe infections (pneumonia, sepsis) are common. Procalcitonin (PCT), a prohormone to calcitonin and a marker of bacterial infections (1), is elevated after cardiac arrest and its release profile seems to be affected by hypothermia (2). We investigated PCT and C-reactive protein (CRP) in patients treated with mild hypothermia after CA.
OBJECTIVES. The aim of this study was to investigate serum levels of PCT and CRP in patients treated with mild hypothermia after CA, and to study their correlation to severe infections and long-term outcome.
METHODS. Sixty-two consecutive patients with out-of-hospital CA of cardiac origin were included, all were treated with hypothermia for 24 h. Blood samples were collected at admittance to the hospital (A), at 2, 6, 12, 24, 36 and 72 h. PCT was analyzed using the Kryptor assay (BRAHMS AG, Hennigsdorf, Germany). Outcomes were dichotomised to either good or poor. A Cerebral Performance Scale (CPC) of 1 or 2 at 6 months was considered a good outcome, a CPC of 3 or lower, a poor outcome. The incidence of infections (pneumonia, sepsis) was at the discretion of the treating physican and according to the INTCAR database (3). SOFA circulation scores at 12 and 48 h and APACHE II were retrieved from medical records. Reciever operator characteristics and area under the curve (AUC) for PCT were calculated.
RESULTS. Thirty-four patients had good outcomes and twenty-eight patients had poor outcomes. Serum levels of PCT were significantly higher at 12, 24 and 48 h in patients with poor outcome (Fig. 1), with AUC values of 0.84 at 24 h and 0.83 at 48 h. PCT did not correlate to the incidence of infections, but did correlate to SOFA circulation scores at 48 h (Fig. 2). CRP had a different time profile with gradually increasing values over time with no significance between groups.
CONCLUSIONS. Procalcitonin is an indicator of severity of illness in patients treated with hypothermia after CA, but is not associated with the presence of severe infections in this patient cohort. PCT elevations and release profile at 24 and 48 h correlated well with neurological outcome at 6 months and should be tested in larger prospective trials.

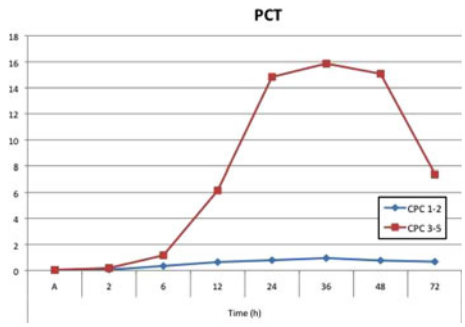

Fig. 1

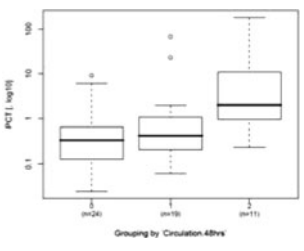

Fig. 2

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0407

COMPARING OPEN-CHEST CARDIAC MASSAGE WITH CLOSED-CHEST ONE IN TERMS OF TIME INTERVAL TO DETERMINING TERMINATION OF RESUSCITATION BY IDENTIFYING UNRESUSCITATIVE STATE IN CASES OF TRAUMATIC CARDIAC ARREST

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INTRODUCTION. Japanese emergency paramedics are not permitted to make the end-of-life decision and to withhold cardiopulmonary resuscitation (CPR) at scene. Patients with traumatic cardiopulmonary arrest (TCPA) are deal with in a similar manner. Most of them, if without decapitation of hemicorporectomy, are transferred to the emergency centers, and attempts to perform CPR are continued. The outcome after CPR is noted poor. Furthermore, the CPR itself burdens the centers considering man-power and time. Although several guidelines for termination of resuscitation (TOR) have been advocated from foreign countries [1], they don't suit Japanese society. Open-chest cardiac massage (OCCM) is not as successful resuscitation as closed-chest one (CCCM) [2]. However, the time and diagnostic aspects comparing OCCM with CCCM have not been known. The purpose of this study is to examine which massage is preferred to reduce the time interval to determining TOR, and what is the decision-making factor of TOR.
METHODS. We conducted a retrospective review of a CPA database of the Emergency Center of the National Defense Medical College from Jan. 1995 to Dec. 2009. Patients with TCPA, those who never had return of spontaneous circulation until TOR, and those on whose charts the time course from hospital arrival to TOR was fully recorded enrolled this study. The intervals were analyzed in OCCM and CCCM groups. Among the cases of OCCM, the intervals were also analyzed by 4 categories according to the causes of cardiac arrest: cardiovascular injury (CVI), tension pneumothorax (TP), non-cardiovascular hemorrhage (NCVH) and others.
RESULTS. Four hundred and forty-eight cases of TCPA had been transferred to the institute. In only 7 cases were determined TOR at the point of hospital arrival, and in 441 attempted CPR. Among them, 214 cases entered this study. OCCM were performed in 178 cases and CCCM in 36. The average interval to TOR in OCCM was 31 min and in CCCM 44 min. The average interval in each category of OCCM group was 23 min in CVI, 34 in TP, 38 in NCVH, and 39 in others. Forty-nine percent of cardiac arrests were caused by CVI. The factors for determining TOR were cardiac collapse, stiffening of cardiac muscles, or unresuscitable CVI.
CONCLUSIONS. The time interval from arrival at hospital to determining TOR was shorter in OCCM than in CCCM. OCCM enabled early recognition of the patient's state to stop CPR on the basis of clear evidence, and help to reduce the time interval to TOR.
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GRANT ACKNOWLEDGMENT. This study has no conflicting interests.

0408

HYPEROXIA POST CARDIAC ARREST: TOO MUCH OXYGEN FOR TOO LONG?

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INTRODUCTION. Hyperoxia following cardiac arrest has been shown to be an independent predictor of in-hospital mortality [1]. It increases the production of reactive oxygen radicals, which in turn induce apoptosis and lead to cellular and tissue damage. In the clinical setting, these mechanisms may contribute to a poor neurological outcome [2]. Guidelines suggest that hyperoxia should be avoided by early titration of arterial oxygen saturations to 94–96 % [3]. Despite this, high concentrations of oxygen are often used immediately post resuscitation.
OBJECTIVES. We investigated the incidence and duration of hyperoxia post cardiac arrest. We also sought to determine contributing factors.
METHODS. We undertook a retrospective case note analysis of all patients admitted between 2008 and 2011 to the Intensive Care Unit of an inner-city university hospital following cardiac arrest. Data were collected regarding type and cause of cardiac arrest, timing of admission to ICU, timing of arterial blood gas analysis and serial pO2 and P/F ratios. Hyperoxia was defined as mild (PaO2 13.5–40 kPa) and severe (PaO2 > 40 kPa) as previously described by Kilgannon et al. [1].
Statistical analysis was performed using the Kruskal–Wallis test for numerical data and Chi-Square test for categorical data. $p < 0.05$ was considered significant. Data are presented as median and interquartile range (IQR).
RESULTS. Data were analysed for 64 patients. 44 (69 %) patients were admitted following out-of-hospital (OOH) cardiac arrest. The median APACHE score was 19. Hospital survival rate was 10 % (n = 2) for In-hospital cardiac arrest and 38.6 % (n = 17) for OOH cardiac arrest ($p < 0.02$).
Immediately post arrest 67.2 % patients were hyperoxic (mild hypoxia n = 24, severe hypoxia n = 19). 58 (90.6 %) patients were hyperoxic at some stage within the first 24 h post arrest [mild hyperoxia n = 28 (43.8 %), severe hyperoxia n = 30 (46.9 %)]. The $pO2_{max}$ on day 1 was 38.1 kPa (IQR 21.27–58.1), and the $pO2_{max}$ within the first 5 days post arrest was 41.25 kPa (25.97–59.73). At the time of first blood gas analysis post arrest, 90.6 % of patients (n = 58) were ventilated with a FiO2 of 1. The time taken to achieve normoxia was 576 min (IQR 263–880).
CONCLUSIONS. In our cohort severe hyperoxia post cardiac arrest was common despite evidence and guidelines highlighting the risks. The delay in achieving normoxia was marked. Early titration of oxygen therapy using oximetry, timely blood gas analysis and education of staff may reduce the incidence of hyperoxia in the post-cardiac arrest period.
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0409

EVOLUTION OF PATIENTS SURVIVING A HOSPITAL CARDIORRESPIRATORY ARREST DURING A 10 YEARS PERIOD

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OBJECTIVES. Determining long term evolution of patients which survived from an in-hospital cardiorespiratory arrest (CPA) and were hospital discharged measuring their survival and functional and general situation according to Utstein style.
METHODS. Monitoring ended after a 10 years period from a cohort of all the surviving patients from, at least, an episode of in-hospital CPA. The studied group, according to Utstein style, was formed from all CPAs consecutively occurred in Hospital Universitario Virgen de las Nieves in Granada (Spain) during a period of 30 months (January 2000–June 2002). CPAs occurred in operating room, resuscitation room 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. Monitoring was made by telephone contact with the patient or a family member, quarterly the first year and later half-yearly until completing 10 years. In this controls patients were classified according to Glasgow-Pittsburgh brain function categories (CPC) for the neurological function and Glasgow-Pittsburgh general function categories (OPC) for the global situation. Cause and localization were collected in case of exitus. An statistical analysis was made involving the association surviving at the end of the follow-up and the optimus neurological functional and general degree at hospital discharge (CPC 1, OPC 1).
RESULTS. In 203 patients subjected to cardiopulmonary resuscitation, 47 survived and were hospital discharged being included in monitoring (hospital survival 23.15 %). Most patients were hospital discharged in an excellent neurological and general functional situation (75 % in optimus degree). At the end of the 10 years period, 22 patients continued alive (46.8 % discharged and 10.8 % attended for in-hospital CPA). 2 could not be localized. Deceases distribution was heterogeneous throughout the studied period with a case accumulation in the first months. All patients with the exception of one presented an optimus neurological and general situation (CPC 1, OPC 1). A statistically significant association was found between CPC/OPC 1 degree at hospital discharge and the probability of being alive 5 years after hospital discharge (Fisher exact test 5.12; $p = 0.024$), but this association got lost at the end of the monitoring undertaken (Yate's correction 2.54; $p = 0.11$).
CONCLUSIONS. At the conclusion of a long-term following up of a cohort of in-hospital CPA survivors, 46.8 % of the discharged patients continued still alive. It is detected an association between a good neurological and general situation after discharged and half term survival (5 years), losing this association in longer periods of time.

0410

USEFULNESS OF EARLY PLASMA S-100B PROTEIN AND NSE MEASUREMENTS TO IDENTIFY NEUROVASCULAR ETIOLOGIES OF CARDIAC ARREST

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INTRODUCTION. Early identification of the cause of the cardiac arrest (CA) is a cornerstone of the prehospital and initial ICU evaluation. Biomarkers could avoid useless imaging procedures in unstable patients. While S-100B protein and Neuron-Specific Enolase (NSE) have been extensively investigated for prognostication of CA neurological outcome, there is no data about their ability to diagnose neurovascular cause of CA. Because of direct cerebral tissue damage, we hypothesized that plasma S-100B protein and NSE concentrations would be higher in case of primary neurological cause of CA, as compared with non-neurological cause of CA.
OBJECTIVES. To assess the utility of plasma S100 protein and NSE measurements for early diagnosis of primary neurological cause after successfully resuscitated CA.
METHODS. Retrospective review (07/2006-05/2011) of 2 prospectively acquired ICU CA databases. All files were reviewed by 3 experts. S-100B protein and NSE were measured at ICU admission in all patients. Patients with primary neurovascular etiology (subarachnoid hemorrhage, ischemic stroke, intracerebral hemorrhage) were compared with randomly selected CA of non-neurological cause.
RESULTS. CA was due to neuro-vascular etiology (subarachnoid hemorrhage, n = 15; ischemic stroke, n = 3) in 18 patients with the following characteristics: age 53 [43–60] year, no-flow 7 [5–10] min, low flow 19 [15–25] min, therapeutic hypothermia 78 %, and ICU mortality 100 %. Comparative group was constituted with 74 patients (cardiac etiology n = 41, non-cardiac non neurological etiology n = 33): age 60 [49–69] year, no-flow 5 [2–10] min, low-flow 15 [10–20] min, therapeutic hypothermia 92 %, and ICU mortality 61 %. Admission S-100B protein concentration was 1.56 [0.58–8.22] µg/L in the neurological group and 0.51 [0.28–2] in the non-neurological group ($p = 0.01$). In contrast NSE concentration was similar in neurovascular and non-neurovascular etiologies (32.1 [16.5–96.6] µg/L vs. 28.4 [18.2–50], respectively, $p = 0.49$). Area under ROC curve to predict neurological cause of CA was 0.7 [95 % CI: 0.56–0.83] for S-100B protein and 0.55 [95 % CI: 0.39–0.71] for NSE. The optimum cardiac S-100B threshold was determined at 3.19 µg/L (sensitivity 45 %, specificity 85 %).
CONCLUSIONS. Even if S-100B protein performs slightly better than NSE, early dosages of these biomarkers are poorly predictive of a neurovascular etiology of CA. These dosages should not be recommended to tailor the imaging strategy employed to investigate the CA cause. Bleak prognosis of CA due to neuro-vascular etiology could play a major role in the lack of diagnostic value of S-100B protein and NSE.

0411

INVESTIGATION OF THE CLINICAL BACKGROUND AND OUTCOME IN SURVIVORS WHO WERE IMPLANTED CARDIOVERTER DEFIBRILLATORS AFTER OUT-OF-HOSPITAL CARDIAC ARREST OF CARDIAC ORIGIN

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INTRODUCTION. An implantable cardioverter defibrillator (ICD) has been recommended for preventing cardiac arrest by providing effective defibrillation in high risk patients with organic heart disease. However little is known about the clinical background and outcomes of the patients who are implanted with cardioverter defibrillators after out-of-hospital cardiac arrest (OHCA).
OBJECTIVES. To investigate the clinical background of patients with ICD therapy after OHCA in a university hospital, and to determine the frequency of ICD discharge in these patients.

METHODS. We retrospectively examined the patients who were admitted to our ICU because of OHCA from 2005 to 2010. Among the survivors, we selected the patients with a good neurological outcome (Cerebral Performance Categories (CPC) 1 and 2) and examined their clinical background and pre-hospital treatment.
RESULTS. During the study period 148 patients were admitted to the ICU for OHCA, and 30 patients were discharged from the ICU with a good neurological outcome (CPC1: 25, CPC2: 5).Their initial cardiac rhythms were VF (23) and PEA(7).Twenty-seven (90 %) of the patients had witnesses to their cardiac arrest, and bystander CPR was performed for 19 (63 %) patients. The patients' mean ICU stay was 6.7 ± 5.3 days and their mean APACHE II score was 25 ± 7. The cause of cardiac arrest was vasospastic angina in 9 patients, acute myocardial infarction in 7, old myocardial infarction in 5, idiopathic VF in 2, dilated cardiomyopathy in 1, hypertrophyic cardiomyopathy in 1, Brugada syndrome in 1, long QT syndrome in 1, and other in 3. Twenty patients were implanted cardioverter defibrillators, and 2 (10 %) were discharged during the follow-up period.
CONCLUSIONS. ICD therapy for survivors of OHCA of cardiac origin with a good neurological outcome was common. Their frequency of occurrence of ICD discharge was similar to the past report. Emergency physicians and intensivists should recognize the indication of ICD therapy.
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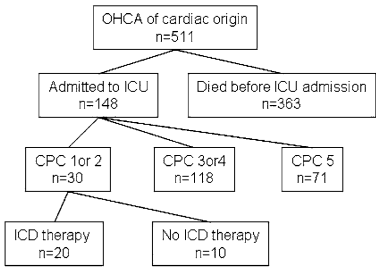

Study profile

0412
THERAPEUTIC HYPOTHERMIA POST CARDIORESPIRATORY ARREST

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INTRODUCTION. Therapeutic hypothermia (TH) potentially improves the outcome of patients post cardiorespiratory arrest as one component of an defined treatment strategy [1, 2]. The international liaison committee on resuscitation (ILCOR) and national institute of clinical excellence (NICE) recommend the use of TH post arrest [1, 2] in specific circumstances. In addition TH may have wider application [1, 2].
OBJECTIVES. To audit our adherence to locally produced TH guidelines and to evaluate our overall outcomes, including subgroup outcome analysis.
METHODS. Retrospective casenote audit of 43 consecutive patients who fulfilled inclusion criteria to receive TH. Patients were cooled to a core temperature of 32–34 °C for 24 h using a targetted surface cooling technique (criticool TM).
RESULTS. 43 patients were identified between January 2009 and September 2011, casenotes were available for 41.38 (97 %, n = 39) patients had advanced life support within 15 min arrest (Fig. 1a). 37 (97 %, n = 38) had return of spontaneous circulation (ROSC) within 60 min (Fig. 1b). 7 (18 %, n = 39) patients achieved target temperature within 4 h of ROSC (Fig. 1c). 24 (63 %) patients were cooled for 12–24 h (Fig. 1d). Of the 41 patients audited 18 (44 %) survived to discharge home, the best outcomes were observed in patients with VF arrest and in hospital arrest (Table 1).

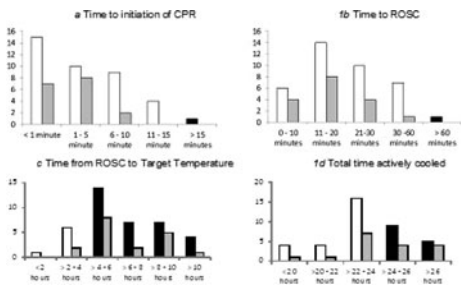

Fig. 1: Results of therapeutic hypothermia audit

		Frequency	Positive outcome
	Outcome	n = 41	n = 18 (44 %)
Primary arrest rhythm	VF	n = 29	n = 14 (48 %)
	Non-VF	n = 4	n = 4 (33 %)
Location of arrest	Hospital	n = 11	n = 6 (54 %)
	Out of hospital	n = 30	n = 12 (40 %)

CONCLUSIONS. Over 90 % of our patients had ALS within 15 min and ROSC within 60 min, perhaps unsurprisingly positive outcome was associated with shorter time to CPR and ROSC. Our survival to home rate of 44 % is comparable to previous studies [1, 2]. The time to achieving target temperature was over 4 h in the majority of cases possibly due to awareness, the diagnostics process itself and lack of initial passive cooling/use of cooled fluids. Subsequent multidisciplinary operational discussions has lead to raised awareness and redesign of the TH protocol. Our results confirm that TH can also be successfully applied to other arrest scenarios e.g. non VF and in hospital.
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0413
OUTCOME OF PATIENTS ADMITTED TO INTENSIVE CARE UNIT AFTER OUT OF HOSPITAL CARDIAC ARREST

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INTRODUCTION. Sudden unexpected cardiac arrest in an out of hospital setting is a devastating event with a very poor outcome. Recent studies show that therapeutic hypothermia in the intensive care unit (ICU) improves survival and neurological outcome in patients with anoxic neurologic injury following out-of-hospital cardiac arrest.
OBJECTIVES. Our objective was to analyse the data of patients admitted to the intensive care unit at our Hospital after an out of hospital cardiac arrest to determine the survival rate, demographics, cause of arrest, effect and extent of cooling, organs supported and length of stay in the unit with an aim to assess the patient population and improve their outcome.
METHODS. It was a retrospective audit of all out of hospital cardiac arrests that were admitted to the intensive care unit at our hospital over a 27 month period between April 2009 and July 2011. Patients were identified through a coding system of out of hospital cardiac arrest and further data gathered through the intensive care unit data collection IT system.
RESULTS. In this study 49 patients were admitted to intensive care unit after out of hospital cardiac arrest over the study period. 69 % of the study population happened to be male sex. The mean age of the patients was 60.2 years. Cause of the arrest was Cardiac in 29 patients (59.2 %). 9 patients (18 %) survived out of the 49. Just under a half (47.2 %) of these patients were cooled within the correct range (32–34 °C). Majority of the patients stayed in intensive care for less than 6 days (n = 40; 81.6 %). Except for one patient, all patients who were in the unit for more than 6 days post arrest died.
CONCLUSION. Of patients who survived, majority (62.5 %) achieved the desired cooling temperature (32–34 °C) compared to only 44.4 % of those who died. From the data collected, we hypothesise that over cooling (<32 °C) can result in a negative outcome. However, this might be secondary to the severity of their disease process. To clarify this, further research is required.
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0414
HYPOTHERMIA AFTER IN-HOSPITAL CARDIAC ARREST -HOSPITAL M'BOIMIRIM—SAO PAULO

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INTRODUCTION. Unconscious adult patients with spontaneous circulation after out-of-hospital cardiac arrest should be cooled to 32–34 °C for 12–24 h to improve neurological outcome. Such cooling may also be beneficial for in-hospital cardiac arrest. We compared the clinical characteristics and outcomes of patients treated with mild therapeutic hypothermia after in-hospital versus out-of-hospital cardiac arrest.
OBJECTIVES. Compare the clinical characteristics and outcomes of patients treated with mild therapeutic hypothermia after in-hospital versus out-of-hospital cardiac arrest.
METHODS. Prospective cohort of patients treated with hypothermia after cardiac arrest in a community hospital in São Paulo, Brazil. After return of spontaneous circulation, survivors of cardiac arrest were cooled to 32–34 °C over 4 h using topical ice and infusions of cold saline beginning within 6 h of cardiac arrest. Goal temperature was maintained for 24 h and monitored with an esophageal thermometer. We compared patients with in-hospital to those with out-of-hospital cardiac arrest.
RESULTS. From Jan-2009 to Dec-2011, 68 survivors of cardiac arrest (42 patients after out-of-hospital and 26 after in-hospital cardiac arrest) were managed with therapeutic hypothermia. The two groups were similar regarding to gender. Patients with in-hospital cardiac arrest tended to be older (44.3 ± 19.6 vs. 33.5 ± 17.9 year, p = 0.07) and to more frequently present with asystole as the cardiac arrest rhythm (45 vs. 15 %, p = 0.10). Patients with in-hospital cardiac arrest had a shorter duration of the arrest (12.3 ± 5.7 vs. 33.7 ± 15.9 min), a longer time to hypothermia initiation (309.3 ± 200.3 vs. 212.8 ± 127.7 min), a longer hospital stay after the arrest (50.75 ± 19.84 vs. 32.45 ± 12.55 days, p = 0.01) and a lower frequency of independence (Glasgow Outcome Scale >3, 35.0 % vs. 68.4 %, p = 0.03) at 30 days.
CONCLUSIONS. Although therapeutic hypothermia is feasible after in hospital cardiac arrest, prognosis might not be as good as in those patients with out of hospital cardiac arrest. Delays in hypothermia initiation, previous comorbidities, and older age could explain the worse outcome in the in-hospital cardiac arrest group.
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0415

DIFFERENCES BETWEEN POST PREHOSPITAL AND INTRAHOSPITAL CARDIAC ARREST ICU PATIENTS

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OBJECTIVES. The aim of our study was to record and to compare the time to the Cardiopulmonary Resuscitation (CPR) as well as severity indexes (Age, APACHE II score), length of stay (LOS), ventilation days (VD), mortality and outcome in ICU post cardiac arrest patients, according to the cardiac arrest place, prehospital versus intrahospital.

METHODS. From November 2005 to February 2012, 391 patients admitted to our both medical and surgical ICU. From these, 33 (8.43 %) were post cardiac arrest patients, 17 men and 16 women and included retrospectively in our study. The patients separated in two groups. Group A involved 16 (48.48 %) patients suffered from prehospital cardiac arrest and group B involved 17 (51.51 %) patients suffered from intrahospital cardiac arrest. We used Glasgow Outcome Score: Good Outcome = Good Recovery + Moderate Disability.

RESULTS. Severity and hospitalization indexes. Group A/Group B.

Severity and hospitalization indexes, Group A/Group B

	Mean	S.D.	Median	Min	Max	P value
Age	62.7/65.2	21.7/13.2	68/64	23/34	95/82	0.69
APACHE II score	25.8/26.4	5.45/3.98	26.5/28	17/17	34/31	0.72
Length of stay	16/13.4	13.4/10	13/12	1/2	50/34	0.54
Vendilation days	14.8/9.88	12.9/8.49	11/8	1/2	47/31	0.21
Time to CPR (min)	14.06/3.7	2.7/0.98	15/3	5/3	15/5	<0.0001

Outcome indexes. Group a/Group B.

Outcome indexes, Group A/Group B

	No. total	Percentage	Odds ratio	C.I. from	C.I. to	P value
Deaths	7:16/6:17	43.7 %/35.2 %	1.42	0.35	5.79	0.72
Good outcome	5:16/5:17	31.2 %/29.4 %	1.09	0.24	4.81	1

CONCLUSIONS. According to our data, we detected no statistical significant dereference between the two groups according to the severity and hospitalization indexes studied, except from the lower time to CPR in Group B patients (intrahospital cardiac arrest). Mortality rate was better in Group B patients but not statistical significant, suggesting that patients who survived cardiac arrest and entered ICU had about the same effective treatment.

Oral Sessions
Methods to optimise infections outcome in the ICU: 0416–0420

0416

HIGH REGIMEN OF CONTINUOUS INFUSION OF VANCOMYCIN DURING CONTINOUS RENAL REPLACEMENT THERAPY

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INTRODUCTION. Continuous infusion (CI) of high doses of vancomycin are recommended to treat life-threatening infections due to less susceptible Gram-positive bacteria [1]. However, this approach has not been evaluated in patients undergoing continuous renal replacement therapy (CRRT), who are at risk of underdosing when standard regimens are used [2].

OBJECTIVES. The aim of this study was to evaluate the adequacy of a new CI vancomycin regimen in septic patients undergoing CRRT.

METHODS. In this prospective, single-center study, we measured vancomycin levels using a new CI regimen, adapted to the renal function [1], used in our Department since January 2011. In case of CRRT, a loading dose of 35 mg/kg was given over a 4-h period, followed by a daily dose of 14 mg/kg. Vancomycin concentrations were measured: (T1) at the end of loading dose; (T2) at 12-h after the onset of therapy; (T3) at 24-h after the onset of therapy. Drug concentrations (at T2 and T3) were considered adequate between 20 and 30 mg/L, insufficient if below 20 mg/L and excessive if above 30 mg/L. CRRT intensity was calculated as: dialysate rate (mL/kg/h) + ultrafiltration rate (mL/kg/h). Data are presented as counts (percentage) or median (IQR).

RESULTS. We treated 26 patients, with median age and weight of 57 (50–65) years and 80 (67–93) kg, respectively. Median loading and daily vancomycin doses were 2800 (2300–3400) and 1112 (1000–1375) mg, respectively. Drug concentrations were: T1 = 46 (37–60) mg/L; T2 = 28 (23–32) mg/L; T3 = 24 (20–26) mg/L. Adequate drug concentrations were found in 17/26 (65 %) of patients at T2 and T3, insufficient drug concentrations in 1/26 (4 %) and 6/26 (23 %) patients at T2 and T3, and excessive concentrations in 8/26 (31 %) and 3/26 (12 %) patients at T2 and T3. Patients with insufficient drug concentrations at T3 had significantly higher CRRT intensity than others (51 [40–70] mL/kg/h vs. 30 [20–50] mL/kg/h).

CONCLUSIONS. This new vancomycin regimen allowed to rapidly achieve adequate drug concentrations in the majority of patients. The intensity of CRRT should be taken into consideration when prescribing CI vancomycin to avoid underdosing.

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0417

A RANDOMIZED CLINICAL TRIAL OF PERIODIC ASPIRATION OF SUBGLOTTIC SECRETIONS IN PATIENTS RECEIVING MECHANICAL VENTILATION

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INTRODUCTION. Aspiration of subglottic secretions is a widely used procedure in the prevention of ventilator-associated pneumonia (VAP). However, whether periodic frequent aspiration of subglottic secretions by device has equal effects compared with intermittent aspiration is unknown.

OBJECTIVES. The aim of this study was to compare the efficacy of periodic frequent aspiration of subglottic secretions by device with intermittent manual aspiration in the prevention of VAP.

METHODS. Single-center randomized controlled study developed from May 2010 to March 2011.We studied adults patients who were expected to undergo mechanical ventilation for more than 48 h.

INTERVENTIONS. Patients were randomly assigned to receive either periodic frequent aspiration (periodic group) or intermittent manual aspiration (intermittent group).

RESULTS. Fifty-nine patients were randomized to periodic group, and 60 patients were randomized to intermittent group. The two groups were similar at the time of randomization with regard to demographic characteristics, surgical procedures performed, and severity of illness. Of the 119 patients, 88 patients (74 %) were received mechanical ventilation for shorter than 48 h for the following reasons: early extubation (79 patients) or intubated by endotracheal tube without a lumen for drainage of subglottic secretions. Of the 31 remaining patients receiving mechanical ventilation, 15 patients (48 %) were randomized to the periodic group and 16 patients (52 %) were randomized to the intermittent group. VAP was seen in 4 patients (26.7 %) of periodic group and 7 patients (43.8 %) of intermittent group. No statistically significant difference for incidence of VAP ($p = 0.320$). Lengths of stay in ICU were shorter among the periodic group (6.3 ± 2.1 days) than the intermittent group (9.8 ± 4.8 days); ($p = 0.0097$). No statistically significant difference for hospital mortality, overall duration of mechanical ventilation, lengths of stay in the hospital. No complications related to continuous subglottic secretions drainage were observed.

CONCLUSIONS. Periodic frequent aspiration of subglottic secretions reduces the lengths of stay in ICU in patients receiving mechanical ventilation.

0418

EFFECTIVENESS OF NEBULIZED AMPHOTERICIN B TO ERADICATE CANDIDA COLONIZATION FROM THE LOWER RESPIRATORY TRACTS OF ICU PATIENTS

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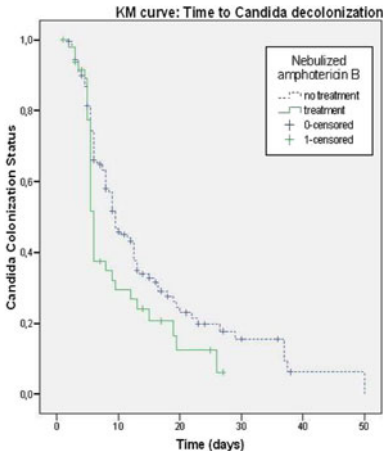
INTRODUCTION. *Candida* species are opportunistic pathogens that are ordinarily found in the human gastro-intestinal tract. In critically ill patients receiving mechanical ventilation, colonization of the lower respiratory tract (LRT) with *Candida* may occur in 25–60 % of patients [1]. Nebulized amphotericin B is commonly used to eradicate *Candida* from the LRT, for example as part of selective decontamination of the digestive tract protocols. However, the effectiveness of this approach in clinical practice is unknown.

OBJECTIVES. To determine the time till eradication of *Candida* species from the LRT in mechanically ventilated intensive care unit (ICU) patients receiving and not-receiving inhalation therapy with nebulized amphotericin B.

METHODS. We included patients admitted to the ICU of the University Medical Center Utrecht from November 2007 until February 2012. We excluded patients with a length of stay <72 h and patients receiving systemic antifungal treatment. Microbiological screening for *Candida* colonization was performed on admission and twice weekly, and samples were processed according to a standardized protocol. Samples obtained in the first 72 h of ICU admission were discarded since positive samples obtained on admission were not an indication to start amphotericin B. Colonization was defined as the presence of *Candida* in two or more consecutive samples obtained on different days. Decolonization was defined as the absence of *Candida* in two consecutive samples, or as the absence of *Candida* in the last available sample before extubation or discharge. Only the first episode of *Candida* colonization per admission was used for analysis. Hazard ratios of eradication of *Candida* colonization in treated patients compared to non-treated patients were determined using Cox regression analysis.

RESULTS. Out of a total of 2948 patients who were admitted for at least 72 h, 288 were colonized with *Candida*. Concurrent systemic antifungal treatment during colonization period was administered to 27 of these patients, who subsequently were excluded, leaving 261 patients for analysis. Decolonization occurred in 36 of 48 (75 %) and 112 of 213 (53 %) patients who received or did not receive nebulized amphotericin B, respectively (HR 1.51; 95 % CI 1.03–2.20). Median time to decolonization was 6.0 (IQR 5.6–6.4) and 9.0 days (IQR 8.1–10.9) in patients receiving and not-receiving nebulized amphotercin B, respectively (log rank test, $p = 0.03$) (Fig. 1). Adjustment for age, sex and time from ICU admission to acquirement of *Candida* did not alter the results.



Time to Candida decolonization

CONCLUSIONS. Inhaled amphotericin B treatment in mechanically ventilated patients with acquired Candida colonization of the lower respiratory tract significantly increases the rate of decolonization.

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0419

BIOMARKERS KINETICS TO EARLY PREDICT RESPONSE IN SEVERE COMMUNITY-ACQUIRED PNEUMONIA

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INTRODUCTION. Despite several attempts, there is no standard definition for clinical response in severe community-acquired pneumonia (SCAP). Early identification of responders and non-responders could help to reduce antibiotic consumption and would allow earlier rescue antibiotic therapy, if needed.

OBJECTIVES. The goal of our study was to evaluate the role of biomarkers kinetics as early (1st 72 h) predictors of response in SCAP.

METHODS. Prospective, single-center, observational cohort study of 90 patients with SCAP admitted to the Intensive Care Department of an University Hospital in Portugal within 12 h after the 1st antibiotic dose. Biomarkers [procalcitonin (PCT), C reactive protein (CRP), lactate and brain natriuretic peptide (BNP)] were measured during the 1st 7 days after ICU admission. Variables were log transformed and two periods were considered: the 1st day in the ICU and the evolution after day 1. This evolution was summarized by two quantities: intercept and slope.

RESULTS. Most of the patients were male (63 %) with a mean age of 60 years. Mean SAPS 3, PSI and SOFA scores were 73 ± 15, 152 ± 40 and 10 ± 3, respectively. 61 % were microbiologically documented (MD) and *St. pneumoniae* was the most frequent pathogen (53 % of all MD). Median time to antibiotherapy was 152 min (IQR 75–275). All patients received combination therapy with a mean duration of 10 ± 7 days. Median duration of mechanical ventilation was 10 days (IQR 5–20) and ICU length of stay was 12 days (8–22). ICU and hospital mortality were 27 and 31 %. After 24 h of antibiotherapy an average one-unit daily reduction in the logLactate was associated with 82 % reduction in the chance of dying (OR = 0.18; $p = 0.006$). On day 3, a one-unit increase in the logPCT and logBNP increased the chances of dying by 2.1 ($p = 0.030$) and 3.3 ($p = 0.007$) times, respectively. No significant association between CRP kinetics and response was observed.

CONCLUSIONS. The kinetics of biomarkers such as PCT, lactate and BNP can be used for an early identification of responders in SCAP.

0420

SEVERE COMMUNITY-ACQUIRED PNEUMONIA: THREE YEARS RESULTS IN A POLYVALENT ICU

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INTRODUCTION. Community-acquired pneumonia (CAP) is common cause of severe sepsis and septic shock and remains as a leading cause of death from infectious diseases around the world. Most severe CAP patients are admitted to the intensive care unit (ICU) to receive intense treatment. Our ICU is a polyvalent one with 18 patient boxes in a second level hospital in Spain.

OBJECTIVES. The purpose of the study was to identify those factors related with survival that could improve clinical results in severe CAP, specially mortality and morbidity.

METHODS. A retrospective chart review was performed in 123 patients admitted to ICU with severe CAP diagnosis from January 2009 to December 2011. We analyze demographic, clinical and microbiological data. The program used for the data processing and statistical analysis was SPSS v15.

RESULTS. A 67.5 % of our CAP cases suffer septic shock and only 32.5 % severe sepsis. 61 % of patients were treated with corticosteroids at admission to ICU. The mean age was 55 years and 37.4 % were women. APACHE II in the first 24 h of admission to ICU was 18.66 with a mortality ICU rate of 33 %, similar to predicted. Mean SOFA score were 6.9. Mortality is related with elder patients (53 vs. 60 years, $p = 0.01$), longer delay time in admission to ICU (0.88 vs. 1.59 days, $p = 0.01$), higher severity by APACHE II score (16 vs. 24, $p = 0.00$) and by SOFA score (5.29 vs. 10, $p = 0.00$), more organ dysfunction (1.77 vs. 3.4 organs, $p = 0.00$), larger radiologic extension (29 vs. 48 %, $p = 0.05$), background of oncohaematological illness ($n = 8$, 75 vs. 30 %, $p = 0.01$), higher LDH (386 vs. 888 UI/L, $p = 0.03$) and procalcitonin (13.4 vs. 37.4 ng/ml, $p = 0.04$), showing at admission leucocytosis or leucocytopenia ($n = 93$, 20 vs. 37 %, $p = 0.05$) and longer mechanical ventilation time (6 vs. 11.5 days, $p = 0.03$). No microorganism was identified in 40.7 % of cases. In 24 % of patients CAP etiology was pneumococcus, with a 33 % of bacteraemia ($n = 10$, 25 vs. 80 %, $p = 0.006$). Bacteraemia increases mortality with statistics significance ($n = 24$, 40.9 vs. 59.1 %, $p = 0.03$).

CONCLUSIONS. In order to decrease mortality rate of CAP we should improve earlier detection of severe patients (those with more than one dysfunctional organ) and earlier admission to ICU to begin an intense treatment. The presence of pneumococcus bacteraemia should advise of the probability of torpid evolution with lethal outcome.

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Assessing the impact of interventions and organisations in intensive care 2: 0421–0425

0421

INTENSIVE AND INTERMEDIATE CARE UNITS IN EUROPEAN HOSPITALS

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INTRODUCTION. European Mortality & Length of ICU Stay Evaluation (ELOISE) is a multi-centre European observational study to assess whether patients admitted to the ICUs of hospitals with availability of intermediate care unit (IMCU) have lower hospital mortality than those admitted to the ICUs without availability of IMCU. Participating Units, enrolled by Country Coordinators, answered a questionnaire to describe their organizational characteristics at Hospital and Unit level.

OBJECTIVE. To analyse the answers to the questionnaire dedicated to the organization of the Units participating in ELOISE according to the geographical area as in the SAPS 3 Admission Score studies (1, 2): Southern Europe & Mediterranean Countries (SEMC); Central & Western Europe (CWE); Eastern Europe (EE); Northern Europe (NE).

METHODS. Data about Hospital, teaching or not, profit or not, and presence of LOC III/II/I Units (3)—and the ICUs (number of beds, Nurse-to-bed ratio, and Physician-to-bed ratio) collected via internet through study website from different geographical area are compared.

RESULTS. The answers double (33), or incomplete (14), and from LOC I/II Units (4) are excluded. This analysis concerns 153 ICUs (111 mixed), 85.6 % of them located in teaching Hospitals, and 62.8 % in hospitals with >500 beds. 52 ICUs (34 %) have intermediate care beds physically included in the ICU, and 125 (83 %) of the 150 ICUs answering the item are located in hospitals with any IMCU. Nurse-to-bed ratio of the ICUs ranges from 0.50 (SEMC), to 0.56 (EE), to 0.88 (CWE), to 1.16 (NE) in morning shift, and from 0.33 (EE), to 0.40 (SEMC), to 0.79 (CWE), to 1.06 (NE) in night shifts. Intensive care qualified Physician-to-bed ratio ranges from 0.12 (CWE), to 0.27 (NE), to 0.29 (EE), to 0.30 (SEMC) in morning hours, and from 0.13 (NE), to 0.10 (SEMC), to 0.08 (both CWE and EE) in nighttimes. Data on the number (N) of ICU beds and the presence of IMCU in the hospital (HO) are reported in the table.

ICUs characteristics

Area	No. of ICUs	Median (IQR) No. of ICU beds	No. of ICUs in HO with IMCU	No. of ICUs in HO with IMCU discharging to IMCU
SEMC	93	12 (9–18)	82 (91 %)	46 (56 %)
CWE	32	11 (10–16)	23 (72 %)	15 (65 %)
EE	20	16 (9–25)	15 (75 %)	9 (60 %)
NE	8	9.5 (8–11)	5 (63 %)	4 (80 %)

Fifty-two (41.6 %) of the 125 ICUs located in hospitals with IMCU report that they do not discharge their patients to IMCU.

CONCLUSIONS. The comparison between geographical areas shows that Northern Europe ICUs have the highest Nurse-to-bed ratio and Southern Europe & Mediterranean Countries ICUs the highest intensive care qualified Physician-to-bed ratio in daytime. A high percentage of the ICUs located in hospitals with IMCU report that they do not discharge their patients to them.

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0422

EFFECT OF DISCHARGE TO A STEP-DOWN UNIT AFTER CRITICAL ILLNESS ON MORTALITY AND HOSPITAL LENGTH OF STAY: A PROPENSITY MATCHED ANALYSIS

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INTRODUCTION. Step-down units (SDU) were created in order to improve care after critical illness; however, the impact of such units on hospital length of stay and mortality is still debated on medical literature.

OBJECTIVES. To evaluate the impact of discharge to a SDU compared to discharge to the ward on mortality during hospital stay and after 30, 60 and 90 days following critical illness. Secondary end-points included hospital length of stay after ICU dismissal and rate of unplanned ICU readmission.

METHODS. We performed a retrospective analysis of prospective collected data including all patients that remained on the ICU for at least 3 days and were discharged of a tertiary hospital from January 2003 to December 2008. Patients were discharged to the ward or to a SDU at discretion of the attending physician. A propensity matched score including 45 variables was created, including severity score, origin before admission, ICU length of stay, reason for admission, comorbidities, organ dysfunctions and physiologic data. Of the initial 690 patients, 399 matched patients (298 discharged to the ward and 101 discharged to a SDU) were included on the analysis. A $p \leq 0.05$ was considered significant.

RESULTS. After the propensity match, mortality was similar for patients discharged to the ward or to the SDU at 30 days (13 vs. 10 %, respectively, $p = 0.36$), 60 days (16 vs. 21 %, $p = 0.26$), 90 days (18 vs. 22 %, $p = 0.37$) and during hospital stay (18 vs. 20 %, $p = 0.20$). Post-ICU length of stay was higher at the SDU group (20 vs. 11 days, $p < 0.01$), mainly due to differences in hospital survivors (18 vs. 11 days, $p < 0.01$; Fig. 1). No difference between groups was found regarding unplanned readmission rates (16 % on the ward group versus 18 % on the SDU group, $p = 0.63$), however, late readmissions occurred in patients at SDU (Kaplan–Meier curves for time to hospital discharge and to first ICU readmission are shown on Figs. 1 and 2).

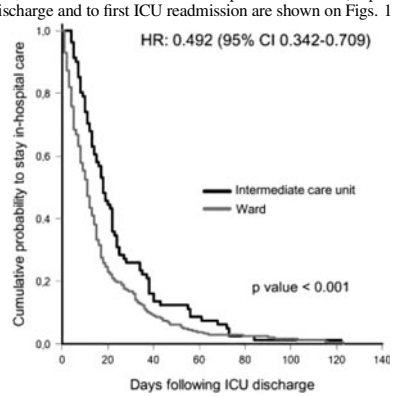

Fig. 1

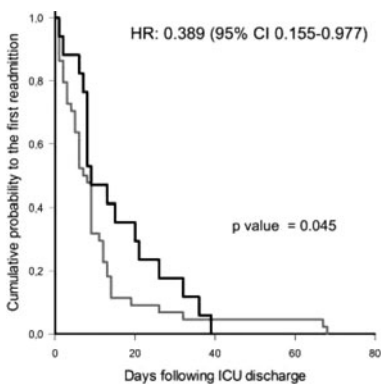

Fig. 2

CONCLUSIONS. Discharge to a SDU is not associated with improved outcomes until 90 days. Hospital length of stay was higher on patients admitted to SDU. Furthermore, we could not observe reduction of unplanned readmissions rates. These data suggest a lack of benefit on mortality and hospital length of stay with the use of SDU. Prospective multicenter studies are urgently needed in order to evaluate the impact of such units.

0423

AFTER CRITICAL CARE, THEN WHAT? PATIENT SUPPORT AFTER CRITICAL CARE: A MIXED METHOD LONGITUDINAL STUDY USING A NOVEL RESEARCH TECHNIQUE

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INTRODUCTION. Significant physical, emotional and psychological sequelae can follow critical care admission [1]. There is arguably a gap to explore patient needs for support after critical care. Critically ill cancer patients have been found to have specific ongoing needs after discharge including: needing reassurance about recovery and recurrence [2].

OBJECTIVES. To explore experiences and needs, over time, of patients discharged from a cancer critical care unit (CCU) using the Intensive Care Experience (ICE-q) questionnaire, Hospital Anxiety and Depression Scale (HADS) and EuroQoL (EQ-5D), associated clinical predictors (APACHE II, TISS, Length of stay, RIKER scores) and in-depth email interviewing.

METHODS. This mixed-method, longitudinal study assessed patient experiences for patients with >48 h stays in CCU at 2 weeks, 6 months, 12 months using the ICE-q, HADS, EQ-5D triangulated with clinical predictors, including age, gender, length of stay (critical care and hospital), APACHE and TISS. Alongside, qualitative in-depth email interviews were conducted at 1 and 6 months (if participants had no computer access a Blackberry® was offered) using Grounded Theory.

RESULTS. 78 patients completed questionnaires. Data was collected from Jan 2010–Mar 2012. 21 patients also completed email interviews a month after discharge. Mean EURO-QoL visual analogue scale scores were 57.37 (SD 19.61) at 2 weeks and 69.61 (SD 18.95) at 6 months, showing improvement over time ($p \leq 0.001$). HADS scores also improved from 2 weeks to 6 months, for both domains of anxiety (decreased from 4.91 to 4.65) and depression (decreased from 6.71 to 4.48, $p \leq 0.001$), as might be expected. Patient acuity in CCU was demonstrated with a mean TISS of 28.66 (27.01–30.32, 95 % CI; SD 7.19); mean APACHE II of 15.44 (14.23–16.72, 95 % CI; SD 5.37) and a median critical care LOS of 90.58 h (3.77 days; range 2–77 days). Gender was a 50 % even split. Mean age was 59.03 (56.11–61.94, 95 % CI; SD 12.94). Of the 62 respondents who reported computer use, 74.2 % reported regular use. The improvement in VAS scores was reflected in emergent themes from qualitative email data: *rehabilitation/recovery in the context of cancer; impact of critical care; emotional and psychological needs* (including sub-themes of: information needs and relocation anxiety). The overarching, core theme related to *adjustment of normality*.

CONCLUSIONS. Recovery, measured by QoL and anxiety and depression scores, improves over time as might be expected. However, in this patient group recovery from critical illness is shaped by ongoing illness and treatment in cancer, and the need for adjustment to a new normality. Email interviews offer a convenient method of gaining in-depth interview data.

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GRANTS. This study was funded by an ESICM/ECCRN Edwards Nursing Science Award.

0424

FUNCTIONAL STATUS AS A PREDICTOR OF ADMISSION TO CRITICAL CARE IN ACUTELY UNWELL PATIENTS

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INTRODUCTION. Access to Critical Care is limited, with demand being higher than availability. Guidance to inform triage decisions has been published but may no longer reflect current pressures [1–2]. We previously identified a set of factors predicting the likelihood of admission in unplanned, urgent referrals to a Critical Care unit in a large UK teaching hospital. [3].

OBJECTIVES. In this study we used a larger dataset to identify independent predictors of admission after adjustment in multivariate analysis.

METHODS. Consecutive urgent patient referrals were prospectively enrolled in a review cohort. Data was collected using a predefined case report form (CRF), which included information on the referral, acute physiological parameters, hospital length of stay (LOS), demographic and functional status, dependency and comorbidities. Univariate logistic regression was performed to identify factors predicting admission, multivariate analysis was performed to identify independent predictors, employing STATA [4].

RESULTS. Between July 2011 and April 2012, 328 patients were referred to critical care, of whom 165 (50.9 %) were declined. Median age (inter-quartile range = IQR) was 67 (53–79) years, 183 (56.1 %) were male, median LOS (IQR) was 1 (1–3) day, median (IQR) Early Warning Score (EWS) was 5 (3–7). Age ($p = 0.14$), gender ($p = 0.026$), ethnic origin ($p = 0.37$), LOS ($p = 0.26$), referral reason ($p = 0.91$) did not impact on likelihood of admission to critical care. On the contrary, odds ratios (95 % Confidence Intervals) for admission were 2.3 (1.48–3.63) for exercise tolerance >100 yards ($p < 0.001$), 3.73 (2.16–6.43) for self-caring status ($p < 0.001$), 0.35 (0.21–0.58) for house-bound status ($p < 0.001$), 0.40 (0.18–0.9) for wheelchair-bound status ($p = 0.026$), 0.48 (0.27–0.84) for renal system ($p = 0.01$), 0.49 (0.29–0.85) for neurological ($p = 0.011$) and 0.45 (0.21–0.97) for malignant ($p = 0.041$) comorbidities, and 1.92 (1.23–2.99) for a EWS >6 ($p = 0.004$), respectively.

After inclusion in multivariate analysis, only self-caring status ($p = 0.001$) remained an independent predictor of admission.

CONCLUSIONS. These findings support our previously presented data, confirming that Critical Care admission decisions in our institution are based mainly on the assessment of patients' functional status. This behaviour is consistent with the application of a "prioritization" model, favouring those patients who will benefit most from critical care admission

(Priority 1) to those who will not benefit at all (Priority 4) and consistent with pressured resources, rather than an "objective parameters" or a "diagnostic" model. [1].
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0425
IMPROVED QUALITY PATIENT OUTCOMES WITH THE INTRODUCTION OF A CRITICAL CARE TRACHEOSTOMY MULTIDISCIPLINARY TEAM

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INTRODUCTION. The increasing use of percutaneous dilatational tracheostomy in the Intensive Care Unit (ICU) has resulted in more tracheostomy patients being discharged to hospital wards incurring tracheostomy-related risks of airway obstruction and delayed time to speech and decannulation. There is preliminary evidence of benefit following introduction of a Tracheostomy Multidisciplinary Team (TMT) service [1].
OBJECTIVES. The aim of this 4-year study was to compare quality outcomes in tracheostomy patients in the 2 years before and 2 years after the implementation of a Critical Care led TMT service with a focus on patient quality outcomes: time to speech and decannulation, hospital length of stay and the rate of hospital discharge with a tracheostomy.
METHODS. Data were collected retrospectively from 2007 to 2011. Patients who had a tracheostomy inserted in ICU and were discharged to hospital wards were included in the study. Data on the pre-determined endpoints were crosschecked and inputted manually into PASW from three separate hospital databases. Demographic data are described parametrically but outcome data were analysed using non-parametric independent samples testing and statistical significance was set at $P < 0.05$. Ethics approval was not necessary as this was a quality review audit.
RESULTS. In total, 209 patients were eligible for study, 77 in the pre and 132 in the post TMT group. The mean (SD) age was 58.7 (±18.1) years and 135 were male. The mean (SD) APACHE (Acute Physiology and Chronic Health Evaluation) II score was 17.2 (±9.7), the mean (SD) ICU LOS was 21.5 (±17.05) days and mortality was 52/209 (24.9 %). Tracheostomy was percutaneous in 155/209 (74.2 %). In the post TMT group, there was a significant reduction in time to (speaking valve) speech and to decannulation. The length of hospital stay and the number of patients discharged with a tracheostomy decreased non-significantly (see Table).

Patient outcomes pre and post TMT implementation

	Pre TMT implementation (n = 77)	Post TMT implementation (n = 132)	p value
Time to speaking valve [days: median (range)]	14 (2–76)	9 (1–76)	0.003
Time to decannulation [days: median (range)]	69 (4–228)	32.5 (2–282)	0.001
Hospital length of stay [days: median (range)]	89 (4–328)	73.5 (7–349)	0.054
Hospital discharge with tracheostomy [number of patients (%)]	10/77 (13 %)	10/132 (7.6 %)	0.227

CONCLUSIONS. The TMT-associated reduction in the time to (speaking valve) speech and decannulation improved patient safety and quality outcomes. The trend towards a shorter hospital stay and fewer patients discharged with a tracheostomy was likely associated with improved health care economies.
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Outcomes for the high-risk surgical patient: 0426–0430

0426
META-ANALYSIS OF GOAL DIRECTED THERAPY IN HIGH-RISK PATIENTS UNDERGOING MAJOR NON-CARDIAC SURGERY

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INTRODUCTION. Patients with a limited cardiac reserve are less likely to survive and suffer from more complications after major surgery [1]. By augmenting DO_2I with a combination of intravenous fluids and inotropes (goal directed therapy; GDT), the post-operative mortality and morbidity of high-risk patients is reduced. However, not all clinical trails are consistent with these findings and GDT is not widely practiced.
OBJECTIVES. We hypothesized that GDT results in greatest benefit in terms of mortality and morbidity in patients with the highest risk of mortality.
METHODS. We performed a systematic search of Medline, Embase and CENTRAL databases for randomized controlled trials (RCTs) and reviews of GDT in high-risk surgical patients. To minimize heterogeneity we excluded studies involving cardiac surgery. Extremely high risk, high risk and intermediate risk of mortality were defined as >20 %, 5–20 % and <5 % mortality rate in the control arm of the trials respectively [2]. Meta-analyses were performed and forest plots drawn using RevMan software. Data are presented as odd ratios (OR), [95 % confidence intervals (CI)], and p values.
RESULTS. A total of 30 RCTs including 4557 patients were reviewed. All studies reported mortality. 4 studies (n = 2221) were excluded from assessment of complication rates as the number of patients with complications was not reported. The mortality benefit of GDT was confined to the subgroup of patients at extremely high-risk of death (OR = 0.71, [0.56–0.90], $p < 0.00001$). Complication rates were reduced in all subgroups of patients (OR = 0.47, [0.39–0.56], $p < 0.00001$). The benefit was greatest among patients in the intermediate risk subgroup (OR = 0.41, [0.31–0.54], $p < 0.00001$), followed by the high risk subgroup (OR = 0.49, [0.36–0.66], $p < 0.00001$), and the extremely high risk subgroup (OR = 0.53, [0.35–0.81], p = 0.003).

Effect of GDT on mortality

Mortality risk subgroups	No. of studies	Number of patients (GDT treatment arm)	Mortality events (GDT treatment arm)	No. of patients (control arm)	Mortality events (control arm)	Odds ratio (95 % CI), p value
All studies	30	2340	135	2217	179	0.71 [0.56–0.90], p = 0.003
<5 %	14	701	14	678	15	0.86, [0.44–1.69], p > 0.05
5–20 %	11	1497	110	1366	113	0.88 [0.67–1.16], p > 0.05
>20 %	5	142	11	173	51	0.18 [0.09–0.38], p < 0.001

Effect of GDT on complications

Mortality risk subgroups	No of studies	Number of patients (GDT treatment arm)	Number of patients with complications (GDT treatment arm)	No. of patients (GDT control arm)	Patients with complications (GDT control arm)	Odds ratio (95 % CI), p value
All studies	26	1334	439	1197	577	0.47 [0.39–0.56], p < 0.001
<5 %	12	623	174	619	271	0.41 [0.31–0.54], p < 0.001
5–20 %	9	511	183	349	170	0.49 [0.36–0.66], p < 0.001
>20 %	4	162	78	210	136	0.53 [0.35–0.81], p = 0.003

CONCLUSIONS. GDT is beneficial in all high-risk patients undergoing major surgery. The mortality benefit of GDT was confined to the subgroup of patients at extremely high risk of death. However, the reduction of complication rates was seen across all subgroups of GDT patients but was greatest in the intermediate mortality risk group.
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GRANT ACKNOWLEDGMENT. None (Authors contributed equally to the design, literature review and analysis of the data).

0427
USE OF SURGICAL SAFETY CHECKLIST REDUCED REOPERATIONS FOR SURGICAL SITE INFECTION IN HIGH RISK PATIENTS

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INTRODUCTION. Use of the surgical safety checklist has been associated with significant reduction in postoperative morbidity and mortality.
OBJECTIVES. Our objective was to assess the efficiency of the surgical safety checklist in reducing reoperation for surgical site infection, unplanned return to operating room, unplanned admission to intensive care unit (ICU) and in-hospital mortality in high-risk surgical patients operated upon in a high-income country.
METHODS. We conducted a prospective cohort study to evaluate the effectiveness of an intra-operative checklist in high-risk surgical patients (ASA score >2) in a high-income country comparing pre-implementation (April–June 2009) and post-implementation periods (period I: July–September 2009; period II: April–June 2010; period III April–June 2011; checklist implementation July, 1 2009). Outcome measures were unplanned return to operating room, reoperation for surgical site infection, unplanned admission to intensive care unit (ICU), and in-hospital death within 30 days.
RESULTS. 609 patients [52.5 % elective, 85.2 % ASA3, mean age 70.1 years (SD 15.5)] were included before, and 1,818 after implementation [52.0 % elective, 86.6 % ASA 3, mean age 68.9 years (16.7)], the latter with 552 in period I (checklist completed for 76.8 % of patients), 558 in period II (checklist completed for 83.2 %) and 708 in period III. Unplanned return to operating room occurred after 45/609 interventions (7.4 %) before, and 109/1,818 (6.0 %) after implementation [adjusted RR 0.82 (95 % CI 0.59; 1.14)]. Reoperation for surgical site infection occurred in 18/609 interventions (3.0 %) before versus 109/1,818 (1.7 %) after implementation [adjusted RR 0.57 (95 % CI 0.32; 1.02)] with similar results in all three periods. Unplanned admission to ICU was observed in 17 interventions (2.8 %) before versus 48 (2.6 %) after implementation [adjusted RR 0.90 (95 % CI 0.52; 1.56)]. In-hospital death occurred in 26 patients (4.3 %) before versus 108 (5.9 %) after implementation (adjusted RR 1.39 [95 % CI 092; 2.11)].
CONCLUSIONS. Reduced reoperation rates for surgical site infection were observed after checklist implementation; however, the use of the checklist did not reduce 30-day mortality and unplanned admission to ICU in high risk patients.
GRANT ACKNOWLEDGMENT. The Department of Anesthesiology, Intensive Care and Clinical Pharmacology and the Department of Surgery, Geneva University Hospitals funded the study.

0428
EARLY POSTOPERATIVE PROCALCITONIN AND ITS ASSOCIATION WITH MORTALITY IN INTENSIVE CARE UNIT PATIENTS AFTER ELECTIVE SURGERY

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INTRODUCTION. Increased serum procalcitonin (PCT) has been shown to occur during systemic inflammation, sepsis, severe tissue injury or shock. Its predictive power for outcome in patients undergoing elective surgery with post-operative intensive care unit (ICU) stay is not known.

OBJECTIVES. To assess the association of early PCT within the first 24 h after ICU admission with mortality in patients undergoing elective surgery.
METHODS. 1846 patients who underwent elective surgery with post-operative ICU stay in a tertiary medical center during a 4-year period were retrospectively screened. All patients with PCT assessment during the first 24 h after ICU admission were included. Exclusion criteria were: patients transferred to another hospital, re-admission, ASA class >4, and liver transplantation. The collected variables were: type of hospital discharge (death or discharge), primary diagnosis, type of surgery, first PCT, maximum lactate concentration and leukocyte count, age, gender, weight, and preoperative ASA class. Mann–Whitney *U* test was performed for PCT and Lactate levels. The effects of variables were tested in a logistic regression model. Statistical significance was assumed at $p < 0.05$.
RESULTS. 496 patients (331 male [m], 66.7 %/165 female [f]/33.3 %) were included. 59 patients out of this cohort died in the hospital (11.9 % [42 m, 71.2 %/17 f, 28.8 %]). The overall median age was 66 years (25 %/75 % percentile: 54/75 years). Patients who died in the hospital were significantly older (71; 63/76 years) than the discharged patients (65; 54/72 years). Median PCT did not differ significantly between ASA classes. Itemized listing of rising PCT concentration ranges revealed increasing mortality: <0.2 ng/ml (3.17 %); 0.2–0.49 ng/ml (8.53 %); 0.5–0.99 ng/ml (10.66 %); 1–1.99 ng/ml (12.36 %); 2–2.99 ng/ml (14.63 %); 3–4.99 ng/ml (24 %); 5–9.99 ng/ml (33.33 %); >10 ng/ml (41.67 %), and overall mortality was 11.9 %. PCT values were higher in the patients who died in the hospital (1.09 ng/ml; 0.51/3.46) than in the discharged patients (0.66 ng/ml; 0.29/1.31; $p < 0.0001$). Lactate was also higher in the patients who died in the hospital (2.5 Mol/l; 1.5/3.75 vs. 1.6 Mol/l; 1.1/2.4; $p < 0.0001$). After logarithmic transformation, PCT (odds ratio [OR]:1.418; confidence interval [CI]:1.077–1.867, $p = 0.013$) and lactate (OR: 2.386, CI: 1.388–4.100; $p = 0.02$), as well as ASA class (OR: 2.095, CI: 1.128–3.891; $p = 0.19$) and age (OR: 1.027, CI: 1.000–1.054; $p = 0.47$) were identified as significant predictors of mortality.
CONCLUSIONS. In our cohort of patients undergoing elective surgery, even a subtle elevation of PCT from <0.2 ng/ml to 0.2–0.49 ng/ml led to a 2.69 fold increase in mortality. In a logistic regression model, PCT, as well as lactate, ASA class and age were independently associated with mortality. Early postoperative PCT assessment could serve as a risk stratification tool in this population.

0429

TIME TRENDS, 30-DAY MORTALITY, AND QUALITY OF CARE IN 3,438 PATIENTS WITH PEPTIC ULCER PERFORATION. A NATIONWIDE COHORT STUDY FROM THE DANISH NATIONAL INDICATOR PROJECT

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INTRODUCTION. Mortality and morbidity following perforated peptic ulcer (PPU) is considerable worldwide, and quality of care and treatment of PPU in Denmark receives substantial attention [1].
OBJECTIVES. The aims of the present nationwide cohort study were to present one of the largest population-based PPU cohorts worldwide, and to examine changes over time in patient characteristics, quality of care, and outcome measures from 2004 to 2011.
METHODS. *Design:* Nationwide cohort study based on prospectively collected data. *Setting :* All 35 hospitals caring for PPU patients in Denmark. *Patients:* A total of 3,438 patients surgically treated for gastric or duodenal PPU between 2004 and 2011 and reported to the PPU database of The Danish National Indicator Project. *Statistics:* Demographic, clinical and prognostic variables, and the proportion of patients fulfilling seven quality of care indicators throughout the observation period were registered: preoperative delay; prophylactic antibiotics; monitoring of body weight, fluid balance, and vital signs; need of re-operative surgery; and 30-day mortality. For re-operative surgery and mortality, we used adjusted regression analyses to compare results in 2011 versus reference years 2005 (first year with valid data on mortality) and 2007 (first year with valid data on re-operative surgery).
RESULTS. Median age (interquartile range) was 71 years (59–81). The proportion of patients with use of ulcerogenic medication and tobacco smoking decreased over time. An increasing proportion of PPU patients had co-existing diseases (66 % in 2004, 74 % in 2011), and the proportion of patients with gastric ulcer increased from 45 % (2004) to 57 % (2011). The inter-department variation in quality of care diminished throughout the observation period, and the proportion of patients fulfilling the individual quality of care process indicators increased in general from 2004 to 2011. However, we could not document a major decrease in 30-day mortality (adjusted RR and 95 % CI, 0.91 (0.75–1.10) in 2011 compared with 2005), or in the need of re-operative surgery (adjusted RR and 95 % CI, 1.14 (0.81–1.61) in 2011 compared with 2007), Tables 1 and 2.

The association of year and re-operative surgery

Study period	N	% with outcome	Crude relative risk (95 % CI)	Adjusted relative risk (95 % CI)*
2007	424	12	1.00 (Ref)	1.00 (Ref)
2008	431	17	1.35 (0.97–1.90)	1.26 (0.90–1.75)
2009	380	16	1.32 (0.94–1.87)	1.18 (0.84–1.66)
2010	404	14	1.15 (0.81–1.64)	1.08 (0.76–1.52)
2011	379	17	1.38 (0.98–1.94)	1.14 (0.81–1.61)

The association of year and 30-day mortality

Study period	N	% with outcome	Crude relative risk (95 % CI)	Adjusted relative risk (95 % CI)
2005	488	28	1.00 (Ref)	1.00 (Ref)
2006	472	31	1.12 (0.92–1.37)	1.02 (0.86–1.21)
2007	424	25	0.90 (0.72–1.13)	0.86 (0.71–1.05)
2008	431	24	0.87 (0.69–1.09)	0.84 (0.69–1.02)
2009	380	28	1.01 (0.81–1.26)	0.88 (0.72–1.07)
2010	404	28	1.01 (0.81–1.25)	0.86 (0.71–1.05)
2011	379	30	1.08 (0.87–1.34)	0.91 (0.75–1.10)

CONCLUSIONS. In this large Danish nationwide PPU cohort, a change in demographic, clinical and prognostic variables from 2004 to 2011 was observed. Despite improved fulfilment of quality of care measures nationwide, the risk of re-operative surgery and short-term mortality did not decrease. Implementing evidence-based interventional perioperative care protocols is recommended [2].
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0430

ASSESSING MULTIPLE BIOMARKERS FOR DIAGNOSIS OF ACUTE KIDNEY INJURY AFTER CARDIOPULMONARY BYPASS

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INTRODUCTION. Acute kidney injury (AKI) following cardiopulmonary bypass (CPB) is common and independently associated with increased mortality. Effective interventions to prevent or treat AKI has been hampered by inadequate diagnostics. Early biomarkers of AKI are being developed, however they may vary in ability to predict AKI in higher risk adult patients.
OBJECTIVES. To investigate the association between post-operative changes in urinary and serum biomarkers and AKI after CPB.
METHODS. We measured urinary α and π glutathione S-transferases (α-GST and π-GST), urinary L-type fatty acid-binding protein (L-FAB), urinary neutrophil gelatinase-associated lipocalin (NGAL), urinary hepcidin and serum cystatin-c (CysC) in 93 high risk patient undergoing CPB and enrolled in a clinical trial. Biomarkers were measured immediately post-operatively and at 24 h after surgery. We assessed ability of biomarkers alone and in combination to predict RIFLE-R defined AKI in the first 5 post operative days. Predictive ability was measured by calculation of receiver-operator characteristic area under the curve (ROCAUC). Pair of biomarkers were combined by determining the weighted sum of their measurements that maximized the ROCAUC of the combination [1].
RESULTS. 25 patients developed AKI. Biomarkers with best predictive ability were greater urine π-GST post-op (ROCAUC = 0.75), lower urine Hepcidin:Creatinine ratio at 24 h (0.77), greater urine NGAL:Creat ratio post-op (0.73) and greater serum CysC at 24 h (0.72). Linear combinations of biomarkers that were associated with significant improvement in ROCAUC were: Hepcidin:Creat 24 h and NGAL:Creat post op (0.84, $p = 0.03$); Hepcidin:Creat 24 h and π-GST post-op (0.86, $p = 0.01$) and CysC 24 h and π-GST post-op (0.83, $p = 0.03$). However when assessed by ability of the ROC *best cut-off* value to define patients at higher and lower risk of AKI these combinations failed to significantly improve classification of risk, as assessed by net reclassification index, when compared against the best of the individual biomarkers (p-values 0.45, 0.18 and 0.49, respectively).
CONCLUSIONS. Biomarkers are promising tools in the diagnosis of AKI after CPB, however predictive performance of many biomarkers may only be fair in populations of high-risk adult patients. Combinations of biomarkers may improve prediction as assessed by ROCAUC, however this may not necessarily translate usefully into better clinical prediction models. It is notable that the best combinations involved one biomarker produced after tubular injury (NGAL, π-GST) and one biomarker filtered in the glomerulus (Hepicidin, CysC) and also one biomarker measured early and one later in the post-operative course. Improvement in prediction may require combination of biomarkers that are associated with different aspects of and different stages in the pathophysiology of AKI.
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Nutrition and glycaemic control in ICU: 0431–0435

0431

CUMULATIVE TIME IN BAND (CTIB): GLYCEMIC LEVEL, VARIABILITY AND PATIENT OUTCOME ALL IN 1

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INTRODUCTION. Safe, effective glycemic control (GC) can improve outcomes, but is difficult to achieve consistently. Glycemic level and variability are independently associated with mortality. Patho-physiologically, the negative outcomes of dysglycemia are associated with exposure and repetition to high glucose levels, indicating that metrics of exposure might accurately capture outcome.
OBJECTIVES. To determine the cumulative time in band (cTIB) thresholds associated with improved outcomes for achieving intermediate levels of GC (4.0–7.0, 5.0−8.0 and 4.0–8.0 mmol/L).
METHODS. Retrospective analysis of patient data (N = 1717) from the SPRINT (N = 784) before-after study and the Glucontrol (N = 933) randomized clinical trial. cTIB is defined as the percentage of blood glucose from start to the present day within the specified band. It is evaluated daily for the 4.0–7.0, 5.0-8.0 and 4.0–8.0 mmol/L bands, with thresholds (t = 50, 60, 70, 80 %) for all patients. The odds ratio (OR) is calculated for cTIB $\geq$ t versus cTIB < t, including 95 % CI for each day 1–14.
RESULTS. Table 1 shows OR range for days 1–14. For all glycemic bandsband all thresholds t, OR > 1.0 for all days, except day 1.

Table 1

(mmol/L band)	t = 50 %	t = 60 %	t = 70 %	t = 80 %
4.0–7.0	1.10–1.42	1.07–1.98	1.08–2.35	1.18–3.76
5.0–8.0	1.14–1.34	0.98–1.65	0.98–2.39	1.07–1.70
4.0–8.0	1.04–1.28	1.00–1.54	0.96–1.65	0.91–2.28

The lower bound of the 95 % CI over days 1–10, where patient data is greatest, is in Table 2.

Table 2

(mmol/L band)	t = 50 %	t = 60 %	t = 70 %	t = 80 %
4.0–7.0	0.85–0.96	0.82–1.12	0.81–1.56	0.84–1.67
5.0–8.0	0.89–0.88	0.76–0.89	0.74–1.02	0.78–0.90
4.0-8.0	0.80–0.82	0.78–0.81	0.74–0.98	0.70–1.10

CONCLUSIONS. Results show that for cTIB in the 4.0–7.0 mmol/L band high cTIB is associated with increasingly lower mortality over days 1–14 and the 95 % CI is increasingly above 1.0 over time. The 4.0–8.0 and 5.0–8.0 mmol/L bands had significantly reduced benefit and confidence in comparison. This suggests that tighter GC positively influences patient outcome if control is maintained and exposure to glycemia outside 4.0–7.0 mmol/L is limited. cTIB is readily calculated and can be used to continuously assess quality of control during a patient's stay unlike other metrics and analyses, which require a full patient stay of data.

0432

COMPARISON OF THREE ENTERAL FORMULAS TO GLYCEMIC AND INFECTIOUS CONTROL IN CRITICALLY ILL PATIENTS UNDER MECHANICAL VENTILATION: HIGH-PROTEIN, HIGH-PROTEIN DISEASE-SPECIFIC AND DISEASE-SPECIFIC DIET SUPPLEMENTED WITH GLUTAMINE

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INTRODUCTION. Infectious complications in critically ill patients determine high morbidity and mortality. Glycemic control with disease-specific diets, insulin therapy and glutamine may reduce these complications.

OBJECTIVES. (1) Evaluate if the administration of a disease-specific enteral formula supplemented with glutamine reduces infectious complications compared to a disease-specific high-protein formula and to a conventional high-protein enteral formula.
(2) Determine glycaemic control with the three diets.

METHODS. Prospective, randomized, single-blind and independent samples study. 150 patients were estimated to detect, with a power of 90 %, a 15 % reduction in infectious complications. Three groups were established: A: conventional high-protein formula, B: disease-specific high-protein formula, C: disease-specific formula supplemented with glutamine (0.5 g/kg/day). Eligibility criteria: age ≥18 years, enteral nutrition ≥5 days. Exclusion criteria: acute kidney failure (creatinine >3 mg/dl), liver failure (bilirrubin >3 mg/dl) APACHE II score <10 or >30, obesity (BMI > 35 kg/m^2). Target level for blood glucose: 110–150 mg/dl by insulin continuous infusion. The Harris-Benedict formula was used to calculate caloric needs. Volume ratio, glycemic control, gastrointestinal and infectious complications were evaluated every day. An intention-to-treat analysis was performed and data analysis was done by: Fisher exact test, Ji-square and ANOVA analysis corrected by Bonferroni method.

RESULTS. 150 patients (A = 52, B = 47, C = 51). Sex (male) 64 %. Age (years) 64 (50–73). APACHE II score on admission: A: 19 (15–22), B: 20 (14–26), C: 20 (16–25). Days of enteral nutrition: A: 11.3 ± 6.2, B: 10.5 ± 6.3, C: 11.2 ± 6 (NS). Days of mechanical ventilation: A: 12.4 ± 9.2, B: 12.8 ± 12, C: 11.9 ± 7.9 (NS). ICU length of stay (days): A: 16 ± 10, B: 16.6 ± 12.5, C: 16.7 ± 8.5 (NS).
NS: p ≥ 0.05. Data are expressed as median and interquartile range except for days of enteral nutrition, mechanical ventilation and lenght of stay expressed as mean ± SD.

Glycemic control

	A (n = 52)	B (n = 47)	C (n = 51)	p
Plasma glucose level (mg/dl)	142.6 ± 39.8	137.4 ± 40.3	139.1 ± 37.3	>0.05
Capillary glucose level (mg/dl)	136.6 ± 34.5	134.1 ± 35	135.5 ± 31.4	>0.05
Insulin (UI)/day	20.8 ± 26.4	14.9 ± 23.1[a]**	14.3 ± 21.5[b]**	** < 0.01
Insulin/gr CHO received	0.11 ± 0.15	0.09 ± 0.15[a]**	0.08 ± 0.15[b]**	* < 0.05 ** < 0.01

Data are expressed as mean ± SD
[a]There are significant differences between groups A and B
[b]There are significant differences between groups A and C

Infectious outcomes

	A (n = 52)	B (n = 47)	C (n = 51)	p
No. of infected patients (%)	26 (50 %)	19 (40.4 %)	14 (27.5 %) b*	*<0.05
No. of total nosocomial infections (%)	36 (45.5 %)	25 (31.6 %)	18 (22.7 %) b**	**<0.01
No. of respiratory infections (%)	25 (48.1 %)	15 (31.9 %)	10 (19.6 %) b**	**<0.01
No. of tracheobronq. infections (%)	14 (26.9 %)	10 (21.2 %)	5 (9.8 %) b*	*<0.05
No. of VAP (%)	11 (21.2 %)	5 (10.6 %)	5 (9.8 %)	>0.05

No number, *VAP* ventilator associated pneumonia

CONCLUSIONS. (1) A decrease in the number of infected patients, total nosocomial infections and respiratory infections (tracheobronquitis) is observed in the glutamine group. (2)Target level of plasma and capillary glucose has been achieved in the three groups. (3)The groups B and C needed less units of exogenous insulin to keep the same levels of glycemia.

0433

CAN THE GASTRIC HORMONE GHRELIN ATTENUATE CATABOLISM AND ENHANCE RECOVERY AND REHABILITATION IN A RODENT MODEL OF ZYMOSAN PERITONITIS?

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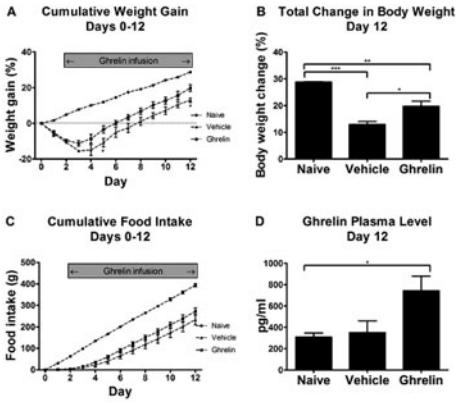
INTRODUCTION. Critically ill patients invariably develop a catabolic state resulting in loss of lean body mass [1]. Recovery can take months and there are no effective treatments to attenuate critical illness-associated weight loss [2]. Ghrelin is an orexigenic hormone produced in the stomach which has immunomodulatory effects [3] and stimulates food intake in cachectic chronic illnesses [4, 5]. The effect of chronic ghrelin administration on recovery from critical illness has not previously been investigated. Intra-peritoneal administration of the yeast cell wall constituent, zymosan causes a prolonged inflammatory peritonitis and a marked decrease in body mass and food intake in rodents.

OBJECTIVES. To determine whether ghrelin can attenuate catabolism and enhance recovery in a rodent model of zymosan peritonitis.

METHODS. Male Wistar rats were implanted with a subcutaneous osmotic mini-pump containing either saline (Vehicle, control) or ghrelin (100 nmol/24 h) with a 48-h delay catheter. These animals then received a single intra-peritoneal injection of zymosan (30 mg/100 g body wt). Control groups with mini-pumps containing ghrelin or saline but not receiving zymosan were run in parallel (data not shown). Naïve animals without pumps were housed under the same experimental conditions. Food intake and body mass were recorded daily. Animals whose food intake was unaffected by zymosan in the first 48 h were excluded from the analysis. Plasma ghrelin levels were measured by multiplex assay (Millipore). Statistical analysis was performed using 1-way and RM-ANOVA.

RESULTS. Preliminary data are reported here. Ghrelin significantly increased cumulative weight gain in septic animals compared to vehicle control on days 5 and 12 ($p < 0.05$) and total weight gain on day 12 ($p < 0.05$) (Figs. A, B), but did not significantly affect cumulative food intake (Fig. C). Ghrelin treatment significantly increased plasma ghrelin levels ($p < 0.05$) (Fig. D).



Figs. A–D

CONCLUSIONS. These data suggest that ghrelin may be useful to promote the recovery of body mass following recovery from critical illness, perhaps through actions other than appetite stimulation. Further studies are needed to elucidate the mechanisms by which ghrelin drives these effects.

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0434

IS EARLY ENTERAL NUTRITION MORE EFFECTIVE THAN LATE IN REDUCING ORGAN FAILURE RATES IN ICU?

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INTRODUCTION. Early enteral nutrition is known to improve intensive care outcome in general.

OBJECTIVES. The effect of early enteral nutrition (<24 h) on different organ failures: respiratory, cardiovascular, hepatic, renal, metabolic and coagulation together with infection complication and anastomotic dehiscence rate.

METHODS. We used our prospectively collected database called PROSAFE (Promoting Patient Safety in Intensive Care) in our intensive care unit from 1 September 2010 to 31 October 2011. We recorded general demographic data, admission characteristics with severity scores (SAPS II; SOFA score), start time of enteral nutrition, complication rates and intensive care/hospital outcome data. We compared the effect of early nutrition by admission severity in three groups by SAPS II score: <45; between 45 and 66; >66. Data are expressed as mean ± standard deviation using ANOVA.

RESULTS. We analyzed 554 patient data: age, length of ICU and hospital stay, SAPS II score, ICU and hospital mortality. There was no statistical significance in patient characteristics between SAPS II subgroups. Table 1 shows the effect of early nutrition in different organ failures (value 0 = no failure, value 1 = failure).

Table 1

	Group A (SAPSII < 45)			Group B (SAPSII 45–66)			Group C (SAPSII > 66)		
	Early	Late	p value	Early	Late	p value	Early	Late	p value
Hepatic failure	0.00 ± 0.00	0.00 ± 0.00	N/A	0.06 ± 0.25	0.13 ± 0.35	0.231	0.15 ± 0.36	0.03 ± 0.19	0.125
Renal failure	0.00 ± 0.08	0.05 ± 0.22	0.009	0.00 ± 0.08	0.05 ± 0.22	0.009	0.15 ± 0.36	0.18 ± 0.39	0.777
Coagulation failure	0.00 ± 0.00	0.00 ± 0.00	N/A	0.06 ± 0.23	0.3 ± 0.18	0.588	0.10 ± 0.31	0.03 ± 0.19	0.317
Metabolic failure	0.00 ± 0.08	0.01 ± 0.13	0.442	0.04 ± 0.20	0.27 ± 0.45	0.001	0.05 ± 0.22	0.25 ± 0.44	0.017
Respiratory failure	0.00 ± 0.05	0.00 ± 0.00	0.654	0.05 ± 0.22	0.06 ± 0.25	0.718	0.02 ± 0.16	0.00 ± 0.00	0.404
Cardio-vascular failure	0.01 ± 0.11	0.05 ± 0.22	0.062	0.14 ± 0.35	0.13 ± 0.35	0.907	0.28 ± 0.45	0.11 ± 0.32	0.087

Anastomotic dehiscence showed significantly lower rate in early enteral nutrition group across all severity: 0.004 ± 0.06 versus 0.06 ± 0.24 ($p < 0.001$). Infection complication rate was lower in early enteral nutrition group only in less severe patients (SAPS II < 44): 0.06 ± 0.23 versus 0.15 ± 0.36, $p = 0.011$.
CONCLUSIONS. Early enteral nutrition significantly reduced renal and metabolic failure and infection rates and showed lower rate of anastomotic dehiscence.
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0435
BEING OVERWEIGHT OR OBESE IS ASSOCIATED WITH DECREASED MORTALITY IN CRITICALLY ILL PATIENTS: A POST HOC ANALYSIS OF A LARGE REGIONAL ITALIAN MULTICENTER COHORT

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INTRODUCTION. The negative health consequences of obesity in the general population may not be applicable to all subgroups of critically ill patients.
OBJECTIVES. To investigate the epidemiology of obesity in a representative cohort of ICU patients in the Piedmont region of Italy and to investigate the possible impact of obesity, as assessed by the BMI, on morbidity and mortality in these patients.
METHODS. All 3902 patientsadmitted to one of 24 ICUs in the Piedmont region of Italy from April 3-September 29, 2006, were included in this post hoc analysis of data from a prospective, multicenter study.
RESULTS. The mean BMI was 26.0 ± 5.4 kg/m^2 with 32.8 % of patients having a normal BMI; 2.6 % were underweight, 45.1 % overweight, 16.5 % obese, and 2.9 % morbidly obese. The prevalence of sepsis syndromes at any time during the ICU stay was similar among BMI categories. ICU length of stay (LOS) was longer in morbidly obese patients (5 [2–12.5] vs. 3 [1–9] days, $p = 0.003$) and shorter in underweight patients (2 [1–5] vs. 3 [1–9] days, $p = 0.006$) than in those of normal BMI. ICU mortality was significantly lower in overweight and obese patients (18.8 and 17.5 vs. 22 %, $p < 0.05$ pairwise) than in those of normal BMI. In multivariate logistic regression analysis, being overweight (OR = 0.73; 95 % CI: 0.58–0.91, $p = 0.007$) or obese (OR = 0.62; 95 % CI: 50.45–0.85, $p = 0.003$) was associated with a reduced risk of ICU death, with normal BMI as the reference category; this reduced risk of death was not, however, present in all patient subgroups, notably females, patients admitted for short-term monitoring or after elective surgery, and patients requiring mechanical ventilation on admission. Being morbidly obese was independently associated with an increased risk of death in patients admitted after elective surgery (OR = 4.63; 95 % CI: 1.07–19.87, $p = 0.039$) whereas being underweight was independently associated with an increased risk of ICU death in patients admitted for short-term monitoring (OR = 3.92; 95 % CI: 1.34–11.43, $p = 0.012$) and after elective surgery (OR = 5.58; 95 % CI: 1.81–17.22, $p = 0.003$).
CONCLUSIONS. In this cohort, a survival paradox was observed with overweight and obese patients having a reduced risk of death in the ICU. Being underweight or morbidly obese was associated with an increased risk of death in some subgroups of patients.

The best in neurointensive care: Acute brain injury: 0436–0440

0436
ASSESSING THE CLINICAL AND COST-EFFECTIVENESS OF ALTERNATIVE CARE PATHWAYS FOR CRITICALLY ILL PATIENTS WITH ACUTE TRAUMATIC BRAIN INJURY

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INTRODUCTION. Acute traumatic brain injury (TBI) is a major cause of death and disability and carries a substantial burden of cost. For patients who present outside a specialist, regional neuroscience centre, and do not require neurosurgery, there is little evidence on whether early transfer to a neuroscience centre is worthwhile.
OBJECTIVES. To assess the relative clinical and cost-effectiveness of 'early transfer' to a neuroscience centre (within 18 h of hospital presentation) versus 'no or late transfer' (after 24 h) for critically ill adult patients with acute TBI who present outside a neuroscience centre and do not require neurosurgery.
METHODS. The Risk Adjustment In Neurocritical care (RAIN) Study validated risk prediction models following TBI. The RAIN Study recruited admissions following acute TBI to 67 adult critical care units in the UK during 2009–2011. Detailed information was collected on baseline prognostic factors, the time of transfer to a neuroscience centre, and mortality. Resource use data were recorded for 6 months, and combined with unit costs to report total hospital and community health service costs. At the 6 month follow-up, data were collected on functional status by the extended Glasgow Outcome Scale (GOSE) and health-related quality of life (HRQoL) by the EQ-5D-3L. The lifetime cost-effectiveness analysis extrapolated from 6-month endpoints, informed by the literature. We report lifetime incremental cost per QALY of 'early' versus 'no or late transfer', overall and for subgroups (age ≤70 vs. >70; mild/moderate vs severe TBI; major extracranial injury vs none). To adjust for baseline differences we used the previously validated risk prediction models in regression analyses. In sensitivity analyses we considered alternative approaches for extrapolating from the 6-month endpoints and undertaking risk adjustment.
RESULTS. There were 584 patients in the 'early' and 263 in the 'no or late transfer' group. After risk adjustment, early transfer was associated, at 6 months, with lower mortality (odds ratio 0.52, 95 % CI 0.34–0.80) and unfavourable outcome (0.88, 0.28–2.79), higher HRQoL for survivors (mean gain 0.13, 0.032–0.225), but positive incremental costs (£15,000, £11,123–£18,880). The lifetime cost per QALY for 'early transfer' was £11,000. For patients older than 70, 'early transfer' was associated with higher mortality, and was unlikely to be cost-effective (probability 0.15 at £20,000 per QALY). For other subgroups, the corresponding probabilities that 'early transfer' is cost-effective were between 0.7 and 1.
CONCLUSIONS. For critically-ill patients with acute TBI aged 70 or less, early transfer to a neuroscience centre appears cost-effective. While this finding is robust to alternative methodological assumptions and choice of risk prediction model, further research is required to investigate potential unobserved confounding.
GRANT ACKNOWLEDGMENT. NIHR Health Technology Assessment Programme.

0437
METABOLIC DISTURBANCES ARE MORE FREQUENT AND SEVERE IN PERILESIONAL THAN IN NORMAL APPEARING BRAIN TISSUE AFTER TRAUMATIC BRAIN INJURY

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INTRODUCTION. Traumatic brain injury (TBI) results in heterogeneous injury to the brain. This heterogeneity may correspond to profound differences in regional brain metabolism. Cerebral microdialysis (MD) has been proved as a useful tool to monitor brain extracellular neurochemistry after TBI.
OBJECTIVES. The aim of this study was to characterize regional brain metabolic disturbances in relationship to clinical parameters.
METHODS. 49 patients with major head injury (median GCS 6, range 5–7) received intensive care treatment according to guidelines. Main therapeutic targets were intracranial pressure (ICP) <25 mmHg and cerebral perfusion pressure (CPP) >60 mmHg. Patients' monitoring included continuous cerebral MD (flow rate 0.3 μL/min) with the measure of glucose, lactate, pyruvate, glutamate and lactate/pyruvate (L/P). MD catheters were classified on CT as placed in normal appearing brain tissue (NA-MD) or near to focal lesions (FCL-MD). Data from the first 72 h of monitoring were used for analysis. Pathological cut-offs were defined: glucose <0.8 mM, L/P >40 and for systemic parameters: ICP >25 mmHg, CPP <60 mmHg, $PaCO_2$ <25 mmHg. Mann–Whitney test was used to evaluate differences between groups. Data are expressed as mean ± SD.
RESULTS. Patients with a median age of 31 yrs (range 23–43) were studied 23 h (range 14–42) after injury. Mean ICP and CPP were in the normal range. Mean $PaCO_2$ was 30 mmHg. 15 pts had FCL-MD and 34 NA-MD monitoring. Cerebral L/P was significantly increased in FCL-MD (43.4 ± 27.2 mM) compared to NA-MD (21.8 ± 7.9 mM; $p = 0.0001$). This increase was almost entirely determined by lactate (5.9 ± 2.5 mM vs. 2.9 ± 1.4 mM; $p < 0.0001$) rather than pyruvate, which was in the normal range in both groups. Cerebral glucose was reduced in FCL-MD (1.4 ± 1.1 mM) compared to NA-MD (1.8 ± 0.8 mM), although not significantly ($p = 0.05$). Glutamate and clinical parameters were not different between groups. 12/15 patients in the FCL-MD group and 11/34 in NA-MD had L/P >40. The percent time of elevated L/P was 16 and 4 % and the difference was statistically significant ($p = 0.0005$). 11/15 and 14/34 patients had glucose <0.8 mM. The percent time of low glucose in FCL-MD was significantly increased compared to NA-MD (33 vs. 9 %, $p = 0.007$). The combination of both alterations was also present (9/15 vs. 8/34 pts), and the percent time beyond pathological levels was still greater in FCL-MD (16 vs. 2 %, $p = 0.007$). ICP, CPP and the other parameters were in the normal range during the episodes of metabolic failure.
CONCLUSIONS. This study confirms the presence of regional-specific brain metabolic disturbances in the acute phase following TBI, with no evident relationship to other parameters like ICP and CPP. The most significant result is the presence of elevated L/P in peri-lesional compared to normal appearing tissue, which likely reflects hyperglycolysis, not ischemia, as suggested by normal pyruvate levels.

0438
EARLY GASTROSTOMY AND TRACHEOSTOMY PREVENT VENTILATOR ASSOCIATED PNEUMONIA IN TRAUMATIC BRAIN INJURED PATIENTS

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INTRODUCTION. Nasogastric tubes represent a risk factor for the development of ventilator-associated pneumonia (VAP). Endotracheal tubes facilitate bacterial colonization of the tracheobronchial tree and lower-airway aspiration of contaminated secretions through mucosal injury, the pooling of contaminated secretions above the endotracheal tube cuff, and elimination of the cough reflex. Alternatively, gastrostomy can be used for administration of enteral feeding and tracheostomy tube facilitates clearance of pulmonary secretions.
OBJECTIVES. To assess the efficacy of early percutaneous endoscopic gastrostomy (PEG) and percutaneous dilatational tracheostomy in preventing VAP in mechanically ventilated (MV) patients with traumatic brain injury (TBI).
METHODS. The study was carried out on 60 patients with closed severe TBI in need for sedation and prolonged (MV) who continued to have a Glasgow coma score(GCS) less than 8 after initial hemodynamic stabilization. Patients included were categorized randomly into 3 groups: Group I: 20 patients to whom a nasogastric tube and an endotracheal tube were placed. Group II: Included 20 patients to whom PEG was placed within 24 h of endotracheal intubation using Bard Ponsky pull through technique. Group III: Included 20 patients to whom percutaneous dilatational tracheostomy and PEG were placed within 24 h of endotracheal intubation. The incidence of VAP and GCS were monitored for 3 weeks following the admission to the intensive care unit. The patients included in the study were followed up till hospital discharge or death for 6 months. The duration of mechanical ventilation (MV) and the length of ICU and hospital stay were determined.
RESULTS. There were no significant differences between the groups regarding baseline characteristics, APACHE II score or the mechanism of injury. The incidence of VAP was 15 (75.0 %), 8 (40.0 %) and 3 (15.0 %) for groups I, II and III, respectively, P = 0.025, 0.001 and 0.046, respectively. The mean duration of MV was 19.40 ± 1.14, 10.55 ± 1.32 and 5.35 ± 1.04 for groups I, II and III, respectively. The mean length of ICU stay was 20.60 ± 0.50, 17.70 ± 1.87 and 13.20 ± 0.83 for groups I, II and III, respectively. The mean length of hospital stay was 165.5 ± 0.00, 152.0 ± 0.00 and 126.8 ± 0.00 for group I, II and III, respectively. The mortality rate was 50.0 %, 35.0 % and 15.0 % of the patients in group I, II and III, respectively. It was significantly lower in group III. Arterial oxygenation ($p = 0.001$) and Glasgow coma scale ($p = 0.001$) were significantly improved in Group III as well.
CONCLUSIONS. Early PEG and tracheostomy within 24 h from admission reduced the incidence of VAP in mechanically ventilated head injured trauma patients with GCS less than 8 which was reflected on improvement of outcome parameters.

0439

EVALUATION OF THE EFFECTS OF INCREASED INTRA-ABDOMINAL PRESSURE (IAP) ON INTRACRANIAL PRESSURE (ICP), BRAIN TISSUE PRESSURE OXYGEN ($PBTO_2$) AND SATURATED JUGULAR BULB (SJO_2) IN A PORCINE NORMOVOLEMIC MODEL

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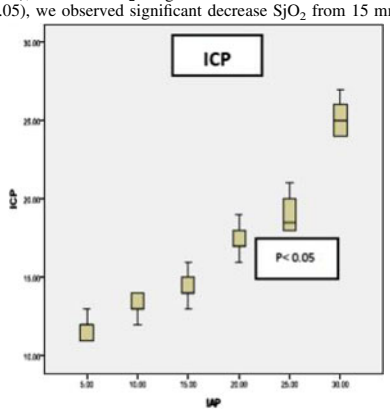
INTRODUCTION. There are reports of decreased cerebral perfusion pressure related to Intra-abdominal hypertension syndrome; in patients with trauma including skull and abdomen has been documented improvement in intracranial pressure by relieve intra-abdominal hypertension by surgery. This protocol evaluates the impact of increased abdominal pressure in perfusion and oxygenation cerebral.

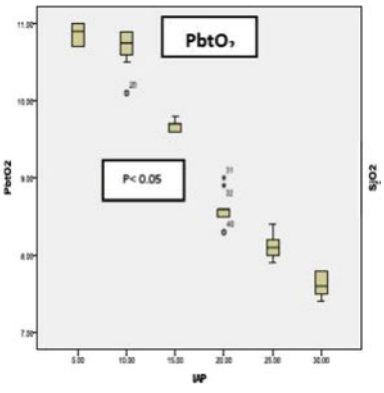
OBJECTIVES. To evaluate the effects of increased intra-abdominal Pressure (IAP) on intracranial pressure (ICP), cerebral tissue oxygen pressure ($PbtO_2$) and saturation of jugular bulb (SjO_2) in normovolemic.

METHODS. We used 2 porcine models weighing 35 kg, which after sedation, relaxation, analgesia and tracheal intubation was induced increase in abdominal pressure at 5, 10, 15, 20, 25, 30 mmHg by administering saline 0.9 % through catheter in abdominal cavity; 10 measurements were made each 1 min at each level of intra-abdominal pressure through the use of a catheter for continuous saturation of the jugular bulb (Edwards Lifesciences™), a catheter to measure brain tissue oxygen (LICOX™) and a catheter to measure ICP intra-parenchymal (Integra™). Subgroups were analyzed according to the level of intra-abdominal pressure and analysis of variance (ANOVA) considering significant a p value <0.05.

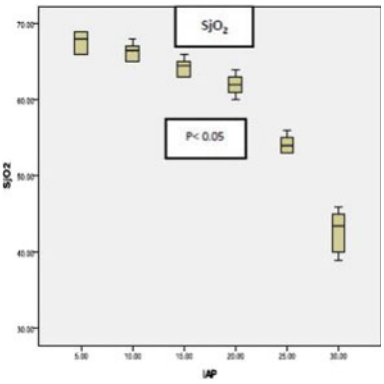
RESULTS. The trend in the increase of ICP and the fall of $PbtO_2$ and SjO_2 is constant, the post hoc analysis to evaluate the ICP showed a significant difference with the PIA of 25 and 30 mmHg ($p < 0.05$), showed $PbtO_2$ a significant decrease with the increase in IAP above 15 mmHg ($p < 0.05$), we observed significant decrease SjO_2 from 15 mmHg ($p < 0.5$).



Graphic 1



Graphic 2



Graphic 3

CONCLUSIONS. In a porcine model with normal brain, ICP increased significantly from 20 mmHg IAP, an oppsite behavior occurred with the PbtO2, while the decrease was significant in SjO2 when PIA reached values higher than 15 mmHg. It is necessary to consider these data in patients with brain damage and severe abdominal disorder that may involve impact.

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GRANT ACKNOWLEDGMENT. Edwards Lifesciences™, Integra™.

0440

GLUCOSE TRANSPORT KINETICS IS PRESERVED IN TRAUMATIC BRAIN INJURY PATIENTS BUT THE MAXIMAL TRANSPORT RATE MIGHT BE REDUCED

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INTRODUCTION. Glucose is the main substrate for cerebral metabolism. Microdialysis studies have shown that a depletion in brain extracellular glucose levels is common after traumatic brain injury (TBI). The more likely mechanism is an increased glucose utilization rather than a reduction in delivery. Glucose transport can also be primarily disturbed after TBI. However, it's still not yet clear whether glucose transport kinetics is preserved or not in TBI patients.

OBJECTIVES. This study was conducted to analyse the cerebral glucose transport kinetics in severe TBI.

METHODS. Six consecutive nondiabetic patients with severe TBI were studied. The median age was 31 years (IR 24–40) and the GCS was 5 (IR 3–6). Systemic glucose was measured in plasma (G_{PL}) and in subcutaneous adipose tissue (G_{SC}). G_{SC} and brain extracellular glucose (G_B) concentrations were measured hourly with microdialysis (infusion rate 0.3 µl/min). A 3 h infusion with 33 % glucose solution was administered at a median time of 67 h (IR 46–88) after TBI. The relationship between brain and systemic glucose was studied using nonlinear regression of Michaelis–Menten (MM) kinetic model for brain glucose transport. The kinetic constants K_t and $T_{max}/CMR_{glucose}$ (ratio) were calculated and compared with previous data in healthy subjects. Differences between groups were studied with unpaired *t* test. Data are presented as mean ± SEM.

RESULTS. The G_{PL} and G_{SC} increased significantly after 3 h of glucose infusion (66–68 % mean change from baseline, $p < 0.0001$). The G_B rose up to a mean of 120 % from baseline ($p < 0.0001$), resulting in a significant increase of the G_B/G_{SC} (0.08 ± 0.01 at baseline vs. 0.11 ± 0.02 at 3 h, $p = 0.0003$). None of the other brain metabolic markers (lactate, pyruvate, glutamate) changed after glucose infusion. The results for nonlinear fitting with MM model were more significant when using G_{SC} ($p < 0.0001$, $r = 0.80$) rather than G_{PL} ($p < 0.0001$, $r = 0.67$) as independent variable, therefore, we used G_{SC} to calculate the MM kinetic constants. K_t was 5.5 ± 1.0 mM, not significantly different compared to previously published data. The ratio was conversely lower (2.3 ± 0.1) in three among five multiple comparisons with previous data. Patients with L/P >25 (four among six) showed lower K_t (3.58 ± 0.41 mM, $p = 0.02$) and lower ratio (1.98 ± 0.09, $p = 0.009$) compared to those with normal L/P values.

CONCLUSIONS. The kinetics of glucose transport in TBI can be described with a MM model and the kinetic constants can be calculated. Ratio values were lower than in healthy subjects suggesting a reduction in T_{max}, the maximum glucose transport rate. On the contrary, glucose transporters affinity was increased (K_t reduction) in patients with L/P >25, suggesting the presence of compensatory mechanisms when oxidative metabolism is disturbed. Further studies are needed to confirm these results in a larger population.

Sepsis therapy: New hints from the lab: 0441–0445

0441

EFFECTS OF STATINS ON MITOCHONDRIAL RESPIRATION AND OUTCOME DURING EXPERIMENTAL SEPSIS

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INTRODUCTION. The pleiotropic actions of statins target several mechanisms involved in the patho-physiology of sepsis, leading to their consideration as an adjuvant therapy [1]. Ubiquinone is an important mitochondrial antioxidant and constituent of the electron transport chain. Ubiquinone production is inhibited by statins, whereas sepsis itself also affects mitochondrial activity. The impact of statins on mitochondrial function in sepsis has not been previously explored.

OBJECTIVES. To study the effects of statins on a long-term rat model of sepsis, with assessment of mitochondrial function via ex vivo measurement of muscle oxygen consumption.

METHODS. Sepsis was induced in instrumented, awake, male Wistar rats by i.p. injection of faecal slurry. Fluid resuscitation was provided by continuous i.v. infusion. Simvastatin 20 mg/kg bd was administrated by gavage commencing either 3 days' pre-sepsis (pre-treatment), or from 6 h post-sepsis (post-treatment). A control group received only vehicle but no active drug (vehicle). Survival was assessed at 72 h (16 per group). In a second set of experiments, rats were sacrificed at 24 h post-sepsis (7 per group) for measurement of (1) plasma biochemistry and simvastatin acid, (2) heart and muscle ubiquinone (CoQ9) levels and (3) oxygen consumption on permeabilized soleus muscle fibers in a Clark electrode chamber. A fourth group of naive animals was also used as healthy controls. Statistics were performed using Wilcoxon test and repeated measures ANOVA and post hoc test Bonferroni.

RESULTS. Survival at 72 h (Fig. 1) was 43.7, 25 and 12.5 % for pre-treatment, vehicle, and post-treatment groups, respectively, ($p < 0.05$).

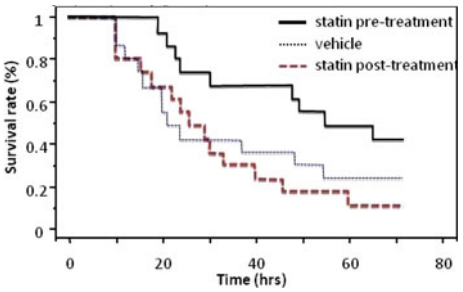

Fig. 1: Survival curve

At 24 h post sepsis, ubiquinone was significantly decreased only in hearts taken from statin pre-treated animals (706 ± 222 vs. 1217 ± 269 pmol/mg protein for vehicle hearts). Plasma simvastatin acid levels were significantly increased in statin pre-treated animals (41 ± 3 ng/ml) compared to naïve animals receiving the same dose (1 ± 0.4 ng/mL). Compared to vehicle-treated animals, statin pre-treatment resulted in significant decreases in urea and creatinine (Table 1). Plasma lipid (HDL and LDL cholesterol, triglyceride) levels were not significantly affected by statins given either before or after the onset of sepsis.

Table 1 Biochemistry

	Sepsis + vehicle	Sepsis + statin pre-treatment	Sepsis + statin post-treatment
Aspartate transferase (IU/L)	195 ± 145	95 ± 27	106 ± 40
Alanine transferase (IU/L)	41 ± 34	32 ± 6	32 ± 7
Creatinine kinase (IU/L)	789 ± 749	402 ± 114	349 ± 152
Triglyceride (mmol/L)	0.67 ± 0.29	0.43 ± 0.23	0.61 ± 0.33
Cholesterol (mmol/L)	1.4 ± 0.29	1.1 ± 0.33	1.6 ± 0.44
HDL cholesterol (mmol/L)	0.55 ± 0.23	0.50 ± 0.2	0.71 ± 0.19
LDL cholesterol (mmol/L)	0.57 ± 0.18	0.41 ± 0.20	0.62 ± 0.22
Urea (mmol/L)	6.9 ± 1.88	5.5 ± 0.7*	6.4 ± 1
Creatinine (μmol/L)	31 ± 6.0	25 ± 3.7*	33 ± 8.1§

* $p < 0.05$ vs. vehicle group
§vs. pre-treatment

The significant reduction in muscle oxygen consumption seen in the sepsis + vehicle group was prevented in both groups receiving simvastatin.

CONCLUSIONS. This study confirms the beneficial effect of statins when given before the onset of sepsis, and this appear to be independent of its lipid lowering-property. This beneficial effect is likely to be multi-factorial but could be attributed in part to a protective effect on mitochondrial respiration.

REFERENCE. Terblanche M. Statins and sepsis: multiple modifications at multiple levels. Lancet Infect Dis. 2007.

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0442
STATINS PROTECTS COGNITIVE IMPAIRMENT IN ANIMAL MODEL OF SEPSIS

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INTRODUCTION. Sepsis is a serious public health problems worldwide. Patients who has survived from infection, it has been described a neuronal dysfunction in the CNS, leading to a framework of cognitive impairment. Statins have the ability to block the cascade of cholesterol formation by acting on the enzyme HMG-CoA reductase, reducing the synthesis of endogenous cholesterol. Recently, it has been observed that anti-inflammatory properties of statins, with decreased production of cytokines, endothelial adhesion molecules and oxidative stress.

OBJECTIVES. The aim of this study is to evaluate the ability of statins (lovastatin and simvastatin) to reduce neurocognitive damage due to sepsis.

METHODS. Feces were extracted (2.5–5.0 mg) from large intestine and diluted in saline, centrifuged in 1100 rpm (10 min). Supernatant was collected and 0.5 ml injected the animals (Swiss Webster, 5 mg/g b.w and C57BL/6, 2.5 mg/g b.w.) feces groups. Control animals received 0.5 ml of saline. The animals were treated at 6, 24 and 48 h after that with antibiotic imipenem and of 1.0 ml saline. The statins groups were treated 1 h before to 48 h after the infection (20 mg/kg b.w., p.o.). After 15 days we analyzed the cognitive damage using the inhibitory avoidance task.

RESULTS. The survival was higher in animals treated with simvastatin (80 %) compared to feces without adjuvant therapy (33.3 %) in Swiss Webster mice, with no significant difference in C57BL/6 model. The severity of sepsis was reduced by statin treatment at 24 h post feces injection in both mice model. The inhibitory avoidance shows that animals that received statin were able to keep the avoidance memory that was missed in untreated infected mice.

CONCLUSIONS. We concluded that lovastatin and simvastatin protected the animals from septic cognitive damage at the level of aversive memory, and it can become a future strategies against neurocognitive damage generated by sepsis.

0443
TARGETING DEXAMETHASONE TO THE RECEPTOR CD163 ON PORCINE MACROPHAGES. IN VIVO ATTENUATION OF THE INFLAMMATORY RESPONSE TO ENDOTOXIN WITHOUT ENDOGENOUS CORTISOL SUPPRESSION

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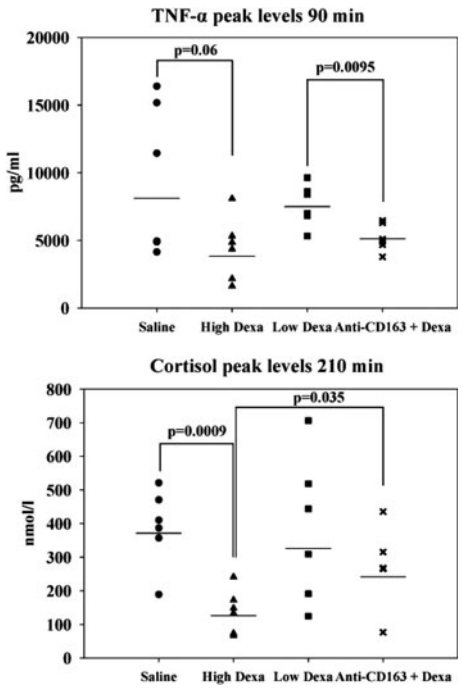
INTRODUCTION. Macrophages are the major source of cytokine release during acute inflammation. Macrophage activation can be dampened by steroid therapy, however with the risk of adverse effects e.g. secondary infections and suppression of endogenous cortisol production. Targeted delivery of low dose steroids to macrophages may provide strong anti-inflammatory effects, without inhibiting endogenous cortisol production. CD163 is a macrophage specific receptor for haptoglobin-hemoglobin complexes. Its endocytic properties and its high expression level make it an ideal target for specific drug-delivery to macrophages. We have now conjugated dexamethasone to a humanized anti-CD163 monoclonal antibody (mAb) enabling targeted delivery and intracellular release of dexamethasone to macrophages.

OBJECTIVES. (1) To evaluate whether targeted macrophage delivery of low dose dexamethasone is more efficient in lowering cytokine levels when compared to free dexamethasone and. (2) to evaluate if targeted macrophage delivery of low dose dexamethasone avoids suppression of endogenous cortisol and ACTH levels.

METHODS. Thirty-six pigs were randomly assigned to six groups: (1) saline, (2) high dose free dexamethasone (1.0 mg/kg), (3) low dose free dexamethasone (0.02 mg/kg), (4) anti-CD163 conjugated with low dose dexamethasone (0.02 mg/kg), (5) anti-CD163 conjugated with very low dexamethasone dose (0.005 mg/kg), and (6) un-conjugated anti-CD163 alone. Treatments were given 20 h prior to infusion of LPS 1 μg/kg/h for 5 h. Blood samples were collected at 8 time-points during the 5 h of infusion and analyzed for cytokines, (TNF-α, IL-1β, IL-6, IL-8 and IL-10) cortisol, and ACTH.

RESULTS. LPS induced a substantial increase in cytokine and plasma cortisol levels. High dose dexamethasone attenuated the cytokine response (Peak TNF-α at 90 min), saline group: median: 8115 [CI: 4209–15644] ng/ml versus high dose free dexa median: 3836 CI: [2040–7215] ng/ml; $p = 0.06$), but also suppressed plasma cortisol levels (Peak cortisol at 210 min), median: 371 [CI: 255–541] ng/l versus median: 126 [CI: 75–213] ng/l; $p = 0.0009$). Low dose free dexamethasone had no effect on neither TNF-α (7498 CI: [5999–9372] ng/ml) nor cortisol levels (326 [CI: 164–645] ng/l). In contrast, when compared to low dose free dexamethasone, targeted treatment with anti-CD163 conjugated with low dose dexa significantly reduced TNF-α (5122 CI: [4155–6314] ng/ml, $p < 0.0095$) without affecting endogenous production of cortisol (242 [CI: 129–451] ng/l, $p = 0.5557$). Similar results as for cortisol was obtained with ACTH.

CONCLUSIONS. Targeted delivery of dexamethasone to macrophages using a CD163 mAb as carrier provides the same anti-inflammatory effects as free dexamethasone at approximately 50 times lower concentrations and does not inhibit endogenous cortisol production. The study supports CD163 as an excellent macrophage target for anti-inflammatory drug delivery.



Graph 1

0444
ERYTHROPOIETIN IMPROVES RATS SURVIVAL AND ACTIVATES AKT PATHWAY IN ACUTE SEPSIS

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INTRODUCTION. Sepsis and septic shock still represent major health issues, with persisting high morbidity and mortality rates in critically ill patients. Cardiac dysfunction [1]

occurs frequently during severe sepsis. Erythropoietin (EPO) can protect organs against ischemia (brain and heart especially) and sepsis. EPO has also emerged as a major tissue protective cytokine in the setting of stress [2].
OBJECTIVES. To determine the beneficial role of EPO on mortality in a model of acute sepsis.
METHODS. For induction of polymicrobial sepsis, cecal ligation and puncture (CLP) [3] was performed in Wistar male rats. EPO (10000 UI/kg) was injected intraperitoneally at the time of surgery. Large number of animals/groups allowed the following indexes to be analyzed : survival of animal (Kaplan–Meyer curves), cardiac function 18 h after surgery (echocardiography and pressure–volume loops), lactates rate, heart function and cytokine profile using RT pCR and ELISA 18 h after surgery.
RESULTS. Survival at 24 h among CLP rats without treatment was 0 and 17 % when treated with EPO ($p < 0.0001$). Septic rats had lower mean arterial pressure ($p = 0.022$) and $+dp/dt_{max}$ ($p = 0.0021$) compared to sham. At the transcriptional level 18 h after surgery, we observed in the heart of septic animals, the induction of mRNA encoding TNFα, IL10, BNP, ANP (respectively ×3, ×5, ×4 and ×2 fold versus sham; $p < 0.05$). Treatment by EPO had little influence on hemodynamic parameters though prevented the rise of plasma lactates. Furthermore, treatment by EPO prevented the expression of these transcripts. In the same time, Protein kinase B (Akt) and Glycogen synthase kinase 3 (GSK-3) phosphorylation increased with treatment by EPO signing the activation of the AKT survival pathway.
CONCLUSIONS. During sepsis in rats, treatment by EPO has a beneficial effect on the abundance of transcripts of heart failure markers and signaling pathways involved in cell survival and animal survival.
REFERENCE(S). 1. Rabuel and Mebazaa. Intensive Care Med. 2006;32:799–807. 2. Walden et al. Critical Care. 2010;14:227. 3. Rittirsch et al. Nature Protocols. 2009;4, n°1:31–6.

0445
DOSE-RESPONSE ANALYSIS OF LONG TERM ANGIOTENSIN II INFUSIONS AS A VASOPRESSOR AGENT IN EXPERIMENTAL SEPSIS

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INTRODUCTION. Renin-angiotensin-aldosteron system activity is increased in sepsis, but associated with reduced pressor effect of Angiotensin II (AngII), possibly induced by cytokine-mediated receptor down-regulation [1].
OBJECTIVES. To describe dose-response patterns of AngII infusion, based on its vasopressor effect, and evaluate the impact of AngII on other systemic hemodynamic parameters during prolonged fecal peritonitis.
METHODS. 12 anesthetized, mechanically ventilated pigs (35–45 kg) were randomized to sepsis (n = 8) or to control condition (n = 4). After induction of fecal peritonitis, resuscitation was withheld for 12 h, and then started and continued for 48 h (or death), according to a protocol with blood pressure [mean arterial pressure (MAP) 75–85 mmHg], mixed venous oxygen saturation, arterial lactate and diuresis targets. Controls also received a minimal dose of AngII (6 ng/kg/min) or were titrated to reach the same blood pressure range as septic animals. Data was analyzed at specific time points (mean of values over 5 min): BL = start of AngII infusion; T_{targ} = time when MAP was first in the target range; T_{30h} = at around 30 h with MAP in or close to target range.
RESULTS. MAP increased in both groups, and cardiac output only in septic animals. Target pressure range was reached in 8 ± 15 min in controls and in 56 ± 93 in septic animals (p = 0.159).

Hemodynamic, oxygen variables, AngII doses/times

Variables	Groups	BL (n = 12)	Ttarg (n = 12)	T30h (n = 12)	p (time-effect)	p (group-effect)	p (time × group)
MAP (mmHg)	Control/ sepsis	75 (±4)/ 64 (±17)	77 (±2)/ 78 (±4)	95 (±16)/ 78 (±9)	0.001	0.076	0.093
CO (L/min)	Control/ sepsis	4.3 (±1.3)/ 3.8 (±1.1)	4.1 (±1.1)/ 4.5 (±2.0)	3.7 (±0.4)/ 5.8 (±0.6)	0.231	0.282	0.022
HR (bpm)	Control/ sepsis	78 (±19)/ 155 (±17)	74 (±13)/ 152 (±19)	64 (±6)/ 141 (±38)	0.267	<0.0001	0.998
SvO2 (%)	Control/ sepsis	51 (±5)/55 (±7)	49 (±6)/ 57 (±6)	48 (±8)/ 56 (±7)	0.853	0.093	0.503
AngII dose (ng/kg/min)	Control/ sepsis	25 (±2)/ 23(±7)	25 (±2)/ 272 (±421)	8 (±4)/ 525 (±285)	0.215	0.017	
Elapsed time (min)	Control/ sepsis	0.0 (±0.0)/ 0.0 (±0.0)	7.7 (±15.5)/ 56.2 (±93.3)	1823.9 (±18.1)/ 1810.6 (±13.9)	<0.0001	0.831	

CONCLUSIONS. In septic animals, both the time to achieve the MAP target and the AngII dose necessary for this were highly variable. Overall, there was a tendency for needing increasing doses of AngII in the septic group. Systemic VO_2/DO_2 did not seem to be altered by AngII.
REFERENCE(S). Bucher M, Ittner KP, Hobbhahn J, Taeger K, Kurtz A. Downregulation of angiotensin ii type 1 receptors during sepsis. Hypertension. 2001;38:177–82.
GRANT ACKNOWLEDGMENT. Swiss National Science Foundation (SNF) grant of Prof. S. Jakob et al. 32003B_127619/1).

Peripheral perfusion: 0446–0450

0446
SUPERIORITY OF MILD HYPOTHERMIA OVER CONTROLLED NORMOTHERMIA IN BLOOD PRESSURE AND CEREBRAL OXYGENATION MAINTENANCE, RESUSCITABILITY, AND PREVENTION OF ORGAN DAMAGE AFTER CARDIAC ARREST IN PORCINE MODEL

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INTRODUCTION. Mild therapeutic hypothermia was implemented in the management of post cardiac arrest syndrome after publication of clinical trials comparing hypothermia with common practice, i.e. usually with hyperthermia. Current evidence on comparison of therapeutic hypothermia (HT) and controlled normothermia (NT) in cardiac arrest survivors is, however, still insufficient.
OBJECTIVES. To compare the effect of mild hypothermia and controlled normothermia on blood pressure, cerebral oxygenation, resuscitability, and organ damage.
METHODS. We used porcine model (sus scrofa domestica; females; 45 kg) under general anesthesia and mechanical ventilation (HT and NT groups, four animals per group). Veno-arterial extracorporeal membrane oxygenation (ECMO) was inserted and at minimal ECMO flow (0.5 L/min) ventricular fibrillation was induced by rapid ventricular pacing. After 20 min of cardiac arrest, circulation was restored by increase of ECMO flow to 4.5 L/min, followed by 90 min of reperfusion. Target core temperature (33 °C in HT and 36.8 °C in NT) was maintained using heat exchanger on oxygenator. Blood pressure was measured invasively in the aortic arch; cerebral oxygenation was assessed by near-infrared spectroscopy. At 60 min of reperfusion, up to three defibrillation attempts were performed. Blood samples for determination of troponin I (TnI), myoglobin (MGB), creatine-phosphokinase (CPK), alanin-aminotransferase (ALT), and neuron-specific enolase (NSE) were taken at 90 min of reperfusion.
RESULTS. Significantly higher blood pressure and cerebral oxygenation values were observed in the HT group ($P < 0.05$). Sinus rhythm was restored in all HT animals after first defibrillation, whereas no restoration was attained in the NT group, even after three defibrillation attempts ($P < 0.05$). The levels of TnI, MGB, CPK and ALT were significantly lower in the HT group ($P < 0.05$ vs. NT), NSE was low and comparable in both groups.
CONCLUSIONS. Our results indicate superiority of mild hypothermia over controlled normothermia in the maintenance of blood pressure, cerebral oxygenation, resuscitability and organ protection after cardiac arrest.
GRANT ACKNOWLEDGMENT. Study was supported by the grant from the Czech Ministry of Health, No. 12153.

0447
THE HEMODYNAMIC AND MICROCIRCULATORY EFFECTS OF GRADED HYPOVOLEMIA IN SPONTANEOUSLY BREATHING SUBJECTS

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INTRODUCTION. Assessing hypovolemia in the critically ill is often difficult although very important. In sedated and mechanically ventilated patients functional hemodynamic monitoring can be useful, but data in spontaneously breathing patients are less convincing.
OBJECTIVES. To investigate the hemodynamic and microcirculatory effects of graded hypovolemia in spontaneously breathing subjects.
METHODS. 20 healthy male volunteers participated in the study. Central hypovolemia was induced by −20 and −40 mmHg lower body negative pressure (LBNP). ECG, blood pressure, central venous pressure (CVP) and arterial oxygen saturation were monitored continuously and were recorded by the Dataq/Windaq system. During baseline and each stage of LBNP the labial microcirculation was investigated by intravital orthogonal polarization spectral (OPS) imaging technique, central venous blood was taken for blood gas analysis and 3–3 min periods of patterned breathing at 6 and 15/min respiratory rate were done. The WinCPRS and the IVM Pictron programs were used for data analysis. We measured the means of minimum and maximum RR interval, systolic and mean arterial pressure, pulse pressure (PP), CVP and stroke volume (SV) for each respiratory cycle during the patterned breathing periods and calculated the means of their differences. Besides, we calculated the pulse pressure and stroke volume variability (PPV, SVV). Data from baseline and that of different LBNP levels were compared by analysis of variance, and of different breathing rates by *t* test. For SV, PP during 6/min, and for SVV and PPV for both respiratory rates ROC analysis was done using data from baseline and −40 mmHg LBNP.
RESULTS. During the graded LBNP central venous oxygen saturation ($ScvO_2$, 76 ± 6 %, 70 ± 6 %$^{\#}$, 67 ± 9 %*, *p < 0.001, $^{\#}p = 0.008$) and the red blood cell velocity significantly decreased (RBCV, 1035 ± 67, 792 ± 153$^{\#}$, 696 ± 156*§ microm/s, *$^{\#}p < 0.001$, $^{\S}p = 0.05$). The most important hemodynamic and ROC data are summarized in the Tables. Slow patterned breathing resulted in significant increase in PPV and SVV ($p < 0.05$ for each comparisons).

Table 1

Breathing rate		6/min			15/min	
	CVP (mmHg)	PPV (%)	SVV (%)	CVP (mmHg)	PPV (%)	SVV (%)
Baseline	12 ± 3	13 ± 5	15 ± 5	10 ± 3	7 ± 2	11 ± 4
−20 mmHg	7 ± 3$^{\#}$	16 ± 7	20 ± 10	6 ± 2$^{\#}$	8 ± 4	13 ± 5
−40 mmHg	6 ± 3*	20 ± 8*	26 ± 12*	5 ± 2*	11 ± 4*§	15 ± 6*

$p < 0.05$: *−40 mmHg vs. baseline; $^{\#}$−20 mmHg vs. baseline; §−40 vs. −20 mmHg

Table 2

	AUC	Cut-off	Sensitivity (%)	Specificity (%)
SV^6	0.97	57 (ml)	94	95
PP^6	0.88	54 (mmHg)	88	85
PPV^6	0.82	13 (%)	88	65
SVV^6	0.84	16 (%)	81	75
PPV^{15}	0.88	7 (%)	88	70
SVV^{15}	0.75	13 (%)	69	75

^{6}6/min

^{15}15/min breathing rate

CONCLUSIONS. During graded hypovolemia CVP, PPV, and SVV changed significantly, which was accompanied by significant decrease in $ScvO_2$ and RBCV. Functional hemodynamic parameters may reflect moderate hypovolemia with good sensitivity and specificity during spontaneous respiration, but their magnitude is increased during slow patterned breathing.
REFERENCE(S). 1. Ward KR et al. Oxygen transport characterization of a human model of progressive hemorrhage. Resuscitation. 2010;81:987–93.
GRANT ACKNOWLEDGMENT. Institutional Scientific Grant of the Department of Anaesthesiology and Intensive Therapy, University of Szeged.

0448
PERIPHERAL PERFUSION ALTERATIONS AFTER MAJOR ABDOMINAL SURGERY ARE ASSOCIATED WITH POSTOPERATIVE COMPLICATIONS

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INTRODUCTION. Surgical trauma after major abdominal surgery causes a systemic inflammatory response syndrome (SIRS), leading to severe endothelial damage and endotoxin exposure, promoting tissue hypoperfusion, hypoxia, and finally postoperative complications. In this regard, early recognition and correction of tissue hypoperfusion might lead to reduction in postoperative complications after high risk surgery, but remains highly challenging.
OBJECTIVE. Given the similarities between the inflammatory responses associated with sepsis and after major abdominal surgery, we investigated whether assessment of peripheral perfusion could help to identify patients in a preliminary stage that could develop early postoperative complications.
METHODS. We prospectively evaluated 86 consecutive patients admitted to the Intensive Care Unit, Post Anesthesia Care Unit, or surgical ward following elective major abdominal surgery. Complete hemodynamic measurements, and peripheral circulation parameters were collected 1 day prior to surgery (BL), directly after surgery (T1), and on the first (T2) and second (T3) postoperative days. Peripheral perfusion was evaluated using a combination of the capillary refill time (CRT), peripheral perfusion index (PPI), and forearm-to-fingertip skin temperature gradient (Tskin-diff). In addition, tissue oxygen saturation (StO2) was measured using NIRS. Postoperative complications were predefined and classified into 'mild' and 'moderate' complications (Grade 0–II) and 'severe' complications (Grade III–IV) according to the expanded Accordion Severity Grading System [1]. Abnormal peripheral perfusion was considered as a CRT > 5, a PPI < 1.4, or Tskin-diff > 4.
RESULTS. Systemic hemodynamic variables were comparable between groups. Table 1 shows the time course for the different peripheral perfusion variables and StO2.

Table 1 Peripheral perfusion parameters

	BL		T1		T2		T3	
	Grade 0–II	Grade III–VI	Grade 0–II	Grade III–VI	Grade 0–II	Grade III–VI	Grade 0–II	Grade III–VI
CRT	2.42 0.16)	2.40 (0.22)	3.76 (0.29)	5.22 (0.53)*	2.90 (0.22)	6.12 (0.80)*	2.48 (0.13)	6.00 (0.68)*
PPI	3.89 (0.40)	2.99 (0.31)	3.65 (0.24)	2.76 (0.87)	5.13 (1.20)	2.08 (0.72)*	3.87 (0.32)	1.68 (0.48)*
Tskindiff	2.20 (0.30)	3.0 (0.60)	2.8 (0.30)	3.2 (0.50)	2.3 (0.20)	3.8 (0.50)*	2.1 (0.2)	4.4 (0.7)*
StO2	84 (1)	80 (1)	86 (1)	84 (1)	82 (1)	83 (2)	84 (1)	83 (1)

*P < 0.05 compared to Grade 0–II. Grade 0–II, minor complications; Grade III–VI, major complications

Before surgery (BL) there was no difference in the peripheral circulation between the 2 groups. Directly after surgery however (T1), there was already a significant difference in CRT between those patients who subsequently developed major complications and those who did not, and even persisted until T3. Correspondingly, PPI and Tskindiff were significantly altered at T2 and T3 in patients who eventually developed major complications. StO2 remained between normal ranges in all patients throughout the study period. Accordingly, the odds to develop major postoperative complications are respectively 8.3 (95 % CI 2.2–32; T2) and 14.5 (4.0–52.7, T3) times higher for a patient with abnormal peripheral perfusion.
CONCLUSIONS. Following major abdominal surgery, abnormal peripheral perfusion is more present in patients who developed complications and may predict outcome, apparently independent of systemic hemodynamics.
REFERENCE. 1. Strasberg SM, Linehan DC, Hawkins WG. The accordion severity grading system of surgical complications. Ann Surg. 2009;250:177–86.

0449

NITROGLYCERIN DOSE-DEPENDENT IMPROVES PERIPHERAL PERFUSION IN PATIENTS WITH CIRCULATORY SHOCK: RESULTS OF A PROSPECTIVE, CROSS-OVER STUDY

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INTRODUCTION. Several clinical studies have assessed the effect of vasodilators as potential adjunctive therapy to recruit microvascular perfusion in circulatory shock. Some clinical investigators have proposed the administration of nitroglycerine (NTG) as a therapeutic approach to recruit the microcirculatory units and improve peripheral tissue oxygenation in septic shock and cardiogenic shock with benefic results. This scenario has led to growing interest in non invasive methods designed to monitor perfusion in peripheral tissues during vasodilator therapy. We question, therefore, whether the noninvasive monitoring of peripheral perfusion could be used to titrate the benefit effects of nitroglycerin.
OBJECTIVES. Based on clinical applications of these methods, we tested the hypothesis that NTG dose-dependent improves peripheral perfusion, as assessed by clinical assessment, body temperature gradient, and near-infrared spectrodcopy (NIRS) in patients admitted to intensive care unit (ICU) for circulatory shock resuscitation.
METHODS. The institutional review board approved the study. All patients admitted for circulatory shock resuscitation and abnormal peripheral perfusion were included. Peripheral circulation parameters included capillary refill time (CRT), forearm-to-fingertip skin-temperature gradient (Tskin-diff) and peripheral tissue oxygenation (StO_2). Global hemodynamic variables included heart rate (HR), central venous pressure (CVP), and mean arterial pressure (MAP). NTG was given as a bolus followed by a continuous intravenous infusion of 2 mg/h and doubled stepwise (4, 8, 16 mg/h) at each 15 min interval until an improvement in peripheral perfusion was observed. A second set of baseline measurements were recorded after 30 min of NTG infusion cessation.
RESULTS. Of 15 patients included in the study (age 63 ± 14 years; 9 males), 12 had septic shock. In all patients, NTG infusion significantly decreased MAP at the maximum dose time point (T_{MX}) and the lowest value recorded was 51 mmHg. Table 1 shows the time course of peripheral perfusion parameters during NTG infusion at T_{BL1}, T_{MX} and T_{BL2}. The magnitude of changes in StO2 was more accentuated for lower StO2 values (StO2 < 75 %): 11 vs. 4 %, $P < 0.05$.

Peripheral perfusion parameters data are mean (SE)

	TBL1	TMX	TBL2
CRT, s	9.4 (0.6)	4.8 (0.3)*	7.1 (0.8)*
Tskin-diff, °C	3.3 (0.7)	0.7 (0.6)*	1.8 (0.6)*
StO2, %	75 (3.4)	84 (2.7)*	79 (2.8)
THI, au	11.1 (1.3)	13.2 (1.4)*	11.6 (1.2)*

CONCLUSIONS. NTG dose-dependent improves peripheral perfusion. Therefore, the noninvasive monitoring of peripheral perfusion can be used to titrate the benefit effects of nitroglycerin to recruit microvascular perfusion.

0450

SUBLINGUAL MICROCIRCULATION IN INTENSIVE CARE PATIENTS WITH INTRA-ABDOMINAL HYPERTENSION

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INTRODUCTION. Microvascular alterations play important role in development of organ failure[1]. It is not known whether increased intra-abdominal pressure (IAP) is associated with microcirculatory perfusion derangements.
OBJECTIVES. To test the hypothesis that increased IAP is related to microcirculatory alterations in intensive care patients.
METHODS. Adult mechanically ventilated patients were included if their IAP was at least 12 mmHg for at least 12 h within first 3 days after intensive care unit (ICU) admission. IAP was measured for at least 4 times daily via urinary catheter. Sublingual orthogonal polarization spectral (OPS) imaging was used to detect microcirculatory function. OPS were done twice a day and 7 days altogether. For final analysis 6 time points were selected: 0, 12, 24, 48, 72 and 144 h. Videos were assessed by two independent researchers. Microcirculation cut-off value for vessels was 20 μm. Data are presented as medians with interquartile ranges.
RESULTS. 15 patients (4 female, 11 males) median age 67 (56–77) years and APACHE II score 28 (18–35) were studied. Reasons for ICU admission were post-resuscitation state (4 cases), gastrointestinal bleeding (2 cases), peritonitis (2 cases), acute pancreatitis, multiple trauma, methanol intoxication, cardiac failure, ruptured abdominal aortic aneurysm (2 cases), and tetanus. Altogether 791 microcirculation videos were taken, 81 % of them had eligible quality for final analysis. Interobserver variability was 24 %, intraobserver variability 6 and 20 %. Results are presented in following table. No significant correlations were found between IAP, APP and microcirculation function.

Main results

	0 h	144 (96–156) h	One-way ANOVA, linear trend, *p* value
IAP (mmHg)	14.5 (12.5–16)	10.5 (7.2–15)	0.0106*
Mean arterial pressure (mmHg)	90 (78–97)	99 (83–105)	0.2029
APP (mmHg)	71.5 (65.5–80,5)	84.5 (73.2–93.5)	0.0564
Heart rate (beats/min)	105 (86–117)	86 (78–97)	0.0071*
Total vascular density (n/mm2)	13.2 (10.1–15.9)	13.4 (10.9–16.9)	0.3449
Perfused vessels density (n/mm2)	12.8 (9.9–15)	12.7 (10.6–15.1)	0.2228
Proportion of perfused vessels (%)	79.2 (67.6–90.2)	79.9 (70.2–91.7)	0.2902
Microvascular flow index	3	3	0.615
DeBacker score	9.1 (7.1–11.4)	9.2 (7.5–11.7)	0.8207

CONCLUSIONS. Increased IAP in ICU patients is not associated with microcirculatory alterations in sublingual area.
REFERENCE(S). 1. De Backer D, Verdant C, Chierego M et al. Effects of drotrecogin alfa activated on microcirculatory alterations in patients with severe sepsis. Crit Care Med. 2006;34(7).
GRANT ACKNOWLEDGMENT. Study is supported by Estonian Science Foundation grant no 8717, by European Social Fund's Doctoral Studies and Internationalisation Programme DoRa.

Tuesday 16 October 2012

Oral Sessions
ABSTRACT AWARD WINNING SESSION: 451–454

0451

COMPARISON OF NEW CLINICAL DEFINITION OF ARDS WITH AUTOPSY FINDINGS

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INTRODUCTION. A new definition based on clinical criteria of acute respiratory distress syndrome (ARDS) has recently been stated to classify patients according to their severity.
OBJECTIVES. To evaluate the accuracy of this new definition by comparing clinical criteria with diffuse alveolar damage (DAD) from autopsy findings.
METHODS. All patients who died and had an autopsy were included. According to the new definition, patients were considered as ARDS if they had acute respiratory failure not fully explained by cardiac failure or fluid overload and bilateral opacities. ARDS was considered as mild or moderate if PaO_2/FiO_2 was respectively less than 300 or less than 200 mmHg, and severe if PaO_2/FiO_2 was less than 100 mmHg with a corrected dead space above 10 L/min and a respiratory static compliance less than 40 ml/cmH_2O. Criteria for DAD were hyaline membranes plus at least 1 of the following: alveolar cell type I or endothelial cell necrosis, edema, organizing interstitial fibrosis, or prominent alveolar cell type II proliferation.
RESULTS. 712 autopsies were analyzed over a 20 year-period (1991–2010) and 262 were excluded for following reason: acute pulmonary edema (N = 88), pulmonary fibrosis (N = 7), death at admission (N = 50), absence of mechanical ventilation (N = 35), absence of risk factor for ARDS (N = 55) or missing data (N = 27). 450 patients had a risk factor for ARDS and 350 of them presented clinical criteria. DAD occurred quasi-exclusively in ARDS patients with a specificity of 97 % among patients with a risk factor. The presence of DAD was correlated to the clinical severity with a sensibility of 14 % among the 50 mild ARDS patients, 40 % in the 156 moderate ARDS and 61 % in the 154 severe ARDS (P < 0.01).The origin of ARDS had no influence on DAD with a sensitivity of 50 % in pulmonary ARDS and 43 % in extra-pulmonary ARDS (P = 0.13). During the first decade

(1991–2000), patients at risk for ARDS received larger tidal volume (686 ± 137 ml vs. 543 ± 91, P < 0.01) than during the second decade (2001–2010). The former patients had also lower PaO_2/FiO_2 ratio and pulmonary compliance, and higher $PaCO_2$ and dead space. Among the patients with a risk factor, DAD was significantly less frequent during the second decade than during the first decade (30 vs. 43 %, $P < 0.01$).
CONCLUSIONS. Although DAD is highly specific of ARDS the sensitivity is low and only half of patients with clinical criteria of ALI/ARDS present DAD on autopsy examination. However, DAD is well correlated to severity of ARDS allowing to specify a more severe population. The rate of patients with DAD significantly decreased over the time and may be due to the reduction of tidal volume.

0452
DISTRIBUTION OF LUNG INFLAMMATION AFTER VENTILATION ACCORDING TO ARDSNET IN EXPERIMENTAL LUNG INJURY

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INTRODUCTION. Positron emission tomographic (PET) imaging of the glucose analog 2-deoxy-2-[^{18}F]fluoro-D-glucose (^{18}F-FDG) can be used to assess metabolic activity of pulmonary inflammatory cells. Information about the dynamics of regional lung inflammation by using this method can increase our understanding of the mechanisms and sequence of events involved in ventilator-induced lung injury (VILI). So far ventilation strategies are only based on the reduction of the overall airway pressure and volume. This so called "lung protective ventilation" is mostly empirically based rather than founded on experimental or clinical data on the evolution of inflammation.
OBJECTIVES. We aimed at studying the location and evolution of inflammation using two consecutive PET/CT imaging of ^{18}F-FDG and to relate inflammation to morphology as assessed by Computed Tomography (CT) during 28 h of application of the protective strategy suggested by the ARDS Network (ARDSnet).
METHODS. We established a two-hit injury ARDS model in eleven pigs. Repeated lung lavages were applied until a PaO_2/F_IO_2 <100 mmHg was reached followed by 210 min of VILI using low positive end-expiratory pressure and high inspiratory pressures/tidal-volume. Afterwards, animals were studied with PET/CT imaging of ^{18}F-FDG. PET images were obtained dynamically after injection of 150 MBq of ^{18}F-FDG. The CT enabled attenuation and tissue density corrections. We performed regional analysis by four equally spaced iso-gravitational levels, and also by the following CT density compartments: hyperinflated, normally aerated, poorly aerated and non aerated. We analyzed the dynamic PET data according to Patlak's method. The animals were studied with two consecutive PET/CT imaging of ^{18}F-FDG; the second PET/CT was performed 24 h after the first one, keeping the application of the protective strategy suggested by the ARDS Network (ARDSnet).
RESULTS. ^{18}F-FDG uptake, reflecting inflammation, was more pronounced in the intermediate gravitational zones than in the most dependent and non-dependent zones. Also, when ^{18}F-FDG uptake was related to lung density, normally aerated regions presented the highest specific uptake (K_{is}). Despite a partial decrease after 24 h, inflammation persisted.
CONCLUSIONS. Dynamic PET imaging of ^{18}F-FDG provides new information on the distribution of inflammation in VILI. The present findings suggest that normally aerated regions - corresponding to intermediate gravitational zones—are the primary target of the inflammatory process accompanying VILI. These findings challenge the actual standard of care ventilatory strategy to minimize VILI.

0453
LECTIN PATHWAY OF COMPLEMENT ACTIVATION AFTER SUBARACHNOID HEMORRHAGE

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INTRODUCTION. Brain ischemia is a main determinant of unfavourable outcome in subarachnoid hemorrhage (SAH) patients. It can play a role in the acute phase as a consequence of the initial intracranial bleeding and/or at delayed stages due to cerebral vasospasm. Recent evidence in ischemic stroke suggests that serum levels of mannose-binding lectin (MBL) and H-ficolin [1, 2], two recognition molecules of the lectin complement pathway, are associated with outcome, however no data are available on the role of the lectin pathway in SAH.
OBJECTIVES. To analyze these components of the lectin pathway in SAH patients and to describe their relationship with SAH severity, clinical vasospasm, radiological findings and long term outcome.
METHODS. Thirty-nine SAH patients were included. Blood samples were collected during the acute phase (1–3 day after bleeding) and the delayed phase (4–15 day after bleeding). Plasma concentrations of MBL, H-ficolin, and MBL/MASP2 (an index lectin pathway activation) were measured by ELISA. Cut-off of MBL deficiency was defined as MBL concentrations <500 ng/ml. SAH severity was assessed using Glasgow coma scale (GCS). Clinical vasospasm (VSP) was defined as neuro-worsening with angiographic confirmation of vessel narrowing. Early cerebral ischemia was defined as an hypodense lesion on CT performed in acute phase, while delayed ischemia was defined as a new hypodense lesion on CT scan performed in delayed phase. Six-month outcome was assessed using Glasgow outcome scale (GOS). Data are expressed as median and range.
RESULTS. MBL median concentration was 1185 (76–3340) ng/ml. Five out of 39 (13 %) patients were MBL deficient. These patients showed lower concentrations of MBL/MASP2 than those with high MBL (234 (22–305) and 295 (17–389) U/ml, respectively, p = 0.014). Conversely H-ficolin concentrations were comparable in the 2 groups. In the acute phase MBL concentrations in patients with early ischemia showed a trend toward an increase compared to those without early ischemia [1202 (285–3341) vs. 880 (75–2569) ng/ml, respectively, p = 0.075]. In the delayed phase, H-ficolin levels were lower in patients with clinical vasospasm compared to those without [22214 (11008–31319) vs. 35719 (23777–59220) ng/ml, respectively, p = 0.007]. MBL, MBL/MASP2 and H-ficolin were not related to acute GCS, delayed ischemia and GOS.
CONCLUSIONS. These findings suggest for the first time that the lectin pathways of complement activation may contribute to cerebral ischemia after SAH. In particular they indicate that serum H-ficolin is related to delayed cerebral ischemia and that higher MBL levels may be related to early ischemia.
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0454
DELIRIUM, SUB-SYNDROMAL DELIRIUM, ANTIPSYCHOTIC USE, AND ASSOCIATED CLINICAL OUTCOMES IN CRITICALLY ILL MECHANICALLY VENTILATED PATIENTS ENROLLED IN THE SLEAP MULTICENTER RANDOMIZED TRIAL

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INTRODUCTION. Delirium is common among critically ill mechanically ventilated patients, and is associated with adverse clinical outcomes, including prolonged mechanical ventilation and length of stay.
OBJECTIVES. We evaluated the incidence of delirium, sub-syndromal delirium, antipsychotic treatment and clinical outcomes among patients enrolled in a multicenter randomized trial comparing two sedation strategies.
METHODS. SLEAP is a prospective, randomized trial conducted in 16 North American centers (clinicaltrials.gov NCT00675363). Mechanically ventilated adults receiving continuous opioid and/or benzodiazepine infusions were randomized to protocolized sedation, or protocolized sedation plus daily interruption of sedation. The primary outcome was duration of mechanical ventilation. All patients had hourly titration of infusions using validated scales, and daily assessment for readiness for spontaneous breathing and for the presence of delirium using the Intensive Care Delirium Screening Checklist (ICDSC). For patients in the daily interruption arm, infusions were resumed, if indicated, at half of previous doses. In patients enrolled in the SLEAP trial, we evaluated the overall incidence, antipsychotic treatment, and clinical outcomes of patients with delirium (ICDSC ≥ 4 at any time), and sub-syndromal delirium (having some features of delirium with ICDSC 1–3 at any time but never ≥4). The incidence of delirium and sub-syndromal delirium, and antipsychotic treatment was also compared between the two SLEAP treatment groups.
RESULTS. Of 419 SLEAP patients, 226 (54.0 %) had delirium, 146 (34.8 %) had sub-syndromal delirium, and 47 (11.2 %) had neither. Patients with delirium and sub-syndromal delirium had longer durations of mechanical ventilation (p < 0.0001), and ICU and hospital lengths of stay (p < 0.0001) but lower ICU mortality (p < 0.0001), compared to patients who never experienced either (Table 1). Patients who had delirium were more likely to receive antipsychotic therapy (and for a longer period of time), and had physical restraints applied more frequently than patients who had sub-syndromal delirium or those who had neither. There were no differences in the incidence or duration of delirium, or the use of antipsychotic therapy, between the protocolized sedation group and the protocolized sedation plus daily interruption group (Table 2).
CONCLUSIONS. Delirium and sub-syndromal delirium were common in patients enrolled in the SLEAP Trial. Patients with delirium and sub-syndromal delirium had a longer duration of mechanical ventilation, and ICU and hospital lengths of stay than patients who developed neither. The use of daily sedation interruption in addition to protocolized sedation was not associated with a lower incidence of delirium or sub-syndromal delirium, or less antipsychotic therapy.
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Demographics and outcomes

	Delirium (ICDSC ≥4 at any time) ever present (N = 226)	Sub-syndromal delirium (ICDSC 1-3, never ≥4) (N = 146)	Neither delirium nor sub-syndromal delirium (N = 47)	P value
Age, years, mean (SD)	56.6 (16.5)	58.8 (17.3)	60.4 (16.0)	0.23
APACHE II, mean (SD)	23.2 (7.2)	23.6 (7.6)	26.6 (8.9)	0.02
Gender, N (% male)	128 (61.1)	66 (45.2)	32 (68.1)	0.002
Duration of MV, days	13 (8.22)	8 (5.12)	5.5 (3.12)	<0.0001
Duration of ICU stay, days	17 (10.29)	11 (7.18)	8 (5.13)	<0.0001
Duration of Hospital stay, days	24 (15.50)	15 (8.35)	5 (3.16)	<0.0001
ICU mortality, N (%)	40 (17.7)	32 (21.9)	29 (61.7)	<0.0001
Patients who received ≥1 dose AP, N (%)	83 (36.7)	20 (13.7)	3 (6.4)	<0.0001
Physical restraint use, days	5 (2.9)	3 (1.6)	0 (0.2)	<0.0001

Comparison of SLEAP groups

	Protocolized sedation (N = 209)	Protocolized sedation and daily interruption (N = 214)	P value
DELIRIUM			
Patients with ≥1 day of delirium, N (%)	113 (54.6)	113 (53.3)	0.92
Patient days with delirium, median (IQR)	1 (0.3)	1 (0.2)	0.72
Patients with ≥1 day of sub-syndromal delirium, N (%)	72 (34.8)	74 (34.9)	0.92
Antipsychotic therapy (AP)			
Patients who received ≥1 dose of AP, N (%)	54 (25.8)	52 (24.3)	0.72
Days patients received ≥1 dose of AP	0 (0.1)	0 (0.0)	0.43

Prevention of infections in the ICU setting: 455–459

0455

WHY THE RATES OF MECHANICAL VENTILATION-RELATED PNEUMONIA HAVE DECREASED IN SPAIN?

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INTRODUCTION. Different indicators of mechanical ventilation-related pneumonia (MVP) of the ENVIN-HELICS registry have remained stable until 2008, around 15 episodes per 1000 days on mechanical ventilation (MV), but a progressive and sustained decrease has been observed in the last 3 years.

OBJECTIVES. To analyze possible reasons that may explain the decrease of MVP in the Spanish ICUs.

METHODS. The ENVIN-HELICS registry is a multicenter, nationwide, prospective incidence study of voluntary participation. MVPs were diagnosed according to ECDC criteria [1]. Frequency is expressed as incidence (per 100 ICU patients and per 100 patients with mechanical ventilation) and incidence density (ID) (per 1000 days of ICU and per 1000 days on MV. Data were recorded using the software application of ENVIN-HELICS, located on a web-based server, which is accessible via Internet [2]. For the analysis of causes, patients' and ICUs' characteristics were analyzed as well as diagnostic methods, prevention measures and nationwide intervention programs implemented in the last 5 years.

RESULTS. Evaluation of the possible reasons for the decrease of MVP rates included: (a) deviation of the MVP diagnosis towards tracheobronchitis; (b) use of different criteria in the diagnosis of MVP; (c) higher rate of use of selective digestive decontamination (SDD); (d) participation of ICUs with a lower complexity (hospital size, APACHE II, ration of use of MV); (e) impact of the Bacteremia Zero (BZ) project; and (f) impact of the design of a new project to prevent MVP. Reference values for each variable associated with the aforementioned reasons are shown in Table 1.

Table 1

	2008	2009	2010	2011
ID of MVP/1000 days on MV	14.95	11.44	11.48	9.41
Diagnoses of tracheobronchitis x 100/patients on MV	9.08	8.42	8.10	9.0
Diagnosis of MVP based on clinical and radiological findings x 100/no. of MVP, (%)	70.1	70.3	72.7	73.9
MVP without etiological diagnosis, no. (% regarding AL no. of MVP)	116 (13.7)	103 (13.9)	141 (17.9)	112 (16.5)
Rates of use of SDD: patient on MV (%) Days on MV with SDD, (%)	4.7 6.3	5.7 7.2	6.4 8.1	5.6 7.0
Size of the hospital, >500 beds, (%) patients in hospitals >500 beds, (%)	39.6 52.0	42.7 54.9	40.3 50.0	47.3 59.8
APACHE II at ICU admission, mean (SD)	14.1 (8.2)	14.4 (8.4)	14.5 (8.3)	14.8 (8.4)
Ratio of use of MV	0.53	0.51	0,50	0,50
Implementation of the BZ/NZ project	NO	YES	YES	YES

CONCLUSIONS. The decrease in MVP rates should be attributed to the sustained development of programs for the prevention of nosocomial infections such as the BZ and NZ projects.

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0456

PROTECTIVE EFFECTS OF FCGR2A POLYMORPHISM IN INVASIVE PNEUMOCOCCAL DISEASES

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INTRODUCTION. *Streptococcus pneumoniae* is a major cause of pneumonia and meningitis. Several genetic polymorphisms have been described to explain differences in susceptibility and severity of encapsulated pathogen-related diseases. Among them, a functional *FCGR2A* polymorphism leading to amino acid change of histidine (H) to arginine (R) at position 131 appears to be a major candidate in adult invasive pneumococcal diseases (IPD). However, previous reports needed confirmation in a large well-defined population.

OBJECTIVES. To compare the frequency of FcγRIIa-R/H131 genotypes in a well-defined cohort of ICU IPD patients with a population of non-infected critically ill patients, and to analyze if the functional genetic polymorphism of *FCGRIIA* was associated with an increased severity of IPD.

METHODS. Prospective genetic association study in a 24-bed medical ICU of a tertiary teaching hospital over 7 years. DNA from all Caucasian patients with IPD (pneumonia and/or meningitis) was genotyped for the FcγRIIa-R/H131 polymorphism.

RESULTS. 243 patients with proven IPD were enrolled, 202 (82 %) with pneumonia and 55 (22 %) with meningitis. Mean age was 61 yo, mean SAPS2 was 50.4, half of the patients had bacteremia, 84 % of the cohort was mechanically ventilated and the hospital mortality rate was 31 %. In the IPD group, distribution of the FcγRIIa-R/H131 genotypes (H/H: 25 %; H/R: 53 %; RR: 22 %) was comparable to distribution in the Caucasian control group. Comparison of the FcγRIIa-R/R131 and the (FcγRIIa-R/H131 + FcγRIIa-H/H131) groups did not demonstrate any difference for age, SAPS2, origin of sepsis and other co-morbid conditions. However, the variant FcγRIIa-R/R131 genotype was independently associated with decreased hospital mortality (OR = 0.251, IC [0.098–0.645]; p = 0.004).

CONCLUSIONS. In a well-defined population of IPD patients, frequency of the variant FcγRIIa-R131 does not differ from other critically ill patients. However, the FcγRIIa-R/R131 genotype was independently associated with increased survival regardless of site of infection.

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0457

CAN WE PREDICT PNEUMOCOCCAL BACTEREMIA IN PATIENTS WITH SEVERE COMMUNITY-ACQUIRED PNEUMONIA?

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INTRODUCTION. Combination therapy (CT) is recommended in severe community-acquired pneumonia (SCAP) but its benefits are limited to patients with bacteremic pneumococcal pneumonia (BPP). Empirical use of CT may lead to antibiotic overuse and resistance emergence.

OBJECTIVES. The goal of this study is to evaluate the role of biomarkers as predictors of pneumococcal bacteremia in SCAP.

METHODS. Prospective, single-center, observational cohort study of 90 patients with SCAP admitted to the Intensive Care Department of a University Hospital in Portugal. Leucocytes (WBC), C reactive protein (CRP), lactate, procalcitonin (PCT), D-Dimer, brain natriuretic peptide (BNP) and cortisol were measured within 12 h after the 1st antibiotic dose.

RESULTS. All patients received combination therapy, mostly with a macrolide (99 %). 13 patients (14.4 %) had BPP, mainly male (54 %) with a mean age of 60 ± 19. BPP patients had significantly higher levels of median CRP (267 (IQR 225–337) vs. 200 (IQR 99–303) mg/l; p = 0.046), PCT (45 (IQR 28–113) vs. 8 (IQR 2–28) ng/ml; p < 0.001), BNP (714 (IQR 484–2941) vs. 402 (IQR 172–874) pg/ml; p = 0.013) and lactate (6.6 (IQR 3.7–10.4) vs. 3.3 (IQR 2.0–6.3) mmol/l; p = 0.015) than non BPP. In receiver operating characteristic, the discriminatory power evaluated by the area under the curve for PCT (0.81; 95 % CI 0.71–0.91) was superior to lactate (0.71; 95 % CI 0.56–0.87), BNP (0.71; 95 % CI 0.55–0.86) and CRP (0.69; 95 % CI 0.57–0.82). At a cut-off point of 17 ng/ml, PCT showed a sensitivity of 92 % (95 % CI: 77–100 %), a specificity of 65 % (95 % CI: 56–76 %), a positive predictive value of 31 % and a negative predictive value of 98 %, as a predictor of pneumococcal bacteremia.

CONCLUSIONS. In this cohort, PCT presented the best ability to predict pneumococcal bacteremia in SCAP patients. The use of combination therapy in SCAP could probably be limited to those patients with a PCT serum level ≥17 ng/ml leading to a reduction on antibiotic use.

0458

SURVEILLANCE OF VENTILATOR ASSOCIATED PNEUMONIA IN A DUTCH INTENSIVE CARE AND THE INFLUENCE OF SELECTIVE DECONTAMINATION OF THE DIGESTIVE TRACT

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INTRODUCTION. In our ICU a continuous infection registration system integrated within our Patient Data Management System (PDMS) is effective in close collaboration with the

department of Medical Microbiology and Infection control. Based on data from the literature, selective decontamination of the digestive tract (SDD) was introduced in August 2006 for all patients with expected mechanical ventilation duration of >48 h.
OBJECTIVES. To determine incidence rates of ventilator associated pneumonia (VAP) before and after the introduction of selective decontamination of the digestive tract (SDD) and to analyse risk factors related to the incidence of VAP.
METHODS. Data on VAP were prospectively collected in patients with an ICU stay >48 h up to maximally 56 days for patients admitted between April 2005 and April 2010. Patients with pneumonia on admission were excluded from analysis. All potential diagnoses of VAP were reviewed by experts to establish the diagnosis based on slightly modified CDC criteria. For every half year during this period the incidence for VAP per 1000 days of mechanical ventilation was calculated. Risk factors were determined for the development of VAP using univariate risk analysis.
RESULTS. A total of 2133 patients were continiously screened for presence of VAP during their ICU stay. Before the introduction of routine use of SDD from April until August 2006 an incidence of 4.0 VAP/1000 invasive mechanical ventilation days (95 % CI: 2.4–5.7) was recorded. After the introduction of SDD, VAP incidence was decreased to 3.2 VAP/1000 invasive ventilation days (95 % CI: 2.3–4.1). Relative risk for routine SDD use was 0.8 (95 % CI: 0.5–1.3). Univariate risk analysis showed that trauma increased the relative risk to acquire VAP with 1.8 (95 % CI: 1.1–2.8).
CONCLUSIONS. Compared to the National Dutch surveillance between 2004 and 2007 (12 VAP/1000 invasive ventilation days) and International VAP registrations (varies from 8 to 19 VAP/1000 invasive ventilation days) our VAP incidence was already low before the introduction of SDD. The introduction of SDD had no significant effect on VAP incidence in our ICU. However, few risk factors were related to the incidence of VAP and thereby a potential subject for further investigation.

0459

COST-EFFECTIVENESS OF RISK-BASED STRATEGIES FOR ANTIFUNGAL PROPHYLAXIS AMONG NON-NEUTROPENIC, CRITICALLY ILL ADULT PATIENTS: THE FIRE STUDY

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INTRODUCTION. Invasive fungal disease (IFD) increasingly occurs in non-neutropenic patients in critical care units. A number of randomised controlled trials have evaluated antifungal prophylaxis in this setting and, despite heterogeneity in patient groups studied (although all high risk), demonstrated a homogeneous effect on the risk of IFD and suggested a reduction in mortality. It is therefore likely to be beneficial to identify and target antifungal prophylaxis at patients at high risk of IFD.
OBJECTIVES. The aim of the Fungal Infection Risk Evaluation (FIRE) Study was to develop and validate risk models to identify non-neutropenic, critically ill adult patients at high risk of IFD and to assess the cost-effectiveness of strategies for targeting antifungal prophylaxis based on these models.
METHODS. Risk factors for IFD were identified by a systematic review of the literature. Prospective data collection was undertaken in 96 UK adult, general critical care units. Data were split into development and validation samples and risk models were developed to predict risk of invasive *Candida* infection at three decision time points: admission to the critical care unit; 24 h; and the end of calendar day 3. The economic evaluation assessed the cost-effectiveness of alternative strategies for providing prophylaxis to patients identified as high risk using the risk models compared with no prophylaxis. A decision-analytical approach was used to project lifetime cost-effectiveness. Probabilistic sensitivity analysis was undertaken to recognise the sampling uncertainty in the input parameters. The main structural assumptions were subjected to sensitivity analysis.
RESULTS. Data were collected on 60,778 admissions between July 2009 and March 2011. 383 admissions (0.6 %) were admitted with or developed IFD (94 % *Candida* species). IFD was associated with increased mortality and length of stay. The risk models had fair discrimination in the validation sample (c index 0.655, 0.732 and 0.709 at admission, 24 h and day 3, respectively). Incremental quality-adjusted life years of prophylaxis strategies compared with current practice were positive but small versus incremental costs. Incremental net benefits of each strategy compared with current practice were all negative. Cost-effectiveness acceptability curves showed that current practice was the strategy most likely to be cost-effective.
CONCLUSIONS. The FIRE Study found a low incidence of IFD among non-neutropenic, critically ill adult patients. Simple risk models were developed with acceptable discrimination for identifying patients at high risk of invasive *Candida* infection. For non-neutropenic, critically ill adult patients admitted to NHS adult, general critical care units, it is not cost-effective to assess risk of invasive *Candida* infection using a prognostic model and provide routine antifungal prophylaxis to patients identified as high risk.
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Metabolism in ICU: 0460–0464

0460

DYNAMICS OF SKELETAL MUSCLE ATROPHY AND ATROPHY GENE EXPRESSION IN CRITICALLY ILL PATIENTS DURING ICU STAY

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INTRODUCTION. Skeletal muscle atrophy mediated by protein degradation, is a common and significant complication in critically ill patients affecting the disease course. The protein degrading ubiquitin proteasome system and its muscle-specific E3 ubiquitin ligases MuRF-1 and Atrogin-1 play a key role in skeletal muscle atrophy.
OBJECTIVES. To investigate skeletal muscle atrophy and its association with expression of the muscular atrophy genes MuRF-1 and Atrogin-1 during the disease course of critically ill patients.
METHODS. Controlled, prospective, monocentric observational study. We included 33 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 two, at day 5 and 15, from ICU patients were obtained. Histological examination of muscle biopsies and quantification of myocyte cross-sectional area (MCSA) for type I, IIa, and IIb fibers using ImageJ software (fiber count >100) were performed. We quantified MuRF-1 and Atrogin-1 mRNA (real-time PCR) and MuRF-1 protein expression (western blot) of all patients and both time points. GAPDH mRNA and protein expression was used as a control. Non-parametric tests were performed. Ethic vote (Charité EA2/061/06).
RESULTS. In the first biopsy, no differences of MCSA for type I and II fibers were found between published data for healthy controls and ICU patients [1]. A significant decrease of MCSA for all three fiber types was found in the second compared to the first biopsy of critically ill patients (n = 16). In the first biopsy, MuRF-1 and Atrogin-1 mRNA expression was significantly increased in ICU patients (n = 29) compared to controls (n = 5). However, MuRF-1 and Atrogin-1 mRNA expression returned to control levels in the second biopsy of ICU patients (n = 21). Accordingly, MuRF-1 protein expression was significantly increased in the first and normalized in the second biopsy of ICU patients.

Table 1

	Controls/ literature	First biopsy	Second biopsy	p (a)	p (b)	p (c)
MCSA type I	3745(3328/ 4272)	3684 (2992/ 4239)	2642 (2325/ 3486)	n.s	0.01	0.01
MCSA type II	3317 (2669/ 3905)	3218 (1750/ 3787)	1940 (1031/ 3202)	n.s	0.04	0.01
MCSA type IIa		3480 (2294/ 4442)	2151 (1227/ 3855)			0.004
MCSA type IIb		2861 (1428/ 3400)	1701 (814/2855)			0.003
MuRF-1 mRNA	0.38 (0.30/0.41)	1.12 (0.78/2.06)	0.34 (0.25/0.58)	0.004	n.s	0.001
Atrogin-1 mRNA	0.40 (0.38/0.45)	0.97 (0.75/1.84)	0.65 (0.47/0.83)	0.001	n.s	0.02

Results shown as median (25/75 percentile). MCSA in μm^2 n.s. = not significant
P(a) = 1st biopsy versus controls/literature, p(b) = 2nd biopsy versus controls/literature, p(c) = 1st versus 2nd biopsy

CONCLUSIONS. Despite absence of myofiber atrophy a strong induction of MuRF-1 and Atrogin-1 expression occurred early during ICU stay. Interestingly, during the disease course, all types of muscle fibers became atrophic, while expression of MuRF-1 and Atrogin-1 returned to baseline. We conclude that MuRF-1 and Atrogin-1 are excellent markers during the early phase of skeletal muscle atrophy, and may initiate its development. However, the role of MuRF-1 and Atrogin-1 during later stages of critical illness induced muscular atrophy is less clear.
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0461

WHOLE BODY PROTEIN TURNOVER IN MECHANICALLY VENTILATED ICU PATIENTS

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INTRODUCTION. Earlier studies have shown that patients with multiple organ failure loose body protein due to a negative protein balance (protein breakdown exceeds protein synthesis). However these patients were studies in the fasted state.
OBJECTIVES. Here we studied whole protein balance in patients with multiple organ failure fed parenterally. Comparison was done with a reference group of healthy volunteers studied in the fasted and parenterally fed state.
METHODS. Eight healthy volunteers were studies after an overnight fast (postabsorptive) and during 3 h of parenteral feeding (Kabiven, Kabi-Fresenius) with 20 % of measured daily energy expenditure. Eight patients depending on mechanical ventilation were studied in the ICU being fed parenterally only according to the clinics routines. Whole body protein synthesis and breakdown rates were measured using stable isotope labeled amino acids. For this, subjects received a prime of $^2H_5$-phenylalanine (0.5 mg/kg), $^2H_4$-tyrosine (0.15 mg/kg) and $^2H_2$-tyrosine (0.3 mg/kg) followed by a continuous infusion of $^2H_5$-phenylalanine (0.5 mg/kg/h) and $^2H_2$-tyrosine (0.3 mg/kg/h). Plasma samples were obtained after 3 h and analyzed for labeled phenylalanine and tyrosine by mass spectrometry. Steady state models were used to calculate whole body protein turnover, synthesis, breakdown and balance. The effect of parenteral nutrition in the reference groups was assessed by paired *t* test. Since the patients received different amounts of parenteral nutrition, the amount of amino acids given during the study was correlated to the protein balance.
RESULTS. For the volunteers, parenteral feeding increase whole-body protein turnover (7.7 ± 1.3 vs. 11.6 ± 2.0 mg/kg/h; $P < 0.0001$). The net balances between protein synthesis and breakdown changed from negative to positive (-1.6 ± 0.5 to 1.8 ± 1.1 mg/kg/h; $P < 0.0001$). This change was attributable to an increase in protein synthesis (6.1 ± 1.3 vs. 9.3 ± 1.8 mg/kg/h; $P < 0.0001$). For the patients, only measured in the fed state, a protein balance not statistically significantly different from zero was observed (0.4 ± 1.8 mg/kg/h). The whole body protein turnover (17.0 ± 6.6 mg/kg/h) and synthesis (14.6 ± 5.4 mg/kg/h) were about 50 % higher than that of the fed healthy volunteers. In the ICU patients, net protein balance correlated positively to the amount of amino acids given ($r = 0.62$).
CONCLUSIONS. The usage of stable isotope methods allow for direct assessment of protein turnover and balance in critically ill patients and the ability of the patients to utilize nutrition to build new body protein. ICU patients have an increased protein turnover compared with parenterally fed volunteers. In addition, these patients seem to be able to respond to increasing amino acids by increasing their protein balance. However, this latter hypothesis generating finding needs to be confirmed is new studies designed for this purpose.
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0462

DOES BODY MASS INDEX INFLUENCE MUSCLE WASTING FOLLOWING CRITICAL ILLNESS?

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INTRODUCTION. It is estimated that 20 % of intensive care unit (ICU) patients are obese (BMI 30–40 kg/m^2)[1]. Obesity on ICU is associated with improved survival compared to normal weight patients, although length of stay and mechanical ventilation are often longer [1]. One explanation for the survival benefit is excess adipose tissue provides additional

energy reserves resulting in muscle reservation. Muscle wasting is common on ICU resulting in poor outcomes[2]. This appears to occur irrespective of calorie or protein intake.
OBJECTIVES. Does body mass index influence the rate and amount of wasting in critical illness. And what impact it has on functional recovery.
METHODS. A prospective observational study; muscle thickness of bicep, forearm and thigh were assessed by ultrasound on days 1, 3, 5, 7, 10 and 14.

Table 1 Patient characteristics

Characteristics (median (IQR)	Normal (BMI 19–24.9) n-17	Overweight (BMI 25–29) n-10	Obese (BMI > 30) n-17
Age (years)	53 (41–72)	65 (57–73)	55 (42–68)
Sex (M:F)	13:4	6:4	12:5
Diagnosis: surgical medical	10 7	5 5	9 8
APACHE 2	20 (17–24)	22 (18–28)	20 (16–26)
ICU stay (days)	16 (6–25)	7 (5–11)	11 (6–18)
Mechanical ventilation (days)	7 (5–14)	4 (3–7)	7 (5–14)
% Mortality	14	40	35
% Energy received	70 (46–77)	50 (31–57)	67 (60–78)
Nitrogen loss (grams) day 5	18.4	NA	21.3

Table 2 Muscle wasting

Mean (SD)	Normal Wt (n-17)	Overweight (n-10)	Obese (n-17)	P (One way ANOVA)
Average period of data collection	8 Days (4.4)	6 Days (4.5)	8 Days (4.3)	
Initial muscle depth (cm)	8.7 (2)	8.4 (2.8)	11.2 (3.4)	0.01
Muscle loss as % from initial	18.2 (11)	12.1 (12)	18.2 (11)	0.62
% loss per day	2.9 (1.7)	1.7 (1.5)	2.5 (1.9)	0.52
Muscle loss (cm) at Day 5	1.1 (1.1)	1 (0.6)	3.9 (2.6)	0.01

RESULTS. 44 critically ill patients were included and grouped according to BMI. The 3 groups did not differ in baseline characteristics (Table 1). Muscle wasting data is shown in Table 2. Post hoc comparisons indicated the obese had significantly different initial muscle depth (p 0.01) and loss at day 5 (p 0.01) from normal weight. T tests and CI's suggest there is no significant difference in terms of % loss per day (p 0.6, CI −1.8 to 1.1) or % loss from initial (p 0.99, CI −9.1 to 9.1) demonstrating similar rates of muscle wasting. The overweight did not differ significantly from either the obese or normal groups. Functional recovery could only be measured in 29 % of patients using MRC score and handgrip. No statistical differences were observed.
CONCLUSIONS. Patients' in all three BMI categories lost muscle in a comparable manner; the absolute loss was most pronounced in the highest BMI group. This suggests similar metabolic responses to critical illness and no protective effect of excess adipose tissue. Measuring muscle loss is only one part of the story; of more importance is the long term recovery. We showed that measures of functional recovery are unsuitable for use within the ICU. Further studies are required to ascertain if this is a true finding and also what impact muscle loss has on recovery post ICU. This in turn will inform nutrition support practices especially in obese patients. Restricting energy and protein intakes in overweight and obese patients has no rationale if all patients lose muscle at similar rates.
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0463
DETERMINATION OF A SIMPLIFIED METHOD FOR ESTIMATING RESTING ENERGY EXPENDITURE IN CRITICALLY ILL PATIENTS

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INTRODUCTION. The accurate assessment of resting energy expenditure (REE) in critically ill patients requires the use of indirect calorimetry. As this method is time-consuming and requires an expensive equipment, predictive equations and capnography are sometimes used to assess REE.
OBJECTIVES. To compare the accuracies, agreement and precision of predictive equations and carbon dioxide production (VCO_2) evaluated against REE measured with indirect calorimetry (MREE).
METHODS. The study was conducted in intubated, mechanically ventilated critically ill patients. For each patient, MREE, respiratory quotient, oxygen consumption and carbon dioxide production (VCO_2) were recorded over a 30-min period. Harris-Benedict (HB) variants (combinations of actual and ideal body weight with and without stress factors ranging from 1.1 to 1.8), an equation combining HB and VCO_2, Penn State equations and an equation using VCO_2 were compared with MREE, in terms of precision (root square mean error, RSME), correlation (correlation coefficient, r), accuracy (percentage of predicted values within 10 and 15 % of reference value), agreement (Bland and Altman method) and bias (95 % confidence interval).
RESULTS. Eighteen patients (mean age 62.7 ± 16.8 years, 5 women, APACHE II score 16.2 ± 6.9) were included. The average MREE was 2346.0 ± 521.8 kcal/day. HB using actual weight and a stress factor of 1.6 was precise (RSME 15.1 %), highly correlated with MREE ($r = 0.71$, $p = 0.0013$) but not accurate (44.4 %). Adding VCO_2 to HB further improved the correlation ($r = 0.83$, $p < 0.0001$), but not the accuracy (43.3 %). All predictive equations variants (including the equation combining HB and VCO_2) loosely agreed with MREE (ranging from −1612.8 to −43.9 and from −613.2 to 688.3 kcal/day, respectively). Estimation of REE from VCO_2 resulted in a largely improved precision (RSME 7.0 %), accuracy (78.3 %) correlation ($r = 0.95$, $p < 0.0001$), and agreement (−330.4 to 334.7) and were unbiased (−3.5 to 7.7).
CONCLUSIONS. The estimation of REE using VCO_2 is more precise, accurate and less biased that the prediction by the HB and Penn State equations, even after correction for stress factors. Hence, the use of capnographs to estimate MREE should be validated prospectively.

0464
CHANGE OF SERUM ALBUMIN AND RISK OF ALL-CAUSE MORTALITY IN CRITICAL ILLNESS: A COHORT STUDY

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INTRODUCTION. Hypoalbuminemia is associated with mortality in critically ill patients. Whether a decline in albumin at critical care initiation from baseline albumin has prognostic implications has not been studied.
OBJECTIVES. We aimed to study the hypothesis that a decrease in albumin at critical care initiation relative to a pre-hospital admission albumin is associated with increased mortality.
METHODS. We performed a two center observational study of patients treated in medical and surgical intensive care units in Boston, Massachusetts. We studied 12,045 patients, age ≥18 years, who received critical care between 1997 and2007. The exposure of interest was the change in albumin measured from 7 to 365 days prior to hospitalization and albumin measured within 48 h of critical care initiation (delta albumin = pre-admission albumin − critical care initiation albumin). Delta albumin was categorized a priori as <0, 0–0.5, 0.5–1.0, 1.0–1.5, and >1.5 g/dL. The greater the delta albumin the larger the decrease in albumin at critical care initiation relative to baseline. The primary end point was 30-day all cause mortality following critical care initiation. Pre-specified secondary end points included 90-day mortality, 365-day mortality, and in-hospital mortality. Unadjusted associations between delta albumin groups and outcomes were estimated by logistic regression analysis. Adjusted odds ratios were estimated by multivariable logistic regression models with inclusion of covariate terms including age, race, gender, Deyo–Charlson Index, patient type (medical versus surgical), sepsis and number of organs with acute failure.
RESULTS. At critical care initiation, the decline in albumin from pre-hospital levels was a robust predictor of all cause mortality following multivariable adjustment. The adjusted OR for 30 day mortality in the Delta albumin groups follow: Delta albumin <0 g/dL: OR = 1.00 (Referent). Delta albumin 0.5–1.0 g/dL: OR = 1.75 (95 % CI 1.51–2.02; $P < 0.0001$). Delta albumin 1.0–1.5 g/dL, OR = 1.96 (95 % CI 1.65–2.33; $P < 0.0001$). Delta albumin >1.5 g/dL, OR = 2.14 (95 % CI 1.75–2.63; $P < 0.0001$). Similar significant associations post adjustment are seen with in-hospital, 90-day and 365-day mortality. Estimating the receiver operating characteristic AUC shows that delta albumin has moderate discriminative power for 30-day mortality (AUC = 0.76; SE = 0.006; 95 % CI 0.75–0.77; $P < 0.0001$, fully adjusted). Patients with delta albumin of >1.5 g/dL have an adjusted OR for the risk of bloodstream infection of 1.37 (95 % CI, 1.07–1.76; $P = 0.01$) relative to delta albumin <0 g/dL.
CONCLUSIONS. A decline in albumin at the time of critical care initiation relative to pre-admission albumin is a robust predictor of all cause patient mortality. The observations may be the result of processes seen at the initiation of critical care, such as increased vascular permeability, generalized inflammation, decreased anabolism and an increased catabolic state.

The best in neurointensive care: Encephalopathy & polyneuropathy: 0465–0469

0465
BRAIN BIOENERGETICS IMBALANCE AND OXIDATIVE STRESS IN SYSTEMIC INFLAMMATION AND SEPSIS

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INTRODUCTION. Sepsis is frequently associated with systemic inflammatory response syndrome that leads to multiple organ dysfunctions. Acute and long-term brain dysfunctions have been demonstrated both in experimental models and septic patients. Oxygen supply and utilization are critical for organ function and the brain tissue is extremely dependent on glucose and oxygen. We had previously observed that mitochondrial function is impaired in the brain during experimental sepsis, which directly affect brain oxygen utilization. The pathologic mechanisms that lead to septic encephalopathy are not completely understood.
OBJECTIVES. Our aim here was to deepen the studies on the effect of systemic inflammation in the brain energy metabolism and understand how it is related to the pathophysiology of septic encephalopathy.
RESULTS. We induced systemic inflammation by either endotoxemia or polymicrobial peritonitis as models experimental sepsis. Mice with systemic inflammation presented hypoglycemia, hyperlactatemia and cognitive impairment. We observed a rapid increase in glucose uptake in the brain of rats with endotoxemia in vivo using Positron Emission Tomography (PET). Remarkably, the increase in glucose uptake occurred earlier in the brain than in other organs, as early as 2 h after disease onset. A similar increase in glucose uptake was observed in vitro in brain slices from mice with polymicrobial peritonitis. The brains of mice with experimental sepsis presented neuroinflammation, mitochondrial dysfunction and oxidative stress, but brain mitochondria from septic mice generated less ROS in vitro. This led us to think in a possible role of NADPH oxidase in generating oxdative stress. Preliminary data form our group show that treatment with apocynin (5 mg/kg) in the acute phase of sepsis prevented the cognitive impairment normally observed 15 days after sepsis onset in mice.
CONCLUSIONS. The results of the present study show a new metabolic phenotype that occurs in the brain in response to systemic inflammation, characterized by a rapid increase in glucose uptake and mitochondrial dysfunction. The early increase in glucose in uptake coincides with brain oxidative stress in the septic brain, and may be related with NADPH oxidase activation. This metabolic dysfunction can be related to the pathophysiology of septic encephalopathy.
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0466

EARLY TREATMENT WITH INTRAVENOUS IMMUNOGLOBULINS IN PATIENTS WITH CRITICAL ILLNESS POLYNEUROPATHY — A RANDOMIZED CONTROLLED, DOUBLE BLINDED STUDY

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INTRODUCTION. Critical illness polyneuropathy (CIP) is a severe complication of critical illness. The clinical features of CIP are muscle weakness and atrophy causing delayed weaning and prolongation of the mobilization phase. Although the exact etiopathogenesis has not been fully elucidated yet, sepsis, systemic inflammatory response syndrome, and multiple organ failure seem to play an important role. CIP is diagnosed by signs of denervation in electromyography. Although there is no causal treatment for CIP, retrospective data suggest that early IgM-enriched intravenous immunoglobulin (IVIG) application may prevent or mitigate CIP. Therefore we aimed to investigate the use of IVIG in the early treatment of CIP in critically ill patients in a prospective, randomized, double blind and placebo controlled setting.

METHODS AND OBJECTIVES. In this prospective, randomized, double blind and placebo-controlled trial critically ill patients with clinical evidence for incipient CIP, a diagnosis of SIRS/sepsis and failure of at least 2 organ systems were randomized to be treated either with IgM-enriched IVIG or with human albumin 1 % as placebo over a period of 3 days. The primary objective was to demonstrate that administration of IVIG prevents and/or mitigates CIP in critically ill patients, measured by electrophysiological stimulation of the median, ulnar and tibial nerves on days 0, 4, 7 and 14. Electrophysiological measures were graded according to compound muscle action amplitude size (CIP score) of the respective nerve. Secondary objectives were mortality from any cause within a 28 days period and lengths of ICU stay.

RESULTS. 38 critically ill patients were included and randomized to either receiving IgM-enriched IVIG ($n = 19$) or placebo ($n = 19$). Baseline characteristics including CIP score on day 0 were similar between the two groups. CIP could not be improved significantly by IVIG treatment for three consecutive days, represented by similar CIP scores of all three measured nerves on days 4, 7 and 14 in the IVIG and the placebo group. Mean CIP score levels of all three nerves significantly increased from baseline to day 4 in both groups.

CONCLUSIONS. Results suggest that early treatment with IVIG does neither significantly improve CIP nor influence length of stay or mortality in critically ill patients. Consisting with the literature, CIP deteriorated during the course of disease in critically ill patients with a diagnosis of SIRS/sepsis and failure of 2 organ systems.

0467

EFFECT OF ELECTRICAL MUSCLE STIMULATION IN PREVENTION OF ICU ACQUIRED MUSCLE WEAKNESS AND FACILITATING WEANING FROM MECHANICAL VENTILATOIN

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INTRODUCTION. The ICU acquired muscle weakness (ICUAMW) is an acquired neuromuscular disorder which is considered a common complication of critical illness survivors presenting with profound muscle weakness and diminished or absent deep tendon reflexes which is associated also with increased duration of mechanical ventilation and weaning period suggesting a possible relation between limb and respiratory neuromuscular involvement. There is no preventive tool and no specific treatment has been proposed so far for ICU acquired muscle weakness. A number of studies have evaluated the role of early mobilization and/or physiotherapy in critically ill patients. These studies involved passive limb mobilization, limb and respiratory muscle training, and bed cycling. Many studies reported beneficial effects of Electrical Muscle Stimulation (EMS) on ICU acquired muscle weakness.

OBJECTIVES. To assess the effect of electrical muscle stimulation in Prevention of I-CUAMW and in facilitating the weaning from mechanical ventilation in critically ill patient.

METHODS. The present study was carried out on 80 critically ill patients on mechanical ventilation for more than 24 h admitted to critical care medicine department of Alexandria University Main Hospital. The patients were randomly categorized into two groups: 40 patients received conventional lines of treatment only (control group) and 40 patients will receive conventional lines of treatment in addition to one daily session of Electrical Muscle Stimulation (EMS) (EMS group). Assessment of occurrence of ICUAMW was done through the MEDICAL RESEARCH COUNCIL SCALE (MRCS) which is a method for clinical assessment of muscle strength.

RESULTS. There were no significant changes between the 2 groups regarding the age, sex and the initial reason for mechanical ventilation. MRCS did not show any significant difference between the 2 groups in the first 3 days post mechanical ventilation while in day 4, MRCS mean value was 46.86 ± 10.88 in EMS group versus 43.70 ± 9.32 in the control group ($p = 0.41$). In day 21, MRCS mean value was 29.67 ± 8.87 in EMS group versus 19.60 ± 4.34 in the control group ($p = 0.37$). Significant difference was also noted in the duration of mechanical ventilation as the mean value in EMS group was 9.01 ± 8.01 days versus 11.97 ± 8.07 in the control group ($p = 0.48$).

CONCLUSIONS. Although the EMS could not prevent the occurrence of ICUAMW in critically ill mechanically ventilated patients but it still has a role in minimizing the degree of muscular weakness and also it could be helpful in facilitation of weaning from mechanical ventilation.

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0468

RESPIRATORY PARAMETERS IMPROVES DURING DIAPHRAGMATIC PACING IN HIGH SPINAL CORD LESIONS PATIENTS

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INTRODUCTION. Diaphragmatic pacing (DP) in ventilator-dependent patients improves quality of life and helps in decreasing morbility. DP implant via thoracotomy is invasive and carries the risk of phrenic nerves injury with consequent inadequate volume generation.

OBJECTIVES. We describe a method by which phrenic nerves can be stimulated through laparoscopic placement of intramuscular diaphragm electrodes [1] with respiratory mechanics evaluation.

METHODS. Nine ventilator-dependent spinal cord injured patients were screened. Pre-implant evaluation requires normal phrenic nerves function, evaluated by phrenic nerve stimulation (cMAP) and transdiaphragmatic pressure (Pdi). A 4 electrodes implant (Synapse Biomedical, USA) was used; best motor response spots were identified intraop and two electrodes for each emidiaphragm were then implanted. An external stimulator controls impulse amplitude, pulsewidth, respiratory frequency and inspiratory time.

RESULTS. A reliable transdiaphragmatic pressure during phrenic nerve stimulation was obtained in six patients. Three patients with no phrenic response were excluded and one patient decide otherwise (Table 1). Five implants were performed with no major complication (hospitalization 21.2 ± 1 days). After 30 days of stimulation, TV increased in 4 out of 5 patients (Fig. 1). Mean SpO2 increase from 93 to 97.7 %, heart rate decrease from 98.6 ± 16 to 79.3 ± 6 bpm. All patients were free from ventilator for more than 12 h/day.

CONCLUSIONS. All patients with positive transdiaphragmatic pressure during phrenic nerve stimulation were implanted with success. This approach proved to be less invasive and increased independence from MV with adequate and effective tidal volume generation, increasing in oxygenation and consequent decreasing in heart rate.

Table 1

Pt n	Pdidx (cmH_2O)	Pdisn (cmH_2O)	cMAPdx	cMAPsn	Surgery
1 SV	6.89 (1.18)	7.12 (0.98)	Y	Y	Y
2 GA	NA	8.65 (1.38)	Y	Y	Y
3 ND	4.46 (0.80)	3.17 (0.65)	Y	Y	Y
4 MA	4,28 (0.64)	7.30 (0.57)	Y	Y	N
5 DA	8.38 (0.81)	7.04 (0.31)	Y	Y	Y
6 FF	NS	NS	NS	NS	N
7 MG	NA	7.37 (0.84)	Y	Y	Y
8 MC	NS	NS	NS	NS	N
9 FL	NS	NS	NS	NS	N

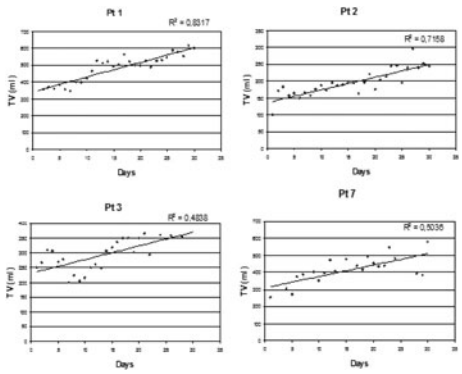

Fig. 1

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0469

LONGTERM EVALUATION OF SEVERE GUILLAIN–BARRE SYNDROME PATIENTS MECHANICALLY VENTILATED FOR MORE THAN TWO MONTHS IN ICU

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INTRODUCTION. Guillain-Barré syndrome (GBS) is an inflammatory demyelinating disease of the peripheral nervous system, with some severe forms requiring prolonged mechanical ventilation in ICU.

OBJECTIVES. Longterm evaluation of disability, depression, traumatic stress disorder and quality of life in Guillain–Barre syndrome patients mechanically ventilated for more than two months in ICU.

METHODS. Patients with GBS admitted in the Neurological Intensive Care Unit of La Pitié-Salpetriere Hospital, Paris, France, were retrospectively identified in our registry between January 2001 and September 2011. Those who were mechanically ventilated for more than two months were included in the study. Patients who had less than 1 year of follow-up were excluded.

The patients were seen in consultation or contacted by phone call to complete several scales; functional scores (Rankin and Barthel), depression scales [Hospital Anxiety and Depression Scale (HAD); Beck questionnaire], one post traumatic stress disorder scale [Impact of event scale revisited (IES-R)] and quality of life scales [36-Item Short Form Health Survey (SF-36), Nottingham Health Profile (NHP)]. The SF-36 scores of our patients were compared with an age and sex-matched French population using Wilcoxon test.

RESULTS. Among 212 patients hospitalized for GBS between January 2001 and September 2011, 21 were mechanically ventilated more than 2 months. 5 were lost-of-follow-up and 2 had less than 1 year follow-up and 2 were excluded because of an evolution towards a chronic inflammatory demyelinating polyradiculoneuropathy (CIDP). Thus 12 patients were finally included for analysis. Their median age was 62.5 years [34.5–78.75] and their ICU

length of stay (LOS) was 3.4 months [2.1–4.2]. Median duration of mechanical ventilation was 2.7 months [2–3.2].
Despite the severity of GBS and the need of long periods of mechanical ventilation and ICU stay, patients had moderate disability. Depression and post-traumatic stress disorder scales were comparable. Their quality of life was slightly decreased compared to the general population in terms of functional impairment but not in terms of psychological and social impact.
CONCLUSIONS. Severe GBS ventilated more than 2 months in ICU, have only moderate disability and decline in the physical impact of the quality of life. The psychological and social component of quality of life is not altered compared to the general population. At longterm, these patients were not depressed and had no post-traumatic stress disorder.
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Sepsis, epidemiology & outcome: 0470–0474

0470

HAS MORTALITY DECREASED IN MECHANICALLY VENTILATED PATIENTS WITH SEPSIS IN THE LAST DECADE?

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INTRODUCTION. The incidence of sepsis is steadily increasing and there is evidence of reduced mortality in some series.
OBJECTIVE. To study survival trends in critically ill mechanically ventilated patients with sepsis.
MATERIALS AND METHODS. We used data from 3 international surveys on the use of mechanical ventilation enrolling 15,802 consecutive adult patients who received mechanical ventilation for at least 12 h in 1,267 ICUs from 37 countries, conducted during 1 month in 1998, 2004 and 2010. For each patient included demographic and baseline data were recorded daily until death, ICU discharge, or day 28, whichever came first. We analyzed ICU and hospital mortality in patients with sepsis as an indication of mechanical ventilation (MV) (S-MV) and in patients with sepsis developed during the period of MV (S-DUR) in the three time periods.
STATISTICAL ANALYSIS. We analyzed differences in the incidence and ICU-mortality in the three periods of time, using the Chi-square test. ICU mortality was adjusted for prognostic factors in a multivariate conditional logistic regression analysis including in the model all variables with $p < 0.1$ in univariate analysis, and the 3 time periods (1998, 2004, 2010). The strength of the association was measured by the odds ratio (OR) and 95 % confidence interval.
RESULTS. We included 16,669 patients in the study. Patients had an increasing age in the different periods (60 ± 16 years. in 1998, 61 ± 15 years. in 2004 and 63 ± 15 years. in 2010, $p = 0.03$), and a higher SAPS II score (52 ± 17, 51 ± 17 and 55 ± 18 in the three periods, respectively, $p = 0.02$). The incidence of S-MV did not increase significantly during the study periods (2.6, 2.7 and 4.1 %, respectively, $p = 0.4$), while the incidence of S-DUR increased significantly (6.5, 6.6 and 13.4 %, respectively, $p > 0.0001$). In the three periods analyzed, mortality of the S-MV (58, 52, 40 %, respectively, $p < 0.0001$) and S-DUR (54, 48, 40 %, respectively, $p < 0.0001$), decreased significantly. In multivariate analysis, the period 2010 compared with 1998 and 2004 was a protective factor for S-MV (OR 0.4 [0.3–0.5]). For the S-DUR, the periods 2004 (OR 0.74 [0.65–0.89]) and 2010 (OR 0.49 [0.49–0.57]) were protective, as compared to 1998, after adjusting for other variables.
CONCLUSIONS. The mortality of sepsis both as an indication for MV and as a complication of MV, has gradually decreased since 1998.

0471

INCIDENCE, ORGAN DYSFUNCTION AND MORTALITY IN SEVERE SEPSIS. A SPANISH MULTICENTER STUDY AND COMPARISON WITH A 2002 COHORT

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OBJECTIVES. 1. To know the current epidemiology, including incidence, mortality and organ disfunction characteristics of severe sepsis admitted to the ICU.
2. To compare current epidemiology with the one described in an historic cohort of patients collected by the same research group in 2002 [1].
METHODS. Prospective observational multicenter cohort study conducted in 11 ICUs of 10 hospitals, during 5 months in 2011. A severe sepsis screening was carried out daily. Episodes of severe sepsis as cause of ICU admission and developed during ICU stay were registered. The results were compared with the ones obtained in a 2002 historic cohort of severe sepsis patients [1]. The evolution of the organ dysfunction in survivors and non-survivors was followed by sequential measurement of SOFA score on days 0–7, 14 and 28 (D0-7; D14; D28) and delta SOFA D0-D3 and D1-D3. Organ failure was defined as a score 3 or 4 in the SOFA score. APACHE II and LOD were computed using data obtained in the first 24 h after inclusion. Quantitative data are described as means (CI 95 %) medians and percentiles and categorical variables as absolute numbers and proportions (CI 95 %). Total SOFA score of the current and historic cohort at D0 and Delta SOFA of survivors and non-survivors were compared using *t* test for equality of the means. Mann–Withney U test and Chi-square test were used as appropriate.
RESULTS. 1868 non-cardiologic (>18 years old) patients were admitted to the ICU during the study period. 221 episodes of severe sepsis in 219 patients were included. The results are shown in tables 1 and 2. Incidence of severe sepsis was 14 % and hospital mortality was 36 %. Cardiovascular failure was the most frequent (77 %), followed by respiratory failure (43 %). Median SOFA evolution in survivors and non-survivors is shown in Fig. 1. Delta SOFA comparison (D0–D3 and D1–D3) is shown in Table 3.
CONCLUSIONS. 1. Incidence of severe sepsis in the ICU continues to be high. No differences in incidence were found with the respect to the 2002 cohort. 2. Lower severity upon diagnosis and lower number of failing organs on day 1 were found in the current cohort.
3. Hospital mortality continues to be high (one third) but it is significantly lower than in 2002. 4. The improvement of organ dysfunction in the first 72 h was more remarkable in survivors than in non-survivors.
REFERENCE(S). 1. Blanco J. et al. Incidence, organ dysfunction and mortality in severe sepsis: a Spanish multicentre study. Critical Care. 2008;12:R158.

Table 1 Study and historic cohorts

	Study cohort 2011 219 patients/221 episodes	Historic cohort 2002 311 Patients/ 324 episodes	p value
Median (IQR)			
Age	69.6 (58.7–78.2)	67.9 (54.8–74.4)	0.08
APACHE II	21 (17–27)	25 (20–29)	<0.01
LOD	5 (3–8)	6 (4–9)	0.057
SOFA day 1	8 (6–11)	10 (7–12)	<0.01
N (%) [CI 95 %]			
Sex (male)	148 (67 %) [60–73]	208 (63 %) [57–68]	0.32

Table 2 Organ failure, incidence and mortality

	Study cohort 2011	Historic cohort 2002	p value
Organ failure in ICU admission	N (%) [CI 95 %]		
0	34 (15.4 %) [11–20]	11 (3.5 %) [2–6]	<0.01
1	67(30.3 %) [24–37]	96(30.6 %) [26–36]	0.9
2	78(35.3 %) [30–42]	97(31.2 %) [26–36]	0.3
3	32(14.5 %) [10–20]	61(19.6 %) [16–24]	0.12
4 or more	10(4.5 %) [2–8]	46(15.1 %) [11–19]	<0.01
Incidence	262(14 %) [12.5–15.7]	324(12.4 %) [11.2–13.7]	0.1
Mortality ICU	59(27 %) [21–33]	150(48 %) [43–54]	<0.01
Mortality hospital	78(36 %) [30–43]	169(54 %) [49–60]	<0.01

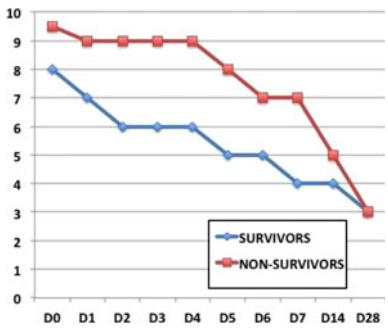

Fig. 1: Median SOFA evolution

Table 3 Delta SOFA comparison

Delta sofa	Survivors Mean (95 % CI)	Non-survivors	*t* test p value
D0–D3	2.35 (1.75–2.96)	1.15 (0.39–1.9)	0.018
D1–D3	1.75 (1.32–2.19)	0.56 (0.04–1.17)	0.002

0472

DEGREE OF COMPLIANCE WITH RECOMMENDATIONS FOR TREATMENT OF SEVERE SEPSIS AFTER 5 YEARS OF CONDUCTING EDUCATIONAL CAMPAIGN. RESULTS OF A SPANISH MULTICENTER STUDY

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OBJECTIVES. To measure the compliance with the Surviving Sepsis Campaign bundles in patients with severe sepsis treated in the ICU. 2. To compare the current level of compliance with the one registered in 2006 after EDUSEPSIS study educational program (postintervention cohort) [1].
METHODS. Prospective, observational, multicenter cohort study conducted during 5 months in 2011, in 11 ICUs of 10 hospitals, serving a population of 1,946,130 inhabitants. All ICUs had participated in the EDUSEPSIS study [1]. All episodes of severe sepsis diagnosed upon ICU admission and all those developed during ICU stay were recorded. The fulfillment of the resuscitation (6 h) and treatment (24 h) bundles since the beginning of the episode was checked. Results are presented in absolute numbers or percentages, with 95 % CI. Student's *t* test and Chi-square test were used to compare means and proportions respectively.
RESULTS. 221 episodes of severe sepsis were registered in 219 patients. ICU mortality was 26.9 % (95 % CI 21–33) and hospital mortality was 36.4 % (95 % CI 30–43). Age, APACHE II, compliance with the bundles and its comparison with the one achieved in the postintervention cohort of the EDUSEPSIS are shown in Tables 1–3.
CONCLUSIONS. 1. Although the complete resuscitation bundle was accomplished in less than a third of patients, the individual elements and whole bundle compliance was significantly higher than that recorded after the EDUSEPSIS educational program.
2. Compliance with the treatment bundle was low and significantly lower than that recorded after the EDUSEPSIS educational program. Only PPlateau <30 cmH_2O reached a compliance >75 %.
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.

Table 1 Study and EDUSEPSIS cohorts

	Study cohort (n = 211)	Postintervention cohort EDUSEPSIS (n = 1465)	p value
Mean (SD) [CI 95 %]			
APACHE II	22.2 (6.6) [21.3–23.1]	21.3 (7.8) [20.9–21.7]	0.83
AGE (years)	66.7(14.4) [64.8–68.7]	62.1 (16.3) [61.3–63.0]	<0.01

Table 2 Sepsis resuscitation bundle

	Study Cohort (n = 211)	Postintervention Cohort EDUSEPSIS (n = 1465)	p value
No. (%) [CI 95 %]			
Measure lactate	193 (87.3) [82–91]	736 (50.1) [48–53]	<0.01
Blood cultures before antibiotics	171 (77.4) [71–82]	914 (62.4) [60–65]	<0.01
Broad-spectrum antibiotics	202 (91.4) [87–94]	1009 (68.9) [67–71]	<0.01
Fluids and vasopressors (MAP ≥ 65 mmHg)	205 (92.8) [89–96]	630 (46.7) [44–49]	<0.01
CVP ≥ 8 mmHg	156 (70.6) [64–76]	344 (26.7) [24–29]	<0.01
SvcO2 ≥ 70 % (SvO2 ≥ 65 %)	84 (38) [32–45]	147 (11.4) [10–13]	<0.01
All resuscitation measures	63 (28.5) [23–35]	147 (10.0) [8–12]	<0.01

Table 3 Sepsis management bundle

	Study cohort (n = 211)	Postintervention cohort EDUSEPSIS (n = 1465)	p value
No. (%) [CI 95 %]			
Low-dose steroids	122 (55.2) [49–62]	611 (41.7) [39–44]	<0.01
Consideration of drotrecogin alfa (activated) (APC)	72 (32.6) [27–39]	760 (51.9) [49–54]	< 0.01
Administration of APC	8 (3.6) [2–7]	74 (5.1) [4–6]	0.36
Glucose control <150 mg/dl	116 (52.5) [46–59]	726 (49.6) [47–52]	0.42
Plateau-pressure control <30 cmH_2O	90 (75.6)* [67–83] *119 patients on mechanical ventilation	712 (82.7) [80–85]	0.06
All management measures	8 (3.6) [2–7]	230 (15.7) [14–18]	<0.01

0473

THE SEVERITY OF ORGAN DYSFUNCTION IS ASSOCIATED WITH EARLY DEATH IN SEVERE SEPSIS AND SEPTIC SHOCK PATIENTS

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INTRODUCTION. The risk factor for early death in sepsis are not well known but the severity of organ dysfunction might play a role [1–3].
OBJECTIVE. To analyze the association between death within 4 days after the first sepsis-induced organ dysfunction and the degree of organ dysfunction assessed by SOFA score and its components.
METHODS. Prospective observational multicenter study including patients presenting with severe sepsis and septic shock in the emergency department, wards or intensive care unit in ten Brazilian public hospitals. The outcome was hospital mortality and early death was defined as death occurring within 4 days after the first sepsis-induced organ dysfunction. Demographic and sepsis-related data were collected. The degree of organ dysfunction was assessed through the Sequential Organ Failure Assessment (SOFA) score in the day of sepsis diagnosis. Data was analyzed using Kruskall-Wallis test followed by Dunn test. We constructed ROC curves to assess the ability of each individual component of SOFA score to predict both early and late death. P values less than 0.05 were considered significant.
RESULTS. We included 2579 patients with a mean age of 62.0(47.0–75.0) years, 55.4 % were male, 39.2 had septic shock, 44.5 %, 40.8 % and 14.5 had severe sepsis or shock diagnosed in the emergency department, wards or intensive care unit, respectively. The global mortality rate was 59.4 % (n = 1533) with 18.7 % (n = 483) of all deaths occurring in the first 4 days. We found a significant difference among survivors, late non-survivors and early non-survivors with higher score in the last two group for all individual components of the SOFA score. Except for the respiratory component, all components were significantly higher in early non-survivors when compared to late non-survivors. In the ROC curves, for all SOFA individual components we found higher area under the curve to predict early death as compared to late death prediction; the neurological component had the best performance (neurological: 0.641 (0.613–0.670) and 0.547 (0.524–0.569); renal 0.638 (0.610–0.666) and 0.517 (0.494–0.539); hemodynamic: 0.601 (0.572–0.630) and 0.533 (0.511–0.556); hepatic: 0.588 (0.559–0.618) and 0.498 (0.475–0.520); hematological: 0.547 (0.518–0.577) and 0.511 (0.489–0.534); respiratory: 0.535 (0.506–0.564). and 0.523 (0.500–0.546), respectively). The global score also had a higher AUC for early mortality (0.686(0.660–0.712) and 0.550(0.528–0.573), respectively).
CONCLUSION. In this observational study, the severity of organ dysfunction was associated with both early and late death, with higher score found among those prone to die earlier. SOFA score and its components at the moment sepsis was diagnosed were better predictors of early death.
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0474

COHORT OF CRITICALLY ILL PATIENTS WITH MULTI-ORGAN DYSFUNCTION: POST-HOSPITALISATION MORTALITY AND RELATED PROGNOSTIC FACTORS

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OBJECTIVE. To assess the post-hospital mortality (hospital follow-up and after 1 year) and the associated factors. Patients and method: Cohort design. Medical-surgery ICU patients in a tertiary hospital. Patients with multi-organ dysfunction syndrome (MODS) during the first 24 h of admission to ICU. Variables of interest: personal background, functional general situation, general information about admission to ICU, hospital stay and contact by phone once a year. Cox regression to evaluate mortality factors.
RESULTS. 545 patients were recruited. During the study period 256 patients (52.9 %) died; out of them 29.5 % in ICU; 14.8 % of 384 patients tranferred to the ward died. Of 327 patients given discharge, 266 patients (81.3 %) were contacted; 14.3 % of those died later. Post-hospitalisation mortality-related variables are: diminished functional general situation (OR 2.42; 95 % CI 1.23–4.75; $p < 0.01$) and re-entry after discharge from hospital (1.45 OR; 95 % CI 1.19–1.764; $p < 0.001$).
CONCLUSIONS. Post-hospitalisation mortality was 14.3 %. The factors influencing hospital mortality are age and a generally diminished functional status, both not modifiable factors. After discharge, the decreased general functional status remains central along with the re-hospitalisation.

Secondary insults in trauma patients: 0475–0479

0475

LONG TERM EFFICACY OF HUMAN BONE MARROW MESENCHYMAL STEM CELLS IN TRAUMATIZED MICE BRAIN IS NOT AFFECTED BY IMMUNOSUPPRESSIVE TREATMENT

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INTRODUCTION. Most of cell types transplanted after traumatic brain injury (TBI) show poor survival. Immunosuppressants are used to enhance graft permanence. Studies addressing the dependence of mesenchymal stem cell (MSC) efficacy on immunosuppression in the injured brain are lacking.
OBJECTIVES. To explore the need of immunosuppression after MSC transplantation in TBI mice.
METHODS. C57Bl/6 mice were subjected to severe TBI (by controlled cortical impact, 1 mm depth) or sham surgery. At 24 h they received an intracerebroventricular infusion of PBS (control) or human bone marrow MSC (150,000/5 µl). Mice receiving MSC were subjected to immunosuppressive treatment with cyclosporin A (CsA, 10 mg/kg ip, immunosuppressed: IS) or no treatment (immunocompetent: IC). Cortical mRNA expression (real time RT-PCR) was assessed at 72 h to analyze immunosuppression ($INF\gamma$) and MSC rejection (MHCII, CD86). Mice were evaluated for sensory-motor (neuroscore) and cognitive (Morris water maze) dysfunctions weekly and at 4 weeks after surgery respectively. Mice were sacrificed at 5 weeks and immunohistochemistry was performed to analyze: cell distribution, pericontusional astroglial activation (glial fibrillary acidic protein, GFAP), pericontusional vessel density (CD31) and subventricular zone (svz) neurogenesis (doublecortin, DCX).
RESULTS. Immunosuppression was confirmed by a significant reduction of $INF\gamma$ mRNA expression in IS compared to IC mice (−73 %) and no signs of rejection were highlighted by MHCII or CD86 expression (MHCII: control = 7.4, IC = 7.7, IS = 7.6; CD86: control = 2.3, IC = 2.5, IS = 2.4 sham relative mRNA expression) 72 h post-injury in pericontusional cortex. MSC improved sensory-motor (neuroscore (mean) at 4 weeks: control = 4.6; IC = 6.9; IS = 6.8) and cognitive (mean latency to platform: control = 46.7, IC = 38, IS = 39.3 s) functions compared to controls. Post mortem analysis at 5 weeks revealed that MSC were present in the injured brain in IS and IC mice in a comparable amount. At this time point, MSC reduced GFAP positivity in the scar region (IC: −34 %, IS: −23 %), increased vessel density (CD31, IC: +19 %, IS: +20 %) and induced neurogenesis in the svz (DCX, IC: +79 %, IS: +82 %) compared to controls.

CONCLUSIONS. Long term MSC survival and efficacy in the injured brain are not dependent on immunosuppressive treatment. MSC induce comparable sensory-motor and cognitive improvements in IC and IS mice and produce structural protection and repair characterized by increased vessel density in the pericontusional tissue, reduction of the gliotic scar and increase of neurogenesis into the svz. These results have important clinical implications since immunosuppressive agents have toxic side effects for TBI patients, therefore a primary goal for translational research should be to avoid unnecessary suppression of a patient's immune system.

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0476

IS SPECIFIC MONITORING OF FIBRINOGEN UPON ADMISSION OF TRAUMA PATIENTS REALLY JUSTIFIED? COHORT OF 663 SEVERE TRAUMA PATIENTS

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INTRODUCTION. The decrease in the level of serum fibrinogen is associated with the increase in bleeding, transfusion requirements and mortality in the initial phase of trauma. Thus, the specific monitoring of the fibrinogen (e.g. thromboelastography) from the admission of trauma patients has been proposed to maintain fibrinogen levels above 1.5–2 g/L. However, isn't the deficit in fibrinogen at the admission of a trauma patient simply associated with the severity of post-traumatic coagulopathy?

METHODS. Between January 2006 and December 2009, all trauma patients who were admitted consecutively to our traumatic intensive care unit and who underwent blood samples with coagulation at the admission, were included. These patients were divided according to the severity of coagulopathy at the admission, defined by a prothrombin time ratio (rPT) and/or activated partial thromboplastin time ratio (rAPTT): ≥1.5 [SEVERE-COAG group], between 1.2 and 1.5 [MODERATE COAG group], and <1.2 [NO-COAG group]. Levels of serum fibrinogen at admission were specifically studied in these groups. The correlation between the severity of coagulopathy and fibrinogen deficiency was determined. Finally the rPT and rAPTT have been tested to predict a deficit in fibrinogen.

RESULTS. For 4 years, 663 severe trauma patients were included: 482 (73 %) men, with mean age of 36.7 ± 17.9 years, mean ISS of 21.3 ± 17.6. On admission, the mean rPT was 1.40 ± 0.90, the mean rAPTT of 1.24 ± 0.78, the mean fibrinogen of 2.0 ± 1.0. Patients were divided as follows: 135 (20 %) in SEVERE COAG group, 215 (32 %) in MODERATE-COAG group and 313 (48 %) in NO-COAG group. Fibrinogen levels differed significantly between these three groups (0.9 ± 0.5 vs. 1.8 ± 0.7 vs. 2.7 ± 0.9, respectively, $p < 0.001$). On admission, the rPT and the rAPTT were significantly linked with fibrinogen, $r = -0.77$ ($p < 0.001$) and $r = -0.78$ ($p < 0.001$), respectively. The rPT and rAPTT predicted a fibrinogen <1.5 g/L with an AUC of 0.94 (95 % CI 0.92–0.96) and 0.91 (95 % CI 0.88–0.93). The Youden specific thresholds were 1.2 and 1.1, respectively. The rPT and rAPTT predicted a fibrinogen <1 g/L with an AUC of 0.96 (95 % CI 0.94–0.99) and 0.97 (95 % CI 0.94–0.99). The Youden specific thresholds were 1.4 and 1.2, respectively.

The usual limits of rPT and rAPTT have been tested to predict a deficit in fibrinogen (Table).

Predictive value for a deficit of fibrinogen

Thresholds	Fibrinogen < 1.5 g/L		Fibrinogen < 1 g/L	
	PPV (%)	NPV (%)	PPV (%)	NVP (%)
rPT ≥ 1.2	52.0	98.7	21.8	99.7
rAPTT ≥ 1.2	77.0	90.5	42.1	99.8
rPT ≥ 1.5	88.3	86.9	54.7	98.9
rAPTT ≥ 1.5	93.3	82.6	70.8	97.7

CONCLUSIONS. The absence of post-traumatic coagulopathy excludes with certainty a deficit in serum fibrinogen at admission of a trauma patient, whereas the severity of coagulopathy predicts the importance of the fibrinogen deficiency. Specific monitoring of fibrinogen does not appear to be vital in these situations.

0477

THE TWIN ATTACKS IN NORWAY ON JULY 22, 2011—STHE TRAUMA CENTER INTENSIVE CARE UNIT CHALLENGES AND SOLUTIONS

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INTRODUCTION. Over the past decades several mass casualty events (MCE) have taken place all over the globe. Although the majority of MCE victims don't require Intensive Care Unit (ICU) admission, a trauma center must have a strategy for immediate increase of ICU capacity. This study was undertaken to describe the ICU experience during and after the terrorist attacks on July 22, 2011, in Oslo.

OBJECTIVES. Oslo University Hospital Ulleval (OUH-U) is the regional trauma center for a population of 2.7 million. Approximately 1.500 trauma patients are admitted per year. The hospital ICU facilities include a total of 34 ICU beds, with 13 at the general surgical ICU, and a 16 bed post anesthesia care unit (PACU). During an MCE, the total number of beds with ventilator capabilities can be temporarily increased to 60.

METHODS. On July 22, 2011, two sequential terrorist attacks took place in the Oslo area. At 1525 a car bomb was detonated in central Oslo. Eight people died at the scene. The second attack occured approximately 2 h later at a political youth camp on a small island 40 km northwest of Oslo. A gunman dressed in a police uniform killed 69 people. More than 220 people were injured in the two attacks.

RESULTS. The major incident plan was activated at 1541 h. The intensivist on call together with the senior ICU nurse administered the triage to the ICUs. The number of available ICU beds was increased from one to 19 staffed ICU beds within 45 min. In the PACU spontaneously breathing patients with no vasopressors were clared for ward. Two patients from the surgical ICU were transferred to the medical ICU.From the first event, 10 casualties were transported to OUH-U. At 1725 h, after the second event, another 5 patients from the surgical ICU were transferred to the medical ICU or to another hospital within the same Hospital Trust. Of the 25 patients arriving before midnight, 10 were admitted in the surgical ICU and 12 in the PACU. Another six patients were transferred from local hospitals within 48 h, all requiring ICU beds. Of the 31 admitted patients, 28 were treated at the trauma center ICUs, resulting in 281 ICU patient days.Over the first 4 weeks, 26 patients required repeated surgery, for a total of 131 operations. A total of 20 patients were severely injured (ISS > 15). One patient died in hospital, for a critical mortality of 5 %. At no time were ED, OR or ICU bed capacity exceeded.

CONCLUSION. The infrastructure in a major trauma center is of vital importance during an MCE. Flexibility between ICUs within a large hospital trust combined with redistribution of non-trauma surgical emergencies converted a potentially chaotic situation into an extended 'business as usual' period. The major difference from everyday practice was the increased proportion of trauma patients. We emphasize the importance of having trauma experienced ICU physicians involved in disaster management planning and patient management during an MCE.

0478

EARLY TRANSFUSION OF BLOOD PRODUCTS IN PATIENTS WITH SEVERE BLEEDING IN PENETRATING ABDOMINAL TRAUMA

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INTRODUCTION. Patients with severe intra-abdominal bleeding after penetrating trauma require immediate surgical intervention. The decision to initiate blood product transfusion (BPT) with all four components (PRC, FFP, Plat. and Crio) should be made as early as possible to avert trauma induced coagulopathy (TIC). We compared the rate of transfusion of all four components given in a 1:1:1:1 ratio during the first 2 h of surgery between survivors and non-survivors. We hypothesized that earlier initiation of all 4 components is associated with better outcome.

METHODS. Of 574 patients with penetrating injuries admitted to our level one trauma center between 2003 and 2011 we identified 125 with severe penetrating abdominal trauma defined by PATI >30 and initial hemo-peritoneum at laparotomy >1500 cc.

RESULTS. The rate of BPT during surgery (all 4 components combined) is depicted in the graph below. Survivors received PT earlier and at a slower rate. BPT was given at a higher rate but initiated later during surgery in non-survivors. The two groups were not significantly different regarding Apache, PATI, ISS, NISS and time of surgery.

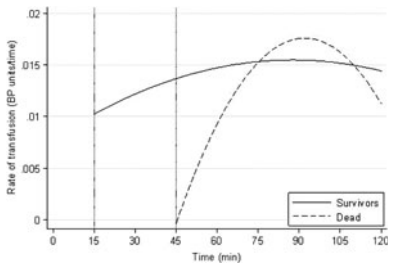

Fig.1 Rate of blood products transfusion during surgery

Table 1

Baseline characteristics	Survivor (n = 107)	Dead (n = 18)	p
Age, year, median (IGR)	26 (21–35)	38 (28–43)	0.001
NISS, n, (%)	40 (27–5)	42 (34–52)	0.3
ISS, n, (%)	25 (16.3)	26 (22.5–34)	0.1
PATI, n, (%)	39 (34–51.5)	42 (33–60.5)	0.7
APACHE II, median (IQR)	18 (10–22)	20 (16–24)	0.1
Surgical time, min, median (IQR)	90 (60–130)	120 (80–170)	0.1

CONCLUSIONS. Early and steady rate of four components BPT during the initial surgery is associated with improved outcome. Late initiation of BPT in these patients even if provided at a faster rate appear to be less effective and may be an inefficient strategy to avert TIC.

0479

THE USE OF PRE-HOSPITAL END-TIDAL CO_2 MONITORING IN MAJOR TRAUMA: IN PATIENTS WITH SEVERE HEAD INJURY AND MAJOR TRAUMA, DOES CAPNOGRAPHY REPRESENT AN ACCURATE AND EFFECTIVE GUIDE TO PRE-HOSPITAL VENTILATION?

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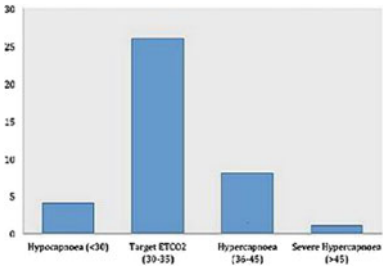
INTRODUCTION. Modernisation of trauma networks and growing operational footprints of trauma centres has lead to an upsurge in transfer distances and pre-hospital times under anaesthesia. Neuroprotective resuscitation strategies and close ventilatory control of carbon dioxide (CO_2) begin at the roadside, with the onus on pre-hospital teams to provide reliable monitoring and safe maintainance of resuscitation.

OBJECTIVES. To assess how well pre-hospital capnography performs in achieving control of CO_2 when providing pre-hospital care to patients with head injury and major trauma requiring mechanical ventilation.

METHODS. We performed a retrospective observational cohort study of adult trauma calls of HEMS missions over 14 weeks at a central London Major Trauma Centre. We selected patients intubated pre-hospital and defined as 'head-injured' (where they had head injury as

the documented reason for induction of anaesthesia, or if at any point in there clinical or radiographic examination had evidence of head injury).
Patients were divided into groups depending to their $ETCO_2$ on arrival at hospital and grouped into *Hypocapnoea* [<30 mmHg], *Target Ventilation* [30–35 mmHg], *Hypercapnoea* [36–45 mmHg] and *Severe Hypercapnoea* [>45 mmHg]. There was parallel analysis of the cohort into those ventilated to '*Target*' against those '*Outside Target*' $ETCO_2$.



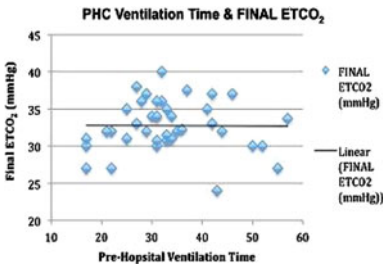
Distribution of cohort into ETCO2 subgroups

RESULTS. Fifty-six patients had trauma service documentation: 73.21 % had a head injury identified by the PHC team; 41 % had head injuries and no haemodynamic instability. It was more likely that patients were ventilated to a tight $ETCO_2$ if they had been identified as head-injured (81.48 vs. 68.75 %), a difference amplified in those with head injury and no shock (55.56 vs. 37.5 %).

Demographic subgrouping in ETCO2 target range

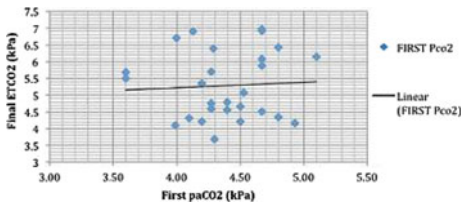
	All patients	Target ETCO2	Outside target ETCO2
Male	86 %	88.9 %	68.75 %
Age > 55	26.79 %	25.92 %	31.25 %
Mean age (years)	42.16	44.89	43.38
Head injury	73.21 %	81.48 %	68.75 %
Mean GCS	9.3	9.2	9
Shock	50 %	40.74 %	50 %
Head injury without shock	41 %	55.56 %	37.5 %
Mean PHC ventilation time (mins)	33.38	35.3	32.67

Comparison of pre-hospital ventilation times found weakly positive correlation between extended transit time and higher $ETCO_2$ values (correlation coefficient +0.196).



ETCO2 (final) against pre-hospital time

In comparison of $pETCO_2$ against first $paCO_2$, mean time for blood gas analysis was 17.45 min (adjusted range 1–34 min; 95 % CI 13.66–21.44), demonstrating a general underestimation of arterial pCO_2 by capnography, with a greater discrepancy at lower values.



Comparing final ETCO2 against first paCO2

CONCLUSIONS. Ventilating patients with pre-hospital $ETCO_2$ within a target range improves outcome, especially in patients with isolated head injuries. In achieving this, capnography appears a useful tool, however, there is significant concern of poor correlation between capnographic and arterial CO_2 in trauma patients. There is little doubt that capnography adds effectiveness to ventilation control, but concerns remain regarding its accuracy. There is a need for more data from this patient group in the form of a prospective observational study where final $ETCO_2$ is paired with $pACO_2$ on immediate arrival to hospital.

Cardiovascular ultrasounds: 0480–0484

0480

DOPPLER BASED RENAL RESISTIVE INDEX PREDICTS REVERSIBILITY OF ACUTE KIDNEY INJURY AFTER CARDIAC SURGERY

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INTRODUCTION. After cardiac surgeyr, acute kidney injury (AKI) commonly occurs in as many as 30 % of patients. The diagnosis of AKI is based on serum and urinary markers, such as serum creatinine, urinary output, fractional excretion of sodium or urea, which are insensitive, unreliable and can be altered by several factors. Some authors have emphasized the role of Doppler-based renal resistive index (RRI) as an earlier predictor of AKI.
OBJECTIVES. The objective of this study was to test whether assessment of RRI can diagnose persistent AKI in a mixed postoperative cardiac surgery population.
METHODS. Patients were prospectively enrolled following cardiac surgery with cardiopulmonary bypass. Measurements of haemodynamic parameters and renal resistive index (RRI) were obtained before surgery, on admission to ICU (T0), 6 h after admission (T6), and on the first postoperative day (POD1). AKI was defined according to the RIFLE classification during the first postoperative week. Persistent AKI was defined as AKI lasting more than 3 days. Data are expressed as median (25th–75th). The Kruskal–Wallis test, Friedman test, Mann–Whitney were used, as appropriate. The predictive value was evaluated using ROC curve and a grey zone approach.
RESULTS. 82 patients were included with a median age of 69 (61–76) years. 15 (18 %) developed persistent AKI, and 6 (7 %) developed transient AKI. Among patients without AKI, RRI decreased on admission to ICU (0.69 (0.63–0.74) vs. 0.64 (0.59–0.68), $p < 0.001$), then progressively increased on the first postoperative day to reach values close to preoperative values (T6; 0.67 (0.63–0.73), POD1; 0.7 (0.64–0.73), $p < 0.001$). Among patients with transient AKI, RRI decreased on admission to ICU (0.7 (0.63–0.79) vs. 0.59 (055–0.77), $p = 0.04$), then progressively increased on the first postoperative day to reach values close to preoperative values (T6; 0.62 (0.57–0.71), POD1; 0.69 (0.62–0.73), $p = 0.04$). Among patient with persistentAKI, RRI increased after surgery (T0; 0.78 (0.73–0.82), T6; 0.77 (0.72–0.84), POD1; 0.77 (0.74–0.80), $p = 0.001$). During the study period, patients with persistent AKI had higher RRI than patients without AKI or with transient AKI ($p < 0.05$) (Fig. 1). Doppler-based RRI on T0 predicted persistent AKI with an area under the receiver-operating characteristic (AUC) curve of 0.93 (95 % confidence interval (95 % CI): 0.85–0.98, $p < 0.0001$). The optimal cut-off of RRI was 0.73 (95 % CI: 0.72–0.75). The grey zone approach identified a range of RRI values between 0.72 and 0.75 that concerned 14 % of patients.

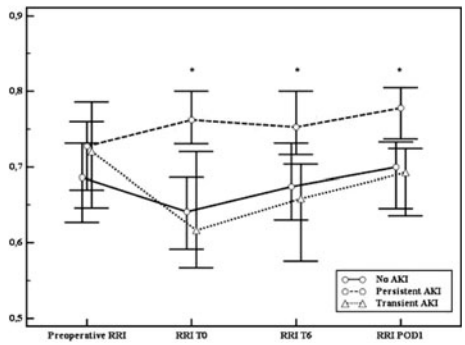

Fig. 1

CONCLUSIONS. The value and the time-course of RRI differed between patients with and without AKI, and with transient AKI or persistent AKI. Doppler-based RRI measured on admission to ICU can accurately predict persistent AKI after cardiac surgery. The optimal cut-off was 0.73 with a grey zone ranging between 0.72 and 0.75.

0481

QUALITATIVE EVALUATION OF RESPIRATORY CHANGES IN INFERIOR VENA CAVA DIAMETER IN INTENSIVE CARE UNIT: A RELIABLE AND FAST TECHNIQUE

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INTRODUCTION. Transthoracic Echocardiography (TTE) in the ICU is a tool for minimally invasive hemodynamic monitoring. Dynamic indices such as inferior vena cava distensibility index (dIVC) can be used to predict fluid responsiveness [1]. The quantitative evaluation of this index has been validated, but the qualitative approach, used routinely, has never been studied. The aim of the study was to evaluate this qualitative (visual) approach.
METHODS. Prospective observational study comparing the qualitative assessment of dIVC with its quantitative assessment. 4 different experiments operators [2] realize the qualitative one and the last operator performs a numerical measure of the index.
RESULTS. 114 patients were studied, among which 97 (63 men, 34 women) were included. The average sensitivity of intensivist for the qualitative assessment of dIVC is 80.7 % and the specificity 93.7 %. The qualitative evaluation detect all of quantitative dVCI superior to 40 %. Most of the errors are included for quantitative dIVC between 15 and 25 %. In the non responders patients, two qualitative evaluation errors were noted for quantitative dIVC between 0 and 10 %. For all operators, the error in the qualitative assessment is found for quantitative values of average dIVC of 22.4 ± 4.6 % and 13.8 ± 4.2. A kappa Fleiss for all operators was also carried out: it is estimated at 0.68 and can be considered good.

Qualitative evaluation	Sen (%)	Spe (%)	PPV (%)	NPV (%)	Kappa (%)
Residents	77	94	83	92	0.73
Intensivist 2 years	74	94	83	92	0.73
Intensivist 6 years	88	93	82	96	0.8
Cardiologist	69	97	90	90	0.72

CONCLUSIONS. Our study shows that the qualitative assessment can detect the majority of patients with dIVC above 30 %, and all patients with dIVC above 40 %. Learning to evaluate the qualitative dIVC seems to be fast but the reliability is enhanced by the experience of the operator. The qualitative approach of dIVC can be easily integrated in a fast TTE.
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0482

USEFULNESS OF THE TRICUSPID ANNULAR PLANE SYSTOLIC EXCURSION AND OF THE DOPPLER TISSUE IMAGING OF TRICUSPID ANNULAR MOTION TO DETECT RIGHT VENTRICULAR DYSFUNCTION IN PATIENTS WITH ACUTE PULMONARY EMBOLISM

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INTRODUCTION. Echocardiographic evaluation of right ventricular (RV) function in patients presenting acute pulmonary embolism (APE) is the cornerstone of risk stratification [1]. Recently, echocardiographic parameters were proposed for the evaluation of RV systolic and diastolic function in patients with heart failure: tricuspid annular plane systolic excursion (TAPSE) and peak systolic velocity of tricuspid annular motion (Sa) assessed with pulsed Doppler tissue imaging. These two easy to obtain and reproducible parameters could be useful to detect RV dysfunction in critically ill patients with APE.
OBJECTIVES. Is to determine the ability of TAPSE and Sa to detect RV dysfunction in critically ill patients presenting APE.
METHODS. Patients admitted to our medical intensive care unit with a proven APE (by angio CT scan) were enrolled prospectively over a 1-year period. All patients underwent an echocardiographic examination at inclusion time. Right/left ventricular end-diastolic dimension ratio (RV-EDA/LV-EDA), systolic pulmonary artery pressure (sPAP), left ventricular ejection fraction (LVEF), velocity–time integral (VTI) of the aortic flow, TAPSE, Sa and the paradoxical septal systolic motion were recorded. We subdivided our population into two subgroups in function of the existence or not of RV dysfunction using classical definition [2].
RESULTS. Fifty-two consecutive patients were included prospectively. Their age was 55 ± 16 years, their SAPSII was 29 ± 18 and their APACHEII was 12 ± 9. Their LVEF was 55 ± 8 %, their VTI of the aortic flow was 18 ± 5 cm. There were significant but weak correlations between TAPSE and RV- EDA/LV-EDA ratio ($r = -0.47$, $p < 0.05$) and between TAPSE and sPAP ($r = -0.26$; $p = 0.05$). There was a weak correlation between Sa and RV-EDA/LV-EDA ratio ($r = -0.28$, $p < 0.05$) but no correlation between Sa and sPAP ($r = -0.001$; $p = 0.98$). Twenty seven patients presented RV dysfunction, their TAPSE and Sa were 17 ± 4 mm and 12 ± 2.7 cm/s, respectively. These latter values were significantly lower than those of TAPSE and of Sa in 25 patients without RV dysfunction (21 ± 4 mm and 14 ± 3.2 cm/s, respectively). A TAPSE value of 21 mm allowed detecting RV dysfunction with a specificity of 89 % and a sensitivity of 64 %. However, a Sa value of 14.5 cm/s had a specificity of 89 % and only 44 % of sensitivity for the detection of RV dysfunction.
CONCLUSION. Our study suggests that TAPSE but not Sa may be useful to detect RV dysfunction in critically ill patients presenting APE.
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0483

THE DIAGNOSTIC AND THE PROGNOSTIC VALUE OF THE PEAK SYSTOLIC TRICUSPID ANNULAR VELOCITY IN CRITICALLY ILL PATIENTS

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INTRODUCTION. The utility and the prognostic value of Doppler tissue imaging of tricuspid annular motion (Sa) for the non-invasive evaluation of right ventricular (RV) systolic function has been recently demonstrated in patients with heart failure (left and right ventricular dysfunction) [1, 2]. Nevertheless, the diagnostic and prognostic value of Sa has not yet been evaluated in critically ill patients.
OBJECTIVES. To determine the correlation between the Sa and the parameters evaluating the left and the right ventricular function in critically ill patients. In addition, we sought to assess whether Sa has a prognostic value in such patients.
METHODS. A retrospective study was conducted over a two-year period and included all the patients who underwent during their stay in our medical intensive care unit an echocardiographic examination included Doppler tissue imaging. We recorded: right/left ventricular end-diastolic dimension ratio (RV-EDA/LV-EDA), systolic pulmonary artery pressure (sPAP), tricuspid annular plane systolic excursion (TAPSE), left ventricular ejection fraction (LVEF), velocity–time integral (VTI) of the aortic flow. The population of patients who had complete data for the RV function parameters was subdivided into two groups whether or not they had RV dysfunction and we compared the mean Sa in the two subgroups. We finally assessed the prognostic value of Sa in the whole population.
RESULTS. Two hundred and one patients were included, their mean SAPSII and APACHEII were respectively 33 ± 18 and 16 ± 10, their mortality rate was 28 %. In the whole population, Sa was 13 ± 4 cm/s, TAPSE was 20 ± 5 mm, LVEF was 53 ± 13 %, VTI of aortic blood flow was 18.6 ± 5 cm, sPAP was 46 ± 15 mmHg and the RV-EDA/LV-EDA was 0.8 ± 0.5. There was a significant correlation between Sa and LVEF ($r = 0.46$; $p < 0.001$) and between Sa and TAPSE ($r = 0.59$; $p < 0.001$). However no correlation was found between Sa and the RV function parameters: RV-EDA/LV- EDA ($r = 0.19$) and the sPAP ($r = 0.11$). In the subgroup of patients with RV dysfunction ($n = 56$), Sa was 13.00 ± 4 cm/s and was not significantly different from the value of Sa 13 ± 4 cm/s ($p = 0.56$) in the subgroup of patients who had not RV dysfunction ($n = 118$). The value of Sa was not different between survivors (13 ± 4 cm/s) and non survivors (13 ± 4 cm/s; $p = 0.6$) in the whole population neither in the subgroup of patients with RV dysfunction [13 ± 4 cm/s vs. 15 ± 5 cm/s ($p = 0.11$)].
CONCLUSIONS. In our critically ill patients, Sa was more correlated with the LV parameters rather than with the RV parameters. The Sa can not be used as a prognostic factor in these patients.
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0484

SEMI AUTOMATED ESTIMATION OF EJECTION FRACTION WITH AUTOEF AT THE BEDSIDE SHOWS GOOD CORRELATION WITH GOLD STANDARD METHOD

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INTRODUCTION. Circulatory instability among patients among patients in the perioperative period or admitted to the emergency department and ICU is a serious condition with high risk of adverse events and a predictor of poor outcome. Point-of-care (POC) ultrasound has become increasingly available as a tool for quick and non-invasive evaluation of circulatory function [1]. However, most assessments of cardiac function are done by visual estimation with poor precision and repeatability.A new approach applicable to routine bedside 2D images known as AutoEF has recently become available. Speckle tracking ultrasound is used for automatic endocardial border detection and estimation of ejection fraction. However, studies investigating the feasibility and reliability of AutoEF measurements applied at the bedside are missing.
OBJECTIVES. To evaluate AutoEF measurements applied to bedside POC ultrasound examination with regard to feasibility, reproducibility and time consumption.
METHODS. A Vivid S6 (GE Healthcare, Horten, Norway) ultrasound system equipped with a M4S phased array transducer (1.5–4.5 MHz) with second harmonic imaging was used for data acquisition.Ward patients from the department of cardiology and department of cardiothoracic surgery were eligible for inclusion. All patients underwent POC ultrasound examination at the bedside according to the FATE protocol [2]; raw data was digitally stored in cineloop format defined by the R-wave in the corresponding electrocardiogram for offline analyzes using EchoPac software (GE Healthcare, Horten, Norway). Ejection fraction was calculated using AutoEF applied to the apical 4-chamber view and as a reference Simpsons method was applied by manual tracing.
RESULTS. Preliminary data are available for 30 patients. Bedside images were suitable for AutoEF analysis in 77 % of cases. Ejection fraction by AutoEF and Simpson analysis were compared using Bland–Altman analysis and showed good agreement ($p = 0.30$) (Figs. 1, 2). Spearmans rho was 0.77 ($p < 0.0001$). Data on intra- and interobserver variability and time consumption are still pending.
CONCLUSIONS. Ejection fraction estimated by AutoEF can be applied to POC ultrasound images obtained at the bedside with results similar to manual tracing by Simpsons method. The modality has clinical potential.
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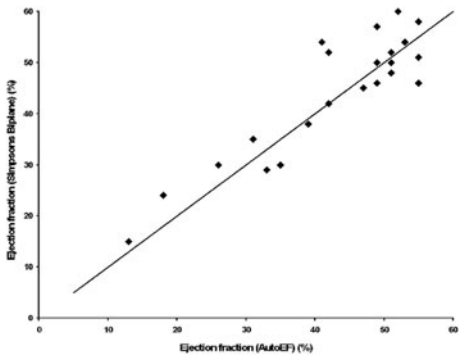

Fig. 1

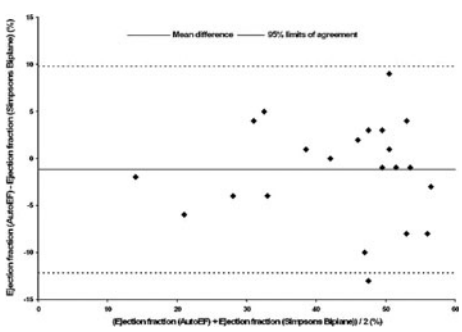

Fig. 2

GRANT ACKNOWLEDGMENT. The John and Birthe Meyer Foundation.

Future perspectives in ARDS treatment: 0485–0489

0485

RANDOMIZED CONTROLLED TRIAL OF TWO METHODS OF NASAL CONTINUOUS POSITIVE AIRWAY PRESSURE (NCPAP) IN PRETERM INFANTS WITH RESPIRATORY DISTRESS SYNDROME: UNDERWATER BUBBLY CPAP VS. MEDIJET SYSTEM DEVICE

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INTRODUCTION. There has been an increasing interest for application of non-invasive respiratory support in preterm infants and different types of Nasal continuous positive airway pressure (N-CPAP) devices are being used in Neonatal Intensive Care Units (NICUs).

OBJECTIVES. The objective of the present study was to compare the duration of CPAP need and possible complications of two methods of (N-CPAP) delivery: Bubble CPAP (B-CPAP) and MJ system device in preterm infants with respiratory distress syndrome.

METHODS. This prospective randomized clinical trial was performed on 161 preterm infants (28–37 weeks of gestational age) with respiratory distress syndrome (RDS) and eligible for CPAP therapy. The Infants were inborn and admitted in level III NICU of Al-Zahra teaching Hospital (Tabriz, Iran) since Apr 2010 till Sep 2011. All infants were randomized at the first hour of life to B-CPAPor MJ system. Short binasal prongs were used in both groups and we set a CPAP level was set to 5–6 cmH_2O. The primary outcome of this study was Duration of CPAP need (hour). Other outcomes such as complications of the two methods of NCPAP were evaluated using a checklist.

RESULTS. Ninety infants were randomized to MJ system, and 71 were randomized to B-CPAP. The mean gestational age and birth weight were similar in the 2 groups, just as were the Duration of CPAP need (44.3 ± 20.64 vs. 49.2 ± 21.2 h, respectively $p = 0.66$). Moreover, the probability of complications such as: CPAP failure rate, pulmonary hemorrhage, pnemothorax, intraventricular hemorrhage, abdominal distention, necrotizing enterocolitis and bronchopulmonary dysplasia (BPD) between the two study groups were the same ($P > 0.05$). There was a trend of more hyperemia of the nose in B-CPAP group in comparison to MJ system group (10 vs. 3.3 %, respectively) but the difference wasn't significant ($pv = 0.08$).

CONCLUSIONS. MJ system is as effective as B- CPAP in management of infants with RDS. Patients in MJ system group had fewer rate of nasal trauma (but it was not significant).

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GRANT ACKNOWLEDGMENT. This Study has been partially sponsored by a grant from: Children Health Research Center, Tabriz University of Medical Sciences, Tabriz, Iran and Medin Medical Innovations GMBH, Germany and Pars Eltyam Kala, Iran Company.

0486

THE VOLATILE ANESTHETIC SEVOFLURANE ATTENUATES VENTILATOR-INDUCED LUNG INJURY THROUGH INHIBITION OF ERK1/2 AND AKT SIGNAL TRANSDUCTION

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INTRODUCTION. Mechanical ventilator support still causes a high rate of morbidity and mortality in intensive care unit and operative room because of ventilator-induced lung injury (VILI). It is characterized by a pulmonary inflammation response appears to be mediated by proinflammatory cytokines.

OBJECTIVES. This study investigates whether the volatile anesthetic sevoflurane with anti-inflammatory effect attenuates ventilator-induced lung injury.

METHODS. Twelve male rabbits were anesthetized and were mechanically ventilated with 50 % oxygen, peak inspiratory pressure (PIP); 10 cmH_2O, I:E ratio; 1:4, PEEP; 5 cmH_2O. All animals were randomly assigned to one of three groups: ventilated with 10 cmH_2O of PIP (Sham group, $n = 4$); ventilated with 30 cmH_2O of PIP (Control group, $n = 4$); ventilated with 30 cmH_2O of PIP and 0.8 vol % sevoflurane (Sevoflurane group, $n = 4$) during the 5 h. After the protocol, the wet/dry weight (W/D) ratio and histopathology of the lung, concentration of IL-8 in bronchoalveolar lavage fluid (BALF), and activation of extracellular signal-regulated kinases (ERK) 1/2, p38 and Akt in lung tissue were measured.

RESULTS. In histopathology, the sevoflurane group showed more less inflammatory cells and architectural changes than control group. The W/D ratio [(5.36 ± 0.13) vs. (6.61 ± 0.20)], expression of IL-8 [(144.08 ± 14.61) vs. (228.56 ± 15.13) pg/ml] and phosphorylation of ERK 1/2 and Akt were decreased significantly in the sevoflurane group compared with the control group.

CONCLUSIONS. Sevoflurane attenuates the VILI in rabbits mainly by inhibiting expression of IL-8 and phosphorylation of ERK 1/2 and Akt might be possible pathway in protection.

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0487

LONG-TERM LUNG STABILITY DURING MECHANICAL VENTILATION AFTER ELECTRICAL IMPEDANCE TOMOGRAPHY (EIT) GUIDED PEEP-TITRATION IN A PORCINE ACID ASPIRATION MODEL OF ACUTE RESPIRATORY DISTRESS SYNDROME

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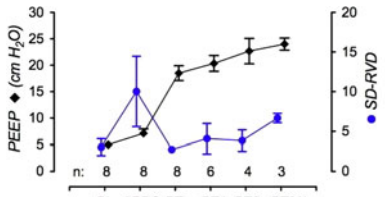
INTRODUCTION. Different strategies have been proposed for positive end-expiratory pressure (PEEP)-titration after a recruitment maneuver in order to prevent alveolar collapse during mechanical ventilation in acute respiratory distress syndrome (ARDS). While one aim is to minimize lung collapse [1, 2], others are maximum lung compliance [3] or homogeneity of lung inflation [4]. Lung stability during mechanical ventilation at the titrated PEEP has been a matter of concern and deterioration of indicator variables may prompt re-titration of PEEP depending on the strategy.

OBJECTIVES. To study lung stability during mechanical ventilation over 24 h after PEEP-titration guided by electrical impedance tomography (EIT) in a porcine model of ARDS.

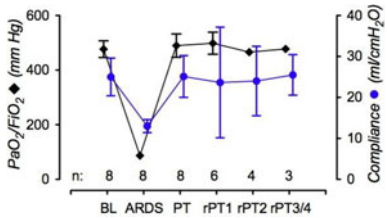
METHODS. We induced ARDS in 8 anesthetized pigs by tracheal hydrochloric acid instillation resulting in heterogeneous lung injury as described earlier [4]. A decremental PEEP-titration (start 30 cmH_2O, 2 cmH_2O steps) following a recruitment maneuver was guided by the standard deviation of the regional ventilatory delay index (SD-RVD) calculated for every single EIT pixel [5]. The PEEP resulting in the smallest SD-RVD during PEEP-titration was considered to provide the best homogeneity of ventilation and thus mechanical ventilation was continued with this PEEP. SD-RVD was reassessed every 4 h and PEEP re-titrated if SD-RVD increased by more than 25 % compared to the previous SD-RVD. PaO_2 (100 % inspired oxygen) and quasi-static lung compliance were measured using standard methods [3].

RESULTS. During initial PEEP titration, a median PEEP of 19 cmH_2O (mean 18.5; SD 3.96) resulted in the smallest SD-RVD. During subsequent mechanical ventilation, only 2 of 8 pigs showed a stable SD-RVD, while the remaining 6 pigs required at least one re-titration of PEEP. Two pigs needed one and 1 pig two, while 3 pigs required three or four re-titrations. PEEP had to be increased after re-titration in 18 cases, remained unchanged in 2 and was reduced in 2 cases. Increases of SD-RVD at 4 hourly assessments were paralleled by decreases of compliance and PaO_2. However, re-titration of PEEP according to SD-RVD resulted in restoration of compliance and PaO2 values to the levels measured after the previous PEEP-titration.



PEEP and SD-RVD at baseline (BL), after induction of ARDS, after initial PEEP-titration (PT) and after subsequent re-titrations of PEEP (rPT).

RVD_PEEP



PAO2_COMPLIANCE

CONCLUSIONS. EIT-guided PEEP-titration allows optimization of gas exchange and lung mechanics during long-term mechanical ventilation in a porcine model of ARDS. However, frequent re-assessment of SD-RVD and re-titration of PEEP seems necessary to reach these goals since lung condition changes over time.

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0488

ASSESSMENT OF REGIONAL LUNG MECHANICS IN SEVERE ARDS USING ELECTRICAL IMPEDANCE TOMOGRAPHY: IMPLICATIONS FOR THE CHOICE OF VENTILATOR STRATEGY

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INTRODUCTION. ARDS affects the lungs heterogeneously, making global indices of lung mechanics potentially inaccurate in guiding ventilator settings. Electrical impedance tomography (EIT) measures regional changes in lung volumes and mechanics, can quantify lung recruitability and may guide the ventilator strategy.

OBJECTIVES. To assess whether the estimation of regional lung mechanics by EIT in response to a PEEP trial would lead to a different ventilator strategy.

METHODS. Patients with severe ARDS underwent an incremental and decremental PEEP trial. Pressure–volume curves were performed at PEEP 0 and PEEP 15 cmH_2O before and after the PEEP trial to assess global and regional recruitability. At each step of the PEEP trial an inspiratory and an expiratory occlusion manoeuvre was performed to obtain static respiratory system compliance (Crs). Global and regional C_{EIT} were calculated as the change in impedance (ΔZ) between an inspiratory and an expiratory occlusion manoeuvre

($\Delta Zi - \Delta Ze$) divided by the static driving airway pressure. Recruitability was assessed by EIT as an increase in C_{EIT} and end-expiratory lung volume after the PEEP trial.
RESULTS. We collected 11 measurements on 8 patients aged 43 ± 13 years (mean ± SD), with a PaO_2/FiO_2 of 99 ± 29 mmHg, Crs of 20 ± 13 mL/cmH_2O and PEEP of 11 ± 3cmH_2O. All patients had >3 quadrant infiltrate on chest X-ray. 5 patients received conventional ventilation (1 with $ECCO_2R$), 1 HFOV and 2 ECMO. Following the PEEP trial, Crs increased to 24 ± 16 mL/cmH_2O (mean ± SD). 62 % of the patients demonstrated recruitability. There was a large, although not statistically significant, difference in the PEEP associated with the best Crs versus the best global C_{EIT} (optimal PEEP) with 10 cmH_2O (3–10) versus 5 cmH_2O (1–15), respectively; [median (range), p = 0.34]. Regional analysis of C_{EIT} demonstrated a mean difference in optimal PEEP between dorsal and ventral regions of 8 cmH_2O, with a median of 5 cmH_2O (range 0–20). This indicates significant inhomogeneity between dorsal and ventral regions. If this regional inhomogeneity is not taken into account and PEEP is set on the best static Crs, that PEEP generated features consistent with overdistention in ventral regions with a reduction in C_{EIT} after the peak C_{EIT} by a median of 30 % (range 3–64 %). Conversely there was evidence of underrecruitment of the dorsal regions demonstrated by a lower C_{EIT} occurring before the peak in C_{EIT} of a median of 30 % (range 7–68 %), compared to their respective best regional C_{EIT}.
CONCLUSIONS. EIT allows the continuous monitoring of regional lung mechanics and response to recruitment. EIT can potentially guide the choice of PEEP and optimise ventilatory support with the aim of minimising regional overdistention and under-recruitment.

0489
THE EFFECT OF BLOOD ACIDIFICATION ON EXTRACORPOREAL CARBON DIOXIDE REMOVAL: LONG TERM ANIMAL STUDY

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INTRODUCTION. In a previous acute study [1], we described the efficacy of an enhanced extracorporeal CO_2 removal technique based on blood acidification.
OBJECTIVES. The aim of the present study was to assess efficacy, safety and feasibility of such technology applied for 48 h.
METHODS. Ten pigs (44 ± 3 kg) were mechanically ventilated and connected to a veno-venous extracorporeal circuit (blood flow 0.25 l/min, gas flow 5 l/min) with a pediatric membrane lung (ML). In eight pigs we continuously infused lactic acid 2.5 mEq/min at the inlet of the ML. After 24 and 48 h, the acid infusion was discontinued for 1 h. Two pigs, controls, did not receive acidification. We adjusted apparatus dead space to maintain a constant arterial pCO_2 (50 mmHg). At baseline and every 8 h, we obtained the amount of CO_2 removed by the ML (VCO_2ML), blood lactate, free hemoglobin, gas analysis from different sites and blood chemistry. Histology was performed on major organs.
RESULTS. Blood acidification increased VCO_2ML by 60–80 %, as shown in Fig. 1. The acid loaded blood pH decreased of 0.4 ± 1.38, while blood pCO_2 increased by 53 ± 32 mmHg. Arterial pH decreased of 0.04 ± 0.03. Arterial lactate never exceeded 4 mmol/l. The histology did not highlight any sign of organs damage due to lactic acid infusion.
CONCLUSIONS. A lactic acid infusion at the inlet of ML proved to be an effective and safe technique to steadily increase VCO_2ML up to 48 h, allowing removal of almost 50 % of the total CO_2 production of an adult man from 250 ml/min of extracorporeal blood flow.

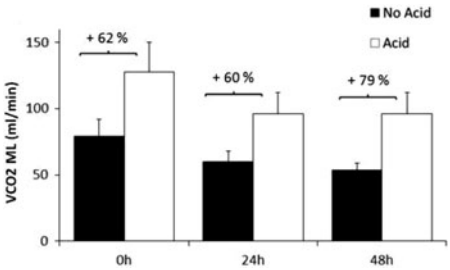

Fig. 1: Membrane Lung VCO_2 (VCO_2ML)

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Poster Corner Sessions
Technology assessment in acute respiratory failure: 0490–0503

0490
EXTRA-VASCULAR LUNG WATER IS AN INDEPENDENT PROGNOSTIC FACTOR IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME

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INTRODUCTION. Acute respiratory distress syndrome (ARDS) might be associated with an increase of extra-vascular lung water (EVLWI) and permeability vascular pulmonary index (PVPI), which can be measured by transpulmonary thermodilution.
OBJECTIVES. We tested whether EVLWI and PVPI are independent prognostic factors in patients with an ARDS.
METHODS. Two-hundred ARDS patients (age = 57 ± 17, SAPSII = 57 ± 20, overall Day-28 mortality = 54 %) were retrospectively included. EVLWI and PVPI were collected (PiCCO device) at each day of the ARDS episode.
RESULTS. The maximal values of EVLWI and PVPI recorded during the ARDS episode ($EVLWI_{max}$ and $PVPI_{max}$, respectively) were significantly higher in non-survivors than in survivors (24 ± 10 vs. 19 ± 7 mL/kg of predicted body weight, $p < 0.001$ for $EVLWI_{max}$ and 4.4 [3.3; 6.1] vs. 3.5 [2.8; 0.4.4], p = 0.001 for $PVPI_{max}$). At multivariate analysis, $EVLWI_{max}$, $PVPI_{max}$, SAPSII, maximal blood lactate, mean positive end-expiratory pressure, mean cumulative fluid balance and the minimal ratio of arterial oxygen pressure over the inspired oxygen fraction were independent predictors of Day-28 mortality. An $EVLWI_{max}$ >21 mL/kg predicted Day-28 mortality with a sensitivity of 73 % [63–82] % and a specificity of 54 % [44–63] %. The mortality rate was 70 % in patients with an $EVLWI_{max}$ >21 mL/kg and 43 % in the remaining patients (p = 0.0003). A $PVPI_{max}$ >3.8 predicted Day-28 mortality with a sensitivity of 65 % [54–75] % and a specificity of 67 % [57–76] %. The mortality rate was 69 % in patients with $PVPI_{max}$ >3.8 and 37 % in the group with $PVPI_{max}$ ≤3.8 ($p < 0.0001$).
CONCLUSIONS. EVLWI and PVPI measured by transpulmonary thermodilution are independent predictors of Day-28 mortality in patients with an ARDS.

0491
NON INVASIVE MEASUREMENT OF BOHR'S DEAD SPACE USING VOLUMETRIC CAPNOGRAPHY

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INTRODUCTION. Physiological dead space refers to the wasted fraction of tidal ventilation that does not participate in gas exchange. First described by Bohr (VD_{Bohr}) as $(PACO_2 - PeCO_2)/PACO_2$ where $PACO_2$ is mean alveolar and $PeCO_2$ mean expired CO_2. Enghoff introduced $PaCO_2$ as a surrogate of $PACO_2$ and the resulting formula (VD_{eng}) is the one commonly used in clinical practice. However a systematic error is introduced as VD_{eng} is contaminated by any shunt effect overestimating its value. We have recently described the use of volumetric capnography (VCap) to directly and non-invasively estimate $PACO_2$ as used by the original Bohr's formula [1].
OBJECTIVES. To compare the performance of VCap based VD_{Bohr} for calculating true physiological VD with two proposed methods that correct for the shunt effect included in VD_{eng} using in vivo measured data.
METHODS. Retrospective analysis of pooled data of different studies using an experimental model of acute lung injury (ALI) including a total of 40 pigs. We used a two hit model combining repeated lung saline lavage with 3 h of injurious mechanical ventilation. Incremental and decremental (after lung recruitment) 2–4 cmH_2O PEEP step changes were performed resulting in different levels of shunt and VD. We compared VCap derived VD_{Bohr} obtaining $PACO_2$ from the mid portion of phase III of the capnogram with: (1) A correction proposed by Kuwabara et al. [2] that substitutes $PaCO_2$ with an estimation of pulmonary capillary pressure of CO_2 ($PcCO_2$) obtained from the shunt formula and mixed venous CO_2 ($PvCO_2$) and (2) a correction proposed by Niklason et al. [3] that estimates the alveolar dead space fraction due to shunt calculated as $(PaCO_2 - PACO_2)/PaCO_2$ where $PACO_2$ is calculated by means of a dedicated software that execute several iterations from several input variables including $PvCO_2$ and shunt and assuming $PACO_2 = PcCO_2$ We also analysed the influence of shunt in the different VD estimations.
RESULTS. VD_{Bohr} correlated well with both correction methods but correlation and agreement were higher with the Niklason method (Table 1). As opposed to VD_{eng} and the Kuwabara method, VDBohr and the Niklason correction were not affected by increasing levels of Shunt (Fig. 1).
CONCLUSIONS. VC derived V_{DBohr} allows monitoring true physiological dead space breath by breath without the need of an arterial blood gas sample an independent of the level of shunt.
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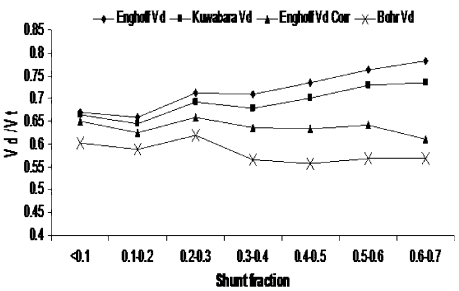
Table 1 VdBohr against the studied Vd estimations

	r	Bias	Limits of agreement	p
VDEng	0.73	0.11	−0.05–0.27	<0.00
Kuwabara	0.78	0.09	−0.06–0.23	<0.00
Niklason	0.86	−0.05	−0.07–0.17	<0.00



Effects of shunt on Vd estimations

0492

THE EFFECT OF VENTILATION WITH DIFFERENT FRACTIONS OF INSPIRED OXYGEN ON INTRAPULMONARY SHUNT IS ALTERED BY LUNG INJURY

A. Reske[1], S. Hammermüller[1], S. Wolf[1], A. Rau[1], D. Buchloh[1], H. Starke[1], S. Huckauf[1], T. Muders[2], C. Putensen[2], H. Wrigge[1]

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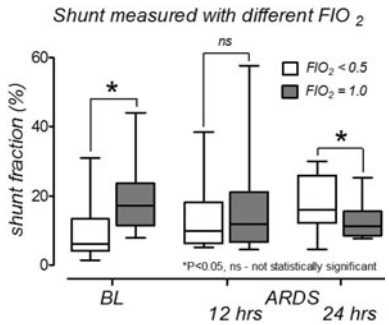
INTRODUCTION. Intrapulmonary shunt through nonaerated lung tissue is the major cause of hypoxemia in patients with acute respiratory distress syndrome (ARDS). Determination of shunt can be helpful for guiding mechanical ventilation (MV) in these patients and several authors proposed that shunt should be measured during MV with pure oxygen to exclude effects of lung units with low ventilation-to-perfusion ratios [1–3]. Unfortunately, there are contradictory reports on the effect of MV with pure oxygen (O_2) on shunt [2–6].
OBJECTIVES. To study effects of MV with different inspiratory oxygen fractions (FIO_2) on shunt before and after induction of ARDS in the same animal.
METHODS. Measurements were performed in 18 pigs during moderate atelectasis in otherwise normal lungs and 12 and 24 h after induction of experimental ARDS due to tracheal hydrochloric acid instillation [7]. Arterial and mixed-venous blood was sampled at all time-points during maintenance FIO_2 and after 5 min MV with 100 % O_2. Shunt was calculated using the Berggren formula [8]. Pigs were ventilated with tidal volumes of 6 ml/kg body weight at 5 cmH_2O positive end-expiratory pressure (PEEP) before and varying high PEEP levels (median 19, range 8–26 cmH_2O) after ARDS.
RESULTS. Maintenance FIO_2 was below 0.5 in all pigs for all time points. Before ARDS, during maintenance FIO_2, median shunt was 6 % (range 1–31 %). Shunt was increased significantly by 100 % O_2 before ARDS (median 17 %, range 8–44 %, $p < 0.05$). Pure O_2 had no effect ($p = 1.0$) on shunt 12 h after ARDS. In contrast, 24 h after ARDS, shunt was significantly lower during 100 % O_2 ventilation (median 16 %, range 5–30 %) than with maintenance FIO_2 (median 11 %, range 8–25 %, $p < 0.01$).



Shunt

CONCLUSIONS. Our findings may be explained by differential effects of O_2 on hypoxic pulmonary vasoconstriction (HPV) and the interaction with PEEP. During atelectasis in otherwise normal lungs, HPV is active but impaired by 100 % O_2 ventilation, while at low PEEP, 100 % O_2 ventilation promotes atelectasis. During ARDS, HPV is impaired by lung inflammation, and 100 % O_2 has limited additional effect, also because high PEEP was preventing further development of atelectasis. The decrease in shunt due to 100 % O_2 MV after 24 h may be explained by improved oxygenation of blood from lung units with low ventilation-to-perfusion ratios, whose transformation into atelectasis is prevented by high PEEP. CT studies are necessary to further elucidate the differential effects of 100 % O_2 MV on shunt in different lung conditions.
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GRANT ACKNOWLEDGMENT. The study was funded by a DFG grant to Hermann Wrigge.

0493

USE OF A FULLY CLOSE LOOP VENTILATION MODE IN LONG TERM VENTILATED ICU PATIENT: A PROSPECTIVE FEASABILITY STUDY

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OBJECTIVES. IntelliVent-ASV is a pressure target close-loop control of ventilation and oxygenation available both for passive and active breathing patients. Minute volume is adjusted according to end-tidal CO_2 (E_TCO_2) in passive breathing patients and respiratory rate in active breathing patients. Combination of tidal volume (V_T) and respiratory rate (RR) is determined using the ASV algorithm based on the Otis equation [1]. FiO_2 and PEEP are adjusted according to SpO_2. Studies have demonstrated its safety in ICU patients [2, 3] and in post cardiac surgery [4]. This study reports the ventilation and oxygenation delivered by IntelliVent-ASV in long term ventilated ICU patients.
METHODS. This prospective, observational, monocentric study included 100 non-selected patients ventilated with IntelliVent-ASV from inclusion, within the first 24 h after intubation until weaning or death. Rate and reason for stopping automation were recorded. Settings automatically selected, delivered ventilation, respiratory mechanics and arterial blood gas results were collected once a day. Patients were categorized in different lung conditions: normal lung, ALI/ARDS, COPD. Analysis of variance compared the ventilation days for each type of lung conditions for the passive and active breathing patients.
RESULTS. Patients (age = 73 [64–79] years; SAPS II = 56 [48–69]) were ventilated using IntelliVent-ASV to weaning or death (31 %) for a median duration of 3.0 [2.0–7.0] days without any safety issue. Ventilation controller was deactivated in two patients because of high $PaCO_2 - E_TCO_2$ gradient. Oxygenation controller was deactivated in 7 patients for 1 day because of poor SpO_2 signal. In passive and active ventilation-days, minute volume, V_T, respiratory rate, FiO_2, and PEEP were statistically different based on lung condition. In passive ALI/ARDS ventilation-days, V_T was significantly lower (7.5 [6.9–7.9] ml/kg) than passive normal lung (8.1 [7.3–8.9] ml/kg; $p < 0.05$) and passive COPD patients (9.9 [8.3–11.1] ml/kg; $p < 0.05$). In passive ALI/ARDS ventilation-days, FiO_2 and PEEP were statistically higher than passive normal lung (35 [33–47] % vs. 30 [30–31] %, 11 [8–13] cmH_2O versus 5 [5–6] cmH_2O, respectively; $p < 0.05$). In active normal lung ventilation-days, V_T was not different (8.4 [7.8–9.1] ml/kg) than in active ALI/ARDS (8.1 [7.5–9.3] ml/kg), and in active COPD (9.3 [8.6–11.6] ml/kg). In active ALI/SDRA and COPD ventilation-days, PEEP was significantly higher than active normal lung (8 [5–10] cmH_2O, 7 [5–10] cmH_2O, 5 [5–5] cmH_2O, respectively; $p < 0.05$).
CONCLUSIONS. IntelliVent-ASV can be used safely in long term ventilated ICU patients and selects automatically different ventilation and oxygenation settings according to the lung condition especially for passive breathing patients.
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[4] Lellouche. Intensive Care Med. 2010 [abstract].

0494

EFFECTS OF ANESTHESIA, MUSCLE PARALYSIS AND CONTROLLED MECHANICAL VENTILATION ON LUNG DIFFUSION FOR CARBON MONOXIDE (DLCO): PRELIMINARY RESULTS

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INTRODUCTION. A recent study by Di Marco et al. [1] demonstrated that patients with no evident pulmonary disease, after at least 24 h of mechanical ventilation, show a significant worsening of pulmonary diffusing capacity of the lung for carbon monoxide (DLCO), probably due to an early alteration of alveolar-capillary membrane.
OBJECTIVES. The aim of this study was to evaluate DLCO variations between pre-operative spontaneous breathing and mechanical ventilation for general anesthesia, and DLCO variations over time during mechanical ventilation.
METHODS. We enrolled 14 patients with no pulmonary disease scheduled for elective surgery. For each patient we measured the coefficient of diffusion (KCO) with the rebreathing technique and end expiratory lung volume (EELV) by CH_4 dilution. DLCO was calculated by KCO × EELV. This data were collected pre-operative in spontaneous breathing, then respectively 10, 60 and 180 min after the onset of tracheal intubation. Each anesthetist set its own controlled mechanical ventilation. Before performing the measure, PEEP was offset.
RESULTS. In comparison to pre-surgery data, we found, just after induction of anesthesia, paralysis and institution of mechanical ventilation a significant reduction of DLCO from 17.4 ± 5.7 to 8.9 ± 2.5 mL mm Hg^{-1} min^{-1} ($p < 0.001$). EELV decreased from 2.9 ± 1.1 to 1.6 ± 0.6 L, ($p < 0.001$) and KCO from 4.8 ± 1.2 to 3.8 ± 0.7 mL mm Hg^{-1} min^{-1} L^{-1} ($p = 0.02$). DLCO, EELV, and KCO did not further change significantly at 60 and 180 min of surgery.
CONCLUSIONS. Our preliminary results suggest that anesthesia, paralysis and onset of mechanical positive pressure ventilation reduce DLCO. This is attributable either to impairment of alveolar-capillary membrane efficiency for gas exchange (KCO decay) and derecruitment (EELV reduction). We did not report any further statistically significant decrease of DLCO, KCO and EELV during mechanical ventilation.
REFERENCES. 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.

0495

RESPONSE CHARACTERISTICS OF PORTABLE VENTILATION SYSTEM: "BOUSSIGNAC VYLIFE"

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INTRODUCTION. Recent technological development on "Boussignac CPAP" system has incorporated two levels of pressurization: "Vylife Boussignac", able to synchronize with ventilation of patient. It is a non-mechanical, open, portable system and easy to use.
OBJECTIVES. To evaluate the performance of system of ventilation portable "Boussignac Vylife", in terms of respiratory muscle and mechanics, breathing pattern and incidence of asynchrony during bilevel pressure. Bench and clinical study.
METHODS. Bench Study: The evaluation is conducted by personal lung simulator; we generate three levels of inspiratory effort (light, medium and high), with three levels of inspiratory pressure during vni2p® mode (orofacial mask applied):IPAP:18, 15 and 10 cmH_2O, Peep 4 cmH_2O; and Pressure controlled mode:18/4 cmH_2O, i/e ¼, RR 18/min. In the absence and presence of leaks. We measure delay time of inspiratory triger, and quality of air pressurization by the integral of Paw in time. Clinical study: Patients admitted to ICU with acute respiratory failure requiring noninvasive ventilation (NIV) were studied. Vni2p® Mode (IPAP:18, 5, 10; PEEP 4 cmH_2O) and CPAP 5 cmH_2O. We compare performance of Vylife vni2p® to Respironics BiPAP Vision®. Each patient his own control. All patients are ventilated with both ventilators in all conditions for 60 min. Measurements: Signal flow, airway pressure and esophageal pressure by pulmonary monitor BicoreCP100. We evaluate parameters on effort, work of breathing, ventilatory pattern, and synchrony, sense of comfort and clinics tolerance. Statistical Analysis: The results are shown as mean ± SD. Comparative statistics relied on the nonparametric Wilcoxon test.
RESULTS. We Studied five patients: four male, mean age 65 ± 9 years old, and APACHE II 19. Reasons for NIV: COPD (N2), Postoperative CCV (N1), pneumonia (N1), sepsis (N1). In time of the study:pH 7.33, $PaCO_2$ 53 ± 2 mmHg y PaO_2 41 ± 1 mmHg and FiO_2 40 ± 10 %.

Table 1 Parameters of effort, work and breathing

	Pressure Level 18/5 cmH_2O		Pressure Level 15/5 cmH_2O		Pressure Level 10/5 cmH_2O	
	Vylife	Vision	Vylife	Vision	Vylife	Vision
RR/VT (B/L/min)	153.23 ± 17.3	83.06 ± 4.09**	152.6 ± 12	132.9 ± 7**	97.60 ± 1.31	116.4 ± 9***
Ti/Ttot (%)	53 ± 16.1	37.34 ± 2.36**	74.21 ± 4.9	36.63 ± 0.71**	31.87 ± 5.7	34.28 ± 2.24**
Flow(L/s)	0.49 ± 0.14	0.76 ± 0.1**	0.48 ± 0.1	0.61 ± 0.01	0.53 ± 0.04	0.60 ± 0.02**
WOBp (J/L)	0.53 ± 0.66	0.01**	0.95 ± 0.12	0.01**	0.83 ± 0.13	0.01**
PTP (cmH2Os/m)	341.1 ± 116.1	3.07 ± 1.49**	424.4 ± 54	3.91 ± 1.95**	157.9 ± 28.8	7.79 ± 6.37**
Dpes (cmH2O)	8.03 ± 3.87	7.68 ± 0.61(ns)	11.59 ± 1.14	6 ± 0.57	11.57 ± 1.07	5.27 ± 0.66**
P0.1(cmH2O)	2.81 ± 1.02	1.39 ± 0.67**	3.69 ± 0.78	1.39 ± 0.61	4.4 ± 0.6	1.8 ± 0.9**

WOBp Work of breathing patient, *PTP* Pressure–time product, *Dpes* Delta esophageal pressure, *P0.1* Airway occlusion pressure at 100 ms, *Ti/Ttot* inspiratory time fraction, *RR/VT* shallow rapid breathing index in liters minutes.*$p < 0.05$,**$p < 0.0001$

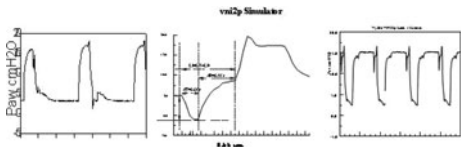

Fig. 1 Bench test: Pressurization and Triger by level of inspiratory effort. Elastance: 22.3 cmH_2O/L. Resistence = 7.1 cmH_2O/L/sg. (A)Controlled mode.(B)niv2p mode with triger -5 cmH2O. Delay Triger:0.08seg. (C)Difficulty controlling leakage is observed

CONCLUSIONS. Our results indicate that pressurization, triger delay and adaptation is appropriate if patient effort is no intense. It is an open system that allows security and does not require opening of valves of demand. The limitation of air leakage control could limit the clinical tolerance. Although our patients appreciate increased work of breathing compared with BiPAP Vision®, this difference could be reduced in patients with less severe respiratory failure, allowing its use in other clinical areas.

GRANT ACKNOWLEDGMENT. Study supported by material of Vigon®.

0496

MONITORING INTRINSIC PEEP BY DIAPHRAGMATIC ELECTRICAL ACTIVITY DURING ASSISTED SPONTANEOUS BREATHING

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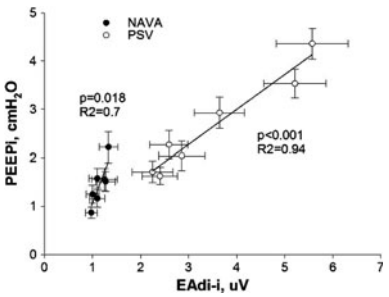
INTRODUCTION. The presence of intrinsic positive end-expiratory pressure (PEEPi) is common among patients undergoing assisted spontaneous breathing. PEEPi increases workload of respiratory muscles, because the patient has to generate a pressure equal to PEEPi before the inspiratory flow can start. The application of external PEEP (PEEPe) may reduce patient's work of breathing and asynchronies between patient's efforts and ventilator.

OBJECTIVES. To determine the usefulness of diaphragmatic electrical activity (EAdi) monitoring for the estimation of PEEPi during pressure support ventilation (PSV) and neurally adjusted ventilatory assist (NAVA).

METHODS. Eight patients with clinical suspicion of PEEPi were studied during two phases, one in PSV and one in NAVA. During each phase, PEEPe was increased, in steps of 2 cmH_2O (lasting 3 min), from 2 to 14 cmH_2O. Airway pressure, flow, volume, esophageal pressure and EAdi waveforms were continuously recorded. At off-line analysis of 10 breaths for each PEEP level, we measured PEEPi from esophageal pressure. We measured the value of Eadi at the onset of the inspiratory flow (EAdi-i) and the delay between Eadi onset and the onset of the inspiratory flow (Eadi-d).

RESULTS. PEEPi levels inversely correlated with PEEPe levels, during both PSV and NAVA ($R^2 = 0.81$; $p = 0.015$ and $R^2 = 0.72$, $p = 0.036$, respectively). EAdi-i inversely correlated with PEEPe during PSV ($R^2 = 0.80$ $p < 0.01$), but loosely during NAVA ($R^2 = 0.5$, $p = 0.07$). Likewise, for every patients but one, PEEPi correlated with EAdi-i during PSV (R^2 0.55-0.99; $p < 0.05$). When grouping values for PEEPe, PEEPi levels correlated with EAdi-i levels both in NAVA and PSV ($R^2 = 0.7$; $p = 0.018$ and $R^2 = 0.94$, $p < 0.001$, respectively) as shown in Figure (each point represents the average of one level of PEEPe). Eadi-d inversely correlated with PEEPe during PSV ($R^2 = 0.76$ $p = 0.011$) but not during NAVA.



Figure

CONCLUSIONS. EAdi monitoring can be helpful to detect the presence of PEEPi and to evaluate the effects of increasing PEEPe levels on patient's inspiratory effort. In NAVA, increased PEEPe levels are not required to obtain adequate patient-ventilator synchrony in presence of PEEPi.

GRANT ACKNOWLEDGMENT. MIUR.

0497

IMPACT OF NAP4: AN AUDIT INTO AIRWAY MANAGEMENT ON A GENERAL ICU

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INTRODUCTION. The NAP4 Project highlighted significant concerns in regards to the management of airway complications on Intensive Care Units $(ICU)_1$. This audit assessed the compliance of out ICU to the NAP4 recommendations.

METHODS. A prospective audit of ventilated patients on ICU. Data collection focused on the documentation of intubation, techniques used to confirm intubation and the continuous use of $ETCO_2$ in ventilated patients. In addition basic intubation boxes and the difficult airway equipment available was compared against the Difficult Airway Society (DAS) Guidelines.

RESULTS. There were 46 patients included in the audit. The majority of patients were intubated on ICU (23), 9 in theatre, 7 in A&E, and 6 on the wards. Documentation of intubation and confirmatory test was poor, with only half (23) having complete documentation. Documented use of $ETCO_2$ was only recorded in 11 patients, 9 of which were from theatre. 80 % of patients had continuous use of $ETCO_2$ whilst ventilated. The basic intubation boxes did not contain a DAS recommended checklist. Items on the checklist, which were not found in the boxes, included NPAs, LMAs, tracheal tube introducers (bougie) and a malleable stylet. The difficult airway trolley did not have a DAS guideline checklist, reinforced or microlaryngeal tracheal tubes, a flexible fibreoptic laryngoscope, proseal laryngeal mask airways or a surgical cricothyroidotomy kit.

CONCLUSIONS. This audit demonstrated poor documentation of intubation and use of $ETCO_2$ to confirm intubation. Compliance with continuous use of $ETCO_2$ monitoring was better; however fell short of the recommended standard of 100 %. Airway equipment was below recommended DAS standards.

RECOMMENDATIONS. A pre-intubation checklist was introduced on the ICU with a standardised sticker introduced to document intubation. In addition a checklist for basic airway equipment was introduced, and a dedicated difficult airway trolley was created, with equipment checklist and DAS guidelines attached. A re-audit is planned for 4-months time.

REFERENCES. 1. The Royal College of Anaesthetists and The Difficult Airway Society. 4th National Audit Project. Major complications of airway management in the UK. NAP4. Report and Findings March 2011.

0498

HIGH OXYGENATION INDEX: BAD LUNGS OR BAD DOCTORS?

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INTRODUCTION. Oxygenation Index (OI) expressed as $FiO_2xPawx100/PaO_2$ has been shown to be a reliable indicator of severity of respiratory dysfunction in paediatrics [1]. Extravascular lung water index (EVLW) has been shown to be predictor of mortality in ARDS in adults [2]. The use of low tidal volumes (Vt) are advocated in mechanical ventilation to reduce the incidence of ventilator induced lung injury in most cases of respiratory failure [3].

OBJECTIVES. We have investigated the relationship of OI, EVLW and Vt in acute respiratory failure.

METHODS. Retrospective analysis of patients with acute respiratory failure where invasive haemodynamic monitoring with transpulmonary thermodilution (PiCCO, Pulsion, Germany) was used. We have collected haemodynamic variables and also respiratory parameters at the time of thermodilution measurements. OI was calculated using the formula described above. For statistical analysis Pearson′s correlation test was used. $p < 0.05$ was considered as statistically significant.

RESULTS. We have analysed 25 patients with 168 measurements. On the whole database we have found a significant positive correlation between OI and EVLW ($r^2 = 0.497$, $p < 0.05$) we could not found any significant association between the Vt and OI. However, in patients who were ventilated with $FiO_2 < 0.6$ the correlation between OI and EVLW disappeared and we found a significant positive correlation between OI and Vt. In patients where FiO_2 was >0.6 the positive correlation between OI and EVLW persisted ($r^2 = 0.586$, $p < 0.05$), without any significant association between OI and Vt.

CONCLUSIONS. In our retrospective analysis we have found that high OI is associated with high EVLW in respiratory failure. However, this association disappears when FiO2 is < 0.6 and high OI is associated with high Vt. Based on these results we postulate that in acute respiratory failure OI could be a useful surrogate measure of the severity of the condition. In these conditions high OI indeed can be used to characterise "bad lungs". On the other hand, when the patient requires lower FiO_2, OI could be used to help to reduce iatrogenic harm in the form of unintentional high Vt, therefore reduce the effect of "bad doctors", who are not adjusting the ventilator settings according to the patients′ condition.

REFERENCES. 1. Trachsel et al. AJRCCM 2005; 170:206–11. 2. Sakka et al. Chest 2002; 122:2080–86. 3. ARDSNet NEJM 2000; 342:1301–08

0499

IMPACT OF LACTIC ACID AND GLUCOSE SOLUTION INFUSIONS ON CO_2 PRODUCTION: PRELIMINARY DATA FROM AN EXPERIMENTAL STUDY IN PIGS

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INTRODUCTION. The infusion of lactic acid at the inlet of an artificial lung has proved to be an effective and safe technique to increase extracorporeal CO_2 removal [1]. However, lactic acid is an energetic substrate and his metabolism produces CO_2.

OBJECTIVES. The aim of this study was to assess the total CO_2 production (VCO_2) during the infusion of lactic acid or glucose solutions while maintaining a constant caloric intake.

METHODS. Four pigs (44.9 ± 5 kg) were sedated and mechanically ventilated. A 50 % glucose solution was administered for 4 h (~88 kcal/h); during the next 4 h 2.5 mEq/min of lactic acid (~44 kcal/h) and 50 % glucose solution at 22 ml/h (~44 kcal/h) were infused. This step was repeated three times for each pig with a two-hour stop between each step. Every hour VCO_2 and arterial lactate were determined. Blood glucose level was kept constant (target = 100 mg/dl) titrating intravenous insulin infusion.

RESULTS. VCO_2 during lactic acid + glucose infusion increased by about 6–7 % compared to the infusion of glucose alone (200 ± 25 ml/min vs. 186 ± 24 ml/min, $p < 0.05$, see Figure 1); blood glucose did not differ between the 2 groups (respectively 101 ± 12 vs. 103 ± 8). The arterial lactate was always lower than 3 mmol/L.
A slight increase in total VCO_2 during lactic acid infusion may be explained by the difference (~3.6 %) between the moles of CO_2 produced by complete oxidation of amounts of glucose and lactate of equal caloric intake.
CONCLUSIONS. When lactic acid infusion is used to enhance extracorporeal CO_2 removal, a decrease of the caloric input equivalent to the metabolic load of the infused lactate would allow to maintain a nearly constant total production of CO_2.

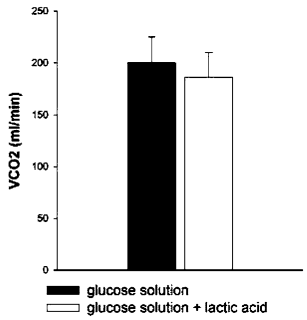

Fig. 1 Total CO_2 production (VCO_2)

REFERENCES. 1. Blood acidification enhances carbon dioxide removal of membrane lung: an experimental study. Zanella A, Patroniti N, Pesenti A. et al. Intensive Care Med. 2009 Aug;35(8):1484-7.

0500

EXTRACORPOREAL MEMBRANE OXYGENATION IN LUNG TRANSPLANTATION ON OUR FIRST TWELVE CASES

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INTRODUCTION. Extracorporeal membrane oxygenation (ECMO) is currently accepted in lung transplantation (LT) as bridge to transplantation, intraoperative extracorporeal respiratory and/or circulatory support and treatment of primary graft dysfunction (PGD). No specific criteria for the use of ECMO for this group of patients can yet be suggested because of the small number of reported studies.
OBJECTIVES. To describe the ECMO indications and results in LT recipients.
METHODS. Descriptive study in a 12 beds intensive care unit (ICU) of a tertiary hospital center between January 2009 and February 2012. Inclusion criteria: patients listed for LT as a bridge to transplant, intraoperative extracorporeal respiratory and/or circulatory support and PGD treatment. We use exclusion criteria recommended by ELSO. Components of ECMO systems included: membrane oxygenator Quadrox or PLS (Maquet), Rotaflow pump (Maquet) and Maquet heparin-coated circuits.
RESULTS. 12 patients were included. They were media age 50.16 (range 36–63) and 66.66 % were men. They had median APACHE II 26 (range 16–41). Underlying diseases were pulmonary fibrosis (n = 7), idiopathic pulmonary hypertension (n = 3), pulmonary emphysema (n = 1) and histiocytosis X (n = 1). Type of LT was single in 2 patients and double in 9 patients. Six patients were supported with venous–venous (VV) ECMO and 6 with venous-arterial (VA) ECMO. ECMO was used to bridge in 5 patients, one of them died before transplantation. All of them, 4 patients, received VV ECMO for respiratory insufficiency and 1 patient received VA ECMO because severe right cardiac failure was associated. Four patients received VA ECMO support in the intraoperative period, three of them suffered respiratory and cardiac failure and a patient had alone cardiac failure. Three patients received ECMO due to PGD. Median time of pretransplantation ECMO was 89.2 h (range 2–330 h). Mean duration of postoperative ECMO was 75 h (range 7–132 h). Median ICU stay was 28.16 days (range 6–52 days). Causes of mortality were: pulmonary thromboembolism (n = 1), unresponsive ventricular fibrillation (n = 1), ischemic stroke with brain death (n = 1), postanoxic encephalopathy (n = 2). Seven patients were discharged from the UCI (58.3 %). Overall 3-month survival rate were 58.3 %.
CONCLUSIONS. ECMO is a valuable therapy in LT to bridge to transplantation, LT intraoperative support and PGD treatment. More studies are necessary to set the criteria to use ECMO in these patients.
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0501

IMPACT OF AIRWAY PRESSURE RELEASE VENTILATION (APRV) AND BIPHASIC INTERMITTENT POSITIVE AIRWAY PRESSURE (BIPAP) MODES ON THE LUNG PROTECTION IN A SPONTANEOUSLY BREATHING LUNG MODEL

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INTRODUCTION. APRV-BIPAP modes of ventilation favor the preservation and variability of spontaneous breathing (SB), with potentially less control on the tidal volume (VT) than a standard assist-control mode. APRV and BIPAP can be adjusted with similar settings: mandatory cycles are strictly time-based with APRV, however, whereas the presence of synchronization windows with BIPAP can result in mandatory cycles in-phase with spontaneous patient's effort. What offers the best compromise between SB maintenance and Vt control is not known.
OBJECTIVES. Using the same ventilator settings with APRV and BIPAP, the impact of SB on the VT and maximal inspiratory values and swings of transpulmonary pressure (Ptp) were evaluated on a bench test model.
METHODS. APRV and BIPAP (with and without pressure support [PS]) were compared on an Evita-XL (Drager) ventilator with the following settings: Phigh 30 cmH_2O, Plow 15 cmH_2O, frequency 15 breaths/min, insufflation time (Thigh) 1 and 3 s. The active lung model (ASL-5000, Ingmar; respiratory system compliance 30 mL/cmH_2O, resistance 5 cmH_2O/L/s) simulated spontaneous breathing activity (mean respiratory rate 20/min with a Gaussian distribution, muscular pressure of −10 cmH_2O).
RESULTS. APRV and BIPAP favored a complex breathing pattern with a wide distribution of V_T (figure 1). Despite identical settings and simulated SB activity, BIPAP produced more cycles with high V_T (≥8 mL/kg) compared to APRV; the latter allowed a better control on the V_T. This is explained by the possibility of synchronization with BIPAP, which also resulted into greater Ptp swings (Fig. 2). This was further exacerbated with the addition of PS to assist SB. Prolonging Thigh (I:E 3:1) did not result into larger V_T, but into higher maximal Ptp because a significant proportion of SB took place at Phigh.

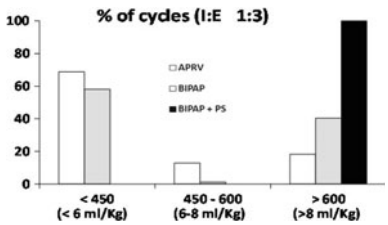

Fig. 1

I:E	Mode	Tidal Volume (ml)	Ptp Maximal (cmH_2O)	Ptp swing (cmH_2O)
1:3	APRV	368 (±195)	32 (±6)	14 (±6)
	BIPAP	466 (±237)	33 (±7)	17 (±8)
	BIPAP + PS	754 (±31)	42 (±0)	27 (±1)

Fig. 2

CONCLUSIONS. Using APRV and BIPAP with the same settings lead to different VT and Ptp in presence of spontaneous breathing. The synchronization with BIPAP resulted in larger VT and greater Ptp swings, hence higher potential risk of VILI, than with the asynchronous APRV. These results require clinical validation.

0502

AUTOMATED CLOSED-LOOP OXYGEN ADMINISTRATION ($FREEO_2$) DURING THE EMERGENCY CARE OF ACUTE RESPIRATORY FAILURE. A MULTICENTRIC RANDOMIZED CONTROLLED STUDY [PRELIMINARY RESULTS]

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INTRODUCTION. Oxygen administration is a routine therapy in the emergency department (ED). We developed an innovative device ($FreeO_2$) that automatically adjusts the oxygen flow in order to reduce the risk of hyperoxia and hypoxemia and to reduce the nursing workload.
OBJECTIVE. The main objective of the study is to evaluate the readiness of this system to maintain adequate oxygenation during the emergency care of patients attending the ED for acute respiratory failure.
METHODS. we are actually conducting a multicentric randomized controlled study comparing standard oxygen administration to $FreeO_2$ (automated adjustment and remote monitoring) during the early phase of treatment of acute respiratory failure within two different ED. Patients in both groups have continuous monitoring of SpO_2, respiratory rate, heart rate and $EtCO_2$. We evaluate for all patients (i) the time within the SpO_2 target (92–96 % for hypoxemic; 88–92 % for hypercapnic) (ii) the time with desaturation (SpO_2 below 85 %), (iii) mean administered oxygen flow and consumption. Randomisation is centralized, using an electronic datafile system.
RESULTS. 90 patients are to be included in each group and we present herein the results of 30 patients (15 in each group; 22 hypoxemic and 8 hypercapnic). No switch from $FreeO_2$ to standard oxygen administration was considered necessary and in all cases $FreeO_2$ was considered to be an efficient form of oxygen administration by the nurses in charge of the patients. It allowed maintaining SpO_2 within range for 75 ± 21 % of time, versus 38.5 ± 11 % with standard oxygen ($p < 0.0001$). Time with desaturation below 85 % was <3.5 % with $FreeO_2$, versus >13 % with standard O_2 ($p = 0.05$). No differences in terms of mean administered O_2 flow were observed. Within the study period the automatic system performed a mean 8500 ± 1000 O_2 flow variations, vs. 2.5 ± 1 with standard O_2.
CONCLUSIONS. In these preliminary results, the $FreeO_2$ system was well accepted by the ED nurses. The system maintains SpO_2 within target better than the manual adjustment. The clinical usefulness and the impact on important outcome parameters of such system remains to be demonstrated.
GRANT ACKNOWLEDGMENT. Fonds de Recherche en Santé du Québec, Fondation Canadienne pour l'Innovation (Fond des Leaders). PHRC National 2010 (Ministère Français de la Santé).

0503
NATIONAL SURVEY OF USE OF OSCILLATOR IN UNITED KINGDOM

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INTRODUCTION. Over the past 20 years mortality from acute respiratory distress syndrome (ARDS) has been steadily decreasing. Although the explanation for this reduction is likely to be multi-factorial, improvements in ventilation techniques have undoubtedly made a major contribution. High frequency oscillatory ventilation (HFOV) was initially proven to be beneficial in children but has recently become popular as a ventilation strategy in ARDS. Earlier studies focussed on the use of HFOV as a rescue therapy, with patients being placed on HFOV only when conventional ventilation was observed to be failing. Since then there has been a trend towards using HFOV earlier on in the course of ventilation although evidence available regarding the benefit of HFOV is not very conclusive [1, 2].
OBJECTIVES. We conducted a telephone survey of all the Intensive care units (ICU) in the United Kingdom to enquire if the units have been using an Oscillator to deliver HFOV. The purpose of the survey was to determine the use of Oscillators in U.K. ICUs.
METHODS. All General adult ICUs in the United Kingdom were surveyed via telephone. The nurse-in-charge or the senior physician for the shift was consulted to ascertain if the unit had an Oscillator and the answers were recorded on paper.
RESULTS. In total 228 General adult ICUs in U.K. were called. We were able to speak to the nurse-in-charge or the senior physician for the shift in 225 of the ICUs called (98.7 % response). 41.3 % (93) of the total ICUs called had an Oscillator to deliver HFOV while the rest of the ICUs (132) did not have an Oscillator. The average bed number of ICUs with an Oscillator was 13.41 compared to the average bed number 8.46 of the units which did not have an Oscillator.
CONCLUSIONS. Three years ago there was only a handful ICUs in U.K. equipped with an Oscillator. Currently, 41.3 % of Intensive Care Units in the United Kingdom are using an Oscillator. Oscillators have become increasingly popular in Intensive Care in the United Kingdom, more so in the larger ICUs.
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Nutrition & glucose control: 0504–0517

0504
EARLY ENTERAL FEEDING IN CRITICALLY ILL SURGICAL PATIENTS UNDERWENT EMERGENCY GASTROINTESTINAL SURGERY

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INTRODUCTION. Early enteral feeding is important and beneficial to the critically ill patients, and many guidelines recommend the early initiation of the enteral feeding. However, the critically ill surgical patients underwent emergent gastrointestinal (GI) surgery had several conditions disturbing the enteral nutrition such as bowel ischemia, obstruction, or bleeding. So, early enteral feeding is controversial in critically ill surgical patients.
OBJECTIVES. The purpose of this study was to evaluate the outcome of the early enteral feeding in critically ill surgical patients under emergent GI surgery.
METHODS. Medical records were retrospectively reviewed from January 2010 to December 2011. The inclusion criteria were followings; patients who stayed for more than 3 days in surgical intensive care unit, patients who underwent emergent gastrointestinal surgery. The exclusion criteria were followings; patients who died within 3 days, patients who underwent simple appendectomy or adhesiolysis, patients who underwent transplantation. The patients were classified by two groups according to the early (E) or late (L) enteral feeding. Early enteral feeding was defined as initiation of feeding within 72 h after operation.
RESULTS. Total eighty-nine patients were enrolled, and mean age was 64.7 (±14.4) years old. And man was 67. Early feeding group was 18 (20.2 %), and late group was 71 (79.8 %). Mortality in 30 days was 7.9 % and in-hospital mortality was 18.0 %. There was no differences in 30 day mortality (E vs. L, 16.7 % vs. 5.6 %, $p = 0.14$) and in-hospital mortality (E vs. L, 16.7 % vs. 18.3 %, $p = 1.0$) between two groups. LOS-H (30.7 vs. 39.5 days, $p = 0.25$) and LOS-ICU(9.9 vs. 8.5 days, $p = 0.56$) did not show differences. The complication and reoperation rate (22.0 % vs. 12.6 %, $p = 0.4$) were same in both groups.
CONCLUSIONS. Early enteral feeding did not showed the better outcomes in critically ill surgical patients. However there are small numbers of patients in this study. It is required to confirm the effectiveness of the early enteral feeding by prospective study.
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0505
IMPLEMENTATION OF A PROACTIVE NUTRITION CLINICAL PRACTICE INCREASES THE PROPORTION OF MECHANICALLY VENTILATED PATIENTS ACHIEVING ENTERAL NUTRITION TARGETS IN THE ADULT NEURO-INTENSIVE CARE UNIT (NICU)

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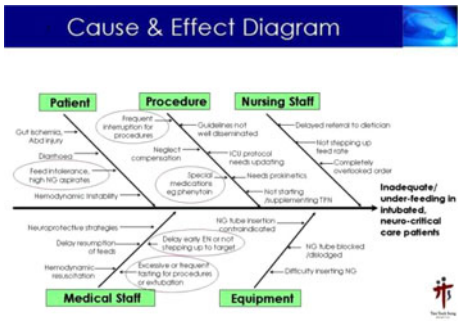
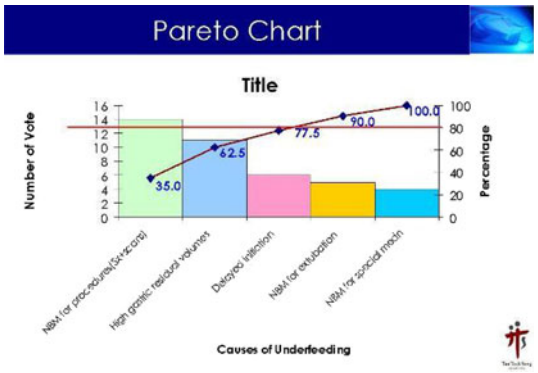
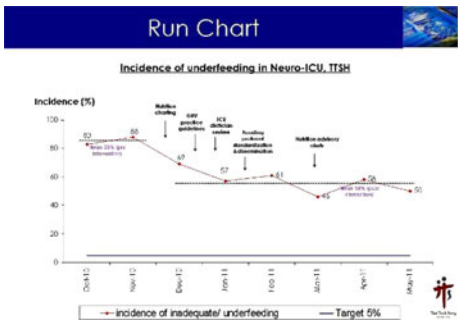
BACKGROUND & HYPOTHESIS. The delivery of enteral nutrition (EN) is often late and inadequate despite evidence that enteral feeding reduces mortality and morbidity in critically ill patients. Early EN averts the risks of gut atrophy, systemic infections, prolonged intubation and ICU stay, and may also improve neurologic outcome in head-injured patients. A review of the baseline mean incidence of underfeeding in intubated neuro-ICU patients in our hospital is 86 % from October to November 2010.
METHODS. Using Clinical Practice Improvement Programme (CPIP) methodology, a multidisciplinary team of doctors, nurses and ICU dietician created a cause and effect (fishbone) diagram to identify the root causes. The Pareto chart revealed the major causes as: 1. Excessive peri-procedural fasting for surgery and diagnostic scans. 2. High gastric residual volumes. 3. Delayed initiation or not stepping up to goal rate of enteral feeding. 4. Excessive fasting prior to and post-extubation. Interventions adhering to Plan-Do-Study-Act principles were implemented: electronic nutrition charting, adopting best practice guidelines for cut-off values for high gastric residual volumes, ICU dietician review for all new intubated admissions, protocol standardisation and dissemination and the use of electronic nutrition advisory alerts.
RESULTS. An absolute reduction in the incidence of underfeeding from 86 to 38 % (i.e. reduction of almost 50 % at the last month of the quality improvement project over a 6-month period).



Cause and Effect diagram



Pareto chart—main causes of underfeeding



Run chart—improvement processes

CONCLUSION. We need to recognize of importance of nutritional care as critical to patient-centric ICU outcomes. Application of present & firm evidence to direct patient care (transfer to practice), standardisation/optimisation of processes, leveraging on IT to facilitate best practices, and multidisciplinary collaboration can help to improve patients' nutritional therapy.

0506
CLINICAL AUDIT OF NUTRITIONAL SUPPORT IN GENERAL INTENSIVE CARE UNIT

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INTRODUCTION. Cahill and associates have identified that large gap exists between clinical recommendations and actual nutritional practices in most of the intensive care units[1]. We did an audit to see whether similar gap in delivering nutritional support existed in our unit with a view to improve our practice.
OBJECTIVES. The main aim of our audit is to examine the nutritional support provided in our intensive care unit to evaluate whether nutrition was initiated with in the recommended

first 48 h of admission and to determine whether non absorption and glycaemia were controlled for.
METHODS. We conducted a prospective cross sectional audit in Hull Royal Infirmary intensive care unit after obtaining approval from the clinical audit department between 01/10/2011 until 30/11/2011. We included all patients who were initiated on enteral or parenteral nutrition. We excluded patients who were initiated on oral nutrition.
We collected data from patient's notes that had details of time and type of nutrition, amount of gastric residual volume in regards to enteral nutrition and glucose measurements. The standards set for this audit were taken from the Clinical practice guidelines (CPG) that was recently updated in 2009 [2] and was compared to results achieved from an observational study looking at best achievable practice [1]. The main recommended standards that were focused in this audit was that nutrition should be initiated within 24–48 h of admission, usage of enteral feeding over parenteral nutrition, usage of motility agents in patients with high gastric residual volume(GRV) and avoidance of hyperglycaemia. The international average time to initiate nutrition was 46.5 h.
RESULTS. We collected data from 61 patients over a month period. Results from our unit show that 88 % (n = 54/61) of patients were initiated on nutrition within 48 h of admission. 87 % (n = 47/54) of patients received enteral nutrition and 13 % (n = 7/54) were established on parenteral nutrition. 30 % (n = 14/47) of patients had absorption problems with enteral nutrition with high gastric residual volume of more than 200 ml. All patients (n = 14/14) who had problems with absorption were initiated on motility agents with a success rate of 93 %. 78 % (n = 42/54) of patients had adequate glycaemic with BM between 4–11 mmol/L. The average time to initiate nutrition in our intensive care unit was 21.6 h.
CONCLUSIONS. This audit has shown that nutritional practice in our intensive care unit meets Clinical Practice Guidelines requirements. From this audit we have identified there is still room for improvement in our nutritional practice and glycaemic control. Motility agents were used in all patients who had high gastric residual volumes in line with recommendation but the use of small bowel feeding was not which we are hoping to improve to avoid unnecessary parenteral nutrition.
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0507
TIME OF ONSET OF ENTERAL NUTRITION IN THE CARDIAC PATIENT, IMPROVED AFTER THE COUNSEL OF THE NUTRITIONAL TEAM?

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INTRODUCTION. Enteral nutrition (EN) is the first choice for cardiac critical care patients. The initiation criteria and the diet formula should be the same as for other ICU patients. The beginning of EN should not exceed 24 h according to the ESPEN Guidelines or 36 h for ASPEN and Canadian Guidelines.
OBJECTIVE. Compare time of initiation of enteral nutrition over the past 2 years, with the involvement of Nutritional Support Team (NST) between periods.
METHODS. Prospective observational study conducted in 15-bed cardiac ICU, from 2010 to 2011. Between these 2 years was made a warning for the early onset of EN from the NST. Patient's pathology, complications, type of nutrition and time of initiation of EN was recorded.
RESULTS. A total of 192 patients have been assessed, 95 in the first survey and 97 in the second. Pathologies: valve replacement 50 (26 %), heart arrest 48 (25 %), myocardial infarction 25 (13.1 %), Heart Transplant 17 (9 %), cardiogenic shock 15 (7.85 %), type A aortic dissection "A "15 (7.85 %), acute pulmonary oedema 8 (4.2 %), coronary by-pass (2.6 %) and Miscellaneous 9 (4.7 %). All need of mechanical ventilation and 86 suffered 2 or more complications (acute renal failure with CVVHD, cardiogenic shock and balloon counterpulsation, surgical intervention…). By comparing both years separately, the beginning of the NE was in the first year under review 37 ± 25.4 h (median 28) and in the second 35.6 ± 24 h (median 31).In the general ICU, in the same hospital was 18 ± 12.4 h ($p < 0.001$). In non-complicated cases began at 32.8 ± 23.7 h versus 37 ± 26 h. In those who suffered one or more complications underwent time ranged from 34 in the first year and the second from 18.7 to 49 h. The EN formula utilized was high protein diets with calorie density of 1 kcal/mL (57 %) for diabetic (33 %) and in the case of respiratory distress and sepsis (7 %) were used Ω3 enriched formulas, antioxidants and γ-linolenic acid. In 6 patients combined EN and Parenteral nutrition to achieve therapeutic doses.
CONCLUSIONS. 1. Overall the average time falls within the criteria for the Early EN ASPEN and Canadian Guidelines. 2. The start time of Nutrition shows a downward trend, both globally and in terms of complications, but not statistically significant, despite the advice of the Nutritional Support Team. 3. It is necessary continue training on Nutrition to approach the goal of European Guidelines (ESPEN).

0508
EARLY ENTERAL NUTRITION IN POSTOPERATIVE CARDIAC SURGERY IN PATIENTS WITH HEMODYNAMIC FAILURE. FINAL RESULTS

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INTRODUCTION. Early enteral nutritional support (EENS) in critically ill patients after cardiac surgery (CS) with hemodynamic failure (HF) is controversial due to the potential risk of gastrointestinal complications, particularly bowel ischemia, and the difficulty to reach the nutritional target.
OBJECTIVES. To assess the safety and the efficacy of EENS in patients with HF after CS.
METHODS. Prospective observational descriptive trial in a surgical ICU of a tertiary care university hospital during 14 months. Inclusion criteria: CS patients with HF (need of vasoactive support with at least moderate doses and/or mechanical circulatory support (MCS: IAoBP or ECMO) that required more than 24 h of mechanical ventilation. Variables (var.) collected were: descriptive, hemodynamic daily assessment (lactate, cardiac index (CI), amine doses, mean arterial pressure), efficacy var. (days of nutritional support, volume and calories delivered, attainment of a previously calculated nutritional goal (NG) of 25 kcal/kg of body weight, reached 96 h after the beginning of nutritional support. Nutritional tolerance (NT) was calculated as: delivered energy/NG), and safety var. (bowel ischemia, abdominal distension, high gastric aspirate volume, vomiting and regurgitation, diarrhea, constipation, bronchial aspiration). EENS was performed according to the protocol of enteral nutrition of our Intensive Care Service. A descriptive analysis was performed (mean [m] ± standard deviation, P50 ± [ICR] or %).
RESULTS. 642 patients were admitted in this period of time. 37 (5.8 %) met the inclusion criteria. $_{m}$age: 57 ± 17 years. $_{m}$EuroSCORE: 8.8 ± 2.7. $_{m}$SAPS II 37.4 ± 9.1. $_{m}$SOFA 7.7 ± 2.8. $_{m}$time of cardiopulmonary bypass 126 ± 64 min. $_{m}$CI: 2.3/−0.7 l/min/m^2. 97 % required vasoactive support with at least two amines in the first 48 h, 27 % required MCS and 68 % met criteria of early multiorgan dysfunction. Mortality was 13.5 %. Enteral Nutrition days per patient: 12.3 ± 8.2.
Volume delivered: P50 1350 cc. Energy delivered: P50 1368 kcal. The NG was reached in 40.5. % of the cases. NT: 89 ±/-40 %. No case of mesenteric ischemia was detected. The most common complication was constipation (46 %), followed by diarrhea (27 %).
CONCLUSIONS. In our experience, EENS in critically ill cardiac surgery patients with hemodynamic failure is possible, safe and not associated with serious complications. Reaching Nutritional goal only by enteral nutrition is difficult.
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0509
NUTRITIONAL SUPPORT IN SURGICAL TREATMENT OF PATIENTS WITH HEAD AND NECK TUMORS

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INTRODUCTION. Head and neck tumors are often accompanied by nutritional deficiency associated with the violation of the act of swallowing, dysphagia, radiological reactions, intoxication. Such patients perform aggressive surgical intervention. The incidence of postoperative complications in these patients is very high.
OBJECTIVES. To determine the need and rational tactics of nutritional support (NS) in patients with head and neck tumors at the stage of surgical treatment.
METHODS. 605 surgical patients in the department of head and neck tumors in 2009 were examined. 136 (22.5 %) consisted of patients with oropharyngeal and cervical esophagus tumors ($T_{III\ -\ IV}N_{0-1}M_{0-1}$), 317 (52.4 %) - patients with recurrent head and neck tumors, i.e., there was a predominance of patients with locally advanced neoplastic process (74.9 %). This made it necessary to speedy implementation of the surgery.
Severe nutritional deficiency occurred in 193 (31 %) patients, significant weight loss (10–30 % over the past 3 months) because of localization of the tumor and/or consequences of anticancer therapy. These patients underwent perioperative NS. According to individual indications, the installation of a nasogastric tube (Portex N°24-28 (n − 76) or endoscopic gastrostomy with a set of Cook (n − 17) was performed. For NS, we used a standard mixture of Nutrizon 1–1.5 liters per day, depending on the needs of the patient and a standard diet, if necessary, in conjunction with infusion therapy. Pre-operative NS was carried out for 2 weeks before surgery. Postoperative NS began in the first 15 ± 3.2 h after surgery and was held until the end of treatment, patients were given advice on nutritional support at home.
RESULTS. NS allowed to improve significantly the nutritional status of patients: all patients stopped losing weight, and in 44.6 % (83 patients) were able to increase body weight by 5 ± 2.8 kg, to improve the general condition, to normalize haematological and biochemical parameters. In all cases the operation was done successfully. There were no complications associated with NS. In 9.3 % at the beginning of nutritional support the development of diarrhea have noted, which ceased after the correction of concentration, infusion rate and volume of the feed mixture.
CONCLUSIONS. According to our research 31 % of patients with head and neck tumors severe nutritional deficiency occurred, which increases the risk of postoperative complications. Pre- and postoperative nutritional support conducting can help to improve the general condition of cancer patients and successfully perform surgery. Nutritional support is an essential component of the preoperative preparation of patients with head and neck tumors.

0510
DEVELOPMENT OF AN INTENSIVE CARE UNIT "CATCH UP" FEEDING STRATEGY: AN AUDIT OF NUTRITIONAL ADEQUACY

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INTRODUCTION. Inadequate nutritional intake in critically ill patients can lead to complications resulting in increased morbidity and mortality (Marik & Zaloga, 2001; Heyland, 1998). Evidence-based recommendations are for patients to achieve ≥80 % of their nutritional requirements within 72 h of feed initiation (Heyland et al., 2011). However, several factors limit nutritional adequacy in critically ill patients receiving enteral feeding.
OBJECTIVES. To inform the development of a feeding strategy to achieve near-target nutritional goal by assessing the nutritional adequacy of enterally tube fed patients and the factors that affect its delivery in patients receiving mechanical ventilation.
METHODS. A retrospective design was used to review data for patients receiving enteral feed at 80 % goal rate over a 3 month period. Nutritional requirements were estimated for the group with the equation of 20–25 kcals/kg & 1.2–1.5 g protein/kg. Eligibility were enterally fed and mechanically ventilated patients >72 h. Energy and protein received and reasons for interruptions in enteral feeding were recorded until ICU discharge or for a maximum of 30 days.
RESULTS. Interim analysis of 15 out of an estimated 60 patients showed that the mean prescribed energy and protein requirements per day were 1763 kcal ± 199 kcal and 80.9 g ± 10.2 g respectively. The mean actual energy and protein intake per day were

1083 kcal ± 320 kcal and 40.9 g ± 12.9 g respectively. A total of 10 patients (66.6 %) received <80 % of their energy requirements, 4 patients (26.7 %) received within ±10 % of this and 1 patient (6.7 %) received full requirements (100 %). All patients (100 %) received <80 % of their protein requirements and 2 patients (13.3 %) received within ±10 % of this. 4 patients (26.7 %) had achieved ≥80 % of their energy requirements by day 4. Fasting for procedures accounted for the majority of feed interruptions (32.8 %). Other reasons for interruptions were high gastric output and enteral feed challenge which accounted for 12.9 % and 10.7 % respectively.

CONCLUSIONS. Interim records revealed an unsatisfactory feeding process. Fasting for procedures was the principle reason for feed interruptions. A "catch up" feeding strategy, namely increasing protein and energy intake could enhance nutritional intake. A full review will be concluded shortly and gathered data will be used to develop a feeding strategy to help optimise nutritional intake and prevent inadequacies in ICU feeding practice.

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0511

DIAGNOSIS AND MANAGEMENT OF GASTROINTESTINAL (GI)-MOTILITY DISORDERS—RESULTS OF A SURVEY AMONG AUSTRIAN AND ESTONIAN INTENSIVE CARE PHYSICIANS (ICP)

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INTRODUCTION. GI-motility disorders are frequent in critically ill patients. Immobility, sedation, hemodynamic instability and most drugs used at the ICU inhibit GI-motility, leading to increased morbidity and mortality, longer ICU stays and higher costs.

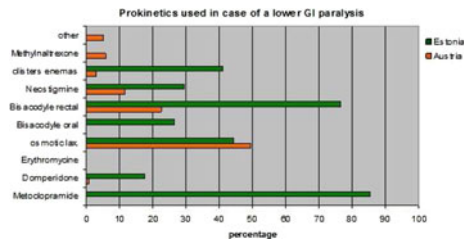
OBJECTIVES. The aim of this study was to evaluate diagnostic and management procedures of GI-motility disorders and to compare the strategies between Austrian (A) and Estonian (EST) ICPs. We also wanted to find out whether the current recommendations have found their way into clinical practice.

METHODS. Evaluation of a multiple choice questionnaire answered by Austrian (n = 137) and Estonian (n = 34) ICPs.

RESULTS (A vs. EST). About a third of all respondents (29 vs. 35 %) use a Standardized Operating Procedure (SOP) to manage GI-motility disorders.

Signs for normal GI-function are the ability for enteral nutrition (EN; 90 vs. 88 %), the passage of stool (88 vs. 68 %) and the absence of GI-symptoms (47 vs. 74 %). Auscultation of the patient's abdomen is a common procedure (93 vs. 100 %), independent from the fact that bowel sounds as an indicator for the GI-function lost their importance (69 vs. 53 %).

Upper GI paralysis: 32 % of the Estonian ICPs prefer a prophylactic prokinetic therapy in contrast to Austrian ICPs (8 %). There is also a clear difference between the two countries concerning the indication for treatment of gastric residual volumes (GRV): >350 ml/day justify prokinetics for 57 % of the Austrian ICPs (vs. 3 %), and >500 ml/day for 41 % of the Estonian (vs. 3 %). Metoclopramide is the most common prokinetic to treat upper GI-motility disorders (88 vs. 100 %). A time limitation of treatment because of tachyphylaxis (≤5 days) is not common (64 vs. 56 %). Erythromycine (not available in Estonia) is used by 70 % of the Austrian ICPs, unfortunately very often at an inadequate high dose (3 × 100 mg vs. 3 × 200 mg: 42 vs. 38 %). Interestingly, 37 % of the Austrian ICPs use neostigmine to treat upper GI-motility disorders (vs. 0 %). Lower GI paralysis: Treatment of a lower GI-paralysis differs significantly between Austrian and Estonian ICPs (see figure; the peripheral μ-receptor antagonist methylnaltrexone is not available in Estonia).



Prokinetics

CONCLUSIONS. This survey clearly demonstrates a need for improvement: Clear recommendations and SOPs are required concerning the indication for prophylactic prokinetic therapy and the amount of gastric residual volumes requiring prokinetic therapy. A stricter implementation of the current recommendations concerning duration of treatment and dosage of erythromycine and metoclopramide is required.

0512

DURATION OF TIME TILL NORMOGLYCEMIA WITH STRICT GLYCEMIC CONTROL IS INDEPENDENTLY ASSOCIATED WITH LENGTH OF STAY IN ICU

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INTRODUCTION. Hyperglycemia is associated with mortality and morbidity of critically ill patients. It is uncertain whether duration of time till normoglycemia (defined as blood glucose level (BGL) <110 mg/dl) is associated with outcome.

OBJECTIVES. To investigate the association of duration of time till normoglycemia with ICU mortality and ICU length of stay (LOS).

METHODS. This is a secondary analysis of a recently completed implementation project of strict glycemic control (aiming for BGL between 80 and 110 mg/dl) in three mixed medical-surgical ICUs in the Netherlands. Patients who reached normoglycemia were included in the analysis. Blood glucose measurements, patient demographics and outcome information were collected. Logistic regression analysis was used to investigate the association between time till normoglycemia and ICU mortality, and time till normoglycemia and ICU-LOS. The multivariate analysis included BGL on admission and median BGL during stay in ICU, severity of illness (APACHE II score); admission type (medical or surgical); need for CVVH and/or mechanical ventilation and the body mass index.

RESULTS. Data of 1.818 patients in the 2 years after implementation were analyzed. Duration of time till normoglycemia was not associated with ICU mortality (Odds ratio 1.00 (0.99–1.00), p = 0.87, and 1.00 (1.00–1.01), p = 0.81, for univariate and multivariate analysis respectively). Duration of time till normoglycemia was associated with ICU-LOS (Odds ratio 1.04 (1.03–1.06), p < 0.001 and 1.05 (1.03–1.06), p < 0.001, for univariate and multivariate analysis respectively).

CONCLUSIONS. Duration of time till normoglycemia is independently associated with ICU-LOS, but not with mortality.

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0513

IMPACT OF HYPOGLYCEMIA AND MEAN BLOOD GLUCOSE ON MORTALITY IN CRITICALLY ILL PATIENTS - A RETROSPECTIVE COHORT STUDY

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INTRODUCTION. Tight glycemic control in critically ill patients is still a controversial topic [1, 2]. One of the main reasons for the ongoing debate is the increased risk for potentially harmful hypoglycemic episodes during intensive insulin therapy [3]. Hence the ideal glucose target range in critically ill patients remains unclear.

OBJECTIVES. The aim of this study was to identify an influence of hypoglycemia and mean blood glucose levels on ICU- mortality in a mixed intensive care cohort.

METHODS. We conducted a retrospective cohort study with 1580 patients admitted to the Medical Intensive Care Unit of the Department of Medicine III, Medical University Vienna, between the years 2000 and 2009. To demonstrate an independent influence of hypoglycemia and mean blood glucose levels on ICU-mortality, multivariable logistic regression analyses were performed.

At least one episode of minimum blood glucose below 40 mg/dl was defined as severe, 40–59 mg/dl as moderate and 60–79 mg/dl as mild hypoglycemia. Odds ratios (ORs) for the three hypoglycemic categories were calculated compared to patients with minimum blood glucose of 80–160 mg/dl.

To identify the ideal mean blood glucose level, the influence of blood glucose categories of <80, 80–110, 110–160, 160–200 und >200 mg/dl on ICU-mortality was investigated.

RESULTS. The highest mortality was found in patients with at least one episode of minimum blood glucose below 40 mg/dl and decreased with severity of hypoglycemia. ORs for <40 mg/dl and 40–59 mg/dl were 4.72 (p < 0.001) und 2.48 (p < 0.001). Mild hypoglycemia did not show a significant influence on ICU- mortality (p = 0.108). Severe and moderate hypoglycemia were found predominantly in patients with comparatively long ICU- stays. When considering diabetes mellitus, the highest mortality was found in non-diabetic patients with at least one episode of minimum blood glucose below 40 mg/dl.

Mean blood glucose of 110–160 mg/dl was associated with the lowest ICU-mortality in our cohort. The OR for this glucose category compared to mean blood glucose of 80–110 mg/dl was 0.59 (p = 0.002).

CONCLUSIONS. Moderate as well as severe hypoglycemia significantly influenced ICU-mortality in our mixed intensive care cohort. The mean blood glucose range with the lowest mortality in this population was 110–160 mg/dl.

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0514

EVALUATION OF GLYCEMIC CONTROL WITH DIFFERENT INTENSIVE INSULINE PROTOCOLS IN CRITICALLY ILL PATIENTS

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INTRODUCTION. We intended to compare intensive insuline protocol (IIP) of our hospital (named as FSM) with Charles University of Prag Protocol (named as CUP) and a modified protocol (named as Modified FSM) that was formed by covering the deficient parts of these two protocols (FSM and CUP) on our critically ill patients.

METHODS. Glycemic control was observed by beginning with three IIPs on 57 patients; aged between 33 and 90, with blood glucose levels (BGL) over 200 mg/dl, measuring BGLs 8875 times in 952 hospital days. Age below 18, brain death, diabetic ketoacidosis, non-ketotic hyperosmolar coma patients were excluded from the study. In FSM protocol (on 22 patients): After the beginning with bolus insuline doses, we have started 2 units/hour intravenous insuline infusion and BGL was checked every 2 hours. Insuline infusions were changed according to the BGL. (BGL > 160 mg/dl: 2.5 U, BGL 140–159 mg/dl: 2.2 U/h, BGL 120–139 mg/dl: 2 U/h, BGL 100–119 mg/dl 1 U/h, BGL < 100 mg/dl: infusion stopped). CUP protocol was begun as shown in the literature on 16 patients. In Modified protocol (on 19 patients): CUP protocol was used above 160 mg/dl and FSM protocol was used below 160 mg/dl. Protocols were compared by the mean values, standard deviations and percentage of measurements on Severe Hyperglycemia (>200 mg/dl), Acceptable Level (151–200 mg/dl), Target Level (81–110 mg/dl), Low normoglycemia level (61–80 mg/dl), hypoglycemia level (<40 mg/dl).

RESULTS. There was no difference in demographic data between groups. The average of the number of attempted bolus insuline dose in Modified FSM protocol was statistically significant lower than other groups (FSM, CUP) (p = 0.026, p = 0.0001). (p = 0.028, p = 0.002). The amount of bolus dose insuline was also significantly lower (p = 0.039, p = 0.006). Total insuline dose was significantly lower in FSM protocol (p = 0.032, p = 0.0001). Severe hyperglycemia percentage of measurements in FSM group was significantly higher (p = 0.055, p = 0.028) and target level percentage of measurements were significantly lower than the other groups (p = 0.003, p = 0.01). Hypoglycemic level

percentage of measurements of CUP protocol was significantly higher than the other groups. ($p = 0.04$, $p = 0.01$).
CONCLUSIONS. Modified FSM protocol was formed because of the higher number of hypoglycemic attacks seen in CUP protocol, the higher percentage of presence of severe hyperglycemia in FSM protocol and maintained better BGLs. We suggest that there is no standard protocol in glycemic control and every intensive care unit has to form their own protocols according to the characteristics of patients and the quality of the team and the equipments.
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0515
GLUCOSE CONTROL IN CRITICAL CARE: PRELIMINARY EXPERIENCE OF THE B BRAUN SPACE GLUCOSE CONTROL™ SYSTEM

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INTRODUCTION. Both hyperglycaemia [1] and high glucose variability [2] are associated with a poor outcome in intensive care patients. However protocols designed to control blood glucose may themselves be associated with poor outcomes due to increased risk of hypoglycaemia [3].
Model predictive control (MPC) algorithms use a model of the glucoregulatory system to predict glucose excursion over time and thus advise insulin requirements. MPC has been shown to be safe and effective in controlling glycaemia in critically ill patients [4]. B Braun Medical Ltd. have incorporated an enhanced MPC algorithm into an insulin and feed infusion system called the Space Glucose Control™ (SGC). We have been using SGC to control glycaemia in critically ill patients in our general Intensive Care Unit at the Royal Cornwall Hospital.
OBJECTIVES. We sought to compare glycaemic control using SGC with our standard Bath protocol[5].
METHODS. We included adult patients receiving insulin for glycaemic control for over 6 h. We excluded patients with a diabetic ketoacidosis or hyperosmolar state. We retrospectively analysed glucose data collected as part of routine care, and compared data from patients on SGC (June 2011 to February 2012) with control patients (March to December 2011) who had received our standard protocol.
We compared time spent in a pre-determined range of 3.5–10.0 mmol l^{-1} using the Chi squared test with Yate's correction. Comparison of mean glucose was assessed with an unpaired t test, and variance was assessed using a one way ANOVA. Incidence of hypoglycaemia ($\leq$2.2 mmol l^{-1}) was noted. **RESULTS.** We identified 14 patients who spent a total of 1,230 h on SGC and 79 control patients who spent 30,481 h on our standard protocol. Significantly more time was spent in range in the SGC group compared to control. We recorded 28 h (2.3 % of total time) out of range in the SGC group compared to 2686 h (8.4 %) in the control group ($p < 0.0001$). Mean [sd] blood glucose was significantly lower in the SGC group compared to control (6.9 [1.6] mmol l^{-1} vs. 7.4 [2.1] mmol l^{-1}, $p < 0.0001$). One way ANOVA showed an F-ratio of 35.7, $p < 0.0001$. No patient suffered hypoglycaemic events whilst on either protocol, though one hypoglycaemic event was recorded in a patient who had been on SGC 6 days earlier.
CONCLUSIONS. In our institution patients receiving glycaemic control with the SGC experienced tighter blood glucose control compared to our standard protocol. We experienced a very low incidence of hypoglycaemia. SGC appears to be a safe and effective means of achieving glycaemic control.
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0516
GLYCEMIA MONITORIZATION AND MORTALITY IN SEVERE SEPSIS AND SEPTIC SHOCK

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INTRODUCTION. Prevention of glucose toxicity by strict glycemic control but also other metabolic and non-metabolic effects of insulin contribute to clinical benefits.
OBJECTIVES. To analyze the levels of blood glucose in patients with severe sepsis and septic shock and related them with clinical parameters and prognoses.
METHODS. Over 20 months (October 2008 and May 2010) we design a cohort prospective study with 150 patients >17 years and *admitted* in Intensive Care Unit (ICU), with severe sepsis or septic shock. Within 24 h from the beginning of the pathology, the determination of blood glucose (mg/dl) was made in serum by Vista Dimension®, Siemens Healthcare Diagnostics), following 2008 clinical guidelines from the Surviving Sepsis Campaign(SSC). Descriptive and comparative statistical analysis was performed using SPSS version 15.0 (SPSS Inc., Chicago, IL, USA).
RESULTS. We analyzed 150 consecutive episodes of severe sepsis (16 %) or septic shock (84 %) admitted in the ICU. The median age of the study sample was 64 (inter-quartile range, 48.7–71) years old; male was 60 %, with APACHE II of 25.48 ± 6.72 and SOFA of 9.7 ± 3.19. The average stay in UCI was 10 ± 5.7 days and 28- days mortality was of 22.7 % (n = 34). The blood glucose was controlled with scores ≤150 mg/dl in 82.7 % (n = 124) of our patients and without hypoglycemia values (≤60 mg/dl). Mortality was non-significant higher in the group with values superior than 150 mg/dl, 26.9 % vs. 21.8 %; p = ns. The medium of glycemia within the first 24 h was non-significant greater in those who passed away, 150.71 mg/dl vs. 144.92 mg/dl; p = ns.
CONCLUSIONS. Our results confirm the importance of the Management Bundle within the first 24 h of the beginning of severe sepsis, the moderate control of glycemia, with values lower 150 mg/dl (8.3 mmol/l) using a protocol that allows to fit to the insulin avoiding hypoglycemia and the fluctuations of the glucose levels.
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0517
A SPOONFUL OF SUGAR - GLYCAEMIC CONTROL USING A MODIFIED BATH PROTOCOL IN AN ADULT INTENSIVE CARE UNIT

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INTRODUCTION. Stress hyperglycaemia is common in critically ill patients and is associated with poorer outcomes in various patient groups [1, 2]. Tight glycaemic control in critically ill patients may increase mortality [3] and the optimal blood glucose range in such patients is unknown. Previously the Bath protocol was used in our unit [4].
OBJECTIVES. Glycaemic control using the Bath protocol in our centre was audited in 2004 and found to have a high incidence of hypoglycaemia. The protocol was modified by increasing the range of optimal glycaemic control from 4–7 mmol/l to 5–8 mmol/l, and re-audited to determine if the risk of hypoglycaemia had subsequently reduced.
METHODS. Prospective data collection from all patients admitted to our ICU requiring our modified Bath protocol intravenous insulin regime for glycaemic control. Patient demographics, incidence of mild (<4.0 mmol/l) and severe (<2.3 mmol/l) hypoglycaemia, incidence of mild (>10.0 mmol/l) and severe (>16.0 mmol/l) hyperglycaemia, presence of diabetes mellitus, sepsis, steroid prescription, ventilatory support and inotrope usage were all recorded.
RESULTS. In 116 audited patient days there were 9 episodes (7.8 episodes per 100 days) of hypoglycaemia (none severe). Of the patients who had a hypoglycaemic episode, 29 % had more than one, and all had hyperglycaemic episodes.
There were 109 episodes (93.9 episodes per 100 days) of hyperglycaemia and one episode of severe hyperglycaemia. Of the patients who had a hyperglycaemic episode, 82 % had further episodes.
Patients with diabetes and those on inotropes were more likely to have dysglycaemic episodes; other characteristics had no demonstrable effect on glycaemic control.
CONCLUSIONS. Our modification of the Bath protocol reduced the risk of hypoglycaemia (7.8 per 100 days in 2011 compared to 11.3 in 2004). Those patients who had hypoglycaemic episodes also had hyperglycaemic episodes, suggesting they were particularly difficult to control. It increased the risk of hyperglycaemia (93.9 episodes per 100 days in 2011 compared to 39.2 in 2004). It appears to give poorer glycaemic control in diabetic patients and those who are most unstable, indicated by inotrope usage. As current evidence suggests there is increased harm associated with hypoglycaemia, and little harm from hyperglycaemia, we conclude that our local modification of the Bath protocol is favourable.
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Cardiovascular failure in the ICU: 0518–0530

0518
EXTRACORPOREAL TREATMENTS AS A RISK FACTORS FOR DEEP VENOUS THROMBOSIS IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Deep vein thrombosis (DVT) is a major complication in Intensive Care Unit (ICU). Since 2006, a vascular ultrasound surveillance program performed by intensivists started in our general Intensive Care Unit (ICU).
METHODS. This prospective study included patients admitted to our ICU of a tertiary referral center for trauma and ECMO assistance (Careggi Teaching Hospital, Florence, Italy) in 2010 and 2011. The level I vascular US consists of evaluation of the lumen, and complete compressibility of the vein compression: it is performed by the intensivist on duty within the first 24 h after ICU admission, every 7 days of the ICU stay or in cases of suspected DVT. Level I examination includes also the proximal upper extremities and internal jugular veins. A level II US examination is performed by a vascular specialist as a second opinion in case of unclear or positive level I examinations. DVTs already present at ICU admission were not included in the study, as well as central venous catheter-related thrombosis less than 3 mm of thickness.
During extracorporeal treatment (extracorporeal membrane oxygenation, ECMO; continuous veno-venous hemofiltration, CVVH), heparin infusion was titrated by a PTT monitoring (60–70 %) performed both by daily central laboratory dosage and by two-hours bedside measurement (Hemochron Jr. Sign. plus, ITC Europe, Milan, IT).
Continuous variables were analysed with Mann–Whitney test. Categorical variables were examined using Fisher's exact test. P significant if <0.05. Univariable comparison were reported as odds ratio (OR) with 95 % confidence intervals (CI). A logistic regression model was adopted to investigate the predictors TVP in overall population.
RESULTS. A total of 802 patients were studies, 74 included in DVT group (incidence of DVT 9.2 %), 728 included in non- DVT group. Groups resulted similar in demographic, clinical characteristics, degree of critical illness. In details, lower extremities DVTs were 19, upper DVTs 9, CVC related DVTs were 46. DVT patients did not show a significant higher mortality (25.7 % vs. 19.6 %, P = 0.1698). Generic predictor for DVT in multivariate analysis were higher BMI (P = 0.0234), duration of mechanical ventilation (P < 0.0001), ICU length of stay (P < 0.0001).
Patients with an increased risk of DVT were those treated with CVVH (**OR 2.553**, CI 1.393-4.676; P = 0.0048), with ECMO (**OR 3.419**, CI 1.702-6.868; P = 0.0013) and with both CVVH and ECMO (**CI 5.573**, CI 1.658-18.737; P = 0.005).
CONCLUSIONS. In our study, extracorporeal circulation independently increases the risk of DVT from two to five times depending of type of extracorporeal treatment (CVVH, ECMO) and under correct anticoagulant range.

0519

SAFETY OF PREOPERATIVE USE OF ANGIOTENSIN-CONVERTING ENZYME INHIBITORS/ANGIOTENSIN IN CARDIAC SURGERY

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INTRODUCTION. Acute kidney injury (AKI) occurs in up to 30 % of patients following cardiac surgery and is associated with significant morbidity and mortality. Because they are thought to increase the risk of hypotension and renal failure, angiotensin-converting enzyme inhibitors (ACEI) and angiotensin receptor antagonists (ARB) are often withheld before cardiac surgery. However, there is conflicting data regarding the safety of preoperative exposure to ACEI and ARB.

OBJECTIVES. The objective of this study was to evaluate the safety of ACEI or ARB used preoperatively on the risk of AKI at 48 h post operatively and the use of vasopressors.

METHODS. Charts from all patients undergoing cardiac surgery between January 2008 and 2010 were reviewed. Patients with end-stage renal disease and patients who died within 96 h of surgery were excluded. Preoperative and intraoperative risk factors for AKI including the use of ACEI and ARB, demographics, duration of bypass, past medical history of diabetes, hypertension or cardiac failure and use of diuretics were assessed. Exposure was defined as having received an ACEI or an ARA in the 48 h preceding surgery. AKI in the first 48 h following cardiac surgery was evaluated using the AKIN creatinine criteria (level 1 or greater). Univariate and multivariate logistic regression were used to evaluate independent risk factors of AKI. Variables with a $p < 0.05$ were included in the multivariate model.

RESULTS. A total of 984 patients were included. The mean age was 65.7, mean weight was 80.6 kg and 75.2 % were men. In the first 48 h, 104 patients developed AKI (10.6 %). In total, 35.9 % of patients were considered exposed to ACEI and 17.7 % to ARB. In univariate analysis, exposure to ACEI was not associated with AKI. However, exposure to ARB was associated with an increased risk of AKI (OR 1.75; 95 %CI 1.09–2.81). In multivariate analysis, ARB exposure was no longer associated with AKI. Statistically significant risk factors of AKI were weight (OR 1.03 per kg; 95 %CI 1.02–1.05), diabetes (OR 1.89; 95 %CI 1.20–2.99), left ventricular ejection fraction lower than 40 % (OR 1.94; 95 %CI 1.14–3.31), and duration of bypass (OR 2.8 per hour; 95 %CI 1.14–3.31). Higher preoperative creatinine clearance was protective (OR 0.98; 95 %CI 0.97–0.99). Preoperative exposure to ACEI or ARA was not associated with increased postoperative vasopressor or inotrope use.

CONCLUSIONS. From this retrospective analysis, it could be suggested that ACEI exposure is neither associated with postoperative AKI in patients with normal preoperative renal function nor with an increased need for postoperative vasopressors or inotropes. The risk of AKI with ARB exposure should be studied more extensively. Future randomized controlled trials comparing the preoperative exposure to these agents are warranted to evaluate the safety of these agents.

0520

HAEMODYNAMICS, INFLAMMATION AND MORTALITY IN MEDICAL PATIENTS WITH FIRST DIAGNOSIS ATRIAL FIBRILLATION WITHIN A GENERAL INTENSIVE CARE UNIT

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INTRODUCTION. Atrial fibrillation (AF) affects at least 1.8 % of the population. The incidence of AF varies between 6.5 % and 15 % in medical intensive care patients. Inflammation and changes in inflammatory biomarkers are associated with AF in a general ICU setting. However, whether the inflammatory changes are more marked in a surgical or medical ICU patients with AF remains unclear. The association of haemodynamic changes, C-reactive protein (CRP) and mortality in medical patients with AF on ICU has not been studied.

OBJECTIVES. To determine association of CRP, heart rate and systolic blood pressure with morbidity and mortality in medical patients with AF within a general ICU.

METHODS. Retrospective observational cohort analysis of 92 medical patients with AF admitted to a Scottish teaching hospital ICU between April 2006 and September 2009. The interaction between CRP, length of stay on ICU, time spent at heart rates between greater than 100 beats per minute, time with systolic blood pressures of $\leq$90 mmHg and the associated morbidity and mortality were evaluated.

RESULTS. Of the 92 medical patients on the general ICU, 75 % had first diagnosis AF and 25 % had pre-existing AF. Hospital mortality was 65.2 % in those with first diagnosis AF compared with 39.1 % in patients with pre-existing AF. APACHE II mean scores were 26.7 versus 27.7 and mean peak CRP was 209.5 versus 197.6 in the respective groups. The first diagnosis AF patients who died spent a shorter mean time with a systolic $\leq$90 mmHg [1000.37 min(min) vs. 1543.63 min] and had a shorter mean length of stay on ICU (15,408.49 vs. 17,059.44 min) compared with patients with pre-existing AF who died. The first diagnosis AF patients had a 56.5 % unit mortality. Of the medical patients with first diagnosis AF whose heart rate exceeded 100 bpm, survivors spent a shorter mean time with a heart rate 100–119 bpm (4,353.79 vs. 4,417.58 min) and 120–139 bpm (1,014.85 vs. 1,178.42 min) compared with non-survivors.

CONCLUSIONS. An association exists between first diagnosis AF, raised peak inflammatory markers, heart rate and mortality in medical patients within ICU. The results may suggest that medical patients with first diagnosis AF are more unwell (despite similar mean APACHE II scores) than those with pre-existing AF and so, it could reflect disease severity. Further adequately powered prospective studies are required, evaluating the association of haemodynamic changes, inflammatory biomarkers and outcomes when these patients are aggressively treated for the underlying cause of their new onset AF. Consideration needs to be given as to whether modifying the inflammatory response by means of the adjunctive administration of antioxidant medications will assist in reducing the incidence of first diagnosis AF in medical patients on ICU.

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0521

EPIDEMIOLOGY, CAUSES AND OUTCOME OF CARDIAC ARREST IN HIV INFECTED PATIENTS: RESULTS OF THE MULTICENTRIC CARAIDS STUDY

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INTRODUCTION. Large use of potent antiretroviral therapy has dramatically improved survival among patients infected with the human immunodeficiency virus (HIV). If cardiovascular diseases are the leading cause of non-HIV related deaths in HIV-infected patients, co-morbidities, chronic medication and immunodepression may lead to multiple other causes of sudden death. While characteristics of organ failure occurring in HIV patients are now well-described, only isolated cases of sudden deaths occurring in HIV patients have been reported.

OBJECTIVES. We aimed at describing characteristics of HIV patients admitted to ICU for successfully resuscitated cardiac arrest (CA).

METHODS. We retrospectively reviewed all cases of CA occurring in HIV infected patients identified in 18 ICUs in France between January 2000 and January 2012. Patients were included if. 1. CA was the reason of admission to ICU, 2. patient over 18, 3. HIV infection was already known or discovered during ICU course. Epidemiological, clinical and outcomes were collected and analysed. Data are expressed as median [interquartile].

RESULTS. 93 patients (median age 44 years [38–51], sex ratio M/F 1.6) were included in the study. SAPS II at admission reached 88 [72–106]. HIV infection was diagnosed for 9 [4–15] years. Viral load was 42.5 [0–12681] copies/mL and CD4 + lymphocyte count was 220 [39–477]/mm^3. Thirty-seven percent of the cohort had had at least one opportunistic infection. Highly active antiretroviral therapy was noted in 69 (74 %) patients. Most of cases were in-hospital CA (55 %). Initial rhythm was non-shockable in 62 % of cases. No flow and low flow durations were 0 [0–6] and 15 [6–30] min, respectively. CA was mostly due to: respiratory cause in 32 patients (including 5 cases of pneumonia), cardiac origin in 31 patients (acute coronary syndrome in 16 patients, rhythm/conduction trouble in 11 patients) neurologic disease in 8 cases and toxic use in 5 cases. CA was deemed directly related to HIV infection in 16 cases (17 %). Initial imaging procedures included brain CT scan in 39 cases, contributive in 4 cases, chest CT scan in 13 cases, contributive in 6 cases, and coronary angiography in 19 cases. Coronary artery lesions were responsible for CA in 12 patients. Therapeutic hypothermia was performed in 34 patients (36 %). Post resuscitation shock occurred in 61 % of the cohort, requiring renal replacement therapy in 30 % of cases. Sixty-seven patients (72 %) died in the ICU: 21 cases of multi-organ failure, 10 cases of CA recurrence, 26 cases of anoxic encephalopathy and 3 cases of refractory CA. Among the 26 surviving patients, 21 were alive at hospital discharge and 18 after 1 year of follow-up.

CONCLUSIONS. Cardiac arrest aetiologies in HIV patients are miscellaneous and mostly not related to HIV infection. Outcome remains bleak but seems similar to the one of HIV seronegative patients.

0522

RIGHT VENTRICULAR DYSFUNCTION MAY WORSEN RENAL FUNCTION AFTER CARDIAC SURGERY WITH CARDIOPULMONARY BYPASS

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INTRODUCTION. Acute kidney injury (AKI), which commonly develops in as many as 30 % of patients after cardiac surgery, is associated with increased morbidity and mortality. Several factors have been described. Some authors have suggested that right ventricular function may participate to AKI in cardiologic area.

OBJECTIVES. The objective of the study was to demonstrate that right ventricular function assessed by transthoracic echocardiography is associated with AKI after cardiac surgery.

METHODS. After IRB approval, 74 patients following cardiac surgery with cardiopulmonary bypass were included. Left and right ventricular function were assessed before the surgery and at admission to ICU (immediately after the surgery) by transthoracic echocardiography: left ventricular ejection fraction (LVEF), right ventricular ejection fraction (RVEF), systolic mitral annular motion at the lateral wall Sl (m), tricuspid annular plane systolic excursion (TAPSE), systolic tricuspid annular motion at the lateral wall Sr(t). Values for TAPSE, Sr(t), and RVEF were divided into quartiles and the bottom quartile used to represent significant right ventricular (RV) dysfunction. Due to the complex geometry and lack of accepted standard for echocardiographic evaluation of RV function, RV dysfunction (RVd) was defined by 2 positive measures significant RV dysfunction among different RV measures (RVEF, Sr(t), TAPSE). Left ventricular dysfunction (LVD) was defined by an ejection fraction below 40 % calculated by the Simpson' formula. AKI was defined using the RIFLE classification. Data are expressed as median (25th–75th).

RESULTS. Median age was 69 (60–75) years, logistic Euroscore was 4.5 (2.2–8.7), cardiopulmonary bypass time was 65 (43–89) min. 20 patients (27 %) developed AKI. Patients with AKI have higher CVP (11 vs. 8, $p = 0.04$). Whereas echocardiographic data were similar before the surgery, patients with AKI have more patterns of RVd (9 vs. 4 patients, $p < 0.0001$), and LVd (6 vs. 5 patients, $p = 0.05$) (Table 1). Multivariate analysis showed a higher association between AKI and RVd (OR = 12.4 95 % CI (2.9–51.3), $p = 0.001$) than AKI and LVd (OR = 5.7 95 % CI (1.3–24.9), $p = 0.02$).

Hemodynamic and echocardiographic data

	No AKI (n = 54)	AKI (n = 20)	P value
Heart rate (beat min-1)	77 (68–87)	79 (70–92)	0.42
Mean arterial pressure (mmHg)	78 (67–95)	78 (69–87)	0.84
Central venous pressure (mmHg)	8 (4–11)	11 (8–13)	0.04
LVEF (%)	52 (40–60)	43 (34–50)	0.13
Sl(m) (cm s-1)	9.3 (8.1–10.8)	7.9 (6.3–10.8)	0.25
RVEF (%)	43 (40–50)	35 (23–40)	0.01
Sr(t) (cm s-1)	8.3 (6.9–9.6)	6.4 (4.7–8.2)	0.02
TAPSE (cm)	1.3 (1–1.7)	1 (0.8–1.3)	0.02

CONCLUSIONS. Our results suggest that RVd may be associated with AKI after cardiac surgery. The venous compartment has a greater part in the hemodynamic regulation of the renal dysfunction than the arterial compartment. Evaluation of the right heart function after cardiac surgery may be part of routine.

0523

EFFICACY OF LEVOSIMENDAN IN INTENSIVE CARE UNIT PATIENTS WITH IMPAIRED CARDIAC FUNCTION MANIFESTING FAILURE TO WEAN FROM MECHANICAL VENTILATION

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INTRODUCTION. Intensive care unit (ICU) patients frequently develop low cardiac output syndromes (LCOS) due to cardiac dysfunction, myocardial injury, and inflammatory activation. LCOS is associated with increased morbidity, mortality, failure to wean from mechanical ventilation (MV) and longer ICU stay.

OBJECTIVES. To evaluate the role of levosimendan in improving cardiac performance and the success rate of weaning from MV in ventilator- dependent, difficult-to-wean patients with impaired cardiac function in the intensive care unit when conventional inotropic proved to be insufficient.

METHODS. From December 2009 to January 2012 we observed 48 ICU patients, M:F ratio : 1:5, mean age 58.5 (range 38–75) years who were ventilator-dependent for $\geq$14 days and had failed a weaning or extubation attempt due to respiratory insufficiency and were identified as difficult to wean from MV. All were assessed by Transthoracic or Transesophageal echocardiography. Twenty five patients had impaired left ventricular performance demonstrated by left ventricular ejection fraction LVEF 28 % (range 15–40), Cardiac Index (CI) <2.1 l/min/m^2 and $ScvO_2$ <65 %. Those 25 patients with LCOS were treated with standard intravenous inotropic agents, 11 patients out of 25 resulted in no improvement but in clinical deterioration. Thus, standard intravenous inotropic support was stopped and levosimendan treatment was introduced. All the patients received a continuous 24-h infusion 0.1 μg/kg/min of levosimendan. In two patients an initial loading dose of 10 μg/kg over 10 min was administrated too. LVEF was measured again within 24 and 48 h after infusion, and weaning from mechanical ventilation and extubation were re-attempted, when clinically deemed feasible. We collected hemodynamic and respiratory variables, complications and outcome.

RESULTS. Levosimendan administration was associated with significantly improved LVEF (28. % before vs. 35 % after, $P < 0.05$), CI (1.8 $\pm$ 0.31 l/min/m^2 vs. 3.0 $\pm$ 0.7 l/min/m^2) and PaO_2/FIO_2 ratio (165 mmHg vs. 208 mmHg, $P < 0.005$) and reduced FIO2 (0.50 vs. 0.40, $P < 0.01$). These changes were associated with significant improvement in the success rate in weaning from mechanical ventilation ($P < 0.05$), with seven of the 11 patients successfully weaned after levosimendan therapy, and four surviving to hospital discharge. Side effects attributable to levosimendan: 2 patients had refractory hypokalemia, one patient had o drop in haemoglobin and 2 patients had hypotension that responded to fluid administration. There was no significant difference in any other important parameter between pre- and post-levosimendan weaning attempts.

CONCLUSIONS. Levosimendan may provide significant benefit to ventilator-dependent patients with impaired left ventricular function especially when is refractory to standard inotropic agents.

0524

DIABETES AND INSULIN: CORONARY ANATOMY AND SURVIVAL IN DIABETIC PATIENTS WITH CARDIOGENIC SHOCK

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INTRODUCTION. Mortality remains substantially higher in patients with Diabetes Mellitus (DM) following reperfusion for acute coronary syndromes (ACS) in comparison with those without diabetes, despite contemporary management with percutaneous coronary intervention (PCI) [1]. Cardiogenic shock is the leading cause of in-hospital mortality after acute myocardial infarction (AMI) [2].

OBJECTIVES. To analyze the influence of diabetes mellitus and insulin treatment on mortality in patients with cardiogenic shock following acute myocardial infarction (AMI). All patients were treated with intra-aortic balloon pump (IABP), coronary reperfusion and vasopressor support.

METHODS. Retrospective analysis was performed over a period of 10 years, on patients admitted to the hospital in cardiogenic shock with AMI. In all patients percutaneous coronary intervention (PCI) was performed and IAPB implanted. We analyzed epidemiological data, coronary disease and mortality related to diabetes mellitus and insulin treatment. Statistical analysis was performed by Chi-square test and Fisher test.

RESULTS. We studied 100 patients with an average age of 62 $\pm$ 10.6 years (64 % male). All patients had cardiovascular risk factors and 40 % had previous ischemic cardiomyopathy (ICM). The APACHE II at admission was 17.26 $\pm$ 9.29. As reperfusion therapy: 74 % were treated with primary angioplasty and 26 % of them received thrombolysis and rescue angioplasty. 75 % of patients had multivessel disease. TIMI III flow result was obtained of the infarct related artery in 88 % of the cases. Among them 49 % were diabetic: 32.74 % insulin dependent diabetes mellitus (IDDM) and 67.3 % insulin non dependent diabetes mellitus (INDDM). Clinical and epidemiological data are presented in Table 1.

Table 1

Risk Factors	No DM (n = 51)	DM (n = 49)
Age	59.82 $\pm$ 10.96	66.04 $\pm$ 9.35
Gender (Male)	37 (72.51 %)	27 (55.1 %)
Tobacco	35 (68.6 %)	19 (38.8 %)
Hypertension	24 (47.1 %)	31 (63.3 %)
Ischemic cardiomyopathy	20 (39.2 %)	20 (40 %)
APACHE II on admission	16.31 $\pm$ 8.92	18.30 $\pm$ 9.73
Mortality*	25 (49 %)	36 (73 %)
Multivessel disease*	66.7 %	84.0 %
Left main coronary artery disease	17.6 %	21.3 %

In Table 2 presented the results when analyzing the same variables differentiating between IDDM and INDDM.

Table 2

Risk Factors	IDDM (n = 14)	INDDM (n = 33)
Age	66.13 $\pm$ 5.9	66 $\pm$ 10.72
Age	7 (50 %)	19 (57.6 %)
Tobacco	6 (42 %)	12 (36 %)
Hypertension	19 (64 %)	19 (57.6 %)
Schemic cardiomyopathy	8 (50.1 %)	12 (36.32 %)
APACHE II on admission	20.33 $\pm$ 12.86	18.31 $\pm$ 10.93
Mortality	10 (71.4 %)	24 (72.7 %)
Multivessel disease	92.9 %	78.8 %
Left main coronary artery disease	31.37 %	15.2 %

CONCLUSIONS. In our study diabetic patients presented more multivessel disease and IDDM patients are more affected by left main coronary artery disease than patients without diabetes. In our study mortality remains substantially higher in patients with DM in comparison with those without diabetes However there are no differences between the IDDM and INDDM.

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0525

A SURVEY ON THE IMPLEMENTATION OF THE EARLY GOAL-DIRECTED THERAPY FOR THE PATIENTS SUFFERING WITH POST-CARDIAC ARREST SYNDROME IN SUZHOU AREA

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INTRODUCTION. Post-cardiac arrest syndrome (PCAS) is a term that describes the complex pathological state created by resumption of spontaneous circulation (ROSC) after prolonged whole-body ischemia. It was defined in 2008 by the ILCOR/AHA consensus statement for post-cardiac arrest care. Treatment plans for PCAS needs a comprehensive, systematic and targeted management post-cardiac arrest. Current studies show that, the goal-directed therapy (GDT) of mean arterial pressure (MAP), oxygen saturation (SpO_2), partial pressure of carbon dioxide ($PaCO_2$), blood glucose (Glu) and body temperature (T) for PCAS have a major impact on the prognosis of patients. However, the implementation of the target management of these indicators for PCAS was rarely reported in the literature.

OBJECTIVES. To evaluate the quality of GDT for the patients suffering with PCAS in Suzhou area, analyze the relationship between the compliance rates of the early GDT and neurological outcome.

METHODS. This was a retrospective cohort study of patients who achieved ROSC after CA and admitted into ICUs of ten general hospitals in Suzhou area from January 2009 to December 2010; we recorded patient's data in the Utstein style, collected MAP, SpO_2, $PaCO_2$, Glu and T during first 48 h after CA. According to the CPC score at ICU discharge, patients were divided into good neurological outcome group (good outcome group, CPC 1 to 2) and poor neurological outcome group (poor outcome group, CPC 3 to 5), we compared the compliance rate of these indicators between two groups. The variables with statistically significant difference were included in the multivariate logistic regression analysis.

RESULTS. A total of 101 CA patients were enrolled for analysis, 17 patients in good outcome group, 84 patients in poor outcome group. Among the indicators of GDT, SpO_2 and MAP reached a higher compliance rate, 90.1 and 81.4 % respectively; Glu and $PaCO_2$ reached a lower compliance rate, 55.4 and 32.8 % respectively; mild therapeutic hypothermia (MTH) reached the lowest compliance rate, only 5 %. There was a significant difference in the compliance rate of SpO_2 and MAP between good outcome group and poor outcome group (96.6 vs. 88.6 %, 85.2 vs. 80.5 %, $P < 0.01$); There was a significant difference in ratio of bystander CPR and the time from CA to ROSC between two groups (88 vs. 59 %, 16.5 min vs. 26.5 min, $P < 0.05$); Multivariate logistic regression analysis showed that the time CA-ROSC was an independent risk factor of the patient′s neurological outcome (95 % CI 0.902 to 0.996, $P < 0.05$).

CONCLUSIONS. We can still further improve the quality of early GDT for the patients suffering with PCAS in Suzhou area, especially in the management of body temperature and carbon dioxide. Early ROSC can improve neurological outcome in CA patients, the early GDT after ROSC play also an important role in improving the prognosis of PCAS.

GRANT ACKNOWLEDGMENT. We are indebted to the cooperative units of this study.

0526

RESULTS VARIANTS OF INTENSIVE THERAPY OF PULMONARY HYPERTENSION IN PATIENTS WITH CONGENITAL HEART DISEASE AFTER SURGICAL CORRECTION

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OBJECTIVES. To evaluate the effectiveness of intensive therapy of pulmonary hypertension (PH) in patients with congenital heart disease (CHD) after surgical treatment.

MATERIALS AND METHODS. As the basis for the study served the assessment and treatment of patients with CHD characterized by a left–right shunt by echocardiography and angiocardiography. The patients were treated in the Surgery of CHD Department of RSCS after Vakhidov within period 2008–2009. Ventricular septal defect (VSD) was observed in 223 patients. From overall, those with PH of 2nd degree (according to classification of SCCVS after Bakulev)—18 patients (8.07 %), the defect's dimensions were 1 $\pm$ 0.3 cm; patients with 3A degree of PH - 8 (3.58 %) with a defect sized 2.0 $\pm$ 0.41 cm; patients with 3 AB-4 degree—3 (15.2 %) with defects 2.2 $\pm$ 0.6 cm. 191 patients had atrial septal defect (ASD). The patients with PH of 2nd degree was 22 (11.5 %), the defect was 2.0 $\pm$ 0.7 cm; those who had 3A degree—6 (3.14 %), the defect was 3.2 $\pm$ 0.7 cm; with 3B-4 degree there were 5 (2.62 %), the defect was 4.0 $\pm$ 1.4 cm. Patent ductus arteriosus was diagnosed in 67

patients. Of these, 13 patients (19.4 %) had PH of 2nd degree with the defect sizes 0.8 ± 0.4 cm; in 3A-B d. - 6 (8.92 %), the defect was 1.1 ± 0.34 cm; in 3B-4th degree—2 (2.98 %), the defect - 1.6 ± 0.4 cm. As a preparation for surgical treatment, during 20 days, all patients were receiving therapy with inhibitors of phosphodiesterase (type 5), sildenafil (Revatio-Viagra, Sinegra per os at a dose 2.5–3 mg/kg/day) + ACE inhibitors (captopril per os at a dose of 2.5-5 mg 2 twice a day) + nitrates (monosan per os at a dose 10–20 mg twice/day). Postoperatively, all patients with 2 degree received the following therapy: sildenafil (Revatio-Viagra, Sinegra per os at a dose of 2.5 - 3 mg/kg/day) + Nitrate (perlinganit I/V at a dose of 0.1–1 mg/kg/min) + Inhibitors ACE (captopril per os at a dose of 2.5–5 mg twice/day). Patients with 3A-B degree, who usually have cardiovascular complications in postoperative period such as right heart failure and hypertensive crises, were administered multi-component therapy. In addition to the above therapy, the patients received inotropic drugs, catecholamines (dobutrex I/V at a dose of 5/8/10 mcg/kg/min), inhibitors of phosphodiesterase-III (milrenon I/V at a dose of 0.5–1 mkg/kg/min), prostaglandins E1 (vazaprostan I/V at a dose 2–6 ng/kg/min), anticoagulants (heparin, percutaneous 10–25 thousand units/day). This regimen was used during 2–5 days depending on the patient's condition, the degree of PH and its dynamics according to the daily echocardiography. Subsequently, patients received ACE inhibitors, analogues of inhibitors of phosphodiesterase-5, nitrates per os at the same doses till patients were discharge.

RESULTS. After 2–3 weeks from the start of this therapy, a significant increase in systemic systolic blood pressure, averaging to 105 ± 2.1 mm Hg ($P < 0.05$) and decrease of systolic pressure in pulmonary artery, average 66.7 ± 4.38 mm Hg ($P < 0.05$) were noted. The systolic PA pressure comprised 63.5 % of the systemic systolic arterial pressure ($P < 0.05$ versus baseline). In patients with VSD, in the first postoperative day systolic blood pressure decreased in PA of patients with PH 3 A degree to 32.5 ± 2.5 %, in patients with 3A-B degree PH decreased to 55 ± 9 %. In patients with atrial septal defect in postoperative systolic blood pressure in an aircraft with Article 3A of LH decreased to 37.5 ± 2.5 %, but with the 3A-B station N to 52.5 ± 2.5 % of. In patients with OAC systolic blood pressure in the postoperative period decreased to 52.5 ± 2.5 %. It should be noted that to the time of discharge, a decrease in systolic blood pressure of PA for a further 8–9 % from the original was observed in all nosological groups.

CONCLUSIONS. Complex intensive therapy in the postoperative period, with the above-mentioned drugs helps to reduce residual PH in the nearest and remote postoperative period.

0527

TRANSCATHETER AORTIC VALVE IMPLANTATION (TAVI) VS. CONVENTIONAL SURGERY (AVR)

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INTRODUCTION. In patients with severe and inoperable aortic stenosis, some trials have proven that TAVI excels standard procedures through improved survival figures, symptoms, functional status, quality of life, and reduced hospitalization, yet TAVI has also been proven less cost-effective.

OBJECTIVES. We aim at reviewing short-term results after 2 years since the implementation of this technique in our premises.

METHODS. Study of retrospective cohorts of patients who underwent isolated aortic valve replacement by either conventional surgery or TAVI (CoreValve device) from June 2010 to December 2011 at the University Hospital Carlos de Haya (Málaga, Spain). Clinical epidemiologic, complication and short-term outcome variables were registered. Qualitative variables are expressed as percentages, while quantitative variables are expressed as means and SD. Fisher′s exact test and Mann–Whitney′s U-test were used where necessary (5 % maximum error ratio).

RESULTS. A total number of 27 TAVI and 154 isolated aortic valve replacement (AVR) procedures were completed. Intervention typology was chosen according to the recommendations of scientific societies, apart from patients′ fulfilment of the anatomic criteria required for percutaneous implant. Mean age was 67 ± 11 years (54 % males) in AVR and 80 ± 6 years (44 % males) in TAVI ($p < 0.05$). Additive EuroSCORE in AVR was 7 ± 2 and 9 ± 2 in TAVI ($p < 0.05$). However, 55.6 % of the percutaneous-valve patients presented previous coronary-tree alterations with stent implantation, while only 7 % of AVR patients showed these alterations ($p < 0.001$). ICU mortality in TAVI and AVR patients was 3.7 and 8.2 %, respectively ($p = NS$). Regarding complications, 48.1 % of TAVI patients showed altered heart rhythm and 33 % required a permanent pacemaker. Electrical disorders were observed in 4 % of AVR patients, while 1.9 % of these patients required a permanent pacemaker ($p < 0.001$ for both). Reoperation was necessary in 14.8 and 1.9 % of TAVI and AVR patients, respectively ($p < 0.001$).

CONCLUSIONS. Even with our limited experience, TAVI patients are observed to be older, to involve higher surgical risk, and to have undergone previous coronary-tree interventions. Although no significant differences were found regarding mortality, a higher rate of complications was observed in TAVI patients. With no short-term differences, a significant rate of postsurgical complications, and a cost-efficiency handicapped technique, analysis of long-term outcomes seems necessary to assess TAVI′s advantages over conventional AVR.

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0528

CLINICAL VALUE REGULATED SUBCLAVIAN-PULMONARY ANASTOMOSIS IN THE EARLY POSTOPERATIVE PERIOD IN PATIENTS WITH FALLOT'S TETRALOGY

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OBJECTIVE. Optimization of the tactics of intensive management of early postoperative period after regulated subclavian-pulmonary anastomosis in patients with Fallot's tetralogy.

MATERIALS AND METHODS. 72 patients were treated after application of regulated subclavian-pulmonary anastomosis according to the technique devised in RSCS after V. Vakhidov within the period from January of 2005 to April of 2011, in the resuscitation and intensive care unit (RICU). Tourniquet regulator to proximal end of anastomosis was used in case of 39 patients and Fogarty catheter for volume dosing of shunt was used in case of 33 patients. By the time of surgery the age of patients ranged from 3 months to 22 years (mean 9.24 ± 3.21 years). 40 patients from total (57.69 %) were male and 32 (42.31 %) were female. All patients went through standard set of clinical examination: echocardiography (with detection of velocity of blood flowing through the subclavian-pulmonary regulated anastomosis), electrocardiography, 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; data of blood coagulation and protein fractions with optimized modes of ALV. The doses and amount of used cardiotonics was taken into consideration.

RESULTS. From overall 52 patients, 11 patients had hyperfunction of anastomosis: the picture of preedema was noted in 6 cases, and 5 patients had "managed" hypervolemia of the pulmonary circulation that manifested as: hemodynamic instability (MABP 75–80 mm Hg, HR −120–140 bpm, CVP—100–140 mm of water), increase of SpO_2 to 90.1 ± 1.2 together with poor values of deep oxygen status (A-a-205.1 ± 5.3 mm Hg, a/A-47.3 % ± 1.4), rales revealed auscultatively, decreased transparency of lung fields in chest radiography. The all above mentioned values served as set of direct criteria for correction of hemodynamics by inflating the balloon of Fogarty catheter, and such achieving anastomotic constriction. Restriction of anastomosis functioning allowed to achieve stabilization of hemodynamic indices (blood pressure 90–100 mm Hg), deep oxygen status (A-a and -230 mm Hg, a/A-30 %, SpO_2-80 % at FiO2-40 %), which were accompanied by disappearance of rales, improvement of radiological and echocardiographic data in dynamics with reduced duration of mechanical ventilation and time of staying in the ICU.

CONCLUSION. 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.

0529

SCREENING OF ASYMPTOMATIC PATIENTS PRIOR TO TRANSPLANTATION OF SOLID ORGANS: PHARMACOLOGICAL STRESS ECHOCARDIOGRAPHY VALUE

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INTRODUCTION. Cardiovascular diseases, mainly coronary artery disease is the leading cause of morbidity and mortality in solid organ transplant patients. Many of these patients are asymptomatic prior to transplantation and in them it is necessary to stratify risk prior to it to raise invasive tests. The dobutamine stress echocardiography has been used as a noninvasive modality for the diagnosis of coronary artery disease and predicting outcome in patients with chronic liver disease and previous renal transplantation.

OBJECTIVE. To analyze the usefulness of stress echocardiography in patients pre-transplant screening asymptomatic solid organ.

MATERIALS AND METHODS. Design : Longitudinal descriptive. Location: Cardiology consultation pretransplant in a third level hospital. Subjects: From October 2009 to January 2011 a total of 254 patients were included.

METHODS. We analyzed the organ failure, if the patient was asymptomatic and risk factors, stress echocardiograms and cardiovascular complications intraoperative or perioperative and cardiovascular events.

FINDINGS. We analyzed 254 patients consultation, 99 patients with liver cirrhosis with a view to liver transplantation and 155 (p) in chronic renal failure with a view to renal transplantation. To all those asymptomatic patients, over 50 years old, with diabetes or more than 1 cardiovascular risk factor, an ischemia test was performed: in 52, a stress echocardiogram was performed, in 49 the protocol was completed, all negative for ischemia inducible, and 3 dynamic gradient in the outflow tract in effort, which disappeared at rest. 3 studies had to be stopped early because of intolerance to medication. Of the 50 studies, 30 patients have been liver transplanted and 10 kidney transplanted, with no intraoperative or perioperative cardiovascular complications, with no cardiovascular events at a mean follow up of 8.3 months.

CONCLUSIONS. The role of stress echocardiography in the pretransplant cardiac evaluation of solid organs is not well defined. We believe that the sensitivity and specificity is similar to nuclear medicine tests, so it can be considered suitable for the screening of these patients, because they also reduce the total amount of radiation received by these patients. Although the follow-up period is too short, we believe that this test is effective and safe enough to continue performing in this group of patients in order to improve peri-and postoperative results.

0530

T-PIECE IMPROVES ARTERIAL AND CENTRAL VENOUS OXYGENATION IN TRACHEOSTOMIZED PATIENTS AS COMPARED TO PRESSURE SUPPORT (PS) VENTILATION

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INTRODUCTION. Ayre's T-piece has mainly been used during weaning as "T-piece trial" before extubation, but it is seldom used as a weaning tool. Its theoretical benefit would be the low airway resistance of the breathing circuit with the disadvantage of the lack of pressure support. The effect of breathing via T-piece on gas exchange as compared to continuous positive airway pressure (CPAP)/PS ventilation has not been investigated yet.

OBJECTIVES. To investigate arterial oxygen tension (PaO_2) and central venous saturation ($ScvO_2$) on T-piece as compared to CPAP/PS ventilation.

METHODS. Tracheostomized, ready to be weaned (1) critically ill patients were prospectively enrolled in this auto-control trial. PaO_2 was determined on CPAP with pressure support (t0), 15 min later on CPAP solely with tube compensation (t1) and on T-piece at 15, 30 and 60 min (t2–4), $ScvO_2$ was measured at t0 and t4. Fraction of inspired oxygen (FiO_2) and positive end expiratory pressure (PEEP) were kept constant throughout. After testing for normality data were statistically analysed with Wilcoxon signed-rank test.

RESULTS. 22 patients were enrolled. T-piece trial was interrupted in 3 cases, due to pulmonary oedema or fatigue. PaO_2 and $ScvO_2$ showed significant improvement on T-piece by t4 as compared to t0. Median [interquartile range] $PaO_2 = 94$ [78–115] vs. 124 [102–152] mmHg, $p = 0.001$; $ScvO_2 = 73$ [72–78] vs. 81 [76–82] %, $p = 0.001$.

CONCLUSIONS. On the same FiO_2 and PEEP, breathing via T-piece improved oxygenation and decreased oxygen consumption as indicated by $ScvO_2$. Our results suggest a potential role of T-piece during weaning from mechanical ventilation.

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Fluid and haemodynamics in the surgical patient: 0531–0544

0531

RESPIRATORY VARIATION OF STROKE VOLUME MEASURED BY OESOPHAGEAL DOPPLER PREDICT FLUID RESPONSIVENESS DURING LAPAROSCOPY

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INTRODUCTION. From recent years, respiratory variation of stroke volume (ΔrespSV) have been demonstrated as an indicator of fluid responsiveness in a wide range of anaesthesia and critical care situations. The intra-abdominal hypertension during abdominal compartment syndrome (ACS) modifies threshold and predictability of ΔrespSV. Laparoscopy is a situation close to ACS for which no study has investigated the predictive value of ΔrespSV.

OBJECTIVES. The objective of this study was to demonstrate that ΔrespSV measured by oesophageal Doppler (ODM) during laparoscopy predict fluid responsiveness.

METHODS. After Institutional Review Board approval, 38 patients were prospectively included. Patients with preoperative arrhythmia, right ventricular failure, frequent ectopic beats, spontaneous breathing and contraindications to ODM probe insertion were excluded. A fluid challenge (VE) with 500 ml of a crystalloid solution was performed over 10 min. Hemodynamics (heart rate, blood pressure), and ODM (peak velocity (PV), stroke volume (SV), corrected flow time (FTc), cardiac output (CO), the ΔrespSV and respiratory variation of PV (ΔrespPV)) data were collected before and after VE. Responders were defined by an increase $\geq$15 % of stroke volume after VE. Quantitative data are expressed as median ± SD. These data before/after VE were compared by paired Student′s t test. A ROC curve was constructed for ΔrespVES, the ΔrespPV, and FTc.

RESULTS. Of the 38 patients, 28 (74 %) were classified as responders. VE was associated with a significant increase in CO, (5.4 ± 1.3 vs. 6.4 ± 1.9, $p < 0.05$), FTc (352 ± 54 vs. 391 ± 48, $p < 0.05$), and PV (77 ± 22 vs. 86 ± 32, $p < 0.05$). ΔrespSV decreased significantly with VE (17 ± 8 vs. 9 ± 8, $p < 0.05$). Blood pressure, heart rate, and ΔrespPV were unchanged after VE. With an area under the curve of ROC (AUC) of 0.87 (confidence interval 95 % (95 % CI) 0.71–0.95), $p < 0.001$), ΔrespSV $\geq$ 15 % predicted fluid responsiveness with a sensitivity of 89 %, and a specificity of 90 %). ΔrespPV and FTc was not predictive of fluid responsiveness with an AUC of 0.57 (95 % CI 0.34–0.79, $p = 0.56$), and 0.52 (95 % CI 0.35–0.68, $p = 0.87$).

CONCLUSIONS. During laparoscopy, under strict physiological conditions, a ΔrespVES $\geq$15 % can accurately predict fluid responsiveness with good sensitivity and specificity. In contrast, FTc and ΔrespPV are not predictive of fluid responsiveness.

0532

TIDAL VOLUME INSTEAD OF ALVEOLAR PRESSURE VARIATION IS THE MAJOR DETERMINANT FOR PULSE PRESSURE VARIATION

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INTRODUCTION. Pulse pressure variation (PPV) is a promising predictor for volume responsiveness. PPV was demonstrated to be linearly correlated with both tidal volume and alveolar pressure variation [1]. However, recent studies showed that decrease in thoracic compliance decreases validity of PPV for predicting volume responsiveness [2].

OBJECTIVES. To investigate whether tidal volume or alveolar pressure variation is the major determinant of PPV.

METHODS. Eight anesthetized piglets under volume control ventilation underwent four stages of thoracic compliance manipulation by thoracic restriction in random order. Each stage comprised of 2 cycles of tidal volume manipulation. In each cycle, five different tidal volumes were applied in random order and PPV was recorded accordingly.

RESULTS. Among 320 arterial pressure tracings obtained during tidal volume manipulations, 1 tracing was excluded due to excessive signal damping. Thoracic restriction increased the alveolar pressure variation (Figure 1) and changed the relationship between alveolar pressure variation and PPV. The PPV was linearly correlated with the tidal volume (Figure 2) and alveolar pressure variation (Figure 3). However, the relationship between the tidal volume and PPV remained unchanged during thoracic compliance manipulation.

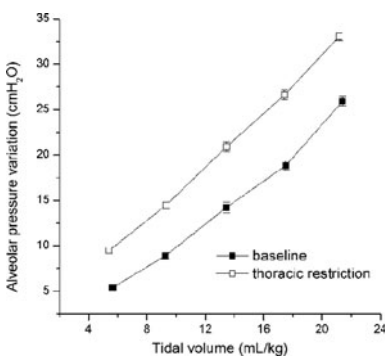

Fig. 1

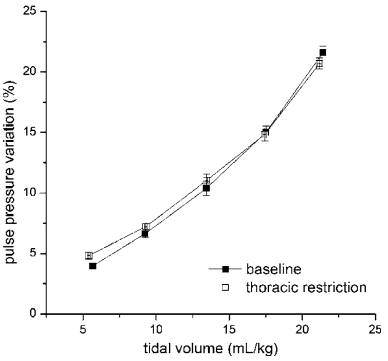

Fig. 2

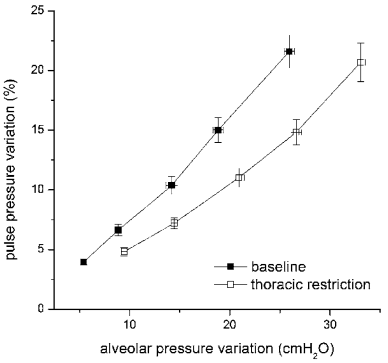

Fig. 3

CONCLUSIONS. Tidal volume instead of alveolar pressure variation is the major determinant for PPV under mechanical ventilation. Thus, tidal volume instead of alveolar pressure variation should be used while interpreting or normalizing PPV.

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0533

NEITHER DYNAMIC, STATIC NOR VOLUMETRIC VARIABLES CAN ACCURATELY PREDICT FLUID RESPONSIVENESS EARLY AFTER ABDOMINOTHORACIC ESOPHAGECTOMY FOR ESOPHAGEAL CANCER

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INTRODUCTION. Hypotension develops frequently early after abdominothoracic esophagectomy for esophageal cancer. However, it remains unclear whether dynamic, static or volumetric variables can accurately predict fluid responsiveness, since this surgical procedure may modify the original structure in the thorax, resulting in a decrease in the constraints of the chest wall imposed on the heart and the lungs.

OBJECTIVES. We examined the ability of stroke volume variation (SVV), pulse pressure variation (PPV), central venous pressure (CVP), intrathoracic blood volume (ITBV) and initial distribution volume of glucose (IDVG) [1], to predict fluid responsiveness early after esophagectomy under mechanical ventilation (tidal volume >8 ml/kg) without spontaneous respiratory activity to meet the essential conditions for monitoring SVV or PPV [2].

METHODS. Forty-three consecutive non-arrhythmic patients undergoing abdominothoracic esophagectomy were studied. In addition to routine cardiovascular variables, SVV, PPV, cardiac index (CI), and indexed ITBV (ITBVI) were measured by single transpulmonary thermodilution technique (PiCCO system) soon after admission to the intensive care unit (ICU) postoperatively on the operative day. Indexed IDVG (IDVGI) was then determined using the incremental plasma glucose concentration at 3 min after administration of glucose 5 g IV as described previously [3]. Fluid responsiveness was defined by an increase in CI $\geq$ 15 % following fluid volume loading (250 ml of 10 % dextran solution over 20 min) compared to pre-loading CI. The area under receiver operating characteristic curve (AUC) was calculated. Linear regression analysis was also performed.

RESULTS. Twenty-three patients were fluid responders, and 20 patients were non-fluid responders. The AUC was the highest for CVP (0.690), and the lowest for ITBVI (0.585), but there was no statistical difference among tested variables. Pre-fluid volume loading IDVGI ($r = -0.523$, $p < 0.001$), SVV($r = 0.348$, $p = 0.026$), and CVP ($r = -0.307$, $p = 0.046$), but not PPV and ITBVI had a significant correlation with a percentage increase in CI after fluid volume loading.

CONCLUSIONS. Results suggest that none of the tested variables can accurately predict fluid responsiveness early after esophagectomy.

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0534
EFFECTS OF CRYSTALLOIDS VERSUS COLLOIDS FOR GOAL DIRECTED FLUID THERAPY ON POSTOPERATIVE PROCALCITONIN LEVELS AFTER MAJOR ABDOMINAL SURGERY

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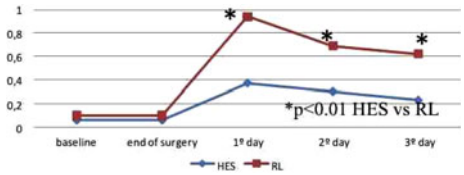
INTRODUCTION. Major surgery can initiate systemic inflammatory processes, characterized by the release of potent inflammatory mediators into the circulation. Limited information is available about the effects of different volume replacement regimens on the inflammatory response during major abdominal procedures.

OBJECTIVES. The aim of this study was to compare the effects of goal-directed (GDT) administration of crystalloids and colloids on procalcitonin plasmatic levels after major abdominal surgery.

METHODS. Thirty-six patients scheduled for elective major abdominal surgery were randomized to receive either 6 % hydroxyethylstarch (130/0.4; n = 18, HES-group) or lactated Ringer's solution (RL-group; n = 18) for intravascular volume replacement, intraoperatively. Volume replacement was guided by GDT protocol based on PiCCO® monitoring. Serum concentrations of procalcitonin (PCT) were measured after induction of anesthesia, at the end of surgery, 24, 48 and 72 h postoperatively. Differences in PCT levels were analyzed using the Kruskal–Wallis and the Friedman's test. Statistical significance was set at $p < 0.05$.

RESULTS. Biometric, perioperative data, and type and duration of surgery were similar between groups. Cardiac Index was significantly higher in HES-group at the end of surgery (4.2 ± 0.8 HES-g vs. 3.2 ± 0.4 RL-g ml/min/m^2, $p < 0.001$). Total amount of fluids was similar between groups (4.267.3 ± 2.094 ml HES-g vs. 4.887.3 ± 1.595 ml RL-g). Serum PCT levels were significantly lower in the HES-group at 24, 48 and 72 h after surgery [0.37 ± 0.26 ng/mL, 0.3 ± 0.19 ng/mL, 0.23 ± 0.17 (HES-g) vs. 0.93 ± 0.70 ng/mL, 0.68 ± 0.62 ng/mL, 0.52 ± 0.54 ng/mL (RL-g); P < 0.01] (Figure 1).



PCT levels ng/mL

CONCLUSIONS. Intravascular volume replacement with HES 130/0.4 may reduce the inflammatory response in patients undergoing major surgery compared to a crystalloid-based volume therapy. This effect can be explained by improvement in microcirculation and a better hemodynamic status.

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0535
CHANGES IN FLUID VOLUME PARAMETERS IN PATIENTS WITH SUBTOTAL ESOPHAGECTOMY DURING THE FIRST THREE DAYS AFTER THE SURGERY

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INTRODUCTION. Subtotal esophagectomy is one of the most invasive surgeries and fluid volume status after the surgery is disturbed due to blood loss and high levels of inflammation. PiCCO system (Pulsion medical system) has been demonstrated to provide useful parameters such as intrathoracic blood volume (ITBV), extravascular lung water (EVLW) in patients with subtotal esophagectomy (1) and pulmonary vasculature permeability index (PVPI) in patients with ARDS (2). Initial distribution of glucose (IDVG) has also been demonstrated to be an alternative indicator of fluid management in those patients (3, 4). However, detailed changes and relationships in those parameters have not been known early days after subtotal esophagectomy.

OBJECTIVES. The aim of this study is to investigate changes of multiple fluid volume parameters in patients with subtotal esophagectomy.

METHODS. After obtaining informed consents from the patients with subtotal esophagectomy in Hirosaki University hospital, we have measured multiple fluids volume parameters concomitant with cardiac index (CI) during the first 3 days after the operation. Those parameters were blood volume (BV), plasma volume (PV), ITBV, EVLW, PVPI and IDVG. The patients' tracheas were extubated on the postoperative day (POD) 1 as long as there was no complication. We have also compared those parameters between short-ICU stay patients (<5 days) and long-ICU stay patients (>7 days) related to pulmonary complications. Statistical analyses were performed with repeated measures ANOVA followed by turkey's multiple comparison test, unpaired *t* test and Pearson correlation test. $P < 0.05$ was considered as significant.

RESULTS. Seventy nine patients were included in this study. CI (L/min/m^2) significantly increased from 2.8 ± 0.6 on POD 0 to 3.6 ± 0.6 on POD 2. Although BV and PV had not changed during the first 3 days, ITBV index (ml/m^2) and IDVG index (ml/kg) significantly increased on the POD 2, from 869.5 ± 141.2 to 966.6 ± 154.1 and from 115.6 ± 18.8 to 121.4 ± 17.0, respectively. ITBV index and IDVG index were significantly correlated with CI (r = 0.37 and r = 0.39, respectively). EVLW index significantly decreased on the POD 1 and PVPI significantly decreased on the POD 1 and 2, compared with POD 0. However, CI in long-ICU stay patients (n = 23) was significantly lower than CI in short-ICU stay patients (n = 55) on POD 2 with the value of 3.3 ± 0.5 and 3.7 ± 0.5, respectively. PVPI in long-ICU stay patients (n = 22) was significantly bigger than PVPI in short-ICU stay patients (n = 54) on POD 2 with the value of 1.7 ± 0.6 and 1.4 ± 0.4, respectively.

CONCLUSIONS. ITBV and IDVG rather than BV and PV indicated refilling in the central extracellular fluid volume on the POD 2. PVPI may be a useful indicator for postoperative pulmonary complication, but the further study is needed.

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0536
INFLUENCE OF FLUID MANAGEMENT IN THE PROGNOSIS OF MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. Discussion about fluid management in critically ill patients and its influence in clinical outcome and prognosis is in force currently. Two strategies in fluid management are known, liberal versus restrictive management.

OBJECTIVES. To describe the clinical characteristics and fluid balance of critically ill patients during ICU admission and to assess the relationship between fluid balance and clinical outcome.

METHODS. Prospective observational study in a 17-bed medical-surgical ICU. Consecutive mechanically ventilated patients admitted in ICU during more than 6 days were included. Time of study was 5 months. The variables analyzed were age, sex, APACHE II at admission, diagnosis, ICU length of stay, requirement for haemofiltration and vasoactive medications, time of mechanical ventilation and mortality. Fluid balance were recorded at 24, 72 h and day 7 of ICU admission.

RESULTS. A total of 49 patients were included during the time of study, 16 women and 33 men. Mean age was 62.3 ± 15.6. APACHE II score at admission was 20.8 ± 6.4. Mean ICU length of stay was 17 ± 10 days. Mean duration of mechanical ventilation was 11.2 ± 8 days. Most of the patients 79.6 % required vasoactive medications and 20.4 % hemofiltration. The most common diagnoses were complicated postoperative surgery (32.7 %) and acute respiratory failure (36.7 %). Mortality was 30.6 %. We distinguish two subgroups according mortality: survivors (n: 34) and exitus (n:15) obtaining the following balances:

Mortality and fluid balance

	Survivors (n:34)	Exitus (n:15)
Age (years)	59.7 ± 17.4	68.3 ± 18.4
Apache II score at ICU admission	19.9 ± 7.2	23 ± 3.2
ICU length of stay (days)	16.6 ± 8.7	17.7 ± 13
Time of mechanical ventilation (days)	10.1 ± 7	13.6 ± 10.1
Fluid balance at 24 h of ICU admission.(ml)	1375.1 ± 2282.8	1291.6 ± 2588.6
Fluid balance at 72 h of ICU admission.(ml)	2188.4 ± 4519	2823.3 ± 3601.8
Fluid balance at 7° day of ICU admission.(ml)	303.5 ± 5194	3169 ± 4293.8

CONCLUSIONS. Based on the data obtained we conclude: • There were no differences in mortality between subgroups in the fluid balance obtained in the first 72 h.
• Positive fluid balance at the 7° day of admission in ICU was higher than survivors in the group of died patients.
• Early adequate fluid resuscitation together with restrictive late fluid management may provide better patient outcomes.

0537
VALUE OF ELEVATED EXTRAVASCULAR LUNG WATER INDEX AND NON-INVASIVE MECHANICAL VENTILATION IN THE POSTOPERATIVE RESPIRATORY FAILURE

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INTRODUCTION. Quantification of the EVLWI (extravascular lung water index) and the PVPI by the transpulmonary thermodilution technique with the pulse contour cardiac monitor (PiCCO^{TM}, Pulsion, Medical System, Munich, Germany), which is based on the thermodilution technique with a single thermal indicator, provides information on the magnitude of the edema, its evolution and its resolution. These parameters would be of great assistance in the management of critically ill patients with pulmonary edema, regardless of its etiology. In clinical practice in the field of post-surgical recovery, it has become apparent that patients with increased EVLWI and pulmonary vascular permeability index (PVPI) are more prone to fail NIMV, resulting in the necessity for intubation for ongoing management. Considering that the EVLWI is a direct measure of the magnitude of the edema and an indirect measure of the degree of pulmonary injury, we present a prospective observational study on the evolution of the EVLWI in patients with ARF after a major abdominal surgery, where the first line of treatment was NIMV.

OBJECTIVES. The objective of this study was to track the progression of the EVLWI and PVPI in patients with acute respiratory failure (ARF) in the postoperative period following a major abdominal surgery, where the first line of treatment was NIMV.

METHODS. Prospective observational trial. 62 patients with Acute Respiratory failure after abdominal surgery who received NIMV via a helmet with PiCCO^{TM} hemodynamic monitoring. EVLWI and PVPI were monitored before and after the application of NIMV.

RESULTS. It was possible to avoid intubation in 63 % of patients. It was observed that the respiratory rate after the first hour of application of NIMV diminished significantly in the non-intubated group (28.34 ± 3.5 vs. 18.18 ± 3.7, $p < 0.01$). Also, the relationship of pO2/FiO2 after the first hour was significantly greater in the non-intubated group (298.43 ± 74.2 vs. 146.2 ± 18.6, $p < 0.01$). We observed that there was a statistically significant difference amongst both groups who had PiCCO^{TM} monitoring, with both the EVLWI (non-intubated 8.4 ± 1.2 vs. intubated 11.6 ± 0.89, $p < 0.01$) and the PVPI (1.8 ± 0.46 vs. 3.3 ± 1.28, $p < 0.01$), as measured before the start of the NIMV.

CONCLUSIONS. We conclude that in this type of patient, the physiological parameters that predict the failure of NIMV with the greatest accuracy are the paO_2/FiO_2 ratio, the respiratory rate and the value of the initial EVLWI and PVPI.

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0538
BALANCED CRYSTALLOID VERSUS BALANCED COLLOID SOLUTION WITHIN A GOAL-DIRECTED ALGORITHM

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INTRODUCTION. All over the world 234.2 million major surgical procedures are performed with a substantial impact of intraoperative haemodynamic management. This study compares a balanced crystalloid and a balanced colloid solution with respect to fluid requirements and side effects.

METHODS. In a double-blinded pilot study, we randomly assigned 50 patients with primary ovarian cancer undergoing cytoreductive surgery to receive either balanced crystalloid or balanced starch (HES, 130/0.4.6 %) solutions up to the dose limit (50 ml/kg BW). The intraoperative administration of the study medication was yielded to optimize stroke volume measured by esophageal Doppler within a goal-directed haemodynamic algorithm.

RESULTS. Baseline patient characteristics were similar in both groups. There was no difference in the intraoperative course of mean arterial pressure, heart rate, central venous pressure or norepinephrine administration. But the balanced HES solution maintained stroke volume better with administration of less study medication. Also, the patients in the colloid group reached the dose limits of the study medication less frequently and later as well as required less transfusion of fresh frozen plasma units. Intra- and postoperative urine output and perioperative plasma levels of creatinine and neutrophil gelatinase-associated lipocalin as renal injury marker were equal in both study groups. No differences in the length of intensive care unit and hospital stay were found.

CONCLUSIONS. Within a goal-directed haemodynamic algorithm to optimize stroke volume a balanced HES solution is associated with better haemodynamic stability and minor need for fresh frozen plasma. There were no signs of impairment on renal function by colloid solutions in this study.

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0539
DIFFERENT COMBINATIONS OF COLLOIDS AND CRYSTALLOIDS IN MAJOR ABDOMINAL SURGERY: HEMODYNAMICS EFFECTS

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INTRODUCTION. Fluid management in abdominal surgery is an important part of anesthesia maintenance. Blood volume maintenance is the main goal of fluid therapy.

OBJECTIVES. To estimate the values of central hemodynamics by using different combinations of colloids and crystalloids in major abdominal surgery.

METHODS. After the permission of the Ethics Committee 75 patients were randomly divided into five equal groups. Patients in the compared groups were identical in sex, age (52.75 ± 1.33), ASA score (2.01 ± 0.01), and duration of surgery (320.68 ± 8.89 min). Group 1 received unbalanced 6 %HES 130/0.4 (Voluven®) and saline solution (0.9 % NaCl), Group 2—Voluven® and Ringer′s solution, Group 3—Voluven® and Ionosteril®, Group 4—balanced colloid 6 %HES 130/0.42 (Tetraspan®) and Ringer′s solution, Group 5—Tetraspan® and balanced crystalloid (Sterofundin®). Intraoperative fluid administration was 9.25 ± 0.65 ml × kg^{-1}×h^{-1} in all groups. Colloids–crystalloids ratio was 1:2. All patients were underwent elective surgery: esophagectomy, pancreatoduodenal resection, right or left hepatectomy. All patients received combined epidural (Th_{7-9} ropivacaine 2 mg/ml, epinephrine 2 μg/ml, fentanyl 2 μg/ml 12–8 ml/h) inhalation (sevoflurane 0.7–0.9MAC) anesthesia. After tracheal intubation one percutaneous 8.5F introducer was inserted into the right internal jugular vein. A Swan-Ganz thermodilution catheter was floated and connected to a monitor (Datex Omehda). Were measured continuously heart rate (HR), arterial blood pressure (BP), central venous pressure (CVP), pulmonary artery pressure (PAP). Cardiac output (CO), cardiac index (CI), pulmonary artery wedge pressure (PAWP), stroke volume index (SVI) were measured and calculated three times (laparotomy, main step of surgery and end of surgery). The wedge pressure was obtained by manually inflating the S-G′s catheter balloon. Mean ± SEM, Bonferroni's correction ($P < 0.05/5$) were calculated.

RESULTS. There were no differences in blood loss (809.3 ± 98.6 ml, in average) and urine output (1.08 ± 0.50 ml × kg^{-1} × h^{-1}) between groups. We have not received significant differences in all hemodynamic parameters between groups. For stabilization blood pressure during the surgery in patients of groups 1 and 2 we used phenylephrine in doses (2.28 ± 1.47 and 2.11 ± 0.35 mg) while in the rest groups the doses of phenylephrine were (1.15 ± 0.38, 0.73 ± 0.20 and 0.53 ± 0.20 mg) $P > 0.05/5$.

CONCLUSIONS. Our data suggest that different combinations of colloids and crystalloids provide hemodynamic stability during major abdominal surgery.

0540
COLLOID VERSUS CRYSTALLOID TO PRELOAD BEFORE SPINAL ANESTHESIA AT TRANSURETHRAL RESECTION OF THE PROSTATE: A RANDOMIZED TRIAL

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INTRODUCTION. Spinal anesthesia (SA) is the most common method of anesthesia for the Transurethral Resection of the Prostate (TURP) in patients older than 60 years and research aimed at improving the outcomes (for example: prevention of arterial hypotension, or the development of TURP syndrome) remain relevant.

OBJECTIVES. In randomized clinical study we tested the assumption that preload (fluid given before the intrathecal injection) with colloid may be more effective than preload with crystalloid for prevention of arterial hypotension after spinal anesthesia while reducing the volume of fluid therapy.

METHODS. In accordance with inclusion and exclusion criteria, were examined 30 patients (60–82 years old, physical status—ASAII–ASAIII) with benign prostatic hyperplasia. All patients underwent TURP under SA with isobaric ropivacaine (0.5 %–15 mg). Depending on the type of preload before SA, patients were randomized (Seed # 2504, http://www.randomization.com) in 2 groups: in Group A (control) used the infusion of 400.0 ml of saline for 20 min, in the Group B was administered 100.0 ml of hydroxyethyl starch 130/0.4 (HES) (Voluven, Fresenius Kabi) for 5 min. Further fluid therapy included: in the 1st group—saline solution, in the 2nd group—400.0 ml of HES and saline. In all cases was using benzodiazepine sedation (Ramsay 3–4). Monitoring: Harvard Standard (NIBP, ECG, HR, SpO_2, to), Perfusion Index (PI), Heart Rate Variability (HRV), Electrodermal activity (EDA). HRV and EDA were recorded as a measures of autonomic arousal in response to stress. Statistical analysis were performed on the 11 stages of anesthesia and surgery. Considered statistically significant value of $p < 0.05$.

General characteristics of the groups

Characteristics Of the groups	Group A (n = 15)		Group B (n = 15)		M-W (U) Test	
	Mean	Std.Dev.	Mean	Std.Dev.	Z	p-level
Age, years	68.06	6.29	70.40	7.98	−0.684	0.493
Weight, kg	77.77	11.94	78.20	9.87	−0.331	0.740
Duration of surgery, hours	1.29	0.64	1.22	0.55	0.124	0.901
Relanium mg/kg x h	0.13	0.02	0.13	0.02	0.913	0.361
Ropivacaine, mg/kg	0.20	0.02	0.19	0.03	0.975	0.330
Preload, ml/kg	5.25	0.75	1.30	0.17	4.666	0.000
Intraoperative infusion volume, ml/kg × h	10.59	5.98	8.37	4.40	0.850	0.395
The total volume of infusion, ml/kg × h	9.06	3.64	6.42	2.31	2.178	0.029

RESULTS. With the full comparability groups, similar efficacy of SA was observed in all patients. Hemodynamic profile in both groups was similar, the studied parameters were stable, the use of vasoactive drugs was not required in all cases. When comparing the groups with each other, the differences between the hemodynamic parameters were found. Parameters of HRV and EDA match the concept of adequate antinociceptive protection during the operation in both groups, however, we found a higher PI (1, sixfold, $p = 0.036$) and a lower value of Baevsky Stress Index (below 2.7 times, $p = 0.049$) in Group B at the initial stages of the SA and surgery. Consequently, after preload of 100.0 ml HES (versus 400.0 ml crystalloids in Group A) we observed a less pronounced stress regulatory systems, and better tissue perfusion after infusion significantly lower volume of fluid.

CONCLUSIONS. This study shows the possibility and expediency of using the colloid preload (about 1.5 ml/kg) to prevent arterial hypotension with a decrease in volemic loads during spinal anesthesia in patients over 60 years, which is important for the prevention of TURP syndrome and complications in the cardiovascular system, which is often compromised in these patients.

0541
VOLUME ASSESSMENT IN PATIENTS DURING MAYOR LIVER RESECTIONS. IS THE BEST THE CENTRAL VENOUS PRESSURE?

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GOAL OF STUDY. The aim of our study was to evaluate the predictive value of CVP (central venous pressure) with regard GED (global end-diastolic volume), and correlate these parameters to cardiac Index (CI) and extravascular lung wáter index.

METHODS. Prospective study. Surgical intensive care unit, university hospital. Patients and interventions: 238 hemodynamic measurements using the PiCCO (Pulsion Medical System, Germany) were performed in 74 patients during major liver resection.

RESULTS. Mean CVP (8.71 ± 3.1 mmHg) was normal, whereas mean GEDI (626.98 ± 237.41 ml/m^2) was decreased. Seventy-five CVP measurements were elevated despite simultaneous GEDI levels indicating a normal or decreased preload. Sensitivity, specificity, positive predictive value, and negative predictive value of CVP with regard to volume depletion (GEDI < 650) were 9.52 (0–24.46, CI 95 %), 66.67 (20.61–100, CI 95 %, 50 (0–100, CI 95 %) and 17.39 (0–35.06, CI 95 %) respectively. CVP did not correlate to GEDI ($r = -0.024$, $p = 0.769$), CI ($r = 0.043$, $p = 0.595$) and EVLWI (extravascular lung water index) ($r = -0.051$, $p = 0.451$). GEDI significantly correlated to CI ($r = -0.482$, $p < 0.01$), VVS ($r = -0.413$, $p < 0.001$) and EVLWI ($r = 0.418$, $p < 0.001$).

CONCLUSIONS. Volume depletion according to GEDI was found in more than half the patients. The predictive values of CVP with regard to volume depletion were low GEDI and its changes significantly correlated to CI and its changes, which was not observed for CVP. Therefore, GEDI appears to be more appropriate for volume management during mayor liver resections.

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0542
COMPARISON OF CENTRAL VENOUS PRESSURE MEASUREMENTS MADE WITH A WATER COLUMN AND A PRESSURE TRANSDUCER IN ICU PATIENTS

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INTRODUCTION. Central venous pressure (CVP)s is the pressure of the blood in the thoracic vena cava. It gives an estimation of the right atrium blood pressure which is a determinant of RVEDV. CVP also indicates the venous vassal tone and its used with fluid bolus challenges to predict volume responsiveness. The waveforms that are evident in CVP trace represent the changes in blood pressure caused by the different phase of myocardium function.

OBJECTIVES. The objective of this study is to compare the measurements of CVP with the water column and the pressure transducer to find if there is a significant difference that dictates prevalence in using one method over the other.
METHODS. 324 ICU patients with or without vasopressors were in this study. In every patient the CVP was measured with the water column and afterwards with the transducer. Before each measurement 10 ml of natural saline were infused in the central venous catheter to have the best accuracy and a zeroing of the CVP was performed.
Technique: To measure CVP with the water column each of these steps was followed the patient was placed in the supine position placement of the 0 point on the same height with the phlebostatic axis filling up the water column with N/S turning of the three-way to be open towards the patient wait for the descend of the level in the water column until it is stable measurement recording in order to measure CVP with the pressure transducer these steps was followed the patient was placed in the supine position placement of the 0 point of the pressure transducer on the same height with the phlebostatic axis and zeroing measurement of the a wave if the CVP trace was typical or c wave if the CVP trace was not typical measurement recording.
RESULTS. Comparison between CVP measurements with the two methods for each catheter insertion point. The comparison showed difference between the measurements in catheters in the left internal jugular, in the right internal jugular and in the right subclavian with a level of significance of $p < 0.01$, $p < 0.01$ and $p < 0.02$. The means of CVP with the 2 methods are different by 1 cm H_2O.
CONCLUSIONS. CVP measurements with the pressure transducer is more accurate and is able to display the CVP trace wave. The water column is cheap and useful in measuring CVP in a variety of clinical settings but the medical staff should always bear in mind due to the deviation between the two methods that are in the higher or lower limits should be interpreted carefully.
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0543
CONTROVERSY OF THE USE OF ALBUMIN IN CRITICAL PATIENTS

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INTRODUCTION. The recognition of hypoalbuminemia as an independent factor of poor prognosis led to the use of human albumin as a treatment for over 50 years. But its use has become increasingly controversial after publication of the Cochrane study in 1998. Nowadays, the replacement of albumin in critically ill patients with hypoalbuminemia remains controversial. Some studies have shown decreased morbidity and mortality when albumin levels >3 g/dL were obtained.
OBJECTIVES. To evaluate the serum levels of albumin in critically ill patients with hypoalbuminemia treated with intravenous administration of albumin.
METHODS. A retrospective analysis (January/2009 to December/2011) of medical records of patients admitted to an intensive care unit (ICU) in which human albumin 20 % was administered.
RESULTS. 153 patients included. Mean age 66.6 ± 16.9 years, males 66 %. The cause of admission was postoperative in 45 % (of which 88 % gastrointestinal). On admission in hospital, 60.7 % had albumin within the reference values, but at the time of admission to ICU only 4.6 % had normal albumin levels. After 3 days of admission (ICU) mean decrease of albumin was 0.9 ± 0.39 g/dl. In 39 % of cases administration occurred in patients without severe hypoalbuminemia (>2 g/dl). Mean dose administered of albumin was 169.4 ± 65.8 ml. The next day of administration: maximum elevation of albumin 1.2 g/dl, mean change 0.43 ± 0.32 g/dl; variation ≤ 0 g/dl in 12.4 % of the sample. At only 7.8 % of the sample albumin levels were ≥3 g/dl. After 3 days only 29.9 % of the sample had albumin levels equal or higher to the day of administration. There was no significant difference in serum levels obtained regardless of the total dose or duration of use. Death rate was 47 %. Average hospitalization time was 21.3 ± 17.5 days.
CONCLUSIONS. Serum albumin was higher than 3 g/dL in only 7.8 % of the sample (regardless of the dose). These data highlight the need to establish protocols that limit the unwarranted use of albumin, reducing costs and minimizing adverse effects.
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0544
EFFECT OF DIFFERENT THERAPY OPTIONS ON IMMUNOGLOBULIN LEVELS IN PATIENTS SUFFERING FROM LIVER FAILURE

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INTRODUCTION. Hypergammaglobulinemia is commonly found in patients suffering from chronic hepatic failure (CHF), whereas in patients with acute liver failure (ALF) normal immunoglobulin values can be found. There are sparse data available about the effect of therapy options on antibody levels in patients with liver failure. The aim of this study was to determine serum immunoglobulin concentrations in patients suffering from CHF, ALF, or acute-on-chronic liver failure (ACLF) and evaluate the impact of liver transplantation (LTX) or albumin dialysis (MARS®) on antibody levels.
MATERIALS AND METHODS. We followed ten patients with ALF, twelve with ACLF and 18 with CHF. Eight patients with ALF and eight with ACLF underwent MARS therapy, whereas the rest received LTX. 13 healthy volunteers served as controls. Serum immunoglobulin levels were assessed by ELISA technique.
RESULTS. In patients with CHF median serum levels of IgA, IgG and IgM were increased in comparison with ALF or healthy individuals. IgA and IgG concentrations were also significant elevated compared to ACLF. Furthermore a decrease in immunoglobulin levels after LTX was detected in patients with CHF, whereas in patients with ALF or ACLF who underwent transplantation no comparable effect was observed. MARS treatment had no apparent effect on the immunoglobulin profile in patients with ALF or ACLF.
CONCLUSION. We provide evidence that LTX reverses hypergammaglobulinemia in patients suffering from CHF, which could be traced back to a reconstituted hepatic antibody clearance, whereas MARS treatment does not affect immunoglobulin levels, thus change immunostatus of patients.

Risk factors, prophylaxis & outcome of ICU infections: 0545–0558

0545
CURB-65 AND PNEUMONIA SEVERITY INDEX FOR INFLUENZA A H1N1 $_V$ PNEUMONIA

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INTRODUCTION. Approximately 35 % of community acquired pneumonia treated in emergency departments required hospitalization. Different prognostic scales have been documented to assess the severity and the indications for hospitalization and ICU admissions. Past 2 years Influenza A H1N1v infections were commonly admitted in the emergency departments.
OBJECTIVES. The aim of the study was to analyze the usefulness of the application of the Pneumonia Severity Index (PSI) and CURB-65 prognostic scales in patients with primary viral pneumonia caused by influenza A H1N1v.
METHODS. Retrospective study performed at a community hospital with a 17 beds-Intensive Care Unit. Patients with influenza A H1N1$_v$ pneumonia microbiologically confirmed requiring hospitalization during a time of study of 2 years were analyzed. Pregnant and bacterial co-infections were excluded from final analysis. Scales CURB 65 and PSI were applied in the emergency department and outcome and destination of admission were analyzed. The data collected were analyzed using SPSS version 18 for Windows.
RESULTS. 24 patients were registered, 19 required ICU admission and 5 patients were admitted in medical wards. Most of the patients admitted in intensive care unit (78.9 %) required mechanical ventilation. Mortality was 21.1 %. Most patients admitted to ICU had CURB 65 scale of 1 (60 %), 13.3 % obtained 0 and 26.7 % 2. PSI scale resulted class I in a 20 %, class II 40 %, 26.7 % class IV and 13.3 % class V. The scales CURB 65 and PSI showed no differences in scores according to the destination of admission and mortality.
CONCLUSIONS. The application of the scales CURB-65 and PSI has not been validated to estimate the risk of pneumonia caused by influenza A H1N1v. Use of CURB-65 and PSI in the emergency department may underestimate the risk of patients with Influenza A H1N1v pneumonia. Based in our results, the ability of these scales to predict ICU admissions for Influenza A H1N1v pneumonia is questioned.
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0546
DEXAMETHASONE AND SURVIVAL IN PATIENTS WITH SEVERE COMMUNITY-ACQUIRED PNEUMONIA

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INTRODUCTION. There is still a controversy about a beneficial effect of corticosteroids in patients with severe community-acquired pneumonia.
OBJECTIVES. To assess whether the adjunctive dexamethasone treatment improves outcome in patients admitted to the intensive care unit (ICU) with severe community-acquired pneumonia (CAP).
METHODS. Retrospective analysis of a prospective, observational cohort study conducted in 16-bed ICU of Sfanta Treime Municipal Hospital, Chisinau, from June 2009 to December 2011.
RESULTS. One hundred of consecutive patients (mean age 54.36 ± 17.35 years) with severe CAP were recruited, of them 47 % received dexamethasone (8 mg per day). Overall mortality in the study was 28 % (28/100). The effects of adjunctive dexamethasone treatment on survival were compared using univariate analysis and a Cox regression model. According to univariate analysis the mortality was higher in the group receiving dexamethasone 42.6 % (20/47) versus 15.1 % (8/53) ($p = 0.023$). Using a Cox hazard regression model, adjunctive dexamethasone treatment was associated with significantly lower adjusted 28-day in-ICU survival (hazard ratio, 3.30; 95 % confidence interval, 2.85–8.13; $p = 0.004$).
CONCLUSIONS. Dexamethasone does not seem to increase ICU survival in patients with severe community-acquired pneumonia.
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0547
THE IMPACT OF SURFACE CLEANING BY BIOSHIELD®75 ON INFECTION RATES IN INTENSİVE CARE UNIT

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INTRODUCTION. BioShield®75 (IndusCo Ltd, NC, ABD), known as surface protector, pierces the cell walls of microorganisms by forming a bed of spikes and prevents them to adhere the surfaces. This efficiency lasts 3 months in case of daily cleaning work. In this

study, the impact of BioShield®75 implementation on presence of microorganisms and infection rates was evaluated.
METHODS. In intensive care unit of 11 beds, BioShield®75 was applied for 7 times. Surface samples were taken before and after implementation. The time period of 12 months before (first period) and 22 months after BioShield 75 (second period) were compared in terms of infection rates and agents. RSHMB UHESKB criteria were used in diagnosis and follow-up of device related infections.
RESULTS. First BioShield®75 application was done on 23rd February 2010 and repeated averagely every 109 (87–140) days for six times. In the first period, 67 surface samples were taken (18 from common environment and 49 from beds) and growth of microorganisms were determined in 24 (35.8 %) samples. Acinetobacter spp. was identified with a ratio of 65.3 % in isolated 28 microorganisms. In the second period, growth was detected in 20 % of 70 samples in which 12 of them were from common environment. Four of 16 (25 %) microorganisms were Acinetobacter spp. It was determined that infection density (ID) was 68.8/1000 hospitalisation days, ventilator induced pnömonia (VIP) rate was 39.3, laboratory supported blood-circulation infection (LS-BCI) rate was 9.4, catheter related urinary system infection (CR-USI) rate was 5.5 in the first period. In the second period, it was detected that ID was 37.9/1000 hospitalisation days, VIP rate was 22.1, LS-BCI rate was 11.2 and CR-USE rate was 3.2. Growth frequency of the most isolated 3 infection agents was shown in the table. According to these results, a decrease of 21 % was seen in infections caused by Acinetobacter species.
CONCLUSIONS. In recent years Acinetobacter spp. infections have been a serious problem for intensive care units. As well as current infection control activities, after BioShield®75, Acinetobacter spp. density has dropped about three times in the examples taken from the media and infection density decreased significantly. These data suggest that infection control can be contributed by implementation of BioShield® 75.
GRANT ACKNOWLEDGMENT. In this study BioShield®75 was covered by Nano-Enterprise.

0548
CAN ROUTINE CLINICAL CHEMISTRY RESULTS BE RELATED TO THE VOLUME OF DISTRIBUTION OF AMPHOTERICIN B LIPID COMPLEX IN CRITICALLY ILL PATIENTS?

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INTRODUCTION. Amphotericin B lipid complex (ABLC) is commonly used to treat systemic fungal infections. Therapeutic drug monitoring is not routinely carried out for ABLC, however Amphotericin B (AmB) is considered to exhibit concentration dependent killing [2]. Low plasma concentrations of a drug are indicative of a large volume of distribution (Vd) and probably an increased concentration in various tissues. Furthermore, the Vd of a drug can be affected by the clinical condition and treatment of a critically ill patient [3]. Therefore the volume of distribution at steady state (Vss) is clinically relevant in ABLC treatment. As AmB is highly protein bound, measured plasma concentrations and therefore calculated Vss may be correlated with plasma protein levels [1]. It is also hypothesised that activity of the mononuclear phagocyte system (MPS) may be raised in the presence of inflammation or infection, and increased uptake by the MPS followed by organ sequestration may be reflected in an increased Vss. Therefore routine clinical markers of infection and inflammation may also correlate with Vss.
OBJECTIVES. To examine the relationship between the relevant routine clinical chemistry parameters and the Vss of ABLC in critically ill patients.
METHODS. The Vss of ABLC in 14 patient cases was calculated using non compartmental analysis in WinNonlin version 5.2 (Pharsight Ltd), as part of a study on pharmacokinetics of ABLC in critically ill patients. Regression analysis was carried out using Minitab version 16, (Minitab Ltd), to test for a relationship between routine clinical markers associated with protein levels, hepatic function, infection or inflammation, and Vss of ABLC. The results were examined before and after removal of statistical outliers.
RESULTS. From single parameter regression, both albumin levels and log C reactive protein (CRP) were found to have a statistically significant relationship ($P < 0.05$) with Vss of ABLC where an increase in Vss relates to a decrease in albumin levels and an increase in log CRP. In 2-parameter multiple regression, statistically significant relationships were found between Vss of ABLC and albumin levels and monocyte count, and between Vss and albumin and Log CRP.
CONCLUSIONS. The results of this study suggest that as albumin levels decrease and/or Log CRP increases, the Vss of ABLC will increase. Relating these routine clinical parameters to Vss of ABLC may be useful in anticipating variations in plasma ABLC concentrations.
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0549
REDUCING CENTRAL VENOUS CATHETER INFECTION—DOES THE STAY SUTURE FOR CVC FIXATION IMPROVE INSERTION SITE COVERAGE?

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INTRODUCTION. Central Venous Catheters (CVCs) are vital for the care of the critically ill and yet debate continues about the best way to secure and dress these lines. Migration of skin organisms from the site of insertion is the most common mechanism of infection for short-term venous catheters [1]. It is therefore essential that the CVC insertion site be covered by a secure adhesive dressing in order to prevent colonisation or contamination. A frequently observed problem is dressings being lifted away from the skin with movement of the CVC lumen. This process may result in exposure of the CVC insertion site and increase the risk of infection. A 'stay suture' is an additional suture placed 3–5 cm above the flange of the line, which is sutured as normal. It encompasses all the lumen holding them close to the neck, preventing them falling forward and lifting the dressing away from the skin.
OBJECTIVES. Our aim was to assess whether or not the use of a stay suture improves the dressing coverage of internal jugular CVC insertion sites.
METHODS. Prospective audits of two large tertiary referral Intensive Care Units (ICU) were conducted. One of these ICUs routinely use the stay suture, the other does not. Both use identical adhesive transparent dressings. Each day all internal jugular central venous catheters (CVCs) on each of the ICUs were assessed. Details on the placement of sutures used to secure the line were recorded. The CVC dressing was assessed and categorized as fully adherent, partially adherent, or exposing the line site. Statistical comparisons were then made between those patients with a stay suture and those without, and between the two centers.
RESULTS. 97 CVCs were assessed. In patients without a stay suture, 75 % of dressings were only partially adherent, versus 15 % in those with a stay suture ($p < 0.01$). In 41 % of those without a stay suture the line site was exposed versus 0 % in those with a stay suture ($p < 0.001$). In the center not routinely using the stay suture, 46 % of line sites were exposed, versus 0 % in the center encouraging its use ($p < 0.001$). It is worth noting that in the center encouraging the use of a stay suture, 85 % of CVCs in this ICU had a stay suture in place.
CONCLUSIONS. The use of a stay suture significantly improved dressing coverage for internal jugular CVCs in this study. By improving dressing coverage and preventing exposure of the CVC insertion point this simple measure has the potential to reduce CVC related infection. Whilst this study was not designed to assess the overall impact on CVC related infection, it does demonstrate that this simple and very low cost measure could prevent the most common mechanism for CVC related infection.
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0550
NURSE-LED QUALITY IMPROVEMENT PROGRAMME TO REDUCE HEALTHCARE RELATED INFECTIONS: 4 YEARS EXPERIENCE

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INTRODUCTION. Since the introduction of the Central Venous Catheter (CVC) bundle [1] on our 10-bedded Critical Care Unit we showed a continuous and sustained reduction in Catheter Related Blood Stream Infection (CRBSI) and Ventilator Associated Pneumonia (VAP) rate on our 10-bedded Critical Care Unit.
OBJECTIVES. We analysed the factors behind this reduction.
METHODS. Retrospective audit on the rate of CRBSI and VAP for a 3 months period before the implementation of the CVC and VAP bundle provided baseline data. Prospective rolling audit was carried out after the bundles were introduced in clinical practice. Robust educational program was rolled out during the implementation phase for medical and nursing staff. In January 2009 we changed our CVCs to antiseptic-impregnated catheters and in January 2010 we have introduced pre-prepared CVC insertion packs (AGB Plus, Arrow). Compliance data was collected based on the information recorded in our clinical information system (Carevue, Philips). CRBSI and VAP diagnosis was made according to the HELICS criteria. We collected data on mean dwell time, number of CRBSIs, site of infection and whether the patient left the unit with a CVC line in situ. We collected data on average ventilation time, VAP rate, time of onset of VAP and outcome of VAP. For statistical analysis Chi-square test and Wilcoxon test were used.
RESULTS. Our main results are summarised in Table 1 and 2.

CRBSI

Years	CVC days	Lines (n)	Mean dwell time (days)	Bundle compliance	CRBSI (n)	Infection rates/ 1000 catheter days
2006	2014	456	4.41	55 %	32	15.9
2008	2112	437	4.83	95 %	5	2.4
2009	2260	444	5.10	100 %	3	1.3
2010	2422	426	5.69	100 %	0	0
2011	2118	338	6.26	100 %	0	0

VAP

Years	Ventilator days	Ventilated patients (n)	Bundle compliance	Confirmed VAP (n)	Infection rates/ 1000 ventilated days/year
2008	1178	146	68 %	16	13.5
2009	849	168	93 %	4	4.7
2010	1183	180	99 %	2	1.7
2011	1021	173	99 %	5	4.9

We have seen a significant increase in the compliance with the bundle and it resulted a significant and sustained reduction in CVC related infection rate, number of patients transferred to the ward with CVC lines and VAP rate (all $p < 0.05$ compared to baseline). Mean dwell time showed a non-significant increase over time. All infected lines were inserted to the jugular vein. Time of developing VAP increased progressively from 8 ± 3 days to 16 ± 3 days over the study period. Mortality of VAP was 37 %, 25 % and 0 %.
CONCLUSIONS. Our data shows that implementation of care bundles can significantly and sustainably reduce and eliminate CRBSI and reduce VAP without extra expenditure on the ICU in a real life setting. 100 % compliance with the bundle over a sustained period seems to be necessary to eliminate CRBSI completely. On top of the CVP bundle the introduction of antiseptic-impregnated catheters helped to achieve this goal. Despite 99 % compliance with the bundle over a sustained period we could not eliminate VAP completely. However, we noticed an increased length of ventilator time before the development of VAP. The use of the clinical information system enables us to display real-time compliance data, which reinforces this message, even with a relatively high medical and nursing turnover.
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0551
INCREASED INCIDENCE BUT DECREASED MORTALITY OF METICILLIN RESISTANT STAPHYLOCOCCUS SPECIES (MRS) INFECTIONS IN A CARDIAC SURGICAL INTENSIVE CARE UNIT

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INTRODUCTION. Evidence from controlled studies reveals that invasive MRS infection is associated with significant increase in mortality, prolonged hospital care and substantial

extra costs. We previously reported [1] the incidence and outcomes of Meticillin resistant staphylococcus species infections in a cardiac surgical intensive care unit over a 5 year period (1999–2003).
OBJECTIVES. The aim of this study is to update the epidemiology of MRS infections in a cardiac surgical ICU and to assess trends of incidence and outcomes of MRS infections over the years.
METHODS. Demographic, clinical and microbiological data of all adult patients who underwent cardiac surgery were prospectively recorded in a 12 beds university hospital cardiac surgical intensive care unit from 2004 to 2009. Results were compared with previous data (1999–2003), defined as historical cohort.
RESULTS. 7351 patients who underwent cardiac surgery in the period 2004-2009 were compared to 6423 patients in the period 1999–2003 (historical cohort). The most frequent sites of MRS isolation were blood cultures (47.9 %), bronchial/alveolar secretions (22.4 %) and central venous catheter (8.6 %). 182 patients (2.5 %) had at least 1 infection caused by MRS, compared to 118 (1.8 %) in the historical group ($p = 0.01$). Mortality rates of patients with MRS infection was 32.4 %, compared to 50.0 % in the historical cohort ($p = 0.003$). The time course of mortality rates is shown in figure 1. Overall, mortality rate associated with MRS infection in patients undergoing cardiac surgery was 0.8 % (59/7351), vs. 0.9 % (59/6423) in the historical group.
CONCLUSIONS. Despite an increased incidence in MRS infections after cardiac surgery over the years, there was a significant reduction in mortality rates in MRS patients; overall, mortality rate associated with MRS infections after cardiac surgery remained unchanged.

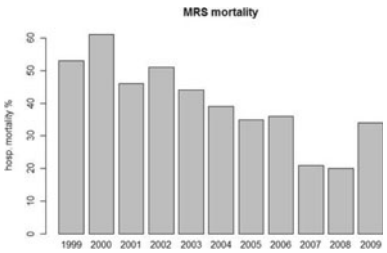

Fig. 1

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0552
USE OF CDC CRITERIA TO CLASSIFY INFECTIONS IN CRITICALLY ILL PATIENTS: RESULTS FROM AN INTEROBSERVER AGREEMENT STUDY

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INTRODUCTION. Correct classification of the source of infection is important in observational and interventional studies of sepsis. Centre for Disease Control (CDC) criteria [1] are most commonly used for this purpose, but the robustness of these definitions in critically ill patients is not known.
OBJECTIVES. To determine the interobserver agreement for classifying infections in the ICU.
METHODS. Data were collected as part of a prospective cohort of 1,214 critically ill patients admitted to two hospitals in The Netherlands between January 2011 and June 2011. Eight observers assessed a random sample of 168 out of 554 patients who had experienced at least one infectious episode in the ICU. Each patient was assessed by two randomly selected observers who independently scored the source of infection (by affected organ system or site), the plausibility of infection (rated as none, possible, probable, or definite), and the most likely causative pathogen. Assessments were based on a post hoc review of all available clinical, radiological and microbiological evidence. For source of infection, the observed diagnostic agreement was classified as partial (i.e., matching on organ system or site) or complete (i.e., matching on specific diagnostic terms).
RESULTS. A total of 206 infectious episodes were observed in 168 patients. Overall, agreement regarding the source of infection was 69 % (142/206) and 89 % (183/206) for complete and partial diagnostic agreement, respectively. This resulted in an overall kappa of 0.85 (95 %CI 0.79–0.90). Table 1 shows diagnostic agreement for the main sources of infection. We then further analyzed the subgroup of 142 episodes where full diagnostic agreement on source of infection had been obtained. For plausibility of infection, the interobserver agreement was 83 and 65 % on a 2- and 4-point scale, respectively. For causative pathogen, agreement was 78 and 70 % for an approximate and exact pathogen match, respectively.

Agreement across sources of infection

Source of infection	Partial agreement	Source of infection	Complete agreement
Lower respiratory tract	86/90 (96 %)	Community acquired pneumonia	28/32 (88 %)
		Hospital acquired pneumonia	32/39 (82 %)
		Ventilator acquired pneumonia	12/17 (71 %)
Abdominal	34/36 (91 %)	Secondary peritonitis	21/24 (88 %)
Blood stream	30/34 (94 %)	Line infection	22/26 (85 %)
		Primary blood stream infection	4/5 (80 %)
Central nervous system	10/11 (91 %)	Secondary meningitis	5/7 (71 %)
		Primary meningitis	4/4 (100 %)

CONCLUSIONS. In this study overall interobserver agreement of CDC criteria was 89 % and complete diagnostic agreement on all aspects of the diagnosis between independent observers was 69 %.
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0553
DURATION OF HYPOTENSION DURING SEPSIS DETERMINES THE EVOLUTION OF ACUTE KIDNEY INJURY

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INTRODUCTION. Sepsis is based on the presence of infection plus the concomitant occurrence of 2 out of 4 so called SIRS criteria. Septic shock is sepsis with the necessity for vasopressors after lack of response to fluid resuscitation.
OBJECTIVES. The aim of this retrospective, single centre study was to look for. 1. the influence of proven sepsis on the evolution to Failure; 2. the influence of hypotension on the evolution to Failure; and 3. the evolution of hypotension during sepsis.
METHODS. During a 21 months period, all patients with bloodstream infection (BSI) by non-commensally flora (gram+, gram− and other) during their ICU-stay were included. Acute kidney injury (AKI) was assessed by the RIFLE-classification, including 2 separate criteria for renal failure: changes in serum creatinine and/or changes in urinary-output. Changes indicate an increasing severity of AKI with 3 different stages: Risk (R), Injury (I) or Failure (F) of kidney function and 2 outcome levels: loss of kidney function or end-stage renal disease. Data were retrieved starting from 1 day before BSI was detected (BSI-1) until 3 days thereafter (BSI + 3). Patients with pre-existing renal failure were excluded. The patients were divided in 4 groups with predominantly stage R, I, F or no-AKI. The influence of the duration of (severe) hypotension, defined as a mean blood pressure <85 mmHg or <65 mmHg were evaluated on the evolution for AKI according to stage R, I and F. Demographic data and signs of infection (WBC, CRP) were gathered. The administration of diuretics and vasopressors (the validated vasopressor load [vpld] and mean inotropic index [mii]) were taken into account.
RESULTS. 145 critically ill patients with an equal distribution of age (mean 62 years), gender and diabetes in all 4 groups were included. None of them were treated with NSAIDs or ACE-inhibitors. Infectious parameters and distribution of diuretics were also equally divided during the different days. Total number of days between BSI and antibiotic treatment in these groups were the same. 1. Significance was seen in septic patients for evolution to F during BSI-1 until BSI + 3 ($p = 0.047$) without any influence of either flora, the degree of vpld or mii 2. The longer the severe hypotension period lasts (<65 mmHg, not 85 mmHg), the more the possibility for F increases ($p = 0.0018$) 3. A Poisson model for repeated measures shows a quadratic evolution of total hypotension time during BSI-1 until BSI + 3 ($p = 0.027$): the maximum is reached at day BSI + 1. Moreover, hypotension is worst (<65 mmHg) in patients with gram-infection ($p = 0.026$). Besides, gram- septic shock has the most severe influence on the evolution of AKI at the first day after positive BSI detection (BSI + 1).
CONCLUSIONS. Alongside the RIFLE-classification to identify the evolution of AKI in septic patients, the duration of severe hypotension and the kind of infection (gram− vs. gram+) should be taken into account and determines the evolution to F.

0554
THE CHRONIC HEPATITIS E INFECTION IS ASSOCIATED WITH A SPECIFIC INTERFERON-RELATED TRANSCRIPTIONAL PROGRAM

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INTRODUCTION. Hepatitis E Virus (HEV) is a new causative agent of chronic hepatitis in solid organ transplant recipients. Clinical studies suggest that the occurrence and persistence of chronic HEV infection are related to the immunological status of patients.
OBJECTIVES. We used whole-genome microarray and real-time quantitative polymerase chain reaction (qRT-PCR) to compare the transcriptional profiles of whole blood from 8 kidney-transplant recipients with chronic HEV infection and 8 matched kidney-transplant recipients without HEV infection.
METHODS. A transcriptional case–control study was performed on blood samples from patients with chronic HEV infection ($n = 8$) and control patients without any viral infection ($n = 8$). Infected patients and controls were matched on sex, age, time since kidney-transplant, and immunosuppressive treatment (presence of a calcineurin inhibitor). Chronic hepatitis E status was defined by the persistence of HEV RNA in blood for longer than 6 months. Whole blood samples were collected on PAXgene tubes and gene expression was studied using whole human genome microarray (Agilent 4 × 44 k G4112A). Data analysis was conducted using R and bioconductor libraries (NCT01090232).
RESULTS. We found an absence of down-regulated genes. In contrast, 30 genes were up-regulated in 8 HEV-infected patients, compared with 8 control patients. The 30 up-regulated genes included 25 interferon-stimulated genes. The up-regulated expression of the genes that encode IFIT1, IFI44L, RSAD2, EPSTI1, and ISG15, was confirmed by qRT-PCR. Interestingly, their levels of expression were related to the severity of the disease.
CONCLUSIONS. The increased expression of interferon-stimulated genes can be related to the persistence of the HEV infection. The study of the peripheral transcriptional signature could be useful to forecast the clearance of HEV in chronic infection or to indicate when antiviral therapy could be initiated.

0555
CLINICAL, LABORATORY AND RADIOLOGICAL DIFFERENCES IN CRITICALLY ILL AND NON-CRITICALLY ILL H1N1 POSITIVE PATIENTS

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INTRODUCTION. Pandemic influenza A (H1N1) virus infection presents with variable severity. Respiratory failure occurs particularly in high-risk patients and may lead to Intensive Care (ITU) admission and eventually death [1]. To date, no clinical or laboratory predictors of disease severity and ITU admission have been identified.
OBJECTIVES. We investigated whether the severity of H1N1 infection correlated with laboratory, echocardiograhic and radiological findings in order to identify potential predictors for ITU admission in these patients.

METHODS. We retrospectively reviewed medical records of adults admitted to the Emergency Department of a large inner-city teaching hospital during the flu pandemic in 2009/2010. Patients with positive pharyngeal swabs for H1N1 were included in the analysis. After classification of patients into critically ill (requiring higher level of care) versus non-critically ill patients, the following data were evaluated: demographic data, hospital mortality, blood gases on admission, routine laboratory data, echocardiographic and radiological characteristics. Results are presented as median and interquartile range. Kruskal–Wallis analysis and the Chi-Quadrat Test were used for statistical evaluation.
RESULTS. 134 patients tested positive for H1N1, 27 patients were admitted to ITU and 2 patients to the high dependency unit. 14 (10.4 %) patients died. Patients requiring ITU admission were older (52 years [39; 57] vs. 38 years, [24; 52], $p = 0.003$), had worse PaO_2/FiO_2 ratios on their first blood gas (19.8, [13.45; 28.66] vs. 36.19 [24.01; 42.86] $p = 0.001$), displayed higher creatinine levels on admission (95 µmol/l [71; 208] vs. 74 µmol/l [64.5; 87.5], $p = 0.002$). The admission platelet count was lower in critically ill patients (139×109/l [16; 217.5] vs. 174×109/l [147; 233], $p = 0.038$), whilst the admission C-reactive protein was higher (131 mg/L [69.5; 239.25] vs. 58 mg/L [26; 121] $p = 0.022$). The admission chest X-rays of those admitted to ITU were more likely to reveal consolidation (51.7 % vs. 21.9 % $p = 0.002$) and pulmonary oedema (37.9 % vs. 2.9 % $p = < 0.001$). Echocardiography revealed abnormalities in 50 % of patients admitted to ITU.
CONCLUSIONS. We have identified multiple clinical, laboratory and radiological findings that are associated with severe H1N1 infection. Further investigation will reveal whether a combination of clinical, laboratory and radiological indicators may be useful in predicting the severity of a H1N1 infection, and thus level of care required.
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0556
QUALITY OF ANTIBIOTIC USE IN INTENSIVE CARE UNITS: EVALUATION OF PARENTERAL VANCOMYCIN USE IN A DUTCH ICU

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INTRODUCTION. Inappropriate antibiotic (AB) use is associated with poor patient outcomes, especially in intensive care units (ICUs). The use of vancomycin has gradually risen in our hospital from 112 parenteral courses of therapy in 2007 to 292 in 2011. At our ICU, the increased use of vancomycin has been attributed to increased colonisation with E. *faecium*, related to the increased use of SDD since 2007.
OBJECTIVES. Following an outbreak of Vancomycin Resistant Enterococci (VRE) in our department, appropriateness of vancomycin use was thoroughly evaluated and critically reviewed.
METHODS. In a 11-bed mixed ICU of a large teaching hospital, a retrospective review was performed including all ICU patients, treated with vancomycin in a 2 year period (2010–2011). Patients were selected using the electronic prescribing system. All written medical and nursing charts of patients treated with vancomycin were retrieved and studied. Data were collected on following aspects of vancomycin use: 1. What was the indication to start vancomycin treatment? Was it documented and if so, was therapy empirical, pre-emptive or culture based? 2. Was therapeutic drug monitoring for vancomycin performed, and if so was this done adequately?
RESULTS. Vancomycin was started 70 times in a total of 52 patients. Median duration of therapy was 5 days (1–38). In 11 cases, vancomycin was prescribed as a one-time dose. Vancomycin was prescribed *empirically* in 27 % of cases (37/70), *pre-emptively* in 10 % (7/70) and *based on available cultures* in 53 % (37/70). In 10 % (7/7) indication of treatment was not retrievable. In 43 % (16/37) cases with known culture results, therapy was based on a positive bloodcultures (*E. faecium* (50 %) and CNS (50 %)). 11/19 prescriptions were for suspected Central Venous Catheter infection. 50 %(35/70) of prescriptions were started at daily multidisciplinary ICU meetings, 57 % of which were culture directed. 11 % (8/70) of prescriptions were started after approval of a microbiologist/IDS and 33 % (23/70) without consulting a microbiologist/IDS. There were no differences in clinical patient characteristics related to pre-emptive, empirical or culture directed therapy. In 27/70 of vancomycin prescriptions MDRD was <60 ml/min. Vancomycin drug level was measured at median of 1.9 days (1–6) after start. In 93.3 % of patients with MDRD <60 and not on CVVH, drug levels were within the therapeutic range. In patients with MDRD > 60, 47.6 % of drug levels were adequate. During CVVH, vancomycin was underdosed in 5/13 (38 %).
CONCLUSIONS. Our findings suggest that vancomycin therapy is generally managed appropriately in our ICU, although there is room for improvement. Drug levels of vancomycin were almost all within the therapeutic range in patients with decreased renal function. In patients with normal renal function and in those on CVVH however, dosage and/or dosing interval was too low to reach therapeutic levels. These findings have changed our daily practice.

0557
CLINICAL OUTCOME AND MICROBIOLOGICAL ASPECTS IN SECONDARY PERITONITIS: THE ROLE OF RECENT ANTIBIOTIC EXPOSURE

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INTRODUCTION. Secondary peritonitis is associated with high degree of organ dysfunction and lead to high rate mortality. As in other kind of infections, prior use of antibiotic can influence future microorganisms involved in peritonitis.
OBJECTIVES. To assess the impact of previous antibiotic use in patients who developed secondary peritonitis.
METHODS. All consecutive patients admitted to a 18-bed medical-surgical ICU during a 28-months period with the diagnosis of secondary peritonitis was identified from a retrospective database. We identified patients recently treated with antibiotics, excluding surgical prophylaxis. Statistical analysis using Chi^2 and t-Student tests.
RESULTS. A total of 59 patients were included. 39 (61.9 %) had received antibiotics (Group A) and 17 (31.7 %) had not (Group nA). Age (69 years (SD 10.4) vs. 66.6 (14.9); p 0.54), sex (69 % vs. 60 % men; p 0.11), APACHE II score (22 (SD 6.92) vs. 20 (7.96); p 0.36), Charlson comorbidity index (2.9 (SD 2.92) vs. 2 (2.05); p 0.23) was similar between both groups. Proportion of planned versus unplanned initial surgery and anatomical or surgical source of peritonitis was not different. We observed a trend to lower intensity of peritonitis in A group, as measured by Mannheim Peritonitis Index (MPI) Patients in this group showed a median MPI of 24.5 versus 28.8 in nA group (p 0.058) We did not find differences in the need for relaparotomy nor the development of residual intraabdominal collections. Degree of inflammatory response and organ failure was also similar between groups: proportion of septic shock was 51.3 % in A group vs. 55 % in nA group (p 0.79), sepsis/severe sepsis 48.7 vs. 45 % (p 0.79), renal failure 41 vs. 30 % (p 0.4), ARDS 5.1 vs. 10 % (p 0.48) and duration of mechanical ventilation 9.7 vs. 7.6 days (p 0.52). No difference was observed in ICU or hospital stay, and survival in both groups was also similar.
Taking into account only those patients (43) with postoperative secondary peritonitis (anastomotic leakage), we observed a significative longer period from initial surgery to relaparotomy (8 vs. 4.5 days; p 0.044), longer ICU stay (18 vs. 8.7 days; p 0.046) and a trend to higher hospital mortality (51.5 vs. 14.3 %; p 0.07) in patients with previous antibiotic use. From a microbiologic point of view, no difference was found in the rate of positive cultures, type of growing or total number of microorganisms per sample. Only in the subgroup of postoperative peritonitis, the rate of positive cultures was higher in A group (64 vs. 44.4 %, ns) and the presence of gram positive lower (p 0.017).
CONCLUSIONS. In our patients, prior exposure to antibiotics was not associated with worse outcomes or differences in microbiologic isolations. Only in patients with anastomotic leakage-related peritonitis, prior use of antibiotics was associated with delayed relaparotomy, lower gram-positive growing and longer ICU stay.
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0558
ABDOMINAL INFECTIONS IN THE ICU—DATA FROM THE EPIC II STUDY

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INTRODUCTION. Abdominal infections are frequent in the ICU and challenging both in terms of achieving adequate source control and selecting appropriate antibiotics. Multicenter data on clinical features and microbiology of abdominal infection are limited.
OBJECTIVE. To analyze the characteristics of the abdominal infections as well as the antibiotics used in patients with abdominal infections included in the EPIC II study, and identify factors associated with mortality.
METHODS. The EPIC II one-day point prevalence study of infection in critically ill patients was performed on May 8, 2007. Demographic, physiological, bacteriological and therapeutic data were collected from 13,796 adult (>18 years) patients in 1,265 ICUs from 75 countries. Infection was defined according to the criteria of the International Sepsis Forum. Patients were followed up until hospital discharge or for 60 days, and ICU and hospital outcomes were recorded. For the purposes of this study, we selected the patients who were diagnosed with intra-abdominal infections. Data are presented as mean (standard deviation [SD]), median (interquartile range [IQR]), or number (%) as appropriate. $P < 0.05$ was considered statistically significant.
RESULTS. Of the 7,087 patients with infections, 1,392 (19.6 %) had abdominal infections on the study day (60 % male, mean age 62.5 ± 16.2 years, SAPS II score 38.9 ± 16.4). Among the comorbidities, cancer and COPD were the most frequent, (23.1 and 16.2 % respectively). SOFA score on the study day was 7.6 ± 4.6. The majority of the patients (885 [63.7 %]) were emergency surgery patients. The median ICU stay was 16 (IQR 6–34) days. Concomitant infections were frequent, with respiratory infection and bloodstream infections in 26.8 and 11.6 % of cases respectively. Microbiology was positive in 931 patients (66.9 %), with a total of 1,289 microorganisms isolated from these patients; these were Gram negatives (48.0 %), Gram positives (28.4 %), anaerobes (11.3 %), fungi (10.1 %) and other (2.2 %). Antibiotics were administered to 1,366 patients on the study day. Penicillin derivatives and other beta-lactam antibiotics were used most frequently (34.6 and 32.2 % of the patients respectively; on the study day, 24.9 % of the patients received antifungals. The overall ICU and hospital mortality rates were 29.4 and 36.3 % respectively. Multivariate analysis found that the only factors independently associated with mortality in these patients were hematologic malignancy, mechanical ventilation, cirrhosis, the need for renal replacement therapy and greater SAPSII score.
CONCLUSIONS. The majority of patients with abdominal infections in ICUs underwent emergency surgery, and cancer was the most common comorbidity in these patients. Two-thirds of the infections were culture positive with aerobic gram-negative bacteria isolated most frequently. A wide variation of antibiotics was used to treat these infections. Mortality remains high in this patient population.

Management of cardiovascular patients: 0559–0572

0559
COMPARATIVE EFFECTS OF DEXMEDETOMIDINE AND CLONIDINE, ALPHA 2 AGONIST, ON CARDIAC FUNCTION, CORONARY VASOACTIVITY AND VENTRICULAR ELECTROPHYSIOLOGY IN GUINEA-PIG

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INTRODUCTION. Alpha 2 agonists are widely used for not only an adjunct to anesthesia but also sedation during mechanical ventilation in intensive care unit. Both dexmedetomidine and clonidine are more selective and specific alpha 2 agonists. Despite the widespread use of these drugs, Cardiac arrest induced by dexmedetomidine has been reported. Since little is known about their cardiac performance on mammalian heart, we therefore evaluated the inhibitory effects of dexmedetomidine on cardiac function with electrical field stimulation and the direct effects on coronary artery or ventricular myocytes in guinea pig hearts, and compared these effects with those of clonidine.
METHODS. All animal experiments were approved by The University Animal Ethics Committee. Under deep anesthesia with pentobarbital, the heart was excised and mounted on a Langendorff apparatus to measure coronary perfusion pressure (CPP). The saline-filled balloon was inserted into the left ventricle to measure systolic left ventricular pressure (sLVP). The coronary flow was maintained at a constant value during the experiments (8 ml/min). The electrical field stimulation (EFS) was applied to stimulate sympathetic nerve terminal. The heart was paced electrically at 240 beats/min. Single ventricular cells were enzymatically isolatedfrom hearts and action potential duration (APD) was investigated by the patch clamp methods. Group comparisons were conducted by one-way repeated—measures analysis of variance (ANOVA) with Dunnett's multiple comparison test. Differences at $P < 0.05$ were considered to denote significance.

RESULTS. Dexmedetomidine almost completely inhibits the increase of LVP induced by EFS at concentrations >10 nM, while, over 100 nM clonidine was required.
Dexmedetomidine increased CPP in a concentration-dependent manner significantly at concentrations >10 nM ($P < 0.05$, 10 nM dexmedetomidine vs. control; $P < 0.01$, 100 nM dexmedetomidine vs. control). On the other hand, clonidine had minimal effects on CPP. Both dexmedetomidine and clonidine had little direct effects on ventricular dP/dt and/or APD. In computer simulation, the concentration of dexmedetomidine reached to 10 nM by initial dose of 1 μg/kg for 10 min.
CONCLUSIONS. The present findings demonstrated that dexmedetomidine inhibits the increase of cardiac function activated by sympathetic stimulation significantly more than clonidine. In addition an elevation of coronary artery resistance in response to dexmedetomidine may further facilitate negative inotropy in vivo.

0560
CAN CARDIOPULMONARY EXERCISE TESTING HELP TO FAST-TRACK PATIENTS FOR OPEN AAA REPAIR?

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INTRODUCTION. Patients undergoing open repair of abdominal aortic aneurysm (AAA) have a high risk of perioperative cardiovascular and respiratory complications. Consequently, it is standard practice in our facility for these patients to be admitted to the Intensive Care Unit (ICU) post-operatively. Cardiopulmonary exercise testing (CPET) is gaining popularity as a risk stratification tool and has shown to be a useful predictor of early and late outcomes in patients undergoing open AAA surgery. [1].
OBJECTIVES. Our aim was to identify whether CPET may be used to identify patients undergoing uncomplicated open AAA repair with a low risk of requiring post-operative organ support in the ICU.
METHODS. Data was analysed for all patients who had undergone CPET prior to elective open AAA repair during the period 1/11/1–5/3/12 (17 months). CPET data was collected from our facility's CPET database. Information relating to the duration of ICU care and level of support was collected from the electronic critical care record (PICIS Solutions). Level of ICU support was determined according to the Critical Care Minimum Dataset (CCMDS) as published by the Department of Health (DoH). [2].
RESULTS. Full data was available for 23 patients (74 % male, median age: 71 years, range: 59–85 years). 12/23 (52 %) patients had an anaerobic threshold (AT) >11 ml/kg/min, 11/23 (48 %) patients had an AT <11 ml/kg/min. Levels of ICU support required are shown in Figure 1. 1 patient with a pre-operative AT >11 ml/kg/min was excluded due to complications of surgery resulting in 5 l intra-operative blood loss. Median length of ICU stay was 3 days (AT >11 ml/kg/min) vs. 4 days (AT <11 ml/kg/min).

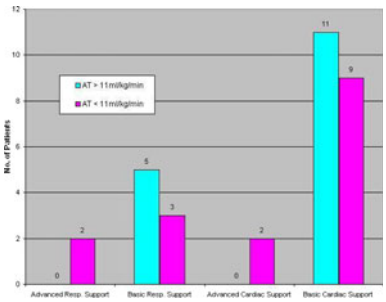

Fig. 1 Level of ICU support according to the AT

CONCLUSIONS. CPET predicted patients undergoing uncomplicated open AAA repair who did not require post-operative advanced respiratory or cardiac support. An AT >11 ml/kg/min was also associated with a reduced length of stay in ICU. These findings would support development of a fast-track program for patients undergoing open AAA repair. This has significant implications for resource utilisation of critical care facilities.
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0561
COMPARISON OF CUSTODIOL HTK AND REPEATED OXYGENATED WARM BLOOD CARDIOPLEGIA FOR ARTERIAL SWITCH OPERATION IN NEONATES

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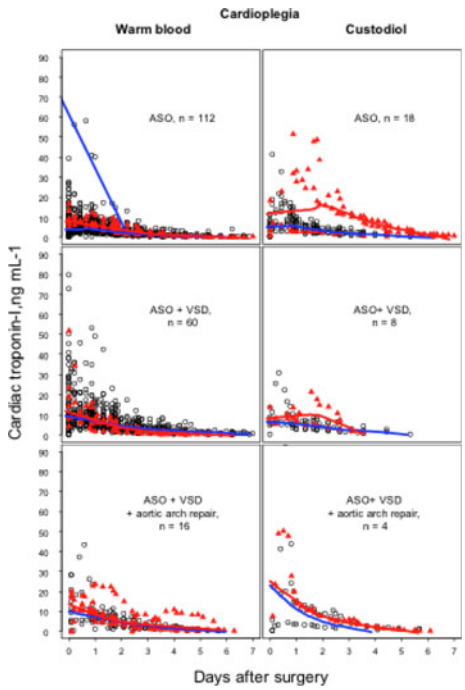
INTRODUCTION. Normothermic Cardiopulmonary bypass (CPB) with repeated warm blood cardioplegia has shown to result in reduced postoperative cardiac troponin-I release [1, 2], in better myocardial protection [3], in fewer days of mechanical ventilation and in a slightly shorter length of ICU stay [2], when compared to hypothermic CPB with cold crystalloid cardioplegia. During the arterial switch operation (ASO) for transposition of the great arteries in neonates, repeated cannulation of the coronary ostia is needed to infuse the warm blood cardioplegia. It is not known whether this could lead to intimal insult or affect long-term results. Custodiol® is used for organ preservation in transplantations, but also as a cardioplegic agent that allows single-dose administration. Custodiol® is used in adults and children [4, 5].
OBJECTIVES. The aim of the present study was to compare myocardial protection between repeated oxygenated warm blood cardioplegia, and Custodiol® cardioplegia in neonates undergoing ASO.
METHODS. All neonates undergoing ASO were retrospectively enrolled from January 2007 through February 2011. They underwent surgery with normothermic CPB and warm cardioplegia, except during a 6-month period, when moderate hypothermia and Custodiol® cardioplegia were used. Baseline and preoperative characteristics were compared after stratification on type of procedure being performed (ASO ± ventricular septal defect closure ± aortic arch repair). Short-term outcome variables and troponin concentrations within the first week of surgery were analysed using mixed models, with type of procedure as random effect, and the use of Custodiol® and the coronary artery pattern as fixed effects.
RESULTS. Overall 30 patients received Custodiol® cardioplegia, and 188 had repeated oxygenated warm blood cardioplegia. Baseline, peroperative characteristics and postoperative course were not significantly different between groups. The 30-day mortality rate was higher in the Custodiol® group, 10 versus 1.1 %, $p = 0.05$, but was related to a higher prevalence of coronary anomalies in this group, 20 versus 9 %, $p = 0.05$. Both the use of Custodiol® and coronary anomalies were independently associated with higher troponin concentrations ($p = 0.001$ each).
Table Short-term outcomes and cardiac troponin I release within 7 days of surgery Multivariable analysis was stratified on the procedure being performed. The composite variable included occurrence of severe Low Cardiac Output Syndrome (LCOS), either requiring postoperative ECMO, or resulting in acute kidney injury requiring dialysis, and death within 30 days of surgery. Length of mechanical ventilation and ICU stay were analysed on a logarithmic scale in order to normalise their distributions.

Variable	Effect of Custodiol		Effect of the coronary pattern	
	Regression coefficient ± SD	P-value	Regression coefficient ± SD	P-value
Delayed sternal closure	-0.02 ± 0.5	0.96	1.22 ± 0.5	0.01
Peak lactatemia within 48 hrs of surgery	0.66 ± 0.5	0.19	1.32 ± 0.7	0.06
Log [length of mechanical ventilation** (days)]	-0.15 ± 0.2	0.38	0.32 ± 0.2	0.11
Log [length of ICU stay** (days)]	-0.15 ± 0.1	0.14	0.11 ± 0.1	0.37
Severe LCOS or death	0.03 ± 0.6	0.96	1.57 ± 0.5	0.004
Overall cTn-I release	1.88 ± 0.6	0.001	2.05 ± 0.6	0.001

** in hospital survivors

short term outcomes and cardiac troponin I

Graph Cardiac troponin I concentrations within the first week of surgery in patients with repeated oxygenated warm blood and Custodiol cardioplegia. Mean concertrations over time are summarized by the moving average curve, smoothed using the loess smoother. Black circles and blue lines refer to patients without coronary amomalies, red triangles and red lines refere to potients with coronary anomalies (Single or Intramual).



First week Troponin I

CONCLUSIONS. Cardiac troponin release was higher when Custodiol® cardioplegia was used in neonates undergoing ASO, suggesting worse myocardial protection, but no difference was noted in short-term outcome.
REFERENCES. 1. Caputo M et al. Ann Thorac Surg. 2005;80(3):982–8. 2. Pouard P et al. Eur J Cardiothorac Surg. 2006;30(5):695–9. 3. Poncelet AJ et al. Eur J Cardiothorac Surg. 2011;40(6):1384–90. 4. Arslan A et al. Transplant Proc. 2005;37(7):3219–22. 5. Holper K et al. Thorac Cardiovasc Surg. 1998;46(2):292–5; discussion 6–7.

0562
THE RELATIONSHIP BETWEEN MELATONIN AND SYSTEMIC INFLAMMATORY RESPONSE SYNDROME IN PATIENTS UNDERGOING CARDIOPULMONARY BYPASS

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INTRODUCTION. It has been known that after heart surgery under cardiopulmonary bypass, systemic inflammatory response occurs and proinflammatory cytokines are released. To date, many agents have been used to decrease the inflammation intensity. Melatonin is one of those whose antioxidant property is well-known and used for this purpose exogenously [1]. However, there are few studies investigating the relation between the endogen melatonin levels and inflammatory response.
OBJECTIVES. In this research, the relation between the preoperative melatonin levels and systemic inflammation consisting in patients undergoing cardiac surgery after cardiac surgery has been studied.
METHODS. Forty-three patients undergoing open heart surgery have been included into the study. Blood samples were taken to investigate endogen melatonin levels the night before surgery at 10 p.m. and to determine TNF-α, IL2, IL6 and IL8 levels at 10 pm the night before surgery, 1th, 8th and 24th hours postoperatively. After statistical mean values of melatonin levels were found, the values below the average were included into the low melatonin group (LM) and values above the average were included into the high melatonin group (HM).Then, the correlation between proinflammatory cytokines determined at four different periods and melatonin levels were investigated.
RESULTS. The mean value of melatonin levels was 50.7 pg/ml. It was determined that, 74.4 % (n:32) of patients were in LM group and 25.6 % (11) of them in HM group. Whereas proinflammatory cytokines were detected to increase postoperatively, no statistical difference was found between LM and HM groups in terms of TNF-α, IL-2, IL-6 ve IL-8 values.
CONCLUSIONS. Even though reaching inflammatory mediators to high levels during postoperative period is an important and expected result, being not affected from the melatonin levels of these values, make us think that the amount of endogen melatonin does not affect the intensity of the inflammation.
REFERENCE. 1. Veneroso C, Marı′a J. Tuñon,Javier Gonzalez-Gallego and Pilar S. Collado. Melatonin reduces cardiac inflammatory injury induced by acute exercise. J. Pineal Res. 2009; 47:184–91.

0563
INFLAMMATORY MARKERS IN THE LUNG DURING OPEN AORTIC SURGERY MEASURED BY BRONCHIAL MICRODIALYSIS

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INTRODUCTION. Open abdominal aneurysm surgery (OAAS) induces a systemic inflammatory response and put patients at risk of multiple organ failure. The lung is one of the organs most at risk. The mechanisms behind this are not fully understood, but the primary alteration is increased local inflammation. To measure inflammatory markers in the epithelial lining fluid in the lungs we have developed the method bronchial microdialysis [1].
OBJECTIVES. The aim of this study was to evaluate the feasibility of bronchial microdialysis in patients. We studied the inflammatory response in bronchi during OAAS to see when a change in the concentration of cytokines could be detected. To our knowledge the responsiveness of the bronchial inflammatory response from time to time in the peroperative period of OAAS has not been previously studied.
METHODS. Sixteen patients scheduled for OAAS were included after signing informed consent. After anesthesia induction a bronchial microdialysis (MD) catheter (100 kDa cutoff), perfused by dextran 60 (Plasmodex®), 1 µl/min, was forwarded until wedging in a distal bronchus. Microdialysate was collected in portions before and during aortic cross clamping as well as 60 and 120 min after de-clamping. Cytokines were measured with bead based multiplex assay analysed by flow cytometry (Bio-Rad, Bio-Plex Pro Human Cytokine 17-Plex Panel). Friedman test was used to assess changes over time. Wilcoxon signed rank test with Bonferroni correction was used to compare different time points. Data are presented as median (min–max) unless otherwise described.
RESULTS. There were no complications related to the method.
IL-7 decreased significantly already during ischemia. IL-6, IL-13 and GM-CSF increased during the first 60 min of reperfusion. IL-5 increased during 60–120 min of reperfusion.

Bronchial cytokines (pg/ml) median(25–75 %)

	After anesthesia induction	Ischemia	Reperfusion 60 min	Reperfusion 120 min	P
IL-2	0.42(0.25–0.58)	0.46(0.25–1.06)	0.69(0.44–1.31)	0.54(0.35–1.28)	0.045
IL-4	0.19(0.11–0.35)	0.20(0.14–0.49)	0.26(0.20–0.69)	0.29(0.15–0.53)	0.025
IL-5	0.20(0.09–0.29)	0.14(0.09–0.23)	0.21(0.13–0.42)	0.32(0.12–0.67)†	0.012
IL-6	18.31(7.86–58.84)	87.77(27.61–295.73)	229.39(93.97–594.83)*	203.04(49.08–571.83)*	<0.001
IL-7	1.12(0.78–1.73)	0.44(0.30–0.91)*	0.64(0.25–0.77)	0.47(0.24–0.56)*	0.002
IL-13	0.12(0.08–0.34)	0.38(0.11–0.63)	0.64(0.32–2.08)*	0.81(0.14–2.7)*	0.001
GM-CSF	10.11(8.62–11.75)	11.70(9.94–13.60)	12.70(10.87–15.72)*	13.63(10.30–15.77)*	0.008
TNF-α	1.39(0.99–2.78)	1.99(0.82–15.30)	3.71(1.31–23.09)	2.52(1.05–16.58)	0.038
	* $p < 0.05$ vs. After anesthesia induction	† $p < 0.05$ vs. Ischemia			

The change in concentration from time period to time period for IL-6 is presented.

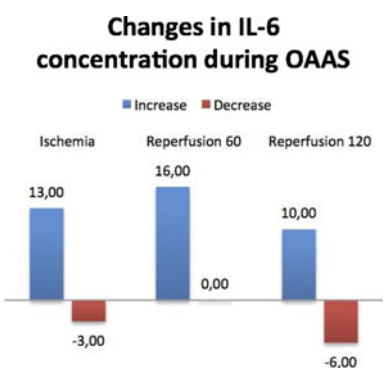

Fig. 1 Progress of IL-6 concentration during OAAS

Aortic cross clamp time 78(48–136) min, 2 patients required prolonged mechanical ventilation, none developed ALI/ARDS, 1 patient developed acute renal failure and none required dialysis.
CONCLUSIONS. Bronchial microdialysis is a feasible method in intubated patients, and can be used for continuous surveillance of the epithelial lining fluid.
There is seen an almost immediate response to the OAAS in the lungs with altered cytokines already during aortic cross clamping. Whether these are locally produced, and the clinical significance, remains to be elucidated.
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GRANT ACKNOWLEDGMENT. The project is conducted with grant from Samarbeidsorganet NTNU and HMN.

0564
PROPHYLACTIC EFFECT OF DEXMEDETOMIDINE FOR SUPRAVENTRICULAR ARRHYTHMIA IN CARDIAC POSTOPERATIVE PATIENTS

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INTRODUCTION. Patients who have undergone cardiac surgery often develop supraventricular arrhythmia such as atrial fibrillation, leading to worse outcomes. Dexmedetomidine (DEX) is a novel sedative agent and decreases heart rate and blood pressure of the patients with α2-agonist effect. We hypothesize that DEX may reduce the incidence of supraventricular arrhythmia during perioperative period in the patients after cardiac surgery.
OBJECTIVES. The purpose of this study is to evaluate the prophylactic effect of DEX for supraventricular arrhythmia in the patients after cardiac surgery.
METHODS. Non-randomized preliminary study was conducted to patients in intensive care unit (ICU) who had undergone cardiac surgery including coronary artery bypass graft, mitral and aortic valve replacement and resection of cardiac tumor. We compared patients who had received DEX postoperatively (DEX group) to those who had not received DEX (control group). DEX was administered from ICU admission to removal of central venous catheter and the dose of DEX was adjusted according to hemodynamics at the discretion of ICU physicians. If adverse events such as bradycardia happened to patients, the infusion of DEX was discontinued. We have investigated incidence of supraventricular arrhythmia, ICU and hospital mortality, duration of ICU and hospital stay and adverse events.
RESULTS. Sixteen patients in the DEX group and 30 patients in the control group were enrolled. The mean age was 64.4 in the DEX group and 67.7 in the control group. APACHEII score was significantly higher in the DEX group (12.4 ± 5.4 vs. 9.4 ± 3.7, $p = 0.03$). There were no significant differences in other patient characteristics between two groups. The mean duration of DEX administration was 4.2 ± 1.0 days and the dose of DEX was 0.28 ± 0.07 µg/kg/hr. Eight of 30 patients in the control group and 1 of 16 patients in the DEX group developed atrial fibrillation within postoperative day 4, however the difference was not statistically significant (6 % vs. 27 %, $p = 0.096$). There was a tendency toward shorter duration of the hospital stay in the DEX group (24.6 ± 10.5 vs. 44.9 ± 41.7 days, $p = 0.09$). ICU and hospital mortality were similar between groups. No patient in the DEX group suffered from bradycardia and hypotension, while one patient in the control group suffered from bradycardia. There were no significant differences in adverse events between two groups.
CONCLUSIONS. Dexmedetomidine might decrease the incidence of supraventricular arrythmia in postoperative patients who undergo cardiac surgery, leading to better clinical outcomes. Further study is ongoing.

0565
HIGH-SENSITIVE TROPONIN T ASSAY IN THE POSTOPERATIVE CARDIAC SURGERY

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INTRODUCTION. Recently newly developed high-sensitive troponin T (hsTnT) assay has been introduced for the cardiac patient management[1].[1] Freund Y., Chenevier-Gobeaux C., Bonnet P., Claessens Y-E., Allo J-C, et al. High-sensitive versus conventional troponin in the emergency department for the diagnosis of acute myocardial infarction. Crit Care 2011; 15:R147.
OBJECTIVES. The objective of this study has been to compare levels of hsTnT in patients undergoing cardiac surgery with cardiopulmonary bypass (CBP) time, aortic crossclamp (ACC) time, ICU stay, mechanical ventilation (MV) time and major complications after cardiac surgery: low cardiac output syndrome (LCOS) and postoperative atrial fibrillation (PAF).
METHODS. Prospective observational study of all adults patients undergoing cardiac surgery at our institution from July to December 2011, excluding off-pump surgery. We collected descriptive variables related to surgery, postoperative and maximum hsTnT values. Continuous variables are presented as mean (standard deviation) or median and categorical variables as percentages. The statistical significance ($p < 0.05$) was determined by non-parametric Kruskal–Wallis test. The Spearman correlation (R) was calculated between the quantitative variables.
RESULTS. A total of 164 patients were included. Mean age 64.1 (13.9) years, 71.3 % men, 47.5 % valve surgery, 20.7 % CABG, 12.2 % combined surgery, 9.15 % aortic surgery, 3.6 % heart transplantation and 3 % pulmonary thromboendarterectomy. 117 (44.3) minutes of CBP time, 96 (45.5) minutes of ACC time, 11 h of MV time, 2 days of ICU stay, 1.23 % mortality.
There was significant correlation between hsTnT and CBP time ($R = 0.35$, $p < 0.0001$), ACC time ($R = 0.42$, $p < 0.0001$), ICU stay ($R = 0.23$; $p = 0.003$) and MV time ($R = 0.16$, $p < 0.05$). The LCOS had a frequency of 26.8 % and FAP of 19.6 %. In our sample we have found statistical significantly relationship between LCOS and hsTnT ($p < 0.05$), not with the FAP ($p = 0.77$).
CONCLUSIONS. In our study there has been correlation between the hsTnT and CBP, ACC, ICU and MV time. According to this early experience, statistical significantly relationship between LCOS and hsTnT has been found. It would be necessary more studies to determine the role of TnThs for the evolution of cardiac surgery.
REFERENCES. 1. Freund Y, Chenevier-Gobeaux C, Bonnet P, Claessens YE, Allo JC, et al. High-sensitive versus conventional troponin in the emergency department for the diagnosis of acute myocardial infarction. Crit Care. 2011; 15:R147.

0566
ATRIAL FIBRILLATION; HAEMODYNAMICS AND MORTALITY IN POST-OPERATIVE PATIENTS ON A GENERAL INTENSIVE CARE UNIT

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INTRODUCTION. Atrial fibrillation is a common arrhythmia affecting at least 1.8 % of the population and rising to over 6 % above 65 years of age. The European Society of Cardiology (ESC) guidelines discuss AF following cardiac surgery, however, there are no guidelines for the management of post-operative AF in non-cardiac patients on intensive care units (ICUs). Incidence of AF post cardiac surgery is 20–50 %. Following non-cardiac surgery it is 0.37 to 20 %. No studies have investigated the relationship between first diagnosis AF, haemodynamics and hospital mortality.

OBJECTIVES. To determine the links between systolic blood pressure, heart rate, and CRP in post-operative surgical patients with first diagnosis AF within an ICU setting and to assess the associated in hospital mortality.

METHODS. Retrospective observational analysis of 100 surgical patients with AF, admitted to a mixed medical and surgical ICU in a Scottish teaching hospital between April 2006 and September 2009. The interaction between time spent with systolic blood pressures of ≤90 mmHg, time at heart rates >100 beats per minute, CRP value and length of ICU stay were evaluated. APACHE II scores and hospital mortality were also recorded.

RESULTS. 77 of 100 surgical patients had first diagnosis AF. In these patients, the hospital mortality was 44.16 % (mean age 68 years) compared with 21.74 % in those with pre-existing AF (mean age 72.4 years). Mean APACHE II score in first diagnosis AF patients who died was 23.5 compared with 24.4 in patients with pre-existing AF who died. First diagnosis AF patients who died spent a longer time (mean) with a systolic blood pressure ≤90 mmHg compared with survivors; 1397.83 min (min) versus 509.84 min. They also had a higher mean peak CRP (238.9 vs. 237.4) and a longer stay on ICU (16799.75 min vs. 16454.37 min). Of the post-operative AF patients whose heart rate exceeded 100 bpm, survivors spent a shorter time than non-survivors with a heart rate 100–119 bpm (3826.25 min vs. 4243.32 min) and 120–139 bpm (1281.76 vs. 1427.04 min).

CONCLUSIONS. Post-operative patients are at significant risk of developing first diagnosis AF. Compared with pre-existing AF, patients with first diagnosis AF are more likely to spend longer with a systolic blood pressure ≤90 mmHg, have a higher peak CRP, a longer stay on ICU and have an increased risk of death. An association between a higher heart rate in AF and mortality is suggested. This has significant implications for further research in this patient population, examining whether strategies involving aggressive early management of heart rates greater than 100 bpm and systolic blood pressures ≥90 mmHg will have an impact on the increased mortality associated with first diagnosis post-operative AF.

REFERENCE. 1. Guidelines for the management of Atrial Fibrillation. The Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology (ESC) Eur Heart J. 2010; 31:2369–2429.

0567
PERIOPERATIVE COMPLICATIONS IN ACUTE TYPE A AORTIC SYNDROME

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INTRODUCTION. Management of perioperative complications is a key point in the treatment of patients with acute type A aortic syndrome (AAAS).

OBJECTIVES. To know the incidence of complications after surgical management of patients with AAAS and the influence in in-hospital mortality.

METHODS. Historical cohorts study that includes all patients with AAAS admitted in the ICU of a single institution from January 2000 to July 2010, followed to September 2010. Clinical and therapeutic features were collected. The variable of interest was death during hospital stay. Chi-squared test was used to determine bivariate associations. Logistic regression was used to assess the simultaneous effect of several factors.

RESULTS. 65 patient [16 (24.6 %) woman, 61.86 ± 12 years old, APACHE II 12.9 ± 7.2 points, Euroscore 7.4 ± 2.6 points] were identified. 2 patients (3.15 %) died before surgery and 6 (9.2 %) during the procedure. Postoperative bleeding happened in 16 (24.6 %) patients. Reintervention was necessary in 7 (10.8 %) of them. Atrial fibrillation (n = 9, 13.8 %), ventricular fibrilation (n = 2, 3.1 %) and auriculo-ventricular blockade (n = 2, 3.1 %) were the most frequent arrhythmias. 16 (24.6 %) patients suffered post-operative ischemic complications: 6 (9.23 %) strokes, 4 (6.1 %) bowel infarction, 3 (4.6 %) limb ischemia and 2(3.1 %) renal infarction. 23 cases (35.4 %) of nosocomial sepsis were diagnosed: ventilator associated pneumonia (n = 10, 15.4 %), catheter-related bacteraemia (n = 7, 10.8 %), catheter-related urinary tract infection (n = 4, 6.15 %) and primary peritonitis (n = 2, 3.1 %). 15 patients (23.1 %) had multiorgan dysfunction. One-third of these was because of sepsis. The most frequent organic dysfunction were: shock (n = 32, 49.2 %), acute kidney injury (n = 29, 44.7 %) needing haemofiltration in 17 cases (26.2 %), and acute lung injury (n = 19, 29.2 %), needing for prolonged mechanical ventilation for more than a week in 23 (35.4 %) and tracheostomy in 5 (7.7 %). UCI stay lasted 8.5 days [median, interquartile range (IR) 3–16.75] and hospital stay 16 (RI 8-31.75). In-hospital mortality was 32.3 %. ICU mortality was 21.5 %. Prior to surgical repair, the leading causes of death were aortic rupture (n = 4, 6.2 %) and cardiac tamponade (n = 3, 4.6 %). After it, ischemia (n = 8, 12.5 %) and sepsis (n = 4, 6.2 %) were the most frequent causes of death. Statistically significant differences in incidence of each postoperative complication were no found. Stratified analysis by severity of complications showed that multiorganic dysfunction [odds ratio (OR) 19.2; 95 % confidence interval (CI) 3.7–97.5, $p < 0.01$] was an independent risk factor for death. The age greater than 65 (OR 1.08, IC 1.009–1.15, p 0.02) are independent risk of mortality in final regression model.

CONCLUSIONS. In our series, ischemia and sepsis are the most frequent postoperative complications. If multiorgan dysfunction is present, the risk of death is 19 times greater. For each year above 65, mortality increases by 8 %.

0568
HIGH-SENSITIVE TROPONIN T ASSAY IN THE DIAGNOSIS OF PERIOPERATIVE MYOCARDIAL INFARCTION AFTER HEART SURGERY

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INTRODUCTION. Perioperative myocardial infarction (PMI) after heart surgery is a relatively frequent complication, with high morbidity and mortality [1].With the recent high-sensitive troponin T (hsTnT) assay there are not published studies regarding the PMI after cardiac surgery.

OBJECTIVES. The aim of this study has been to compare the diagnostic performance of hsTnT with creatinine kinase MB (CKMB) in patients undergoing cardiac surgery.

METHODS. We designed a prospective observational study of all adults patients undergoing cardiac surgery at our institution from July to December 2011, excluding off-pump surgery. We collected descriptive variables related to surgery, postoperative and the maximum values of CPMB and hsTnT. The PMI diagnosis has been made with values at five times the upper limit of laboratory normal of CPMB, when associated with the appearance of new pathological Q-waves or left bundle branch block in the electrocardiogram [2]. Continuous variables are presented as mean (standard deviation) or median and categorical variables as percentages. The statistical significance ($p < 0.05$) was determined by non-parametric Kruskal–Wallis test. The diagnostic utility of hsTnT was evaluated with a receiver operating characteristic (ROC curve) and confidence interval.

RESULTS. A total of 164 patients were included. Mean age 64.1 (13.9) years, 71.3 % men, 47.5 % valve surgery, 20.7 % CABG, 12.2 % surgery combined, 9.15 % aortic surgery, 3.6 % heart transplantation and 3 % pulmonary thromboendarterectomy. 117 (44.3) min of cardiopulmonary bypass time, 96 (45.5) minutes of aortic cross-clamp time, 11 h of mechanical ventilation time, 2 days of ICU stay, 1.23 % mortality.

The mean concentration of TnThs was 1100.8 (948.7) ng/L. The prevalence of PMI was 5 %. TnThs levels were higher associated with PMI ($p < 0.005$). The ROC analysis yielded an area under the curve of 0.81, 95 % CI (0.62–0.99) for the PMI.

In our sample TnThs value of 1631 ng/L had a sensitivity of 62.5 % (22.7–100), a specificity of 82.7 % (76.4–88.9), a negative predictive value of 97.7 % (94.8–100) and a positive predictive value of 15.6 % (1.5–30).

CONCLUSIONS. The TnThs could be a good parameter for the diagnosis of PMI. We have obtained in our sample a cut off of 1631 ng/L with high specificity and negative predictive value. It would be necessary a larger study to validate this biomarker for the PMI after cardiac surgery and to achieve a cut off with greater specificity and sensitivity.

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0569
EVALUATION OF DEXMEDETOMIDINE HYDROCHLORIDE AS A BASAL AGENT IN CONSERVATIVE THERAPY FOR ACUTE AORTIC DISSECTION

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INTRODUCTION. When we treat patients with acute aortic dissection conservatively, suitable sedation and control of blood pressure is important. Usually, the combined use of sedative and anti-hypertensive agents has been performed. Using propofol and/or midazolam as a sedative agent, respiratory depression may appear, and tracheal intubation may be needed. Dexmedetomidine is a 2-adrenergic agonist that can be used for sedation of non-intubated patients in intensive care. It is unique in its ability to provide sedation without causing respiratory depression.

OBJECTIVES. The goal of the study was to evaluate dexmedetomidine as a basal agent in conservative therapy for pain relief, antihypertension and comfort in patients with acute aortic dissection.

METHODS. The subjects were 15 patients with acute aortic dissection who underwent conservative therapy in the ICU of our hospital from January 2010 to February 2012. Combinations of drugs and intratracheal intubation for pain relief, sedation, hypotension and pulse control were evaluated retrospectively.

RESULTS. Dexmedetomidine was administered at doses of 0.07–0.79 μg/kg/hr for a mean period of 5.7 days (2–11 days) in combination with nicardipine (0.008-0.014 mg/kg/hr) in 15 patients, landiolol (0.5–2 μg/kg/min) in 6, fentanyl (0.19–0.90 μg/kg/hr) in 10, nitroglycerin in 3, and propofol and midazolam in 1 patient each. Haloperidol and risperidone were used to maintain sleep at night in 6 and 2 patients, respectively. The Richmond Agitation Sedation Scale (RASS) was −1 to +1 in 13 patients and −2 to +4 in 2 patients. All patients were treated without intratracheal intubation. Noninvasive positive-pressure ventilation was used in 2 patients.

CONCLUSIONS. Dexmedetomidine was effective as a basal agent in conservative therapy for patients with acute aortic dissection. We were able to obtain suitable sedation and manage the blood pressure of the patients without the need for intubation.

0570
CLINICAL CHARACTERISTICS AND INITIAL MANAGEMENT OF ACUTE TYPE A AORTIC SYNDROME

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INTRODUCTION. Early diagnosis and management of acute type A aortic syndrome is still a challenge for intensive care and emergency physicians.

OBJECTIVES. To know clinical features and initial management of patient with acute type A aortic syndrome admitted in our ICU.

METHODS. Descriptive study of all patients with acute type A aortic syndrome (AAAS) admitted in the ICU of a single tertiary hospital from January 2000 to July 2010, followed to September 2010. Clinical and therapeutical variables were collected.

RESULTS. 65 patients were identified [16 (24.6 %) women, 61.86 ± 11.9 years old]. 36 (55.4 %) were derived from other hospitals. The main symptom was chest pain in 60

(92.3 %) patients and syncope in all other. The time from the beginning of symptoms to the first medical contact was 5 h [median, interquartile range (IR) 3–24 h] and to the diagnosis was 7 h (IR 4–23.7). Systolic pressure at the admission was 123.65 ± 36 mmHg and diastolic 68.3 ± 19.2 mmHg. Antihypertensive therapy was administered to 6 (9.2 %) patients and norepinefrin to 5 (7.7 %). The time to achieve hemodynamic objectives from the first medical contact was 6 h (median, IR 4–24). 37 (56.9 %) patients suffered simultaneous descending aorta dissection. With respect to haemorrhagic complications, 6 (9.25 %) patients presented pleural effusion at the admission, 6 (9.25 %) mediastinic hematoma, 2 (3.15 %) retroperitoneal hematoma and 33 (50.8 %) pericardial effusion, 12 of them with cardiac tamponade. Aortic regurgitation was observed in 38 (58.5 %) patients and myocardial dysfunction in 9(13.9 %). Preoperative global hypoperfusion was present in 54 (83 %) patients. Regarding malperfusion syndrome, coronary ischemia was present in 15 (23 %) patients, cerebral ischemia in 9 (13.8 %), mesenteric ischemia in 3 (4.6 %) and limb ischemia in 13 (20 %). APACHE II score was 12.88 ± 7.2 points and euroscore 7.42 ± 2.58 points. Emergent surgery was performed in 58(89.2 %) patients. 2(3.15 %) died before surgery. The time from the diagnosis to surgery was 5 h (median, RI 3–33.5). 21 (32.3 %) died in the hospital: 14 (21.5 %) in the ICU, 6(9.2 %) in the operation room and 1 (1.5 %) in the ward.

CONCLUSIONS. In our series patients with AAAS shows similar clinical characteristics and mortality to that reported in the literature, while the incidence of malperfusion syndrome is greater. The main feature in the treatment of this patients is the variability in delay to the optimal management.

0571

HEMODYNAMIC AND OXYGEN TRANSPORT DURING AORTOCORONARY SHUNTING ON THE WORKING HEART

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OBJECTIVE. To evaluate the impact of the algorithm based on a combination of transpulmonary dilution and continuous venous blood oxygen saturation monitoring on preoperative infusion therapy and hemodynamic correction and on the length of postoperative stay in an intensive care unit and at hospital after aortocoronary bypass surgery without extracorporeal circulation.

SUBJECTS AND METHODS. The patients were randomized to two hemodynamic monitoring groups: 1. routine monitoring (RM) (n = 20) and 2. complex monitoring (CM) (n = 20). In the RM group, therapy was based on the values of central venous pressure, mean blood pressure (BP mean), and heart rate (HR). In the CM group, it was founded on the values of intrathoracic blood volume index, BP mean, HR, central venous saturation ($ScvO_2$), and cardiac index (CI). Measurements were made before, during, and 2, 4, and 6 h after surgery.

RESULTS. In the CM group, colloidal solutions and dobutamine were significantly more frequently used, which was followed by increases in $ScvO_2$ and CI as compared with the baseline values. The frequency of use of ephedrine was significantly higher in the RM group. The algorithm based on complex monitoring reduced the time of achieving the criteria for transferring from the intensive care unit and the length of postoperative hospital stay by 15 and 25 %, respectively.

CONCLUSION. Thus, the goal-oriented algorithm based on the complex monitoring of hemodynamic and oxygen transport makes it possible to reveal hemodynamic disturbances and correct them early, which can improve an early postoperative period during aortocoronary bypass surgery on the working heart.

0572

HAEMODYNAMIC CHANGES AFTER AORTIC CLAMPING AND UNCLAMPING IN ELECTIVE ABDOMINAL AORTIC SURGERY—AORTIC ANEURYSM DISEASE VERSUS AORTIC OCCLUSIVE DISEASE

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INTRODUCTION. Previous studies demonstrated that patients with aortic aneurysm disease (AAD) have poorer outcome and more extensive ICU requirements compared to patients with aortic occlusive disease (AOD). In theory, patients with AOD develop compensatory mechanisms secondary to the decreased aortic flow, i.e. periaortic collateral circulation and changes in distribution of blood flow, as well as changes in cardiac function. Thus, the aortic clamping procedure may inflict less haemodynamic challenges in AOD patients compared to patients with AAD, in which aortic blood flow is preserved.

OBJECTIVES. We investigated the haemodynamic response during aortic clamping and reperfusion in elective abdominal aortic surgery, hypothesising that changes in cardiac output (CO), stroke volume (SV) and systemic vascular resistance (SVR) would be larger in patients with AAD.

METHODS. Ten patients with AAD and eight patients with AOD were included. Using the oesophageal Doppler monitor (CardioQ^{TM}, Deltex Medical) haemodynamic values were recorded after induction of anaesthesia but before aortic clamping (T1), 10 min after aortic clamping (T2), and 10 min after aortic declamping (T3).

RESULTS. In AAD patients SVR increased after aortic clamping and decreased after declamping. CO and SV did not change during clamping, but both increased significantly after declamping.

In AOD patients no significant changes were observed at any time.

Variable	Type	T1 vs T2	T2 vs T3
CO	AAD	3.44±1.77 vs 2.69±0.61	2.69±0.61 vs 4.62±1.32 *
	AOD	3.46±0.79 vs 3.42±1.39	3.42±1.39 vs 4.00±0.88
SV	AAD	60.5±33.7 vs 45.2±12.2	45.2±12.2 vs 66.6±22.8 *
	AOD	58.0±24.0 vs 52.6±20.1	52.6±20.1 vs 55.7±13.8
SVR	AAD	1446±284 vs 2247±766 #	2247±766 vs 1110±499 *
	AOD	1599±799 vs 1802±694	1802±694 vs 1456±349

[Results]

*p=0.001 #p< 0.05

CONCLUSIONS. The haemodynamic response to aortic clamping and declamping in elective aortic abdominal surgery is more pronounced in patients with AAD, presumably due to less developed periaortic collateral blood flow. This may reflect the severeness of ischaemic trauma and could be useful in predicting post operative complications and thus the individual level of postoperative observation.

Ventilatory support in the brain-injured patient: 0573–0585

0573

IS $PACO_2$ MANAGEMENT OPTIMAL UNDER CONTROLLED MECHANICAL VENTILATION (CMV) DURING NEURO-RESUSCITATION?

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INTRODUCTION. Both hypocapnia and hypercapnia can be deleterious to brain injured patients. Strict $PaCO_2$ control is difficult to achieve because of patient's instability and unpredictable effects of ventilator settings changes.

OBJECTIVE. The aim of this study was to evaluate our ability to comply with a protocol of controlled mechanical ventilation (CMV) aiming at a $PaCO_2$ between 35 and 40 mmHg in patients requiring neuro-resuscitation.

METHODS. Retrospective analysis of consecutive patients (2005–2011) requiring intracranial pressure (ICP) monitoring for traumatic brain injury (TBI), subarachnoid haemorrhage (SAH), intracranial haemorrhage (ICH) or ischemic stroke (IS). Demographic data, GCS, SAPS II, hospital mortality, $PaCO_2$ and ICP values were recorded. During CMV in the first 48 h after admission, we analyzed the time spent within the $PaCO_2$ target in relation to the presence or absence of intracranial hypertension (ICP > 20 mmHg, by periods of 30 min) (Table 1). We also compared the fraction of time (determined by linear interpolation) spent with normal, low or high $PaCO_2$ in hospital survivors and non-survivors (Wilcoxon, Bonferroni correction, $p < 0.05$) (Table 2). $PaCO_2$ samples collected during and after apnoea tests were excluded. Results given as median [IQR].

RESULTS. 436 patients were included (TBI: 51.2 %, SAH: 20.6 %, ICH: 23.2 %, IS: 5.0 %), age: 54 [39–64], SAPS II score: 52 [41–62], GCS: 5 [3–8]. 8744 $PaCO_2$ samples were collected during 15′611 h of CMV.

PaCO2 and intracranial pressure

PaCO2 Range (mmHg)	<35	35–40	>40
ICP < 20	31.4 %	49.9 %	18.7 %
ICP ≥ 20	44.3 %	38.3 %	17.4 %

PaCO2 and hospital mortality

PaCO2 Range (mmHg)	<35	35–40	> 40	Number
Non-survivors	37.2 [16.2–62.6] %	47.0 [23.9–59.8] %	10.1 [0.8–23.2] %	173
Survivors	23.6 [8.9–47.5] %*	53.9 [35.2–67.6] %*	12.1 [3.0–27.4] %	263
p	0.0002	0.0003	0.1313	

*: different from non-survivors

CONCLUSIONS. Despite a high number of $PaCO_2$ samples collected (in average one sample every 107 min), our results show that patients undergoing CMV for neuro- resuscitation spent less than half of the time within the pre-defined $PaCO_2$ range. During documented intracranial hypertension, hypercapnia was observed in 17.4 % of the time. Since non-survivors spent more time with hypocapnia, further analysis is required to determine whether hypocapnia was detrimental *per se*, or merely reflects increased severity of brain insult.

0574

HIGH FREQUENCY OSCILLATORY VENTILATION (HFO) COMBINED WITH TRACHEAL GAS INSUFFLATION (TGI) AS A RESCUE VENTILATION STRATEGY IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS) AND TRAUMATIC BRAIN INJURY (TBI)

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INTRODUCTION. Adequate oxygen delivery to the brain and maintenance of cerebral perfusion pressure are of paramount importance in the management of TBI patients in order to prevent secondary brain injury. The development of ARDS in this group presents a challenge for the intensivist because conventional ventilation (CV) may fail to restore normocapnia and normoxemia [1].

OBJECTIVES. To evaluate HFO-TGI as a rescue ventilation strategy in patients with severe TBI and ARDS, where the application of CV was associated with severe oxygenation disturbances and/or non-protective tidal volumes/plateau pressures to achieve $PaCO_2$ control.

METHODS. We prospectively included 9 patients with severe TBI (pre-intubation GCS < 8) who required an intracranial pressure (ICP) protocol: anesthesia with propofol and/or midazolam, $PaCO_2$ control with increased minute ventilation, hyperosmolar therapy, and/or induction of barbiturate coma (4 cases) and severe ARDS (PaO2/FiO2 <100 mmHg at positive end-expiratory pressure (PEEP) ≥10 cmH_2O with/without plateau pressure >35 cmH_2O). The rescue intervention consisted of daily, 12-hour sessions of HFO, combined with recruitment maneuvers, and TGI of 5-8 L/min. HFO-TGI sessions were interspersed with CV. Initial HFO frequency, oscillatory pressure amplitude, and bias flow were 3.5 Hz, 85–95 cmH_2O, and 60 L/min, respectively; a 3–5 cmH_2O tracheal tube cuff leak was used. HFO mean airway pressure (mPaw) exceeded preceding CV-mPaw by 10–15 cmH_2O. Rescue intervention was stopped when PaO2/FiO2 > 100 mmHg could be maintained for >12 h during post-HFO-TGI CV and CV-plateau pressure was ≤35 cmH_2O.

RESULTS. Patients age = 34 ± 14 years (male/female = 7/2). On enrollment, CV-tidal volume, respiratory rate, Paw, and PEEP were 8.4 ± 1.2 mL/kg-predicted, 26.0 ± 5.2/min, 20.3 ± 3.3 cmH_2O, and 14.3 ± 2.9 cmH_2O respectively. Each patient received 3–4 HFO-TGI sessions and a total of 31 sessions were administered. Patient ICP (during HFO-

TGI = 19.1 ± 4.8, pre = 20.1 ± 5.2, post = 20.0 ± 6.0 mmHg), $PaCO_2$, hemodynamics, and cerebral perfusion pressure values did not change significantly during HFO-TGI sessions compared to pre- and post-session CV values. PaO_2/FiO_2 was higher during the HFO-TGI sessions (during HFO-TGI = 189.4 ± 65.5, pre = 81.1 ± 16.9, post = 128.8 ± 40.6 mmHg, $P < 0.001$). Plateau pressure and respiratory compliance improved after the HFO-TGI sessions (respective values: pre-HFO-TGI = 38.7 ± 10.2 vs. post-HFO-TGI = 45.2 ± 12.8 mL/cmH_2O, $P < 0.001$; pre-HFO-TGI = 30.8 ± 4.8 cmH_2O vs. post-HFO-TGI = 28.6 ± 4.8, $P < 0.001$).

CONCLUSIONS. HFO-TGI may effectively reverse severe oxygenation disturbances and improve respiratory mechanics in patients with TBI and ARDS, without affecting ICP, $PaCO_2$, and hemodynamics.

REFERENCE. 1. Neurocrit Care 2011; 15:623–33.

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0575

HIGH-FREQUENCY OSCILLATORY VENTILATION IN PATIENTS WITH CEREBRAL ANEURISMS RUPTURE

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INTRODUCTION. ARDS and ALI is one of the main factors of the secondary brain injury in patients with cerebral aneurisms (CA) rupture. Conventional mechanical ventilation (MV) is the main method of hypoxemia correction in critically ill patients with CA rupture and ARDS/ALI. But sometimes MV in such patients could be accompanied by intracranial pressure (ICP) increase and cerebral perfusion pressure (CPP) decrease due to high intrathoracic pressure.

OBJECTIVES. To assess ICP, CPP, MAP and arterial blood gases dynamics during HFOV in patients with cerebral aneurisms rupture.

METHODS. We used HFOV (n = 10) in two patients with cerebral aneurisms rupture. Before HFOV start we used pressure controlled MV. The main indications for HFOV were decrease PaO_2/FiO_2 below 100 on MV. ICP, CPP, MAP, PaO_2/FiO_2 ratio and $PaCO_2$ were analyzed during MV and after 30 min HFOV start.

RESULTS. HFOV was not accompanied by ICP, MAP and CPP changes (ICP on MV—18 ± 2 mm Hg, on HFOV—17 ± 3 mm Hg; MAP on MV—98 ± 9 mm Hg, on HFOV—107 ± 6 mm Hg; CPP on MV—81 ± 7 mmHg, on HFOV—90 ± 9 mmHg). $PaCO_2$ didn't change as well (MV—34.6 ± 3.7 mmHg, HFOV—36.1 ± 3.2 mmHg). Transfer from MV to HFOV lead to PaO_2/FiO_2 ratio increase from 104 ± 11 to 137 ± 13. We didn't mention any complications during HFOV.

CONCLUSIONS. HFOV is safe methods of respiratory support in patients with CA rupture and ARDS/ALI. HFOV doesn't influence ICP, MAP and CPP and could be accompanied by arterial oxygenation improvement.

0576

HAEMODYNAMIC AND OXIMETRIC STABILITY DURING APNEA TESTING IN CPAP

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INTRODUCTION. Up to 39 % of the patients show complications during conventional apnea testing (AT), mainly hypoxia and haemodynamic instability. It puts at risk the execution of the test and the potential organ donor. Nowadays AT in continuous positive airway pressure (CPAP) ventilation mode is recommended.

OBJECTIVES. To study haemodynamic and oximetric changes that take place during AT in CPAP ventilation mode and to determine the adverse effects incidence as hypotension, hypoxia or procedure cancellation.

METHODS. Prospective study in a 24 beds intensive care unit of an university hospital. An AT in CPAP mode with 8 cm H_2O for 10 min was performed in 53 patients with probable diagnosis of brain death. Patients were monitorized using a PiCCOplus system (Pulsion Medical Systems, Munich, Germany). Haemodynamic variables obtained by pulse contour waveform arterial analysis were recorded in minutes 0, 3, 5, 7, 10. Arterial blood samples were drawn at the same time. A 20 % variation relative to basal values (T0) was considered significative.

RESULTS. pCO_2 increased during all the procedure but the highest was in interval T0–T3, mean value 15.90 mmHg ($p < 0.001$). The pO_2 value fell during T0–T7 interval and increased in T7–T10 interval, mean values 13.9 mmHg ($p = 0.003$) and 48.21 mmHg ($p \leq 0.001$) respectively. 72.5 % of the patients had a $pO_2/FIO_2 \geq 300$ mmHg in T0, and only a 3.8 % of them lost this value in T10. For the patients with pO2/FIO2 < 300 in T0, 5.8 % reached this value in T10. Only 5.7 % shown a significative hypoxemia 216.34 (SD 148.775) but this never caused test cancellation. None of the patients showed saturations lower than 93 %.The indexed systemic vascular resistance (IRVS) fall was mild and it was significative in T7–T10 interval, 247 din/seg/cm^5/m^2 ($p < 0.001$). The systolic and mean arterial blood pressure (SBP, MBP) decreased in 9.6 and 17.3 % of the patients respectively. The cardiac index (CI) increased significantly at the end of T10 ($p = 0.015$), and the greatest increase was in T0–T3 interval with a mean value 0.23 l/min ($p = 0.029$). Neither arritmia nor cardiac arrest happened.

	T0	T10	T0–10
CI (l/min/m2)	3.07 (0.86)	3.41 (1.09)	−0.33 (0.69)
ISVR (din/seg/cm^5/m^2)	2290.56 (846.47)	1978.28 (707.2)	312.28 (530.98)
pH (mmHg)	7.36 (0.08)	7.16 (0.08)	0.19 (0.05)
pCO_2 (mmHg)	41.4 (10.2)	75.09 (14.32)	−33.58 (10.17)
pO_2 (mmHg)	411.8 (59.5)	379.69 (149.68)	32.06 (70.76)
SBP (mmHg)	126.52 (23.28)	127.02 (24.12)	−0.46 (26.86)
MBP (mmHg)	87.68 (16.89)	85.56 (19.5)	2.06 (19.85)
Heart rate (beats/min)	88.18 (21.77)	91.77 (18.18)	−3.59 (11.48)

CONCLUSIONS. AT in CPAP has shown to be a safe procedure. All the patients complete the test. Adverse effects incidence was scarce (5.7 % hypoxemia and 17.3 % MBP decrease) and even CI and SBP increased at the end of the procedure. Most patients maintained oxygenation and haemodynamic stability during the procedure so its use is recommended.

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0577

SEVOFLURANE SEDATION USING THE ANAESTHETIC CONSERVING DEVICE AFTER NEUROSURGERY

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INTRODUCTION. Intensive Care Unit sedation poses many problems. The action and side-effects of intravenous drugs in the severely ill patient population of an ICU are difficult to control. The Anesthetic-Conserving Device (AnaConDa) can be used to administer inhaled anesthetics using an ICU ventilator. Inhaled sedation is efficient and easily controllable; in low concentrations it causes minimal changes in the patient and very little interference with hemodynamics. Awakening after inhaled sedation is quick and predictable.

OBJECTIVES. To assess the safety and efficacy of using the AnaConDa with sevoflurane when maintaining sedation after neurosurgery.

METHODS. Prospective observational study of 32 consecutive patients in the Surgical Intensive Care Unit (SICU) of a tertiary university hospital after neurosurgery between September 2011 and April 2012. We studied 32 SICU patients who received sevoflurane via the AnaConDa. The patients were under sevoflurane sedation administered with the AnaConDa placed in the inhalation tube. The sevoflurane dose was set using the Belda et al. [1] normogram to give an end-tidal concentration of sevoflurane between 0.5 and 0.7 % on the basis of data from a gas analyzer. Fast-track extubation protocol was used.

RESULTS. The sedation goal (Richmond -4,-5) was reached with sevoflurane in all 32 patients. The mean (SD) time each patient were under sedation with the AnaConDa in place was 78 (12.32) min. The end-tidal concentration of sevoflurane never exceeded 1 %. Richmond agitation-sedation scale were -5 at 60 min in all cases; Deeper sedation was desired for the first 60 min to avoid awakening related to relaxing. The mean time until awakening was 4.38 min (range 1–18 min). The mean time until extubation was 12 (6.69) min. Hemodynamic changes were nonsignificant, and no renal or hepatic dysfunctions were observed.

CONCLUSIONS. Routine SICU postoperative neurosurgical patients sevoflurane sedation with the AnaConDa is easily feasible, effective, safe, and has a relatively short awakening period. With this device, it is possible to monitor the concentration administered. The use of volatile anesthetics on the ICU could adopt a permanent position in various intensive care sedation concepts in future. It may be possible thereby to optimize the treatment process both in medical and economical terms. It is the first study using sevoflurane sedation in neurosurgical patients.

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0578

USE OF A HEATED HUMIDIFIER ALLOWS TO SAFELY REDUCE TIDAL VOLUME IN PATIENTS WITH ACUTE BRAIN AND LUNG INJURY

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INTRODUCTION. Low tidal volume (VT) ventilation is a standard treatment in patients with acute lung injury (ALI). The application of such a protective ventilatory strategy can be associated with a certain degree of hypercapnia which is, however, contraindicated in patients with acute brain injury (ABI) to avoid secondary cerebral damage. In fact, low VT ventilation is rarely applied in patients with contemporary ABI and ALI. CO_2 clearance can be increased by reducing the instrumental dead space.

OBJECTIVES. We tested the hypothesis that the reduction of dead space obtained by replacing the heat and moisture exchanger (HME) with a heated humidifier (HH) may allow to implement a protective ventilation strategy in patients with ABI and ALI.

METHODS. Three ventilatory strategies (45 min each) were consecutively applied in 8 deeply sedated patients with severe ABI (head trauma, subarachnoid hemorrhage) and early ALI (chest trauma, pneumonia): (1) HME with conventional VT to obtain a $PaCO_2$ between 30 and 35 mmHg (HME1); (2) HH with low VT to obtain the same $PaCO_2$ (HH); (3) same as in HME1 (HME2). At the end of each step we recorded arterial blood gases, VT, plateau pressure (Pplat), intracranial pressure (ICP), cerebral perfusion pressure (CPP), mean arterial pressure (MAP), and mean flow velocity in the middle cerebral artery measured by transcranial doppler (MCA-TCD). For statistical comparison, data from HME1 and HME2 step were averaged (HME) and compared with HH. Non-parametric statistical tests were used.

RESULTS. Patients developed ALI after 3.1 ± 1.1 days of mechanical ventilation. As compared with HME, $PaCO_2$ increased with HH but remained in the preset target (33 vs. 31 mmHg, $p = 0.02$). With HH, VT (7.2 vs. 9.4 ml/kg with HH and HME, respectively, $p < 0.01$), Pplat (19 vs. 23 cmH_2O, $p < 0.01$), and CPP (68 vs. 73 mmHg, $p = 0.05$) decreased, while MCA-TCD (73 vs. 77 cm/s), ICP (16 vs. 13 mmHg) and MAP (84 vs. 85 mmHg) did not change. PaO_2 was slightly, but significantly lower with HH (100 vs. 111 mmHg, $p = 0.02$).

CONCLUSIONS. The use of HH allows to safely reduce VT and to implement a protective ventilation strategy in patients with ALI and ABI without affecting neurologic parameters.

0579

TRACHEOSTOMY INSERTION ON THE NEUROCRITICAL CARE UNIT (NCCU): A 3 YEAR RETROSPECTIVE REVIEW

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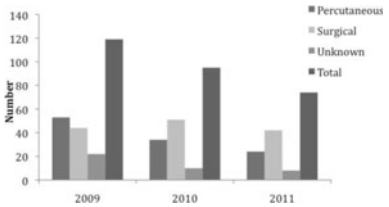
INTRODUCTION. Tracheostomy provides airway protection and a route for mechanical ventilation in intensive care patients. Much debate surrounds whether 'early' tracheostomy is advantageous compared to a process of prolonged endotracheal intubation. Neurocritical care patients may represent a distinct population from a general ICU cohort due to the greater potential for lack of airway protection.

OBJECTIVES. Our aim was to retrospectively assess 3 years worth of tracheostomy insertions on a busy neurocritical care unit characterising (by specialty) the date of insertion, decannulation location, route of insertion (surgical vs. percutaneous) and effect of tracheostomy timing on length of stay.

METHODS. Patients admitted between January 2009 and 2011 were identified from daily handover logs. Further data was obtained from hospital computer systems. Admission to NCCU was used to calculate the day of tracheostomy insertion. Decannulation location was recorded as either: NCCU, ward, discharged to local hospital, died with or unknown. Length of tracheostomy was calculated if a decannulation date was available.

RESULTS. 288 patients received new tracheostomies during their stay. 137 were surgically placed, 111 were inserted percutaneously and for 39 we were unable to ascertain their method of insertion. Tracheostomy insertions seemed to decline by year (119 in 2009, 84 in 2010 and 75 in 2011) mainly due to a fall in the number of percutaneous tracheostomies (**Graph 1**).



Tracheostomy insertion by year and technique

	Number	ITU length of stay	Hospital length of stay	Day of Tracheostomy	Length of Tracheostomy
Neurosurgery (TBI)	86	32 (25)	78 (73)	14 (7)	39 (80)
Neurosurgery (Elective)	15	23 (18)	48 (26)	8 (4)	31 (19)
Neurosurgery (Non-TBI)	93	31 (19)	66 (57)	11 (10)	38 (31)
Neurology	22	38 (36)	61 (50)	11 (9)	26 (38)
Trauma	22	33 (22)	54 (40)	10 (6)	20 (12)
Surgical	25	33 (28)	63 (46)	11 (7)	26 (38)
Medical	25	26 (12)	58 (57)	9 (7)	24 (25)
All	288	31 (23)	61 (50)	11 (7)	29 (35)

Table 1 highlights the number of tracheostomies by specialty, length of NCCU and hospital admission, day of tracheostomy and length of tracheostomy (all data as mean (SD)). Tracheostomy appeared to be performed later in Traumatic Brain Injury (TBI) patients than to other groups. A threshold of 7 days was used to define 'early' tracheostomy as used in previous work [1]. When all neurosurgical and neurological patients were looked at early tracheostomy was associated with significant reductions in both NCCU and hospital stay (22 vs. 34 days and 43 vs. 75 days respectively $P < 0.05$ for both) with no significant change in mortality or duration of tracheostomy. The majority (29 %) were discharged to their local hospital with their tracheostomy in situ. 24 % were decannulated on NCCU, 21 % on the ward, 10 % of patients died with their tracheostomy and in 17 % of cases a decannulation location was unavailable.

CONCLUSIONS. Tracheostomy is a common procedure on the neurocritical care unit, the day of insertion appears to vary somewhat by underlying diagnosis. Tracheostomy before day 7 appears to shorten length of NCCU and hospital stay in neurological patients, corroborating previous work. A significant proportion of patients are discharged to the ward with tracheostomy; this has implications for staffing.

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GRANT ACKNOWLEDGMENT. N/A.

0580

PREDICTING FACTORS OF PROLONGED MECHANICAL VENTILATION AND NEED OF TRACHEOTOMY IN PATIENTS WITH SEVERE HEMORRHAGIC STROKE

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OBJECTIVES. To analyze neurologic factors associated to prolonged mechanical ventilation (PMV) and tracheotomy (TCH) in patients with severe hemorrhagic stroke. To know if TCH is associated to a decrease in the incidence of lung infections (VAP).

METHODS. Population of 27 patients with subarachnoid hemorrhage (SAH) and 49 with intracerebral haemorrhage (ICH) admitted in ICU under mechanical ventilation. GCS at admission 7 points. The reason for TCH was prediction of prolonged mechanical ventilation (MV). Average day of tracheotomy 11.5 ± 6 days after onset of ventilation; average age 48.7 years. Variables analyzed (in groups with and without TQ): Length of stay, APACHE, GCS, hydrocephaly, Fisher level (in SAH), intraventricular hemorrhage (Grab score); volume of hematoma (in ICH). Groups analyzed 26 patients with tracheotomy (TCH Group) and 50 patients without tracheotomy (Group non TCH). In both groups association between Ventilation Associated pneumonia and tracheotomy was also studied. Statistical analysis: Chi Square test (Fisher) and Mantel-Haenzel test.

RESULTS. In SAH group, GCS Fisher score and hydrocephaly were not associated to prolonged mechanical ventilation and TCH; The PMV and TCH were significantly associated to high score of Graeb ($p < 0.01$)(85 % in group of TCH and 17 % in group of non TCH). In the ICH group the incidence of TCH in patients with high intraventricular bleeding was high, but non significantly different from the NonTCH Group. The rest of variables analyzed were not significantly associated to PMV. In the TCH Group the incidence of VAP was lower than in Non-TQ Group (20.5 vs. 56.8 VAP/1,000 days of MV; 14.8 vs. 43.5 VAP/100 days of ICU stay.

CONCLUSIONS. (1) In patients with severe hemorrhagic stroke, high score (evaluated by Graeb score) of intraventricular bleeding is associated to prolonged mechanical ventilation and need of TCH. (2) The TCH was associated in this group of patients with a lower rate of VAP.

0581

BENEFITS OF PERFORMING EARLY TRACHEOSTOMY IN THE INTENSIVE CARE UNIT OF A SECONDARY LEVEL HOSPITAL OF NORTH INDIA, OUR TWO YEARS EXPERIENCES

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INTRODUCTION. In most of the intensive care units tracheostomy is being performed on many patients who needs long term ventilatory support. The patients always do get benefited after the tracheostomy. Though there is always debate about the timing of tracheostomy and technique of procedure.

OBJECTIVES. To find out the benefits of performing early tracheostomy in the intensive care unit on the patients requiring long term ventilatory support.

METHODS. The study was conducted in 14 bedded intensive care unit of secondary level hospital in India over a period of 2 years (from April 2010 to March 2012). Total of 64 tracheostomies were performed over this period on the patients who needed long term ventilatory supports. Out of which 52 were male patients and 12 were females. Age of the patients were between 22 and 70 years. After the procedure weaning time from the ventilator was noted. Most of the procedures were performed by percutaneous technique.

RESULTS. The common diagnosis of the patients were brain injuries extradural and subdural hemorrhages 65 %, stroke 25 %, spinal injuries and other diagnosis 10 %.We performed tracheostomy within 7 days of the start of ventilation in most of the patients. After tracheostomy most of the patients (56 %) were able to be weaned off from the ventilatory support within next 2 days and subsequently were shifted out of the intensive care unit to wards. The patients who expired in the intensive care unit were around 24 % and patients who were shifted to other centers for further management were around 20 %. Most frequent complications of the procedures were bleeding and endotracheal tube cuff perforation.

CONCLUSIONS. The early performing of tracheostomy (within 5 days) resulted in decrease in peak air way pressure of the ventilator, decrease in requirement of the sedatives to the patients, helping in early weaning from the ventilator, increasing effectiveness of chest physiotherapy in removing the retained secretions. Here in our institute we have been performing the early tracheostomy in the patients who need long term ventilatory support or who we find difficult to wean from ventilator early.

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0582

EARLY VERSUS LATE TRACHEOSTOMY IN PATIENTS WITH ACUTE BRAIN INJURY

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INTRODUCTION. A majority of patients with Acute Brain Injury (ABI) need ventilatory support and require endotracheal intubation. Long-term mechanical ventilation is the most common situation where tracheostomy is indicated for patients in Intensive Care Units (ICU). There has been substantial debate regarding the timing of tracheostomy. We reviewed our data to determine the impact of early tracheostomy (ET) and late tracheostomy (LT).

OBJECTIVES. To evaluate the effectiveness and safety of ET (≤10 days after intubation) versus LT (>10 days after intubation) in critically ill patients with ABI predicted to be on prolonged mechanical ventilation.

METHODS. Fifty-seven patients admitted to the ICU with ABI from December 2008 through January, 2012 were reviewed. The inclusion criteria were ABI with a Glasgow Coma Scale (GCS) score ≤ 8 at the time of admission. All of these patients required mechanical ventilation and subsequently underwent tracheostomy. According to the timing of tracheostomy, subjects were classified as ET group (≤10 days; $N = 27$) or LT group (>10 days; $N = 30$). At admission, we collected demographic data and determined the following scores: Acute Physiology and Chronic Health Evaluation (APACHE) II and Sequential Organ Failure Assessment (SOFA).The Wilcoxon rank sum test, the log-rank test, and Fisher exact tests were used to compare these groups.

RESULTS. The average time of the tracheostomy procedure was 8.0 ± 1.5 days in the ET group and 15.0 ± 4.0 days in the LT group. There were no significant differences between the groups (ET vs. LT) regarding the demographic data or the scores: APACHE II (28 ± 7 vs. 27 ± 8; $p = 0.39$) and SOFA (6.1 ± 2.7 vs. 7.0 ± 3.0; $p = 0.48$). However, patients in the ET group had a significantly shorter stay in the ICU than patients in the LT group (22.0 ± 7.0 vs. 27 ± 12 days; $P = 0.008$). There was no difference between the groups in ventilator days (18 ± 7.0 vs. 20.0 ± 12.0 days; $p = 0.58$). The mortality rate was lower in the ET group (9 vs. 47 %; $p = 0.04$). Ventilation associated pneumonia occurred less in the ET group, although the difference was not significant (3 vs. 23 %; $p = 0.13$). There were no differences regarding the occurrence of late pneumonia or in the duration of mechanical ventilation between the groups.

CONCLUSIONS. On the basis of these findings, early tracheostomy was beneficial, resulting in a shorter ICU stay.

0583
DIFFUSE AXONAL INJURY AS A PREDICTOR OF NEED OF PROLONGED MECHANICAL VENTILATION IN HEAD INJURED PATIENTS

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OBJECTIVES. To analyze neurologic factors associated to risk of prolonged mechanical ventilation (PMV) and tracheotomy (TCH) in patients with severe traumatic brain injury (TBI). To know if TCH is associated to a decrease in the incidence of lung infections (VAP).
METHODS. Population of 64 patients with severe TBI admitted in ICU under mechanical ventilation. GCS at admission 7 points. The reason for TCH was prediction of prolonged mechanical ventilation (MV). Average day of tracheotomy was 11.7 ± 5.5 days after initiation of ventilation; average age 44.9 ± 19.4 years. For risk of PMV and TCH associated factors were studied comparing group with TCH (17 patients) and group without TCH (47 patients). Variables analyzed (in both groups): Length of stay, APACHE, GCS on admission, length of MV, mortality, Traumatic Coma Data Bank (TCDB) classification and incidence of diffuse axonal injury (DAI). In both groups association between Ventilation Associated pneumonia and tracheotomy was also studied. Statistical analysis: Chi Square test (Fisher) and Mantel-Haenzel test.
RESULTS. No significant differences for TCDB classification were observed between patients with or without TCH. The need for PMV and TCH was significantly high in the group with DAI compared with the group without DAI ($p < 0.01$). A longer ICU stay was observed in group with TCH (30.6 ± 11.3).In the TCH Group the incidence of VAP was lower ($p < 0.001$) than in Non-TCH Group (54.7 vs. 80.8 VAP/1,000 days of MV; 44.1 vs. 58.3 VAP/100 days of ICU stay.
CONCLUSIONS. 1. In patients with severe TBI, DAU is associated to prolonged mechanical ventilation and need of TCH. 2. The TCH was associated in patients with severe TBI with a lower rate of VAP.

0584
PHYSIOLOGICAL VARIABLES DERANGEMENTS ARE POWERFUL PREDICTORS OF OUTCOME AFTER TRAUMATIC BRAIN INJURY

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INTRODUCTION. Severity of primary brain injury, secondary insults during the Intensive Care Unit (ICU) stay and impaired vasoreactivity have been individually proposed as prognostic factors for outcome after traumatic brain injury (TBI).
OBJECTIVES. Aim of the study was to identify the predictive power of these variables for outcome after TBI.
METHODS. All traumatic brain injured patients were consecutively recruited in the BrainIT network (20 European ICUs) with the following inclusion criteria: age > 18, GlasgowComaScale (GCS) <12, mean arterial pressure (MAP) and intracranial pressure (ICP) monitoring. The following physiological variables were continuously recorded and were analyzed according to Edinburg University secondary insult grading scale: MAP, ICP, SO_2, temperature, endtidalCO_2. Vasomotor reactivity was calculated as the Pearson correlation coefficient (PRx) between MAP and ICP values recorded on a minute by minute base and averaged over 24 h. Severity of injury was expressed by GCS, pupils diameter and light reactivity and CT scan according to the Marshall Scale. All patients were neurologically evaluated according to the GlasgowOutcomeScale extended (GOSe) at 6 months.
RESULTS. 155 patients satisfied inclusion criteria and completed GOSe evaluation at 6 months. PRx was significantly different over time (72 h window) between patients with favorable and unfavorable GOSe (ANOVA for repeated measurements: $p = 0.0319$). ($p = 0.03$). In the univariate analysis age ($p = 0.0001$), GCS motor ($p = 0.01$), pupils score ($p = 0.01$), CT scan ($p = 0.002$), PRx on day 1 ($p = 0.03$), ICP insult grade 3 ($p = 0.03$), hypertension insult grade 2 ($p = 0.03$), tachycardia insult grade 2 ($p = 0.04$), hypotension insult grade 3 ($p = 0.05$) were significantly different between patients with favorable and unfavorable outcome. All variables significant on univariate analysis were included in a multivariate regression logistic model to evaluate a potential predictor of outcome (favorable and unfavorable). In this multivariate analysis age (OR = 1.038; CI: 1.015, 1.061) and ICP insult grade 3 (OR = 2.290; CI: 1.039, 5.049) remained in the final model to predict outcome.
CONCLUSIONS. Physiological variables derangements are important predictors for outcome after TBI. Secondary insults evaluation and vasoreactivity assessment should be part of a multimodal monitoring approach to optimized TBI management.

0585
ANALYSIS OF ARTIFICIAL RESPIRATION, CONTROLLED VOLUME AND PRESSURE, IN PATIENTS WITH HEMORRHAGIC STROKE

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OBJECTIVES. To analyze the results of respiratory support in the modes of the control volume (Volume Control) and the control pressure (Pressure Control) in patients with acute stroke to hemorrhagic type.
METHODS. A prospective randomized study of 75 patients, (24–65 years) with hemorrhagic stroke, brought to the hospital within 6 h from the onset of the disease who required respiratory support. Patients were randomly divided into 2 groups: 1st—39 patients with controlled ventilation mode volume (VC); 2nd—36 patients with controlled ventilation pressure (PC). The investigated patients were comparable in all the parameters. Surgery held in 71.8 % (28 patients) in group 1, 61.1 % (22) in group 2. All patients underwent a standardized treatment. Evaluation of mechanical properties of the lungs and gas exchange was carried out based on the following parameters: F, Vt, MV, Ti, PIP, Pplat, PEEP, Clt, FiO_2, SpO_2, PaO_2, $PaCO_2$, $AaDO_2$, PaO_2/FiO_2, Qs/Qt, a-vCO_2. The study was conducted at the 6 stages: 1—when entering the patient in the ICU (the severity score on the integral scales, 2—beginning of mechanical ventilation (1st day), 3—day 3, 4–5th day, 5–7 day, 6—the 10th day of respiratory support. In the fifth stage was recorded at the current situation of the patient (alive, dead, or is transferred to the SAR profile separation). Evaluated lethality in groups, length of stay in the ICU (intensive care unit) and timing of hospital treatment, and the survivors—the outcomes of treatment for the GOS.
RESULTS. In a comparative assessment of options for respiratory support in patients depending on the mode ventilation (VC and PC) did not reveal statistically significant differences of all stages. Clt at all stages of the study the average was above 40 ml/cmH_2O and did not differ significantly between the study groups. At all stages of the study, regardless of the mode of mechanical ventilation, to ensure "stable" performance $PaCO_2$, blood pH, ABE, lactate, and a-vCaO_2, with no significant differences among patients in both treatment groups. Duration of mechanical ventilation in patients in Group 1 had an average of 33.8 % (higher than in group 2 (12.7 days and 8.4 days, respectively). This is related to a longer hospital stay for patients of group 1. The average number of points on the outcomes of intensive therapy on a scale of GOS (among survivors) in both groups was virtually identical (5.3 points and 5.1 points respectively). However, the overall mortality rate in group 1 was two times lower than in group 2 (4 and 8 deaths, respectively).
CONCLUSIONS. Mortality in patients with hemorrhagic stroke during mechanical ventilation in the PC mode was greater (22.2 %) than during mechanical ventilation in the mode of VC (10.3 %), but not statistically significant, indicating the need for further research.

ARDS: New trends in treatment 1: 0586–0599

0586
TREATMENT OF COMBINED BURN AND SMOKE INHALATION INJURY WITH COMBINED ANTICOAGULANTS VS. SOLE ANTITHROMBIN: POTENTIAL BENEFITS AND PITFALLS

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INTRODUCTION. Inhibiting the procoagulatory pathway in acute lung injury represents a promising treatment approach. The optimized treatment strategy, however, still needs to be defined [1].
OBJECTIVES. In the present randomized, controlled experiment we tested the hypothesis that a combined therapy with intravenous (iv) recombinant human antithrombin (rhAT) and nebulized heparin and tissue plasminogen activator (TPA) is superior to sole iv rhAT infusion for the treatment of acute lung injury in an established ovine model of combined cutaneous burn and smoke inhalation injury.
METHODS. After instrumentation for chronic monitoring, a tracheostomy as well as a 40 % total body surface area 3rd° cutaneous flame burn and smoke inhalation injury (48 breaths of cold cotton smoke) were performed under deep anaesthesia. The sheep were then randomly assigned to receive an iv infusion of 6 U kg^{-1}•h^{-1} rhAT (started 1 h post injury; n = 6), an iv infusion of 6 U kg^{-1}•h^{-1} rhAT III (started 1 h post injury) combined with nebulized heparin (10,000 IU every 4 h, started 2 h post injury) and TPA (2 mg every 4 h, started 4 h post injury; n = 4) or 0.9 % NaCl iv (n = 6). All sheep were awake, mechanically ventilated and fluid resuscitated according to standard formulas during the 48 h study period. Data are expressed as mean ± SE at 48 h.
RESULTS. Both strategies attenuated lung injury, as suggested by higher PaO_2/FiO_2 ratios (rhAT: 199 ± 48 mmHg, combination: 360 ± 29 mmHg) compared with control animals (83 ± 6 mmHg, $p < 0.05$ each). Notably, this effect was more pronounced with the combined treatment ($p = 0.035$ vs. rhAT). In addition, the combination therapy was associated with significantly lower pulmonary vascular resistance (119 ± 6 vs. 166 ± 17 dyn sec cm^{-5}•m^{-2}) and pulmonary shunt fraction (22 ± 2 vs. 30 ± 4 %) as compared to sole rhAT infusion ($p < 0.05$ each). Sole rhAT therapy, in turn, more profoundly reduced pulmonary as well as systemic vascular leakage, as represented by pulmonary lymph flow (16 ± 7 vs. 38 ± 5 mL h^{-1}, $p = 0.047$) and net fluid balance (1086 ± 572 vs. 3274 ± 877 mL, $p = 0.059$), respectively. The migration of neutrophils in the lymph was only reduced by sole rhAT infusion (Control: 330 ± 64 % of baseline; rhAT: 50 ± 22 % of baseline; combination: 330 ± 94 % of baseline).
CONCLUSIONS. The combination of iv rhAT with nebulized heparin and TPA more effectively improved pulmonary gas exchange as compared to sole rhAT. However, anti-inflammatory effects and the reduction of vascular leakage mediated by antithrombin were compromised by the combination strategy. These results suggest that combined treatment strategies need to be carefully evaluated for possible interactions between the individual compounds.
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GRANT ACKNOWLEDGMENT. Shriners of North America Grant: #8954,8450,#8520, #8630.

0587
IS ABSOLUTE ESOPHAGEAL PRESSURE RELATED TO SEVERITY OF ILLNESS IN ALI/ARDS PATIENTS?

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INTRODUCTION. Mechanical ventilation based on low tidal volumes is usually applied in ALI/ARDS patients but uncertainty exists on the level of positive end expiratory pressure (PEEP) to prevent lung collapse. Actually several bedside methods are available for PEEP setting, based either on lung mechanics or on the estimated transpulmonary pressure (P_L), i.e. airway pressure (Paw)—pleural pressure (Ppl). Directly measured esophageal pressure (Pes) is considered an adequate surrogate of Ppl and it is used as a reference value to set PEEP [1].
OBJECTIVES. To evaluate if, in ARDS patients, the absolute esophageal pressure is correlated with the overall severity of the disease (expressed by the total lung weight and the fraction of not inflated lung tissue), the lung recruitability and the mechanical properties of the respiratory system.
METHODS. 51 sedated and paralyzed ARDS patients underwent spiral CT scans, at 5 and 45 cmH_2O of airway pressure for clinical reasons, and each lung image was analyzed by a dedicated software. The absolute value of esophageal pressure (Pes) was registered during a release maneuver; the lung recruitability, i.e. the proportion of total lung weight accounted for non aerated lung tissue in which aeration was restored during a recruitment maneuver, and chest wall elastance (Ecw) were computed. Possible correlations were investigated using the linear regression method.
RESULTS. The absolute value of esophageal pressure was not significantly related with the total lung weight ($r^2 = 0.01$, $p = 0.53$), the fraction of not inflated tissue ($r^2 = 0.02$, $p = 0.36$) or lung recruitability ($r^2 = 0.04$, $p = 0.15$). We found weak but significant

correlations between the absolute value of esophageal pressure, the elastance of the chest wall and the total lung volume (Table).

Analysis Results

	P	R^2
Pes vs. Ecw	<0.0001	0.11
Pes vs. total lung volume	0.01	0.16

CONCLUSIONS. We could not find any relationship between esophageal pressure, lung collapse/recruitability or lung weight. These data suggest that caution must be exerted in selecting PEEP according to the absolute value of esophageal pressure.

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0588

CHANGES IN THE INCIDENCE, TREATMENT AND MORTALITY OF ARDS IN A WHOLE NATION OVER 23 YEARS OF FOLLOW-UP

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INTRODUCTION. Acute respiratory distress syndrome (ARDS) is associated with high mortality and morbidity. Several changes have occurred in the treatment of ARDS during the last two decades.

OBJECTIVES. To assess changes in incidence, treatment and in short and long term survival of patients with ARDS over 23 years in a whole cohort.

METHODS. We studied the hospital and ICU charts of all patients in Iceland who fulfilled the consensus criteria for ARDS in 1988-2010. Demographic variables, APACHE II scores and ventilation parameters were collected from hospital charts.

RESULTS. The age-standardized incidence of ARDS to the European population during the study period was 7.2 cases per 100,000 person-years (95 % CI: 6.54–7.93) and increased by 0.2 cases per year ($p < 0.001$). The use of pressure-controlled ventilation almost totally replaced the use of volume-controlled ventilation from 1993. The peak inspiratory pressure (PIP) decreased significantly (-0.5 cmH_2O/year, $p < 0.001$) but the peak end-expiratory pressure (PEEP) has increased slightly (0.1 cmH_2O/year, $p < 0.001$) during the observation period. The overall hospital mortality was 37 % and decreased by 1 % per year ($p = 0.03$). The mortality went from 50 % in 1988–1992 to 33 % in 2006–2010. Higher age (OR 1.62 per 10 years) and APACHE II score (OR 1.68 per 5 points) increased the odds of hospital mortality while a higher calendar year of diagnosis (OR 0.71 per 5 years) reduced the odds of mortality in multiple regression. Adding dominant respiratory treatment, PIP and PEEP to the model did not change the results. The ten-year survival of ARDS survivors was substantially reduced compared to a reference population (68 vs. 90 %, $p < 0.001$).

CONCLUSIONS. The incidence of ARDS has increased but hospital mortality has decreased substantially during the 23 years of observation. Changes in treatment other than changes in mode of invasive ventilation, decreased PIP or increased PEEP explain the observed improvement in hospital survival. Survivors of ARDS have poor long-term survival compared to reference population.

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0589

RECRUITMENT MANEUVERS IN ACUTE LUNG INJURY/ACUTE RESPIRATORY DISTRESS SYNDROME. A SYSTEMATIC REVIEW

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INTRODUCTION. In Acute Lung Injury/Acute Respiratory Distress Syndrome (ALI/ARDS), recruitment Manoeuver (RM) aim at preventing derecruitment. RM is defined as a transient increase in transpulmonary pressure delivered by the conventional ICU ventilator. Two previous reviews on the effects of RMs in ALI/ARDS have already been reported. Since them, additional studies have been performed.

OBJECTIVES. The primary objective was to assess the effect of RMs on mortality in patients with ALI/ARDS. The secondary objective was to assess the benefits (improvement in oxygenation) and risks (barotrauma, haemodynamic impairment) of RMs.

METHODS. We searched the MEDLINE (from inception to June 30, 2011) throughout the Pub Med platform and Cochrane CENTRAL by using a combination of "text words" and Mesh Terms to define study population, intervention and study design. We compared RM versus no RM from prospective randomised controlled studies with two parallel groups.

RESULTS. Two-hundred and forty-three studies were retrieved from the literature search strategy, of which 8 were included (1319 participants) and 5 were excluded. The risks for selection bias, attrition and reporting was low and that of blinding unclear in the 8 studies. The quality of evidence was moderate. The Jadad score was =3 in 4 and <3 in 4 studies. RM significantly reduced mortality at ICU discharge (RR 0.82; 95 % CI 0.70–0.95, $P = 0.01$) in 4 studies and at day 28 (RR 0.84; 95 % CI 0.72–0.99, $P = 0.03$) in 5 studies. The mortality recorded at any time was significantly reduced in the RM group (0.54 [0.33, 0.88], $P = 0.01$) in 6 studies (figure 1). In seven studies reporting on barotrauma, there was no significant effect of RM. Six studies reported the values of PaO2/FIO2 in the mid-term. The heterogeneity across studies was largely significant and by using the random-effect model no statistical significant effect of RM was found.

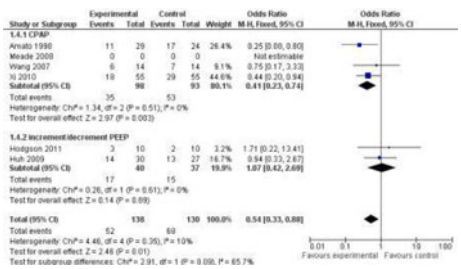

Fig. 1

CONCLUSIONS. We recommend not to use RMs in the routine practice of mechanical ventilation in ALI/ARDS patients. Well designed, adequately powered, randomised controlled trials testing the effects of a standardized regimen of RMs to another RM regimen on patient outcome are lacking.

0590

EXTRACORPOREAL MEMBRANE OXYGENATION IN PATIENTS WITH HEMATOLOGIC MALIGNANCIES AND SEVERE ACUTE RESPIRATORY DISTRESS SYNDROME

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INTRODUCTION. The survival of patients suffering from hematologic malignancies (HM) acquiring acute respiratory failure has improved markedly in recent years. Thus, unlimited intensive care has been advocated for selected patients with HM. However, the use of extracorporeal membrane oxygenation (ECMO) has not been reported in this patient group so far.

OBJECTIVES. To describe the clinical courses of patients with active HM suffering from severe acute respiratory distress syndrome (ARDS) in need for ECMO therapy.

METHODS. Retrospective cohort study on patients treated in a university hospital.

RESULTS. We report on 10 consecutive patients with active HM and severe ARDS treated with ECMO between June 2006 and May 2011 (m/f-ratio: 6/4; median age: 32 years, 24–55 interquartile range; SAPS II: 63, 41–67). The underlying HM were highly aggressive non-Hodgkin lymphoma (i.e. acute lymphoblastic leukemia and Burkitt′s lymphoma) in five patients, other non-Hodgkin lymphoma and Hodgkin′s lymphoma in two patients each, and multiple myeloma (MM) in one patient, respectively. Aetiology of ARDS was pneumonia in eight patients and sepsis of non-pulmonary origin in two patients. Two patients received induction chemotherapy while being on ECMO, three patients had recently received induction or consolidation chemotherapy, four patients had undergone allogenous peripheral blood stem cell transplantation within the last year, and one patient was in partial remission of her MM. One patient received veno-arterial ECMO due to septic cardiomyopathy, all others veno-venous ECMO. The median SOFA score was 12 (12–13) and the PaO_2/FiO_2-ratio 56 (50–59) prior to the start of ECMO. All patients needed vasopressors and four patients underwent hemofiltration during ECMO. Thrombopenia occurred in nine (lowest platelet count: 14; 11–21 G/l) and leukopenia in five patients (lowest leukocyte count: 2.0; 0.2–4.2). All patients received platelet and red cell transfusions. ECMO therapy was employed for 10 (7–12) days, mechanical ventilation for 16 (12–24) days. The ICU length of stay (LOS) was 21 (13–40) days, the hospital LOS 61 (44–104) days. ICU as well as hospital survival was 40 %. Two patients with severe bleeding (lung and upper gastrointestinal tract, respectively) died in the course of multi-organ failure. At a median follow-up of 43 (26–59) months three survivors were in complete remission and the patient with the MM was still in partial remission.

CONCLUSIONS. ECMO therapy was feasible and associated with long-term survival and favourable hematologic outcomes in a significant proportion of severely ill patients with HM and severe ARDS. Thus, ECMO therapy may be a therapeutic option in these patients and should not be generally withheld.

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0591

PROGNOSIS OF PATIENTS UNDER MECHANICAL VENTILATION WHO NEED EARLY REINTUBATION

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OBJECTIVES. To analyze the prognosis of mechanically ventilated patients who need early reintubation.

METHODS. Results of a 1,661 mechanically ventilated patients database, from a 2 years multicenter study in 13 Spanish medical-surgical Intensive Care Units (ICU). Early reintubation was defined as the need for endotracheal intubation during the first 48 h after extubation. Being an observational study, ventilatory modes and weaning techniques were the established for each unit′s protocol. Variables: APACHE II in the first 24 h of mechanical ventilation (MV), age, sex, cause of ICU admission, reason of MV, length of MV, reason of reintubation, noninvasive ventilation prior to MV, ICU mortality and in-hospital mortality.

RESULTS. ICU admission causes: medical 63.5 % (n = 1,055), surgical 26 % (n = 432), trauma 6.8 % (n = 143), acute coronary syndrome (ACS) 1.9 % (n = 31). Early reintubation required in 8.7 % (n = 144). Male 68 % (n = 98). Age: 63.4 ± 15.5 years. APACHE II 20.5 ± 7.3. 14.6 % of patients (n = 21) were treated with noninvasive ventilation (NIV) prior to intubation. Reintubation causes shown in Figure 1. The MV time was 24.2 ± 20.3 days. 61.1 % (n = 88) were tracheostomized. ICU mortality was 20.8 % (n = 30), and hospital mortality of 29.8 % (n = 43). Tracheostomy was more frequent among reintubated patients (61.1 vs. 23.6 % $p < 0.001$) and length of MV was longer in these patients than in those who did not require reintubation (24.2 ± 20 vs. 12.3 ± 14.45 days, $p < 0.049$). ICU mortality was lower in reintubated patients (20.8 vs. 28.5 % $p = 0.02$) and no differences in extra-ICU mortality were found (9 vs. 6.3 % $p = 1.19$).

Reintubation causes	
Secretion Retention	27.8 % (n = 40)
Hypoxemia	26.4 % (n = 38)
Muscular weakness	14.6 % (n = 21)
Consciousness level decrease	13.2 % (n = 19)
Respiratory acidosis	4.2 % (n = 6)
Other	13.9 % (n = 20)

CONCLUSIONS. Although we are aware about limitations of this study: a retrospective study and differences between the two subgroups, reintubation is associated with a longer need for mechanical ventilation, resulting in a higher prevalence of tracheostomy and increased ICU mortality. To develop weaning protocols that may lower the rate of reintubations is needed.

0592
INTUBATION-RELATED TRACHEAL ISCHEMIC LESIONS: INCIDENCE, RISK FACTORS AND OUTCOME

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OBJECTIVES. To determine incidence, risk factors and outcome of tracheal ischemic lesions related to intubation.
METHODS. Planned post hoc analysis of a randomized controlled study aiming to determine the impact of continuous control of cuff pressure (P_{cuff}) on microaspiration of gastric content [1]. All adult patients requiring mechanical ventilation through a polyvinyl chloride-cuffed tracheal tube ≥48 h were eligible for this study. Patients received (1:1) continuous control or routine care of P_{cuff}. In both groups, target P_{cuff} was 25 cmH_2O. Fiberoptic tracheoscopy was performed during the 24 h following extubation in order to diagnose tracheal ischemic lesions based on a predefined quantitative score.

Tracheal ischemia score			
Lesion	Moderate (≤2 lesions)	Severe (>2 lesions)	Confluent
Hyperemia	1	2	3
Ischemia	4	5	6
Ulcer	7	8	9
Tracheal rupture	10	10	10

Patients were considered as having severe tracheal ischemic lesions if they had a tracheal ischemia score > median score. In patients with ≥2 ischemic lesions, ulcer or tracheal rupture, fiberoptic tracheoscopy was repeated 2 weeks after the last extubation. Risk factors for severe tracheal ischemic lesions were determined using univariate analysis. All variables with a p value <0.1 by univariate analysis were introduced in the logistic regression model.
RESULTS. 96 patients were included in this study. All of these patients had at least one fiberoptic tracheoscopy during the 24 h following extubation. 37 (38 %) patients had a tracheal ischemia score > median score (5 [IQ 1, 7]). 80 (83 %) patients had at least one tracheal ischemic lesion. The most common lesion was ischemia (67 %), followed by hyperemia (53 %), ulcer (10 %), and tracheal rupture (1 %). Univariate analysis identified duration of neuromuscular blocking agent use, overinflation of tracheal cuff (>30 cmH_2O), percentage of P_{cuff} determination >30 cmH_2O, duration of assist-control ventilation, and high plateau pressure as risk factors for severe tracheal ischemic lesions. Continuous control of P_{cuff} was not significantly associated with severe tracheal ischemic lesions. Duration of assist-control mechanical ventilation was the only factor independently associated with severe tracheal ischemic lesions (OR [95 % CI] 1.10 per hour [1.02–1.20]). No significant difference was found in duration of mechanical ventilation, ICU stay, and mortality between patients with severe tracheal ischemic lesions and those without these lesions. A fiberoptic tracheoscopy was performed 2 weeks after extubation in 22 patients, representing 62 % of patients with an indication for this examination. Post-extubation tracheoscopy was normal in all patients, except the one with tracheal rupture who had important improvement.
CONCLUSIONS. Tracheal ischemic lesions are common in intubated critically ill patients. Duration of assist-control mechanical ventilation through a tracheal tube is the only independent risk factor. These lesions healed in the majority of patients 2 weeks after extubation.
REFERENCE. 1. Nseir S, et al. Am J Respir Crit Care Med 2011;184:1041–7.

0593
A SYSTEMATIC REVIEW OF PHARMACOTHERAPIES FOR ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS)

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INTRODUCTION. Despite optimal mechanical ventilation, ARDS is associated with 35-40 % mortality. Multiple pharmacotherapies have been studied to improve outcomes.
OBJECTIVE. To conduct a systematic review to evaluate the effect of pharmacolotherapies in patients with ARDS on all-cause mortality and adverse events.
METHODS. We searched MEDLINE, EMBASE and CENTRAL (inception to December 2011) for randomized controlled trials (RCTs) of pharmacotherapies (excluding those that were inhaled, nutritive, or manipulated fluid status) compared to a control group and reporting mortality, duration of ventilation, and adverse effects. Two reviewers independently screened citations, selected articles for inclusion, and abstracted clinical and methodological data from included studies with disagreements resolved by a third reviewer.
RESULTS. From 13,132 citations, 53 trials (6502 patients) of 21 medications met selection criteria. We performed meta-analyses for 10 therapies (PGE1, NAC, early high-dose and late low-dose corticosteroids, procysteine, sivelestat, surfactant, neuromuscular blockers [NMBs], intravenous beta agonist, granulocyte–macrophage colony stimulating factor [GM-CSF]).

Effect on Mortality due to pharmacologic therapies		
PGE1	693 (7)	0.97 (0.79–1.19)
NAC	262 (6)	0.81 (0.60–1.08)
Early high dose steroids	196 (3)	1.05 (0.81–1.37)
Late low dose steroids	204 (2)	0.52 (0.11–2.52)
Procysteine	247 (2)	1.41 (0.68–2.91)
Sivelestat	758 (4)	0.96 (0.75–1.27)
Surfactant	1855 (11)	1.02 (0.90–1.14)
Early NMBs	431 (3)	0.66 (0.50–0.87)
Intravenous beta agonist	364 (2)	1.16 (0.68–1.96)
GM-CSF	148 (2)	0.89 (0.50–1.61)

12 studies individually examined acyclovir, inhaled beta-agonists, dazoxiben, factor VII, IL-10, indomethacin, ketoconazole, lisopylline, pentoxypylline, activated protein c, simvastatin, and xuebijing). Both NMBs (RR 0.71; 95 %CI 0.51–1.00; p = 0.05 and pentoxipylline (RR 0.67; 95 % CI 0.47–0.95) reduced mortality, although the latter finding was based on 1 small RCT. No other treatment reduced mortality. 22 RCTs reported on adverse events (risk varied from 0–22 %), but definitions and reporting varied considerably among trials.
CONCLUSION. Although most pharmacotherapies for ARDS have not reduced mortality, early NMBs are a promising approach that warrant further study.

0594
HEMODYNAMIC EFFECTS OF PRONE POSITIONING IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME

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INTRODUCTION. The hemodynamic effects of prone positioning have been incompletely investigated.
OBJECTIVES. We aimed at studying its effects on the different determinants of cardiac output and on the intra-abdominal pressure.
METHODS. In 18 patients with an ARDS, positive end-expiratory pressure (PEEP) was titrated for reaching a plateau pressure of 30 cmH_2O. Patients were moved to the prone position. Cardiac output, pulmonary vascular resistances (pulmonary artery catheter), intra-abdominal pressure and end-diastolic and end-systolic areas of both ventricles (echocardiography) were measured.
RESULTS. Prone positioning increased intra-abdominal pressure, decreased pulmonary vascular resistance (from 510 ± 343 to 358 ± 205 dynes sec m^2/cm^5), improved the ratio of arterial oxygen tension over oxygen inspired fraction (from 148 ± 63 to 209 ± 79 mmHg) and increased the end-diastolic area of the left ventricle (LV) (from 14.67 ± 5.40 to 16.76 ± 5.10 cm^2). In the 10 patients with a LV ejection fraction ≥50 %, prone positioning increased cardiac index (from 3.01 ± 1.00 to 3.77 ± 0.96 L/min/m^2), while in the eight patients with a LV ejection fraction <50 %, prone positioning decreased cardiac index (from 3.75 ± 1.32 to 3.41 ± 1.46 L/min/m^2) and increased the end-systolic area of the left ventricle (from 7.33 ± 3.24 to 8.76 ± 3.53 cm^2).
CONCLUSIONS. Prone positioning increased the LV preload and decreased the pulmonary vascular resistance. The resulting effect on cardiac index depended upon the LV systolic function.

0595
EVALUATION OF UTILISATION OF INHALED NITRIC OXIDE IN ARDS PATIENTS IN A UNIVERSITY HOSPITAL: ARE THERE SUBGROUPS WHO RESPOND BETTER?

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INTRODUCTION. Inhaled Nitric Oxide (INO) has drawn interest over the last 2 decades for its role in treating ARDS. It improves oxygenation by improving ventilator-perfusion mismatch through selective vasodilation of ventilated parts of the lungs. Although it has not been shown to improve mortality [1] or ventilator free days, it is occasionally used in selective group of patients with ARDS with refractory hypoxemia in some critical care units.
OBJECTIVES. We evaluated the practice of using INO in our unit in the last 2 years (2008–2010). In addition to that, we endeavoured to search for patient groups who benefitted most, mainly in terms of oxygenation, from INO.
METHODS. Patients' case notes and detailed observation charts for the duration of the NO therapy was assessed along with chest radiographs. Arterial blood gas and ventilator parameters were recorded at time 0 (initiation of INO) and then at 1, 6, 12, 18, 24, 36, 48 and 72 h, also at the time when NO was stopped. A slope of P:F ratio was made for each patient along this time line and this slope was used as a marker of change in oxygenation in these patients in response to INO. This slope was assessed against various beseline physiologic parameters of these patients.
RESULTS. The basic demographics and relevant parameters of the patient population is depicted below.

Total no	24
Male	15
Age (years)(SD)	46 (17)
APACHE II (SD)	20 (4)
Lung injury score (SD)	3.02 (0.6)
Baseline PEEP (cmH_2O) (SD)	14 (3)
Duration of NO therapy in hours (SD)	86 (61)
NO dose in ppm (SD)	11.2 (5.4)
In-ICU mortality	75 %

The patients were then subdivided in 2 groups for each of the following baseline physiological parameters according to a cut off value chosen arbitrarily (Hb cut-off 9 G/dL, PCO_2 cut-off 7 kPA, MAP cut-off 70 mmHg, lung compliance 30 ml/cmH_2O). The slopes for each subgroup pair were compared with each other in the following way.

Subgroups as per hoemoglobin		Subgroups as per PCO_2		Subgroups as per Mean arterial blood pressure		Subgroups as per lung compliance (ml/cmH_2O	
<9 G/dl	Slope- 0.337	<7 kPA	Slope-1.137	<70 mm Hg	Slope-1.304	<30	Slope-1.546
>9 G/dl	Slope-1.669	>7 kPA	Slope-0.992	>70 mm Hg	Slope-0.813	>30	Slope-0.646
p = 0.01		p = 0.4		p = 0.21		p = 0.08	

CONCLUSIONS. Expectedly, there was high mortality in this patient group with high baseline PEEP. Notably, the patients with stiffer lungs (lower compliance) had better oxygenation response to NO. Similarly, more hypercapnic patients had a better response (although not statistically significant). Therefore, sicker patients, especially the group with unfavourable baseline ventilatory parameters, had a better physiological response to NO. Higher baseline Hb was better predictor of favourable oxygenation response. Interestingly, Hb is known to cause breakdown of NO quickly in the systemic circulation [2], hence keeping its effects localised to the pulmonary circulation. This might be indicative of a preferably higher Hb target in patients receiving NO.
The limitation of our data is that this has been derived from a relatively small patient population. However, after testing the above findings in a larger population, there might be a rationale in using this novel treatment strategy in a selective patient group with ARDS.
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0596
NON-PHARMACOLOGICAL TREATMENTS FOR ALI/ARDS. AN ESICM SYSTEMATIC REVIEW

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INTRODUCTION. In acute lung injury/acute respiratory distress syndrome (ALI/ARDS), ventilator non-pharmacological interventions are essentially supportive therapies aiming at prevention of mechanical damage in mechanically ventilated patients.
OBJECTIVES. This overview of reviews is dedicated to non-pharmacological ventilatory interventions in ALI/ARDS and their effect on mortality. The following ventilatory non pharmacological treatments were considered: protective lung ventilation (PLV) split into limitation in VT and airway pressure and higher positive end-expiratory pressure (PEEP), recruitment maneuvers (RM), high frequency oscillation (HFO) and prone positioning (PP).
METHODS. We have searched several data bases and primary journals for meta-analyses or systematic reviews examining the effects of interventions of interest on mortality.
RESULTS. We retained 18 systematic reviews and/or meta-analyses: 6 dealing with PLV, 5 with PEEP level, 2 with RM, 1 with HFO and 4 with PP. Since the 2 systematic reviews on RM were not updated, we have performed a specific meta-analysis for that intervention. This meta-analysis is reported in a companion paper. Therefore, the two systematic reviews on RM were not discussed in the review. Furthermore, one review served for both PLV and higher PEEP interventions. As a result, in the present paper we discussed 15 different systematic reviews and/or meta-analyses. We judged the quality of reviews as good and the quality of evidence as high in most reviews.PLV was associated with a significant reduction in mortality at Day 28 (0.74 [0.61–0.88]), at hospital discharge (0.80 [0.69–0.92]) and at the end of follow-up (0.83 [0.72–0.95]). The effect of the combination Lower VT/Higher PEEP as compared to Higher VT/Lower PEEP was associated with a significant reduction in mortality at hospital discharge (0.38 [0.20–0.75]) and at end of follow-up (0.35 [0.18–0.68]).Higher PEEP was significantly associated with a reduction in ICU mortality in the review on individual patient data (0.87 [0.78–0.97]) as were the mortality at hospital discharge in 2 reviews (0.89 [0.80–0.99] and 0.87 [0.78–0.96]) and the mortality at the end of follow-up in one review (0.83 [0.72–0.95]).We reported the most recent review on HFO which included 6 trials. There was a significant reduction in day 30 mortality favouring HFO (0.77 [0.61–0.98]). None of the 4 reviews on PP found a significant effect on mortality. In one review, mortality at Day 28 was significantly reduced in the subgroup of ARDS patients exhibiting the most severe hypoxaemia as defined as PaO_2/FIO_2 ratio <100 mmHg.
CONCLUSIONS. Present review showed that using lower VT and higher PEEP combined with lower VT during mechanical ventilation in ALI/ARDS patients was beneficial to patient survival. For HFO, recommendations may arise from the results of a large ongoing trial comparing HFO to PLV. PP may be used in the most severely hypoxaemic patients.

0597
TIMING OF ARDS RESOLUTION UNVEILED—RELIABILITY OF T.A.R.U. STUDY

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INTRODUCTION. ARDS-Acute Respiratory Distress Syndrome, there is paucity of literature for a definition of ARDS resolution time. In order to validate surrogate outcomes for testing novel therapeutic strategies, we proposed a definition for the ARDS resolution. And it is of utmost importance to assess its reliability before external validation.
OBJECTIVES. To test the reliability of recently proposed definition for the ARDS resolution.
METHODS. In this retrospective observational pilot study Olmsted county patients, who admitted to Mayo Clinic, Rochester Hospitals in year 2009 with diagnosis of ARDS, were included. AECC guidelines were used for determination of ARDS onset time. Medical charts were manually reviewed for first time improvement of Pao2-Fio2 ratio (P: F) >200, since ARDS onset, which should have lasted for at least 48 h or at discharge (Proposed as ARDS resolution time). Two reviewers, blinded to each other, using Standard Operating Procedure (SOP) for above definition, assessed the ARDS resolution, its duration and pertinent variables. Cohen's kappa was used to measure the agreement and the differences were shown by using Bland–Altman plot.
RESULTS. Pilot study consisted of a total of 27 patients with a diagnosis of ARDS. Median (IQR) age was 62 (41–73) years and 74 % (20 out of 27) of them were males. The agreement for resolution versus no resolution in between reviewers was excellent (kappa value = 0.85). The mean (95 % CI) difference in ARDS duration was 0.22 (−2.4 to 2) hours (P = 0.84). The mean (95 %CI) difference in P: F—at resolution, was −7.8 (−19 to 3.7; P = 0.17).
CONCLUSIONS. The proposed ARDS resolution definition is easy to use and interrater reliability is very high.
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0598
IMPACT OF THE IMPLEMENTATION OF A PROTOCOL-DIRECTED MANAGEMENT ON THE SURVIVAL OF PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME

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INTRODUCTION. The mortality of patients with Acute Respiratory Distress Syndrome (ARDS) remains high, ranging between 40 and 60 %. Numerous studies have tested the effect on survival of single interventions, like the setting of tidal volume, level of PEEP or the use of neuromuscular blockers.
OBJECTIVES. This retrospective study aimed to identify the predictors of mortality in a cohort of ARDS patients, and in particular the impact on mortality of a standardized management combining the best evidence-based practices.
METHODS. From January 2008 to December 2010 in our ICU, 35 patients with ARDS were included in a clinical trial testing the effect of prone position on mortality. This study used an algorithm for the setting of tidal volume, level of PEEP and FIO_2, use of neuromuscular blockers and weaning procedure. This algorithm was progressively implemented for all the patients cared for ARDS in the ICU. Then we studied the outcome and predictors of 28-day mortality in a cohort of 125 patients with ARDS, 53 cared in 2005–2007 with a non-standardized management and 72 in 2008–2010 with a protocol-directed management.
RESULTS. There was no significant difference between the two periods regarding the age of the patients, SAPS II at admission, percentage of immunosuppression, aetiology of ARDS, use of vasopressive agents at day one, and PaO_2/FIO_2 at day one. The patients cared with ARDS in 2008–2010 received a lower tidal volume (mean value during the first 24 h 6.4 ± 0.9 vs. 8.5 ± 1.8 ml/kg predicted body weight; $p < 0.0001$), a higher level of PEEP (9.7 ± 2.9 vs. 6.7 ± 2; $p < 0.0001$) and more frequently neuromuscular blockers during the first 48 h (87.5 % vs. 54.7 %; $p < 0.0001$) than patients admitted in 2005–2007. There was a significant decrease of 28-day mortality in 2008–2010 (30.5 vs. 49 %; p = 0.035) compared with 2005–2007. Multivariate analysis identified four predictors of 28-day mortality: the inclusion in the clinical trial with a strict application of the algorithm (Odds ratio [OR] 0.30; 95 % confidence interval [CI] 0.11–0.79) and the PaO_2/FIO_2 (OR 0.98; 95 % CI 0.97–1.0) were protective, and the age (OR 1.05; 95 % CI 1.02–1.08) and an immunosuppression (OR 11.7; 95 % CI 1.69–81.4) were aggravating.
CONCLUSIONS. The strict application of a protocol-directed management combining the best evidence-based practices improved the survival of patients with ARDS.

0599
UTILITY ARDSNET MODEL OF MORTALITY IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME

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INTRODUCTION. The mortality in acute respiratory distress syndrome (ARDS) depends on age, comorbidity and severity of organ dysfunction. The Model of Acute Lung Injury Mortality in ARDS Network used in the study ARMA, it has been proposed as more specific, simple and predictive of mortality, so it is important to assess in our population if it is applicable in predicting prognosis.
OBJECTIVES. To evaluate the usefulness of ARDSNet Prediction Model as predictor of mortality in our population.
METHODS. This is a retrospective, observational study which examined 20 cases with the diagnosis of ARDS according to the criteria of the American-European consensus on admission to the ICU during the period 2010–2011. We evaluated age, gender, admission SOFA, SOFA on the third day, Charlson index, the ARDSNet Prediction Model, Gajic Score; PaO_2/FiO_2, PEEP, tidal volume/kg, VQ ratio, VE40, VE/$PaCO_2$, and dead space. We performed sensitivity analysis, specificity and area under the curve, estimating the statistical significance by Chi square was considered significant when it had a value less than 0.05. The analysis was performed in SPSS V 18.
RESULTS. We studied 14 male patients and 6 female, mean age was 60.5 ± 15.4 years; SOFA at admission 13 ± 2.8 points, Charlson index of 1.5 ± 1.5, with a ARDSNet Prediction Model of 2.3 ± 1.2 points. The entry PaO2/FiO2 111 ± 34. Ventilatory parameters used were PEEP of 13.1 ± 3.7, tidal volume of 6.7 ± 1.2 ml/kg. ARDSNet model is the best predictor of early mortality with an area of 0.80, CI (95 %) 0.61 to 0.99, p = 0.023. The Charlson scale was also very helpful with an area of 0.80, CI (95 %) 0.51 to 0.96, p = 0.076. The best predictor of mortality on day 3 is the SOFA scale with area of 0.87, CI (95 %) 0.61 to 0.98, p = 0.023. See Table 1.

Variable	Area	IC (95 %)	p
ARDSNet prediction model	0.80	0.61–0.99	0.023
Gajic score	0.33	0.074–0.59	0.13
SOFA day 1	0.75	0.52–0.97	0.064
SOFA day 3	0.87	0.61–0.99	0.023
Charlson	0.74	0.51–0.96	0.076
PaO_2/FiO_2 Day 1	0.27	0.36–0.50	0.09

CONCLUSIONS. In this study we observed in patients with ARDS, the ARDSNet Prediction Model evaluated at admission is the best predictor of mortality, Charlson scale was also useful. The best predictor of mortality on day 3 is the SOFA scale. No parameter of oxygenation or mechanical ventilation correlated with mortality at admission or the third day.

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Abdominal complications in the ICU: 0600–0613

0600

EFFECT OF THORACIC EPIDURAL ANALGESIA ON THE INCIDENCE OF COMPLICATIONS IN PATIENTS UNDERGOING COLONIC AND RECTAL CANCER SURGERY: A RETROSPECTIVE ANALYSIS OF DATA FROM 610 PATIENTS

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INTRODUCTION. Thoracic epidural analgesia (TEA) is commonly used intraoperatively and for the management of postoperative pain. The afferent neural blockade induced by epidural analgesia can decrease intra- and postoperative neuroendocrine stress responses. TEA can protect patients from the postoperative development of infectious complications.
OBJECTIVES. To evaluate the influence of the modes of anesthesia on perioperative period in patients undergoing colonic and rectal cancer surgery.
METHODS. All patients were underwent colorectal surgery between January 2008 and December 2010. The following exclusion criteria were used: emergency operations, stage 4 cancer and laparoscopic-assisted technique. Patients were divided into two groups by the mode of anesthesia. Group 1—thoracic epidural analgesia (TEA) + general anesthesia. Group 2—general anesthesia (GA).
RESULTS. Patients in both groups were similar in gender, age (62.82 ± 11.01 vs. 64.27 ± 10.11), ASA score (1.95 ± 0.63 vs. 1.97 ± 0.56), duration of the surgery (143.49 ± 43.09 vs. 145.64 ± 49.27 min.). Essential hypertension was in 62 % patients in Group 1 and in 55 % in Group 2, ischemic heart disease in 22 and 18 % respectively. In both groups the diabetes mellitus and COPD patients accounted 7 and 8 %, respectively. The use of TEA during and after surgery did not require more fluids than the combined general anesthesia and opioid analgesia in the postoperative period. The duration of postoperative mechanical ventilation was significantly lower in Group 1 (2.64 ± 1.75 vs. 3.09 ± 2.17 h, $p = 0.002$). LOS in the ICU did not differ between groups. However, LOS in the hospital was significantly lower in Group 1 (10.63 ± 2.64 vs. 11.48 ± 4.27 days, $p = 0.05$). There were no significant differences in the complications between groups (10.15 and 14.38 %). In Group 1 patients we did not observe cardiac arrhythmia and decompensation of diabetes mellitus. 92 % of complications were developed at the second day after surgery and later. Mortality was 1.84 and 1.75 % ($p > 0.05$) in Group 1 and Group 2, respectively.
CONCLUSIONS. Using TEA in the perioperative period reduces the duration of mechanical ventilation and the hospital LOS in patients undergoing colonic and rectal cancer surgery.

0601

LONG-TERM MORTALITY IN PEPTIC ULCER PERFORATION—A FOLLOW-UP STUDY

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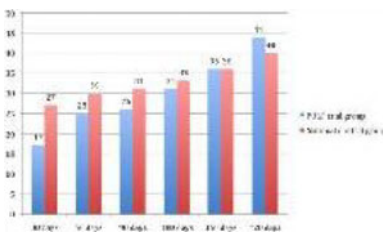
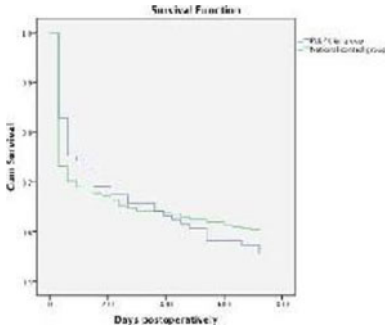
INTRODUCTION. Morbidity and mortality rates in patients with perforated peptic ulcer (PPU) remain substantial. In a recently published non-randomized intervention study (The PULP trial), 30-day mortality was reduced from 27 % to 17 % (NNT 10) after the implementation of a perioperative care protocol, in surgically treated PPU patients [1].
OBJECTIVES. The objective of the present study was to evaluate if the apparent benefit of a multimodal evidence-based perioperative care protocol, persists in the long-term.
METHODS.
Design : Multicentre follow-up study.
Participants and setting: A total of 117 patients surgically treated for PPU between 1 January 2008 and 31 December 2009 in seven gastrointestinal departments in Denmark were included. Pregnant and breastfeeding women, non-surgically treated patients, patients with malignant ulcers, and patients with perforation of other organs were excluded.
Intervention: A perioperative care protocol based on The Surviving Sepsis bundles (2), including screening for sepsis, initial circulatory and respiratory stabilization, early use of broad-spectrum empirical antibiotics, admission to a high-dependency unit, early goal-directed fluid therapy, and thorough and invasive monitoring of vital parameters.
Outcome measures: 60-day, 90-day, 180-day, 1-year, and 2-year mortality rates.
Statistical analysis: Long-term mortality rates in the PPU intervention group, and in the concurrent external national PPU control group from the original study, were compared using Kaplan–Meier survival statistics.
RESULTS. Baseline demographic, clinical, and perioperative data were comparable in the two groups. The observed statistically significant 30-day mortality of 17 % (20/117) in the intervention group, as compared to 27 % (138/512) in the concurrent national control group; Chi^2-test $p = 0.005$, was offset one year postoperatively. At that time, the mortality rate in both groups was 36 %, Table 1 and 2.



30-day mortality (%)



Kaplan–Meier survival statistics

CONCLUSIONS. The reduced 30-day mortality rate associated with the implementation of a perioperative care protocol in patients surgically treated for PPU offsets one year post-operatively. This could be due to a compensatorily increased long-term mortality in the survived frail PPU patients. Furthermore, full comparability of the intervention and control group cannot be assured in this non-randomized trial, which in turn could result in bias. Registration number: NCT00624169 (http://www.clinicaltrials.gov).
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0602

DEMOGRAPHICS AND OUTCOME OF PATIENTS SUBMITTED TO MAJOR ABDOMINAL SURGERY

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INTRODUCTION. Overall incidence of post-operative complications and death is low. However age, co-morbidities and surgery related factors have strong impact on outcome. Better understanding of patient's characteristics and surgical results are lacking but fundamental in quality assessment.
OBJECTIVES. To evaluate demographic characteristics and incidence of post-operative complications in patients submitted to major abdominal surgery.
METHODS. Retrospective analysis of a cohort of patients admitted to an eight bed recovery/intermediate surgical intensive care unit ($_i$SICU) in a level 3 university hospital. Adult patients admitted to $_i$SICU after intra-peritoneal non-vascular surgery during a 14 month's period were included. Data concerning general demographics, type of surgery, length of stay, mortality and major post-operative complications were analysed.
RESULTS. A total of 702 patients were admitted to the $_i$SICU between January 2010 and February 2011 and 450 (50.4 % males) were eligible to be included. Median age was 65 years(34.2 % $\geq$ 65 years). Main co-morbidities were high blood pressure (50 %), cardio-vascular disease (27.6 %) and 42.2 % had solid neoplasia. American Society of Anesthesiologists (ASA) Score was $\geq$3 in 51.8 %. Main surgical procedures were colorectal in 49.3 %, gastric in 18.9 % hepatobiliopancreatic in 14.4 %. Emergency surgery was performed in 22.4 % patients. Median Simplified Acute Physiology Score (SAPSII) was 20. Median length of stay was 2 days in $_i$SICU and 8 in hospital. Rate of invasive mechanical ventilation was 10.7 %. Main major complications were septic, with 13.3 % of patients developing severe sepsis/septic shock during hospital stay. Intra-abdominal and deep surgical site infection occurred in 8.2 % and anastomotic leakage in 4.7 %. Ten percent had respiratory complications (pneumonia, acute lung injury/ARDS) and early acute acute kidney (AKInetwork definition) occurred in 91 patients (20.2 %). $_i$SICU mortality was 4.2 % and hospital mortality was 6.4 % (29 patients).
CONCLUSIONS. In this study, high risk surgical patients with severe co-morbidities, and important physical limitations submitted to major abdominal surgery (mostly complex gastro-intestinal and hepatobiliopancreatic), were found to have high rate of post-operative complications (mostly septic related to surgical procedures) and death as reported before [1]. Better identification of risk patients and implementation of better peri-operative care in suitable critical care facilities may improve outcome.
REFERENCES. 1. Pearse RM et al, Identification and characterisation of the high-risk surgical population in the United Kingdom. Crit Care. 2006; 10(3):R81.

0603

POSTOPERATIVE HIGH FREQUENCY CHEST WALL OSCILLATION THERAPY IN CRITICALLY ILL ABDOMINAL SURGERY PATIENTS: RANDOMIZED CONTROLLED STUDY

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INTRODUCTION. High frequency chest wall oscillation therapy (HFCWO) is used for improvement in airway clearance. Postoperative patients requiring intensive care at risk to develop pneumonia and clearance of secretions may be difficult due to type of surgery and pain. Enhanced mucociliary clearance with HFCWO devices previously used in cystic fibrosis COPD and thoracic surgery patients.
OBJECTIVES. We studied short term effects of HFCWO on postoperative abdominal surgery patients.
METHODS. Nonintubated postoperative abdominal surgery patients requiring intensive care included into the study. Patients were randomized either to standard chest physiotherapy group (early mobilization, incentive spirometry, postural drainage) or standard chest

physiotherapy plus HFCWO group. HFCWO was applied for 10 min at 12 Hz with. Laboratory data were collected for 3 days and the patients were followed until discharge from the hospital.
RESULTS. We included 30 patients to each group. Mean age was 61 ± 13 years and 33 was male 27 was female. Mean body mass index was 26 ± 5 kg/m^2. APACHE II scores were 12 ± 3 and 10 ± 3 in control and therapy groups. Statistically significant difference occurred only in second day PaO_2, SaO_2 and third day arterial pH values which were clinically insignificant. Mean ICU and hospital stay was 5.2 ± 2.8, 4.5 ± 2.6 and 17.9 ± 14.7, 17.5 ± 11.0 days in control and therapy groups respectively ($p > 0.05$). Intubation and mechanical ventilation were required for 2 patients in control and for 1 patient in therapy groups. Noninvasive mechanical ventilation was performed in 2 control patients while it is required for therapy group. Three patients in control group and 2 patients in therapy group died. Nosocomial pneumonia were developed in 5 (16.6 %) control group patients and in 2 (6.6 %) therapy group patients ($p > 0.05$). There were no complications related to HFCWO therapy.
CONCLUSIONS. HCFWO therapy did not help to improve physiological parameters and has no effect on duration of ICU and hospital stay, mortality. Number of nosocomial pneumonia attacks were lower with HFCWO but did not reach to statistical difference. HFCWO is a safe technique which we did not observe any complications.
GRANT ACKNOWLEDGMENT. This study is supported by Erciyes University Research Projects Department.

0604
EXTENDED MEASUREMENTS OF INTRA-ABDOMINAL PRESSURE DO NOT INCREASE THE DETECTION RATE OF INTRA-ABDOMINAL HYPERTENSION

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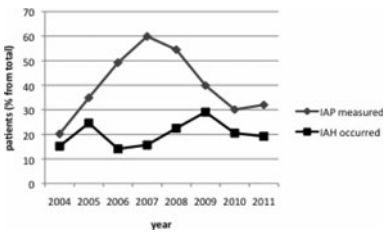
INTRODUCTION. Intra-abdominal hypertension (IAH) occurs in approximately one-third of ICU patients and may contribute to poor outcome [1, 2]. It is not clear whether limiting intra-abdominal pressure (IAP) measurements with preselected risk patients allows sufficient detection of IAH.
OBJECTIVES. To analyze whether IAP monitoring in all mechanically ventilated (MV) intensive care patients results in increased detection rate of IAH. To describe the incidence and mortality of IAH.
METHODS. Electronic database including all the patients treated in general ICU of Tartu University Hospital was divided into three subgroups according to IAP measurement policy in different years: 1. 2004–2005: MV patients with at least one additional predefined risk factor for IAH (multiple trauma, abdominal surgery, pancreatitis, post-CPR status, fluid resuscitation above 5 litres/24 h, vasoactive or inotropic support, renal replacement therapy); 2. 2006–2009 (protocolized until June 2009): all MV patients expected to stay in ICU for at least 24 h; 3. 2010–2011: MV patients with additional risk factor according to the locally developed list (BMI > 30, PEEP >10 cmH_2O, PaO_2/FiO_2 <300, use of vasopressors/inotropes, pancreatitis, hepatic failure/cirrhosis with ascites, gastrointestinal bleeding, laparotomy).
RESULTS. 2729 patients with complete data (representing 97 % of all treated patients) were studied. IAP was measured in 1248 patients (45.7 %). IAH (IAP equal or above 12 mmHg) occurred in 546 patients (20.0 % of total) during their ICU stay. 594 patients (21.8 %) died. Mortality of patients with IAH was 29.9 % vs. 19.7 % in patients without IAH ($P < 0.001$). IAP was measured in 27.1 %, 50.7 % and 31.0 % of patients during the first, second and third period ($P < 0.001$), whereas IAH occurred in 19.6 %, 20.2 % and 19.9 % respectively ($P = 0.949$). Yearly data are shown on Fig. 1.



Yearly incidence of IAH

CONCLUSIONS. Extended measurements do not increase the detection rate of IAH. The incidence of IAH is between 15 and 30 %. IAH is associated with increased mortality.
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GRANT ACKNOWLEDGMENT. The study is supported by Estonian Science Foundation grant no 8717.

0605
INTENSIVE CARE UNIT ADMISSION AFTER CYTOREDUCTIVE SURGERY AND HYPERTHERMIC INTRAPERITONEAL CHEMOTHERAPY. AN INEVITABLE MEASURE?

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INTRODUCTION. Patients undergoing cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) are transferred to the intensive care unit (ICU) per protocol for stabilization and surveillance for complications related to the extensive procedures.
OBJECTIVES. Aim of this study was to evaluate the occurrence of early postoperative complications after CRS and HIPEC in a single referral centre.
METHODS. Data on ICU stay and the occurrence of early and later postoperative complications were retrospectively recorded.
RESULTS. 147 consecutive patients were included. Mean age was 58 ± 11. On admission mean APACHE II was 13.3 ± 3.6 with a mean predictive mortality of 14.6 ± 7.0, mean APACHE IV was 31.7 ± 10.9 with a mean predictive mortality of 15.3 ± 8.7, mean SAPS 2 was 32.5 ± 8.7 with a predictive mortality of 16.0 ± 11.7. On admission in the ICU 75.5 % needed mechanical ventilation. Vasopressors were used in 4.7 % of the population. Mean ICU stay was 2 days (range 1–6). No severe complications occurred during ICU stay. Two people needed readmission on ICU of whom one died. Total 30 days mortality was 1 patient, 0.6 %.
CONCLUSIONS. Mortality after CRS an HIPEC does not correlate with the predicted mortality of the APACHE and SAPS score. Complications in the first postoperative days are rare but postoperative mechanical ventilation is common. Therefore other forms of advanced care rather than ICU stay directly following CRS and HIPEC are appropriate, but should preferably be based on the extent of resections performed, individual patient characteristics and general risk factors.

0606
HYPERLACTATEMIA PREDICTS POSTOPERATIVE FISTULA AFTER PANCREATIC SURGERY

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INTRODUCTION. Pancreatic surgery is a complex and high-risk procedure. The incidence of postoperative pancreatic fistula (POPF) ranges from 5 to 35 % and leads to major complications such as intra-abdominal abscesses or hemorrhage. Risk factors as pancreas texture, comorbidities or surgical procedures are described. Whether early postoperative hemodynamic management could play a role in POPF occurrence has not been studied.
OBJECTIVES. We aimed to determine in a retrospective high-volume center's cohort whether postoperative hyperlactatemia could predict POPF occurrence.
METHODS. We retrospectively reviewed data from 96 consecutive patients admitted between 2007 and 2010 in ICU after duodenopancreatectomy or caudal pancreatectomy. Postoperative hemodynamic optimization was achieved following a goal-directed therapy protocol aiming at normalizing hemodynamic and perfusion parameters within the first 6 h. Univariate analysis was conducted to compare lactate levels at 6 h between patients evolving with versus without POPF. A logistic regression model was developed and included potential confounding factors. A stepwise selection procedure was applied with a significance level at 0.05 to enter and 0.1 for removal. Receiver operating characteristic (ROC) analysis was performed.
RESULTS. Ninety-six patients were included (59 % male, median age 65). Two patients were excluded because of perioperative hemorrhagic shock. ICU stay was 38 ± 8 h. The performed procedures were predominantly duodenopancreatectomy (77 %). Overall rate of POPF was 29 %. Amount of administered fluid or cumulative fluid balance did not differ significantly between groups ($p = 0.13$ and $p = 0.32$). The amount of transfused red blood cells (RBC) was higher in the POPF group (360 ± 83 ml vs. 173 ± 29 ml; $p = 0.005$). Univariate analysis exhibited an association between hyperlactatemia (defined as lactate level above 2.5 mmol/L) and POPF (OR 4.14; ^{95}CI 1.7–10.5; $p = 0.002$). In multivariate analysis, hyperlactatemia (OR 4.1; ^{95}CI 1.6–10.3; $p = 0.003$) and RBC transfusion (OR 1.22;^{95}CI 1.03–1.43; $p = 0.019$) were independent predictors of POPF occurrence and the best parameters to build a predictive model. Age, fluid balance, vasopressors or hemoglobin were not significant predictor variables. Amounts of RBC transfusions did not differ in the high versus normal lactate group (262 ± 63 ml vs. 205 ± 34 ml; $p = 0.41$). Finally, hyperlactatemia and RBC transfusions were not correlated ($r = 0.04$; $p = 0.70$). The area under the ROC curve was 0.67 (^{95}CI 0.55–0.79; $p = 0.009$).
CONCLUSIONS. Hyperlactatemia above 2.5 mmol/L after pancreatic surgery has a great ability to predict POPF. Very interestingly, hyperlactatemia was independent of RBC needs and was observed despite similar hemodynamic achievements. Inflammatory changes after surgery may account for this observation and should be further evaluated.
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0607
THE DEVELOPMENT CHARACTERISTIC OF RESPIRATORY COMPLICATIONS IN THE EARLY POSTOPERATIVE PERIOD AFTER SURGERIES PERFORMED ON ESOPHAGUS

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OBJECTIVE. To conduct a comparative assessment of the nature and frequency of early postoperative complications observed in esophageal surgery performed on the subjects of esophageal benign and malignant lesions.
Materials and methods. The basis for the work was the analysis of conducted studies of the early postoperative period, of 194 patients aged 14–74 years, after reconstructive operations on the esophagus for benign and malignant diseases of the esophagus. Intra- and postoperative monitoring included recording of heart rate (HR), arterial blood pressure (BP), central venous pressure (CVP), pulse oximetry (SpO_2), indicators of deep oxygen status, blood lactate concentration (cLac), acid–base status (ABB) in arterial blood, Hb, Ht, electrolytes, coagulation. Patients were also carried out X-ray study and tracheobronchofibroscopy.
RESULTS. Studies of the structure of complications in the early period after operations on esophagus showed that the proportion of respiratory disorders accounted for 85.6 % of all cases, while specific complications associated with a particular type of surgery comprised 14.4 %. Four types of disorders were identified in the structure of respiratory complications: disturbed ventilation, atelectases in 16.6 % and 15.2 % respectively for benign and malignant diseases of the esophagus; collapse of different parts of lung in 17.7 and 16.3 % of patients; pneumonia occurred in 12.5 and 12.1 % respectively; manifestations of various forms of bronchitis were verified in 26.8 and 14.3 % of cases, and their frequency markedly reflected the initial state of the upper respiratory tract infections in patients with cicatricial strictures after combined burns of the esophagus, larynx and trachea, which increased risk of respiratory disorders in the early postoperative period in patients with benign diseases of the esophagus by 2.4 times.
CONCLUSION. Thus, the analysis of structure of early postoperative complications after esophageal surgery showed that the number of respiratory complications as in benign and as well as in malignant diseases of esophagus was 5.9 times higher. Moreover, the number of bronchitis in the structure of the respiratory complications in patients with benign disease of esophagus prevailed, which increased the risk of respiratory complications in the early postoperative period by 2.4 times.

0608
VALUE OF C REACTIVE PROTEIN AND PROCALCITONINE IN THE EVALUATION OF GRAPH FUNCTION AFTER LIVER TRANSPLANT

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INTRODUCTION. C reactive protein (CRP) has been proposed as a marker of liver dysfunction in acute liver failure and after orthotropic liver transplant (OLT). Procalcitonine (PCT) has not been studies on this setting, existing scarce data on its behaviour in this scenario.
OBJECTIVES. To evaluate the usefulness of CRP and PCT to detect liver dysfunction early after OLT.
METHODS. Prospective cohorts. We included all the patients admitted to our Unit because OLT and registered during the first 3 days the usual parameters of evaluation of the graph function and PCR-PCT. Liver dysfunction was defined according to the Toronto Group Criteria excluding the biliary production because our patients do not carry a biliary drainage; severe dysfunction was considered when grade III and primary dysfunction when grade IV was computed in the third day after surgery. This study was approved by the Ethics committee of our centre.
RESULTS. 59 patients, 52.7 ± 9.8 years, 74.6 % males. Apache II at admission 17 ± 5. Median ICU stay 3 (2–4) days.
5.1 % patients developed grade III dysfunction and 8.5 % grade IV (3 cases required retransplant. ICU mortality was 6.8 % (grade IV mortality 40 vs. 3.7 % without it, $p < 0.05$). On day one CRP levels were 76.6 ± 108.3 and PCT 10.6 ± 17.1. Patients with grade III-IV dysfunction had the first day higher levels of AST ($p < 0.05$), ALT ($p < 0.005$) and INR ($p < 0.005$) but these variables are used in the definition of dysfunction.
No relationship was detected for CRP (53.1 ± 27.3 vs. 79.6 ± 115.8, p ns), PCT (7.4 ± 4.6 vs. 11.1 ± 18.2, p ns), lactate (3.1 ± 1.1 vs. 2.3 ± 1.7, p ns), Factor V (28.3 ± 17.5 vs. 30.9 ± 15.4, p ns) or total bilirubin (4.8 ± 3.5 vs. 4.9 ± 3.3, p ns) (data as III-IV stages vs. 0-II stages). Regarding mortality; AST, ALT, bilirubin and CRP did not show relationship but APACHE II ($p < 0.001$), lactate ($p < 0.05$), INR ($p < 0.001$), Factor V ($p < 0.05$), acute kidney injury ($p < 0.05$) and PCT (30.4 ± 38.6 vs. 9 ± 12.7, $p < 0.001$) were related to mortality. PCT was higher when AKI was present (first day 13.8 ± 21.6 vs. 7.1 ± 11.5, p ns; second day 14.6 ± 18.3 vs. 7.1 ± 9.5, p 0.06).
CONCLUSIONS. CRP and PCT are elevated after liver transplant and even when CRP and PCT were lower in patients with dysfunction showed a wide variability, not being useful for evaluation of graph dysfunction. PCT can be useful as prognostic marker beside coagulation factors but this effect could in part be explained because kidney dysfunction appears to affect its serum levels.
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0609
DOES INDOCYANINE GREEN (IG) CLEARANCE (IGC R_{15}) PREDICT MORBIDITY AND MORTALITY AFTER HEPATIC RESECTION FOR HEPATOCELLULAR CARCINOMA IN CIRRHOTIC PATIENTS?

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INTRODUCTION. The risk of postoperative liver dysfunction (POLD) and fatal outcome is still a major concern after major liver resections in cirrhotic pts (complication rate 20–40 %, mortality 1–5 %). Preop definition of functional reserve of the liver is then mandatory. Recently, $ICGR_{15}$ was proposed in cirrhotic patients with normal bilirubin and absent/controllable ascites to select the extension of the liver resection (R_{15} safe limits: 19 % bisegmentectomy, <29 % segmentectomy, <39 % limited resection; enucleation >40 %).
OBJECTIVES. To evaluate R_{15} as a predictor of morbidity and mortality in a series of cirrhotic patients undergoing different hepatic resections irrespective of Makuuchi criteria.
METHODS. 100 consecutives patients (Jul 2007–Dec 2010, 73 males; median age 65 years; CHILD A_5 58 pts, A_6 29 pts, B_7 9 pts, B_8 4 pts, MELD 6–20) who underwent hepatic segmentectomies composed the study population. Preop IG 0.25 mg/Kg was given to measure R_{15} (LiMon device). We evaluated liver function at POD 1, 3, 5. We defined postop liver failure according to "50–50 criteria" (Belghiti) or in presence of refractory ascites. Perioperative death was death due to a postoperative complication within POD 30. Data are reported as x ± sd or median; appropriate statistic tests were used. $P \leq 0{\cdot}05$ was considered significant.
RESULTS. Four patients died (4 %), two on POD 30 (30 dd mortality 2 %) due to septic shock; two on POD 90. Intraoperative blood loss was 500 ml ± 348 ml (range 100–2,000 ml). 33 patients (33 %) were admitted in the ICU (median ICU LOS 3 dd; range 1–19). ICU mortality rate was zero. Length of stay was 11.3 ± 11.3. In patients A_5 and A_6 R_{15} intervals were <10, ≥ 10 < 19, and ≥ 19 < 30. $R_{15} \geq 30 < 40$ and $R_{15} \geq 40$ were recorded in A_6 and $B_{6\text{-}8}$ patients. POLD and refractory ascites were 11 and 38 % respectively. No correlation was found between R_{15} and mortality ($p = 0.514$) while a correlation was found between $R_{15} \geq 40$, POLD, ascites and hospital discharge ($p = 0.0033$, $p = 0.001$ and $p = 0.001$ respectively). Postop ascites was significantly associated with preop portal hypertension ($p = 0.029$).
CONCLUSIONS. R_{15}. 1. was closely correlated to the severity of the liver disease; 2. reliably predicted liver failure, ascites and hospital discharge; 3. did not predict 30 and 60 dd mortality. R_{15} is a reliable and simple tool to identify the different degrees of severity of liver disease in cirrothic patients. According to the incidence of major complications recorded in our series and their low impact on the medium and long term outcome, Child B patients with $R_{15} > 40$ (MELD > 10) and considered for liver transplant might be offered a surgical tumor debulking with an acceptable risk of postoperative liver failure. With a correct and feasible liver transplant indication, the postoperative morbidity risk seems worth to be accepted: Dedicated postoperative ICU monitoring and skilled and aggressive treatment are mandatory parts of the program.

0610
PREOPERATIVE CARDIAC RISK EVALUATION (PCRE) IN LIVER TRANSPLANT (LTX) CANDIDATES: REVISITING THE PROCESS TO TARGET THE APPROACH OF THE ASYMPTOMATIC CANDIDATE

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INTRODUCTION. In an era of limited grafts availability, accurate preoperative evaluation is essential to minimize adverse outcomes after LTx. Potentials for perioperative cardiovascular complications are now recognized in LTx candidates: coronary artery disease (CAD) ranges from 3 to 27 % in LTx population, impacts on short and long term outcome (up to 40 % mortality) and mandates a systematic approach to identify asymptomati pts at risk. Agreement on the screening approach is lacking, but the clinical burden is relevant: heart stress tests are performed up to 80 % of the pts with variable results and non conclusive predictive values.
OBJECTIVES AND METHODS. We retrospectively studied 172 consecutives pts (males 75 %; MELD score 15 ± 7, CHILD Pugh 8 ± 3 %) who underwent LTx between Jan 2009 and Jul 2011 to assess the incidence of CAD and to evaluate the appropriateness of our CRE approach. Basic PCRE included (according to AHA/ESA 2007–2010 guidelines) clinical history with METs and RCRI (LTx 1 point + 1 point for each major risk factor: CAD, diabetes, peripheral vascular disease, pCreatinine >2 mg/dl), EKG and TT echocardiogram: criteria for heart stress test (Myocardial Perfusion Scanning, SMPS) were age > 50 years **or** the presence of 1 major **or** 2 minor risk factors. Selective coronary angiography (SCA) was performed in patients with positive SMPS, known CAD, presence of CA stents.
RESULTS. All the pts underwent LTx: 30 dd and 1 year survival rates were 99 and 93 % respectively. Diabetes was present in 24 % of the cases, hypertension in 19 %, renal insufficiency in 4 %. Known CAD was present in 7 pts (4 %). RCRI score ≥ 2 (attributed risk of major cardiac event or death > 5 %) was recorded in 49 pts (28 %). 101 candidates (61 %) underwent SMPS (criteria: 85 % age > 50; 41 % RCRI ≥ 2). Positive test was present in 7 pts (7 %): all SMPS tests were falsely positive according to SCA and no new CAD case was diagnosed. No death or major event related to CAD was recorded in this series (autopsy confirmation for the CAD pt who die) and no acute coronary event occurred in 1 y FU, yielding for SMPS a NPV of 100 %, but an inconsistent PPV.
CONCLUSIONS. PreLTx CRE mandates the redefinition of high risk candidates: aims are patient safety (no false negative), screening efficiency (no false positive), appropriate utilization of clinical resources, cost containment. According to our data (to be validated in a larger prospective study), the basic PCRE for the asymptomatic pt should be appropriate in case of candidates <60 years, with RCRI < 2 or with <2 minor risk factors. SMPS was, as reported by others, overused in our pts:, it should be reserved for pts older than 60 years or in case of RCRi ≥ 2. In this series, with adherence to guidelines, SMPS could have been used in <50 % of the cases without increased risks or prognostic disadvantages but with significant cost containment.

0611
EMERGENCY LAPAROTOMIES; OUTCOME ON SURGICAL MORTALITY; THE EFFECT OF A ROUTINE ADMISSION POLICY FOR POSTOPERATIVE PATIENTS TO CRITICAL CARE (ITU AND HDU) FOLLOWING EMERGENCY SURGERY

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INTRODUCTION. The Royal College of Surgeons of England [1], reported that high risk general patients should be considered for admission to Critical Care following emergency surgery. Mortality rates as high as 25 % are reported and in the >80 years group may be as high as 50 %.
OBJECTIVES. To demonstrate significantly improved outcomes in postoperative surgical patient mortality by routine admission to ITU/HDU.
METHODS. 5 year prospective study. All patients undergoing emergency laparotomy were referred for ITU/HDU admission. Vascular/gynaecological and renal surgery were excluded. Patients with terminal disease were not accepted for ITU/HDU. Data was gathered using 3 databases; hospital theatre database, ITU database (wardwatcher), operating department database.
RESULTS. 2006; n = 142, mean age; 63.9 years, mean AII; 14.4, ITU mortality 9.8 %,hospital mortality 20.4 %, ITU LOS 7.1 days, >80 years ITU mortality 10 %, hospital mortality 43 % 2007; n = 232, mean age 67 years, Mean AII; 14.1, ITU mortality; 12.3 %, hospital mortality 17.6 %, ITU LOS 4.95 days, >80 years ITU mortality 16 %, Hospital mortality 33 % 2008; n = 205, mean age 64.1 years, mean AII 13.5, ITU mortality 10 %, hospital mortality 14 %, ITU LOS 5.9 days, > 80 years ITU mortality 12.9 %, Hospital mortality 28.9 % 2009: n = 197, mean age 65.4 years, Mean AII; 14.8, ITU mortality 9.6 %, hospital mortality 16.7 %, ITU LOS 6.2 days, >80years ITU mortality 20 %, hospital mortality 34 % 2010; n = 218, mean age 66.3 years, Mean AII; 14.1, ITU mortality 7.7 %, Hospital mortality 15 %, ITU LOS; 6.03 days, >80 years ITU mortality 14.5 %, hospital mortality 25 %. On average over 80 % postoperative patients referred to Critical Care were accepted. Hospital mortality of patients not accepted for Critical Care was 13 % (24 out of 179) during study period.
CONCLUSIONS. Routine admission of surgical patients following emergency laparotomy to a Critical Care area (ITU/HDU) results in improved postoperative mortality in all patients and benefits >80 years old significantly in comparison with published data.
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0612
AUDIT OF LEVEL OF CARE AND EMERGENCY LAPAROTOMIES

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INTRODUCTION. Emergency laparotomy is a common procedure with a high mortality. In the UK there have been several national level discussions about post operative care of these patients [1, 2] and a national audit has been set up [3]. The Royal Derby Hospital (RDH) has a surgical level 1 care facility called Step Down Unit (SDU) not available in many other UK hospitals. This occupies the care gap highlighted in the recent NCEPOD report [2]. In view of this we undertook an audit of emergency laparotomies following the National Laparotomy Audit proforma. The results of the national audit have not yet been released so we are presenting our data in isolation.
OBJECTIVES. To assess patient outcome according to level of post-operative care (LOC): Level 0 (surgical ward), level 1 (SDU), levels 2 and 3 (ITU).
METHODS. A retrospective case note audit on 168 consecutive emergency laparotomy patients from 2011. For all patients complications and mortality were recorded, ASA grade, age and LOC initially received. Statistical data analysis was then performed.
RESULTS. Of 168 patients, 22.0 % (n = 37) went to the ward post operatively, 41.7 % (n = 70) went to SDU and 36.3 % (n = 61) ITU. Mean age of ward patients (57.1) was significantly different from SDU (65.4) ($p = 0.036$), but there was no age difference between SDU and ITU (69.4) ($p = 0.23$). Mean ASA of ward patients (2.16) was lower than SDU (2.56) but did not reach statistical significance ($p = 0.053$). There was a very

significant difference between mean ASA grade of patients on SDU and those on ITU (3.28) ($p = 0.00009$). Complications and mortality were influenced by increasing patient age ($p = 0.0008$) and ASA grade ($p = 0.013$). There was no difference in the mortality rate between ward (13.5 %) and SDU (7.1 %) ($p = 0.28$). ITU had a significantly higher mortality rate (31.1 %) than SDU ($p = 0.0004$). Complication rates were not significantly different between ward (35.1 %) and SDU (50 %) ($p = 0.40$). ITU had a significantly higher complication rate (70.5 %) than SDU ($p = 0.021$).

CONCLUSIONS. It has been shown that a higher ASA grade and older age are both associated with increased complications and mortality rates [1, 4]. Despite SDU patients being significantly older with a trend towards having a higher ASA grade than ward patients, complications and mortality rates were not significantly different. This suggests that a level 1 care facility has a valuable role in the post operative management of emergency laparotomy patients.

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0613

EMERGENCY LAPAROTOMY—USE OF CRITICAL CARE RESOURCES AND MORTALITY IN A UK TEACHING HOSPITAL

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INTRODUCTION. Emergency laparotomy represents a high-risk surgical group with a substantial 30-day mortality in the region of 15–20 %. A UK national report published in 2011 highlighted major deficiencies in how these patients are cared for including provision of appropriate postoperative care [1]. Previous studies have demonstrated a low ICU admission rate despite the high mortality in this group [2]. There is, however, relatively little data about the impact of critical care admission on clinical outcomes for patients undergoing emergency laparotomy.

OBJECTIVES. With the planned expansion of level 2 (high dependency unit) facilities at our own institution we planned to look at data from an ongoing audit of patients undergoing emergency laparotomy in order to evaluate the impact of a potential increase in critical care admission on mortality.

METHODS. Patients undergoing non-elective laparotomy were identified from the emergency theatre logbook and data were collected from patient notes using a standardised data collection form based on that used in the UK emergency laparotomy network audit. Data were examined from April to December 2010 and January to October 2011 during which time there was an expansion of level 2 critical care facilities. Mortality data were obtained using the hospital's electronic patient administration system.

RESULTS. The results are summarised in Table 1.

Emergency laparotomy data

	April to December 2010	January to October 2011
Number of cases	n = 336	n = 313
Intra-operative cardiac output monitoring	35 %	72 %
Ward post op	70 %	36 %
Level 2 care (HDU) post op	10 %	26 %
Level 3 care (ICU) post op	20 %	36 %
30-day mortality	14.3 %	13.1 %
6-month mortality	28.4 %	(Jan–Jun)19 %

CONCLUSIONS. The results indicated an increase in utilisation of critical care services in this high-risk group from 2010 to 2011 at our institution. The 30-day mortality was similar to that in previous studies [3]. There appeared to be a reduced 6-month mortality, the significance of which is unclear from single centre study with relatively small numbers. It may, however, indicate an improved survival benefit for patients admitted to critical care following emergency laparotomy.

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Emergency medicine: 0614–0627

0614

CLINICAL SIGNIFICANCE OF PROCALCITONIN (PCT) LEVELS IN PATIENTS WITH SUSPECTED INFECTION ADMITTED TO THE EMERGENCY DEPARTMENT

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INTRODUCTION. Recent studies showed that implementation of Procalcitonin (PCT)-guided clinical protocols might reduce unnecessary antibiotic exposure [1]. In January 2011, PCT assay has been introduced among laboratory tests of San Gerardo Hospital (Monza, Italy), a large university-affiliated northern-Italy facility, and, since then, it has been available 24 h/7 days a week.

OBJECTIVES. We aimed at describing PCT clinical significance and the influence of PCT levels on ED physicians' decision of prescribing antibiotics (ATB) when infection was suspected.

METHODS. We conducted an observational retrospective study including 536 consecutive patients admitted to the ED of San Gerardo Hospital between January and September 2011, in whom infection was suspected and plasma PCT measured. Exclusion criteria were: children under 2 years old and suspected or confirmed pregnancy. For each patient we collected clinical history, laboratory findings, sepsis severity and clinical outcomes. Antibiotics prescription in the ED was recorded, too. Data were compared by t-test and one-way ANOVA.

RESULTS. Patients were 62 ± 22 years old and 235 (44 %) were female. 314 out of 536 patients (59 %) were hospitalized, while all others were discharged at home. In-hospital mortality was 8 % (41 patients). PCT levels in hospitalised patients were higher than in those discharged at home (0.5 ± 0.07 ng/mL vs. 0.12 ± 0.03 ng/mL; $p < 0.001$). Non-survivors showed higher levels of PCT than survivors (1.22 ± 0.07 ng/mL vs. 0.21 ± 0.06 ng/mL; $p = 0.001$). Moreover, PCT was increasingly higher in non-septic patients (n = 278 [52 %]; PCT = 0.83 ± 4.01 ng/mL) vs. patients with sepsis (n = 95 [18 %]; PCT = 1.57 ± 4.75 ng/mL) vs. severely septic patients (n = 163 [30 %]; PCT = 14.33 ± 77.69 ng/mL) ($p = 0.01$). Patients treated with antibiotics in the ED (n = 129, 25 %) showed no differences in PCT levels in comparison to non-treated patients (0.29 ± 0.07 ng/mL vs. 0.27 ± 0.06 ng/mL, p = ns). Subgroups analysis on a month-by-month basis did not show any progression, from January to September, in the association between PCT laboratory levels and antibiotics prescription.

CONCLUSIONS. Circulating PCT levels were correlated with severity of disease and with clinical outcome in patients admitted to the ED with suspected infection. PCT testing in these patients did not seem to influence ED physicians' decision to prescribe antibiotic therapy.

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GRANT ACKNOWLEDGMENT. MIUR.

0615

HAEMOPERITONEUM SEMI-QUANTITATIVE ANALYSIS ON HOSPITAL ADMISSION IMPROVES THE PREDICTION OF MASSIVE TRANSFUSION: A STUDY OF 381 SEVERELY INJURED PATIENTS WITH BLUNT ABDOMINAL TRAUMA

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INTRODUCTION. Early detection of trauma patients requiring massive transfusion (MT) allows earlier administration of blood products, which may reduce mortality. A haemoperitoneum can be selected as a risk factor in different scoring systems predicting MT, but is only of limited importance, if present or absent.

OBJECTIVES. The main goal of our study was to assess whether a semi-quantitative analysis of haemoperitoneum size (minimal, moderate or large) on hospital admission was useful for predicting MT in patients severely injured with blunt abdominal trauma.

METHODS. A retrospective review of severe trauma patients consecutively admitted to the trauma intensive care unit at Lapeyronie University Hospital between January 2005 and December 2009 was conducted. Patients diagnosed with blunt abdominal trauma directly admitted from the scene to our level I trauma centre who had a computed tomography (CT) scan on admission were included. The haemoperitoneum size was defined using the Federle score on CT as large, moderate or minimal/none. The association between MT (≥ 10 units of packed red blood cells in the first 24 h) and moderate and large sizes of haemoperitoneum was assessed using a multiple logistic model including other variables previously validated as risk factors for MT (systolic blood pressure, base deficit, open or complex femur fracture and complex pelvic fracture).

RESULTS. Of the 381 patients meeting the inclusion criteria, 270 (71 %) were male; the mean age was 35.5 ± 18.2 years and mean Injury Severity Score was 23.4 ± 17. Ninety-seven (26 %) had large haemoperitoneum, 107 (28 %) had moderate haemoperitoneum and 177 (46 %) had minimal/no haemoperitoneum. Eighty-three patients (22 %) required MT. The positive predictive value for MT of a large haemoperitoneum was 41 %, 23 % for a moderate haemoperitoneum and 10 % for minimal/no haemoperitoneum ($P < 0.001$). The corresponding values for hypotensive patients were 61 %, 32 %, 25 %, respectively ($P < 0.001$). In the multivariate analysis model, only the large size of hemoperitoneum was significantly associated with MT (OR 6.4, 95 % CI 2.9–14, $P < 0.001$).

Predictive values for MT

Size of haemoperitoneum	All patients (N = 381)		Hypotensive patients (n = 182)		Non-hypotensive patients (n = 199)	
	PPV	NPV	PPV	NPV	PPV	NPV
Large	41 % (32–51)	85 % (81–89)	61 % (48–73)	71 % (63–79)	8 % (0–17)	95 % (92–98)
Moderate	23 % (15–31)	79 % (74–84)	32 % (21–43)	56 % (46–65)	6 % (0–13)	94 % (91–98)
No/minimal	10 % (6–15)	68 % (62–75)	25 % (12–37)	55 % (46–63)	5 % (1–8)	93 % (87–99)

CONCLUSIONS. A large haemoperitoneum was most strongly associated with MT than a moderate haemoperitoneum in severe trauma patients. When associated with hypotension, MT is necessary for nearly 2/3 of the patients. The assessment of the size of haemoperitoneum on admission substantially improves the prediction of MT in trauma patients and should be used to trigger and guide initial haemostatic resuscitation.

0616
DETERMINATION OF GAS FLOW VIA AIRWAY EXCHANGE CATHETERS USED FOR AIRWAY EMERGENCIES

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INTRODUCTION. Airway exchange catheters (AEC) may be employed as a conduit for endotracheal tube placement, to aid endotracheal tube exchange or as conduit for re-intubation in an awake, spontaneously breathing patient during a trial of extubation. As AECs are valuable tools for patients with difficult airways, they have been also used for oxygen insufflation in emergencies [1]. Because the inner diameter of these devices is small, high driving pressure may be required in order to provide adequate gas flow.

OBJECTIVES. The aim of this study was to determine gas flow via different AECs at different applied driving pressures.

METHODS. Gas flow was measured in vitro in 4 different AECs of different length and diameter using a flow meter (PF-300, Imtmedical, CH). The gas flow was provided by a calibrated high pressure regulator connected to the central gas supply (air) which yielded 8 different driving pressures with a range between 0.25 and 2.5 bar, in 0.25 bar increments. Gas flow was measured in a 2 cm caliber tube resembling in size the human trachea, distal to the catheter tip, ensuring laminar gas flow. All measurements were performed in triplicate. All data are expressed as mean (SD) and were compared using ANOVA, followed by linear regression analysis.

RESULTS. Table 1 shows the characteristics of the AECs used: French gauge, inner diameter in mm, and length of the AEC. The last column in the table shows the gas flow measured distal to the catheter tip at 1 bar driving pressure.

Catheter name	French gauge	Inner diameter (mm)	Cather length (cm)	Flow via catheter at 1 bar driving pressure (l/min)
Cook Airway Exchange Catheter	11.0 Fr	2.3	83	22
Cook Airway Exchange Catheter	14.0 Fr	3.0	83	27
Cook Airway Exchange Catheter	19.0 Fr	3.4	83	28
Aintree Intubating Catheter	19.0 Fr	4.6	83	29

For every catheter, there was a linear increase in gas flow with 0.25 bar increments in driving pressure ($p < 0.001$) (Fig 1).

In Fig 1, the numbers associated with the plots represent the diameter and, respectively, length of the catheters.

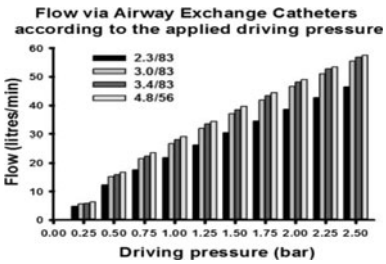

Fig. 1

There were statistically significant differences in flows at the same driving pressures between the smallest caliber AEC, 2.3/83 and the two largest caliber AEC, 3.4/83 and 4.8/56 ($p < 0.05$ for each). There were no statistically significant differences between 2.3/83 and 3.0/83 (Fig 1). The gas flow via AEC 3.0/83 was different only from the 4.8/56 catheter for the same pressures.

CONCLUSION. A linear increase in gas flow values with increasing driving pressures was found for different AECs, flows ranging from 4.8 to 57.5 litres/min. The higher values measured in this study are much larger than the normal minute ventilation in a 70 kg healthy adult man (5-8 liters/min), and could potentially lead to complications in airway emergencies, including barotrauma and volutrauma [2]. Our findings add to the current knowledge base to find optimal ventilator settings to oxygenate and ventilate patients via airway emergency catheters.

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0617
ARE WE STUCK IN PROFESSIONAL SILOS? A NEEDS ANALYSIS FOR INTER-HOSPITAL PATIENT TRANSFER TRAINING

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INTRODUCTION. Adverse events (AEs) occur frequently during inter-hospital patient transfers (IHPT) of the critically ill [1]. IHPT is often performed by ad-hoc teams of ambulance and hospital staff. Shared knowledge, "mental models" and inter-professional relationships are crucial for success.

OBJECTIVES. As part of an ongoing project we surveyed staff involved in IHPT to assess experience of AEs and explore the need for training in strategies to improve team working.

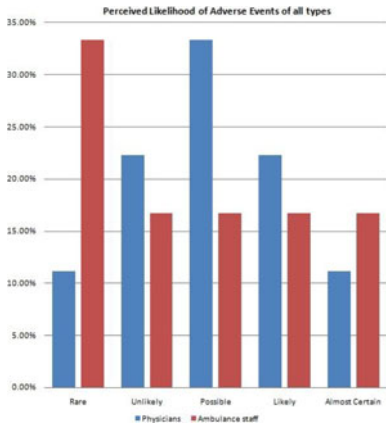
METHODS. Online survey link emailed to anaesthetic trainees (31 replies) and ambulance staff (16 replies). Open and closed questions explored recollections of critical events and identified demographics and experience.

RESULTS. Collectively respondents had participated in >500 IHPTs. 42 % Doctors and 38 % paramedics had directly experienced AEs during IHPT.

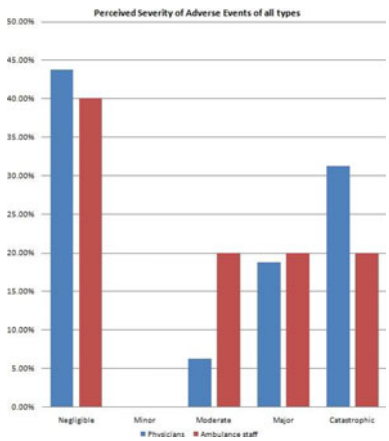
Incidence of Adverse Events described, by category

Type of Adverse Event	Episodes "heard about" by physicians	Episodes "heard about" by ambulance staff	Episodes directly experienced by physicians	Episodes directly experienced by ambulance staff
Airway problem/ extubation	6	0	3	0
Equipment failure - infusion pump	6	0	1	0
Equipment failure - monitor	2	0	3	0
Equipment failure - ventilator	1	0	2	1
Road traffic collision/ injury to staff	1	0	1	0
Ran out of fuel	1	1	0	0
Patient deterioration	3	1	3	1
Exhaustion of drugs/ oxygen	1	0	2	0
Navigation error/ urgency of ambulance response	0	1	1	1

They rated likelihood and severity of AEs according to NHS guidance [2]. Generally, doctors thought AEs more likely to occur than paramedics.



Perceived Likelihood of Adverse Events



Perceived Severity of Adverse Events

We drew on conceptual frameworks of cross boundary professional identities to qualitatively interpret free text responses [3]. This frame has 4 dimensions: 1. *Legitimacies:* Inadequate inter-professional collaboration was common. Feelings of abandonment, not being considered and perceived poor communication were described. 2. *Relationships*: Frequent misunderstanding and acrimony between doctors and paramedics: hospital staff not understanding the "paramedic remit"; "talking down to" paramedics; "carelessness" by doctors. 3. *Knowledges:* Doctors described "patient deterioration" more often, although for paramedics there may be a view that with an anaesthetist on board, their role is less critical than usual. 4. *Spaces:* IHPT teams occupy contested spaces: in hospitals and ambulances. Both paramedics and doctors seemed to become outsiders and be uncomfortable in that ("bumping heads" in the back of ambulances; "waiting ages" for patients in parking bays, finding the destination hospital).

CONCLUSIONS. Team members have varying perceptions of their role during IHPT and appear unwilling to step outside usual professional boundaries. This may affect responses to AEs. As so many respondents thought AEs in transfers "likely" or "almost certain" this has implications for training. Hierarchical relationships and silo thinking present real challenges to team members. Expressions of frustration that staff were unable to move beyond their functional and organisational silos suggests that training should focus on building partnership activity. Focus groups will now be used to refine these concepts.

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0618

EVALUATION OF CONTINUOUS NON-INVASIVE BLOOD PRESSURE MEASUREMENT USING CNAP DURING INTERHOSPITAL TRANSPORTATION OF INTENSIVE CARE PATIENTS

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INTRODUCTION. Arterial blood pressure (BP) is one of the most important variables in emergency medical care as well as in routine anaesthesia monitoring. Especially in patients at risk, BP needs to be obtained frequently or even continuously which is done either intermittently using a BP cuff (NBP) or continuously by an invasive arterial line (IBP). Using NBP hypotensive phases might be partly detected on delay or undetected [1]. Particularly under prehospital conditions (PC) NBP is hindered by agitations and the time interval between two measurements is prolonged by unsuccessful attempts, therefore the use of continuous BP would be eligible even in emergency medicine. CNAP Monitor (CNSystems Medizintechnik AG, Graz/Austria) is non-invasive and provides continuous BP readings. This principle is well evaluated and its comparability to IBP under clinical conditions has been shown [2]. In our study we want to evaluate CNAP under PC.

METHODS. After approval of the local ethics board 17 intensive care patients needing interhospital transportation by a ground based mobile intensive care unit could be enrolled to the study. The patients were already monitored by IBP; measurements were obtained during transportation and data were collected by ZOLL M-Series CCT Monitor (Chelmsford, MA, USA). We compared data to 85 patients under optimal conditions in the operating theatre. Statistics: Bland–Altman method for comparisons of repeated measures, percentage error (PE) [3] for interchangeability.

RESULTS. See tables.

Percentage Error (PE)

	Cut-off PE (%)	MICU (%) n = 17	OP (%) n = 85
SAP	14.7	28.0	16.6
DAP	17.5	35.3	18.0
MAP	18.7	23.9	15.8*

Cut-off PE: Calculated PE as an interchangeability criterion. MICU: mobile intensive care unit, OP: comparison group, SAP: systolic arterial pressure, DAP: diastolic arterial pressure, MAP: mean arterial pressure. *: interchangeability criterion fulfilled

Bland–Altman-Plot

	MICUSAP	MICUDAP	MICUMAP	OPSAP	OPDAP	OPMAP
Bias [mmHg]	10.4	−5.5	-0.9	2.1	−7.4	−6.1
SD of Bias [mmHg]	16.9	11.7	10.2	16.4	9.7	10.4
Limits of Agreement [mmHg]	−22.7 43.6	−28.5 17.5	-20.9 19.1	−30.0 34.3	−26.4 11.6	−26.6 14.3

MICU mobile intensive care unit, *OP* comparison group, *SAP* systolic arterial pressure, *DAP* diastolic arterial pressure, *MAP* mean arterial pressure

CONCLUSIONS. Compared to optimal conditions in the operating theatre CNAP is less precise under PC. There is no statistically interchangeability. Regarding the little bias therapeutically decisions should be made according the MAP in CNAP. According to CNAP SAP is overestimated (10.45 mmHg) while DAP is underestimated (5.5 mmHg). Possible reasons for these findings might be both principles higher error-proneness under PC because of patient movements and agitations during the car ride. In conclusion we found that CNAP might be helpful for earlier detection of dangerous hypotensive episodes than NBP. Using CNAP avoids typical risks involved in IBP, but IBP is still more precise even under PC.

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GRANT ACKNOWLEDGMENT. Dr. Hanss has received an unrestricted grant from CNSystems, Graz, Austria. Dres. Reifferscheid and Ilies received travel costs reimbursement from CNSystems, Graz, Austria. There was no additional payment depending on the results of the study. CNSystems, Graz, Austria, supplied the CNAP™ Monitor.

0619

CHARACTERISTICS OF PATIENTS ADMITTED TO THE INTENSIVE CARE UNIT FOLLOWING SELF-POISONING IN AN IRISH HOSPITAL

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INTRODUCTION. Drug related illness remains a major problem worldwide accounting for up to 10 % of hospital admissions. A minority require intensive care admission.

OBJECTIVES. The aim of this study was to quantify the proportion of intensive care admissions attributable to self-poisoning in an Irish teaching hospital, to determine the characteristics and outcome of these patients, and ascertain if results correlated with international norms.

METHODS. This study was carried out in a 9 bed ICU of a 500 bed acute tertiary referral hospital. A retrospective review was performed of all ICU admissions over the period 2006–2010. Data was collected on patient age, sex, ICU admission diagnosis, type and number of substances involved, APACHE II score, length of ICU stay, need for intubation, dialysis or inotropic support, ICU and hospital outcome.

RESULTS. There were 2090 admissions over the 5-year period, 80 (3.8 %) due to self-poisoning. Male to female ratio was 0.9:1. Mean age was 35 (16–75) and APACHE II score 14 (2-36) giving a predicted mortality of 15 %. Reasons for admission included drug overdose, cardiac arrest, respiratory insufficiency and metabolic or renal dysfunction. The most common substances involved were benzodiazepines, opiates and tricycle antidepressants (TCAs). The majority of patients ingested one drug (51 %). 84 % of patients were ventilated, 27.5 % required inotropic support and 14 % continuous renal replacement therapy. Average ICU stay was 3.5 days (0.1–15.3). ICU mortality was 6.3 %.

CONCLUSIONS. Self-poisoning accounts for approximately 4 % of ICU admissions. The characteristic patient admitted with self-poisoning in this study was female in her mid-thirties. However, in more recent studies from Scotland, Australia and Ireland, a higher percentage of males were admitted to ICU following self-poisoning. The rate of opioid, benzodiazepine and illicit drug use in self-poisoning has increased in Ireland and internationally, while there has been a decline in barbiturate use and toxicity after ingestion of household products. A short period of intubation is typical, with minimal additional organ support required. Patients tend to have a short average length of stay. A mortality rate of 6.3 % is similar to previous international studies and is lower than suggested by APACHE II score. This contrasted with previous Irish studies in which an ICU mortality of 22 to 25.6 % was found.

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0620

THE EFFECTS OF CHANGES TO RESUSCITATION GUIDELINES ON THE INCIDENCE OF SEVERE CHEST WALL INJURY IN COMATOSE SURVIVORS OF OUT OF HOSPITAL CARDIAC ARREST

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INTRODUCTION. The Resuscitation Council (UK) [1] and the European Resuscitation Council [2] published new resuscitation guidelines in October 2010. The importance of high quality chest compressions are emphasised, and rescuers are advised to perform chest compressions to a depth of 5–6 cm. Following these changes we conducted a retrospective study comparing the incidence of severe chest wall trauma in survivors of out of hospital cardiac arrest between the first quarters of 2010 and 2011. This showed an increased incidence of chest wall injury with an associated prolonged ICU stay since implementation of new guidelines. This did not reach statistical significance [3].

OBJECTIVES. To conduct a retrospective review comparing the incidence of severe chest wall trauma—multiple rib fractures (2 and above), flail segment or flail sternum—in patients presenting with out of hospital cardiac arrest 1 year before and after resuscitation guidelines were changed. To evaluate if the trend revealed in our initial study would reach statistical significance over the course of a year.

METHODS. Data were collected from all patients who presented to the ICU of the Royal Infirmary of Edinburgh following out of hospital cardiac arrest between October 2009 and September 2010, and between January 2011 and December 2011. We recorded age, survival, length of ICU stay and presence of severe chest wall trauma.

RESULTS. Between October 2009 and September 2010, 6 out of 64 patients (9.4 %) presented with severe chest wall injury following out of hospital cardiac arrest. 1 out of these 6 patients survived - this patient had an ICU length of stay of less than 10 days. Between January 2011 and December 2011, 10 out of 63 patients (15.9 %) presented with significant chest wall trauma following out of hospital cardiac arrest. 6 out of these 10 patients survived: 3 had ICU length of stay of greater than 10 days. The increased incidence of chest wall trauma does not reach statistical significance ($p = 0.29$ [two-tailed Fisher's exact test]). The age ranges of both groups were similar.

CONCLUSIONS. Our study showed an increased incidence of chest wall trauma since resuscitation guidelines were changed that did not reach statistical significance. It may be that our relatively small numbers were unable to show a statistically significant difference. We encourage others to prospectively evaluate the incidence of chest wall injury in patients presenting following cardiac arrest.

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0621

HIGH SENSITIVITY CARDIAC TROPONIN AS A SCREENING TOOL IN A GENERAL EMERGENCY DEPARTMENT

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INTRODUCTION. Cardiac troponins are the elected surrogate markers for myocardial lesion, therefore fundamental in acute myocardial infarction (AMI) diagnosis and management. The recent appearance of high sensitivity tests—significantly more sensitive than the tests in current use—will be an important adjustment to daily practice, namely in the differential diagnosis of atypical chest pain.

OBJECTIVES. In order to assess the added diagnostic increment of high sensitivity tests in a general emergency room setting, we decided to compare the use of high sensitivity cardiac troponin T (hs-cTnT) to a standard cardiac troponin I test (cTnI) to evaluate the importance of the recent test in atypical chest pain patients.

METHODS. In a two months' time span, we prospectively studied patients that were consecutively admitted to the emergency room for atypical chest pain (pinpoint localized and unrelated to physical strain) and normal electrocardiograms. Patients presenting with fever, physically traumatized, renal failure or with known previous coronary events were excluded. All the patients underwent a testing protocol consisting of a peripheral venous sample at arrival (sample 1), at 3 h post-arrival (sample 3) and between 6 and 9 h post-arrival (sample 6). The three samples were used to test hs-cTnT (99th percentile = 0.0135 pg/ml-Roche Diagnostics®) and cTnI (99th percentile = 0.02-μ/L-Dimension Vista®). The two tests were compared.
RESULTS. A population of 46 patients was studied. Average age was 60 ± 14 years old, of which 17 (38 %) were female. The values obtained by the two tests had the following correlations: sample 1: $r = 0.7$; $p < 0.0001$; sample 3: $r = 0.9$; $p < 0.001$; sample 6: $r = 0.9$; $p < 0.0001$. There were 19.5 % (9/46) of patients who displayed a diagnostic elevation for hs-cTnT (8 male/1 female). For cTNI 13.0 % (6/46) patients had diagnostic elevations. In the 6 patients positive for both hs-cTnT and cTnI (all male), 5 had concordantly positive values for all the samples (55.5 %—5/9 patients—positive concordance for the 3 samples). In the remaining cTnI positive patient the diagnostic elevation was just on sample 6. Overall there was a 6.5 % (3/46) increment in AMI suspected diagnosis and an extra admission sample suspected diagnosis of 2.1 % (1/46) due to hs-cTnT use (see ROC curve comparison for sample 1).
CONCLUSIONS. In this sample population it was possible to better judge atypical chest pain through hs-cTnT. We believe the high sensitivity capability to be particularly important in this subset of general emergency room patients, since their diagnostic workup is often difficult and lengthy.
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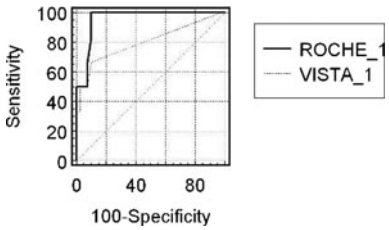
GRANT ACKNOWLEDGMENT. This work was possible with the support of Roche Diagnostics.



ROC curves for sample 1 (AUC comparison-p = 0.154)

0622
A PROSPECTIVE INTERVENTION STUDY TO COMPARE EFFICIENCY OF DIFFERENT COOLING TECHNOLOGIES FOR MILD THERAPEUTIC HYPOTHERMIA

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BACKGROUND. Mild therapeutic hypothermia (32–34 °C) is neuroprotective in patients with post-hypoxic brain injury after cardiac arrest. Various mechanical devices are available to induce and maintain hypothermia followed by slow and controlled re-warming. These devices have not been well studied in comparative clinical trials. We performed a prospective intervention study to compare four frequently used cooling systems.
DESIGN. Multi-centered prospective intervention study in four university hospitals.
INTERVENTIONS. Four different cooling systems were used to induce and maintain hypothermia. Two devices (Medi-Therm and Blanketrol) used external water-circulating cooling blankets, one (Arctic Sun) used gel-coated adhesive cooling pads, and one (ThermoGard) used endovascular cooling catheters with balloons circulating ice-cold saline. For the latter system we studied three different catheters with two, three or four water-circulating balloons, respectively.
MAIN RESULTS. So far 80 patients have been enrolled. Baseline characteristics were similar for all groups. Endovascular cooling appeared to have the fastest induction rates but this was significant only vs. the Medi-Therm II system ($p = 0.013$). Time within target range ± 0.5 °C was 96.8 ± 7.0 % for ThermoGard, 57.4 ± 29.3 % for Medi-Therm II, 67.5 ± 15.9 % for Blanketrol, and 81.6 ± 21.7 % for Arctic Sun. The differences between ThermoGard versus Medi-Therm II, ThermoGard versus Blanketrol, and Arctic Sun versus Medi-Therm II were statistically significant. No major complications occurred with any device.
CONCLUSIONS. This study is ongoing and the results are preliminary. Based on the preliminary results endovascular cooling may provide faster induction, and cooling catheters and adhesive gel pads may provide more reliable temperature control during maintenance compared to traditional surface cooling devices.

0623
INTEGRATION OF A CARDIAC OUTPUT MONITORING SYSTEM INTO A SEPSIS MANAGEMENT BUNDLE IN THE EMERGENCY DEPARTMENT

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INTRODUCTION. Current evidence supports the view that early recognition and targeted resuscitation strategies reduce morbidity and mortality in patients with severe sepsis if instituted early (<6 h from admission). Fluid bolus administration remains a crucial step in sepsis resuscitation. Clinical parameters alone have been shown to be poor reflections of the adequacy of fluid resuscitation. Rivers et al. demonstrated significant mortality benefits using a protocol centered round central venous oxygen saturation as a target and central venous pressure as a safety-net. Uptake of this approach has been reported to be suboptimal in many regions including the United Kingdom. The primary goal of fluid administration is an improvement in stroke volume. Measurement of stroke volume or cardiac output is now possible with a number of minimally invasive and non-invasive techniques. Implementation of this strategy within peri-operative care has demonstrated a reduction in morbidity and mortality in a number of studies. We describe integrating a non-invasive validated cardiac output monitor into a sepsis resuscitation bundle in a tertiary Emergency Department (ED) in the United Kingdom (UK). We believe this is the first such series from the UK.
OBJECTIVES. Integrate the Ultrasonic Cardiac Output Monitor (USCOM) into a sepsis resuscitation bundle in the ED and determine the impact of this intervention on achieving international sepsis management recommendations and determine the inter-observe validity of this tool within our setting.
METHODS. A number of ED clinicians underwent training to obtain a cardiac output measurement using the USCOM device. Data was collected prospectively on patients presenting with presumed sepsis or severe sepsis and further clinical management was conducted under protocol based on the surviving sepsis campaign guidelines. SV responsiveness was defined as 10 % change in SV in response to a fluid challenge.
RESULTS. Data was collected on a total of 131 patients with pneumonia, urospsis, abdominal sepsis, viral infections and other diagnoses. Core treatments and investigations in sepsis were undertaken to a satisfactory standard and demonstrated improvement based on previous institutional data. USCOM monitor was applied successfully with a high degree of inter-observer correlation (inter-class correlation 0.94). Agreement was highest when high quality doppler traces were obtained and these were predicted by the clinicians. This data correlated favorably with previously published USCOM data from Australasia.
CONCLUSIONS. Cardiac output monitoring using USCOM can be applied safely within patient flow and time constraints of a UK ED. Measurements obtained in this setting are comparable to the validation literature of the device.
GRANT ACKNOWLEDGMENT. Device provided by manufacturer (USCOM Ltd, Sydney, Australia for study).

0624
THE STRONG ION GAP IN THE EMERGENCY DEPARTMENT

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INTRODUCTION. Traditional data interpretation of blood gas analysis has advanced significantly in the last few years. The human body carefully controls its own acid–base balance and a disturbance of this balance may have lethal consequences. Even though we understand the importance of interpreting biochemical abnormalities, we often fail to appreciate the pathophysiological disturbances initiating the abnormalities, leading to confusion as to the cause and treatment of the acid–base derangements. This is the first head-to-head comparison of the Strong Ion Gap calculations in comparison to other methods of interpretation conducted solely in the Emergency Department.
OBJECTIVES. Our objective was to measure the accuracy of different methods of interpreting acid–base abnormalities using the Strong Ion Gap model as the gold standard. Comparison was made to the Boston and Copenhagen approach, the Anion Gap (AG) and the Albumin-Lactate-Phosphate corrected Anion Gap (1).
METHODS. All arterial blood gas sample results were retrieved from two blood gas analysers (AVL800 flex, *Radiometer*) dedicated to Emergency Department use. The sample was included if a simultaneous laboratory biochemical analysis was performed. Data was collected from November 2011 to April 2012 to include a total of 300 patients. The examiners were blinded to the clinical conditions of the patient.
RESULTS. When compared to the Strong Ion Gap (reference standard), the Copenhagen and Boston approach had a combined sensitivity of 61.95 %, specificity of 93.75 %, Negative Predictive Value (NPV) of 58.25 % and Positive Predictive Value (PPV) of 94.59 %. When compared to the reference standard, measuring the Albumin-Lacate-Phosphate corrected Anion Gap (ALPCAG), it had a sensitivity of 91.15 %, specificity of 17.19 %, NPV of 52.38 % and PPV of 66.03 %.
CONCLUSIONS. The Strong Ion Gap proved to be superior to the other methods in detecting acid–base disturbances. Correcting for the Albumin, Lactate and Phosphate made the Anion Gap calculation more sensitive. The combined Copenhagen and Boston approach was not accurate enough to reliably detect metabolic disturbances.
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0625
NON-INVASIVE VENTILATION (NPPV/CPAP) IN PATIENTS WITH CHEST TRAUMA: A SYSTEMATIC REVIEW

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INTRODUCTION. Patients with chest trauma are at high risk of acute lung injury (ALI) and respiratory failure. Positive pressure ventilation improves outcomes in this population but its use is associated with prolonged ICU stay and infectious complications.
OBJECTIVES. To systematically review the published literature on the use of NPPV/CPAP in patients with chest trauma, and provide suggestions to improve the clinical decision-making regarding the management their management.
METHODS. We conducted a formal literature search of MEDLINE and EMBASE (inception to 2/2012), to identify all relevant English language studies regardless of study design. Two investigators independently and in duplicate abstracted data and assessed the methodologic quality of included randomized controlled trials (RCTs) using the Cochrane domain and observational studies using the Newcastle-Ottawa scale.
RESULTS. Our search identified 424 articles. Eight studies, with a total of 348 patients, met criteria for final review. Of these, 3 were RCTs and 5 were observational studies. There was significant heterogeneity in the severity of injuries, the degree of hypoxemia, and the time at which patients were enrolled in the study. Two studies assessed the use of NPPV early in the disease process before the development of respiratory distress or hypoxemia. One was an RCT of fair quality and the other a retrospective analysis of an administrative dataset. Both studies found a decrease in the rate of intubation and infectious complications in the NPPV group. The other 6 studies assessed the use of NPPV/CPAP in patients with ALI or respiratory distress after chest trauma. Three of the studies were observational

without a comparison group. Two RCTs of poor quality showed a decrease in overall mortality, length of ICU stay and complications in the NPPV group. Four studies (2 RCTs and 2 retrospective studies) contributed to clinical outcome data in patients with NPPV/CPAP compared to invasive mechanical ventilation, and showed decreased ICU stay (5.3–16 days vs. 9.5–15 days), complications (0–18 vs. 38–49 %) and mortality (0–9 vs. 6–50 %) in the NPPV/CPAP group. All studies used epidural nerve blocks or PCA pumps in the NPPV/CPAP group as a co-intervention to manage pain.
CONCLUSIONS. The early use of NPPV/CPAP in appropriately identified patients without respiratory distress has the potential to prevent intubation, and decrease the ICU length of stay and complications in patients with chest trauma. However, this should only be done in conjunction with adequate pain control and in a monitored setting. Use of NPPV/CPAP to prevent intubation in patients with chest trauma who have ALI or respiratory distress remains controversial because of the lack of good quality data. Further research is necessary using stringent study designs and appropriate patient selection before definitive recommendations can be made for patients with chest trauma, with or without respiratory distress or hypoxemia.

0626
HEAD INJURY (TBI) LIGHT: IS IT BE WORSE ANTIPLATELET OR ANTICOAGULATION?

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OBJECTIVE. To identify factors related to the care of patients with oral anticoagulant or antiplatelet treatment for mild head injury treated in the emergency department of a tertiary hospital.
METHODS. We performed an observational, descriptive, longitudinal and retrospective study of patients treated for mild head injury, defined as a GCS score of 15 on arrival to the emergency room (ER). The working tool used was the review of medical records of patients.
The variables measured were age, sex, trauma mechanism, associated injuries, type of treatment in two variables, oral anticoagulant therapy (OAT) or antiplatelet therapy, reason for anticoagulation/antiplatelet therapy, hemostasis and the initial INR in emergency, GCS score, initial cranial CT scan result, length of care in the emergency and definitive treatment. All patients underwent thrombotic risk scales (scale CHADS2) and hemorrhagic (HAS-BLED scale). They conducted a telephone survey follow-up month after discharge.
RESULTS. A total of 55 (55 % female) patients, with mean age of 81.45 years (range 37-96 years), 56 % treated with antiplatelet agents and 44 % anticoagulated with acenocumarol. The usual reason for anticoagulation/antiplatelet therapy was atrial fibrillation (80 % of cases) the most common mechanism of injury (90 %) was TBI after a fall from his own height, with associated maxillofacial injuries. The INR was mostly (87.6 %) in the therapeutic or subtherapeutic levels. The average time for performing CT scan was 3 h of arrival to the emergency and the resulting common finding (90.2 %) diffuse injury type I, and the current management was temporary discontinuation of treatment and observation. The 10 % required hospitalization. The average point on the CHADS2 was 3 and the haemorrhagic risk level defined by the HAS-bled was estimated as 82.3 % higher in the patients. The relative risk of bleeding compared to non-anticoagulated, estimated in our series was 0.73. In telephone follow-up month, showed no bleeding or thrombotic events.
CONCLUSION. Patients with mild head injury and anticoagulant or antiplatelet therapy are at high risk of thrombosis and bleeding. The risk of bleeding is greater in anticoagulated patients. There is no greater morbidity and mortality in anticoagulated with respect to antiplatelet agents.

0627
USE OF TOLVAPTAN IN INTENSIVE CARE PATIENTS

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INTRODUCTION. Tolvaptan is an arginine vasopressin V_2 receptor antagonist that induces water diuresis. Tolvaptan has been used for the treatment of hyponatremia complicated by the syndrome of inappropriate anti-diuretic hormone secretion in Europe and for the treatment of heart failure in the United States. In 2011, tolvaptan was also approved in Japan for treatment of patients with congestive heart failure who do not respond sufficiently to other diuretics. Although fluid overload and congestion occur due to various causes in intensive care, to our knowledge, there have been no studies evaluating the use of tolvaptan.
OBJECTIVES. In this study, the effect of tolvaptan on fluid overload and congestion in intensive care patients was examined retrospectively.
METHODS. Patients who were treated with tolvaptan in the intensive care unit (ICU) from January 1st, 2011 to February 29th, 2012 were evaluated retrospectively. Following the decision of the intensivists, Tolvaptan was administered to patients who did not respond sufficiently to other diuretics. Tolvaptan was administered as a suspension through a nasogastric tube. The patient background, combined diuretics, body weight and renal function before and after administration, and urinary parameters were compared. Effects on hemodynamics were also recorded. Differences between before and after administration of tolvaptan were compared by paired-t test and the significant difference observed when the p value was <0.05.
RESULTS. Tolvaptan was administered to 10 patients (mean SOFA score: 10.2). Patient's background included patients with fluid overload after cardiac surgery, those with ascites after disseminated intravascular coagulation (DIC) following abdominal surgery, those with burn, those with congestion after septic shock and those with hemorrhage due to traffic injury. The agents used before the administration of tolvaptan included furosemide and carperitide, acetazolamide. None of the patients responded sufficiently to these diuretics and did not reach the target fluid or body weight. The mean administration period was 3.6 days. The mean urine volume between before and after administration changed from 1131 to 3053 mL/day ($p < 0.05$), the mean body weight from 75.4 to 71.2 kg ($p < 0.05$), the mean serum sodium from 135 to 139 mEq ($p < 0.05$). The mean creatinine clearance increased from 29 to 39 mL/min. The patients reached their target body weight 2.8 days after administration of tolvaptan. One patient discontinued tolvaptan due to hypernatremia (serum sodium increased from 139 to 154 mEq). No other adverse effects due to tolvaptan were observed.
CONCLUSIONS. Tolvaptan was effective to treat fluid overload and congestion in intensive care patients, although serum sodium levels may increase.

End of life care–Ethics of research: 0628–0641

0628
WHO SHOULD CARE FOR ADVANCE DIRECTIVES?

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INTRODUCTION. Intensivists have to take important decisions for incompetent patients. Surrogate decision makers are often unavailable or don't know what to do. Advance Directives (AD) were developed to respect the patients' autonomy. However, very few patients had written AD at ICU admission, even for major elective surgeries. To understand the reasons of this lack, it is necessary to focus on prehospital practioners who may eventually help increasing the number of patients with AD.
OBJECTIVES. To investigate physicians' self-rated communication skills and their attitudes towards AD in patients planned for heart surgery.
METHODS. Self-administered questionnaire including Quality of Communication Score (min/max(0/10))[1] sent to primary care physicians and specialists potentially involved in care of patients planned for heart surgery.
RESULTS. From 409 questionnaires, 172 were returned (42 %) and 164(40 %) completed by: General Practitioners: 50 (31 %), Internists: 73 (45 %), Intensivists: 22 (13), Cardiologists: 18 (11 %). Private activity: 121 (73 %). General Communication score [median (min/max;IQR)]:9(5/10;2); End-of-life communication score: 7 (1/10;2)0.138/162 (85 %) physicians thought AD are useful. Women were more prone to say so ($p = 0.01$), the cardiologists the least ($p = 0.007$). 16/159(10 %) physicians never talked about AD to their patients, 99 (62 %) did so with 1–10 % of their patients, 20 (12 %) with 11–25 %, 14(9 %) with 26–50 %, 7 (4 %) with 51–75 % and 3(2 %) with all patients. 32/159 (20 %) physicians were not involved in any patient planned for heart surgery during the previous year, and 81 (51 %)were for 1-5, 17 (11 %) for 6–10 patients. 57/118 (48 %) physicians never talked about AD with these patients, 45 (38 %) had done so with 1–5, 7 (6 %) with 5–10. 66/159 (42 %) physicians thought that the generalists should speak about AD to such patients, 40 (25 %) the cardiologists, and 23 (14 %) the internists. 129/158 (82 %) physicians thought that they should ask patients about AD, 101 (64 %) would ask for a copy for the medical record, 81 (51 %) if AD would be still accurate and 78 (49 %) who is the holder. The physicians' characteristics need to be compared with their attitudes towards AD to target future interventions in order to increasing the prevalence of AD.
CONCLUSIONS. A great majority of physicians thought that AD were useful, but fewer talked about AD. They discussed AD only with a minority of patients, and 10 % never talked about it. Generalists and cardiologists are seen as the physicians who should speak about AD to patients planned for major heart surgery. Physicians rated their general communication skills as very good (9/10), but less so regarding end-of-life (7/10). Further studies should explore how intensivists who need AD may contribute to enhance their writing in collaboration with prehospital practitioners. Comparison with what patients and relative think is awaited.
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0629
END-OF-LIFE DECISION-MAKING IN PATIENTS WITH SEVERE SEPSIS

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INTRODUCTION. Many patients with severe sepsis die on the ICU after receiving decisions to limit therapy.
OBJECTIVES. To describe end-of-life (EOL) decision-making.
METHODS. Prospective observational 14-month study of consecutive patients with severe sepsis who received therapy-limiting decisions in three adult ICUs with 72 surgical, neurological, and medical beds. Responsible nurses, residents and attending physicians were questioned on the day of the first therapy-decision and on the day of death or discharge.
RESULTS. 142/434 patients (33 %) with severe sepsis received EOL decisions: 41 % withhold (WH), 17 % withdraw (WD), 75 % do-not-resuscitate and 11 % do-not-dialyze orders. Patients with EOL decisions were older, had more comorbidities, higher median SOFA (11 vs. 7) and SAPS II scores (59 vs. 42), higher ICU and hospital mortality rates (71.1 vs. 16.9 % and 88 vs. 28.5 %, respectively), and shorter hospital stays (488 vs. 685 h; all $p < 0.001$). ICU stay was 206 vs. 186 h (n.s.)
Median time between first decision and death or discharge was 30 h. Advance directives were present in 17 %, a health care proxy was named in 33 %. On the first day, patients' wishes were known in 54, 43 and 29 % (to attendings, residents or nurses, respectively), increasing to 64, 66 and 39 %, respectively on the last day.
EOL decisions were initiated mostly by the attending physicians (85 %) and/or surgeons (27 %). 21 % and 30 % of nurses, respectively, and 6 and 5 % of residents, respectively did not know who initiated or who agreed with the EOL-decisions. Documentation about decision-making was incomplete.
22 attendings, 13 residents and 17 % of nurses judged that EOL decisions should have been reached earlier. More nurses (11 %) than physicians (1 %) judged that pain medication and/or sedatives were insufficient.
Discomfort with existing decisions was low (median 0 on 11-point Likert scale). Care was perceived to be somewhat more strainful by residents (median 3, IQR 1–4]) and nurses (3, 2–5) than by attendings (2, 0–3). Reasons for increased strain were mainly workload and delays or conflicts regarding EOL decisions.
CONCLUSIONS. EOL decisions are frequent in patients with severe sepsis and are usually initiated by senior ICU physicians. Nurses mostly do not participate in EOL decision-making and communication, but perceive inadequate EOL care more often and experience more strain during EOL care than physicians.
Trial registration: NCT01247792 clinicaltrials.gov.

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0630

PRACTICES AND PERCEPTIONS OF CAREGIVERS IN THE DECISION-MAKING PROCESS (DMP) FOR WITHDRAWING LIFE-SUPPORTING TREATMENTS (LST): A FRENCH SURVEY

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INTRODUCTION. A French law in 2005 has reinforced end-of-life patient's rights, and put the accent on a DMP based on teamwork and transparency.

OBJECTIVES. Objectives of this study were to know ICUs' practices and caregivers' opinions about the DMP for withdrawing LST and to assess the involvement of staff members in the process.

METHODS. A close-ended questionnaire was developed by the SRLF Nurse Committee. The questionnaire was sent to caregivers via the SRLF mailing list from June to September 2011. The questionnaire was also online on the website of the Society. Any ICU caregivers could complete it anonymously. Data were collected about the ICU and the respondent's characteristics, the DMP, the procedures of LST withdrawal and the perceptions of caregivers. Only the results concerning the DMP are detailed here. Data were descriptive and were analyzed per ICU and per responders.

RESULTS. Of the 768 French respondents, 45.7 % were physicians, 42.8 % were nurses (others 11.5 %), working in 341 ICU's. The mean patient-to-nurse ratio was 2.8. Visiting hours were not restricted in 17.5 % of the ICUs and were restricted but increased for relatives of end-of-life patients in 80.5 %. About trainings and procedures, 97 % of physicians consider being informed about the DMP for withdrawing LST versus 65 % of nurses. DMP procedures are written only in 39 % of ICUs, and texts (law, recommendations) are known by 94 % of physicians versus 60 % of nurses. Withdrawing LST decision is mainly made during a daily staff meeting (62 %) or a dedicated meeting (58 %); in this meeting 97 % of physicians versus 70 % of nurses are present. The majority of caregivers agreed on the necessity for decision-making process to be collaborative but most of them believe that this doesn't occur in actual practice. 90 % of physicians but less nurses: 67 % think that the nursing staff is actually involved in the process. In case of « unreasonable obstinacy » only half of the nurses dare to express themselves (versus 86 % of physicians). Despite legal statements and SRLF guidelines, half of caregivers still considers that the opinion of a physician who does not belong to the ICU staff is nor useful nor essential, and it's rarely requested. When this opinion is requested, this is the family doctor or the patient's specialist one's. Both physicians and nurses quoted the whole quality of DMP 7/10.

CONCLUSION. Nurses' commitment in the DMP for withdrawing LST is still insufficient; physicians have to develop interdisciplinary collaborative dialog. Lack of collegiality and communication may contribute to staff conflicts and burnout syndrome.

0631

PARENTAL EXPERIENCE OF END-OF LIFE CARE IN THE PEDIATRIC ICU: A QUALITATIVE STUDY IN THE ITALIAN CONTEXT

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INTRODUCTION. There is considerable variability among European countries regarding the management of end-of-life (EOL) care and EOL decisions in the pediatric critical care setting [1]. In Italy, recommendations on these issues are available [2] but no study has investigated the parents' experience.

OBJECTIVES. To explore parents′ experience of EOL care and decision making in the pediatric intensive care unit (PICU).

METHODS. We carried out a pilot study at a PICU of a university hospital in Milan, Italy. Parents of children who died in the PICU between 2007 and 2010 after a stay of at least 24 h were eligible to participate. Such parents were mailed an informative letter and were subsequently contacted by telephone. In-depth interviews were conducted with accepting parents to explore their experiences concerning end-of-life care and the decision making process. Parents were asked to think back over and describe their child's stay in PICU and the final moments of his/her life. The interviews were audiorecorded and then qualitatively analyzed by two researchers using the phenomenological approach [3].

RESULTS. Of the 15 families meeting the inclusion criteria, 4 could not be located, 3 declined to participate and 8 accepted. We therefore conducted 8 interviews with 12 parents. Three themes emerged that describe the parents' experience: 1. loss of parental role: parents described a loss of parental role and a lack of physical intimacy with their child. 2. delegating and assuming responsibility: parents' willingness to engage in the participation process fluctuated over the course of the stay in PICU. Parents wanted to participate and expressed their preferences but relied on the physicians for the ultimate decision; 3. reclaiming the dying process: the dying process was described by parents as a moment that belonged to them but unfortunately, in some cases, was 'stolen' by ICU staff.

CONCLUSIONS. Our findings suggest that in order to improve EOL care we need to better integrate medical and parental priorities, in a shared process that allows parents to preserve the connection with their child and their parental role [4]. The most critical aspect for parents was not related to the involvement or otherwise in life support decisions, but rather to the possibility of staying connected with the child at the time of death.

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0632

PRELIMINARY EXPERIENCE WITH THE INTRODUCTION OF THE LIMITATION OF LIFE-SUSTAINING THERAPIES IN THE ELECTRONIC MEDICAL RECORD

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INTRODUCTION. The limitation of life-sustaining therapies (LLST) is an increasingly widespread practice. However, sometimes it is not clearly reflected in the medical history, leading the implementation of measures that could have been avoided, including admission to ICU, with the suffering and economic cost that would be created.

OBJECTIVES. To describe our experience with an electronic record that allows consulting at any time, in which patients have the LLST been set and the concrete therapies restricted.

METHODS. Different specialists identify hospital patients not eligible for life-sustaining therapies, and include them in a computerized program, leaving the activation of LLST reflected in the medical record. The computer program consists of a stop icon that appears on patient's record. When activated, an access control appears requesting the physician's code of identification (the nursing staff can only consult).

There are three levels of limitation as not all patients require a limitation of all available therapeutic measures. In level 3, each doctor decides which life-sustaining therapies are applicable. In level 2 only conservative medical treatments may be prescribed and in level 1 all the measures should be directed at providing comfort and pain relief.

RESULTS. We included 500 cases of LLST activation in 267 days (1.9 cases/day); 0.9 % of patients admitted to hospital at that time. The mean age was 78 years. 53 % were men. 38.6 % were activated in internal medicine, 21.8 % in the emergency department, 12.4 % in the ICU, 9 % in oncology, 3.6 % in cardiology, 3 % in pulmonology, 2.8 % in neurology, 2 % in hematology and general surgery, 1.4 % in gastroenterology, 1 % in nephrology, 0.8 % in anesthesiology and urology, 0.5 % in traumatology and 0.2 % in pediatrics. The reasons for activation were: futility (34.8 %) previous functional limitation (28.8 %), poor quality of life (16.2 %), age (12.2 %), life expectancy less than 6 months (5.8 %) and 0.2 %, advanced care directives.

The levels activated were: 13.8 % Level 1, Level 2 and Level 3 47.4 % 38.8 %.

LLST activation was suspended in 2 cases and the level was changed in 36 (7.2 %). The patient was reported in 13.6 % of cases and the family in 92.4 %. 45.4 % died and 21.2 % were moved to a socio-medical center. The days between admission and LLST activation were less than 2 days in 62.2 % of cases and more than 2 days in 80 %. The days elapsed between the LLST activation and death/discharge were: less than 7 days in the 63.8 % of the cases and less than 14 days in the 85.4 %.

CONCLUSIONS. This is a useful tool that facilitates the development of daily activity of both medical and nursing staff. It allows knowing at what point is the patient's progress, measures to adopt and to restrict. It also allows applying a special care plan with which to assist and support both the patient and family members.

0633

COMBINING QUANTITATIVE AND QUALITATIVE METHODOLOGIES: DISCREPANCIES OR SYNERGIES?

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INTRODUCTION. Information provision and good communication are important to the next of kin (NOK) of dying patients′ in a critical care environment (ICU) [1]. As the measurement of improved communication between clinicians and NOK is multifaceted, its analysis is likely improved by a qualitative dimension to the study [2].

AIMS. Evaluate the relative importance of information giving and communication practices to NOK within end-of-life critical care environment.

METHODS. A retrospective study, surveying relatives of patients who died within a critical care service during (2005–2006). A 31 item questionnaire allowed for collection of both qualitative and quantitative data. Quantitative analysis was carried out by the Geary Institute UCD, Dublin. Qualitative data analysis involved documentation of all verbatim respondents comments, 4 independent reviews and a focus group review to organise comments into categories preordained by the subject matter of the quantitative domains. Categories were then subjected to thematic analysis.

RESULTS. Quantitative results: The doctor was the primary communicator relative to the nurse (57 vs. 23 %) and their communications were regarded as appropriate: nurses 90 %, doctors 80 % satisfaction rating. Manner of information provision garnered a rating of 87 % (nurse) and 82 % (doctor). Adequacy of information provision to the NOK achieved a satisfaction rating of 78 %.

Qualitative results: The primary theme which emerged from the thematic analysis was a lack of communication/information for the NOK. This theme is represented by the following small selection of resondent comments: ID (identity).

"But after the first day or two we had to ask for information" ID14
"No member of staff told me anything. Doctors did not discuss it" ID24
"If it was possible to be given a time for doctors to communicate with families" ID38
" Nursing staff were supportive but not informative…." ID44
" Did not see a doctor at any stage!" ID49
"No information for 5 days" ID66
"No doctor came to talk to me during her illness" ID82
"Information from the doctor was irregular and scant" ID104
"The information tended to change from person to person" ID120.
"No nurse would tell us anything" ID131
"There should be more contact with medical staff" ID139

CONCLUSIONS. Quantitative results indicated that respondents were satisfied with communication/information practices in ICU. Qualitative data highlighted deficiencies in information provision to NOK from both doctors and nurses. This discrepancy might suggest that the questionnaire format on its own may not be sufficient to obtain knowledge regarding attitudes and beliefs within a population. Combining quantitative and qualitative methods may add a new dimension to research findings [2].

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0634
PROGNOSIS OF PATIENTS WITH NON RESECTABLE LUNG CANCER ADMITTED IN ICU: A 6-YEAR SINGLE-CENTER SURVEY

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INTRODUCTION. Admission of patients with lung cancer to the ICU has been criticized especially for patient with poor outcome. Thus, clinicians need tools either to admit or not such patients into the ICU.

OBJECTIVES. This study aimed to identify the prognostic factors in ICU and for the mid-term follow up for non resectable lung cancer patients admitted in the ICU for medical reasons.

METHODS. This was a retrospective study ranging from January 2005 to December 2010 including all ICU patients admitted with non resectable lung cancer and excluding those hospitalized for surgical reasons. The studied variables included the characteristics of the tumor, of the ICU stay, the end of life decisions (EOL), and the survival in ICU and at 6 months.

RESULTS. 66 patients were included in this study. The mortality rate was 53 % with a median survival of 2 months (1–4) after the ICU discharge. The multivariate analysis revealed that the factors associated with a higher mortality rate in ICU were an elevated SAPS II score at the admission (HR = 1.04, 95 % CI [1.00–1.08]) and an EOL decision (HR = 4.5, 95 % CI [1.58–12.83]). Factors associated with a higher survival rate in ICU were the realisation of a bronchoscopy during the ICU stay (HR = 0.28, 95 % CI [0.11–0.70]) and an ICU admission between 2008 and 2010 (HR = 0.2, 95 %CI [0.07–0.59]). Factors associated with a higher survival rate at 3 month were a SOFA score under 7 at admission, the absence of ARDS, of invasive ventilation or of EOL decision during the stay.

CONCLUSIONS. The prognostic in ICU does not seem to be correlated to the cancer evolution but rather to the acute pathology: proposing the admission of the lung cancer patients in ICU followed by an early re-evaluation seems to be conceivable.

0635
AGE AND END-OF-LIFE DECISIONS IN PORTUGUESE ICU (RESULTS FROM THE DEFIVUCI STUDY)

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INTRODUCTION. Social evolution and science as made possible a huge prolongation of life duration (life expectancy doubled in a century). However when it is necessary an ICU admission, old and very old people tends to have more diseases and less physiological reserve, challenging ICU admission policies, treatment strategies and end-of-life decisions. So it is important to analyse reality and study characteristics and results from patients admitted to ICU according to their age and its influence on prognosis.

OBJECTIVES. To describe and compare prognosis and end-of-life decisions (ELD) on old and very old patients admitted to Portuguese ICU.

METHODS. Nine Portuguese adult ICU have participated in this part of the end-of-life decisions in intensive care units study (DEFiVUCI). A prospective survey was made collecting data from all patients admitted in three consecutive months in 2009 and other 3 months in 2010. A specific protocol was designed for this propose and the investigators, in each ICU, were senior doctor. For this study ELD were defined as DNR orders, withhold and withdraw life sustaining treatments and diagnosis of brain stem death. For analysis proposes the cohort was divided in eight groups according to age (≤40, 41–64, 65–79 and ≥80 years) and sex.

RESULTS. Protocols from 964 patients with a median age of 63 were completed, 68 % males and mortality was 21 % in 2009 and 24 % in 2010. For analysis proposes the cohort was divided in eight groups according to age ≤40 (129 pts), 41–64 (340 pts), 65–79 (360 pts = 37.3 %), and ≥80 years (135 pts = 14 %) and sex. Severity of illness defined by SAPSII at admission was augmenting gradually through age: 32 for ≤40, 40 for 41–64, 45 for 65–79, and 47 for ≥80 years. Health performance at admission evaluated by ECOG (Zubrod) scale showed a climbing percentage of symptomatic patients with age increments. However the most relevant criteria influencing decision for establishment of ELD was the severity of illness at admission in all age groups. Patients without ELD had SAPS II 42 (either in 2009 and 2010) but those with ELD had 62 and 53 ($p < 0.001$), respectively.

CONCLUSIONS. Majority of patients in our study were old or very old. Males predominate in all groups except in ≥80 years. Age, in this cohort, is not a limiting factor for prognosis, "per se". Functional status at admission is a relevant factor in prognosis but not determinant of the prognosis. Severity of illness at admission has the higher correlation with prognosis. This data reinforce the importance of an individualized evaluation of patient condition to sustain admission decisions, treatment decision and end-of life decisions when justified.

0636
DIFFERENT POINT OF VIEW IN THERAPY RESTRICTION. COMPARISON OF THE OPINIONS OF HUNGARIAN INTENSIVE CARE NURSES AND PHYSICIANS

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INTRODUCTION. Worldwide only a fraction of patients receives cutting edge medical therapy at intensive care units; hence therapy restriction has become an outstanding ethical, legal and financial issue.

OBJECTIVES. We have examined with a multicenter retrospective study the opinions of the medical stuff about end-of-life care at Hungarian intensive care units.

METHODS. We have performed a questionnaire evaluation among physicians and nurses of intensive care units about influencing factors of therapy restriction, the method of decision making process, and the frequency of different end-of-life decisions. The questionnaire containing 21 questions, it were delivered electronically to Hungarian ICUs, and then we have analysed the responses anonymously. The retrieved 302 answers (191 physicians, 102 nurses) were analysed using non-parametric student test.

RESULTS. The nurses found both personal (2.72/5 vs. 1.98/5) and material (2.81/5 vs. 2.12/5) resources more restrictive factor during patient admission than physicians ($p = 0.025$, $p = 0.0024$). The refusing of admission to ICU by the patient is significantly stronger restrictive factor according to the opinion of the physicians (2.33/5 vs. 3.06/5 $p = 0.015$). The lack of personal resources is more pronounced factor also in therapy withdrawal by the opinion of nurses (1.90/5 vs. 1.39/5 $p = 0.049$), while the life expectancies were evaluated more important surviving factor by the physicians in case of therapy restriction (3.00/5 vs. 3.82/5 $p = 0.007$). According to the answers of nurses, their opinion is hardly taking into consideration during decision making process (1.81/5), while the physicians felt it significantly stronger influencing factor (2.36/5 $p = 0.055$).

CONCLUSIONS. We were proved with the results of our study that the opinions of ICU nurses and physicians are different in the field of therapy restriction. Under the end-of-life decision making process do not develop a consensus among the members of the staff, the opinions of the nurses is hardly taking into consideration. The ICU physicians found the lack of the personal resources significantly weaker limiting factor during treatment limitation than the ICU nurses.

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0637
TREATMENT OF TERMINAL PATIENTS IN AN INTENSIVE CARE UNIT (ICU/HU)

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INTRODUCTION. The majority of deaths in Brazil happen in hospitals and more specifically in ICU. In this country there are ethical but not formal and legal definitions about palliative care and limit of therapeutic effort (LTE). To optimize the treatment of those who are dying it is important to know about their dying process and so as to modify the treatment all over that time.

OBJECTIVES. To analyze the deaths occurred in the ICU/HU/UFSC. To compare the profile of patients and treatment instituted with respect to time (years 2004–2011).

METHODS. Retrospective cohort study, approved by Ethical Committee (N = 375/05). Death of patients admitted to the ICU/HU/UFSC from July 2004 to July 2011, were analyzed. Demographic characteristics, clinical features and the treatment performed for the patients who died were evaluated. It was considered if LTE preceded the death. Data were analyzed using *t* Student and c^2 tests (*p* value <0.05).

RESULTS. The HU/UFSC is a hospital with 150 beds for adults (8 in the ICU). During the study 780 patients died in the ICU. During the period 2004–2007 died 329 (G1), and 2008-2011 died 451 (G2). Cardiopulmonary resuscitation (CPR) was realized in 26 % of the no LET patients in G1 and 32 % in no LET patients in G2. CPR was not realized in LET patients. When compared with G1, G2 presented an increase in age, severity of illness and the time in the ICU. The score APACHE II was similar in both groups (LET and no LET). The LET were more frequent in older patients and in those who stay longer in ICU and in the hospital. LET was present in 28 % of the patients at G1 and 54 % at G2 ($p < 0.001$). In G1, the LET more common were vasoactive drugs (18 %) and in G2 were vasoactive drugs (14 %), all futile medications (16 %) and optimized treatment (16 %) ($p < 0.001$).

CONCLUSIONS. There were modifications of the profile of critically ill patients and LET′s conduct with respect to time. Recently, more treatments were limited and LET were more frequent in older patients and whose longer hospital stays.

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0638
END OF LIFE ISSUES IN EUROPEAN ICU′S

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INTRODUCTION. Treating the dying patient is one of the hardest challenges of modern medicine. Recently End-of-Life (EOL)treatments attracted a lot of consideration among those physicians working in the Intensive Care Units (ICU).

MATERIALS AND METHODS. We analyzed the EOL situation across seven European countries (Holland, Belgium, Spain, Germany, Austria, France and Italy).

RESULTS. Literature shows that the only two countries to have a law on euthanasia are Holland (the first to introduce it) and Belgium, whereas the others appear to condemn the practice as well as any other form of assisted suicide. On the other hand, none of the European countries examined has a precise legislation on the EOL matter but all agree on the ethical obligation to ease the pain and suffering of the dying patient with adequate palliative treatments. Holland [1] recognizes the legal right to refuse any medical treatment and is the only nation that applies the interruption of artificial nutrition(AN).In Belgium [2] their bioethical principles sustain the patient's self-determination and don't encourage futile therapies. France [3] is awaiting a law to strengthen the obligation to grant palliative cures. In Spain [4] treatment limitation is common and widely accepted. Germany [5] is still awaiting legislation and accepts the limitations of invasive treatments and life-saving procedures. Austria [6] has several recommendations based on the principles that critical care medicine has the right to sustain life but not to delay death. Italy [7, 8] has a very confused situation. The deliberate administration of lethal doses of drugs is really low if compared to the rest of Europe and the EN and hydration issue is still an open debate.

DISCUSSION AND CONCLUSION. A clearly-defined common European legislation should be written to protect the patient during the most delicate, personal and painful

moment of his life while safe-guarding physicians to decide on EOL procedures according to their conscience.
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0639
ETHICS OF HOSPITAL RESUSCITATION—OPINIONS OF DOCTORS

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INTRODUCTION. Resuscitation is an element of hospital care and in the particular cases a significant medical and ethical problem. The essence of the problem is the decision about starting or stopping resuscitation, especially in patients whose current hospital treatment completely have no effect, and in whom cardiac arrest might be a consequence of multi-organ dysfunction. In a situation where therapeutic options have been exhausted and the patient′s condition is deteriorating and do not indicate any improvement, starting CPR in cardiac arrest might not be medically and ethically justified.
OBJECTIVES. To know the doctors' opinion regarding the problem of hospital resuscitation in the ethical and medical context. All doctors working in a large teaching hospital [over 500 beds] representing various medical specialties [internal diseases, cardiology, surgery, anesthesiology and intensive care].
METHODS. Physicians were asked to anonymously fill in the questionnaire prepared by one of ICU specialists. The survey included comprehensive descriptions of five patients, diagnosed and treated in hospital, whose clinical condition was deteriorating due to the severity of basic illnesses and lack of response to applied multifactorial therapy. For each clinical case two following questions were asked with an option to select one of three answers.
Question 1: Will you start CPR in cardiac arrest in this particular patient to restore basic life functions and continue hospital treatment?
Re.: 'yes', 'no' or 'I don't know'.
Question 2: Do you think that a decision to initiate CPR in cardiac arrest in such a patient should be team decision?
Re.: ′Yes′, ′no′ or ′this does not matter′.
RESULTS. The opinions of 50 physicians, results are summarized below. 30 % of respondents were anesthesiologists and their opinions were in line - 'not' for resuscitation in all cases and team decision concerning the initiation of resuscitation. For the remaining respondents opinions were almost clear: 90 % wouldn't start CPR, 10 % had no opinion, 100 % would like to have team decision.
The majority of respondents wouldn't start CPR in situations when therapeutic options have been exhausted and the patient has little chance of improvement, like the patients described.
CONCLUSIONS. The reality is different from the above survey results—in 5 cases described, there was a decision to start CPR. After ROSC they were transferred to the intensive care unit, where they lived for an average of 11 h.
We believe that the significant divergence of views and realities indicate the need of discussion about the existing situation. Its objective it to help to achieve.
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0640
RESULTS OF ORGAN DONATION PROGRAMME IN OUR HOSPITAL FROM 2004 TO 2011

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INTRODUCTION. Organ donation programme in Croatia implements the so-called Spanish model, which sets up a network of transplantation coordinators in each donor hospital who are in charge of the whole donation process (detection of potential organ donors, diagnosis of brain death, donor management, interview with the family and organization of the retrieval process). Our center is a hospital which performs organ donation with the most success in Croatia.
OBJECTIVES. Objective of the study was to analyze the results of introducing transplantation coordinator in our hospital from 2004 to 2011.
METHODS. A retrospective analysis of 143 brain-dead patients admitted to our centre from 2004 to 2011 was performed.
RESULTS. Number of organ donors from 2004 to 2011 in our centre was 123 and the number of brain deaths was 143, which means that 86 % of brain-dead patients were utilized organ donors. Average number of organ donors in our centre in one year is 15, 37. Number of organ donors from years 2004 to 2011 was 5, 6, 8, 11, 18, 18, 28 and 29, respectively. Average age of organ donors is 48 years (in years 2004 to 2011: 51, 50, 39, 48, 44, 48, 52, 52, respectively). Average percentage of organ donors per number of all deaths in ICU is 11.9 % (in years 2004 to 2011: 5.9, 5.6, 5.8, 10.4, 12.1, 11, 22, 22.5, respectively). Average percentage of organ donors per number of all deaths in hospital is 1.4 % (in years 2004 to 2011: 0.4, 0.5, 0.5, 1.5, 1.9, 1.5, 2.5 and 2.6, respectively). Average number of organs per organ donor is 2.45 (in years 2004 to 2011: 1.6, 2.4, 2.6, 3.0, 2.7, 2.1, 2.6 and 2.6, respectively). Brain death in our patients was caused by bleeding (in 41 % of cases), trauma (in 38 % of cases), ischemia (in 12 %), tumour (6 %) and CNS infection (3 %).
CONCLUSIONS. Appointment of hospital transplantation coordinator in our hospital lead to increasing the number of established brain deaths, as well as utilized organ donors and number of organs retrieved from each organ donor. In our hospital there is a trend of increasing those numbers each year from year 2004 when the first transplantation coordinator was appointed. Hospital transplantation coordinator is a intensivist who is a leading physician having a crucial role in every part of the donation process, from identification of potential organ donors to organ donor management and organization of the retrieval. Organizing organ donation process by a transplantation coordinator makes this process more efficient and successfull.
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0641
VERY ELDERLY PATIENTS IN INTENSIVE CARE UNIT. ANALYSIS AND OUTCOME OF A GROWING POPULATION

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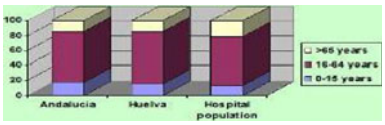
INTRODUCTION. The average age of the population is increasing. An increasing number of patients who reach old age with better quality of life and requiring treatment that was unthinkable a few years ago were made to people of that age. In our area (hospital population) the population is aging, as can be seen in Graph1.
Graph1. Age of population



graph1

OBJECTIVES. The aim is to analyze the characteristics of the population over 80 years in our unit and its differences with the population under that age.
METHODS. Descriptive and retrospective observational study of patients admitted to an intensive care unit (ICU) of 6 beds in a 125-bed rural hospital, fromJanuary 2007 to December 2011. We analyzed the characteristics of patients over 79 years (Elderly) and compared with those of patients younger than 80 years (Young). Descriptive stastical analysis using SPSS.
RESULTS. Were entered into this period 1,677 patients, of which we exclude that were admitted less than 24 h, thereby leaving a total of 1,233 patients. Of these 1,233 patients, 12.4 % belong to the Elderly. Then the characteristics of both groups. (Table 1).

	Elderly	Young
Gender	57.5 % male	69.7 % male
Admission from Emergency room	47.1 %	60.8 %
Postsurgery admission	31.4 %	20.4 %

Significant differences between groups regarding gender, significantly higher number of males from the group Young. The emergency source is also significantly higher in the Young. The group should be significantly Elderly operating room. Both groups are treated equally intensive. As for the limitation of treatment is higher in the Elderly. As a community hospital there is a group of patients who are transferred to another hospital, usually for some special treatment. For the analysis of mortality has been found to survive transferred patients*. Mortality in the ICU has a non-significant trend to be higher in the Elderly, whereas the hospital mortality is significantly higher. Gravity, for APACHE II, is significantly higher in Elderl. The NEMS at 24 h is similar in both groups. There is no difference in the average stay in ICU, but in the hospital stay does.
Table 2.

	Elderly	Young
ICU long of stay (days)	2.72	3.97
Hospital long of stay(days)	5.09	10.07
APACHE II	15.56 ± 7.4	12.82 ± 8.5
NEMS 24 H	27.03 ± 8	26.35 ± 7.4
Intensive treatment	80.4 %	79.6 %
Limitation of therapeutic effort	13.1 %	4.2 %
ICU Mortality	14.4 %*	9.3 %*
Hospital Mortality	24.3 %*	12.5 %*

CONCLUSIONS. In our ICU we admitted elderly into with the intention of intensive treatment without difference with young. Elderly has more severity of illness, but takes the same effort by nurses within 24 h. Elderly has a lower ICU stay, but instead a longer hospital stay. It has a higher ICU mortality, although not significantly. In the group of elders apply more limiting therapeutic efforts. This could be a cause of increasing hospital mortality.
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Organisation of intensive care: 0642–0655

0642
PROJECT ICU WITHOUT WALLS: EFFECT ON MORBIDITY AND MORTALITY OF THE PATIENTS OF INTENSIVE CARE UNIT (ICU)

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INTRODUCTION. The delay in the treatment of patients at the hospital and its admission does not programmed in the ICU, the delay in the admission and readmission at ICU are associated with increased risk of morbidity and mortality, lenght of stay and increase of health care's costs.

OBJECTIVE. To assess the effect of the identification and early intervention of patients at risk outside the ICU and the follow-up of the patients discharged from ICU with high risk of bad evolution about the morbidity and mortality of patients of the ICU.
METHODS. Study "before-after". Control period: from June 2010 to January 2011. Intervention period: June 2011 to January 2012, during which made early intervention of patients at risk with analytics alterations detected by a PC software, follow-up of patients seen on previous guard duty's day, patients commented by other specialist from Internal Medicine, General Surgery and Emergency area and patients followed-up after discharged from ICU. We compared SAPS 3, ICU and hospital lenght of stay, and ICU and hospital mortality of the two periods. The variables are presented as mean and standard deviation; the qualitative variables with number of events and percentage. All the studied variables estimated that they could have relation with mortality were used in multivariate analysis.
RESULTS. There were 580 eligible patients through PC software 167 were intervened; 14 patients intervened at the request of the partners of other specialties, 4 were from follow-up of patients seen on previous guard duty's day and 35 were followed-up after discharge from the ICU. Table 1 shows results of patients admitted in ICU.

	Group 1	Group 2	p
ICU admission: n	292	296	
Age mean (range)	60 (14–89)	63 (15–94)	0.052
Sex female: n (%)	113 (39)	105 (35)	0.41
SAPS 3: mean (ds)	51 (14)	50 (14)	0.36
ICU lenght of stay: mean (ds)	4.2 (6.6)	3.9 (5.3)	0.9
Hospital lenght of stay: mean (ds)	6.1 (6.6)	5.8 (5.8)	0.85
ICU mortality: n (%)	26 (9)	13 (4)	0.03
Hospital mortality: n (%)	29 (10)	23 (7)	0.29

In the multivariate analysis, being the dependent variable ICU mortality, only two factors had significant relationship with such a variable were admission in the intervention period OR 0.42 (95; 0.18 to 0.98) (p 0, 04) and SAPS 3 OR 1.11 (95; 1.07–1.14) (p 0, 05).
CONCLUSIONS. The identification and early intervention of patients at risk outside the ICU and the follow-up of the patients discharged from ICU with high risk of bad evolution are associated with a decrease in ICU mortality because we detect them in a less serious level.

0643
INCREASED MORTALITY ASSOCIATED WITH BEFORE NOON ADMISSION TO INTENSIVE CARE: A RETROSPECTIVE ANALYSIS

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INTRODUCTION. The time of admission (e.g. out-of-hours or week-ends) in intensive care units (ICU) has been related with increased mortality [1]. Interestingly, patients admitted to intensive care are mostly admitted after noon as indirectly showed in two recent retrospective studies [1, 2]. The reason of this admission pattern is not clear, but may be related to organizational or even extraneous factors, such as fatigue due to the decision making [3].
OBJECTIVES. To study variation before and after noon in admissions to ICU in a District General Hospital (DGH) and its association with intensive care outcome.
METHODS. A retrospective audit analysis using an intensive care database (Acubase™). We studied 2601 admissions to a London DGH from September 2002 to March 2012. Main measures: Admission before (am) and after (pm) noon, age, gender, Apache II score, ICU and hospital observed mortality. Data were analyzed using Systat version 5.2 for Macintosh. Univariate analysis was performed using the Student t test and the Pearson Chi-square according to the type of data. $P < 0.05$ was considered significant.
RESULTS. Significantly more patients were admitted before noon compared with after noon, following a ciclic pattern (Fig. 1). Patients admitted before noon were significantly younger. No differences were found between both groups in regards to gender and Apache II score. Patients admitted before noon had a significantly higher observed ICU mortality and in-hospital mortality (Table 1).
CONCLUSIONS. Our study shows that the admission before noon is associated with a higher observed mortality. This finding is important and will need to be investigated to rule out reversible causes that might improve the outcome of critically ill patients.
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	AM	PM	P value
N(%)	889 (34)	1712 (66)	<0.001
Age (X ± SD)	54.4 ± 19.8	59.6 ± 18.3	<0.001
Gender (F/M)	386/501	800/907	0.104
APACHE II	17 ± 9.8	16.5 ± 8.7	0.19
ICU mortality (%)	29.3	24.1	0.012
Hospital mortality (%)	42.6	38.3	0.019

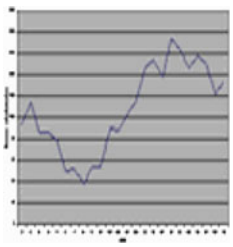

Fig. 1 Admission Cycle

0644
EFFICACY OF AN OUTREACH TEAM IN COMPARING OUR TWO HOSPITAL SITES REGARDING TIME FROM DECISION TO ADMISSION TO INTENSIVE CARE UNIT

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INTRODUCTION. It is well known that delayed ICU admission impairs patient outcome, and presence of an ICU outreach team helps in early detection of patient deterioration.
OBJECTIVES. We analyzed the characteristics of unplanned intensive care admissions comparing our two hospital sites: without (Hospital A) and with (Hospital B) an outreach team.
METHODS. Random patient files (n = 100) were selected from our unplanned admissions into intensive care units between May–July 2009 at each hospital site. We collected data on length of time from decision of ICU admission to actual ICU admission, together with admission SAPS II severity score. We also recorded patient demographics along with ICU and hospital mortality. Data is expressed as the median (minimum–maximum) value.
RESULTS. We analyzed 99 patient's data: 50 from Hospital A, and 49 from Hospital B. The patient characteristics are in Table 1.

	Hospital A	Hospital B	p value
Age	65 (16–86)	71 (25–91)	0.14
Length of ICU stay	4 (1–36)	5 (1–65)	0.14
Length of hospital stay	13.5 (1–152)	19 (2–187)	0.43
SAPS II score	44 (19–77)	47 (19–73)	0.23
ICU mortality	26.00 %	18.37 %	0.18
Hospital mortality	26.00 %	20.41 %	0.34

The length of time taken from decision to admission to ICU was significantly different between the two sites. Hospital A, the median time was 3 h 30 min (3 min–24 h), hospital B, the median time was 1 h 15 min (15 min–4 h 10 min), $p < 0.001$. In analysing the six vital signs recorded prior to ICU admission, we found lower compliance in Hospital A for respiratory rate recording (34/48, 71 % vs. 40/44, 91 %) and level of consciousness (37/48, 77 % vs. 38/44, 86 %) compared to Hospital B.
CONCLUSIONS. Intensive care outreach team has a significant impact on time from decision to admission to ICU; there is also better compliance with physiological observations; however we could not prove any outcome benefit in our sample.
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0645
ESTIMATED TOTAL AND ADVANCED RESPIRATORY SUPPORT BED DAYS FOR PATIENTS WITH TRACHEOSTOMIES IN CRITICAL CARE UNITS IN ENGLAND

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INTRODUCTION. Tracheostomies are often performed in Intensive Care Units (ICUs) in patients requiring prolonged advanced respiratory support. Serious airway incidents can occur with tracheostomies but data regarding their frequency and nature on a national scale, or baseline denominator data is lacking.
OBJECTIVES. Extrapolate from a high quality database of critical care admissions in the North West of England to estimate the number of tracheostomies managed in England′s ICUs, including total critical care and advanced respiratory support bed days.
METHODS. The Greater Manchester critical care network 'MIDAS' database was interrogated for all admissions between 1/1/10 and 25/1/12 using Microsoft Excel. Hospital Episode Statistics (HES) is a data warehouse for NHS hospitals in England. The Intensive Care National Audit & Research Centre (ICNARC) collects data from selected critical care units. Neither HES nor ICNARC collect airway information but can be used to extrapolate MIDAS data.
RESULTS. 8 NHS Trusts (17 ICUs in 11 hospitals, 154 beds) submit to MIDAS. 84,623 bed days for 16,589 admissions were analysed. There was a mean of 64 tracheostomies per ICU per year (60 percutaneous, 4 surgical). The tracheostomy remained for a mean of 12.0 days (range 1.0–24.9 days), with advanced respiratory support delivered via tracheostomy for a mean of 9.1 days (range 3.1–23.0 days). Crudely extrapolating from HES, we estimate 16,238 tracheostomies were managed in England during 2009/10 (15,382 percutaneous) totalling 194,856 bed days. ICNARC data comprises of admissions with complete data, but also incomplete (probable admission) datasets. We can therefore similarly estimate from ICNARC that each ICU in England can expect to manage between 48 and 51 tracheostomies per year (46–48 percutaneous). HES recorded 315,173 ICU advanced respiratory support bed days for the year 2009/10. Extrapolating our data, we estimate 147,766 of these days were spent receiving advanced respiratory support via a tracheostomy (46.9 %).
CONCLUSIONS. Approximately 15,000 percutaneous tracheostomies are managed (and probably performed) in England's critical care units. By comparison, HES recorded 5,704 surgical tracheostomies performed in 2009/10. The different methods used to collect national ICU bed information in England makes direct extrapolation potentially flawed. However, the makeup of the North West's ICUs is broadly representative of the national picture and the MIDAS database is of high quality. Recent high profile publications have highlighted the serious airway incidents that can occur when managing patients with tracheostomies, especially those receiving advanced respiratory support. A national tracheostomy database would provide accurate figures along with denominator data for incidents occurring in patients with tracheostomies.
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0646
IMPACT OF ICU OCCUPANCY ON SURVIVAL OF SEPSIS PATIENTS ADMITTED VIA THE EMERGENCY DEPARTMENT

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INTRODUCTION. Sepsis is an important issue in the hospital, especially in the Emergency Department (ED) and Intensive Care Unit (ICU) due to high prevalence, mortality, and resources consumed. How sepsis patients enter the hospital through the emergency department and characteristics that affect admission to hospital may help improve our understanding of outcomes.

OBJECTIVES. To examine if ICU occupancy is associated with the survival of Sepsis and Severe Sepsis patients.

METHODS. A Multi-centre observational study was conducted using administrative databases to identify adult patients (≥18 years) with sepsis and severe sepsis admitted to all Alberta Health Services Calgary zone adult multisystem intensive care units (Foothills Medical Centre, Peter Lougheed Hospital and Rockyview General Hospital) through the Emergency Department (ED) between January 1, 2006 and September 30, 2009. We examined the association between hospital outcome and ICU occupancy calculated at the time of Physician assessment in the ED broken down into the following categories: less than 80 %, between 80 and 84 %, between 85 and 89, and 90 % and above. Sepsis and Severe Sepsis were defined using ICD10 codes according to the CIHI—In Focus: A National Look at Sepsis [1] report.

RESULTS. 1770 sepsis patients were admitted through the Emergency Department (ED), 1036 (58.5 %) were coded as Sepsis and 734 (41.5 %) were coded as Severe Sepsis. A gradual decrease was observed for hospital survival as ICU occupancy increased with 80.8, 78.9, 78.8 and 72.6 % of sepsis patients being discharged alive as associated with ICU occupancy of less than 80, 80–84, 85–89 and 90 % and above. In patients with sepsis, ICU occupancy was associated with increased in-hospital mortality, even after adjusting for age, sex, triage level, Charlson index and time of first ED physician assessment. No association was found between ICU occupancy and Severe Sepsis.

CONCLUSIONS. In patients with sepsis admitted via the ED, increased ICU occupancy at the time of the patient's first ED physician assessment was associated with higher in-hospital mortality. Future research is required to look at whether this is a process (i.e. misidentification of patient) or structural (i.e. lack of beds) issue.

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0647
RELATIONSHIP BETWEEN DISTANCE TRAVELLED TO AN INTENSIVE CARE UNIT AND HOSPITAL OUTCOMES IN PATIENTS WITH SEPSIS AND SEVERE SEPSIS

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INTRODUCTION. Delays in admission to the Intensive Care Unit (ICU) have a significant impact on survival rates in critically ill patients. In patients with sepsis or severe sepsis, the time period leading up to diagnosis and treatment is critical in improving outcomes. Access to critical care services can significantly affect timing of treatment and outcomes, specifically the geographical location of healthcare facilities relative to a patient's residence.

OBJECTIVE. To investigate how distance travelled to a health care facility with a critical care unit affects outcomes in patients diagnosed with sepsis or severe sepsis.

METHODS. This was a multi-centre retrospective cohort study using administrative databases of adult patients (aged 18 years or greater) diagnosed with sepsis or severe sepsis admitted to an ICU in the Alberta Health Services (AHS) Calgary zone tertiary care through the ED or hospital inpatient care units between April 1, 2006 and March 31, 2010. The association between distance and hospital outcome was broken down in the following categories: 0–10, 11–20, 21–30, 31–40, 41–50m, and 50+ km. Secondary analysis of the influence of distance on outcomes was performed; ED length of stay (≥7 h or <7 h), ICU length of stay (≥3 days, <3 days), and overall hospital length of stay (≥7 days or <7 days).

RESULTS. A total of 1057 patients were admitted to the ICU during the study period, 402 (37.96 %) coded as sepsis and 655 (62.04) coded as severe sepsis. ED length of stay differed significantly between sepsis and severe sepsis patients (8.21 [4.63–12.67], 6.45 [3.61–11.1] respectively, p value 0.001). A higher proportion of severe sepsis patients were admitted through the ED needing resuscitation (triage score = 1, p value = 0.001) or classified as urgent (triage score = 3, p value = 0.004). Shortest route distance to hospital from residence was 0.17 km, longest was 318.35 km (median of 9.81 km). There was no significant difference in hospital mortality in patients diagnosed with sepsis or severe sepsis if residing up to 50 km away from the admitting site but in sepsis patients there was a significant difference in survival if residing >50 km from the hospital site (80 %, p value = 0.005) while severe sepsis patients had no significant difference. No differences in ICU length of stay or total hospital length of stay were found for patients admitted closer to the hospital or further from the hospital. A significantly larger proportion of sepsis patients admitted to the ICU who spent ≥7 h in the ED resided 11–20 km away from the admitting site (69 %, p value = 0.002).

CONCLUSIONS. This study demonstrates the impact of distance from hospital on overall survival of patients diagnosed with sepsis or severe sepsis, where a patient residing a distance of > 50 km away greatly affects survival.

0648
INTENSIVE CARE UNIT IN THE EMERGENCY DEPARTMENT: A POSITIVE EXPERIENCE FROM A TAIWAN TERTIARY MEDICAL CENTER

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INTRODUCTION. Delayed access to the intensive care unit (ICU) bed poses a potential threat of life to the critically ill emergency department (ED) patients. This situation may be tackled by setting up an ICU in the ED designed to provide multidisciplinary critical care, so as to allow higher flexibility in bed utilization and an enhanced collaboration with the front line ED crew. A 14-bed ICU has been set up in a tertiary medical center ED in northern Taiwan since 1997. The EDICU admits adult ED patients requiring medical (MICU, 56 beds), coronary (CCU, 14 beds), alimentary system (ACU, 10 beds) and neurology ICU (NMICU, 14 beds) care but no vacant beds in the respective unit are available. All specialty ICUs also admit critically ill ward patients.

OBJECTIVES. To study the efficacy of EDICU to provide adequate intensive care and thus to improve patient outcomes.

METHODS. Medical records of the ED patients admitted to MICU, CCU, ACU, NMICU and EDICU from January 2007 to July 2011 were retrospectively reviewed to determine the ED waiting time for an ICU bed, the lengths of stay (LOS) in EDICU, subsequent specialty ICUs and wards, and the inhospital survival status.

RESULTS. A total of 13,644 patients were assessed. EDICU cared 790 (27.1 %) patients in 2007, but the percentage has decreased to 22.3 % in 2011. About one-fourth of the EDICU patients were subsequently transferred to the specialty ICU; the other 50 % were transferred to the ward. In total, EDICU cared 26.0 % of patients waiting for MICU, 25.6 % for CCU, 29.2 % for ACU, and 31.8 % for NMICU. Compared with those directly admitted to specialty ICUs, patients first admitted to EDICU had a shorter ED waiting time ($p < 0.01$), except for NMICU patients. However, ED waiting time did not predict inhospital mortality. Specialty ICU LOS but not EDICU LOS predicts inhospital mortality, again except for NMICU. Compared with those directly admitted to CCU and ACU, patients first admitted to EDICU with a subsequent transfer (7.5 % for CCU and 8.8 % for ACU admissions) had a higher risk of death (OR [95 % CI]: 1.65 [1.18–2.31] and 1.62 [1.05–2.50], respectively; $p < 0.01$). Patients first admitted to EDICU had longer ICU LOS, yet these patients had a higher chance to be transferred to wards. EDICU patients had a lower mortality rate compared with MICU and ACU patients (both $p < 0.01$), but a higher mortality rate compared with CCU patients ($p < 0.05$).

CONCLUSIONS. EDICU has provided intensive care to a disproportionally high volume of ED critical patients. EDICU has also achieved a shorter ED waiting time, a higher chance of surviving the ICU, and for MICU and ACU patients, an improved survival.

0649
OFF-HOURS ICU ADMISSION AND ITS IMPACT ON MORTALITY: A SINGLE CENTRE EXPERIENCE

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INTRODUCTION. It has been postulated that off-hours admission to an intensive care unit (ICU) portends a higher mortality. However, the evidence in the available literature remains unclear.

OBJECTIVE. We aimed to evaluate if the above association existed in our local practice.

METHODS. We performed a retrospective cohort study of all admissions for severe sepsis to the medical ICU at our university hospital between 2004 and 2010. Office hours were defined as 8am to 5 pm on weekdays, excluding weekends and public holidays. During office hours, the ICU was managed by a full team of consultant intensivists, registrars, residents, respiratory therapists, and pharmacists. During off hours, in-house medical cover was provided solely by an on-call registrar and resident. We compared patient characteristics, treatment provided and outcomes between admissions during office and off-hours.

RESULTS. A total number of 437 admissions occurred during office hours and 587 during off-hours. There were no differences in age (mean age 60 ± 17 years versus 61 ± 17 years), gender (64 % male versus 59 % male), and Acute Physiology and Chronic Health Evaluation (APACHE) II score (mean 26 ± 9 versus 27 ± 8) between the two groups (p all >0.05). The use of appropriate empirical antibiotics (83 % versus 81 %), mechanical ventilation (79 vs. 78 %), and vasoactive agents (69 vs 67 %) in the first 24 h of admission were similar in both groups. There was no difference in hospital length of stay (median 14 days versus 13 days; $p = 0.61$) and hospital mortality (38 vs. 42 %; $p = 0.22$). In a multivariable logistic regression model which included patient demographics, comorbidities, source of infection, presence of bacteraemia, APACHE II score, Sequential Organ Failure Assessment (SOFA) score and treatment instituted, office versus off-hours admission was not an independent predictor of hospital mortality.

CONCLUSIONS. Off-hours admissions were not associated with higher mortality in our practice. Given the heterogeneity surrounding the organization and management of different ICUs, findings from one centre cannot be generalised to others. Evaluation of local data by individual ICUs should be undertaken to ensure no discrepancy exists in the outcome of patients regardless of admission hours.

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0650
OUT OF HOURS ADMISSION TO INTENSIVE CARE: DOES IT MAKE A DIFFERENCE?

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INTRODUCTION. Recent evidence suggests that patients admitted to hospitals in the UK over the weekend have an increased risk of death when compared to those admitted during the week [1]. Likewise, for intensive care admissions, studies suggest that mortality seems to be worse for patients admitted both out of hours [2] and at weekends [3], although data available from the UK is limited.

OBJECTIVES. To assess whether outcomes for patients admitted to intensive care are different depending on time and day of admission. To determine if mortality is worse for patients that are brought to intensive care after hours and at the weekend in a UK setting.

METHODS. This was a retrospective cohort study of all patients that were admitted to a UK general and burns intensive care unit (ICU) from December 2010 to December 2011. Burns patients were excluded from the final analysis. Outcomes were compared for 3 groups of patients; those admitted during the daytime, out of hours and at weekends. Outcome measures included ICU length of stay, ventilator days, ICU and in-hospital mortality.

RESULTS. There were 694 admissions during the study period, 24 burns patients were excluded. 51 % of patients were male and the mean age was 59. 27 % of patients were admitted out of hours (Monday to Friday 20:00 to 07:59) and 30 % were admitted at the weekend (Friday 20:00 to Monday 07:59). There was no significant difference between the 3 groups with respect to age, sex, mean APACHEII score and proportion of ventilated patients.Median length of stay for patients admitted during daytime hours was 3 days,

compared to 2 days and 3 days for out of hours and weekend admissions respectively. Patients admitted during the day were ventilated for a median of 3 days compared with 2 days for out of hours and 3 days for weekend admissions. ICU mortality for daytime admissions was 16 % compared to 11 % for weekend ($p = 0.08$) and 16.7 % out of hours. In-hospital mortality rates were 22 % for daytime admissions, 21.5 % for weekend and 22.8 % for those admitted out of hours. Subgroup analysis did not reveal a significant difference in outcomes when comparing medical and surgical patients.
CONCLUSIONS. Admission to the ICU out of hours and at weekends did not lead to increased length of stay or number of days ventilated. ICU and in-hospital mortality rates were not statistically different for patients admitted out of hours or at weekends compared to the daytime.
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0651
FIRST DATA OF ANALYSIS OF HANDOVER FROM INTENSIVE CARE UNIT TO MEDICAL HIGH DEPENDENCY UNIT

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INTRODUCTION. The concept of continuity of care after Intensive Care Unit (ICU) stay must play a pivotal role in the recovery after critical illness. The implementation with a formal handover system can contribute to the effectiveness of communication and, consequently, patient's safety.
METHODS. This pilot study was performed in the ICU and High dependency Unit of the Emergency Department of a tertiary referral center (Careggi Teaching Hospital, Florence, IT) in collaboration with the Center for Clinical Risk Management and Patient Safety of Tuscany Region (Florence, IT). 1. To determine a quantification system for handover quality assessment was used an handover probe composed of 5 content item. 2. Diagnosis and present state of the patient. 3. Recent changes in the conditions or treatment. 4. Anticipation in changes of conditions or treatment. 5. What to monitor along shifts (physicians and nurses).6 Warning signs. All content items were evaluated through 4 items:1. Availability: traceability of data in the documentation. 2. Relevance: importance assigned to information. 3. Redundancy: the strength of the mode of communication. 4. Accordance: level of agreement between the two units agree about object of the handover. Each item was scored as follow: Relevance: 0.5 (relevant for ICU or HDU) or 1 (relevant for both ICU and HDU). 2. Accordance: 0 (data differs in quality) or 1 (data are comparable). 3. Redundancy: by telephone (0.1), by paper support (0.2), or face to face (1). 4. Availability: scoring from 0.1 to 1. Total quality resulted from the sum of each item score. The quantitative outcomes were then integrated with the elements elicited through focus group sessions.
RESULTS. Table 1 summarized the results obtained studying the transfer of 11 patients form ICU to HDU during July and August 2011.

TABLE 1
Total quality of information transfer

Diagnosis and present state of the patient 37.1/44 (84.3 %)
Recent changes in the conditions or treatment 24.1/44 (54.8 %)
Anticipation in changes of conditions or treatment 14.7/44 (33.4 %)
What to monitor along shifts 24.6/44 (55.9 %)
Warning signs 18.6/44 (42.3 %)

CONCLUSIONS. Our data underlined that in handover the more critical features were represented by the correct communication concerning the single patients warning signs and the redundancy of information, which were constituted mostly by paper support instead of a face to face handover.
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0652
OBSERVATIONAL PROSPECTIVE STUDY OF WHICH PATIENTS WOULD BENEFIT FROM A FOLLOW UP PROGRAM ON THE WARD AFTER BEING DISCHARGED FROM ICU

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INTRODUCTION. The ICU is only one geographical location but the patient's outcome depends on the management before and after discharge to the ward. Between 6 % and 25 % of patients discharged alive from the intensive care unit die before being discharged from hospital [1].Illness is continuum and the intensivist must assist in the management of patients on the general ward and monitor the progress of patients recently discharged from the ICU [2]. But is it necessary for all patients? If we cannot increase resources it will be necessary to identify which patients will benefit from follow up on the ward in a way that will not result in an excessive workload. For this reason it will be necessary to study which kinds of patients die more in the ward unexpectedly.
OBJECTIVES. To identify predictable factors of mortality after discharge from our intensive care unit (Hospital Universitario Virgen de la Victoria, Málaga).
METHODS. Observational prospective study of 1460 consecutives patients admitted into a multidisciplinary 18-bed ICU, between January 2011 and December 2011. Data concerning diagnosis on admission, predicted in-hospital mortality according to APACHE II, service of origin, Sabadell score, risk factors associated with bad prognosis (mechanical ventilation, renal failure, vasoactive drugs, tracheostomy, parenteral nutrition and nosocomial infections), readmission and vital status on being discharged from hospital (alive or dead) were collected.
RESULTS. Of 1460 patients admitted into the ICU, 371 died (25.6 %). 173 of those (11.6 % of the total), were alive when leaving ICU but died on the ward. There is greater possibility of dying on the ward for those admitted in ICU from the ward, or those admitted because of a postsurgical complication. The Sabadell Score is a good predictor of post ICU mortality. Another predictor of post ICU mortality is the expected mortality according to APACHE II.
CONCLUSIONS. With our hospital's characteristics, those patients who would benefit from a follow up program on the ward would be those who do not have limited treatment and are medical patients who score 1 or 2 on the Sabadell Score, or are discharged with tracheostomy, or those whose reason for admission into the ICU was postsurgical complication.
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0653
INTERHOSPITAL TRANSFERS IN A NON-TERTIARY HOSPITAL - DOES THE PRACTICE MEET THE GUIDELINES?

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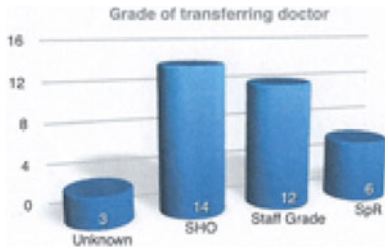
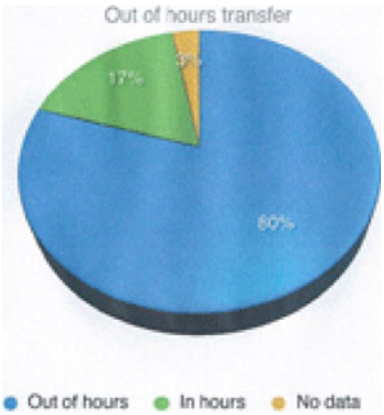
INTRODUCTION. Critically ill patients are frequently transferred from secondary hospitals to other units in their network or tertiary centres. Transfers are for specialist care, due to lack of staffed critical care beds or for repatriation. With conservative estimates of 4,500 transfers a year in England, and this increasing, need for safe critical care transfers is of paramount importance.
OBJECTIVES. The aim of this audit was to analyse interhospital transfers made in the year 2010-12 from our hospital and to compare the data with current Intensive Care Society guidelines to assess compliance and identify areas for improvement.
METHODS. A single centre retrospective audit in an 8 bed mixed ICU of a non-tertiary university hospital. During the audit period (2010–2012) 35 critical care transfers were made. We audited data of referring team, location, receiving team, transfer reason, decision-departure time, intubation details, arterial blood gases (ABG), comments of the teams, time of transfer, documentation and transferring doctor grade.
RESULTS. Transfers were by SHO level doctors in 40 % of cases, staff grade and registrar level doctors in 25 % each, 10 % were not documented.



Grade of transferring doctor

Most (57 %) were transferred for tertiary care. A significant proportion (28 %) were for non-clinical reasons. The transfer source was most often A&E at 51 % of transfers, with ICU 23 % and wards 20 %. The majority (80 %) of transfers occurred outside normal working hours.



Out of hours transfer

Transfer decision to departure time varied, with an average time of 4 h 47 min and a mode of 3 h.

Decision to departure times

Receiving destinations were primarily within the hospital's transfer network. Intubation and ABG details were too poorly recorded to comment upon. Records of the doctor performing the transfer were well kept but those of the receiving team were generally absent. All results have been mitigated by incomplete data sets.
CONCLUSIONS. Critical care transfers are a complex task performed away from access to assistance by a heterogenous group of doctors with variable skills. Research suggests that SHO level trainees may lack the skills or experience to be the most suitable for this role.

Reasons for transfer involve a significant proportion where the patient does not directly benefit which, whilst being in line with current guidelines, is a recognised source of concern. As expected, transfers from A&E are the largest subgroup reflecting a need for some to rapidly access tertiary care. Of serious concern was the significant lack of data capture despite a standardised transfer form. This may be due to lack of time when managing a critically ill patient or lack of introduction to transfer processes in frequently rotating doctors.
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0654
ICU MORTALITY RATES IN ADMISSIONS DURING WEEKENDS, NIGHTS AND OUT-OF-HOURS

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INTRODUCTION. The media has recently highlighted the possible need for hospital consultants to work more weekends, as studies have seen an increase in deaths that occur at the weekend.
OBJECTIVES. What is the most common day of presenting to ICU? Is there a difference in mortality among adults admitted to ICU during the weekday versus weekend, day versus night, or in hours versus out of hours? Can APACHE II scores or average length of time between hospital admissions and ICU admissions be a good predictor of ICU mortality?
METHODS. This is a retrospective case note review looking at all patients that were admitted to a district general hospital, East Surrey Hospital, Intensive Care Unit over a year. This involved a total of 538 patients.
RESULTS. The largest numbers of patients are admitted to ICU on a Monday (17.3 %) and the least on a Sunday (9.7 %). There is a greater chance of mortality if admitted at the weekends (36 %) than the weekdays (26 %); during the night (30 %) than the day (27 %); and out of hours, i.e. nights and weekends, (32 %) versus in hours, i.e. weekdays during the day (24 %). But Chi-Squared analysis demonstrates no association between the two groups. ANOVA summary shows a significant difference ($p < 0.001$) between groups in APACHE II scores. Furthermore, an increase in the length of time between hospital admission date and ICU admission date occurs during weekdays, day time and in hours, rather than weekends, night time and out-of-hours. This increase is more marked in the mortality group over the survivors group.
CONCLUSIONS. It is well documented in the literature that there is an increase in mortality rates during the weekend and the night. Our sample data shows this pattern of observed weekend mortality rate had no statistical difference using Chi-Squared analysis. ANOVA analysis revealed that APACHE II scores can significantly differentiate between survivor and mortality groups but are not necessarily different when comparing weekday versus weekend, day versus night, or in hours versus out of hours. The average length of time between hospital admissions and ICU admissions may be a better predictor of ICU mortality. Patients admitted during the weekday, day time and during working hours are more likely to be waiting on the ward for longer rather than during the weekend, night, and out of hours and subsequently have a greater chance of dying.
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GRANT ACKNOWLEDGMENT. Nil.

0655
REORGANIZATION OF ADMISSION DEPARTMENT AND CREATION THE EMERGENCY DEPARTMENT IN KIPSHIDZE CENTRAL UNIVERSITY HOSPITAL (TBILISI, GEORGIA)

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INTRODUCTION. Georgia was a constituent republic of the former Soviet Union. There is number of old Soviet style hospitals in Georgia. Problematic issues regarding the reception department were: patients were not triaged; traditionally most patients were admitted to the hospital based just on the chief complaint; Earned what is being accomplished in the EDs in other countries, we concluded that this model could decrease delays in care, improve the patient's outcome, decrease inappropriate admissions, and improve resource utilization.
METHODS. Project was created in 2006–2007. Because we had to deal with a core service process, we chose the process improvement methodology to achieve our goal. The first step in this project was to create the working team and share the responsibility among the team members.Was used 4 step quality improvement approach for running the project: 1. Was identified what to change—the structure and process in the reception department; Was created the problem statement—to create the modern department with the high quality staff and to follow the evidence based medicine principles; Was identified the opportunities of improvement—opportunities to change the design of the department according the criteria for ED, to change the patient flow, documentation flow, material and drug flow processes, documentation; to create the policies and clinical protocols according the evidence-based medicine. 2. We analyzed why old system produces the effect that we aim to improve; We defined measures. 3. We developed the hypotheses of changes. 4. The last step was PDSA approach. We planned the number of activities, shared responsibilities between the team members, defined the list of measures, defined the method for data collection. Then we implemented the list of changes in the department and then monitored them. The final step of this project was to choose the staff for working in emergency department.
RESULTS. The new emergency department dramatically changed the situation in KCUH.
BENEFITS. 1. It is possible to make a decision regarding disposition of patient and save inpatient beds of hospitals; 2. Based on the initial diagnosis it makes possible hospitalization of patients in predefined specialty departments with minimal errors; 3. Patient is under regular monitoring for which ED has all necessary equipment and diagnostic means, which is very important in case of critical care patients. 4. Patients who doesn't need hospitalization stay at ED for further management. 5. There is less need for involvement of different specialists in management of patients. 6. Mortality rate in hospital was reduced from 3.6 % to 0.7 % and in ICU/CC from 45 % to 9 %. 6.Average LOS in hospital was declined from 6 days to 3 days. It saves financial resources of hospital.
CONCLUSION. Mortality and LOS was reduced dramatically. It saves the hospital resources and financial resources as well. This is very important for country with limited resources.

Paediatrics 2: Not small adults!: 0656–0669

0656
MORTALITY EVOLUTION IN THE LAST DECADE IN PAEDIATRIC INTENSIVE CARE—A MULTIDISCIPLINARY UNIT EXPERIENCE

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INTRODUCTION. Death is the ultimate, unwanted event in paediatrics. However it will remain an unavoidable reality in critical care. In this work we aim to describe and reflect on mortality evolution through the last decade in the Paediatric Intensive Care Unit at Coimbra's Children's Hospital.
METHODS. Descriptive study on mortality during ICU stay, in an eight bed multidisciplinary neonatal and paediatric intensive care unit, over a 10-year period (from January 2001 until December 2010). All patients who died in the ICU were included. Retrospective data collection through database and clinical files review. Recorded variables included: gender, age, background, length of stay, admission, referral, treatment, ways to die, autopsy, organ donation. Data analysis was performed with the Statistical Package for Social Sciences version 18.0 (SPSS).
RESULTS. Overall there were 3399 admissions during the study period and 203 (6 %) children died. There was a tendency to decreasing mortality rates from 10 % in 2001 to 3, 4 % in 2010. One-third of deaths occurred in neonates (62 patients). There was no difference regarding gender. Urgent admissions represented 96 % of deaths. Interhospital referral occurred in 54 % of the cases. Main diagnosis were hypoxic ischemic encephalopathy (26 %) and congenital malformations (22 %) on neonates and trauma (22 %), haematological and oncologic patients (17.5 %) e cardiac failure (13 %) in the paediatric group (141 patients). Average length of stay was eleven days. Regarding dying events 36 % of the children died after resuscitation manoeuvres failure, 12 % had a do not resuscitate order, 23 % had limitation of care and 29 % had brain death. In the brain death diagnosis group there were 33 % of organ donors. In 33 % autopsy was performed with the parents consent.
CONCLUSIONS. There was a signficant improvement on mortality rates through the 10 year period study. Neonatal mortality represented one-third of the cases with hypoxic ischemic encephalopathy with multiorgan failure still being the main diagnosis. Another third of deaths represented limitation of care and do not resuscitate orders.

0657
"EARLY LACTATE AREA" AS AN OUTCOME PREDICTOR IN PEDIATRIC SEPTIC SHOCK

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INTRODUCTION. The early detection of factors that associated the outcome in septic shock could help early recognizing the patients who are at risk of mortality and timely changing in therapy, which may improve the outcome. Blood lactate levels are supposed to reflect the anaerobic metabolism related to cellular hypoxia and has been used as a prognostic marker in septic shock. In several studies, lactate associated parameters have shown to be well related to mortality. These results suggest that not only the severity, but also the duration of hyperlactatemia are related to mortality.
OBJECTIVES. The elevated lactate levels, poor lactate clearance and hyperlactatemia (described as a 'lactate area') despite of aggressive shock management would be correlated with mortality in pediatric septic shock patients. We try to evaluate whether early lactate area is useful as an early prognostic marker in pediatric septic shock.
METHODS. This was a restrospective study of pediatric patients with septic shock admitted to the pediatric intensive care unit of the Asan Medical Center from February 2007 to August 2011. Serial lactate levels were obtained immediately and every 6 h after admission during 24 h. The lactate clearance was defined as the percent change in lactate level after 24 h from initial lactate measurement. Lactate area (mmol/L*hr) defined as the sum of area under the curve of serial lactate levels during 24 h after admission. Receiver operating characteristic (ROC) curves were constructed to evaluate the reliability of lactate variables as prognostic factor.
RESULTS. A total of 65 patients were included in this study and the overall 28-day mortality of the patients was 26.2 %. Survivors compared with non-survivors had initial lactate level of 3.13 ± 2.79 vs. 6.16 ± 4.87 mmol/L, lactate clearance of 32.8 ± 63.4 vs. -30.8 ± 75.6 % and lactate area of 59.71 ± 56.04 vs. 168.00 ± 107.04 mmol/L*hr ($p < 0.05$). The average of lactate levels in each time changed substantially from time to time and there are significant differences in changes in each survivors and non-survivors group ($p < 0.001$). Multivariate logistic regression model was performed, variables identified as significantly correlated with 28-day mortality were lactate clearance ($p = 0.041$) and lactate area ($p = 0.036$). The initial lactate levels did not show significant values ($p = 0.914$). The area under the curve of ROC indicated a strong predictive power for the lactate area (AUC = 0.828) superior to initial lactate level (0.699) or lactate clearance (0.719). The obtained cut-off point for the lactate area of 96 mmol/L*hr had the maximum sum of sensitivity (58.0 %) plus specificity (79.2 %). The relative risk of mortality of the lactate area above 96 mmol/L*hr was 1.923 (95 %CI; 1.070-3.456, $p = 0.005$).
CONCLUSION. The present study indicates the important result of early lactate area can be feasible and clinically useful as a good predictor of mortality in pediatric septic shock patients.

0658
NOSOCOMIAL INFECTIONS IN THE PEDIATRIC INTENSIVE CARE UNIT: ANALYSIS OF RISK FACTORS

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INTRODUCTION. Nosocomial infections (NI) are known as a potentially cause of morbidity and mortality in the Pediatric Intensive Care Unit (PICU). Limited research has investigated risk factors related in children.
OBJECTIVES. To identify the risk factors associated with NI in a PICU.
METHODS. Prospective study carried out over 3 years in a fourteen bed PICU (2006–2008). Patients admitted up to 24 h with external dispositives were included.

Epidemiologic and clinical data, severity of illness (Pediatric Risk of Mortality Score PRISM 2), supportive treatment, presence of NI (CDC criteria), length of stay (LOS), dispositive-days and survival status were collected. Statistical analysis: X^2 was used to compare categorical variables; t-student was used to compare continuous variables. We analyzed risk factors to develop NI through multiple logistic regression.
RESULTS. We included 1868 children, mean age 5.8 ± 6.04 years, 43.7 % female (816). The mean PRISM 2 score was 6.45 ± 6.21. Medical illness in 35.3 % (659) and 99 died (5.3 %). We diagnosed 30 episodes of Central line-associated bloodstream infection (CLABSI); 49 ventilator-associated pneumonia (VAP) and 38 catheter-associated urinary tract infections (CAUTI). Patients with NI had a higher PRISM 2 score respect to those without NI (11.81 ± 6.18 versus 6.15 ± 6.08, $p < 0.001$). Children with NI required inotropes infusion, mechanical ventilation (MV), parenteral nutrition (PNT), dyalisis and received antibiotics more often than those without NI ($p < 0.05$ in all cases). Mortality was higher in children with NI (15 % respect to 4.8 %, $p < 0.001$). Multivariate analysis of risk factors to develop NI: inotropes OR 2.34 [IC95 % 4.52–1.21], PNT OR 2.75[IC95 % 3.71–5.52], Dyalisis OR 3.83 [IC95 % 1.19–12.34]; PICU LOS OR 1.13[IC95 % 1.11–1.16], MV OR 4.09 [IC 95 % 1.48–11.36], surgical pathology OR 1.9[IC95 % 1.03–3.52]. Risk for CLABSI: Central-line days were the only independent risk, OR 1.12 [IC95 % 1.07–1.17]. Risk analysis for VAP: PNT OR 2.2 [IC95 % 1.07–4.80], inotropes OR 2.5[IC95 % 1.13–5.55] and ventilator days OR 1.06[IC95 % 1.03–1.09]; Risk analysis for CAUTI: urinary- catheter days OR 1.16[IC95 % 1.07–1.16] and dyalisis OR 9.17[IC 95 % 2.51–32.25]. Multivariate analysis of risk of mortality: PRISM2 OR 1.19[IC95 % 1.14–1.1.23], VAP, OR 2.75[IC 95 % 1.21–6.25], inotropes OR 2.77[IC95 % 1.51–5.10] and medical illness OR 3.49[IC95 % 1.88–6.50].
CONCLUSIONS. Surgical pathology, inotropes, PNT, dyalisis, mechanical ventilation and PICU LOS are risk factors to develop a NI. Duration of dispositive increase the risk for every site of NI. The presence of VAP is an independent prognostic factor. Strategies to reduce duration of dispositives use are mandatory in PICUs.
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0659
COMPLICATIONS OF EMERGENT ENDOTRACHEAL INTUBATION IN CHILDREN AND ADOLESCENTS IN THE INTENSIVE CARE UNIT AND EMERGENCY ROOM

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INTRODUCTION. Emergent endotracheal intubation (EETI) in critically ill patients is fraught with mild to severe complications and carries a high risk of morbidity and mortality in critically ill children. The risks of EETIs in children and adolescents in the emergency room (ER) and intensive care unit (ICU) have not been previously investigated.
OBJECTIVES. The purpose of this study was to delineate the risks of EETI in children and adolescents in ER and ICU.
METHODS. We conducted a retrospective cohort study in a ten-bed PICU and ER in a tertiary children's hospital. Both the units were managed by the same medical staff (including physicians and nurses) during day hours and off hours. We reviewed all intubation cases in the PICU and ER setting between April 2008 and March 2011. Patients who were aged above 18 years and had undergone elective intubations and intubations for cardiopulmonary resuscitation were excluded. Intubation was classified as emergent after a review of the patient's vital signs and written documentation by nurses and physicians. We recorded age, gender, reason for admission, presence of chronic diseases, indication for intubation, time of intubation, place of intubation and complications due to EETI. The following clinical outcomes were measured: the number of days of mechanical ventilation, length of stay in PICU and mortality. Intubations performed between 17.00 and 08.00 h were categorized as 'off hours'.
RESULTS. During the study period, 96 EETIs were performed, of which, 15.3 % had complications of desaturation, 1.0 % had hypotension and 3.1 % had bradycardia. There were no significant differences in the age, gender, chronic disease status or indication between intubations with complications and those without complications. Intubations in the ER patients and intubations during off hours were significantly more likely to be associated with complications (odds ratio, 4.19 and 2.38; $p = 0.02$ and $p = 0.17$, respectively). Complications were not associated with either prolonged mechanical ventilation or length of stay in the PICU. Increase in mortality with complication-related intubation was not statistically significant (odds ratio, 2.34; $p = 0.30$).
CONCLUSIONS. EETIs in ER children and adolescents and during off hours are associated with two times more risk of complications than those in PICU patients and during day hours.
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0660
MENINGOCOCCAL DISEASE ADMISSIONS IN A PAEDIATRIC INTENSIVE CARE UNIT

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INTRODUCTION. Meningococcal infection has a high mortality and morbidity in children. Aggressive initial shock approach, early referral, secondary transport and vaccination are potential factors with impact in reducing its mortality. In Portugal anti-meningococcal C vaccine was commercialized in 2001 and introduced in the national vaccination plan in 2006. Since 2005 secondary transport has been available in Portugal's central region.
OBJECTIVES. To characterize children admitted to a PICU due to meningococcal disease, to evaluate their prognostic scores and mortality rates.
METHODS. Retrospective study of children with the diagnosis of meningococcal disease (definitive or presumed) admitted to a PICU during a twelve year period (2000-2011). Sepsis and multi-organ failure were defined based on the *International Consensus Conference on Pediatric Sepsis* criteria. Two periods were created according to the year of admission: period A: 2000-2005 and period B: 2006-2011. Prognostic parameters, organ failure, PRISM and mortality rates were compared in these groups. Statistical analysis was done using SPSS® 17.0.
RESULTS. During the study period 70 children were admitted with meningococcal disease. When compared with other causes of admission a decrease in the number of admissions due to meningococcal disease was observed (period A: 3.4 %; period B: 1.5 %; $p = 0.001$). Mean time between the beginning of the disease and PICU admission was 16.4 h in period A and 14.1 h in period B ($p = 0.257$). Secondary transport was used in 6.5 % in period A vs. 29 % in period B (0.027). Median age was 2.4 years in period A and 1.5 years in period B ($p = 0.238$). No significant differences were found between children from both periods regarding the presence of meningitis (41 % vs. 29 %; $p = 0.461$). Rapidly progressive purpura occurred in 78 % in period A and 50 % in period B ($p = 0.032$). Concerning organ failure, children from period A had multi-organ failure (80 %), disseminated intravascular coagulation (76 %) and coma (22 %) more frequently than children from period B (29 %, 29 %, 0 %; $p < 0.05$). Mortality was 26 % in period A and 0 % in period B ($p = 0.016$) and standardized mortality by PRISM was 1.3 and 0 in period A and B respectively.
CONCLUSIONS. A decrease in the number of admissions due to meningococcal disease after 2005 was observed, which is probably due to the introduction of the anti-meningococcal C vaccine in the national vaccination plan. Mortality decline can be explained by less severe cases, possibly owing to an improvement in the initial patient stabilization and to secondary transport.

0661
EALY GOAL-DIRECTED THERAPY IN PEDIATRIC PATIENTS WITH SEVERE BURN INJURY

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INTRODUCTION. The shock accompanying severe burns is a life-threatening condition associated with high mortality. Any reasonable application of a vasoactive drugs or adjustment to infusion therapy scope and speed is possible only after central hemodynamic indices have objectively been assessed. Monitoring with PiCCO technology enables to obtain comprehensive information on-line to formulate a goal-directed approach to therapy. Our study aims at objectifying indications for use of catecholamines and/or adjustment to infusion therapy based on PiCCO technologies.
METHODS. This was a prospective study on 12-month trial included 13 children (8 boys and 5 girls) 3 to 14 years of age, with total area of burns coming to more than 40 %. Data were collected at: 60 min (baseline), 12 h and 24 h after PICU admission. The following parameters served as target points for this study: 1. CI - <3.5 and >5.0 l/min/m^2, 2. SVRI - 1525.5 ± 325.5 dyne·sec·cm^{-5}/m^2, 3. GEDI - 525.5 ± 105.5 ml/m^2.
RESULTS. Admission diagnosis were hyperkinetic type of hemodynamics with ↑ CI - 6.3 ± 0.6 l/min/m2 and ↓ SVRI 701 ± 157 dyne·sec·cm-5/m2, with ↓ GEDI ml/m2 339 ± 48.9 ml/m2. The volume infusion was 5.1 ± 0.4 ml/kg/hr. Based on the baseline data infusion of dopamine and dobutamine was terminated to start norepinephrine with 0.05-0.1 μg/kg/min dosing, and increase infusion up to 11.7 ± 2.3 ml/kg/hr. We received statistically valid ($p < 0.001$) changes in the central hemodynamics expressed as ↑ SVRI and ↑GEDI up to 1263 ± 123 dyne·sec·cm-5/m2 and 484 ± 12.4 ml/l2 respectively, and ↓ CI up 4.8 ± 0.4 l/min/m^2. Therefore, the target points were reached just within the first 12 h of intensive care.
CONCLUSIONS. The changes in the catecholamines therapy and infusion therapy are related to interpretation of transpulmonary thermodilution and pulse contour analysis data. Changes in the central hemodynamics have to do with reductions in pre- and after-loads without changes in myocardium contractility. Norepinephrine with 0.05 μ/kg/min—catecholamine of the first line of administration.

0662
PEDIATRIC HYPOTENSION: QUANTIFICATION OF THE DIFFERENCES BETWEEN THE TWO CURRENT DEFINITIONS

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INTRODUCTION. Hypotension in childhood can be determined using two different definitions (1): a blood pressure (BP) value below the fifth percentile (definition 1) or below two standard deviations of the mean for age and gender (definition 2). Nevertheless, these values are not mathematically identical.
OBJECTIVES. To quantify the differences between the two current definitions of pediatric hypotension.
METHODS. We used the Excel-MS to develop high-resolution graphics with 3,202 points each to represent each of the two current definitions of blood hypotension for 1 to 17 year old children in the 50th percentile of height. Each point represents the calculation of the polynomial equation that comprehends the statistical processing of the last Report on Blood Pressure (2). Differences less than 1 mmHg were not considered. The groups were defined according to the age: Group I (1–13 years) and Group II (13 years or older). The Student's t test was used whenever applicable and values of 0.05 were considered significant.
RESULTS. We found 100 % disparities between the two definitions of blood hypotension. The four graphics show that the two definitions do not share any values in common, and result consistently in distinctive monotonic curves that represent the 5th and 2.275th percentiles. The mean difference between both definitions was 3.9 ± 0.17 mmHg, with 95 % CI of 3.72 to 4.05. The differences between the values of the two definitions were fixed: 3.8 mmHg for Systolic Blood Pressure (SBP) for boys and 3.2 mmHg for girls, while for Diastolic Blood Pressure (DBP) the differences were 4.12 mmHg for boys and 3.89 mmHg for girls. Although the differences in the values were fixed, the impact on Blood Pressure was variable (3.2–11 %) and depending on the age, and more significant in DBP in comparison with SBP (7.05 × 3.75 %, respectively; $p < 0.001$.
In group II, the threshold of SBP was higher than that used for adults (90 mmHg) in 100 % of cases in the definition ×74 % in boys and 39 % in girls in definition 2.
CONCLUSIONS. The present study shows that there is a mathematical difference between the current definitions of hypotension in childhood. Prospective studies will be necessary to establish a single definition of pediatric hypotension, and to evaluate the potential impact of

such a difference in the management of hypotensive states in childhood, such as pediatric septic shock.
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0663
INTRA-ABDOMINAL TUMORS IN A PICU

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INTRODUCTION. The objective of the present study was to observe the histopathological pattern of intra-abdominal tumors in children less than 15 years.
METHODS. The study was carried out at the Department of Pediatric Intensive Care Unit, Heraklion, during a period of 7 years, from March 2005 to March 2012. The histopathological and demographic data of 15 intra-abdominal tumors of both sexes (8 boys and 7 girls) under 16 years of age was collected and analyzes to determine the various morphological types of intra-abdominal tumors in relation to age and sex.
RESULTS. Neuroblastoma was the most common tumor constituting 46.7 % of all cases, followed by Wilms'tumor (26.7 %), hepatoblastoma (13.2), teratoma and granulosa cell tumor (6.7 %) each. Majority of the patients 73.3 % were under 5 years of age.
CONCLUSIONS. Intra-abdominal tumors are more common in males. Neuroblastoma was the most common tumor. Most of the tumors were noted in children less than 5 years of age.

0664
INFLUENZA A (H1N1) VIRUS IN A PICU

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INTRODUCTION. H1N1 influenza A virus infection involved the public Health System worldwide so much that on June 2009 WHO announced the disease from epidemic as pandemic. Our purpose was to investigate the incidence, clinical characteristics, treatment and outcome of H1N1 in children with respiratory tract infection required hospitalization in PICU.
METHODS. Influenza A in children hospitalized in our unit with respiratory infection during the period April 2009–March 2012 was confirmed by special pharyngeal sample.
RESULTS. During this period, 58 out of 322 children were admitted in our Unit with respiratory infection. Seven patients (12 %) (4 girls and 3 boys, age $2^{1/2}$, $4^{1/2}$,5, $6^{1/2}$, 8, 9 and 10 years), all unvaccinated for H1N1, were influenza A infected. Their initial symptoms were: – Fever $>38^{o}$ C (5 cases).
– Respiratory infection (2 cases of pneumonitis).
– Bronchial asthma and pneumomediastinum.
– Febrile + status epilepticus.
– Cardiac arrest, multiorgan failure.
Five children needed intubation and mechanical ventilation. Five had underlying disease - two had asthma, one had bronchopulmonary dysplasia and heart disease, and two had cerebral palsy. Oseltamivir was administered immediately and for 5 days in all cases and in one case, with persistent infection, for 15 days. The outcome was good in 6 cases and only the child with bronchopulmonary dysplasia and heart disease developed multiorgan failure and eventually died.
CONCLUSIONS. 12 % of patients with respiratory infection in our PICU was H1N1 positive. One patient with severe underlying disease died. 71 % need mechanical ventilation and the majority of them had co-morbidities.

0665
ARTERIAL THROMBOPHILIA IN PEDIATRIC INTENSIVE CARE UNIT

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INTRODUCTION. Thrombophilia was initially attributed to inherited hypercoagulability state, in the same way as hemophilia, however by the time this term extended to include acquired cases as well. True idiopathic thrombosis is extremely rare in children. Multiple risk factors are often present in pediatric patients; indwelling catheter, inflammatory conditions, malignancy, immobilization, thrombophilia and congenital heart disease. The role of thrombophilia in determining the risk of arterial thrombotic events is less well defined.
OBJECTIVES. This study aimed to collect the number of children hospitalized in PICU, suffering from arterial thrombosis and to reveal the possible etiological factors.
METHODS. The study was conducted from 1st of January 2007 till 1st of January 2012, comprising 436 children aged from 2 months to 17 years old. The patient ' s records were retrospectively evaluated.
RESULTS. Table 1.

Patients	Factor of thrombophilia	Other factor for thrombosis	Area of thrombosis
4 years old male	Protein C deficiency	Femoral artery catheter	Femoral artery
17 months male	Factor VIII	Infection	Posterior cerebral artery
3 ½ years female	G20210A	Congenital heart operation	Medial cerebral artery

CONCLUSIONS. Arterial thromboses encountered in our PICU do not constitute a frequent diagnosis, however when exist can lead to great disability (stroke, limb loss …) or even death. It also seems that a combination rather than a single factor play role in the formation of arterial thrombus in children. (congenital heart disease -thrombophilia, infection -thrombophilia, catheter - thrombophilia).
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0666
IMMUNE CONDITION IN CHILDREN WITH NEPHROTIC SYNDROME

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INTRODUCTION. Abnormalities in T cell regulation of the immune system plays an important role in pathogenesis of primary nephrotic syndrome in children. Character and frequency of hypoimmune conditions and their impact to the diseases progression has not established.
OBJECTIVES. To determine range of changes in cell immunity in children with nephrotic syndrome with different results of immunosuppressive treatment.
METHODS. By the non direct immune fluorescence with markers for CD cells (CD3, CD4, CD8, CD16, CD20, CD25, CD38, CD71) subpopulation of lymphocytes determined in 18 children with steroid sensitive nephrotic syndrome and in 14 children with steroid resistant nephrotic syndrome.
RESULTS. Increasing of T suppressors and decreasing ratio of Th/Ts noted in children with steroid resistant nephrotic syndrome - overall suppressive type of the immune response was found. Decreased level of particular indicators of cell immunity (B lymphocytes and natural killer cells) found in more than 1/3 patients with steroid resistant nephrotic syndrome in comparison with less than ¼ of patients with steroid sensitive nephrotic syndrome. In children with steroid sensitive nephrotic syndrome ratio of Th/Ts normalized, frequency of cell immunity abnormalities decreased after treatment with prednisolone. In children with steroid resistant nephrotic syndrome ratio of Th/Ts continued to decrease, frequency of cell immunity abnormalities increased.
CONCLUSIONS. Suppressive type of immune response and immunodeficiency condition was distinctive for children with steroid resistant nephrotic syndrome. This may become a basis for justification of prescribing stimulators of immune system.

0667
ACUTE FLACCID PARALYSIS IN PEDIATRIC CARE UNIT (PICU)

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INTRODUCTION. Acute flaccid paralysis is characterized from dysfunction of upper in contrast to spastic tetraplegia owing to dysfunction of lower motor neuron. The term, includes great number of diseases; demyelinating (Acute Disseminated Encephalo Myelitis, infectious (polymyelitis, other neurotropic viruses) and ischemic (anterior spinal artery syndrome) in case of spinal cord damage,as well as polyradiculoneuropathies, myastheniae, myopathies in case of neuron, neuromuscular or muscular damage respectively.
OBJECTIVES. The recording of frequency and cause of acute flaccid paralysis in paediatric population resulting in PICU.
MATERIAL. 436 patients aged from 2 months to 17 years old.
METHOD. Retrospective study of patients being hospitalized in PICU from 1st of January 2007 to1st of January 2012.
RESULTS. Table 1

Patient	Diagnosis	Imaging	Mobility	Respiratory muscle paralysis	Autonomic participation	Discharge	Follow up
8 years old female	Anterior spinal artery syndrome	Cervical spinal cord oedema	4 limbs paralysis	+	+	Failure of independent walking	No particular neurologic improvement
5 ½ years old female	Guillain–barre	Enhancement of nerve roots in cauda equina	4 limbs and cranial nerve paralysis	+	+	Improved mobility of left upper and lower limb	Ability of independent walking

CONCLUSIONS. As it was expected, no cases of viral poliomyelitis appeared in paediatric population during this five years study. Entrance criteria in PICU for acute flaccid paralysis are the respiratory muscle involvement with the need of mechanical ventilation as well as autonomic system participation with haemodynamic instability. Critical ill cases of Guillain–Barre with four limbs and cranial nerve paralysis have good outcome, in contrast with ischemic conditions in spinal cord.

0668
PREDICTIVE FACTORS FOR NIV SUCCESS IN ACUTE RESPIRATORY FAILURE AT CHILDREN

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INTRODUCTION. Identifying the predictive factors of NIV helps defining which patient will benefit from NIV treatment and do not delaying the intubation.
OBJECTIVES. To identify clinical and laboratory predictive factors for NIV success in acute respiratory failure.
METHODS. This is a prospective study. Are included all children admitted at PICU during January 2011- December 2011. Noninvasive ventilation was used as the primary support for acute respiratory failure. Clinical and laboratory data were evaluated before NIV and after 2 hours.
RESULTS. A total of 42 patients were included. NIV success rate was 73.8 % with efficacy in both hypoxemia and hypercapnia. Prism score in the succes group was 9.5 ± 3.9 points versus 14.5 ± 6.6 points in the failure group. ($p = 0.0184$). PRISM score < 10 points before NIV results significant predictive factor for NIV success with sensitivity 67.74 %; specificity 72.73 %, predictive positive value 87.5 % and predictive negative value 44.4 %. Analyzing with ROC curves RR reduction and HF reduction as predictive factors for NIV success we found: for the reduction of RR > 10/min: predictive positive value was 88.2 % and predictive negative value—87.5 % ($p < 0.001$); for the reduction of HF > 10 beats/min : predictive positive value was 88.6 % and predictive negative value—100 % ($p < 0.001$). A value of initial PaO2/FiO2 > 250 mmHg may be considered as a predictive factor for NIV success. Low values of PaO_2/FiO_2 decrease the possibility for NIV success.

CONCLUSIONS. Low values of PRISM score, a higher initial PaO_2/FiO_2 and the reduction of cardio-respiratory parameters after two hours NIV are predictive factors for NIV success.

0669
ONCOLOGIC CASES NEEDED HOSPITALIZATION IN PICU AT UNIVERSITY HOSPITAL DURING 2005 TO 2011 PERIOD

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INTRODUCTION. As is known, in PICU except of children with critical illness, some other cases need to be hospitalized as postoperative monitoring, administration of anesthetics for imaging or invasive procedures (magnetic resonance imaging, bone marrow biopsy). Children with neoplasms have both the above reasons to be hospitalized.
OBJECTIVES. The record of children with neoplasia needed hospitalization in PICU during 6 years period.
MATERIAL: In the last 6 years (2005–2011), 34 oncologic patients were admitted (16 females and 18 males) aged from 20 months to 15 years old.
RESULTS. CNS neoplasia (13 cases): rhabdomyosarcoma, astrocytoma, medulloblastoma, optic nerve gleioma, craniopharyngioma Wilm 's tumor (4 cases) Hematologic malignancies (6 cases) ALL, AML, non Hodgkins lymphoma, histiocytosis Retinoblastoma (1 case) Hepatoblastoma (1 case)Teratoma (1 case) Liver biopsy (4 cases) Bone marrow biopsy (1 case) Central venous catheter insertion (3 cases) From the above patients 2 patients died, one with medulloblastoma and one with hepatoblastoma.
CONCLUSIONS. Children with neoplasms hospitalized in PICU for deterioration of underlying disease, postoperative monitoring, and administration of anesthesia for imaging or invasive practices.

Epidemiology of ICU-related infections: 0670–0683

0670
ANALYSIS OF RISK FACTORS FOR CRBSI IN A HOSPITAL-WIDE TPN POPULATION—AN ASSOCIATION WITH LIPID ADMINISTRATION

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INTRODUCTION. The reduction of healthcare associated infection (HCAI) is vital to patient care and safety. Catheter-related bloodstream infection (CRBSI) is one of the most frequent HCAIs and its associated morbidity, likely mortality and expense are the most significant adverse effect of central venous catheters (CVCs) [1]. Differences between Critical Care and ward patients have been claimed [2–4].
OBJECTIVES. In this 12-year study of a hospital-wide population of patients receiving total parenteral nutrition (TPN) via CVCs, in whom there has been a progressive decrease of CRBSI[5], we examined risk factors for CRBSI, and compared CVCs inserted in Critical Care (intensive care and high dependency units(ICU/HDU) with those in operating theatres for ward patients (ward/OT).
METHODS. 525-bed acute and tertiary care, university hospital. A prospective database was maintained by the critical care-led TPN team which recorded data on all patients with CVCs inserted for TPN administration. This database was examined (1997–2008).
RESULTS. CVC insertion in ICU/HDU was associated with significantly lower risk of CRBSI ($p < 0.01$). CRBSI was marginally associated with increased mortality ($p < 0.1$). Administration of lipid formulation of TPN was associated with increased risk of CRBSI ($p < 0.01$). There was no association between CRBSI and diabetes, or insulin administration ($p > 0.05$), or anatomical location of CVC in subclavian, internal jugular or femoral veins in ICU/HDU or ward/OT CVCs ($p > 0.05$).
CONCLUSIONS. CRBSI was marginally associated with mortality thus underlining the importance of CRBSI prevention. The rate of CRBSI was lower in the ICU patients than in those inserted in the clean OT environment suggesting that ongoing CVC care is important to CRBSI occurrence. Commonly claimed associations with CRBSI (e.g. CVC anatomical site) were not confirmed in this study, but the use of lipid in TPN was associated with CRBSI. This large study of prospectively collected TPN patient data, provides for the first time, evidence of an association between lipid administration and CRBSI.
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0671
COMPLICATIONS OF PERIPHERALLY INSERTED CENTRAL CATHETERS (PICC)

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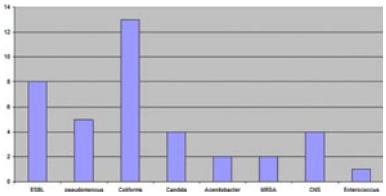
INTRODUCTION. Peripherally inserted central venous catheters are normally inserted in patients who are likely to require long term venous access and those with difficult veins They are generally considered to be associated with less risk of infection [1, 2].
OBJECTIVES. To determine the incidence of complications associated with PICC lines particularly infection related complications at our institution.
METHODS. After obtaining approval from institutional research board, a retrospective review of charts was performed from November 2010 to 2011.
RESULTS. A total of 398 PICC lines were inserted over a period of 1 year. All PICC lines were inserted by two radiologists. Difficult venous access (32 %), administration of parenteral nutrition (11 %), chemotherapy (6 %) and need for long term venous access (51 %) were the commonest indications for insertion of PICC lines. A total of 131 (33 %) complications were documented. Forty-eight percent of the complications were due to line related infections, this was followed by blockage in 26 % of patients, deep vein thrombosis (DVT) in 8 %, malposition (9 %) and others (accidental removal, leakage, local swelling) 10 %. One patient had a sustained supraventricular tachycardia which resolved following removal of the PICC line. The mean duration of PICC line was 31.5 days, patients who developed line related infection had a mean duration of 27 days. Pathogens isolated from blood cultures are shown in Fig. 1. Deep vein thrombosis occurred within 15 days in all patients and was associated with use of large bore catheter (6F).



Pathogen is isolated from blood culture
CONCLUSIONS. Complications particularly line related infections are common in patients with PICC lines and may represent poor maintenance. The incidence of DVT is probably underestimated as we did not routinely perform USS in all patients.
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0672
NO DIFFERENCE IN THE CATHETER RELATED INFECTION (CRI) RATES BETWEEN TOTAL PARENTERAL NUTRITION (TPN) AND STANDARD INTENSIVE CARE UNIT/HIGH DEPENDENCY UNIT (ICU/HDU) CENTRAL VENOUS CATHETERS (CVCS)

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INTRODUCTION. Catheter related infection (CRI) is the most important complication of CVCs and the ongoing effort to reduce its incidence entails the reduction of recognized risk factors where possible. Total parenteral nutrition (TPN) has been postulated as a risk factor but data to establish this are scarce[1].
OBJECTIVES. The aim of this study was to establish whether TPN was a significant risk factor for CRI by using the opportunity of a national audit of CRI in ICUs to compare a single hospital's ICU/HDU data with the internal data on TPN CVCs[2] within the same hospital.
METHODS. A multi-centre, national audit of CRI in Irish ICUs was conducted in the quarter Nov 2010–Jan 2011 using HELICS definitions of CRI and the study hospital's data (which demonstrated a CRI rate less than the national average CRI rate of 2.1 per 1,000 CVC days) are utilized as the control group in this study. As the audit nurse for the said national audit was the same as the hospital TPN surveillance nurse and the diagnostic criteria and processes were common to both audits, the ICU/HDU data were compared with the standard hospital TPN audit data. A period of 18 months (April 2010–September 2011) surrounding the national audit was chosen for the study group to achieve similar numbers of CVC and CVC days for valid comparison. Statistical significance was attributed at the $p < 0.05$ level.
RESULTS. Table 1 demonstrates CRI rate in TPN CVCs was not significantly different ($P = 0.4$) from the rate in standard CVCs in the same hospital's ICU/HDU patients.

Comparison of ICU/HDU CVC data with that of TPN CV

	ICU/HDU audit (national)	Hospital TPN audit
Number of patients	217	211
Number of CVC's	398	319
Number of CVC days	2,281	2,013
Episodes of CRI	3	5
CRI per 1,000 CVC days	1.3	2.5 ($p = 0.4$)

CONCLUSIONS. The absence of a significant difference between the results of the concurrent audits demonstrates that TPN was not a significant, specific risk factor for CRI thus confirming the doubt regarding this oft quoted association [1]. The study suggests that the CRI rate achievable in TPN CVCs, in association with educational processes and other infection control measures effected by a TPN surveillance nurse [2], is no different from that pertaining in standard CVCs.
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0673
RISK FACTORS FOR IN-HOSPITAL MORTALITY IN CRITICALLY ILL PATIENTS WITH BACTEREMIA

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INTRODUCTION. Bacteremia in critically ill patients is a major cause of morbidity and mortality. Its prognosis is variable, depending on several factors: age, site of acquisition, pathogen, source of infection, underlying diseases and antibiotic inadequacy.
OBJECTIVES. To evaluate risk factors for in-hospital mortality in critically ill patients with bacteremia.
METHODS. Retrospective, single-center, observational cohort study of 197 bacteremias between September 2010 and February 2012 in an intensive care unit (ICU) of an University Hospital in Porto, Portugal.
RESULTS. Most of the patients were male (58 %), mean age of 62 ± 15.2 years and mean SAPS II score of 58 ± 20.03. Co-morbidities were present in 65 % of the patients: diabetes mellitus (28 %), neurological disorder (21 %) and cancer (18 %). Bacteremias were ICU, community and hospital acquired in 52, 28 and 20 %, respectively. 65 % of the bacteremias

occurred ≥ 5 days after hospital admission. Primary bacteremia was observed in 42 % and secondary bacteremia in 58 % of the cases. Intra-abdominal infection (28 %), pneumonia (26 %) and urinary tract infection (23 %) were the most prevalent foci of secondary bacteremia. Antibiotics had been used previously in 60 % of the cases (carbapenems: 24 %; glycopeptides: 22 %; piperacillin-tazobactum: 21 %). Previous hospitalization and ESKAPE isolation within 90 days of ICU admission were documented in 41 and 33 % of the cases, respectively. Most frequent pathogens were *E. coli* (29 %), *Ps. aeruginosa* (29 %), and coagulase-negative staphylococci (12 %). ESKAPE pathogens caused half of the episodes. Antibiotherapy was adequate in 74 % of the bacteremias and combined therapy was used in 47 %. Median hospital length of stay was 38 days (16–64) and hospital mortality rate was 47 % (n = 93 pts).In univariate analysis, age (58 ± 15.1 vs. 67 ± 14.3; <0.001), SAPS II score (50 ± 12.9 vs. 66 ± 22.8; <0.001), presence of co-morbidities (54 vs. 76 %; p = 0.001), namely neurological disorder (14 vs. 29 %; p = 0.012) and cancer (13 vs. 24 %; p = 0.041), previous hospitalization within 90 days (33 vs. 50 %; p = 0.017) and antibiotic inadequacy (18 vs. 35 %; p = 0.008) were significantly associated with in-hospital mortality. In logistic regression analysis, the only risk factors independently associated with in-hospital mortality were: the presence of co-morbidities (OR 2.4; 95 % CI 1.158–4.829), antibiotic inadequacy (OR 2.3; 95 % CI 1.060–4.889) and SAPS II (OR 1.05; 95 % CI 1.029–1.075).
CONCLUSIONS. Bacteremia in critically ill patients is associated with important hospital mortality. Co-morbidities, antibiotic inadequacy and SAPS II were the only independent risk factors for in-hospital mortality in critically ill patients with bacteremia.

0674
VENTILATOR ACQUIRED PNEUMONIA IN A NEUROSURGICAL ICU: A PROSPECTIVE STUDY

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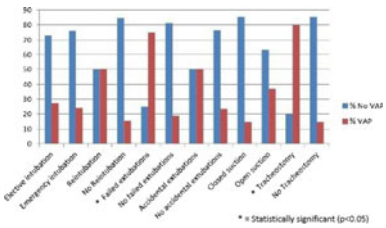
INTRODUCTION. A ventilator-associated pneumonia (VAP) is defined asa pneumonia occurring when an invasive respiratory device was present, even intermittently, in the 48 h preceding the onset of the infection. VAP is the principal cause of hospital acquired infections (HCAIs) in the intensive care unit and has been estimated in other studies to affect between 10–30 % of mechanically ventilated patients [1]. It causes increased hospital stay, increased cost of treatment, and mortality from delay in initiation of appropriate antimicrobial treatment can reach 50 % [2].
OBJECTIVES. To determine the incidence of VAP among neurosurgical ICU patients assessing the effect of predisposing risk factors, the causative organisms and their antibiotic susceptibilities.
METHODS. Prospective audit over a 5 week period in a tertiary Irish neurosurgical ICU. All patients on the ten bed unit were screened on a daily basis. The Hospitals in Europe link for infection Control through surveillance (HELICS) case definition for VAP was used [3]. Statistical analysis was done using Microsoft Excel 2010 and Stata v.10.
RESULTS. VAP incidence among neurosurgical patients was 22.5 % (9/40). 42 % patients with head trauma suffered a VAP (versus 15 % incidence in non-traumatic brain injury), p = 0.102. Tracheostomy, increased duration of intubation and failed extubation (i.e. patients requiring re-intubation within 72 h), were statistically significant predictors for VAP (p = 0.007, p = 0.0025 and p = 0.041, respectively). Initial blind antimicrobial therapy was appropriate to the organism eventually cultured in 37.5 % cases. No significant correlation was observed between VAP incidence and factors such as use of proton pump Inhibitors, smoking or COPD. Microbes isolated were *E. coli* (26 %), *C. albicans* and *P. Aeruginosa* (13 % each respectively) and other mixed microbes (46 % cases).



Correlation between intubation factors and VAP
CONCLUSIONS. Incidence of VAP among neurosurgical ICU patients is 22.5 %, and the main risk factors for its development are failed extubation and tracheostomy, with head trauma and re-intubation possibly playing a role. Increased duration of ventilation also increases neurosurgical patients' risk of VAP.
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0675
USE OF TIGECYCLINE IN INTENSIVE CARE: A FRENCH PROSPECTIVE OBSERVATIONAL STUDY

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INTRODUCTION. Little information is available on tigecycline activity in patients with serious underlying disease or organ failure [1,2].
OBJECTIVES. This prospective observational study aimed at describing tigecycline prescribing patterns and patient outcomes in French ICUs.
METHODS. Data of all adult patients treated with tigecycline alone or in combination for suspected or documented infection in 26 ICUs were collected over 7 days. Response to treatment was classified as cure (no other treatment or surgery), failure (persistent/relapsing infection, infection-related death > 48 h after tigecycline start, discontinuation due to adverse effects), or undetermined (death < 48 h, tigecycline < 4 days due to de-escalation, antibiotics for another infection). We distinguished the less (SOFA ≤ 7) from the most (SOFA > 7) severely ill patients.
RESULTS. 156 patients were included (09–08 to 04–10): 64 % male, age 60 ± 15 years, SAPS II on admission 42 ± 16. At tigecycline start, 45 % had a SOFA > 7 [median 11 (8–24)]; 34 % had fatal underlying disease, 10 % chronic renal failure, 33 % were immunosuppressed and 19 % diabetic. 93 % had received antibiotics in the past 30 days. Tigecycline was given in first-line in 47 % of patients, mostly in combination (67 %), for intra-abdominal (IAI, 56 %), skin and soft tissue (SSTI, 19 %), or other infections (36 %, mainly pulmonary 24 %), and for 10 ± 9 days in average. 84 % of infections were hospital-acquired and 12 % of patients had bacteremia. Tigecycline was stopped prematurely in 52 % of patients, whatever the severity of illness, mainly due to resistant strain (n = 13), clinical failure (n = 14), de-escalation (n = 20), death (n = 14) or new infection (n = 4). Response to treatment is shown in the table. The cure rate was 60 % at the end of treatment and 53 % at 7 days (SSTI 63 %, IAI 54 %, other infections 46 %). Failure at the end of treatment was due to persistent infection (n = 12), infection-related death > 48 h (n = 4) or clinical failure (n = 12), and at day 7 to relapse (n = 32). At both time points, the cure rate was similar with tigecycline alone or in combination; in Gram-positive, Gram-negative and anaerobic infections; and in mono or polymicrobial infections. It was similar in the less and the most severely ill patients at the end of treatment but not 7 days later (Table).
CONCLUSION. In this severe ICU population, the success rates were comparable to those obtained in clinical studies using other antibiotics in ICU. Tigecycline is a valuable alternative for the management of serious infections in ICU.

Response to treatment

	Total (%)	SOFA ≤ 7 (%)	SOFA > 7 (%)	*p* value
At the end of tigecycline	N = 156 (%)	N = 86	N = 70	
Cure	93 (60)	55 (64)	38 (54)	0.079
Failure	28 (18)	17 (20)	11 (16)	
Undetermined	35 (22)	14 (16)	21 (30)	
7 days later (or at discharge)	N = 145	N = 82	N = 63	0.044
Cure	77 (53)	49 (60)	28 (44)	
Failure	32 (22)	19 (23)	13 (21)	
Undetermined	36 (25)	14 (17)	22 (35)	

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0676
COLONIZATION OF INLINE SUCTION CATHETER AT 72 HOURS

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INTRODUCTION. The use of closed multi-use tracheal suction systems in ventilated patients offers a number of possible physiological and microbiological advantages. However, use of these systems has been associated with increased prevalence of tracheal colonization thus, effective self-cleaning mechanisms are necessary. The DAR closed system suction catheter (Covidien AG) claims to have a unique cleaning system to prevent colonization of the suction catheter tip.
OBJECTIVES. Using an in vitro model we assessed the degree of catheter colonization in this multi-use catheter system.
METHODS. Two hundred forty catheters were evenly divided into four groups and challenged with four different pathogens and tested for colonization: *Staphylococcus aureus* (ATCC 6538); *Pseudomonas aeruginosa* (ATCC 9027); *Klebsiella pneumoniae* (ATCC 4352); *Escherichia coli* (ATCC 8739). A sterile mucous stimulant was inoculated with a pathogen and suctioned up (30 cm) into the suction catheter. The catheter was immersed to 50 mm in the mucous stimulant. Mucous stimulant was suctioned 12 times per 24 h period for 3 days after each suction intervention the catheter tip was cleansed according to the instruction for use. At the end of each 24 h period the catheter tip was cultured for remaining pathogens. The results are presented as percentage reduction using the following algorithm R = (A − B)/A × 100, where R is percentage reduction, A is the average viable cells of bacteria in the mucous stimulant and B is viable cells of bacteria on the catheter tip.
RESULTS. The obtained percentage reduction for each pathogen at each time period is presented in Table. The percent reduction represents greater than one Log reduction in each pathogen for the entire test period and indicates that the cleaning system on the test product is effective.

Prcentage reduction

	24 h	48 h	72 h
S. aureus	99.01	98.70	98.47
P. aeruginosa	99.00	97.91	97.67
K. pneumoniae	99.04	99.97	97.24
E. coli	98.02	97.82	97.90

CONCLUSIONS. Based on the results obtained in this in vitro study it is reasonable to assume that the TY-CARE Excel can be used continuous for 72 h. Although the result demonstrated greater than one Log reduction in pathogens after 72 h the study cannot address whether this will prevent colonization of the trachea. Further studies on patients are required to elucidate the results from this in vitro study.
GRANT ACKNOWLEDGMENT. The study was sponsored by Covidien AG.

0677
STREAMLINING OF ANTIBIOTIC THERAPY AND OUTCOME OF ICU PATIENTS

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INTRODUCTION. Streamlining of antibiotic therapy is recommended.
OBJECTIVES. To evaluate the rate of antibiotic change in patients treated in a 26 bed ICU during 2 years (2010–2011) on the third day of treatment and the relationship between appropriate therapy and outcome.

METHODS. All antibiotic treatments were followed and on the third day they were classified according to. 1. Continue the same treatment for a total of 7 or more days; 2. Stop; 3. Short treatment of 5 days; 4. Deescalation; 5. Escalation. In addition treatment could be classified in a sixth category when patients were discharged before the third day and in category seven if patients died within the first 3 days. Mortality of patients across the five first groups was assessed and was correlated to the appropriateness of the treatment. Treatment was deemed appropriate if the documented microorganisms were susceptible to the empirical therapy given on the first day of treatment.
RESULTS. Among 2,513 hospitalized patients, 743 (29.6 %) received 1,046 antibiotic treatments, started either on admission (n = 514, 49.1 %) or during the ICU stay (n = 523, 50.9 %). No infection could be confirmed in 150 cases, 87 were solely based on clinical grounds and 809 (77.3%) were microbiologically documented. Considering the 896 infections episodes, 411 (49.2 %) treatments were continued on day 3 in 326 patients (1), 39 (4.3 %) were stopped in 38 patients (2), 36 (4 %) were given for 5 days in 36 patients (3), 219 (24.4 %) could be deescalated in 203 patients (4), and 133 (14.8 %) were escalated in 127 patients (5). Fifteen patients were discharged alive (6) and 43 other died before day 3 (7). No statistically significant difference in mortality could be observed between patients in whom treatment was continued (20.2 %), stopped (26.3 %), deescalated (20.2 %) or escalated (33 %) (p = 0.1). Among the 809 documented treatments, there were 653 (80.7 %) appropriate treatments and 156 (19.3 %) inappropriate. If only the first episode of infection was taken into account, 102 patients did not receive an appropriate treatment, among whom 27 died (ICU mortality = 26.5 %) and 471 did among whom 103 died (mortality = 21.2 %) The comparison of mortality was not statistically significant (p = 0.361). If patients were separated between those who received for each episode of infection an appropriate treatment (n = 448, mortality 21 %) and those who received at least one time an inappropriate treatment (n = 141, mortality 28.4 %), the comparison did not reach the significance level: p = 0.08.
CONCLUSIONS. Although streamlining of antibiotic therapy has to be recommended, our prospective study did not show a correlation between mortality and appropriateness of antibiotic treatment whether upon the first infectious episode or during the whole ICU stay.

0678
MODIFICATION OF LOCAL ECOLOGY AND GUIDELINES DEVIATION EXPLAIN FAILURE OF EMPIRIC ANTIMICROBIAL THERAPY IN INTRAABDOMINAL INFECTIONS

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INTRODUCTION. An early appropriate empirical antimicrobial therapy is the cornerstone of severe sepsis management. We have shown previously that guidelines deviation explained most of the observed failures in the treatment of ventilator-associated pneumonia (1). Local protocol adherence increases the success of antimicrobial therapy in severe sepsis. However, it seems important to regularly reassess their relevance.
OBJECTIVES. This study evaluated antimicrobial therapy appropriateness in intraabdominal infections in intensive care unit (ICU). Description of the results included the ≪ difficult-to-treat ≫ character of the identified bacteria.
METHODS. Medical charts of patients admitted to our ICU between November 2007 and December 2010 were screened (n = 4,405). During this period of time, 108 patients were admitted for severe intraabdominal infection, including 53 (49 %) for which a microorganism was identified. We retrospectively included these 53 patients in the study and collected demographic, clinical, biological and bacteriological data, as well as the initial antimicrobial therapy and its appropriateness. Our local guidelines during the study period were to administer a combination of piperacillin-tazobactum and aminoglycoside. The observed differences were called statistically significant if the p value was below 0.05. P values were computed with Wilcoxon rank sum test for quantitative parameters [expressed as median (IQR)], and with Fisher exact test for qualitative ones [expressed as absolute count (percentage)]. The *appropriateness* of the antimicrobial therapy was assessed on the resistance profile of the identified pathogens. The ≪ difficult-to-treat ≫ character was defined by a resistance profile of either C3G-R, ESBL, Imipeneme-R for gram negative bacteria, Oxa-R for *Staphylococcus aureus*, and Amox-R for *Entorococcus sp.*
RESULTS. Empirical antimicrobial therapy for intraabdominal infections was appropriate in 33 (62 %) patients. Failures were mostly related to a resistance mechanism (n = 11, 60 %). The empiric antimicrobial therapy failure was increased in the case of ≪ difficult-to-treat ≫ bacteria (77 *vs.* 33 %; $p = 0.009$) and in the cases of non-adherence to our guidelines (77 *vs.* 33 %; $p = 0.009$). The mortality was higher in the case of an inappropriate antimicrobial therapy, but the statistical significance was not reached (30 *vs.* 23 %; $p = 0.75$).
CONCLUSIONS. These data show that, in our local ecology, failures in empirical antimicrobial therapy for intraabdominal infections are related to antibiotic resistance profiles and non-adherence with local guidelines. Our results enhance the need for a regular assessment of the relevance of local protocols. In our local ecology, piperacillin-tazobactum may no longer be recommended as an empirical antibiotherapy.
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0679
MANAGING CONTINUOUS VANCOMYCIN INFUSION

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INTRODUCTION. Continuous infusion of vancomycin has been proposed as a more convenient alternative to intermittent administration as therapeutic ranges can be achieved more rapidly, and continuous infusion may also facilitate dose adjustment and reduce variability in drug concentrations. However, in the critically ill patient vancomycin pharmacodynamics is altered, making the optimal initial dosage difficult to determine and the target levels hard to achieve.
OBJECTIVES. To evaluate the vancomycin prescription patterns during the first 72 h of treatment in a mixed-case ICU.
METHODS. We conducted a retrospective observational study including all patients treated with continuous vancomycin infusion during the year 2011. Exclusion criteria included: duration of treatment inferior to 72 h, administration of vancomycin outside the ICU in the previous 48 h and concurrent use of continuous renal support therapy.
RESULTS. A total of 44 patients met the inclusion criteria; vancomycin use was empirical in 79.6 % (35) of the cases, directed to MRSA in 13.6 % (6), directed to enterococcal infections in 4.5 % (2) and to coagulase negative staphylococcus in 2.3 % (1). The mean duration of therapy was 7.5 days (SD = 4.3). In 43 patients a loading dose was used (mean 14.3 mg/kg; SD = 4.4 mg/kg) and the mean perfusion starting dose was 28.9 mg/kg/day (SD = 6.7 mg/kg/day). The first vancomycin concentration dosing was obtained within 10.5 h (mean) of the loading dose and only in 11.4 % (5) of the patients the concentration was in the 20–25 µg/ml range proposed by our ICU protocol. In spite of insufficient vancomycin concentration on the first dosing present in 35 patients, only in 71.4 % (25) of them the dose was increased. At 24 h after vancomycin initiation 47.7 % (21) of the patients had therapeutic concentrations, while at 48 h 81.8 % (36) of the patients where in the therapeutic range. The loading vancomycin dose, the perfusion dose and the baseline creatinine clearance where not predictors for attainment of therapeutic levels at 24 h ($p > 0.05$), neither were these variables associated with the total time passed until therapeutic vancomycin concentration was obtained.
CONCLUSIONS. This study shows that more than half of the patients had insufficient vancomycin concentration during the first 24 h of therapy. Neither vancomycin doses nor baseline creatinine clearance were associated with the time until therapeutic levels were documented. Study limitations (a retrospective study with small number of patients) could have influenced the data obtained, but we also consider that other variables that were not accounted for, like variations in distribution volume, enlargement of the extracellular space, and significant fluctuations in renal clearance, could be responsible for this results.

0680
PREVALENCE OF ANTIBIOTIC USE AGAINST MULTI-DRUG RESISTANT GRAM-POSITIVES (MDR-GP) IN ICUS IN THE REGION OF MADRID

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INTRODUCTION. The incidence of MDR-GP infections is increasing, particularly in ICUs [1]. Therefore, adequate use of antimicrobials is extremely important. Significant reductions of incidence densities of infections have been reported in Spain associated with the implementation of two prevention projects: "Zero-Bacteremia" and "Zero-Ventilator-associated pneumonia".
OBJECTIVES. To study whether anti-MDR-GP antibiotic use parallels the reported reductions in infections.
METHODS. A comparative one-day point-prevalence multicentre observation of anti-MDR-GP antibiotic use in ICU patients was performed in November 2005 and 2011, respectively, of hospitals located in the region of Madrid. Study variables were type of antimicrobial agent, indication, empiric vs directed and first line vs rescue therapy, and patient demographics. Surgical antibiotic prophylaxis was not considered. Chi-square and t tests, as appropriate, were used for comparison and performed with Stata ver 11™.
RESULTS. The distribution of public hospitals was 69 % in 2005 and 62.3 in 2011, 265 patients admitted in 2005, occupancy rate: 78 %, mean patient/unit: 9.4 (DS 4.2). In 2011:281 patients, mean/unit 7.8 (SD 4.8) (p = 0.164) In 2005, 45 patients (16 %) against GPR and 2011 39 patients (13.8 %) in 20 ICUs (p = 0.405). The drug distribution was in 2005 Linezolid (LNZ) 22 (50 %), vancomycin (VAN) 18 (38.7 %) and Teicoplanin 5 (11.3 %). In 2011 was LNZ 23 (59.5 %); Van 12 (30.9 %); teico 1 (2.35 %), tigecycline 2 (4.74 %) and Daptomycin 1 (2.35 %) (p = 0.234). The most common indication in 2005 was severe sepsis of unknown focus (37 %) and in 2011. pneumonia (41 %). LNZ was more frecuente used in pneumonia (41 %), and in 2011 in (72 % of indications), The second indication was bacteremia in five cases, whose treatment of choice was vancomycin (12 %) patient profile: in 2005, the average APACHE 21 (7), median days of ICU admission to initiation of treatment 18 (8–39), SOFA on onset of AB 8 (6–13). In 2011, the APACHE was 19.6 (8.1), day of ICU admission to initiation of treatment 12 (5–24), and showed a SOFA of 7 (5.5–9).
We found no differences in hospital size distribution. Indications linezolid increased for pneumonia from 41 % in 2005 to 56 % in 2011 ($p < 0.01$) and decreased for bacteremia from 13 to 8.7 % ($p < 0.01$).
CONCLUSIONS. In spite of recent reports on reductions in the incidence of ICU-acquired infection, we did not observe significant decreases in the quantitative use of specific, anti MDR-GP antibiotics. Qualitative differences were found for linezolid, probably reflecting availability of recent new data for this and other antibiotics.
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0681
CHARACTERISTICS OF EXTENDED-SPECTRUM BETA-LACTAMASE (ESBL) PRODUCERS ISOLATED IN A JAPANESE UNIVERSITY HOSPITAL

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INTRODUCTION. The incidence of hospital and community-acquired infection caused by ESBL producing organisms is increasing worldwide. However, the characteristics of these organisms differ in each country and area. Although the detections rate of ESBL producing organism are still low (∼ 5 %) in Japan in comparison to western countries, some studies have reported the spread of ESBL producing bacteria recently in Japan. Knowledge of the local characteristics of these organisms is very important for physicians to administer early appropriate antibiotic treatment.
OBJECTIVES. To investigate the characteristics of ESBL producing *E. coli* in a Japanese university hospital.
METHODS. The study retrospectively examined the incidence of isolation, characteristics of clinical background and antibiotic susceptibility of ESBL producing *E. coli* from 2004 to 2011.
RESULTS. The number of isolates increased from four cases to 71 cases in 7 years. The rate of community-acquired infection (outpatient and inpatient whose isolates were observed within 48 h after admission) tended to increase every year (graph 1). An evaluation of the characteristics of antibiotic susceptibility in this hospital revealed that imipenem/cilastatin (100 %), piperacillin/tazobactum (93.2 %), amikacin (96.6 %), and fosfomycin (86.3 %) had good susceptibility. However levofloxacin demonstrated poor susceptibility (24.7 %; graph 2).
CONCLUSIONS. The isolation of ESBL producing *E. coli* is rapidly increasing in this hospital. The increasing rate of community acquired infection is becoming a serious problem. The poor susceptibility of levofloxacin and high susceptibility of fosfomycin are characteristics of organisms isolated in this institution.

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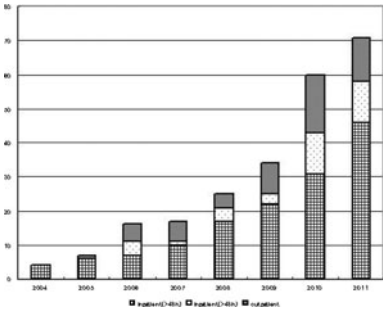
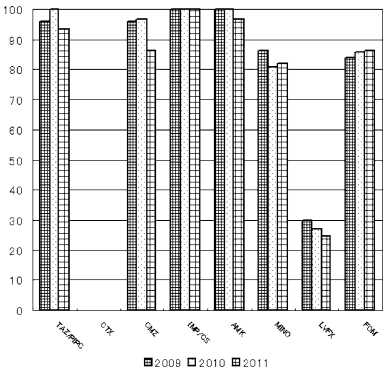
GRANT ACKNOWLEDGMENT. No grant.



Number of isolation of ESBL producing *E. coli*



Susceptibility data of ESBL producing *E. coli*

0682
IMMUNITY IN SEPTIC PATIENTS WITH PNEUMONIA

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INTRODUCTION. Immunity is an important factor in the systemic response during the evolution of septic patients and should respond differently depending on the causative organism.

OBJECTIVE. To study the differences between innate and acquired immunity in septic patients with pulmonary origin by bacterial or viral pneumonia.

METHODS. Prospective observational study. We recruited patients admitted to ICU with a diagnosis of severe sepsis during a period of 6 months (February–July 2011). We studied in the pneumonic subgroup those caused by bacteria and virus. Epidemiological data were collected and also leukocytes, neutrophils, lymphocytes and monocytes' number were determinated, as well as lymphocyte subpopulations and the expression of HLA-DR on CD14+ cells at admission, at 48 h and at discharge from the ICU.

RESULTS. After implementation of the protocol, 52 patients were included, mean age 62 ± 17 years, mortality was 29 %. Apache II was 26 ± 8.6; mean stay in the ICU of 11.6 ± 11 days. The origin of sepsis was abdominal in a 42.3 %, followed by pulmonar (34 %). 18 patients (34 %) with pneumonia, ten were diagnosed of bacterial pneumonia (BN) and four of virus pneumonia (VN). The leukocyte count at admission was 13,761 ± 9,300 in the BN and 15,987 ± 9,500 in the VN; the lymphocytes were 1,007 ± 80 in the BN and 1,255 ± 370 in VN. The CD4 represented 38 % of lymphocytes in the BN and 54 % in VN (P = 0.003); The CD4/CD8 ratio did not change significantly, although it was higher in VN (1.95 ± 1.6/3.2 ± 0.95; ns). The percentage of CD4 cells did not increase significantly at 48 h after admission in patients with BN. The percentage of CD56 was higher in the BN group at admission, with statistical significance (16.5/6 %, P = 0.034) and decreased at 48 h (11.3 %, ns); CD19 lymphocytes showed no differences. The recount and percentage of monocytes did not differ and the expression of HLA-DR was much higher at admission in the VN group (672 ± 789 mean fluorescence intensity (MFI)/ 191 ± 125 MFI), but not statistically significant. These values remained in BN at 48 h, to increase at discharge (329 ± 141 MFI).

CONCLUSIONS. In the BN there is an increase of CD56 cells in compared to VN and an initial decrease of CD4, which disappeared within 48 h. The number of monocytes and its percentage are similar but the expression of HLA-DR is initially the triple in VN.

0683
COST-EFFECTIVENESS ANALYSIS OF IMMUNONUTRITION FOR UPPER GASTROINTESTINAL CANCER PATIENTS UNDERGOING SURGERY IN BRITISH HOSPITALS

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INTRODUCTION. Immunonutrition (IN) containing arginine has been demonstrated to decrease complications as well as length of hospital stay in surgical patients in numerous meta-analyses of randomized clinical trials [2]. Its impact on hospital costs has already been assessed in gastrointestinal (GI) cancer surgery based on Swiss, US, Italian and German hospital costs [3, 1, 4).

OBJECTIVES. The objective of this study is to assess whether IN is a cost-effective option in hospitals of the British National Health System (NHS) for upper GI cancer patients undergoing surgery.

METHODS. A previously developed economic model was used to estimate the cost saving of IN therapy versus patients not receiving IN therapy in patients with upper GI-surgery. The input data in the model were based on the meta-analysis of Cerantola et al. (2011). The proportion of patients with complications in the treated and non-treated arm are expressed in a relative risk [0.69 (95 % CI 0.58–0.83)] and the length of stay (LOS) were derived from this meta-analysis. Two approaches to compute the difference in costs per patient were performed (a) based on cost per day related to the LOS of patients of each group (IN versus control); and (b) based on a weighted average costs of health related groups (HRGs) for patients having GI-surgery with and without complications. In addition for each approach costs, relative risk and LOS have been varied in different scenarios to assess the impact of each variable on the results.

RESULTS. The difference in cost per patient for approach (a) was £ 1,958 to £ 2,586 per patient, depending on the NHS trust or PCT considered. The cost saving for patients treated with IN in approach (b) ranged from £ 665 to £ 879 per patient. When the hospital cost per day recommended by the NICE was used, cost savings with approach (a) ranged from £ 1,585 to £ 2,094. When the baseline complication risk was varied in the approach (b), use of IN pre-operatively remained cost-savings for hospitals with a complication rate as low as 5 %.

CONCLUSIONS. Costs of IN are more than offset by the savings linked to decrease in LOS and to avoided costs of treatment for complications. Thus, as in the US, Switzerland, Italy and Germany, in the NHS hospital setting, IN is an effective and cost-saving nutritional intervention in upper GI surgery.

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Clinical outcome predictors in sepsis: 0684–0697

0684
TIMING OF DECOMPRESSION IN SEVERE ACUTE PANCREATITIS COMBINED WITH ABDOMINAL COMPARTMENT SYNDROME: A MATTER OF LIFE OR DEATH

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INTRODUCTION. A tense abdomen is a common clinical finding in patients with severe acute pancreatitis (SAP). The development of intra abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) has a strong correlation with unfavourable outcomes in SAP patients. Despite that surgical decompression is widely considered as the first choice treatment in SAP patients who develop ACS, the indication and optimal time of decompression remain unknown and no experimental data exists until now.

OBJECTIVES. The aim of this study was to evaluate the effects of different time points for decompression in a 24 h-lasting porcine model.

METHODS. Following baseline measurements, 24 animals were divided into three groups (eight animals each group): one SAP alone group and two SAP + ACS groups which received decompression at 6 h and 12 h, respectively. We used a N_2 pneumoperitoneum to induce ACS and retrograde intra-ductal infusion of sodium taurocholate to induce SAP. Global hemodynamics, systemic oxygenation and serum biochemical parameters of the animals were measured. Histological examination of intestine and lung was performed at the end of observation.

RESULTS. The survival time of the 12 h group was significantly shortened when compared with SAP and 6 h groups (P = 0.008). Decompression performed at 6 h could restore systemic hemodynamic profiles, oxygen-derived parameters, organ function and inflammatory intensity to a level similar to SAP alone group. In contrast, animals with delayed decompression developed more severe hemodynamic and organ dysfunction. The histopathological analyses also revealed higher grade tissue damage of intestine and lung in 12 h group.

CONCLUSIONS. Early decompression in a porcine model of SAP incorporating ACS was associated with significantly reduced mortality, improved systemic hemodynamics, better organ function, alleviated histological injury and inflammatory intensity.

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0685
LACTATE CLEARANCE WITHIN THE FIRST 24 HOURS OF SEPSIS

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INTRODUCTION. Lactate clearance is a prognostic factor in sepsis but the optimal cut off and actions related with the clearance are still not clear.

OBJECTIVES. To determine the prognostic value of lactate clearance in the first 24 h of sepsis and to evaluate the relationship with the surviving sepsis campaign (SSC) bundles.

METHODS. Prospective observational study, from 2006 to 2011, in a polyvalent intensive care unit (ICU) in an academic hospital. We included all the admitted patients with severe sepsis and/or septic shock. We collected epidemiological and clinical data, lactate within the first 6 h of sepsis, 24 h lactate and administrated treatment. Data were analyzed with Chi-square, t test and multivariable logistic regression. Youden test was generated to determine the prognostic cutoff. Results were presented as mean ± standard deviation, percentage or odds ratio (OR).

RESULTS. We included 544 patients, mean age of 66.6 ± 14.8 year-old, APACHE II 18.5 ± 7.8 points and number of organic failure at admission of 1.14 ± 0.97. The origin of the patients was 62.8 % in an emergency department, 29.3 % in a hospital ward and 7.9 % from ICU. The most frequent sepsis sources were: abdominal (37.9 %), respiratory (31.3 %) and urinary tract (17.6 %). In-hospital mortality was 29.8 %. The optimal cutoff for a lower mortality within the first 24 h of sepsis was lactate clearance ≥ 10 %, with a sensitivity of 51 % and a specificity of 71 %. Patients with a lactate clearance ≥ 10 % within the first 24 h have a lower mortality (21.2 % vs 39.1 %; $p < 0.001$) in a univariate analysis. If we adjusted for initial lactate value and severity, lactate clearance ≥ 10 % was independently associated with mortality (OR 0.49; 95 % CI 0.30–0.81; $p < 0.05$). The group with a lactate clearance ≥ 10 % trend towards a better fulfillment of 6 and 24 h bundles of SSC (5.1 vs 2.2 %; $p = 0.12$ and 21.2 vs 19.7 %; $p = 0.68$). We performed a multivariate analysis including some of 6 h bundles (antibiotic treatment, fluid administration, vasopressors and initial lactate value). The fluid administration was associated independently with lactate clearance ≥ 10 % (OR 6.41 CI 95 % 2.01–20.45; $p > 0.05$). No action in 24 h bundles was associated independently with lactate clearance.

CONCLUSIONS. Lactate clearance ≥ 10 % during the first 24 h of sepsis is associated independently with lower mortality. Fluid administration in initial resuscitation was independently associated with lactate clearance ≥ 10 %.

0686
IMPROVED OUTCOME OF SEVERE ACUTE PANCREATITIS IN THE INTENSIVE CARE UNIT

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INTRODUCTION. The incidence of acute pancreatitis has risen over the last three decades [1]. Approximately 25 % of patients with acute pancreatitis develop severe acute pancreatitis (SAP) with associated organ dysfunction and require admission to an intensive care unit (ICU) [2]. SAP is associated with high ICU and hospital mortality [3].

OBJECTIVES. Our aim was to describe the current epidemiology and management of patients with SAP receiving modern critical care and to evaluate the prognostic role of commonly used scoring systems [computed tomography severity index (CTSI), acute physiology and chronic health evaluation (APACHE) II, sequential organ failure assessment (SOFA), and pancreatitis outcome prediction (POP) score].

METHODS. Retrospective analysis of 50 patients with SAP admitted to ICU in a single tertiary care centre in the UK between January 2005 to December 2010.

RESULTS. The most common aetiologies were alcohol (40 %) and gallstones (30 %). On admission to ICU, the median APACHE II score was 12 [interquartile range (IQR) 9–16], median SOFA score five (IQR 3–5), median POP score eight (IQR 5–12) and median CTSI was four (IQR 2–7.5). Median length of stay in ICU and hospital were 13.5 and 30 days, and ICU and hospital mortality were 16 and 20% respectively. Acute kidney injury was significantly more common among hospital non-survivors compared to survivors (100 vs. 42.9 %, $p = 0.0001$). 80 % of patients tolerated enteral nutrition. Empirical antibiotics were administered to 46 % of patients. The median number of CT scans per patient while in ICU was two (IQR 1–4, range 1–14). The APACHE II and POP score were equally predictive of mortality (area under receiver characteristics curve 0.85 and 0.83, respectively). Among hospital survivors, 11 patients (27.5 %) developed insulin dependent diabetes mellitus and two patients (5 %) needed long-term RRT for end-stage renal failure.

CONCLUSIONS. The outcome of patients with SAP in ICU was better than previously reported but associated with a long and resource demanding stay in ICU. Development of AKI was associated with increased mortality. The POP score was not superior to APACHE II in predicting mortality.

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0687
RECTUS ABDOMINIS MUSCLE TISSUE METABOLISM IN PATIENTS WITH INTRA-ABDOMINAL HYPERTENSION

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INTRODUCTION. Increased intra-abdominal pressure (IAP) causes metabolic derangements in rectus abdominis muscle (RAM) of experimental animals [1].

OBJECTIVES. We hypothesised that intra-abdominal hypertension (IAH) is associated with metabolic derangements in RAM of critically ill patients.

METHODS. Adult mechanically ventilated patients with IAP exceeding 12 mmHg for at least 12 h within first 3 days after ICU admission were enrolled. IAP was measured for at least four times daily via urinary catheter. Microdialysis catheters (CMA 60) were inserted into RAM tissue under sedation with ultrasound guidance. Microdialysate perfusion rate was 0.3 ml/min. Samples were collected at 26 time points: hourly (first 8 h), every 2 h (following 8 h) and every 4 h (until 72 h). Samples were analyzed with CMA 600 analyzer. One-way ANOVA combined with post-test for linear trend was used to identify systematic changes of metabolites over the time. Correlation analysis adjustment for repeated observations per individual patient was made [2]. Data are presented as medians with interquartile ranges.

RESULTS. Ten patients [one female, nine males; median age 64.5 (51.5–78.2) years] were studied. Their median APACHE II score was 28.5 (21.2–36.7). Reasons for ICU admission were post-resuscitation state (two cases), gastrointestinal bleeding (two cases), acute pancreatitis, multiple trauma, methanol intoxication, cardiac failure, ruptured abdominal aortic aneurysm, and tetanus. One patient died during observation period, others were discharged from ICU after 11 (7.5–17.5) days in median. Main results are shown in Table 1.

Table 1

	Baseline	72 h	p value
IAP (mmHg)	14.5 (12.5–15.6)	10.5 (8.7–11.5)	$p = 0.0002$
MAP (mmHg)	85 (79–98)	91 (79–97)	$p = 0.04$
APP (mmHg)	64.5 (61–80,5)	78.5 (70.2–102)	$p = 0.03$
RAM lactate (mM)	5.25 (2.8–11.04)	3.78 (3.21–4.35)	$p < 0.0001$
RAM pyruvate (μM)	127 (52–205)	138 (101–197)	$p = 0.47$
RAM glucose(μM)	4.43 (3.15–6.79)	5.39 (2.82–10.38)	$p = 0.09$
RAM glycerol (μM)	248 (168–397)	302 (100–462)	$p = 0.29$
RAM glutamate (μM)	44.3 (26.8–103)	10.4 (5.89–35.2)	$p < 0.0001$
RAM L–P ratio	52.9 (38.6–54.7)	28.9 (19.6–35.5)	$p = 0.04$

RAM tissue glutamate significantly correlated with IAP ($p = 0.021$; $r = 0.244$), while pyruvate and glycerol levels were related to MAP ($p = 0.00026$, $r = -0.268$ and $p = 0.008$, $r = -0.191$) and APP ($p = 0.009$, $r = -0.284$; and $p = 0.026$, $r = -0.235$)

Tissue L–P ratio was not associated with the perfusion indices

CONCLUSIONS. Low APP is associated with unfavourable metabolic changes in RAM tissue of critically ill patients. While in the current patient series no visceral perfusion catastrophes occurred, it is reasonable to speculate that more pronounced intra-abdominal hypertension with associated low perfusion pressure would early on indicate low visceral organ perfusion. This hypothesis warrants further investigation.

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0688
HIGH SENSITIVITY TROPONIN-T AS PROGNOSTIC BIOMARKER AND RELATION WITH MYOCARDIAL DISFUNCTION IN SEVERE SEPSIS AND SEPTIC SHOCK

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INTRODUCTION. Since the end of the 90 s, troponin has been studied as a biomarker in patients with sepsis and it also has been linked to myocardial dysfunction. In 2011, a study [1] was published and pointed possible advantages of the new high sensitivity troponin-T (hs-cTnT) in septic patients.

OBJECTIVES. The primary end-point of this study was to analyze hs-cTnT as a prognostic biomarker for 28-day mortality in septic patients. The secondary end-point was to study the relation between hs-cTnT levels and myocardial dysfunction.

METHODS. Prospective observational study with patients admitted in the ICU and diagnosed of severe sepsis or septic shock. A database was created with clinical and laboratory findings. Microbiological results were collected. Hs-cTnT was analyzed on admission and 72 h later. A transthoracic echocardiography during the first hours after admission could be performed in a subgroup of these patients by the same operator, in order to evaluate sepsis-related myocardial dysfunction. A second independent operator revised them. Continuous variables were expressed as mean (± SD) or median (IQR). Student's t or U of Mann–Whitney or Kruskal–Wallis tests were used for comparisons. Chi-squared or Fisher's exact test's were used for comparisons of categorical data. Statistical significance was established at p value < 0.05. All analyses were conducted by using SPSS® v12.0.

RESULTS. A total of 42 patients were included in the analysis. Clinical data were: men, 64 %. Mean: 61.8 ± 15.9 years. Septic shock was predominant, 69 %. The most frequent infectious focus was abdominal (48 %), followed by respiratory (17 %). Severity scores were: APACHE II: 19.6 ± 7.1; SAPS II: 44.6 ± 16.0 and SOFA: 7.1 ± 3.3. 28-day mortality was 35.7 %, all in the septic shock group. Hs-cTnT levels could be determined in 38 patients at admission and 33 of them after 72 h. Mean initial hs-cTnT was 24.3 ng/L in those who had died versus 16.4 ng/L in survivors ($p = 0.03$). Mean 72 h hs-cTnT was 22.7 ng/L in non survivor patients versus 14.1 ng/L in survivor patients ($p = 0.02$). (Fig. 1). No relationship between myocardial dysfunction and initial hs-cTnT has been found in this study, but a significant hs-cTnT increase after 72 h ($p = 0.03$) (Fig. 2) was observed in all patients with myocardial dysfunction.

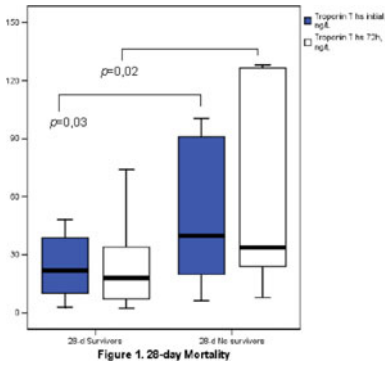
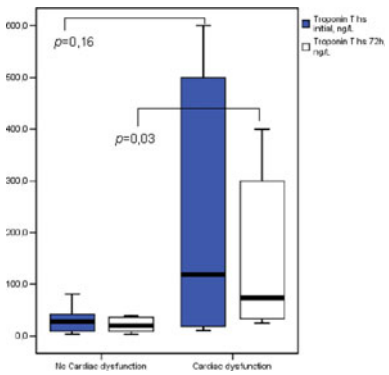


Figure 1. 28-day Mortality

28-Day mortality



Cardiac dysfunction

CONCLUSIONS. Hs-cTnT is likely to be an initial good prognostic biomarker that can predict 28 day-mortality in septic patients. Higher levels were found in dead subjects compared with survivors, both on admission and at 72 h. In this study it seems that there is no relationship between high values of initial hs-cTnT and myocardial dysfunction. However, all patients with myocardial dysfunction showed a significant higher 72 h hs-cTnT level.

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0689

THE PIRO CONCEPT: RESPONSE-ASSOCIATED CONDITIONS FOR COMMUNITY-ACQUIRED SEVERE SEPSIS AND SEPTIC SHOCK RELATED-MORTALITY (RESULTS FROM THE SACIUCI STUDY)

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INTRODUCTION. The PIRO concept proposed a staging system in which factors related to demographic and biological characteristics could be used to stratify patients with sepsis across four domains. It suggested that patients could be graded on the basis of their predisposing conditions (P component), the nature and extent of the insult (infection-I component), the nature and magnitude of the host response (R component), and the degree of organ dysfunction (O component).

OBJECTIVES. To identify response-associated conditions (R component) associated with hospital mortality in ICU patients admitted with community-acquired sepsis.

METHODS. Sepsis, severe sepsis and septic shock patients were systematically selected from the Portuguese ICU-admitted community-acquired sepsis prospective cohort study (SACiUCI). Variables concerning de R component were repeated measures along the first 5 days in ICU and included C-reactive protein (CRP), cardiac rate, leukocytes and neutrophils. The trends of the variables over the 5 days were summarized with the initial value at day 1 and the slope of the tendency, using a linear mixed model (LMM). Afterwards, we used a logistic regression to predict hospital mortality, using as covariates the intercepts (initial values) and slopes obtained in the previous step. CRP, leukocytes and neutrophils had skewed distributions and were transformed comply with the normal assumptions of the LMM.

RESULTS. A total of 891 patients (age 60 ± 17 years, 64 % men, and hospital mortality 38 %) were studied. Response factors (R component) associated with mortality were the slope of CRP (squared root transformed) (OR = 2.3, p = 0.001), initial value of cardiac rate (OR = 1.04, p < 0.001), cardiac rate slope (OR = 1.1, p < 0.001), initial value of log-neutrophils (OR = 0.4, p < 0.001) and log-neutrophils slope (OR = 0.002, p < 0.001). Those variables were found to be the best predictors of death with an AUC-ROC 0.72 and a test of goodness-of-fit (Hosmer and Lemeshow) of p = 0.678.

CONCLUSIONS. This study, based on a large prospective cohort, showed a group of easily identifiable response conditions associated with hospital mortality, in a clinically homogeneous sample that included exclusively patients with community-acquired sepsis. It is important to evaluate these conditions taking into account their evolution over the first days in ICU rather than as isolated measurements in each day. Finally, these findings may add to our knowledge concerning response conditions for sepsis related-mortality, as part of the overall PIRO concept.

0690

OUTCOMES FOLLOWING SEVERE ACUTE PANCREATITIS IN A HPB REFFERAL HOSPITAL ICU

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INTRODUCTION. Pancreatitis carries a high mortality of 11.8 % in the UK and can range from 8–39 % in the presence of necrosis. The current incidence in the UK is 9.8 per 100,000 and increasing [1, 2]. Evidence based recommendations have been published [3] and more recently a study showing promising improvements in outcome for a protocolised stepwise approach to drainage of necrotic pancreatic tissue has been published by the Dutch Pancreatitis Study Group [4]. We present our early outcomes after introduction of such a stepwise approach in a UK setting.

METHODS. Ward watcher and PAS databases were interrogated for all cases admitted with the primary diagnosis coding of acute pancreatitis to the critical care unit between 2008 and 2011. Forty-four case notes were identified. Data was extracted from the case notes, ICE desktop pathology system and the PACS digital imaging systems.

Data collection included demographics, APACHE2 score, organ failures, ICU length of stay (LOS) and ICU mortality. In addition data was collected on interventions to remove pancreatic necrotic tissue.

RESULTS. All data collected on the 44 cases is presented in Tables 1 and 2 below.

Table 1 Patient characteristics and management [*mean (SD)]

Age (years*)	57 (19)
Sex (M/F, %)	15/29 (34%)
APACHE2 score*	18 (8)
Aetiology (n, %)	
Gallstones	19 (42.9)
EtOH	3 (7.2)
Idiopathic	22 (50)
Interventions (n, %)	9 (20.5)
Stepwise percutaneous drainage	6 (13.6%)
Open necrosectomy	3 (6.8%)

Table 2 Outcomes [*median (range)]

Duration Organ support (days)	
Cardiovascular*	1 (0–46)
Ventilation*	1 (0–69)
Renal replacement*	0 (0–8)
Critical care LOS (days*)	4.5 (1–73)
ICU mortality (n, %)	23 (51.2 %)

CONCLUSIONS. Our cohort had a high mortality rate. This is within the range reported in the literature [1, 2, 3] but higher than reported by the Dutch Pancreatitis Group [4]. However our cohort were sicker at admission to ICU with a higher APACHE2 score than reported in the Dutch cohort. Furthermore many were too sick to enable investigations for aetiology and some did not survive to the 3rd week, thus a relatively short critical care LOS, and a low intervention rate.

Following a MDT agreement and formalised protocols to include a stepwise approach we look forward to comparing these outcomes to a future prospective cohort.

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0691

SEARCH FOR THE HOLY GRAIL: TISSUE MARKERS FOR SEPSIS

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BACKGROUND. An ideal tissue marker of perfusion in sepsis remains an elusive goal. Commonly available markers provide an insight in predicting severity in sepsis.

OBJECTIVE. Comparison among various tissue perfusion markers of sepsis in terms of predicting mortality at baseline in these subgroups.

SETTING. A multi disciplinary medical-surgical CCU of a tertiary care unit.

STUDY MODULE. Consecutive patients presenting with sepsis were included. At baseline samples for central venous oxygen saturations ($SCVO_2$), arterial lactate and base excess were drawn. Mortality and discharge from CCU were considered as end points. Data collection was done with focus on demographics, stay in CCU, $SCVO_2$, lactate, base excess values and mortality. ROC curves were drawn for association of mortality with tissue perfusion markers. SPSS version 11 was used for statistical analysis.

RESULTS. Total of one hundred and thirty patients were included (n = 130).Mean age of the cohort was 44.2 ± 12.3 years (range 21–69). Mean SOFA score was 16.3 ± 2.5 (range 12–20). Average $ScVO_2$, lactate and base excess values were 55.9 ± 10.2, 84.2 ± 20.8 and −5.44 ± −2.4, respectively. In hospital mortality was 45.4 % (n = 59).Mean follow up duration was 9 ± 3.4 days. Area under the curve for $ScVO_2$, lactate and base excess was 0.55, 0.76 and 0.88 respectively.

CONCLUSION. In our sepsis cohorts' high negative base excess values at baseline were best in predicting mortality vis-à-vis lactate levels and $SCVO_2$ values. The above results can be better explained if a stewart model is followed. However we need greater number of patients and intervention trials to assess further validation of the above results. Having a better marker would assist us in triage of sepsis patients and targeting our therapeutic interventions accordingly.

0692
THE PROGNOSTIC VALUE OF CENTRAL VENOUS TO ARTERIAL PCO_2-GAP IN PATIENTS ADMITTED TO ICU WITH SEVERE SEPSIS OR SEPTIC SHOCK: TIME DOES MATTER

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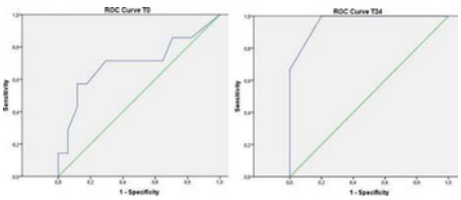
INTRODUCTION. Sepsis and septic shock are major causes of in-hospital mortality. Identification of prognostic and therapeutic targets is therefore of particular importance. In this respect $Scvo_2$ is only of partial value since many septic patients appear to have a saturation above 70 % [1].

OBJECTIVES. To evaluate the prognostic value of the pCO_2-gap, a global index of tissue perfusion, in patients with severe sepsis or septic shock.

METHODS. This post hoc analysis of a prospective observational study was performed on 54 patients, from two Dutch hospitals, with sepsis or septic shock according to international criteria [2]. Arterial and central venous blood samples were collected every 6 h during the first 24 h after admission to the ICU. The relation between an increased pCO_2-gap (>0.8 kPa) and in-hospital mortality was assessed for every time point.

RESULTS. No significant relation between an increased pCO_2-gap and in-hospital mortality was observed at T0. However, a significant relation between an increased pCO_2-gap and in-hospital mortality was found 24 h after ICU admission (T24) ($P = 0.008$, odds ratio = 30).



ROC curves

Figure 1 shows the receiver operating characteristic (ROC) curves representing the reliability of pCO_2-gap at T0 (left) and T24 (right) as predictor for in-hospital mortality. The area under the ROC curve (AUC) is significantly higher for patients with a pCO_2-gap > 0.8 kPa at T24 as compared to patients with a pCO_2-gap > 0.8 kPa at T0 (AUC 0.967 vs. 0.702; $p < 0.001$).

CONCLUSIONS. Persistence of an increased (>0.8 kPa) central venous pCO_2 difference significantly enhances the likelihood of bad outcome.

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0693
PROGNOSTIC VALUE OF INFECTION MARKERS IN SEPTIC PATIENTS ADMITTED TO ICU

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INTRODUCTION. Sepsis, severe sepsis and septic shock are leading causes of morbidity and mortality at the ICU. Prognostic value of several laboratory parameters has been described. An early diagnosis and treatment of sepsis has been shown as a chance to improve outcome.

OBJECTIVES. To describe the clinical characteristics of patients admitted in ICU with sepsis and analyse their relation with laboratory values clearance within the first 24 h of admission.

METHODS. Patients admitted in the ICU with diagnosis of sepsis, severe sepsis and septic shock in 1 year (from May 2009 to May 2010) were included. Age, sex, time of mechanical ventilation, Apache II, SOFA and SAPS II scores on admission were registered. Laboratory variables, such as leukocyte count, platelet count and aPTT ratio were prospectively recorded. Lactates at admission and after 24 h were also recorded. Leukocyte clearance was obtained by the difference between the value at 24 h of ICU stay minus the value on ICU admission. Results were compared according to mortality.

RESULTS. 73 septic patients were enrolled. Five were excluded because they didn't complete 24 h of staying in ICU. Mean age was 63.4 ± 16.2 years, 18 female and 50 male. ICU length of stay was 11.1 ± 8.3 days and the mean APACHE II score was 20.1 ± 10.3. Mean SAPS II score was 60.6 ± 17.7 with mean SOFA score of 7.1 ± 3.4. According to the clinical outcome, we divided the patients in two groups: survivors and non-survivors.

Results

Results	Survivors	Non-survivors
Lactates at admission	1.92 ± 1.71	2.62 ± 2.48
Lactates at 24 h	1.32 ± 0.66	2.17 ± 1.93
HCO3- at admission	24.79 ± 4.39	22.85 ± 6.43
aPTT ratio at admission	1.08 ± 0.31	1.12 ± 0.26
Leukocyte clearance	247 ± 4,716	4,771 ± 17,759
Platelets at admission	223.000 ± 124.000	221.000 ± 164.000

CONCLUSIONS. In our study we found that increased leukocytes clearance and lower lactates (both at admission and 24 h after admission) were associated with a better outcome in septic patients. Bicarbonate, aPTT ratio, as well as platelet count at admission, weren't associated with an increase in survival. Lactate and leucocytes clearance early in the course of ICU admission for sepsis may indicate an improved outcome compared with those with lower clearance of these parameters.

0694
OXYGEN EXTRACTION FRACTION IS ASSOCIATED WITH PROGNOSIS OF PATIENTS WITH SEPTIC SHOCK

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INTRODUCTION. Oxygen extraction fraction (OEF) is an index of the mismatch between oxygen supply and oxygen demand, hence global tissue hypoxia.

OBJECTIVES. The aim of this study was to investigate whether OEF is associated with prognosis of septic shock patients who underwent early goal-directed therapy.

METHODS. This was a retrospective, observational study conducted in an emergency intensive care unit (ICU) of a tertiary referral hospital. We enrolled consecutive septic shock patients who were admitted to the ICU and underwent early goal-directed therapy from January 2010 to December 2011. According to 28-day mortality, enrolled patients were divided into two groups, the survivors and the non-survivors. We collected data with respect to age, gender, infection site, pathogen, underlying diseases, and the Acute Physiology and Chronic Health Evaluation II (APACHE II) score at admission. We also collected data with respect to central venous pressure, mean arterial pressure, serum lactate, hemoglobin, arterial oxygen saturation, and central venous oxygen saturation at admission (0 h) and 6 h after admission (6 h), respectively. Then, we calculated OEF and compared the data between the survivors and the non-survivors.

RESULTS. Among 126 patients, 86 were the survivors and 40 were the non-survivors. In univariate analysis, low APACHE II score, high mean arterial pressure at 6 h, low serum lactate level at 0 and 6 h, high haemoglobin concentration at 0 h, and low OEF were associated with 28-day survival. In multivariate analysis, low APACHE II score [odds ratio (OR) = 0.856, 95 % confidence interval (CI), 0.790–0.929, $p < 0.001$] and low OEF at 6 h [OR = 0.006, 95 % CI, 0.000–0.683, $p = 0.034$] were independently associated with 28-day survival.

CONCLUSIONS. Low oxygen extraction fraction at 6 h after admission was associated with 28-day survival of patients with septic shock who underwent early goal-directed therapy.

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0695
THE PIRO CONCEPT: ORGAN DYSFUNCTION-ASSOCIATED CONDITIONS FOR COMMUNITY-ACQUIRED SEVERE SEPSIS AND SEPTIC SHOCK RELATED-MORTALITY (RESULTS FROM THE SACIUCI STUDY)

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INTRODUCTION. The PIRO concept proposed a staging system in which factors related to demographic and biological characteristics could be used to stratify patients with sepsis across four domains. It suggested that patients could be graded on the basis of their predisposing conditions (P component), the nature and extent of the insult (infection-I component), the nature and magnitude of the host response (R component), and the degree of organ dysfunction (O component).

OBJECTIVES. To identify organ dysfunction (O component) conditions associated with hospital mortality in ICU patients admitted with community-acquired sepsis.

METHODS. Sepsis, severe sepsis and septic shock patients were systematically selected from the Portuguese ICU-admitted community-acquired sepsis prospective cohort study (SACiUCI). Variables concerning de O component were repeated measures along the first 5 days in ICU and included glycemia, serum lactate and SOFA (sepsis-related organ failure assessment) score. The trends of the variables over the 5 days were summarized with the initial value at day 1 and the slope of the tendency, using a linear mixed model (LMM). Afterwards, we used a logistic regression to predict hospital mortality, using as covariates the intercepts (initial values) and slopes obtained in the previous step. Glycemia, serum lactate and SOFA score were skewed distributions and we used transformations of those variables to comply with the normal assumptions of the LMM.

RESULTS. A total of 891 patients (age 60 ± 17 years, 64 % men, and hospital mortality 38 %) were studied. Organ failure factors (O component) associated with mortality were initial value of log-serum lactate ($p < 0.001$), log-serum lactate slope ($p < 0.001$), initial value of square root-SOFA ($p < 0.001$) and square root-SOFA slope ($p < 0.001$). Those variables were found to be the best predictors of death with an AUC-ROC 0.81 and a test of goodness-of-fit (Hosmer and Lemeshow) of $p = 0.588$.

CONCLUSIONS. This study, based on a large prospective cohort, showed a group of easily identifiable organ-dysfunction conditions associated with hospital mortality, in a clinically homogeneous sample that included exclusively patients with community-acquired sepsis. It is important to evaluate the factors associated with organ-dysfunction taking into account their evolution over the first days in ICU rather than as isolated measurements in each day. Finally, these findings may add to our knowledge concerning organ-dysfunction conditions for sepsis related-mortality, as part of the overall PIRO concept.

0696
IMPACT OF FLUID BALANCE IN THE OUTCOME OF SEPTIC CRITICALLY ILL PATIENTS

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INTRODUCTION. Fluid resuscitation to reach hemodynamic stability is an important point in the management of the septic patient. The altered vascular permeability induced by inflammation in these patients can lead to excessive interstitial fluid sequestration, impaired tissue oxygenation and organ failure progression. Recent evidence suggests that, following initial resuscitation, a positive fluid balance may be associated with more days of mechanical ventilation, longer intensive care stay and increased mortality.

OBJECTIVES. To analyze the relationship between fluid balance and outcome of patients admitted to our intensive care unit with the diagnosis of sepsis.
METHODS. All patients with sepsis at admission to our 9-bed mixed intensive care unit (ICU) in a one-year period (May 2009 to May 2010) were retrospectively evaluated. Demographic data, severity scores at admission, length of stay in ICU, duration of mechanical ventilation support, cumulative fluid balance at discharge from ICU, morbidity and mortality were collected. Exclusion criteria were ICU stay < 24 h.
RESULTS. We included 68 patients: 50 males, mean age 63.4 ± 16.2 years, SAPS II 60.7 ± 17.7, APACHE II score 20.1 ± 10.3, SOFA score 7.1 ± 3.4. The main sepsis focus at admission was respiratory ($n = 44$; 64.7 %), intra-abdominal ($n = 19$; 23.5 %), central nervous system ($n = 4$; 5.9 %) and others infection sites ($n = 4$; 5.9 %). The 68 patients studied were divided in two groups: 47 patients were handled with liberal fluid management (LFM group) and presented a positive cumulative fluid balance at ICU discharge and 21 patients with conservative fluid management strategies (CFM) representing a negative or neutral cumulative fluid balance. We found major differences concerning development of ARDS during ICU stay (LFM n = 12; 25.5 % *vs* CFM n = 3; 14.3 %), need of vasopressors support (LFM n = 42; 89.4 % *vs* CFM n = 12; 57.1 %) and mortality in the ICU (LFM n = 26; 55.3 % *vs* CFM n = 1; 4.8 %). We did not found significant differences between the groups regarding length of stay (LFM 10.7 ± 8.8 days; CFM 16.5 ± 4.9 days) or duration of mechanical ventilation (LFM 9.2 ± 8.1 days; CFM 10.2 ± 8.2 days).
CONCLUSIONS. In our study a positive fluid balance during ICU stay was associated with development of ARDS, need of cardiovascular support and was strongly associated with an increased mortality in critically ill septic patients. This data supports that, after the initial resuscitation, fluid overload is associated with higher mortality in septic patients, pointing the need for careful fluid management in critically ill patients, especially in those with the intense inflammatory response seen in sepsis.

0697
MITOCHONDRIAL FUNCTION EVALUATION IN PERIPHERAL BLOOD LYMPHOCYTES AND THEIR RELATION WITH MULTIPLE ORGAN DYSFUNCTION AND OUTCOME IN SEPTIC PATIENTS IN CRITICAL CARE UNITS, MEDELLÍN COLOMBIA

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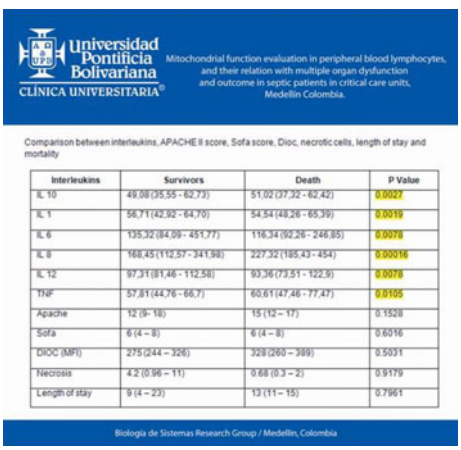
INTRODUCTION. Mitochondria is an organella which creates energy from electrons transported along the mitochondrial complexes and then generates a proton gradient, across the mitochondrial inner membrane, the electrons are channeled to complex IV and then to molecular oxygen which is the final electron acceptor, the energy generated is used to generate ATP. There is a growing evidence showing association between changes in mitochondrial function and development of organ failure in human sepsis [1]. Mitochondrial dysfunction has been closely related with programmed cell death and necrosis.
Lymphocyte function plays a crucial role in sepsis, and in the context of immune response [2] have demonstrated that mitochondrial dysfunction and related necrosis and apoptosis are taking place in peripheral blood lymphocytes(PBL) when necrosis occurs intense inflammatory response take place.
OBJECTIVES. In this study we propose to describe mitochondrial changes in PBL and their impact in severity and outcome in critical care patients with severe sepsis after 24 h of admission and standard therapy.
METHODS. A descriptive and longitudinal case control study was performed, once sepsis severe was confirmed a day after admission and therapy, blood samples were taking to laboratory and flow cytometry, to evaluate cell death after mitochondrial dysfunction which was detected by 3,3′-dihexyloxacarbocyanine iodide (DiOC), and then we evaluate the up going cellular changes and their relation with morbidity and mortality and final outcome, we measure IL1, IL6, IL8, IL10, IL11 and TNF.
RESULTS. 36 patients were evaluated 52.8 were men and 47.2 were women average age was 62 years old, infections more frequently associated were abdominal (36 %) urinary tract infections (32 %) and pneumonia (8 %) we calculated APACHE II mean was 13.89, (SD 5.76 RIQ 9.25–17.00) Median SOFA score was 6.11 (SD 2.6 RIQ 9.25–17.00) Lactic acid levels were 1.1 median (SD 10.8 RIQ 1.2–11.02) cytometric analysis showed 6.7 % of necrotic cells (SD 9.3 RIQ 0.67–10.9) and fluorescein medium index 289 (SD 90.3 RIQ 251.4–341.8) IL6 and IL8 were elevated statistically significant in ill patients against healthy controls ($p < 0.00001$).
Our results show that 31 (86 %) of our patients had mitochondrial dysfunction in PBL, but it was not related with lactate levels, sofa score and mortality. However, we found a statistically significant relation between IL8 levels and mortality.



Mitochodria Dioc mortality

CONCLUSIONS. Mitochondrial failure is common in (PBL) of septic patients but we need to evaluate their impact in cell death mechanism, and its relation with organ failure.
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Electrolytes & trace elements: 0698–0711

0698
THE ASSOCIATION BETWEEN HYPERPHOSPHATEMIA AND MORTALITY IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Although well studied in those with kidney disease, no data are available on hyperphosphatemia and mortality in critically ill patients.
OBJECTIVES. We aimed to study the hypothesis that high PO_4 would be associated with all cause mortality in a heterogeneous critically ill population.
METHODS. We performed a two center observational study of patients treated in medical and surgical intensive care units in Boston, Massachusetts. We studied 16,899 patients, age ≥ 18 years, who received critical care between 1997 and 2007. The exposure of interest was PO_4 at critical care initiation categorized as <3.0 mg/dl, 3.0–4.0 mg/dl, 4.0–4.5 mg/dl, 4.5–5.5 mg/dl, 5.5–6.5 mg/dl and >6.5 mg/dl. The primary outcome was all cause 30-day mortality determined by the US Social Security Administration Death Master File. Unadjusted associations between phosphorus groups and outcomes were estimated by logistic regression analysis. Adjusted odds ratios were estimated by multivariable logistic regression models with inclusion of covariates including age, gender, race, creatinine, calcium, Deyo–Charlson index, patient type, number of organs with failure and sepsis.
RESULTS. 30-day all cause mortality was 13.9 %. PO_4 at critical care initiation is predictive for short term and long term mortality. 30 days following critical care initiation, patients with PO_4 5.5–6.5 mg/dL have an OR for mortality of 3.54 (95 % CI, 2.99–4.20; $P < 0.0001$) and patients with $PO_4 > 6.5$ mg/dL have an OR for mortality of 6.15 (95 % CI, 5.25–7.19; $P < 0.0001$) relative to patients with PO_4 3.0–4.0 mg/dL. PO_4 remains a significant predictor of mortality at 30 days following multivariable adjustment. Patients with PO_4 5.5–6.5 mg/dL have a multivariable OR for mortality of 2.16 (95 % CI, 1.78–2.62; $P < 0.0001$) and patients with $PO_4 > 6.5$ mg/dL have an multivariable OR for mortality of 3.58 (95 % CI, 2.93–4.36; $P < 0.0001$) all relative to patients with PO_4 3.0–4.0 mg/dL. Results were similarly significant for 90 and 365 day mortality as well as in-hospital mortality. Calcium Phosphorus product ($CaxPO_4$) > 55 is associated with an increase in 30 day mortality (OR 4.19; 95 % CI 3.61–4.87; $P < 0.0001$) relative to $CaxPO_4 < 55$. However with adjustment only for phosphorus, the association between Calcium Phosphorus product and 30 day mortality association was eliminated. $PO_4 < 3.0$ mg/dL is not a risk factor for increased mortality relative to PO_4 3.0–4.0 mg/dL. Further, the PO_4-mortality association was not altered in patients with a subsequent decline in PO_4 in the 48 h following critical care initiation.
CONCLUSIONS. In a large population of critically ill adults, an elevated PO_4 level at critical care initiation is a significant predictor of the risk of short and long term all cause patient mortality. Further studies are required to confirm our findings, establish mechanisms underlying these observations and to determine if strategies to lower phosphorus may lead to changes in outcome.

0699
THE ASSOCIATION OF MALNUTRITION AND MORTALITY FOLLOWING CRITICAL ILLNESS: A REGISTRY BASED COHORT STUDY

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INTRODUCTION. Malnutrition is widely implicated as an etiologic factor in a variety of chronic illnesses. Whether malnutrition affects survival following critical care is unknown.
OBJECTIVES. We hypothesized that malnutrition at the time of critical care would be associated with all cause mortality.
METHODS. We performed a two center observational study of patients treated in medical and surgical ICUs in Boston, Massachusetts. All data were obtained from the Research Patient Data Registry at Partners Healthcare. We studied 51,581 patients, age ≥ 18 years, who received critical care between 1997 and 2007. The exposure of interest, malnutrition, was considered to be present if ICD-9 code 260–263.1, 263.8, or 263.9 was assigned to the patient 3 days prior to or up to 7 days after critical care initiation. The primary outcome was all cause 30-day mortality determined by the US Social Security Administration Death Master File. The secondary outcomes were bloodstream infection, as well as 90 and 365 day mortality. Adjusted odds ratios were estimated by multivariable logistic regression models with inclusion of covariate terms thought to plausibly interact with both nutrition status and mortality.
RESULTS. 58.2 % of the cohort was male, 79.6 % was white, 50.5 % were medical patients, 13.6 % were septic. The mean ± SD age was 61.7 ± 18.4. The 30-day mortality rate was 14.2 %. 1,692 cohort patients were diagnosed with malnutrition. Patients with a malnutrition diagnosis have higher odds of mortality 30 days following critical care initiation, (OR 1.54; 95 %CI, 1.36–1.74; $P < 0.0001$) relative to patients without a diagnosis of malnutrition. Following adjustment for age, race, gender, Deyo–Charlson index, and medical vs surgical patient type, the adjusted OR for 30-day mortality was 1.48 (95 % CI 1.31–1.68; $P < 0.0001$) relative to patients without a diagnosis of malnutrition. The multivariable adjusted OR for 90-day mortality was 2.03 (95 % CI, 1.82–2.27; $P < 0.0001$) and the adjusted OR for 365-day mortality was 2.37 (95 % CI, 2.14–2.64; $P < 0.0001$) all relative to patients without a diagnosis of malnutrition. Further adjustment for creatinine, hematocrit and white blood count did not alter the effect sizes or significance of the mortality data. In a subgroup analysis of patients who had blood cultures drawn 48 h prior to or after critical care initiation (n = 18,596), diagnosis of malnutrition was associated with

increased risk of bloodstream infection (adjusted OR for bloodstream infection was 1.47; 95 % CI, 1.25–1.72; $P < 0.0001$ relative to patients without a diagnosis of malnutrition).
CONCLUSIONS. In a large population of critically ill adults, a diagnosis of malnutrition is significantly associated with all-cause patient mortality and the risk of bloodstream infection. Further studies are required to confirm our findings, extend the observations to the severity of malnutrition present, and establish mechanisms underlying these observations.

0700
ACUTE VARIATION OF URINARY PH AND AMMONIUM DURING CONTROLLED HYPO- AND HYPER-VENTILATION: A PRELIMINARY REPORT

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INTRODUCTION. The ability of the kidney to excrete H^+ ions as urinary ammonium ($NH_4^+{}_U$) varies according to physiological needs and alterations of acid–base equilibrium [1, 2]. However, the renal response to respiratory acid–base alterations has been traditionally considered as slow.
OBJECTIVES. To elucidate whether a short-term period of hyper- and hypo-ventilation inducing alterations of plasmatic pH within normal ranges may lead to a rapid modification of urinary pH (pH_U), and concentrations of $NH_4^+{}_U$ and others electrolytes.
METHODS. We enrolled eight patients admitted to a post-operative ICU after major surgery. Patients were connected through their urinary catheter to a urinary analyzer (K.IN.G®—Kidney INstant MonitorinG) [3], allowing quasi-continuous measurements of pH_U, and urinary $NH_4^+{}_U$ concentration. After 30 min, an arterial blood sample was collected, and patients were randomly assigned to either a one-third reduction of their basal minute ventilation (hypo-ventilation, with arterial pH—pHa > 7.40) for 2 h, or a one-third increase of their basal minute ventilation (hyper-ventilation, with pHa < 7.40) for 1 h. Ventilation was then moved back to baseline ventilatory setting, and observation period lasted 4 h. Blood-gases and end-tidal CO_2 ($ETCO_2$) were monitored through the entire study period.
RESULTS. In patients undergoing hypoventilation (n = 4), $ETCO_2$ and $PaCO_2$ progressively increased from 31 ± 3 to 41 ± 3 and from 32 ± 2 to 45 ± 5 mmHg ($p < 0.01$) respectively, while pHa decreased from 7.45 ± 0.01 to 7.35 ± 0.01 ($p < 0.01$). Such variations were paralleled by a slight reduction in pH_U (from 5.6 ± 0.4 to 5.2 ± 0.2) and an increase in $NH_4^+{}_U$ from 4.7 ± 1.6 to 6.1 ± 2.2 mEq/L (p = ns for both). When considering the time difference to achieve the maximal variation, such increase was close to the statistical significance (up to 6.9 ± 2.2 mEq/L, $p = 0.06$). In patients undergoing hyperventilation (n = 4), $ETCO_2$ and $PaCO_2$ progressively decreased from 34 ± 2 to 29 ± 2 and from 40 ± 3 to 32 ± 4 mmHg ($p < 0.01$) respectively, while pHa increased from 7.40 ± 0.03 to 7.47 ± 0.05 ($p < 0.01$). Similarly, pH_U rapidly increased from 5.1 ± 0.1 to 6.0 ± 0.5 ($p = 0.04$), and $NH_4^+{}_U$ decreased (from 10.0 ± 2.9 to 2.9 ± 2.4 mEq/L, $p = 0.02$). Time for achieving maximal $NH_4^+{}_U$ variation was significantly shorter in patients undergoing hyperventilation than in those undergoing hypoventilation (75 ± 10 vs. 150 ± 24 min, $p = 0.03$). Diuresis and hemodynamics remained stable throughout the study.
CONCLUSIONS. Assessing pH_U and $NH_4^+{}_U$ variations may be a non-invasive method to monitor $PaCO_2$ variations during acid–base respiratory alterations.
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0701
IS VITAMIN D DEFICIENCY ASSOCIATED WITH DEVELOPMENT OF ACINETOBACTER BAUMANNII INFECTION IN CRITICALLY ILL PATIENTS?

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INTRODUCTION. Vitamin D deficiency has been increasingly identified in critically ill patients, recently [1]. Afterwards its effects on critically ill patients has become the subject of curiosity.
OBJECTIVES. The aim of the study is to evaluate the relationship between Vitamin D deficiency and nosocomial infections in critically ill patients.
METHODS. We performed a prospective observational study in 201 consecutive patients admitted to the medical intensive care unit of Gazi University Hospital between October 2009 and March 2011. 25-hydroxyvitamin D (25-OH D) levels were measured by radioimmunoassay at admission and deficiency was defined as < 20 ng/ml.
RESULTS. The median serum level of Vitamin D was 14.9 (7.5–26.4) ng/ml in the study population. Of 201 study patients, 139 (69 %) were vitamin D deficient. The APACHE II and SOFA scores were higher in the vitamin D deficient group ($p = 0.008$ and $p = 0.005$, respectively). There were no significant differences between the two groups regarding demographics and the co-morbid conditions. Although the rates of nosocomial infections developed in the ICU were similar in patients with and without vitamin D deficiency ($p = 0.117$), *Acinetobacter baumannii* infections developed more commonly in the deficient group then the sufficient group (25 vs 10 %, $p = 0.012$). The median 25-OH D levels were 11.8 (6.3–17.2) ng/ml and 15.7 (8.1–28.9) ng/ml in patients with and without *A. baumannii* infections, respectively ($p = 0.024$). Analysis by multiple logistic regression demonstrated vitamin D deficiency to be an independent risk factor for development of *A. baumanni* infection ($p = 0.042$), in addition to the invasive mechanical ventilation ($p = 0.001$).
CONCLUSION. Vitamin D deficiency is common in critically ill patients and it seems to be associated with development of *Acinetobacter baumannii* infections.
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0702
RELATIONSHIP BETWEEN ZINC, MAGNESIUM AND SUPEROXIDE DISMUTASE AS ANTIOXIDANT BIOMARKERS IN CRITICALLY ILL PATIENT

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INTRODUCTION. Zn^{2+} deficiency is linked to inflammatory processes mediated by reactive oxygen species that are increased in those lacking circumstances. Measurement and monitoring of Zn^{2+} is important to prevent the development of serious and potentially fatal complications in critically ill patients.
OBJECTIVES. The aim of this study was to define the status of Zn^{2+} in plasma and erythrocytes at admission and 7 days of ICU stay in critically ill patients, and to evaluate its relationship with other antioxidant biomarkers as Mg^{2+} and superoxide dismutase (SOD).
METHODS. A prospective study was done on 63 critically ill consecutive patients with inclusion criteria: ≥ 18 years old, SIRS and APACHE II > 15. Zn^{2+} and Mg^{2+} were measured by flame atomic absorption spectrometry (AAS) in wet-mineralized samples of erythrocyte. Mg^{2+} and Zn^{2+} content in administered nutrition was recorded daily during the 7 days of studied stay, and percentage of RDIs were obtained. SOD activity was measured by spectrometry with an enzymatic method in erythrocytes. Permission was obtained from an institutional ethical committee and written informed consent was asked.
RESULTS. At admission 37.5 and 31.2 % of patients were deficient in erythrocyte Zn^{2+} and Mg^{2+}, respectively, increasing to 48 and 41.8 % at seventh day of ICU stay. There were significant differences between initial and final levels ($p < 0.05$, in both elements). A significant correlation was found between Zn^{2+} administered by nutritional (PE and/or E) treatment (95 % below RDIs) and erythrocyte Zn^{2+} content ($p < 0.05$) at seventh day, and erythrocyte Zn^{2+} level is positively associated with erythrocyte Mg^{2+} level content ($p < 0.02$) and SOD activity ($p < 0.05$) of critically ill patients.
CONCLUSIONS. Adequate intake of Mg^{2+} and Zn^{2+}, and Mg^{2+} and Zn^{2+} levels in erythrocyte are needed to be monitored at admission and during ICU stay of patients and may have prognostic, and perhaps therapeutic, implications. Development of Mg^{2+} and Zn^{2+} deficiencies during an ICU stay may be associated with different metabolic and clinical alterations that are attributed to other causes or are unknown, but complicate evolution of critically ill patient.
REFERENCES. Enteral nutrition, biomarkers, research, inflammation—multiple organ failure.

0703
CHANGES ON SELENIUM BIOMARKERS IN CRITICAL CARE PATIENTS DURING ICU STAY

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INTRODUCTION. Deficient status in selenium, a cofactor of the antioxidant enzyme glutathione peroxidase (GPx), together with hypercatabolic state, can affect the clinical course during the patient's stay in the intensive care unit (ICU). The resulting increase in oxidative stress has been recognized as a central mechanism in the pathophysiology of critical illnesses, particularly the appearance of multiorgan failure.
OBJECTIVES. Demonstrate that selenium deficiency can affect the clinical course during the patient's stay in the intensive care unit (ICU).
METHODS. A blood sample was obtained on the day of admission in the ICU from 65 critically ill patients in Granada province (southern Spain) who fulfilled the inclusion criteria, i.e., presence of systemic inflammatory response syndrome (SIRS) and APACHE score > 15 (among others). Plasma concentration of selenium and erythrocyte concentration of GPx enzyme were determined. Selenium was measured with inductively coupled plasma mass spectrometry (ICP-MS). GPx was measured indirectly as enzyme activity (reduction of organic peroxides by c-GPx), and selenoprotein P was measured by SEPP1 enzyme-linked immunoassay.
RESULTS. On admission to the ICU, GPx enzyme activity was below the reference value (<5.6 U/mL) in 86.5 % of the patients, and this proportion had decreased significantly to 60 % ($p < 0.05$) by day seven of their ICU stay. Normal activity levels were not seen in any of the patients (>24 U/mL). Mean plasma concentration of selenium was 56 ± 12.9 μg/dL, and on the day of admission 67.7 % of the patients were selenium deficient. By day seven of their ICU stay this proportion had increased significantly to 100 % ($p < 0.05$). Below-normal values of SEPP1 (<3.43 μg/L) were found in 77.3 % of the patients on the day of admission, and this proportion had increased to 100 % by the end of their ICU stay.
CONCLUSIONS. During their ICU stay, antioxidant GPx enzyme activity increased and plasma concentration of selenium decreased in the patients we studied. This selenium deficiency can lead to increased stress and increased demands on endogenous antioxidant synthesis. This in turn can exhaust the available plasma stores of this trace element that patients depend on during their stay in the ICU. In patients admitted to the ICU, selenium intake should be monitored in order to ensure optimum antioxidant response and palliate the adverse effects of this nutritional deficiency.
REFERENCES. Selenium, biomarkers, inflamatory.

0704
PROGNOSTIC CONSEQUENCES OF BORDERLINE DYSNATREMIA: PAY ATTENTION TO MINIMAL SERUM SODIUM CHANGE

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INTRODUCTION. Abnormal serum sodium concentrations are known to adversely affect physiologic function. Moderate to severe dysnatremia has been associated with adverse

outcome [1]. Doubts exist however regarding prognostic impact of minimal changes in serum sodium concentration.
OBJECTIVES. To assess the prevalence of dysnatremia, including minimal changes in serum sodium concentration and to estimate its prognostic impact.
METHODS. Observational study performed on a prospective database fed by 13 intensive care units. Unselected patients with ICU stay longer than 24 h were enrolled over a 14-year period. Definitions: 1. Borderline hyponatremia and hypernatremia were defined as serum sodium concentration between 135 and 137 mmol/L or 143 and 145 respectively. 2. Mild, moderate and severe hyponatremia were defined as serum sodium concentration <135, <130 and <125 mmol/L respectively. 3. Mild, moderate and severe hypernatremia were defined as serum sodium concentration >145, >150 and >155 mmol/L respectively. Prognostic impact of dysnatremia was assessed using a Fine and Gray subdistribution hazard regression model [2].
RESULTS. 11,125 patients were included in this study. Among these patients, 3,047 (27.4 %) had mild to severe hyponatremia at ICU admission, 2,258 (20.3 %) had borderline hyponatremia at ICU admission, 1,078 (9.7 %) had borderline hypernatremia and 877 (7.9 %) had mild to severe hypernatremia. After adjustment for confounder, both moderate and severe hyponatremia (sHR 1.82, 95 % CI 1.002–1.395 and 1.27, 95 % CI 1.01–1.60 respectively) were associated with day-28 mortality. Similarly, mild, moderate and severe hypernatremia (sHR 1.34, 95 % CI 1.14–1.57; 1.51, 95 % CI 1.15–1.99; and 2.64, 95 % CI 2.00–3.81 respectively) were independently associated with day-28 mortality. Other variables independently associated with day-28 mortality in this model were an underlying cardiac dysfunction (sHR 1.26, 95 % CI 1.13–1.41), underlying immunodepression (sHR 1.30, 95 % CI 1.17–1.45), age > 64 years (sHR 1.56, 95 % CI 1.43–1.71), severity assessed by SOFA score (sHR per point 1.21, 95 % CI 1.20–1.23), and decision to forgo life sustaining therapies (sHR 3.24, 95 % CI 2.90–3.62). In this model, ICU admission for intoxication protects from mortality (sHR 0.21, 95 % CI 0.13–0.34).
CONCLUSIONS. One-third of critically ill patients had a mild to moderate dysnatremia at ICU admission. Dysnatremia, including mild changes in serum sodium concentration, is an independent risk factor for hospital mortality and should not be neglected.
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0705
ASSOCIATION OF VITAMIN D DEFICIENCY AND THE DEVELOPMENT OF SEPSIS: A REGISTRY BASED COHORT STUDY

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INTRODUCTION. Studies provide evidence for vitamin D as a promoter of innate immunity. Vitamin D deficiency is associated with bloodstream infection risk in the critically ill.
OBJECTIVES. We hypothesized that deficiency in 25-hydroxy vitamin D (25(OH)D) would be associated with sepsis in the critically ill.
METHODS. We performed a two center observational study of patients treated in medical and surgical intensive care units in Boston, Massachusetts. All data was obtained from the Research Patient Data Registry at Partners HealthCare. We studied 2,399 patients, age ≥ 18 years, who received critical care between 1998 and 2009. The exposure of interest was serum 25(OH)D measured 7 to 365 days prior to hospital admission and categorized as deficiency in 25(OH)D (≤ 15 ng/mL), insufficiency (16–29 ng/mL) and sufficiency (≥ 30 ng/mL). The primary outcome was sepsis defined by ICD-9-CM codes 038.0–038.9, 020.0, 790.7, 117.9, 112.5, or 112.81 assigned 3 days before to 7 days after critical care initiation. To validate the accuracy of ICD-9 sepsis assignment, 297 cohort patient charts were evaluated for the presence of sepsis defined by the 2001 SCCM/ESICM, ACCP, ATS, SIS consensus guidelines, 3 days prior to critical care initiation to 7 days after critical care initiation. Charts were sampled by an investigator blinded to the exposure of interest and outcome. 30-day mortality as a secondary outcome was determined by the US Social Security Administration Death Master File. Adjusted odds ratios were estimated by multivariable logistic regression models with inclusion of covariate terms thought to plausibly interact with both vitamin D levels and sepsis.
RESULTS. Pre-admission 25(OH)D deficiency is predictive for sepsis. Patients with 25(OH)D deficiency have an Odds Ratio (OR) for the risk of sepsis of 1.81 (95 % CI 1.42–2.30; $P < 0.0001$) relative to patients with 25(OH)D sufficiency. 25(OH)D deficiency remains a significant predictor the risk of sepsis following multivariable adjustment for age, gender, race, Deyo–Charlson index, and surgical versus medical patient type (OR 1.72; 95 % CI, 1.35–2.20; $P < 0.0001$). Patients with 25(OH)D insufficiency have an OR for the risk of sepsis of 1.30 (95 % CI, 1.03–1.63; $P = 0.03$) and an adjusted OR of 1.28 (95 % CI, 1.02–1.61; $P = 0.04$) all relative to patients with 25(OH)D sufficiency. Further, septic patients with 25(OH)D deficiency have an adjusted OR for the risk of 30-day mortality of 1.72 (95 % CI, 1.06–2.78; $P = 0.03$) relative to septic patients with 25(OH)D sufficiency. Validation of ICD-9 sepsis assignment for consensus guidelines defined sepsis showed that ICD-9 sepsis assignment had a sensitivity of 94.4 %, specificity of 67.0 %, a positive predictive value of 83.5 % and a negative predictive value of 87.1 % for the consensus definition for sepsis.
CONCLUSIONS. Deficiency of 25(OH)D is a significant predictor of the risk of sepsis and mortality associated with sepsis in a critically ill patient population.

0706
INCIDENCE AND CLINICAL CONSEQUENCES OF ACUTE TUMOR LYSIS SYNDROME IN HIGH RISKS HEMATOLOGICAL MALIGNANCY AT THE ERA OF URATE OXIDASE: RESULTS OF A MULTICENTER COHORT STUDY

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INTRODUCTION. Tumor lysis syndrome (TLS) caused by the destruction of malignant cells leads to metabolic abnormalities, which may either remain isolated (laboratory ATLS) or lead to organ dysfunction (clinical ATLS). No study was specifically designed to evaluate incidence and clinical outcomes in patients admitted with high TLS risk malignancy.
OBJECTIVES. To evaluate incidence and clinical outcomes in patients admitted with high TLS risk malignancy.
METHODS. Prospective multicenter cohort study performed in 14 hospitals. Consecutive adult patients with malignancies at high risk of TLS were included. TLS was defined according to the Bishop and Cairo criterion [1]. Acute kidney injury was defined according to the AKIN definition [2].
Results are reported as medians (interquartile range, IQR) or numbers (%). Conditional logistic regression analyses were performed to identify variables significantly associated with occurrence of a clinical TLS, AKI and 3-month mortality, as measured by the estimated odds ratio (OR) with the 95 % confidence interval (95 % CI).
RESULTS. 153 patients [median age 54 (38–66)] were included in this study. Underlying malignancy was an acute leukemia 89 patients (58 %), high-grade non-Hodgkin's lymphoma in 45 patients (29.5 %) and Burkitt's leukemia/lymphoma in 19 patients (12.5 %). Of the 153 patients, 17 (11.1 %) had laboratory TLS and 30 (19.6 %) clinical TLS. Clinical manifestation of TLS was acute kidney injury (AKI) in every of the patients. Four patients developed neurological manifestations of their TLS. After adjustment for confounders, phosphates at admission [OR per mmol/L 5.3 (95 % CI 1.5–18.3)], LDH [OR per x N 1.1 (95 %CI 1.005-1.25)] and DIC [OR 4.1 (95 % CI 1.4–12.3)] were associated with clinical TLS.TLS was not associated with day 90 mortality (20 % in patients without TLS vs. 36 % in patients with TLS; $P = 0.052$). Only TLS was however retained as risk factors for day 90 mortality after adjustment for confounder [OR 2.45 (95 % CI 1.09–5.50); $P = 0.03$].
CONCLUSIONS. Our study clarifies the incidence of TLS in patients with hematological malignancy considered to be at high risk of TLS. In this population of patients, one-third of the patients will develop TLS and one-fifth clinical TLS. Our study confirms that TLS is an independent risk factor of AKI in this population of patients and is likely to be associated with day 90 mortality.
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0707
THE EFFECT OF HIGH DOSE OF ZINC AND SELENIUM ON SERUM LEVELS OF INTERLEUKIN-2 AND T-LYMPHOCYTE IN SURGICAL CANCER PATIENTS

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INTRODUCTION. The Trace elements Zinc and Selenium are important for the immune system function. The daily requirements of Zinc and Selenium are based on the requirements of healthy individuals. It is not clear, how recommended daily allowance values, should be applied to cancer patients especially post-operative patients as Cancer patients are one of groups at risk of Zinc and Selenium deficiency. The most prevalent causes of Zinc and Selenium deficiency in GIT cancer is malnutrition and inadequate intake.
OBJECTIVES. The aim of the study was to evaluate the effect of high dose of Zinc and Selenium on the immune system in surgical patients with GIT cancer.
METHODS. The study was carried out in SICU at NCI Cairo. It was carried out on 30 admitted to the SICU following GIT cancer surgery. The patients were assigned to one of two groups: (C) Control group 15 patients: received a standard amount of Zinc and Selenium and (ZS) group 15 patients: received higher dose of Zinc (20 mg/day) and Selenium (100 μg/day) for 7 days. In all patients, nutritional support was administered entral, parenteral or combined according to our protocol. Zinc and Selenium were given as a separate infusion in normal saline over 12 h. Serum levels of zinc and selenium, Interlekin-2 and total lymphocyte count and T-lymphocyte were measured at day zero and day eight.
RESULTS. There was no significant difference in demographic data between (C) and (ZS) groups. At day zero, both levels of zinc and selenium were below the lower value of the reference range and no significant difference was found between both groups in serum levels of zinc (56.7 ± 1.85 and 58.86 ± 1.82 respectively, $p = 0.0728$) or in serum levels of selenium (46.49 ± 2.6 and 54.86 ± 3.1 respectively, $p = 0.072$). At day eight the difference between the two groups in serum levels of zinc was highly significant (77.23 ± 2.01, 114.96 ± 3.03 respectively, $p < 0.001$) and also in serum levels of selenium (71.16 ± 2.9 and 134.56 ± 4.26 respectively, $p < 0.001$). At day zero, no significant difference was noted in the mean serum levels of interleukin-2(pg/ml) between (C) and (ZS) group, (793 ± 81.6 and 802 ± 84.1 $p = 0.805$) but the difference was highly significant at the 8th day of the study ($1{,}355.66 \pm 115$ and $3{,}019.5 \pm 312$ $p < 0.001$). At day zero both groups did not have significant difference in the count of the total lymphocytes, T helper (CD4) or (CD8) cells or CD 4/8 ratio the difference was highly significant in total lymphocytes ($\times 10^9$/L) (1.99 ± 0.147 and 3.83 ± 0.408, $p < 0.001$), in CD 4 % (47.7 ± 1.78 and 61.23 ± 2.94, $p < 0.001$) and in CD 8 % (24.46 ± 1.33 and 21.43 ± 1.135, $p < 0.01$) at the 8th day of the study.
CONCLUSIONS. Our data suggest that. 1. There is Zinc and Selenium deficiency in GIT cancer patients. 2. High doses of Zinc and Selenium can modulate biomarkers of immune system in these patients.
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0708
ELECTROLYTE SUPPLEMENTATION IN CRITICALLY ILL ADULTS: ARE WE KEEPING UP?

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INTRODUCTION. During critical illness electrolyte imbalances are common and may be associated with increased morbidity and mortality [1, 2, 3]. Although frequently performed, the role of electrolyte supplementation in critical care patients remains controversial [4].
OBJECTIVES. We investigated correlations between specific electrolyte abnormalities and the efficacy of electrolyte supplementation.
METHODS. Daily measurements of serum potassium (K^+), magnesium (Mg^{++}), inorganic phosphate ($PO4^{3-}$) and calcium (ca^{++}) over 3 days post admission (D1–3) were recorded retrospectively in 75 patients requiring intensive care. Total oral and parenteral electrolyte supplementation was noted. Replacement of electrolytes was performed when $K^+ < 3.5$ mmol/l, $PO4^{3-} < 0.7$ mmol/l, $Mg^{++} < 0.75$ mmo/l, or $Ca^{++} < 2.2$ mmol/l. We analysed patients with persistent electrolyte derangements at D3 to compare the total amount of Ca^{++}, Mg^{++}, K^+ and $PO4^{3-}$ given.

Statistical analysis was performed using the Kruskal–Wallis test and Spearman correlation (r). Data are presented as median and interquartile range (IQR).
RESULTS. 75 patients were eligible for inclusion (median age 62 years (IQR 49–76), APACHE II score 17 (IQR 13–23).
Hypocalcaemia was the most common electrolyte disturbance (49 % of patients). Following treatment serum Ca^{++} was normal in 58 % of patients. There was no difference in the amount of calcium given in patients who normalized their calcium and those who failed to do so at day three.
Hypokalemia, hypophosphatemia and hypomagnesemia were seen in 14, 16 and 47 % of the cohort, respectively. Mg^{++} normalized in 75 % of patients. There was a positive correlation between hypokalemia and hypophosphatemia ($r = 0.424$, $p < 0.0001$). However, while most patients (97.2 %) normalized their serum potassium by D3, the rate of hypophosphatemia increased (30 %). Despite supplementation, there was a significant decrease in $PO4^{3-}$ from admission until D3 ($p < 0.001$), although patients who were hypophosphatemic received more $PO4^{3-}$ in total [23.59 mmol/l, IQR (0;35.88)] than patients in whom $PO4^{3-}$ normalized [3.93 mmol, IQR (0;21.58)].
CONCLUSIONS. While serum potassium normalized in nearly all patients, hypophosphatemia was refractory to treatment in many patients. Our findings suggest that phosphate levels may be more difficult to correct than potassium and calcium levels. More frequent analysis and/or individually tailored replacement strategies may ensure correction of these electrolyte derangements within 3 days after ITU admission.
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0709
HYPOPHOSPHATAEMIA: AN UNDERESTIMATED COMPLICATION IN TREATMENT OF SEVERE DIABETIC KETOACIDOSIS

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INTRODUCTION. Hypophosphatemia is commonly present during therapy of severe diabetic ketoacidosis, but it is rarely associated with substantial clinical manifestations. Complications of severe hypophosphatemia include weakness, confusion, changes of the state of consciousness, muscle fatigue and subsequent respiratory failure and haemodynamic instability.
OBJECTIVES. The aim of this prospective clinical study was to evaluate the presence of hypophosphatemia in patients treated for severe diabetic ketoacidosis and to compare their metabolic status with specific clinical manifestation.
METHODS. Patients with severe hypophosphatemia during treatment of severe diabetic ketoacidosis (DKA) were monitored within a period of 48 h after admission. Following parameters were evaluated at times 0, 12, 24, and 48 h: pH, bicarbonate, glycaemia, potassium (K), phosphate (P), CRP, and urinary ketones, as well as the clinical status. Simultaneously, cumulative doses of insulin, energy, fluids, K, and P were summarized.
RESULTS. Out of 597 patients admitted to the medical ICU between January 1, and December 31, 2011, 17 patients had a diagnosis of severe diabetic ketoacidosis (2.84 %), while eight patients from this group (47 %) had evidence of severe hypophosphatemia (less than 0.3 mmol/L) during the treatment. Out of these, two patients revealed clinical symptomatology which required temporary ventilatory support. The total dosage of insulin within the first 24 h was significantly lower in these patients (60 IU) in comparison to the mean value of the whole study group (163 IU). Furthermore, only 200 kcal were delivered to these patients within the first 24 h (compared to 1,956 kcal), 4,050 ml fluids (6,437 ml), 60 mmol K (108 mmol), and 0 mmol P (49 mmol). The clinical symptomatology resumed completely in all patients within the next 24 h after supplementation of fluid, energy, K, and P.
CONCLUSIONS. Although phosphate supplementation is not routinely recommended during treatment of diabetic ketoacidosis, we should be aware of potential clinical manifestations of hypophosphatemia. Therefore, monitoring of serum phosphate level and its repletion if necessary should be considered. Delivery of insulin, energy, and potassium is essential.
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0710
ABNORMAL POTASSIUM LEVELS IN ICU PATIENTS: RELATION WITH OUTCOME

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INTRODUCTION. The dangers of hypokalemia and hyperkalemia are universally known. In various patient populations a relation between elevated potassium levels and outcome has been observed. However, systematic studies have not been performed in critical care.
OBJECTIVE. To assess the role of potassium derangements in ICU patients in relation with outcome.
METHODS. We analyzed a 10-year cohort of all patients of 15 years and older who were admitted to our regional intensive care unit (ICU) that includes surgical units and a medical unit. All potassium levels (reference range 3.5–5.0 mmol/L) determined during the first 7 days of ICU-admission were included. In case of multiple hospital and ICU-admissions, only the last admission of the patient was analyzed. The authenticity of all severe hypokalemia's and hyperkalemia's were separately verified by examination of patient files. Hospital mortality was used as outcome measure.
RESULTS. 256,410 potassium in 22,349 patients (62 % males, mean age 60 years) with a hospital mortality of 14 % were evaluated. 5.3 % of the potassium measurements in 20 % of the patients were < 3.5 mmol/L and 6.6 % of the measurements in 18 % of the patients were >5 mmol/L. 57 % of the hypokalemia's and 50 % of the hyperkalemia's occurred on the first ICU-day. When mortality was determined as a function of the minimal and maximal potassium values, a U-shaped curve was observed with a mortality that was steady at 12 % between 3.7 and 4.7 mmol/L. Mortality rose to 20 % at the left side of the U-curve at a potassium level of 3.3 mmol/L and to 20 % at the right side of the curve at a potassium level of 5.1 mmol/L, with further increases in mortality at both extremes of this curve.
CONCLUSIONS. Analogous to glucose levels, mildly abnormal levels and levels within but at the extremes of the reference range were associated with increased mortality. This association may result from related prognosticators such as renal function. If there would be a survival benefit in regulating potassium levels within a more stringent range is not known.

0711
THE INFLUENCE OF TWO POTASSIUM TARGET LEVELS ON THE FLUID BALANCE IN CRITICALLY ILL PATIENTS

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INTRODUCTION. In critically ill patients, the fluid balance is frequently severely disturbed. Sodium and potassium are the key electrolytes of the extracellular and intracellular compartments respectively. But while there is an abundance of literature considering the administration of sodium containing i.v. fluids and fluid balance, hardly any data can be found on potassium in this respect.
OBJECTIVES. To determine the relation of the potassium target and the fluid balance in critically ill patients during intensive care admission.
METHODS. This concerns a predefined substudy of the GRIP-COMPASS trail[1], which compared the effect of two different potassium targets on the incidence of supraventricular arrhythmias in 1,200 patients admitted to the thoracic ICU. Potassium levels were regulated with the nurse-centered computerized decision support system called GRIP-II[2]. In the low-normal potassium group (LNP), the target value was 4.0 mmol, in the high-normal potassium group (HNP) this was 4.5 mmol/l. This sub-study included all patients who were admitted for at least 5 days. Fluid balances were calculated for each calendar day (00:00–23:55), starting at the first day after the admission day (day zero). All laboratory measurements were performed as a part of standard care and were retrieved from the hospital information system. Primary endpoint was the overall fluid balance during ICU admission.
RESULTS. A total of 120 patients with altogether 2,203 admission days (61 patients in the LNP-group and 59 in the HNP-group) were included. The mean potassium value was 4.27 ± 0.31 mmol/l in the NLP-group and 4.48 ± 0.34 mmol/l for the HNP-group ($P < 0.001$). The median fluid balance over the total length of stay did not differ between the two groups (NLP is 512 ml, NHP = 624 ml). Figure 1 demonstrates the fluid balance during the first 5 days of admission at the ICU of the two groups. On the second day, the NLP group had a significantly higher fluid balance than the NHP group. On the other days there was no significant difference.
CONCLUSIONS. Two different potassium target levels within the normal range did not result in a difference in the overall fluid balance in critically ill patients. This indicates that even in critically ill patients the intracellular compartment is relatively inelastic with regard to potassium administration.
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Ventilatory support 1: 0712–0725

0712
INTRA-THORACIC PRESSURE DISTRIBUTION DURING MECHANICAL VENTILATION: INFLUENCE OF TIDAL VOLUME AND THORACIC COMPLIANCE

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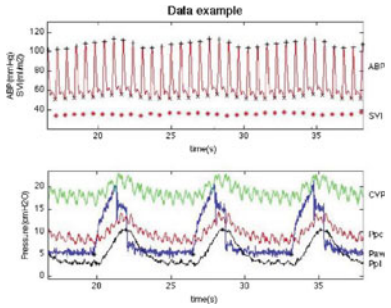
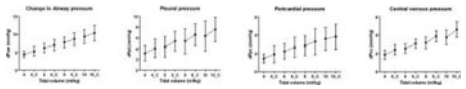
INTRODUCTION. In mechanically ventilated patients, the intermittent positive pressure causes the intra-thoracic pressure to increase periodically and thereby continuously influences the circulation. The resulting variations in arterial waveform, quantified by pulse pressure variation (PPV), systolic pressure variation (SPV) or stroke volume variation (SVV), are more pronounced when the heart operates on the steep portion of the Frank-Starling curve and can therefore be used to predict volume responsiveness.
OBJECTIVES. The aim of the present study was to provide insight in the way the ventilatory pressures are being distributed within the thorax and how they influence the circulation in humans during various levels of tidal volume (TV) and chest compliance.
METHODS. Following informed consent, small non-compliant balloon-catheters were positioned in the pleural and pericardial cavity during surgery in 20 patients scheduled for elective coronary artery bypass grafting. Pressure monitoring included intra-arterial (IAP), central venous (CVP), airway (Paw), pericardial (Ppc) and pleural pressure (Ppl). Data recording was performed during controlled ventilation (PRVC) at TV's of 4, 6, 8 and 10 mL/kg with normal and decreased chest compliance (by an elastic band). From the IAP-signal, the PPV and SPV were calculated and SVI and SVV were monitored using PiCCO.
RESULTS. Figure 1 shows a representative sample. Due to the increased TV (from 4 to 10 mL/kg) and decreased chest compliance (15 ± 5 %), ΔPaw (peak pressure-PEEP), ΔPpl, ΔPpc and ΔCVD increased significantly (Fig. 2). The mean percentage of airway pressure that was transmitted to the pleura, pericard and CVP was 70 ± 18, 38 ± 14 and 43 ± 10 %, respectively. Dynamic indices changed from 3 ± 2 to 14 ± 7, 2 ± 1 to 10 ± 4 and 7 ± 4 to 17 ± 6 % for PPV, SPV and SVV, respectively.
CONCLUSIONS. Tidal volume and chest compliance both have a important impact on the way the airway pressure is distributed within the thorax and influences the circulation. This data can be used to correct the threshold values of dynamic indices for patient specific parameters like tidal volume and chest compliance to improve the prediction of fluid responsiveness.



Data example figure 1



Data example figure 2

0713
OUTCOMES OF PATIENTS RECEIVING INVASIVE MECHANICAL VENTILATION REFERRED TO A NATIONAL WEANING UNIT IN THE UK

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INTRODUCTION. Regional weaning centres provide cost effective care for patients who have undergone prolonged mechanical ventilation [1]. We report the experience of a UK tertiary weaning centre.

OBJECTIVES. To investigate the outcomes of patients receiving invasive mechanical ventilation (IMV) referred to a national weaning unit.

METHODS. Patients receiving IMV referred from intensive care units between January 1992 and August 2010 were identified. Underlying diagnosis, number successfully weaned from IMV, length of stay and long term survival were investigated.

RESULTS. A total of 431 patients were identified who had been ventilated for a mean duration of 44 days before transfer. Mean age was 58 years (SD 15.65), there were 238 males. Diagnostic groups were: Respiratory 164 (38.1 %), neuromuscular/chest wall deformity 198 (46.0 %), post operative patients 53 (12.3 %) and others 16 (3.6 %). The mean Apache II score (available in 159 of the patients) was 23.7 (SD 8.9).

403 patients survived to discharge, mean length of stay on the weaning unit was 36 days. A total of 315 patients (73 %) were successfully weaned (i.e. discharged without IMV). A higher proportion of respiratory patients (81.8 %) were successfully weaned compared to non-respiratory patients (67.8 %).

Of those patients successfully weaned from IMV, 176 (55.9 %) were discharged with nocturnal non-invasive ventilation. A higher proportion of respiratory patients (41.5 %) and those with neuromuscular diseases/chest wall deformities (47.4 %) were discharged with nocturnal NIV, compared to post op/other patients (23.2 %).

Mean survival post discharge was 48.0 months. Patients with respiratory diagnoses survived 40.1 months, those with neuromuscular/chest wall diseases 53.2 months, post operative patients 47.7 months, and those with other diagnoses 64.2 months.

CONCLUSIONS. The majority of difficult to wean patients referred were successfully weaned from IMV. Those with respiratory diagnoses were more likely to wean than those without. Mean length of post discharge survival was 4 years. The mortality in this group in the weaning centre was 6.5 %.

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0714
TISSUE INHIBITOR OF METALLOPROTEINASES-1 (TIMP-1) IS ASSOCIATED WITH DISEASE SEVERITY AND MORTALITY IN ACUTE RESPIRATORY FAILURE

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INTRODUCTION. Several studies have addressed that matrix metalloproteinases (MMP) probably have an important role in acute lung injury[1]. High tracheal aspirate levels of MMP-8 are associated with illness severity in paediatric ARDS[2]. Many studies have reported that an imbalance between MMPs and TIMP-1 associate with increased mortality in septic patients.

OBJECTIVES. To study the systemic levels of MMP-8 and TIMP-1 in patients with acute respiratory failure (ARF) and a subgroup of patients with ALI/ARDS, and the association with disease severity and prognosis with these enzymes in a large group of mechanically ventilated critically ill patients.

METHODS. Admission MMP-8 and TIMP-1 levels were analysed from blood samples of 563 patients that needed mechanical ventilation for more than 6 h. Laboratory analysis was performed using immuno-fluorometric assay for MMP-8 and ELISA for TIMP-1. Associations of the enzyme levels with 90-day mortality were tested by comparing the enzyme levels between survivors and non-survivors, by comparing survival in quartiles based on TIMP-1 levels and by performing ROC analysis to calculate AUCs. Association of the enzyme levels with degree of hypoxaemia was studied by comparing enzyme-levels between PaO_2/FiO_2 quartiles.

RESULTS. TIMP-1 levels were higher in non-survivors, median 367.36 ng/mL (IQR 199.00–561.50) *vs* survivors, median 239.53 ng/mL (IQR 141.65–412.14) ($P < 0.001$) but there were no difference in MMP-8 levels ($P = 0.102$) or the MMP-8/TIMP-1 molar ratio ($P = 0.117$) between non-survivors and survivors. In the ALI/ARDS subgroup the differences in admission MMP-8 ($P = 0.538$) or TIMP-1 ($P = 0.09$) levels between survivors and non-survivors were not significant. Difference in survival between quartiles based on TIMP-1 was significant (Log Rank $P < 0.001$). ROC analysis produced AUC 0.633 (95 % CI 0.580–0.686) for TIMP-1. TIMP-1 was associated with severity of hypoxaemia. TIMP-1 levels were higher in the subgroup than in the whole cohort ($P = 0.009$).

CONCLUSIONS. Increased systemic levels of TIMP-1 but not MMP-8 are associated with unfavourable outcome and more severe hypoxaemia in a large unselected cohort of mechanically ventilated critically ill patients. The discriminative power of TIMP-1 in predicting outcome is only moderate. Our result, together with similar results in previous studies on septic patients creates hypothesis that TIMP-1 may have an independent, yet unknown, pathophysiological role in ARF.

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0715
PREDICTIVE FACTORS FOR EXTUBATION FAILURE IN MEDICAL ICU PATIENTS

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INTRODUCTION. Extubation failure occurs in 15–20 % of patients after success of a spontaneous breathing trial, and is associated with a high mortality rate (40–50 %). Age > 65 years and underlying chronic cardiac or respiratory disease were recently found as two major factors of extubation failure [1]. However, few studies have evaluated predictive factors of extubation failure.

OBJECTIVES. To determine other predictive factors for extubation failure such as impact of delirium, ICU-acquired paresis, strength of cough, amount of secretions, severity scores, systolic and diastolic left ventricular dysfunction. We also collected the care-givers' prediction for high risk of extubation failure.

METHODS. We conducted a prospective monocentric study over a 1-year period with a daily screening of planned extubation which was systematically performed after a spontaneous breathing trial. Exclusion criteria were mechanical ventilation < 24 h, self or accidental extubation, and end of life extubation. We measured at time of extubation severity using SOFA, delirium using ICDSC (Intensive Care Delirium Screening Checklist), ICU-acquired paresis using MRC score (Medical Research Council), blood gases before and after extubation. Strength of cough and amount of secretions were evaluated by the respiratory therapist before extubation and we systematically collected the physician's prediction of reintubation. To evaluate cardiac function an echocardiography were performed in spontaneous ventilation.

RESULTS. Among 177 extubated patients, extubation failure occurred in 15 %. Mortality was 63 % in case of failure vs. 7 % in case of success. A high risk for extubation failure was successfully predicted by the patient's attending physician with a sensibility of 48 % and a specificity of 89 %. No differences were found in terms of SOFA score, blood gases before extubation in patients who failed extubation as compared to patients who succeeded. Predictive factors of extubation failure were: a low MRC score (43 ± 15 vs. 52 ± 10, $p < 0.01$), hypercapnia *after* extubation ($PaCO_2 > 45$ mmHg), weakness of cough, copious secretions, and left ventricle ejection fraction (48 ± 14 vs. 54 ± 12 %, $p < 0.05$). Delirium and diasolic cardiac dysfunction had no influence on extubation failure.

CONCLUSION. Whereas hypercapnia, cough weakness and copious secretions have already been found associated with extubation failure, this is to our knowledge the first study showing that ICU-acquired paresis and left ventricle ejection fraction are predictive factors for extubation failure. Blood gases before extubation and delirium had no impact on extubation failure. The sensibility to predict a high risk for extubation failure by the physician was particularly low (<50 % of the patients who failed extubation).

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0716
STATIC AIRWAY, LUNG AND CHEST WALL PRESSURE–VOLUME CURVES IN HEALTHY AND LAVAGE INJURED LUNGS AND AT INCREASED INTRAABDOMINAL PRESSURE IN PIGS

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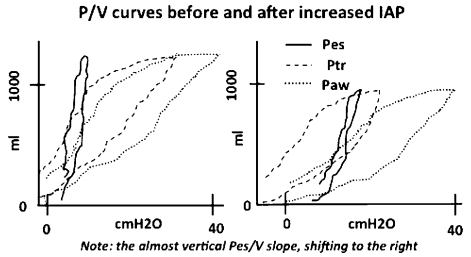
INTRODUCTION. Esophageal pressure (Pes) measurements are necessary to separate lung and chest wall mechanics. Tidal variation in Pes is well related to tidal variation in pleural pressure, but Pes changes after PEEP increases give inconsistent information.

OBJECTIVES. The aim of the present study was to study static airway (Paw), esophageal (Pes), assessed via esophageal balloon catheter, and transpulmonary pressure (Ptr)–volume (P/V) curves in healthy and injured lungs (lavage) with and without increased intraabdominal pressure (IAP) (obtained by intraperitoneal (IP) fluid infusion) during inflation to high airway pressures (Paw) and to a pressure where pneumothorax occurred.

METHODS. In six anesthetized, muscle relaxed, ventilated pigs (24–27 kg) static P/V curves (Paw, Pes and Ptr) were obtained using a flow of 4 l/min through a valve that closed/opened in periods of 640 ms. Before each P/V curve functional residual capacity (FRC) was measured by SF_6 washout. In three animals P/V curves, Paw 0–40 cm H_2O, were recorded at baseline, after lavage and after lavage +3L colloid infusion IP and in the other animals at baseline and after colloid infusion IP. Finally, the lungs were inflated to a pressure where they ruptured. IAP was assessed from the bladder pressure.

RESULTS. FRC at baseline was 326 ± 65 ml. During the early part of inflation Pes rose to a level of 5 ± 1 cm H_2O and Paw to 11 ± 3 at a volume of 276 ± 112 ml above FRC, chest wall compliance being 56 ± 27 ml/cmH_2O. During further inflation up to Paw of 41 ± 2 cmH_2O, Pes only rose to 11 ± 2 cmH_2O at a volume 1246 ± 413 ml above FRC, chest wall compliance being three times higher, 180 ± 94 ml/cmH_2O (see Fig, left panel).

In the three pigs with lung lavage, FRC was 200–274 ml. At the lower inflection point 50–120 ml above FRC Paw was 14–19 cm H2O and Pes rose to 4–5 cm H2O. During further inflation up to Paw 39–44 cm H2O and a lung volume of 910–1,640 ml above FRC, Pes only rose to 7–11 cm H_2O, chest wall compliance being 163–338 ml/cmH2O for the PV-curve above the lower inflection point. After IP infusion (IAP 17–20 cmH20), there was a rightward shift of the PV-curve (see Fig., right panel).
Lung rupture occurred at a Paw of 93–111 cm H_2O and Ptr of 63–97 cm H_2O.
CONCLUSIONS. The limited increase in Pes during the whole inflation indicates that the chest wall (abdomen) does not act as an elastic entity, but rather a fluid container that is pushed caudally during the inflation. This causes the lung to be "unprotected" against overinflation by the chest wall at high lung volumes.



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0717
THE PULMONARY VASCULAR PERMEABILITY INDEX PVPI IS DEPENDENT ON AGE AND BODY HEIGHT OF A PATIENT

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INTRODUCTION. The ratio of extravascular lung water (EVLW) to pulmonary blood volume gives the dimensionless parameter pulmonary vascular permeability index (PVPI). It is used to distinguish increased lung permeability as seen in ARDS from hydrostatic pulmonary edema resulting from volume overload. A threshold of 3 or larger is described to allow the diagnosis of ARDS with a sensitivity of 85% and a specificity of 100% [1]. However, we recently showed that preload volumes derived by transpulmonary thermodilution are dependent on age [2], while EVLW index is dependent on body height of a patient [3]. Therefore, the question arises whether PVPI is a truly independent parameter and a fixed cut-off value is useful in clinical practice.
OBJECTIVES. To investigate the relationship of PVPI with gender, height and weight of a patient.
METHODS. We investigated PVPI in 101 patients scheduled for elective brain tumor surgery. This database was primarily used for definition of normal ranges of transpulmonary thermodilution parameters. Findings were then verified in a cohort of 190 critically ill patients from our neurosurgical intensive care unit.
RESULTS. 641 valid measurements were performed in the 101 patients used for definition of normal values. No patient showed clinical signs of over-hydration or cardiopulmonary failure and all were discharged regularly from the ICU on postoperative day one. Despite this, an EVLW index greater than 10 ml/kg was seen in 46 patients, while a PVPI greater than three, indicative for ARDS, was found in 15 patients. PVPI showed a strong and significant inverse relationship on the patients' age ($p < 0.0001$), height ($p = 0.02$) and actual body weight ($p = 0.03$). The latter finding of a significant inverse dependency of PVPI on age ($p < 0.0001$) and body height ($p = 0.01$) could be reproduced in the database of critically ill patients (3,963 measurements), while body weight lost its significant influence ($p > 0.05$). 89 (45 %) patients presented with clinical signs of ARDS during their ICU stay. Maximum PVPI in ARDS patients was 2.9 on average, while patients without ARDS had a mean maximum PVPI of 2.6 ($p = 0.13$). PVPI in deceased patients ($n = 54$, 28 %) had a mean maximum PVPI of 2.9, while survivors showed a PVPI of 2.8 ($p = 0.44$).
CONCLUSIONS. PVPI is dependent on age and height of a patient. Therefore, we caution on clinical decisions based on single values of PVPI. Especially, the established threshold of 3 could not be verified in two larger series of patients without and with critically ill condition. Whether changes over time in repeated measurements of PVPI are useful to describe the clinical course of a patient remains to be investigated.
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0718
FIRST REPORT OF REVERSE TRIGGERING (RESPIRATORY ENTRAINMENT) IN CRITICALLY ILL ADULTS: AN OBSERVATIONAL STUDY

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INTRODUCTION. Respiratory entrainment refers to the establishment of a fixed repetitive temporal relationship between the neural and the mechanical respiratory cycle.1 It constitutes a form of patient-ventilator interrelation described more than 30 years ago in animals and normal humans. Reports of respiratory entrainment in critically ill adults, however, are lacking.
OBJECTIVES. In light of an accidental observation we retrospectively reviewed existing recordings of mechanically ventilated and deeply sedated patients searching for entrainment events, defined as muscular effort apparently triggered by the ventilator. We detected whether the patients were entrained with the ventilator, i.e. with a regular pattern and, if so, which were the characteristics of this patient-ventilator relationship.
METHODS. Over a 3 month period all available recordings of airway flow, airway pressure and esophageal pressure or EAdi in intubated patients, ventilated with an assist control mode of ventilation were visually inspected. In case of reverse triggering, the duration of phase locking, entrainment ratio (the number of spontaneous efforts within each ventilator breath) and phase difference (dP) were evaluated. The dP was the time, in seconds, elapsing between the commencement of ventilator and neural breath. The dP divided by the ventilator cycle duration and multiplied by 360^0 provided the phase angle (θ). The standard deviation (SD) of the different θ around a mean value expressed the strength of entrainment.
RESULTS. All seven patients (pt) examined entrained for a portion varying from 7 to 100 % of their total recording period. They all had acute respiratory distress syndrome (ARDS) with a mean Ritchmond agitation and sedation scale (RASS) of −4.5. 1:1 ratio was present in six points and persisted from 43 s to as long as 24 min. Three patients also exhibited 1:2 and 1.3 ratios. 1:2 ratios were short-lived, being disturbed every 10–12 cycles, by non entrainment epochs. The 1:3 ratio was detected in one patient and lasted for 25 s. Most neural efforts occurred around the cycling phase, failing to trigger the ventilator. 1:2 entrained periods had wider SD compared to 1:1 periods (Fig. 1).

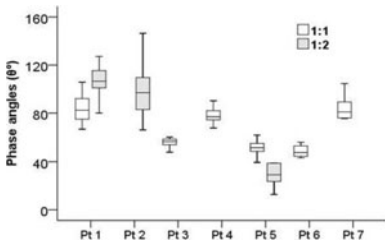

Figure 1
CONCLUSIONS. Respiratory entrainment of variable durations and ratios was identified in all seven sedated patients with ARDS and caused regular reverse triggering. Ventilator-induced or 'reverse triggered' breaths leading, in most cases, to isometric diaphragmatic contraction, illustrate a new form of patient-ventilator asynchrony.
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0719
LUNG HYPERINFLATION MAY DEPRESS RIGHT VENTRICULAR FUNCTION AND LEFT VENTRICULAR DIASTOLIC FUNCTION IN POST CARDIAC SURGERY PATIENTS

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INTRODUCTION. Lung hyperinflation may increase right ventricular after load and depress global cardiac function, but data are lacking on the effects on left ventricular diastolic function. This topic is clinically relevant, as fluid infusion has been proposed to oppose the effect of high peep [1].
OBJECTIVES. The aim of this study is to evaluate by a modified nitrogen multiple washout technique (NMBW) combined with the study of the static compliance and with an echocardiography study: (1) the lung hyperinflation (2) the right ventricle function and the left ventricle diastolic function during lung hyperinflation.
METHODS. 30 post cardiac surgery patients with ALI were ventilated with an Engstrom carestation ventilator (GE Health care) in according with the ARDS net guidelines. FRC measurement was carried out with the COVX module integrated within the ventilator (GE Healthcare, Helsinky, Finland.) by a NMBW technique. Every patient had a basal FRC measurement and then three measurements at PEEP 15/10/5 cm H_2O. At every step we studied the changes of FRC, Crs,PaO2/FIO2 ratio and performed a transesophageal echocardiography (VIVID I GE Healthcare) to evaluate the integral of velocity time of right ventricular outflow tract (RVOT VTI) and stroke volume (SV) trough the main PA. Diastolic function was evaluated by conventional pulsed-wave Doppler and and pulsed-wave TDI at lateral mitral anular wall. Lung hyperinflation was identified as the point where the increase of FRC was accompanied by a decrease of the static compliance [2]. All data are reported as mean ± SD. ANOVA test was used to compare changes during the time.
RESULTS. At Table 1 are reported the main results of this study.

Table 1

	PEEP 15	PEEP 10	PEEP 5
FRC ml	2,975 ± 644	2,412 ± 585*	2,059 ± 556**
Crs ml/cm H2O	33 ± 8	39 ± 9*	45 ± 10**
PaO2/FIO2	310 ± 62	291 ± 78	185 ± 89#
RVOT VTI cm	24 ± 2	25 ± 3	27 ± 6*
SVI mL/m2	34 ± 2	35 ± 3	37 ± 1*
e′ cm/sec	4.9 ± 2	5.2 ± 2	5.6 ± 1.5*

*$p < 0.05$, ** $p < 0.01$ vs PEEP 15

# $p < 0.01$ vs PEEP 15

CONCLUSIONS. 1. In post cardiac surgery patients combined monitoring of FRC and Crs may detect hyperinflation. 2. Hyperinflation may depress right ventricular function. 3. Diastolic function may be also hampered. These data may question fluid loading strategy to improve cardiac function at high PEEP [1].
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0720

PULMONARY ADMINISTRATION OF ACTIVATED RECOMBINANT FACTOR VII IN DIFFUSE ALVEOLAR HAEMORRHAGE IN PULMONARY LYMPHANGIOLEIOMYOMATOSIS: A CASE REPORT

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INTRODUCTION. Hemoptysis due to diffuse alveolar haemorrhage (DAH) is a life threatening condition with high mortality. Pulmonary administration of recombinant activated factor VII (rFVIIa) appears to be a promising, effective and safe treatment.

OBJECTIVES. To present a case of successful treatment of life threatening DAH with a pulmonary administration of rFVIIa and a review of published literature on similar treatment of DAH with rFVIIa with the emphasis on the dosage used.

METHODS. A patient with pulmonary lymphangioleiomyomatosis developed a severe hemoptysis with extreme hypoxemia. The bleeding was diagnosed as a diffuse alveolar bleeding by bronchoscopy. She was treated with intrapulmonary administation of 50 microg/kg of rFVIIA in 50 ml of 0.9 % sodium chloride (25 ml into each of the main bronchi). A second episode of DAP, not so severe, accured 2 weeks later and was again treated with the same dosage of rFVIIa. We also reviewed current literature on pulmonary administration of rFVIIA in DAH with the emphasis on the dosage used.

RESULTS. After the administration of rFVIIa a prompt response was observed. Hemostasis was achieved immediately and critical hypoxemia markedly improved in the next 12 h. The same response was observed in the second episode of DAH. No trombotic complications were observed. The patient is now stable and is on a waiting list for lung transplantation. We reviewed PubMed database and other sources and found 11 case reports of succesfull pulmonary administration of rFVIIa in DAH in adults and 1 in a child. The dosage used in nine adult patients was 50 microgr/kg diluted with 50 ml of 0.9 NaCl and in two adult patients 90 microgr/kg were used.

CONCLUSIONS. Pulmonary administration of rFVIIa appears to be an effective and safe treatment for DAH. The dosage used in most cases was 50 microgr/kg diluted with 50 ml of 0.9 NaCl (25 ml into each of the main bronchi). No thrombotic or other complications were observed.

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0721

INTRABDOMINAL PRESSURE IN DIFFERENT LEVELS OF BED POSITION AND PEEP IN ICU PATIENTS

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OBJECTIVES. Intrabdominal pressure in different levels of bed position and PEEP in ICU patients.

INTRODUCTION. Intrabdominal pressure (IAP) is considered as a diagnostic useful tool in ICU. However, the effect of different levels of PEEP and of bed position on IAP measurements is not clear [1].

OBJECTIVES. To assess IAP in critical care patients in different bed positions and different PEEP levels.

METHODS. We measured IAP in 49 ICU patients using a previously suggested technique [1]. IAP was measured in every patient at three different bed positions (0°, 30°, 45°) and at 0° at four different ePEEP settings [(cm H_2O) 0, 5, 10, 15]. IAP measurement was performed by two investigators and was repeated twice at each patient.

RESULTS. Mean (SE) IAP (mmHg) at 0°, 30° and 45° were 10.5 (0.92), 12.4 (0.9), and 13.1 (0.91) respectively. IAP at 0, 5, 10, 15 PEEP was 9.9 (0.88), 10.2 (0.9), 10.9 (0.91), 11.5 (0.91) respectively. Differences between measurements at 0° or 0 cm H_2O PEEP and other bed positions or PEEP were statistically significant ($p < 0.001$): mean difference among different bed positions and 0° was 2.3 (0.2) and among different PEEP levels and zeroPEEP was 1 (0.08).

CONCLUSIONS. Statistically significant differences in IAP measurements were found between different bed positions and PEEP compared to 0º or 0 cm H2O PEEP, however absolute IAP differences (mmHg) between the different settings used in this study was small.

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0722

THE ROLE OF RESIDUAL PULMONARY FUNCTION DURING VV-ECMO SUPPORT IN AN EXPERIMENTAL MODEL OF MULTIORGAN FAILURE ASSOCIATED WITH SEVERE RESPIRATORY FAILURE

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INTRODUCTION. ECMO support has been increasingly used to support patients with multiorgan failure (MOF). The rule of residual pulmonary function in this scenario, however, has not been systematically explored.

OBJECTIVES. To study the optimization of pulmonary function during vv-ECMO support of pigs with MOF.

METHODS. In a pig model of peritonitis-induced sepsis and severe respiratory failure associated with surfactant depletion, a period of 6 h with protective ventilation with PEEP 10 cmH_2O, driving pressure 10 cmH_2O and respiratory rate = 10 (CESAR-protocol) [1] was compared to a 6 h period of support with residual pulmonary function optimization with alveolar recruitment and PEEP titration, with a plateau pressure $\leq$ 30 cmH_2O (OLA-protocol). Whole study was carried out using VV-ECMO support and a $FiO_2 \leq 0.3$. Hemodynamic, respiratory and metabolic data were collected in both periods. Data are shown as median and (P25, P75). Friedman test was used in the analysis. A multilinear model was built with the arterial oxygen content as the dependent variable, in order to explore the determinants of the oxygenation.

RESULTS. Five pigs were studied in the standard protocol. The main results are shown in the Table 1. The mathematical model resulted in: $CaO_2 = 7.040.49 \times$ Cardiac Output (L/min) + 0.05 × ECMO_bloodflow (mL/min) + 0.95 × Hb (g/dL) − 0.06 × Pulmonary shunt (%), with a $R^2 = 0.71$.

Table 1 Variables of the animals during support

Variables	Baseline	3 h (Cesar approach)	6 h (Cesar approach)	9 h (OLA approach)	12 h (OLA approach)	P value
PaO2 (mmHg)	50 (50, 52)	76 (55, 77)	61 (58, 69)	89 (63, 90)	77 (69, 93)	0.003
PEEP (cmH_20)	10 (10, 10)	10 (10, 10)	10 (10, 10)	18 (18, 22)	18 (18, 20)	0.006
Tidal volume (mL/kg)	3.6 (3.3, 6.0)	1.2 (0.8, 1.9)	1.8 (1.6, 2.8)	2.3 (1.5, 2.7)	2.3 (2.1, 3.5)	0.129
Shunt (%)	62 (52, 81)	85 (59, 100)	93 (85, 94)	72 (67, 72)	45 (38, 69)	0.036
Stroke volume (mL/min)	61 (51, 86)	38 (35, 74)	41 (33, 63)	31 (28, 41)	28 (27, 31)	0.007
Animals on norepinephrine	0	1	2	3	3	–
Dosage norepinephrine (mcg/kg/min)	0	0.5 (0.5, 0.5)	0.4 (0.2, 0.5)	0.2 (0.2, 0.7)	0.4 (0.3, 0.8)	0.406
Lactate (mg/dL)	13 (10, 14)	20 (8, 46)	16 (10, 70)	52 (20, 59)	43 (16, 78)	0.008
ECMO blood flow (mL/min)	2,100 (1,500, 2,340)	3,500 (3,000, 5,500)	3,500 (3,100, 4,180)	3,000 (3,000, 3,380)	2,520 (2,000, 3,380)	0.012

CONCLUSIONS. The pulmonary residual function has an important rule during the VV-ECMO support, being an important tool to be explored if hypoxemia persists.

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0723

HIGH MOPRTALITY IN *SEVERE ARDS*—IS THE ASSOCIATED CIRCULATORY FAILURE THE CULPRIT?

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INTRODUCTION. Optimal fluid resuscitation in patients having concomitant septic shock with SEVERE ARDS is a perplexed issue, having risk of underfilling and worsening of shock versus fluid overload leading to pulmonary edema and worsening hypoxia. As per the recent Berlin definition for ARDS, SEVERE ARDS have predicted mortality of 62% and in many previous studies such high mortality is attributed not to hypoxia but to other organs failure.

OBJECTIVES. Whether stroke volume variation (SVV) guided fluid resuscitation has an impact on improvement of shock, oxygenation and mortality in patients with septic shock and SEVERE ARDS was tested in this retrospective analysis [1, 2, 3].

METHODS. Inclusion criteria; 1. Septic shock with dose of norepinephrine $\geq$ 0.1 mcg/kg/min Or dopamine $\geq$ 10 mcg/kg/min. 2. PO_2/FiO_2 ratio $\leq$ 100. 3. PEEP > 10 cm H_2O_3 ARDSnet protocol ventilation under deep sedation. 4. Arterial line with Flotrac-Vigileo system. Exclusion Criteria: were atrial/ventricular arrhythmias, renal replacement therapy and therapies for refractory hypoxia. During this 24 h study period, fluid resuscitation was carried out guided by SVV which was continuously monitored with third generation Flotrac-Vigileo system (version 3.02). Intravenous fluids were given in the boluses to keep SVV < 12 % throughout the study period neglecting CVP values. Vasopressors were titrated to keep mean arterial pressure (MAP) $\geq$ 65 mmHg. Patients were kept under deep sedation with Fentanyl and/or Propofol infusion. PEEP and FiO_2 were adjusted as per the ARDSnet PEEP-FiO_2 table.

RESULTS. 14 patients with "Septic Shock" AND "Severe ARDS" with Mean APACHE II score 24.06 were included for analysis. At 0 h of study period, CVP, MAP, SVV and PEEP were 15 (± 5.8) mmHg, 70.2 (± 17.12) mmHg, 14.78 (± 7.68) % and 11.41 (± 2.16) cm of H_2O respectively and at 24 h of study period, CVP, MAP, SVV and PEEP were 17(± 3.4) mmHg, 71.2 (± 12.28) mmHg, 10.28 (± 2.02) % and 12.77 (± 3.25) cm of H_2O respectively.(p values non significant) SVV guided fluid resuscitation volume received during the 24 h study period was 4.99 (± 2.76) litre. Arterial lactates reduced (4.22 ± 2.68 to 1.93 ± 1.0 mmol/L, $p < 0.05$) and PO2/FiO2 ratio increased (79.07 ± 20.7 to 182.5 ± 67.16, $p < 0.001$) significantly at 24 h. Mean duration of vasopressor therapy in survivors was 81.2 ± 39.55 h. 5/14 patients eventually need RRT. Ten out of 14 patients (71.4 %) were discharged to home. All cause 28 day mortality was 28.6 %.

CONCLUSIONS. SVV guided fluid resuscitation in septic shock with SEVERE ARDS may attenuate the amount of circulatory failure occurring in these patients owing to high PEEP, by optimizing preload in a targeted way without worsening oxygenation and in turn may reduce the mortality arising from coexistent circulatory failure.

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0724

COMPARISON OF TWO METHODS OF WEANING OF MECHANICAL VENTILATION (T TUBE AND PSV ZEEP) DURING A FIRST TEST OF WEANING

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INTRODUCTION. Two trials of weaning have been proposed to assess the severability of ventilated patients in intensive care [1]: a test of T tube (TT) and a test in pressure support ventilation with ZEEP (PZ). These two tests may lead to physiological variations on the

work of breathing in patients difficult to wean from group three [2,3]. No comparative data is available concerning patients eligible for the first test of weaning.
OBJECTIVES. The objective of this study was to compare changes in cardiac parameters between the two types of weaning tests in patients undergoing elective first test of weaning.
METHODS. It was a two-center prospective study comparing cardiorespiratory parameters between a group of 30 patients with T-tube weaning test and a group of 30 patients with a PSV-ZEEP weaning test. Inclusion criteria were a mechanical invasive ventilation of at least 48 h in ICU, $SpO_2 \geq 90$ % with $FiO_2 \leq 40$ % and PEEP ≤ 8 cmH2O, hemodynamic stability and a BPS score between −1 and +1. The weaning trial lasted 1 h. The echocardiographic data (E, A, Ea wawes, DTE), the heart rate (HR), the BNP and the blood gas were collected at H0, H1 and H6 postextubation.
RESULTS. The groups TT vs PZ did not differ in the median age (64.5 vs. 61.5, p 0.63), the SAPS II (47 vs. 47, p 0.98), the existence a known heart disease (47 vs 27%, p 0.18). The median BNP (262 vs 188, p 1.00), median values of the wave Ea (0.13 vs 0.12, p 0.34) and E/Ea (5.8 vs 6.5, p 0.19) were not different before the weaning test. The median values of E/Ea (5.7 vs 6.9, p 0.19) and BNP (204 vs 198, p 0.79) at the end of weaning test and their evolution during the test were not different, as well as median values of BNP (276 vs 169, p 0.59) and E/Ea (6.0 vs 6.9, p 0.31) at H6 postextubation. The different values of the E and A waves, TDE, or HR, blood gas at each time did not differ. The failure rate of the test was 7 % in each group and the rate of H48 reventilation was 23 % (TT) vs 37 % (PZ) (p 0.54).
CONCLUSIONS. In patients undergoing a first weaning test, the choice of weaning trial does not appear to influence the evolution of echocardiographic parameters and BNP. A low failure rate of weaning trial may explain some of these results.
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0725
ADVERSE RESPIRATORY EVENTS IN THE POST-ANESTHETIC CARE UNIT

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INTRODUCTION. Adverse respiratory events (ARE) remain one of the major causes of morbidity in the post-anesthesia period. The aim of this study was to determine incidence and determinants of postoperative ARE.
METHODS. This observational and prospective study was conducted in a post anesthetic care unit (PACU). Three-hundred-forty adult patients were consecutively admitted and evaluated for the occurrence of ARE after elective surgery during three weeks in May 2011. Demographics data, perioperative variables, and postoperative length of stay in the PACU and in the hospital were recorded. ARE were defined as upper-airway obstruction, hypoxia (mild/moderate and severe), respiratory failure, decreased inspiratory capacity and respiratory arrest. Descriptive statistics were used to present data and comparisons were made using the Mann–Whitney U-test to compare continuous variables and Chi-square or Fisher's. Multivariate analysis were done with a logistic binary regression with the calculation of an odds ratio (OR) and its 95% confidence interval (CI).
RESULTS. Postoperative ARE developed in 64 patients (19%). ARE were more frequently in females (69 vs 31 %; $p = 0.038$), after high risk surgical procedures (42 vs 24 %; $p = 0.004$), in patients in which muscle relaxants were used during anesthetic management (78 vs 58 %; $p = 0.002$); in patients with postoperative ARE were less frequently preoperative medicated with benzodiazepines before surgery (28 vs 43 %, $p = 0.033$). Patients with postoperative ARE had more frequently hypoactive emergence defined by the Richmond agitation and sedation scale (14 vs 5 %, $p = 0.013$) and residual neuromuscular blockade (47 vs 11 %, $p < 0.001$). In the multivariate analyses residual neuromuscular blockade was an independent risk factor for occurrence of ARE in the PACU (OR 7.24, CI 3.89–13.45, $p < 0.001$).
CONCLUSION. Adverse respiratory events are an important and common complication after surgery. Residual neuromuscular blockade was an independent risk factor for their occurrence in the PACU.
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Fluid responsiveness & goal directed therapy: 0726–0739

0726
THE EFFECT OF SEMIRECUMBENT POSITION ON HEMODYNAMIC STABILITY IN VENTILATED CRITICALLY ILL PATIENTS—PROSPECTIVE MULTIVARIATE ANALYSIS

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INTRODUCTION. The semirecumbent position (45°) in mechanically ventilated patients is advocated as a part of multifactorial concept in prevention of ventilator-associated pneumonia. Because of lack of the data on adverse effects (hemodynamic instability, thromboembolism) there is still uncertainty about the benefits and harms of head of bed elevation in the daily practice.
OBJECTIVES. To investigate the effects of supine (0°), semi-upright (30°) and upright (45°) position on hemodynamic stability in ventilated critical ill patients.
METHODS. Prospective self-controlled study in two hundred patients at tertiary University Hospital. The mechanically ventilated patients were randomised to six possible sequences of head of bed positioning. The hemodynamic parameters in each position as well as constant variables, which may have impact on the hemodynamic stability, were assessed (Tables 1, 2).

Table 1 Admission diagnosis (N, %)

Carcinoma post-operative	52 (26.0%)
Trauma (excluding traumatic brain injury)	29 (14.5%)
Cardiovascular/cardiogenic shock	29 (14.5%)
Infection/sepsis	27 (13.5%)
Transplantation	20 (10.0%)
Gastrointestinal	11 (5.5%)
Acute respiratory failure	10 (5.0%)
Liver failure	5 (2.5%)
Neurological/stroke	5 (2.5%)
Haemorrhage/shock	4 (2.0%)

Table 2 Baseline characteristics of study patients

Age (years) median (min; max)	62 (18; 91)
SAPS II median (min; max)	38 (13.0; 69.0)
Ventilation mode spontaneous vs. pressure controlled	74 (37%) vs. 126 (63%)
Length of Ventilation (h) median (min; max)	24 (1; 670)
Tidal volume(ml) median (min; max)	495 (310; 1,400)
PEEP (cmH2O) median (min; max)	6 (4; 20)
Noradrenalin (μg/kg/min) median (min; max)	0.07 (0.00–0.67)
Propofol (mg/kg/min) median (min; max)	0.02 (0.00–0.07)
Fluid balance last 24 h (ml/24 h) median (min; max)	550 (−2,643; 4,279)
CRP (mg/l) median (min; max)	92.9 (2.9; 398)

RESULTS. The mean arterial pressure and the mean central venous oxygen saturation were significantly lower in the semi-upright and upright position when compared with the supine position (Table 3), (Figs. 1, 2). The head of bed elevation from 0° to 30° ($p < 0.001$), from 0° to 45° ($p < 0.001$) and from 30° to 45° ($p < 0.001$) led to statistically significant decrease in mean arterial pressure. Moreover, the positioning to 45° was associated with significant decrease in central venous oxygen saturation 0° vs 45° ($p < 0.001$) and 30° vs 45° ($p = 0.0018$), where the head of bed elevation 0° vs 30° ($p = 0.26$) did not showed significant changes. In the 45-degree position 77 (38.5 %) patients showed the mean arterial pressure lower than 65 mmHg and 61 (30.5 %) patients had the central venous oxygen saturation less than 70 %.

Table 3

Head of bed elevation (degree)	0°	30°	45°	p-values: global (0° vs 30°; 0° vs 45°, 30° vs 45°)
Mean arterial pressure (mmHg) (mean (SD))	83 (14.5)	75.1 (13.1)	71.1 (15.2)	<0.001 (<0.001; <0.001; <0.001)
Central venous oxygen saturation (%); (mean (SD))	76.1 (8.0)	75.6 (8.2)	74.3 (9.0)	<0.001 (0.26; <0.001; 0.001)

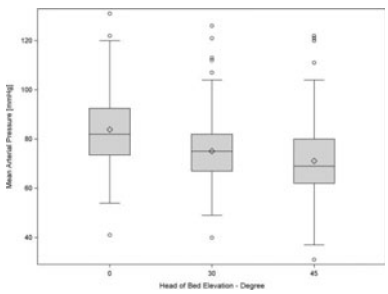

Figure 1

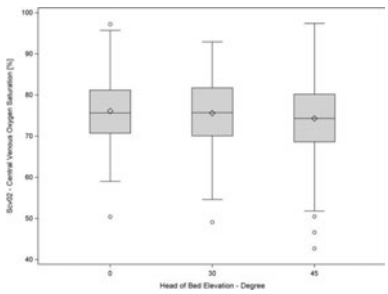

Figure 2
Linear mixed models with head of bed elevation as one fixed factor ($p < 0.001$) showed additional significant effects on the mean arterial pressure for the factors SAPS II ($p = 0.023$) (Fig. 3), dose of noradrenalin ($p = 0.012$), dose of propofol ($p = 0.034$) and ventilation mode ($p < 0.001$). In a multifactorial model, the remaining significant factors on the mean arterial pressure are head of bed elevation ($p < 0.001$), dose of noradrenalin ($p = 0.069$) and ventilation mode ($p < 0.001$).
The multifactorial model of the central venous oxygen saturation showed significant effects of the fixed factors head of bed elevation ($p < 0.001$), dose of noradrenalin ($p = 0.009$) and length of ventilation ($p = 0.013$).

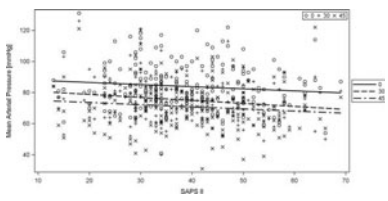

Figure 3

CONCLUSIONS. The semirecumbent position (45°) has significant negative effects on hemodynamic stability and therefore should be carefully reconsidered in ventilated critically ill patients. Especially at risk are sedated and ventilated patients with high SAPS II Score and inotropic support.

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0727

FLUID RESPONSIVENESS INCREASED AFTER PROPOFOL INFUSION IN CRITICALLY ILL PATIENTS

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INTRODUCTION. It is of prime importance to improve understanding of how to assess fluid responsiveness in order to better select which hemodynamically compromised patients.

OBJECTIVES. To investigate the effects of propofol on cardiac preload, cardiac index (CI) and fluid responsiveness in critically ill patients.

METHODS. Twenty-nine patients with circulatory failure admitted to intensive care. An initial passive leg raising test (PLR1) was conducted to evaluate preload-dependency at baseline. Then, propofol was infused at 1.0 (interquartile range: 1.0–1.5) mg/kg/h. A second PLR test (PLR2) was then performed. Finally, 250 mL saline was infused over 5 min. Central venous pressure (CVP) and CI (NICOM® technology) were obtained before and after the two PLR tests and fluid challenge. A $\geq$ 10 % increase in CI during PLR was considered a positive test, indicative of preload-dependency. A $\geq$ 10 % increase in CI after the fluid challenge defined fluid responsiveness.

RESULTS. Following propofol infusion, there were significant decreases in CVP (amounting to -13.7 ± 16.2 % and -15.0 ± 11.1 % in patients with negative and positive PLR1 tests, respectively) and CI (amounting to -5.5 ± 4.5 % vs. -9.8 ± 4.9 % in patients with negative and positive PLR1 tests, respectively). For those with negative PLR1, there were significant increases in CI induced by PLR2 compared with PLR1 ($+13.5 \pm 8.3$ % vs. $+1.0 \pm 6.4$ %, $p < 0.05$). For those with positive PLR1, no statistical difference was observed in CI changes induced by PLR2 ($+22.7 \pm 8.8$ % vs. $+20.7 \pm 7.7$ %). Among the 18 patients with negative PLR1 before propofol infusion, 11 experienced positive PLR2 after propofol infusion and fluid challenge indicated 12 fluid responders among those patients. Finally, all of the 11 patients with positive PLR1 before propofol still had positive PLR2, and were confirmed responders after fluid challenge.

CONCLUSIONS. Propofol infusion in patients with circulatory failure decreased cardiac preload and enhanced preload-dependency and fluid responsiveness.

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0728

TISSUE PERFUSION INDICATORS PREDICT AND DEPEND ON SYSTEMIC FLUID RESPONSIVENESS IN CRITICALLY ILL SEPTIC PATIENTS WITH PRESUMED HYPOVOLEMIA

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INTRODUCTION. Fluid therapy is pivotal in the hemodynamic management of critically ill patients. It is as yet unknown whether an increase in stroke volume (SV) through a fluid challenge (FC), i.e. fluid responsiveness, improves tissue perfusion. And if so, whether a tissue perfusion response upon passive leg raising (PLR) predicts fluid responsiveness.

METHODS. Critically ill patients, receiving invasive hemodynamic monitoring and requiring fluid therapy, were eligible for enrollment. They underwent a 30° passive leg raising test followed by a fluid challenge of 250 ml of colloid solution. During the PLR and FC, stroke volume and cardiac output (CO) were measured as well as sublingual microcirculatory perfusion (sidestream dark field imaging) and cutaneous tissue perfusion and oxygenation (laser Doppler flowmetry and reflectance spectroscopy).

RESULTS. Data is presented as median (IQR). Thirty-five patients were included in our study, of whom 19 (54 %) were fluid responsive (FR; $\geq$ 5 % increase in SV). After the FC, SV, CO, mean arterial pressure (MAP) and pulse pressure (PP) increased in responders, as well as microvascular flow index (MFI), functional capillary density (FCD), vessel density (VD), laser Doppler flow and microvascular hemoglobin oxygen saturation (Table 1). In the non-responders, microcirculatory perfusion did not change after a FC. The PLR test also increased SV [67 ml (54–84) to 73 ml (57–87) $p < 0.05$], MAP [68 mmHg (63–75) to 80 mmHg (70–92) $p < 0.01$] and PP [66 mmHg (52–73) to 65 mmHg (59–82) $p < 0.01$] as well as MFI [3.2 (2.8–3.8) to 3.7 (3.0–3.8) $p < 0.05$] and FCD [14.5 mm/mm^2 (13.5–15.6) to 15.7 mm/mm^2 (14.2–17.2) $p < 0.05$] in the responders. Fluid responsiveness was predicted by changes in MFI (AUC 0.78 ± 0.09, $p < 0.001$) and VD (AUC 0.74 ± 0.09, $p < 0.01$) during a PLR, and by baseline values of MFI (AUC 0.71 ± 0.10, $p = 0.04$), VD (AUC 0.75 ± 0.10, $p < 0.01$) and FCD (AUC 0.78 ± 0.09, $p < 0.01$) prior to PLR.

CONCLUSIONS. Several indices of non-invasively assessed tissue perfusion increase in fluid responsive critically ill patients. Additionally, changes in microcirculatory perfusion during a PLR as well as their baseline values are able to predict such fluid responsiveness.

Table 1

	Responders (n = 19) before FC	Responders (n = 19) after FC	Non-responders (n = 16) before FC	Non-responders (n = 16) after FC
Stroke volume (ml)	70 (45–87)	78 (56–97)***	82 (65–118)	78 (63–112)*
Cardiac output (l/min)	5.8 (5.2–7.6)	7.0 (6.0–8.1)***	7.3 (6.4–10.3)	7.1 (5.8–8.6)**
Mean arterial pressure (mmHg)	72 (64–75)	75 (70–82)**	74 (68–81)	76 (69–84)
Heart rate (bpm)	89 (78–100)	92 (71–105)	96 (82–107)	95 (80–105)*
Microvascular flow index	3.3 (2.9–3.9)	3.9 (3.0–4.0)**	3.2 (3.0–3.8)	3.6 (3.0–3.9)
Functional capillary density (mm/mm2)	15.0 (13.2–17.5)	16.2 (14.4–17.8)*	16.0 (14.2–17.3)	15.7 (15.3–18.0)
Vessel density (1/mm)	10.8 (10.3–12.1)	11.9 (10.6–13.1)**	11.0 (10.5–13.2)	11.6 (10.9–12.8)
Laser Doppler flow (AU)	115 (30–335)	169 (34–351)*	270 (41–311)	286 (123–358)
$\mu HbSO_2$ (%)	49 (26–56)	51 (40-59)*	55 (38–65)	52 (40–65)

Hemodynamics and microcirculatory values before and after a fluid challenge, divided by responders and non-responders based on a $\geq$ 5 % increase in stroke volume to a fluid challenge of 250 ml

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ vs before fluid challenge

$\mu HbSO_2$ microvascular hemoglobin oxygen saturation, AU arbitrary units

0729

GOAL-DIRECTED THERAPY FOLLOWING CARDIAC SURGERY IMPROVES RENAL FUNCTION AND REDUCES DURATION OF STAY IN INTENSIVE CARE

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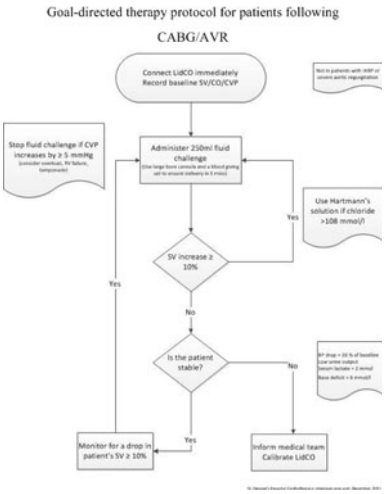
INTRODUCTION. Goal directed therapy (GDT) has proven benefits to patients undergoing high risk surgery (1). Recently we introduced a GDT protocol in cardiac intensive care unit (CICU) for the management of post operative patients (Fig. 1).



GDT protocol

OBJECTIVE. In this preliminary analysis we assessed the impact of GDT on creatinine clearance (CrCl) in addition to duration of CICU and hospital stay.

METHODS. Data were collected retrospectively on all patients admitted following coronary artery bypass graft and/or aortic valve replacement. We compared a standard therapy group (ST) with patients receiving GDT protocol in the first 8 h. In the former group fluid therapy was guided by routine clinical and haemodynamic observation in addition to serum lactate. Pre-operative baseline CrCl using the Cockroft Gault method was compared with day three CrCl using the same calculation.

RESULTS. The ST patients consisted of 67 patients and 45 in the GDT group (Table 1).

Table 1 Baseline characteristics

–	ST (67)	GDT (45)	p value
Age	71.16 (8.58)	68.67 (12.27)	0.24
Sex F:M	1:4.15	1: 3.09	0.53
Weight kg	81.43 (18.45)	84.22 (17.92)	0.43
Height cm	168.49 (14.39)	170.76 (10.41)	0.38
Baseline CrCl ml/min	76.71 (31.36)	77.97 (31.1)	0.65
Surgery CABG	50	35	0.82
AVR	5	5	0.52
CABG + AVR	12	5	0.42
Emergency surgery	2	3	0.38

The ST group had no change in their day 3 CrCl post operatively (76.71 ml/min (31.36) at baseline and 76.62 ml/min (37.3) on day three, p = 0.97), whilst there was an increase in day three CrCl in the GDT group (77.97 ml/min (31.13) at baseline compared to 82.84 ml/min (37.04), p = 0.02). Although there was no difference in CrCl on day three between the two groups but the median ICU duration of stay was 25 h [42] in the ST group vs. 21 (5) h in the GDT group, p = 0.002 (Table 2).

Table 2 Patients outcome data

	ST (67)	GDT (45)	p value
Total fluids in CICU for the first 8 h	2,906 (1,207)	3,088 (1,031)	0.4
Day three CrCl ml/min	76.62 (37.3)	82.84 (37.04)	0.39
Percentage change of day three CrCl from baseline ml/min	−1.27% (30.6)	5.6% (21.9)	0.38
Renal replacement therapy	8 (12.3%)	4 (9.8%)	0.61
CICU duration of stay hours	25 (42)	21 (5)	0.002
Hospital duration of stay days	7 (7)	6 (5)	0.08
Mortality	1	1	0.78

There was a trend towards a reduction in the duration of hospital stay in the GDT group (ST 7 days (7) vs. GDT 6 days (5), p = 0.08)

CONCLUSIONS. There was no difference in CrCl between GDT and ST on 3rd postoperative day. There was an associated increase in CrCl in the GDT compared to their baseline. There was also a reduction in the duration of CICU stay. These findings await confirmation in a larger cohort of patients.

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0730

DRAINAGE OF PLEURAL EFFUSIONS MAY INCREASE PRELOAD AND BE PART OF HEMODYNAMIC OPTIMISATION

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INTRODUCTION. Pleural effusion (PLE) is a frequent complication in intensive care patients. As shown in case reports, PLE can cause hemodynamic impairment [1]. In addition, we have previously performed an animal study demonstrating that incremental PLE decreases left ventricular preload and causes hemodynamic impairment [2]. In spite of this, PLE is not given much attention when dealing with patients with hemodynamic instability. Systematic knowledge on the hemodynamic effects of PLE is still sparse, and has not previously been described with echocardiography, which offers detailed information on chamber dimensions and function, loading conditions and blood flow.

OBJECTIVES. To perform a clinical study investigating the hemodynamic effects of pleuracentesis in patients with PLE.

METHODS. The study was prospective and patients served as their own controls. Patients were examined immediately before pleuracentesis (T1) and one hour after (T2). Echocardiographic measures included left ventricular end-diastolic and end-systolic volumes (LVEDV and LVESV), left ventricular outflow tract (LVOT) velocity time integral (VTI), LVOT size and heart rate were recorded at T1 and T2. Stroke volume was derived from LVOT size and LVOT VTI. The volume of the drained effusion was measured at T2. A student's *t* test was performed to test for differences between T1 and T2. *P* values < 0.05 were considered significant.

RESULTS. 21 patients with PLE requiring pleuracentesis were included (left n = 10, right n = 8, bilateral n = 3).

Results

	T1 (± 1.96*SD)	T2 (± 1.96*SD)	P-value
LVEDV (ml)	96.6 (± 23.3)	100.3 (± 22.3)	0.041
LVESV (ml)	47.0 (± 12.8)	46.3 (± 12.2)	0.735
Stroke volume (ml)	64.2 (± 19.0)	67.7 (± 19.6)	0.021
Heart rate (min-1)	83.8 (± 14.4)	79.3 (± 14.6)	0.005
MAP (mmHg)	86.0 (± 14.0)	89.5 (± 12.3)	0.213
Cardiac output (l/min)	5.69 (± 1.61)	5.62 (± 1.38)	0.644
Mean effusion (ml)		759 (range 200–1,800)	

CONCLUSIONS. Drainage of pleural effusion increased preload as indicated by increased LVEDV, which is a surrogate measure of preload. In addition, the improved stroke volume was seen in connection with a slower heart rate, while the cardiac output was maintained. Pleuracentesis in patients with even small volumes of PLE could be part of hemodynamic optimisation.

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0731

NON-INVASIVE ASSESSMENT OF HEMODYNAMIC RESPONSE TO A FLUID CHALLENGE USING FEMORAL DOPPLER IN CRITICALLY ILL VENTILATED PATIENTS

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INTRODUCTION. Management of acute circulatory failure requires assessment of hemodynamic response to a fluid challenge (FC). Transthoracic echocardiography (TTE) is now a recognized tool for cardiac output assessment but can be limited by poor thoracic insonation. Peripheral arterial flow analysis with ultrasound Doppler is likely to avoid this pitfall.

OBJECTIVES. We hypothesized that femoral artery blood flow Doppler parameters can assess cardiac response to a FC.

METHODS. We prospectively recorded in 52 patients under mechanical ventilation 2 femoral artery blood flow parameters: velocity time integral variation (%VTIf) and maximal systolic velocity variation (%Vfmax) before and after a FC of 500 ml saline infusion. Aortic velocity time integral variation (%VTIAo) registered on TTE, before and after FC was compared to %VTIf and %Vtmax.

RESULTS. %Vfmax and %VTIf were found to be positively correlated with %VTIAo ($r^2 = 0.46$ and 0.51 respectively, $p < 0.0001$) and were significantly different between responders and non-responders (11 ± 3.4 % versus 5.9 ± 4.3 % and 14.9 ± 4.2 % versus 5.5 ± 5.5 % respectively, $p < 0.0001$). Considering fluid response assessment, increasing of %VTIf ≥ 10 % and Vfmax ≥ 7 % after a FC showed a sensitivity of 80 and 84 %, a specificity of 85 and 73 %, and an area under the curve of 0.905 and 0.851 respectively.

CONCLUSIONS. Variation of femoral Doppler parameters before and after FC mirrors central hemodynamic response to fluid loading. This tool could be considered as an alternative to TTE in case of poor thoracic insonation whereas accuracy needs to be refined.

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0732

CHANGES IN ARTERIAL BLOOD PRESSURE INDUCED BY PASSIVE LEG RAISING PREDICT HYPOTENSION DURING INDUCTION OF SEDATION

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INTRODUCTION. Severe hypotension is sometimes observed following dexmedetomidine bolus administration.It may be of great benefit if we could identify which patients are at risk for this hemodynamic consequence directly before dexmedetomidine administration.

OBJECTIVES. In this study, we sought to determine whether indices of fluid responsiveness, changes in pulse pressure (PLR-ΔPP) and systolic blood pressure (PLR-ΔSBP) induced by passive leg raising test before sedation, could predict hemodynamic changes during dexmedetomidine infusion in critically ill patients.

METHODS. Fluid responsiveness was estimated by a passive leg raising test (PLR). Fifty patients [71(61–78) years old] were conducted PLR before dexmedetomidine sedation. Patients were assigned into 'Nonresponders' group and 'Responders' group according to hemodynamic responses to PLR (nonresponders; PLR-ΔPP < 10.3 %, responders; PLR-ΔPP ≥ 10.3 %). Sedation was performed with dexmedetomidine infusion (0.5 μg kg^{-1} over 10 min loading then 0.2–0.7 μg kg^{-1} h^{-1}). Radial artery pulse pressure, heart rate, and central venous pressure (CVP) were measured at each phase of the study procedure (i.e., before and during PLR, and then before and during dexmedetomidine infusion). Hemodynamic fluctuations during the dexmedetomidine sedation were recorded and compared between the two groups. This trial was registered with clinicaltrials.gov, number NCT01447875.

RESULTS. Blood pressure fluctuations during the induction of dexmedetomidine sedation were significantly greater in Responders. Changes in PP during PLR were positively correlated with changes in SBP during PLR ($r = 0.759$; $p = 0.000$). Changes in PP induced by PLR and by dexmedetomidine infusion were negatively correlated ($r = -0.282$; $p = 0.047$). PLR-induced changes in PP were significantly correlated to dexmedetomidine infusion-induced changes in SBP ($r = -0.323$; $p = 0.022$). Finally, PLR-induced changes in SBP were significantly correlated to dexmedetomidine infusion-induced changes in SBP ($r = -0.304$; $p = 0.032$).

CONCLUSIONS. Pre-sedative PLR-ΔPP and PLR-ΔSBP were found to predict BP fluctuation during the induction of dexmedetomidine sedation. Pre-sedative PLR test may be a useful tool to identify patients with high risk of hemodynamic events and may be used to indicate the need for prophylactic treatment.

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0733

VALIDITY OF CORRECTED FLOW TIME (FTC) AS A PREDICTOR OF FLUID RESPONSIVENESS IN PATIENTS WITH SEPSIS-INDUCED HYPOTENSION

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INTRODUCTION. Accurate evaluation is important to avoid unnecessary volume replacement, which can be deleterious in critically ill patient. Therefore the prediction of fluid responsiveness is a major issue in optimizing hemodynamic therapy. It is also known that the corrected flow time (FTc) can be used as a preload index. However, most patients enrolled in those studies were monitored in an operation room or intensive care unit with mechanical ventilation.

OBJECTIVES. To determine the validity of FTc as a predictor of fluid responsiveness for patients with sepsis-induced hypotension in the emergency department.

METHODS. A total of 26 adult patients, who presented in the emergency department with sepsis-induced hypotension with spontaneous breathing, were enrolled in this prospective, interventional study. These patients were monitored by Esophageal Doppler (ED); FTc, central venous pressure (CVP), stroke volume index (SVI), and inferior vena cava diameter (IVCD) were measured before and after fluid challenge. Responsiveness to fluid challenge was defined as an SVI increase ≥ 10 %. Receiver operating characteristic (ROC) curves were constructed and compared to evaluate the overall performance of preload indices (CVP, FTc, IVCD) in terms of predicting fluid responsiveness.

RESULTS. Of the hemodynamic parameters initially measured, there were statistically significant differences in FTc and CVP between the responsive and unresponsive groups. Before and after fluid challenge, noticeable changes were observed in mean arterial pressure (MAP), CVP and IVCD between the two groups. Only the responsive group demonstrated statistical difference in FTc. The areas under the curves for FTc (0.870; 95 % CIs, 0.708–0.979; $P = 0.009$) were significantly greater than those for CVP and IVCD.
CONCLUSIONS. The FTc may be a good predictor of fluid responsiveness relative to sepsis-induced hypotension for patients in the emergency department.
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0734
THE DIAMETER AND COLLAPSIBILITY OF THE INFERIOR VENA CAVA DO NOT CORRELATE WITH CHANGES IN CARDIAC OUTPUT DURING EARLY HEMORRHAGE: A CONTROLLED STUDY IN HEALTHY BLOOD DONORS

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INTRODUCTION. The expiratory diameter of the inferior vena cava (IVC) has been proposed as a measure of volume status [1]. In addition, the variation in IVC diameter during positive pressure ventilation is a sensitive marker of volume responsiveness [2]. However, the majority of patients breathe spontaneously. The correlations between IVC values and changes in cardiac output induced by volume shifts remain to be described in these patients. In the emergency- or perioperative setting this would help to identify the patients most vulnerable to the effects of hemorrhage and optimize volume therapy.
OBJECTIVES. To correlate the IVC collapsibility index (IVC-CI) and the alteration in IVC expiratory diameter to the changes in cardiac output (CO) induced by controlled, early hemorrhage.
METHODS. The study was approved by the regional ethical committee. Healthy individuals scheduled for voluntary blood donation were eligible for inclusion. Ultrasonic measurements of the IVC and CO were performed prior to blood donation and immediately following needle withdrawal thereby minimizing volume re-distribution. Longitudinal imaging of the IVC was performed and cine loops including entire respiratory cycles were stored. The expiratory- and inspiratory diameters were subsequently calipered off-line 2 cm upstream of the hepatic veins' inflow using frame to frame analysis. IVC-CI was defined as (IVCexpiratory − IVCinspiratory)/IVCexpiratory. In the cardiac apical 5-chamber view the velocity time integral (VTI) of the left ventricular outflow tract (LVOT) was measured and CO was calculated as VTI × area of the LVOT × heart rate.
Measurements before and after donation were compared with a student's *t* test and correlations analyzed with Spearman's correlation coefficient. $P < 0.05$ was considered statistically significant.
RESULTS. Forty volunteers were included and three were later excluded because of vasovagal reaction [1], inadequate image quality [1] and left bundle branch block [1]. Volume reduction was exactly 480 ml in all volunteers. IVC-CI prior to blood donation was 0.15 % ± 0.11. Blood donation caused a decrease in IVC expiratory diameter from 21.1 mm ± 0.07 to 16.1 ± 0.08 ($P < 0.001$). CO was reduced from 5.36 L/min ± 0.21 to 4.36 L/min ± 0.14 ($P < 0.001$). IVC collapsibility did not correlate with changes in CO (rho = 0.02, p = 0.897), see Fig. 1. In addition, neither absolute nor relative changes in IVC expiratory diameter correlated with CO change (both P-values > 0.596).

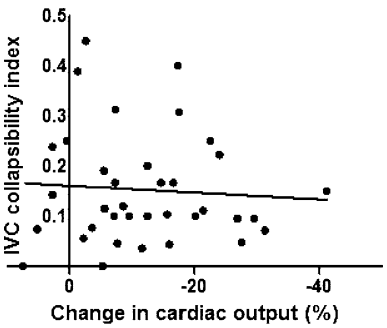

Figure 1
CONCLUSIONS. In healthy volunteers breathing spontaneously, blood donation of 480 ml caused a significant reduction in both IVC expiratory diameter and CO. IVC-CI prior to donation and changes in IVC diameter did not correlate with CO change.
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0735
COMPARING HEMODYNAMIC EFFECTS DURING TWO METHODS OF EXTERNAL LEG COMPRESSION VERSUS PASSIVE LEG RAISING AFTER CARDIAC SURGERY

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INTRODUCTION. Like passive leg raising (PLR), external leg compression (ELC) improves hemodynamics, depending on methods by shifting venous blood from the legs into the thorax, at least temporarily [1].
OBJECTIVES. We compared two different ELC methods (circular, A, vs wide, B, inflatable bandages) from lower to upper legs with PLR before each ELC series.
METHODS. Twenty-nine mechanically ventilated patients in the intensive care unit after major cardiac surgery were studied. PLR A (n = 16) was followed by ELC A, and PLR B (n = 13) was followed by ELC B. ELC was inflated to 30 cmH2O for 15 min from the lower leg. Hemodynamics were measured by thermodilution and recorded prior, during and after interventions.
RESULTS. Hemodynamics responses were shown in Tables 1 and 2. Cardiac output (CO) was increased during PLRA, ELC A, PLR B and ELC B by mean of 3, 5, 7 and 4 %, respectively.

Table 1 PLR A and ELC A

	PLR			ELC			P changes
	Before	PLR	P	Before	ELC	P	PLR vs ELC
HR	80 ± 12	79 ± 12	0.114	81 ± 13	81 ± 13	0.686	0.109
CO	6.1 ± 1.7	6.3 ± 1.8	0.016	6.4 ± 1.8	6.7 ± 1.9	0.001	0.757
SV	77 ± 20	81 ± 20	0.002	80 ± 19	82 ± 18	0.007	0.167

	PLR			ELC			P changes
	Before	PLR	P	Before	ELC	P	PLR vs ELC
HR	74 ± 7	74 ± 8	0.111	76 ± 7	75 ± 7	0.055	1.000
CO	5.4 ± 1.3	5.8 ± 1.4	<0.001	5.2 ± 1.2	5.4 ± 1.2	0.003	0.012
SV	73 ± 18	80 ± 20	<0.001	70 ± 17	73 ± 17	<0.001	0.009

CONCLUSIONS. After cardiac surgery, ELC by circular inflatable bandages resulted in more augmentation of CO than wide bandages and the effect was similar to that of PLR, in spite of different pressure responses. This may relate to the circular compression and inflation from lower to upper leg moving more blood to the thorax by squeezing.
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0736
MODIFICATION OF STROKE VOLUME VARIATION WITH INCREASED INTRA-ABDOMINAL PRESSURE IN NORMOVOLEMIC PORCINE MODEL

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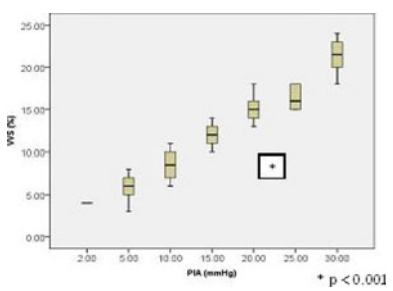
INTRODUCTION. The monitoring the critically ill patient is essential to assess their physiological conditions and organ reserve. In most cases, hemodynamic monitoring is useful because it focuses on tissue perfusion, especially in the context to continue resuscitation. One of the current issues is whether or not there is a response to fluid management. The pulse pressure variation (PPV), the stroke volume variation (SVV) and systolic pressure variation (SPV) have demonstrated improved sensitivity and specificity to predict fluid response, but there are conditions under which the determination becomes invalid.
Among these factors are: tachycardia, arrhythmias, use of vasoactive, low tidal volumes. The intra-abdominal hypertension produced hemodynamic changes with impact in stroke volume.
OBJECTIVES. To analyze the stroke volume variation in different levels of intra-abdominal pressure in normovolemic porcine models.
METHODS. We used three pigs, York-Landrace 50–50, weighing approximately 35–38 kg. A intraperitoneal catheter was placed and saline 0.9 % infused to increase intra-abdominal pressure. The IAP baseline was 5 mmHg with increased intra-abdominal pressure 5 mmHg every 10 min up to 30 mmHg. We obtained measurements of hemodynamic variables with the system FloTrac-Vigileo Edwars Lifesciences™. The stroke volume variation was measured. Statiscal analysis was performerd by ANOVA, considering significant p less than 0.05. We used the SPSS v.18.
RESULTS. A total of 180 measurements were performed.



SVV and IAP
CONCLUSIONS. Increased intra-abdominal pressure progressively increases in stroke volume variability in normovolemic pigs.
Intra-abdominal hypertension is a factor that modifies the stroke volume variation; so that its interpretation should be cautions in the presence of this problem.
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0737

COMPARISON OF CENTRAL VENOUS CATHETER AND PULMONARY ARTERY CATHETER GOAL DIRECTED THERAPY IN PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK

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INTRODUCTION. Early goal directed therapy with using a central venous catheter (CVC) decreases mortality and morbidity in sepsis. There is an ongoing debate for pulmonary artery catheter (PAC) use in hemodynamic monitoring.

OBJECTIVES. To investigate whether CVC goal directed or PAC goal directed therapy has any superiority over each other in severe sepsis and septic shock patients in critical care unit.

METHODS. Randomized controlled study was performed in an 18 bed medical ICU. First group received central venous catheter goal directed therapy as described before [1]. Second group received PAC goal directed therapy with the proposed method described before [2]. Patients included into the study within 12 h of diagnosis of severe sepsis or septic shock. There were 15 patients in CVC group and 14 patients in PAC group.

RESULTS. Mean age for CVC group was 62 ± 12 and 64 ± 16 for PAC group ($p > 0.05$). APACHE II scores for CVC and PAC groups were 21 ± 5 and 22 ± 3 respectively ($p > 0.05$). There was no any statistically significant difference in basal characteristics, underlying diseases, source of sepsis and causative agents between the groups. Admission and 72nd hour SOFA scores were also similar between the groups. During the interval from initiation of study to 72nd hours, the patients assigned to CVC group and PAC group had similar lactate levels (3.78 ± 2.46 and 1.92 ± 1.06 vs 3.41 ± 1.69 and 2.05 ± 1.05 mmol/L) ($p > 0.05$). There was no difference in arterial pH levels at admission and 72nd hour (7.34 ± 0.10 and 7.36 ± 0.09 vs. 7.30 ± 0.11 and 7.31 ± 0.12). Fluid requirements for the same period were not statistically different for CVC and PAC groups respectively ($3,262 \pm 2,261$ and $4,489 \pm 2,194$ vs. $4,385 \pm 2,301$ and $5,473 \pm 2,366$ mL). There were not any statistically significant differences in noradrenalin and dopamine requirement, PEEP levels, duration of mechanical ventilation, duration of ICU stay between the groups. Eight patients (53%) in CVC group and 6 patients (43 %) died in ICU ($p > 0.05$).

CONCLUSIONS. There are no any clinical and hemodynamic differences between CVC and PAC guided early goal directed therapy. CVC guided early goal directed therapy may be preferred to PAC guided therapy since pulmonary artery catheters are more invasive than central venous catheters and requires more education to interpret data derived from them.

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0738

PULSE PRESSURE AND STROKE VOLUME VARIATION ARE GOOD PREDICTORS OF FLUID RESPONSIVENESS IN SEVERE SEPSIS PATIENTS

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INTRODUCTION. PPV and SVV are dynamic preload indicators. Specific interactions of cardiovascular system and lungs under mechanical ventilation cause cyclic variations of PPV and SVV. Real time measurement of PPV and SVV by arterial pulse contour analysis is useful to predict volume responsiveness in severe sepsis patients.

OBJECTIVES. Results presented are of prospective, nonrandomized control trial of 2 years duration conducted at Department of anesthesiology at Zagreb University Hospital. Volume responders and nonresponders were defined. Correlation between PPV, SVV and other hemodynamic data in severe sepsis patients were analyzed.

METHODS. Study was conducted from Oct 2009 to Dec 2011. Severe sepsis group included 46 patients (22 male, age 46 ± 8; 24 female, age 41 ± 6, APACHE II score 36 ± 8) undergoing major abdominal surgery with clinically and laboratory confirmed severe sepsis (defined according to international criteria).

Exclusion criteria: patients with LVEF < 45 %, atrial fibrillation, pulmonary edema, children, pregnant women and patients who did not sign informed consent. Severe sepsis patients were divided in: volume responders and volume nonresponders. Responders were defined as patients with an increase in SVI of $\geq$ 15 % after fluid loading. PPV, SVV, LVSV and CI were assessed by arterial pulse contour analysis using LiDCO + system continuously during 8 h. Simultaneously, mean arterial pressure, SVRI, heart rate, oxygen delivery, oxygen consumption and central venous oxygen saturation were assessed. Hemodynamic data were recorded before and after fluid administration of 500 ml of 6 % hydroxyethyl starch over 30 min. All patients were mechanically ventilated, in sinus cardiac rhythm. Circulatory instable patients had vasoactive support and SOFA scores calculated. Ventilator settings and dosage of vasoactive drugs were all kept constant during the study. Data were compared using Student's t test. Correlation was estimated using Pearsons coefficient. $P < 0.05$ was considered statistically significant.

RESULTS. A positive response to fluid loading was present in 58.4 % of patients. Baseline PPV correlated with baseline SVV ($r = 0.92$, $P < 0.001$). PPV and SVV were significantly higher in responders than in nonresponders. PPV: 15.2 ± 4.1 vs. 7.4 ± 4.5; $P < 0.001$. SVV: 14.4 ± 3.3 vs. 7.1 ± 3.1; $P < 0.001$. Other baseline haemodynamic data were not different between two groups. There was no difference between area under receiver operating characteristic curves of PPV (0.927; 95 % confidence interval 0.816–1.00) and SVV (0.93; 95 % confidence interval 0.842–1.00). Optimal threshold value for discrimination between responders and nonresponders was 12 % for PPV (sensitivity 82.8 %, specificity 81.6 %), 10 % for SVV (sensitivity 90.3 %, specificity 81.8 %).

CONCLUSIONS. PPV and SVV measured by LiDCO + are reliable predictors of fluid responsiveness in mechanically ventilated severe sepsis patients, with a sinus cardiac rhythm.

0739

PROTOCOLIZED GOAL-DIRECTED HAEMODYNAMIC MANAGEMENT INCREASES AVAILABLE HEART DONORS

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INTRODUCTION. Available heart donors (AHD) limits cardiac transplantation. Aggressive haemodynamic management is advocated by international organizations to increase donor's pool. There is no management experience with arterial pulse contour waveform analysis and transpulmonary thermodilution in suspected brain death patients (BD).

OBJECTIVES. To increase AHD achieving better haemodynamic stability in BD thanks to a goal-directed haemodynamic management.

METHODS. Prospective study in a 24 beds intensive care unit of an university hospital. The haemodynamic monitoring was performed using a pressure waveform analysis and transpulmonary thermodilution femoral artery catheter PICCOplus (Pulsion Medical Systems, Munich, Germany).The targets to be achieved at the begining of apnea testing (T0) were: cardiac index (CI) 3.0–5.0 l/min/m^2, global end-diastolic volume index (GEDVI) 650–800 ml/m^2, systolic volume variation (SVV) < 13 %, indexed systemic vascular resistance (ISVR) 1,700–2,400 din/seg/cm^5/m^2, lactate < 14 mmol/L and to avoid dopamine (D) and adrenaline (A).Terlipressine (T) was used as a rescue treatment of the NA.

RESULTS. 52 BD with a mean age of 58.3 years (SD 14.80), mean weight 80.58 kg (SD 20) and mean BMI 28.50 kg/m2 (SD 6.12) were studied. 49 % were men. 23 % had dyslipidemia, 40 % arterial hypertension, 6 % ischemic heart disease, 38 % smoking, 15.3 % diabetes and 32.1 % alcohol abuse.Main causes of death were 46.15 % intracerebral hemorrhage and 30.76 ischemic stroke. T0 values were: CI 3.07 L/min/m^2 (SD 0.86), GC 5.71 L/min (SD 1.78), ISVR 2,290 din/seg/cm^5/m^2 (SD 846), SVV 12 % (SD 8), heart rate 88 beats/min (SD 21), lactate 13.18 mmol/l (SD 10), systolic and mean blood pressure 126 mmHg (SD 23) and 88 mmHg (SD 17) respectively. 69 % received NA, dose 0.61 μg/kg/min (SD 1.75), dobutamine (DB) 23 %, dose 5.17 μg/kg/min (SD 3.24), both 13 %. Only one patient received A.

Those trated with T had a significative increase of ISVR ($p < 0.020$) but with no differences on CI. Neither fluid balance in last 24 h 926 ml (SD 2,046) nor NA or DB dose in T0 show significative differences between AHD and those who were not ($p = 0.792$). 30.76 % of the patients were AHD. The hospital and therefore region rate of heart donors per million habitants was increased from 6 to 28 last year.

CONCLUSIONS. Implementation of a goal-directed haemodynamic optimization protocol using an arterial pulse contour waveform analysis and transpulmonary thermodilution system with restriction of A and D, is associated with an increase in AHD.

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Airway care & instrumentation: 0740–0753

0740

CLINICAL PROFILE OF PATIENTS REFERRED TO CHEST PAIN UNIT FROM EMERGENCY HOSPITAL DEPARTMENT

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INTRODUCTION AND OBJECTIVES. Chest pain is one of the most common clinical entities in hospital emergency departments, requiring proper risk stratification, given its potentially fatal prognosis. The aim of our study was to analyze clinical and epidemiological profile of patients assessed in a chest pain unit (CPU).

MATERIALS AND METHODS. Prospective analysis of all patients consecutively referred for chest pain clinic from the emergency hospital department to CPU, in the period June 2009 to October 2011.

RESULTS. We included 837 patients, mean age 59.58 ± 13.36 years (14–93 years), 489 (58.4 %) males. 25.7 % were smokers, 57.3 % had hypertension, 13 % were diabetics and 49.2 % had dyslipidemia. The 23.4 % had a history of previous ischemic heart disease, requiring coronary revascularization in 14.1 %. The mean patient comorbidity, expressed by the Comorbidity Charlson Index was low, 0.91 ± 1.28. Anemia was present in 13.7, 15 % lung disease, 6.5 % advance renal failure, history of stroke 3.8 and 2.9 % peripheral arterial disease. 2.2 % of patients were previously diagnosed with rheumatic fibromyalgia and 17.2 % had affective disorders. Almost all patients had a preserved left ventricle systolic function (97.1 %) and 4.9 % atrial fibrillation. Prior the first visit, 56.4 % of patients received antiplatelet agents, 4 % anticoagulants, 28.2 % beta blockers, 25.2 % calcium channel blockers, 20.3 % ACE inhibitors, 29 % ARBs, 28.6 % nitrates and 44.9 % statins.

CONCLUSIONS. The typical clinical profile of patients evaluated by a chest pain unit corresponds to a middle aged man, with presence of some classic cardiovascular risk factor in at least half the cases, and with a reduced comorbidity. In a quarter of cases have a previous history of ischemic heart disease, with significant use of drugs.

0741

CAN FIXED NO. 7.5 ET TUBE SAVES LIVES BETTER IN EMERGENCY?

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INTRODUCTION. This study is done to improve quality of airway management in emergency situation.

OBJECTIVE. To analyze outcomes in unplanned (emergency) intubations using fixed no.7.5 ET tube for adult patients in a tertiary care hospital.

METHODS. Patients getting admitted were analyzed for variables such as gender, APACHE II scores, co morbidities like diabetes, hypertension, coronary artery disease, smoking and duration of stay in ICCU. Death/discharge from ICCU was considered as end points. Those were divided in two groups [A] fixed no.7.5 ET tube group and [B] Non-fixed no. ET tube group (other than no. 7.5 ET tube), getting admitted to hospital in the same

duration for similar variables. A multivariate logistic regression analysis was done using SPSS version 11.
RESULTS. Forty patients were enrolled for fixed No. 7.5 ET tube (n = 40, M:F 28:12) during April 08–March09 which were compared against a control group of forty-one patientswhere non fixed ET tube were used (n = 41, M:F 26:15). The results were as follows—(refer Table).

Results

Feature	Fixed No.7.5 ET tube group	Non-fixed no. ET tube group
Age in years	55.7 + 7.2	51.9 + 8.7
APACHE II	17.4 + 3.3	17.8 + 2.7
Pre coronary intervention intubation	27 (68%)	27 (66%)
Peri coronary intervention intubation	8 (20%)	9 (22%)
Post coronary intervention intubation	5 (13)	5 (12)
Stay in ICCU (days)	4.6 + 1.2	6.1 + 4
Within 30 days mortality	3 (8%)	7 (18%)
Hypoxic brain injury	0	3 (7%)

We find that hypoxic brain injury and mortality had a statistically significant association with non fixed no. ET tube group ($p = 0.012$)

CONCLUSION. There was a major difference in the two groups in terms of outcomes (mortality and hypoxic brain injury) in unplanned intubations in cardiac tertiary care hospital.

0742
THE EFFECTS AND SAFETY OF CLOSED TRACHEAL SUCTION SYSTEM VERSUS OPEN TRACHEAL SUCTION SYSTEM FOR MECHANICALLY VENTILATED PATIENTS: A META-ANALYSIS

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INTRODUCTION. The effects and safety of closed tracheal suction system versus open tracheal suction system for mechanically ventilated patients are highly controversial.
OBJECTIVES. To evaluate the effects and safety of closed tracheal suction system (CTSS) versus open tracheal suction system (OTSS) for mechanically ventilated patients.
METHODS. All randomized controlled trials (RCTs) comparing CTSS with OTSS for mechanically ventilated patients were identified. All related data were extracted. Meta-analysis was conducted using the statistical software RevMan 5.1 on the basis of strict quality evaluation, the methods recommended by the Cochrane Collaboration.
RESULTS. Twelve RCTs involving 1,205 patients in CTSS group and 1,179 patients in OTSS group were included. The results of Meta-analysis showed that CTSS was associated with a significant reduction in duration of mechanical ventilation [WMD-0.73, 95 % CI (−1.07, 0.40), $P < 0.0001$], but not the incidence of ventilator associated pneumonia (VAP) or risk of microbial colonization or mortality or length of ICU stay, when compared with OTSS. However, CTSS decreases the risk of arrhythmia [RR 0.23, 95 % CI (0.07, 0.74), $P = 0.01$] and minimizes the disturbance to heart rate [WMD-1.97, 95 % CI (−3.03, −0.91), $P = 0.0003$] and mean arterial pressure [WMD-2.01, 95 % CI (−3.02, −1.01), $P < 0.0001$] and SpO_2 [WMD-1.00, 95 % CI (−1.14, −0.86), $P < 0.00001$].
CONCLUSIONS. Compared with OTSS, CTSS could reduce the duration of mechanical ventilation of critically ill without any adverse effect.
GRANT ACKNOWLEDGMENT. This work was partly supported by Natural Science Foundation of Southeast University (No. KJ2010492) and Natural Science Foundation of China (No. 81070049).

0743
MULTICENTER OBSERVATIONAL STUDY ON PRACTICE OF TRACHEAL SUCTIONING IN PATIENTS UNDER MECHANICAL VENTILATION

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INTRODUCTION. Tracheal suctioning manoeuvre takes part in the routine care of patients under mechanical ventilation. This procedure is necessary to maintain the patency of artificial airway, but carries the risk of adverse reactions or worsening of clinical condition.
OBJECTIVES. This multicenter observational study aimed to evaluate the adherence of practice to current guidelines [1], the incidence of adverse events, and the impact of a discrepancy between the practice and the recommendations on the occurrence of adverse events.
METHODS. This one day-study was performed on 29th September 2011 in 68 french intensive care units. Each patient under invasive mechanical ventilation was observed for one tracheal suctioning manoeuvre. 496 patients were included. The rate of adherence to each of seven recommendations was expressed as the percentage of adequate manoeuvres. The adequation score was defined as the number of recommendations which were applied for each suctioning manoeuvre. The adverse events were defined as follows: hemorrhagic secretions, oxygen desaturation defined by a decrease in pulse oxymetry greater than 5 %, and hemodynamic intolerance (bradycardia < 30/min and/or tachycardia > 150/min and/or hypotension < 80 mmHg and/or hypertension > 200 mmHg of arterial blood pressure).
RESULTS. The adherence to each recommandation was as follows: no routine use of saline instillation prior to suctioning = 96.3 %; suctioning without disconnecting the patient from the ventilator = 82.3 %; duration of the suctioning event limited to less than 15 s = 79.5 %; shallow suction = 57.7 %; monitoring of the level of suction negative pressure = 57.6 %; tracheal suctioning performed only when secretions are present = 55.6 %; adequate size of suction catheter = 5.3 %. The incidence of each adverse event was as follows: hemorrhagic secretions = 7.4 % of suctioning manoeuvres; oxygen desaturation = 3.3 %; hemodynamic intolerance = 7.4 %. Overall, 16 % of suctioning manoeuvres were complicated by one or more adverse event. The adequation score was similar in the group of manoeuvres with adverse events (4.5 ± 1.1) and in the group without (4.3 ± 1, p = 0.27).
CONCLUSIONS. Some recommendations regarding endotracheal suctioning of mechanically ventilated patients are poorly applied. About 50 % of patients are still routinely suctioned. However, the incidence of adverse events as defined here is low and the discrepancy with the recommendations doesn't impact the incidence of adverse events.
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0744
PERCUTANEOUS TRACHEOSTOMY: AN AUDIT OF A GREEK MILITARY FORCES ICU

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INTRODUCTION. Percutaneous tracheostomy is preferred in the ICU setting because there is no need of transferring the patient to the theater to perform an open tracheostomy it is claimed to be faster safer and associated with fewer complications than an open tracheostomy.
OBJECTIVES. The purpose of this study was to audit the results of percutaneous tracheostomies performed in ICU environment during a 2 year period by house officers in anaesthetics and trainees in intensive care.
METHODS. The tracheostomy kit used was the Portex percutaneous dilatation tracheostomy kit. The main reason to perform the tracheostomy was respiratory support. All procedures were performed in the ICU.
RESULTS. 122 tracheostomies were performed with a complication rate of 6.5% in patients aged 72.2 ± 15.3 years by 17 trainees in a 2 year period with a mean number of tracheostomies per trainee 7.2. The complications were difficulty in dilation (one patient) change of tracheostomy tube because of cuff rupture [1] subcutaneous emphysema [2] immediate hemorrhage-ligation [2] The mean time that was needed to perform a tracheostomy was 5 min and it was measured from the start of infiltration of the local anesthetic to the insertion of the tube.
CONCLUSIONS. Percutaneous dilation tracheostomy is as safe as open tracheostomy and possibly more when it is performed in a controlled environment by trained medical personel. This type of tracheostomy allows quick turnover of patients leading to increased number of ICU beds becoming available, allows a decrease of the level of care for tracheostomy patients leading to decreased costs and is an essential ability for anesthetists and intensivists.
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0745
FEASIBILITY AND SAFETY OF BRONCHOSCOPE-AIDED PERCUTANEOUS DILATATION TRACHEOSTOMY IN OBESE CRITICALLY ILL PATIENTS

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INTRODUCTION. Intensive care unit (ICU) patients, mainly those in need of prolonged mechanical ventilation, may require tracheotomy which once was done in the operating room. Obese critically ill patients are at greater risk for requiring intubation and prolonged mechanical ventilation. Percuteneous dilatational tracheotomy (PDT) was first described in 1985 and now is a well-established procedure that can be performed at the bedside by an intensivist with less surgical equipment required.
OBJECTIVES. To evaluate the safety of performing percuteneous dilatational tracheotomy (PDT) with Fiberoptic bronchoscopy assistance in obese patients requiring prolonged mechanical ventilation.
METHODS. Sixty-two patients 17–79 years of age, 25 females and 37 males with body mass index 38 ± 8 kg/m^2 underwent PDT with bronchoscopy assistance due to prolonged endotracheal intubation between December 2009 and March 2012. The procedures of percuteneous dilatation tracheotomy with guide wire dilator forceps (GWDF) were done bedside with bronchoscopic guidance under general anaesthesia in the intensive care unit. Operative and post operative complications were observed.
RESULTS. Overall complication rate was low and occurred in ten patients, there was no procedure-related mortality. Subcutaneous emphysema without pneumothorax occurred in three patients, two patients had a transitory hypotension related to sedation and five patients had peristomal oozing.The mean time for procedure completion was 15 min and no patient required conversion to surgical tracheotomy. The bronchoscopic examination that was performed in 24 of the patients 20 days after tracheotomy tube removal showed no scar formation.
CONCLUSIONS. PDT with bronchoscopic guidance is safe for obese critically ill patients that can be done by an experienced intensivist at the bedside setting.

0746
PERCUTANEOUS TRACHEOSTOMY PERFORMED WITHOUT BRONCHOSCOPIC GUIDANCE: EXPERIENCE IN 310 PATIENTS

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INTRODUCTION. Bearing in mind the advantages and minor morbidity of percutaneous tracheostomy techniques, they are considered the first choice in patients on prolonged mechanical ventilation. This invasive procedure can be performed for intensivists and the bronchoscopic guidance is considered an optional recommendation.
OBJECTIVES. To describe 4 years of experience in the implementation of the percutaneous tracheostomy program with Griggs technique (Guide Wire Dilating Forceps), without bronchoscopic guidance, performed exclusively by the intensivist team, in a Trauma Intensive Care Unit Level III in Argentina.
METHODS. We prospectively registered all cases where this technique was used from 12/08/2007 to 31/08/2011. Demographic characteristics, timing of tracheostomy, days from tracheostomy to weaning, total duration of mechanical ventilation, ICU length of stay (ICU LOS) and procedure-related complications using Dulgerov's classification were recorded.
RESULTS. 310 procedures were recorded over 4 years, mean age 40.5 years, mean APACHE II 16.18. The main causes for patient admission were: polytrauma with TBI 130

patients (41.9 %), postoperative emergency 42 patients (13.54 %), stroke 30 patients (9.6 %), septic shock 25 patients (8 %). The ICU mortality rate was 26.45 %.
Early complications: two cases of pneumothorax (severe complication); intermediate complications: 11 events of drop of oxygenation and four tracheoesophageal fistula and cannulation difficulties in 15 cases; and five episodes of hemorrhage; all these were considered mild. The incidence of stoma infection was 6.12 % (19 patients).
Timing of thracheostomy: 111 procedures were performed before 7 days (early tracheostomy) and 199 were performed after 7 days (late tracheostomy).

Timing of tracheostomy

	E.T	L.T
ICU LOS (days)	17.95	23.32
ARM total days	15.37	20.11
Days from tracheostomy to weaning	10.75	8.34

CONCLUSIONS. The implementation of this technique performed by the intensivist team has operative advantages, especially in the ICU setting with high number of patients on mechanical ventilation and high turnover. When early tracheostomy was compared with late tracheostomy, and in line with data published in the literature, patients with ET required a shorter duration of mechanical ventilation and ICU stay.
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0747
LOW PRESSURE HIGH VOLUME CUFFED ENDOTRACHEAL TUBES IN EMERGENCY SURGERY

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INTRODUCTION. Complications associated with high pressure, low volume (HPLV) cuff endotracheal tubes (ETT) include increased risk of tracheal injury and stenosis. The need to exchange a HPLV to a low-pressure high-volume (LPHV) ETT can increase risk to critically ill patients and may be delayed if the patient is unstable. To avoid this all ICU patients should be intubated with a LPHV ETT. However, post-operative ICU requirement is not always easily predicted in the pre-operative setting. In the past there was concern regarding the increased cost of LPHV ETT. There have also been developments of LPHV ETTs, which have improved the risk of micro-aspiration [1,2].
OBJECTIVES. 1. To identify the usage and knowledge of LPHV ETT amongst anaesthetists in a teaching hospital. 2. To achieve consensus on the use of ETTs in emergency operations.
METHODS. Anaesthetists of all grades were surveyed to discover choice of ETT for emergency laparotomy, awareness of costs and complications, cuff pressure measurement in theatre, ICU experience, and experience changing ETTs.
RESULTS. Fifty-one surveys were distributed with a 100 % response rate. Knowledge regarding ETT costs was limited [32 (63 %) unaware of cost differences of ETTs]. There was a marked difference in opinion with regard to routine use of LPHV during emergency laparotomies with those with recent ICU experience favouring LPHV (59 vs. 29 %). This was less marked in the routine use during all emergency operations (27 vs. 18 %). The group recently in ICU were more likely to have performed an ETT exchange (62 vs. 25 %), which may partially account for the difference in opinion on routine use. Those with recent ICU experience are also more likely to be aware of the morbidity of HPLV ETTs with long-term use.
CONCLUSIONS. Due to the risk of complications associated with HPLV ETTs and ETT exchange, LPHV ETT should be used routinely for all emergency laparotomies. There is no difference in cost between low and high pressure ETTs. Implementing the routine use of LPHV for emergency laparotomies would therefore have little financial impact.
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GRANT ACKNOWLEDGMENT. No grants were received for this project.

0748
DEVELOPMENT OF POST EXTUBATION PNEUMONIA: ROLE OF 24 HOURS OF ENDOTRACHEAL INTUBATION AND MECHANICAL VENTILATION. AN EXPERIMENTAL STUDY

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INTRODUCTION. Tracheal intubation is a major risk factor for nosocomial pneumonia, since microaspiration of bacterial colonized secretion across the endotracheal tube cuff is considered a primary pathogenetic way for ventilator associated pneumonia (VAP).
OBJECTIVES. We hypothesized that 24 h of tracheal intubation would allow the access of a conspicuous bacterial load into the lower airways to enhance the onset of pneumonia in the post extubation period.
METHODS. Fourteen sheep were randomized into two groups: 1. Seven were mechanically ventilated for 24 h (control group); 2. Seven were mechanically ventilated for 24 h and then were extubated and maintained in spontaneous ventilation for 48 h (awaken group). At the end of the study all the sheep underwent to microbiology and histology of the lung. No antibiotics were administered.
RESULTS. In the control group one animal developed pneumonia during mechanical ventilation while five had heavily colonized lung (median of three lobes, colonization range: 1.09E + 05–1.38E + 09). In the awaken group one animal developed pneumonia during mechanical ventilation and three developed pneumonia during the 48 h following extubation (median of 4.5 lobes, colonization range: 2.8E + 05–1.8E + 09). Two animals had sterile lungs in the control group and three in the awaken group.
CONCLUSIONS. Twenty-four hours of tracheal intubation can lead to colonization of the lower airways, even without any clinical signs. This colonization can precipitate the development of pneumonia after extubation.

0749
THE IMPACT OF CRITICAL CARE ON ORAL HEALTH. AN OBSERVATIONAL STUDY

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INTRODUCTION. A failure to maintain oral health can have a number of serious impacts on patients: Deteriorating oral health is associated with healthcare associated infections (HCAIs)(1). The effect of an increased incidence of HCAIs is an increase in mortality, morbidity and healthcare-associated costs. Poor oral health affects quality of life, wellbeing and personal dignity. A failure to maintain oral health could lead to a worsening of existing oral conditions or new orofacial disease such as periodontal disease and caries.
OBJECTIVES. To assess the impact of critical care admission on oral health, as assessed by dental plaque.
METHODS. Observational study in a critical care unit (CCU). Patients were enrolled within 24 h of admission. The quanitiy of dental plaque amount was assessed at baseline and again at one and 2 weeks. Assessment was performed using the Debris Index-soft deposits, a well validated index of dental plaque. The categories are: 0 = no debris or stains present. 1 = soft debris covering not more than one-third of the tooth surface or presence of extrinsic stain. 2 = soft debris covering more than one-third but not more than two-thirds of the tooth surface. 3 = soft debris covering more than two-thirds of the tooth surface. Plaque was assessed on six representative teeth 'Ramfjord teeth', (dental notation: UR6, UL1, UL4, LL6, LR1 and LR4) on outer or buccal surfaces only due to anticipated difficulties of access to lingual aspects. The sum of the index over all six teeth was used (range 0–18).
RESULTS. 50 patients were recruited, of whom 36 were still present in CCU at week one and ten at week two. The principal reasons for patient loss were early discharge (n = 11), died (n = 2) and transfer to a different hospital (n = 1). The majority of patients were post-operative, 56 % were dependent on others for oral care.
There was a statistically significant (Fishers exact test, p = 0.04) median increase in the amount of plaque from baseline to week one and a further (non-significant) increase from week one and week two (Table 1).

Median dental plaque at baseline and median change

	Baseline	Change in plaque: baseline to week 1	Change in plaque: week one to two
Number of patients	50	36	10
Debris index-soft deposits	4	1.5 (−1.0, 4.0)	1.0 (−8.0, 6.0)

There was no difference in plaque increase between those who were self-caring and those dependent on others to deliver oral care.
CONCLUSIONS. Admission to critical care is associated wih a statistically signifcant deterioration in oral health and, with it, the potential sequelae. This is despite a unit policy on addressing oral health. These results will form the basis for an interventional study to reduce the impact of critical care admission on oral health.
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GRANT ACKNOWLEDGMENT. There was no external funding.

0750
ORAL CARE AND COLONIZATION IN A MULTIDISCIPLINARY ICU

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BACKGROUND. Infections, especially by resistant and multi-resistant types of microorganisms remain a great threat for the hospitalized person and mostly for the critical one. In bibliography, there is a solid knowledge about the relation between oral health status and types of infection (e.g. pneumonia) which indicates that oral hygiene is a high priority care.
AIM. The aim of the study is to explore the oral care practice that is in use, oral health status and colonization.
METHOD. All sequential admissions (195 in total) that met the admission criteria in a 4-month period in a general ICU were included in the study. Two factors were measured; oral health status (modified Eliers score-range: five; worst and 15; best) and throat colonization (semi-quantitative cultures) in the first 24 h of admission and between 5th-7th day (2nd measurement).
RESULTS. Our sample consisted of 64 subjects (M39/F25, mean age 55 ± 18). APACHE II and SOFA (first 24 h) were 17 ± 2.9 and 7 ± 5.9 respectively. Only two of them were ventilated through tracheotomy (3 %) and edentulous were 17 %. Eliers score on the first 24 h (8 ± 1.9) and on the 2nd examination (8 ± 1.7) appeared to be unaffected ($p > 0.05$) and to have (positive) correlation ($p = 0.000$ and $r = 0.585$). Second measurement cultures showed colonization with gram negative bacteria to be worse [1–2 Gram negative types, instead of 0–1 on admission ($p > 0.05$ and $r = 0.13$)]. Based on these two factors, the repeated measurement analysis revealed that the current oral care provided had no influence on heath status of the oral cavity ($p > 0.05$) while significant colonization of oropharyx with gram negative bacteria ($p = 0.000$).
CONCLUSION. The mouth hygiene procedure that is in use in the ICU studied, seemed to have no effect on oral health status. Oral health status in first 5–7 days in ICU found to correlate with respective on admission. More research is needed in order to infer the best practice for oral care among critical ill patients.

0751
A RESEARCH ON PREDICTIVE FACTORS OF TRACHEOSTOMY FOR PATIENT WITH ACUTE ORGANOPHOSPHATE INSECTICIDE POISONING PATIENTS

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INTRODUCTION. The majority of patients with organophosphate insecticide poisoning need assisted respiration as the toxicity causes respiratory paralyze, excessive Secretion,

inhalation of gastric contents, pneumonia and all these can lead to respiratory failure. Further, many of the patients tend to have tracheostomy to reduce complication caused by tubing for along time.
OBJECTIVES. The objective of this research is to reduce the mortality of the patients with organophosphorus pesticide. In doing so, the patients who had tracheostomy and are in initial stage of treatment, among the ones who are with organophosphate insecticide poisoning, have been investigated.
METHODS. The research has been conducted with 141 patients those who are with organophosphate insecticide and have been hospitalized in department emergency medicine of emergency center of chosun university hospital from January of 2007 to December of 2010. The patients have been divided into two groups and their medical records have been investigated.
RESULTS. Of 141 patients with organophosphate intoxication, 105 of them did not tracheostomy and 16 were dead cohorts (15.2 %). Their size of pupil was 1 mm. Factors such as amount of organophosphate ingested, PAM time after ingestion, average body temperature, arrival time, atropinization time after ingestion, AST/ALT, Bun/Cr all appeared to be significant factors in death cohorts ($P < 0.05$). 36 patients among the total had tracheostomy and 11 once of them were in dead cohort (30.6 %) and their average age was 58 years. The facts affect the state of patients in dead cohort include the amount of intoxication which between 327.27 ± 194.1 ml, performing intubation 686 min after intubation, reaching to the hospital after 580 min, injecting PAM 744 min after intoxication, injecting atropine 627 min after intoxication. The largest cases of patients state was found to be stupor with 14 patients (38.9 %) the level of Cholinesterase in blood appeared to be significant in dead cohort as 391.00 ± 353.9 IU/L ($P < 0.05$).
CONCLUSIONS. The initiative predictive factors of tracheostomy for the patients with organophosphate insecticide poisoning are as follows: late-visiting to hospital, PAM injection long time after taking poison, atropine injection long time after taking poison, when pneumonia is found by chest radiograph, fast heart beat, small size of pupil and low level of pseudo cholinesterase.
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GRANT ACKNOWLEDGMENT. Further planned studies are necessary on the use of tracheostomy for treatment of poisoning victims, especially those intoxication by organophosphorus insecticides.

0752
AUDIT REGARDING THE REQUIREMENT OF CHEST X-RAYS FOLLOWING PERCUTANEOUS DILATATIONAL TRACHEOSTOMY

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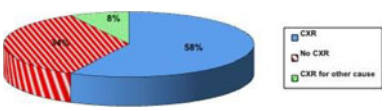
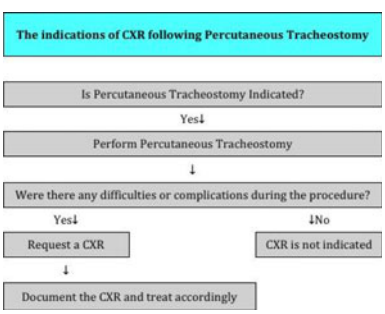
INTRODUCTION. Percutaneous dilatational tracheostomy (PDT) is an invasive procedure performed frequently in ICU. Indications include; prolonged respiratory wean, bypassing an obstruction, prevention of aspiration and removal of secretions by aspiration and long term airway management[1]. It is performed using a bronchoscope and continuous capnography for continous monitoring. The incidence of minor procedural complications is between 20–30 % [1, 2]. The rates for major complications resulting from percutaneous tracheostomy including pneumothorax, pneumomediastinum major bleeding and tube malposition have is 0–2 % in different studies [2, 3, 4, 5]. CXR Should be considered if there were any complications but not routinely required post uncomplicated PDT insertion [1, 2, 6].
OBJECTIVES. To review our practice and determine if CXRs are required post uncomplicated PDT insertion.
METHODS. This is a retrospective audit in a single ICU. It was performed by reviewing patients' notes and ICU monitoring charts for the period August–November 2011. Data collection included all non emergency PDTs, complications and post procedure CXRs.
RESULTS. Twenty-six patients case notes were reviewed (all PDTs August–November 2011), CXRs were requested in 15 (58 %) cases (Fig. 1). A potential complication was suspected in only one case, after multiple attempts during insertion and a CXR was requested. This was reported as normal. No other abnormalities were revealed on any of the other chest x rays. Two further CXRs were requested for reasons unrelated to the PDT (post chest drain insertion and post naso-gastric tube insertion).



CXR requests post PDT
CONCLUSIONS. Our findings show that PDT was performed safely during the study period and a CXR is not routinely required following an uncomplicated procedure. This has cost implications, as well as reducing the potential exposure to radiation for both patients and staff. We produced the flowchart below (Appendix 1) to decide whether a CXR is necessary following insertion of a PDT.



Appendix 1 CXR flowchart post PDT insertion

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GRANT ACKNOWLEDGMENT. Royal Blackburn Hospital, ICU Department.

Sedation practices & delirium: 0754–0764

0754
INCIDENCE, SEVERITY AND TREATMENT OF DELIRIUM IN CARDIAC SURGERY PATIENTS: AN OBSERVATIONAL STUDY

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INTRODUCTION. Delirium is a common yet under diagnosed condition in cardiac surgery patients, and may cause prolonged cognitive impairment and increased risk of complications. Patients are at risk of pulling catheters and lines and may fall attempting to get out of bed. The aging patient population present with many risk factors for developing delirium, but diagnostic tools have been few. Almost 50% present with hypoactive delirium, which is often not diagnosed, nor treated correctly. To optimize effect, treatment should be initiated early, maintained until clinical improvement, and then tapered gradually. Recently, DOS scale (Delirium Observation Screening scale) was developed and validated in elective cardiac surgery patients in The Netherlands, with interesting results. This encouraged us to evaluate the effects of systematic delirium screening and treatment in cardiac surgery patients. To our knowledge, no prior studies have evaluated use of DOS scale in this context.
OBJECTIVES. To evaluate the incidence and severity of delirium, and the effects of standardized treatment in a population of Danish cardiac surgery patients.
METHODS. The study is currently ongoing. It is a prospective, observational study of adult patients scheduled for cardiac surgery. DOS score baseline data are recorded before surgery and used three times/24 h throughout the admission. If the patient is admitted to the thoracic ICU, patients are screened for delirium with CAM-ICU. Patient characteristics, type of surgery, complication rates and types, length of stay and 28 day mortality is recorded. The study has two observation periods. In the first observation period, current clinical practice (incidence and severity of delirium, preventive measures and treatment) is recorded in 100 patients. A clinical treatment guideline for delirium based on systematic use of DOS scale/CAM-ICU is then introduced. In the second observation period another 100 patient courses are evaluated, and data are compared. Primary endpoint is delirium free days. Secondary endpoints: Complication rates, 28 day mortality, length of stay, cognitive function at discharge. A sample size calculation based on an increase in delirium free days of 30 % ($\alpha = 0.05$, $\beta = 0.8$) gives a sample size of 2×50 patients.
RESULTS. Data collection begins in mid April 2012 and is expected to be completed August 2012. We expect to be able to present preliminary results by the time of the congress.
CONCLUSIONS. By using a systematic approach to find and treat delirium in our population of cardiac surgery patients, duration and severity of delirium may be reduced, thus improving the hospitalization course for these patients.
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0755
THE USE OF HOPANTENIC ACID FOR THE CORRECTION OF POSTOPERATIVE COGNITIVE DYSFUNCTION IN SCHOOL-AGE CHILDREN: A RANDOMIZED TRIAL

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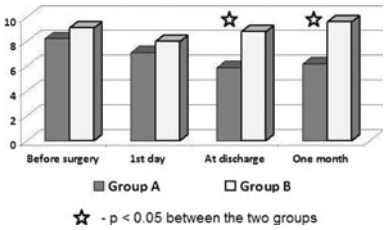
INTRODUCTION. To date, there is no doubt that anesthetics are neurotoxic to developing brain and may cause postoperative cognitive dysfunction (POCD). Therefore, research on the prevention and treatment of cognitive disorders in children, are relevant. Hopantenic acid—is a nootropic agent, has a stimulating effect on the CNS against a background of cerebral insufficiency of exogenous origin in children.
OBJECTIVES. Assessment of the feasibility and efficacy of Hopantenic acid for the correction of early postoperative cognitive dysfunction in school-age children.
METHODS. In accordance with inclusion and exclusion criteria, we examined 40 children of school age (7–16 years old, physical status ASAI–ASAII) with routine surgical pathology (varicocele, cryptorchidism, inguinal hernia). All children received standard total intravenous anesthesia (TIVA): propofol 6–7.5 mg/kg x h and phentanyl 2.5–3 mkg/kg x h. Monitoring: harward standard and bispectral index (BIS). The same level of anesthesia depth was maintained intraoperatively in all cases: values of BIS = 40–60 %. Duration of TIVA-50–80 min (68.2 ± 12.5). Before and after surgery (first day, at discharge, one month) in all children neuropsychological status including Bourdon test, test "10 words", Spielberger scale and Conners Rating scale was assessed. After surgery patients were randomized (Seed # 18,494. www.randomization.com) in two groups: A (n = 20, control); B (n = 20, for cerebral protection Hopantenic acid (Pantogam) 40 mg/kg × day was given per os in one month after surgery). Statistical significance was determined using Wilcockson-Mann–Whitney's criterion (U). Quantitative data are expressed with median and standard deviation, and qualitative data—with percentage.
RESULTS. Two groups were comparable for the main confounding factors (by age, sex, anthropometric data, duration of anesthesia, hemodynamic profile, doses of drugs and the depth of anesthesia). It was found that using TIVA (on the basis of propofol and fentanyl), in the early postoperative period 62.5 % of school-age children has evolved POCD, which persisted in the group A at discharge and 1 month after the surgery in 80 % of cases.

Cerebral protection with Hopantenic acid significantly decreased severity of POCD or totally ceased its symptoms by the time of discharge (3–5 days in low-traumatic operations).



The state short-term memory in the stages of the s
Conners rating scale through a month after surgery showed a decrease in the Group B level of hyperactivity and inattention compared with controls (16.7 ± 8.3 vs. 26.2 ± 7.2; p = 0.003). Through 1 month after surgery in 30 % of patients in group B an improvement cognitive function compared with preoperative data was observed.

The results of Bourdon test on stages of the s

Stages of the study	Test results	Group A (n = 20)	Group B (n = 20)	M-W (U) Test, p-level
Before surgery	Concentration of attention	1.20 ± 1.05	1.40 ± 0.67	0.248
	Stability of attention in the first minute	2.24 ± 0.60	2.50 ± 0.45	0.332
	Time, spent in the test (s)	143.61 ± 30.57	128.00 ± 16.19	0.132
Before discharge	Concentration of attention	0.43 ± 0.20	1.68 ± 1.33	0.001
	Stability of attention in the first minute	1.92 ± 0.44	2.87 ± 0.62	0.001
	Time, spent in the test (s)	171.25 ± 23.66	123.00 ± 22.14	0.001
One month after surgery	Concentration of attention	0.38 ± 0.19	3.44 ± 1.55	0.001
	Stability of attention in the first minute	1.88 ± 0.36	2.83 ± 0.69	0.001
	Time, spent in the test (s)	168.33 ± 14.58	124.00 ± 24.59	0.001

CONCLUSIONS. Hopantenic acid (40 mg/kg per day) is effective in the treatment and prevention of POCD in school-aged children operated under TIVA, based on propofol and fentanyl.

0756

DELIRIUM INCIDENCE AND OUTCOMES OF OCTOGENARIANS ADMITTED TO A UK TEACHING HOSPITAL CRITICAL CARE UNIT AFTER EMERGENCY SURGERY OVER A 3 YEAR PERIOD

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INTRODUCTION. Despite the increasing proportion of elderly patients, there is scant data on the mortality outcomes and incidence of delirium in this high-risk group after emergency surgery and the potential implications this may have regarding future resource demand. Delirium has an incidence of 15-80% in critical care and is an independent predictor of mortality and is associated with increased Critical Care (CC) and hospital lengths of stay (LOS) [1, 2].
OBJECTIVES. To describe the prevalence of delirium and the outcomes and resource use of octogenarians admitted to a UK CC after emergency surgery.
METHODS. Retrospective data was collected from all octogenarians admitted to CC after an emergency laparotomy between 2009–2011. CC database and hospital information systems were used. Delirium was identified using the intensive care delirium screening checklist.
RESULTS. 118 patients were admitted to CC (7.8 % total admissions). 52 % were female (range 80–98 years), 48 % male (range 80–91 years). 69 % patients were General Surgical, 22 % Vascular, 9 % Upper Gastro-Intestinal. Average LOS was 4.5 days in Critical Care and 29 days in Hospital. 11 % patients required Renal Replacement Therapy (RRT) for an average 3.6 days. 41 % patients needed advanced respiratory support (ARS) for an average 3.8 days. Delirium was assessed in 107 patients. Delirium incidence was 29, 35 and 9 % for all CC patients, ARS requiring and RRT requiring patients respectively. Of the Delirium Positive patients, 55 % were female with an average Apache II score of 21.6 versus 18.6 in the delirium negative group. There was no significant difference in the average duration of ARS and RRT required by the delirium positive patients (1.16 versus 1.26 days ARS and 0.32 versus 0.34 days RRT respectively).

Table 1

Patient group	CC mortality n, (%)	Hospital mortality n (%)	CC LOS range, mean (days)	Hospital LOS range, mean (days)
All patients (n = 118)	20 (17)	39 (33)	1–34, 4.5	1–247, 29
ARS (n = 48)	15 (30)	22 (45)	1–34, 7.5	1–79, 20
No ARS (n = 69)	5 (7)	17 (25)	1–24, 3.8	1–247, 35
RRT (n = 13)	7 (54)	9 (69)	1–34, 8	1–79, 19
No RRT (n = 105)	13 (12)	30 (29)	1–32, 4	1–247, 30
Delirium POS (n = 31)	3 (9)	11 (35)	1–26, 5.5	3–119, 28.5
Delirium NEG (n = 76)	7 (9)	18 (24)	1–34, 4	1–247, 32

CONCLUSIONS. CC and Hospital mortality in octogenarians after emergency surgery is 17 and 33 % respectively. This study concurs with others demonstrating that age is not a good predictor of outcome after surgery [3]. This cohort did not have a significant impact on renal or advanced respiratory resources or CC LOS. In this octogenarian cohort, delirium occurred in 29% and there was a trend towards longer CC LOS and higher Hospital mortality.
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0757

INCIDENCE OF INADEQUATE EMERGENCE AFTER ANESTHESIA: EMERGENCE DELIRIUM AND HYPOACTIVE EMERGENCE IN THE POST-ANESTHESIA CARE UNIT

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BACKGROUND. Inadequate emergence after anesthesia can be characterized by the patient's activity level into two subtypes: emergence delirium and hypoactive emergence. The aim of this study was to evaluate the incidence and determinants of inadequate emergence after elective surgery in the Post-Anesthesia Care Unit (PACU).
METHODS. Prospective study including 266 adult patients who had been admitted into the PACU for 3 weeks (May 2011). For the evaluation of inadequate emergence in its two forms it was applied the Richmond agitation and sedation scale (RASS) 10 min after admission at the PACU. Emergence delirium was defined as a RASS score ≥ +1 and hypoactive emergence was defined as a RASS ≤ −2. Demographics data, perioperative variables, and postoperative length of stay in the PACU and in the hospital were recorded. Descriptive statistics were carried out for all studied variables and the Mann–Whitney U-test, the Chi-square test and the Fisher exact test were applied. $P < 0.05$ was considered significant.
RESULTS. Of the 266 patients, 40 (15 %) displayed symptoms of inadequate emergence: 17 patients (6.4 %) screened positive for emergence delirium, and 23 patients (8.6 %) showed hypoactive emergence. Determinants of emergence delirium were a longer duration of preoperative fasting (median 17 versus 14 h, p = 0.001), a higher VAS score for pain at PACU admission (77 versus 38 % had pain VAS > 3), and the presence of major surgical risk (29 versus 7 %, p = 0.001); these patients had a higher incidence of post-operative delirium (21 versus 3 %, p = 0.017) and had higher nausea VAS score 6 h after surgery (0.75 ± 1.92 versus 2.12 ± 2.37, p = 0.001). determinants of hypoactive emergence were a longer duration of anesthesia (median 195 versus 120 min, $p < 0.001$), being submitted to a high risk surgery (70 versus 29 %, p = 0.002); these patients had more frequently post-operative delirium (44 versus 9 %, $p < 0.001$), and had more frequently adverse respiratory events (22 versus 6 %, p = 0.02). Patients with hypoactive emergence had longer length of PACU stay (median 2 versus 1.6 h, p = 0.017) and length of hospital stay (median 6 versus 4 days, p = 0.020).
CONCLUSION. Inadequate emergence after surgery is a frequent complication. Preventable determinants for emergence delirium were higher postoperative pain scores and longer fasting times. Hypoactive emergence was more frequent than emergence delirium and was associated with a longer postoperative PACU and hospital stay. Patients with emergence delirium had more frequently higher nausea VAS score 6 h after surgery and delirium; and patients with hypoactive emergence had more frequently delirium and respiratory events.
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0758

IS DELIRIUM IN OLDER INTENSIVE CARE PATIENTS AN INDEPENDENT PREDICTOR OF HOSPITAL LENGTH OF STAY?

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INTRODUCTION. The consequences of delirium in the intensive care unit (ICU) remain unclear.
OBJECTIVES. This study sought to determine if delirium in the ICU was an independent predictor of prolonged hospital length of stay (LOS).
METHODS. This prospective cohort study was conducted in Surgery Clinic of of the Constanta County Emergency Hospital from January 2011 to December 2011. The study included patients aged 65 and older who were in the ICU for less than 8 h at enrollment. Patients were excluded if they refused consent, were previously enrolled, were unable to follow simple commands at baseline, were comatose, or did not have a delirium assessment performed by the research staff. The Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) was used to determine delirium status. To determine if delirium in the ICU was independently associated with time to discharge, Cox proportional hazard regression was performed adjusted for age, comorbidity burden, severity of illness, dementia, functional impairment, nursing home residence, and surgical procedure.
RESULTS. A total of 124 patients met enrollment criteria. The median age was 75 years [interquartile range (IQR) = 69–81], 54.8 % patients (68) were female, and 88 (70.9 %) were delirious in the ICU. Median LOS was 8 days (IQR = 3–12.5) for delirious ICU patients and 4 day (IQR = 2–8) for nondelirious ICU patients ($p < 0.001$). The hazard ratio (HR) of delirium for time to discharge was 0.81 (95 % CI 0.47 to 0.89) after adjusting for confounders, and indicated that ICU patients with delirium were more likely to have prolonged hospital LOS compared with those without delirium.
CONCLUSIONS. Delirium in older intensive care patients is an independent predictor of hospital length of stay.

0759

BIOMARKERS AND ASSOCIATED FACTORS FOR ICU DELIRIUM

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INTRODUCTION. Delirium should be evaluated in mechanically ventilated patients since the development of delirium has been found as a predictor of mortality. And inflammation has been reported to be related to the mechanism of delirium.
OBJECTIVES. Biomarkers and factors associated with delirium were investigated between delirious and nondelirious patients.
METHODS. Adult mechanically ventilated patients admitted to the ICU between July 2010 and October 2011 were enrolled. RASS scores, the results of CAM-ICU, and physiological parameters were recorded at the two points of extubation and 24 h after extubation. Routine blood test and the specific blood analysis such as cytokines, cortisol, and procalcitonin (PCT) were simultaneously measured at the two points. The patients identified as positive on CAM-ICU were defined as "delirious" and the others were "nondelirious".
RESULTS. Twelve patients were delirious and 16 patients were nondelirious. Delirious patients were compared with nondelirious ones, and statistically significant differences were found in the following variables: APACHE II score, use of midazolam, use of fentanyl, RASS scores at the two points, SOFA score at extubation, serum PCT at extubation, and serum IL-6 at 24 h after extubation. Age, use of midazolam, and use of fentanyl were identified as independent associations for delirium development.
CONCLUSIONS. Serum PCT and IL-6 in delirious patients were higher than those in non-delirious ones. Associated factors for delirium were age and use of midazolam and fentanyl.
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0760
THE WHITE STUFF: USAGE AND MONITORING FOR COMPLICATIONS AT THE ROYAL LONDON HOSPITAL ICU

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INTRODUCTION. Propofol is widely used as a sedative agent in ITUs due to its favourable pharmacological profile. However, there are increasing reports of "Propofol-related infusion syndrome," a rare yet fatal complication of high dose propofol use. The dose and duration of propofol is considered a major risk factor for its development. Lipid profile and 12 lead ECGs are not performed routinely on patients at risk of PRIS, despite being early markers of its development. The summary of product characteristics recommend that lipid levels are checked after 3 days of continuous infusion.The RLH ITU 2009 sedation guidelines, capped the dose at 4 mg/kg/h. It also recommends formal review after 4 days to include performing a risk benefit analysis and consideration of alternative sedation. This mirrors the guidance from the SCCM.
OBJECTIVES. 1. Review propofol usage at RLH ICU with reference to: How propofol is prescribed, adherence to sedation guidelines with regard to dose and duration, frequency of monitoring for hyperlipidaemia and arrhythmia. 2. Develop strategic approach on how to monitor patients on high doses of propofol for prolonged periods.

METHODS. From March to September 11, a sample of patients in the RLH ITU who were on propofol for four or more days were evaluated with reference to: how propofol is prescribed, total daily doses of propofol administered, administration of concomitant midazolam, frequency of monitoring of lipid profile and 12 lead ECG.
RESULTS. Data on 20 patients (19 M, 1F) was collected prospectively, mean age 35 years (range16–58). 17pts had traumatic brain injury. Mean duration of propofol administration was 7.9 days (range 4–16 days). 39 prescriptions were reviewed, only eight based on weight. Eight prescriptions would have allowed an "overdose". Max dose was exceeded on eight occasions in five patients. 11 patients were also on concurrent midazolam. Lipid profile was measured in only four patients all of whom displayed triglyceride level of >2.2 mmol^{-1}. All patients had continuous ECG monitoring and an admission 12 lead ECG. Nine patients had no further ECG.
CONCLUSIONS. At the RLH ITU, propofol is prescribed according to weight in a minority of cases although the doses administered are generally within the recommended dose limit. Despite this patient group being at high risk of development of PRIS, lipid profile and 12 lead ECG are rarely performed. Further to this, significantly abnormal lipid levels are not followed up. We suggest that in patients at high risk of PRIS, lipid levels and 12 lead ECG are monitored after 3 days continuous infusion and twice weekly thereafter. Abnormal results should trigger consideration to start an additional, propofol sparing agent or switching to an alternative sedative agent.
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0761
LONG-TERM OUTCOME OF DELIRIUM IN CRITICALLY ILL PATIENTS

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INTRODUCTION. In Intensive Care Unit (ICU) patients, little research has been performed on the relationship between delirium and long-term outcome, including health-related quality of life (HRQoL), cognitive functioning and mortality. In addition, results seem to be inconsistent. Furthermore, in studies that reported increased mortality in delirious patients, no proper adjustments were made for severity of illness during ICU admission.
OBJECTIVES. To investigate the association between ICU delirium and long-term HRQoL, cognitive functioning and mortality. The hypothesis was that delirious patients have worse long-term outcome in comparison with non-delirious patients.
METHODS. A prospective observational cohort study was conducted. A median of 12 months after ICU discharge, questionnaires were sent to all survivors. HRQoL and cognitive functioning were measured with the EuroQol-6D. Age, gender and severity of illness were considered relevant covariates. Severity of illness was estimated using the APACHE-IV score and the maximal SOFA score during admission. HRQoL was investigated with linear regression analysis, cognitive functioning using logistic regression and mortality with Cox regression analysis.
RESULTS. The patient population consisted of 690 patients admitted to the ICU, subdivided into delirious ($n = 257$) and non-delirious patients ($n = 433$). During follow-up, 181 (26 %) patients died. The response rate of the questionnaire was 70.6 %. After adjusting for the predefined covariates, delirium was significantly associated with a lower HRQoL (β: -0.137; 95 % CI -0.140 to -0.005) and more mild and severe cognitive impairment (odds ratio: respectively: 2.3; 95 % CI 1.3 to 4.2 and 5.8; 95 % CI 1.3 to 15.2). No significant association between delirium and long-term mortality was found (hazard ratio: 1.0; 95 % CI 0.7 to1.4).
CONCLUSIONS. Delirium during ICU admission was associated with lower HRQoL and worse cognitive functioning, 1 year after discharge. Furthermore, delirium on the ICU was not associated with long-term mortality after adjusting for relevant covariates, including severity of illness during ICU admission.

0762
HEART RATE VARIABILITY IN INTENSIVE CARE UNIT PATIENTS WITH DELIRIUM

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INTRODUCTION. Symptoms of intensive care unit (ICU) delirium include hypertension and tachycardia, which suggest sympathetic overactivity. However, autonomic function has never been investigated in delirium.
OBJECTIVES. To assess autonomic function in delirious ICU patients using heart rate variability (HRV).
METHODS. Between 2010 and 2011, a total of 13 patients with ICU delirium, according to the DSM-IV criteria, and 12 patients without delirium were investigated in the 32-bed, mixed adult ICU of the University Medical Centre Utrecht (UMCU). We excluded patients with conditions or medication which affect HRV. HRV indices were assessed off-line in the frequency domain in 5-minutes segments of electrocardiogram recordings with fixed frequencies according to the guidelines of the Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology [1]. The low-frequency (LF) component of HRV reflects both sympathetic and parasympathetic tone, whereas the high-frequency (HF) component reflects parasympathetic tone [1]. The LF/HF ratio is a measure of sympathetic/parasympathetic balance [1]. HRV indices were logarithmically transformed and compared between the two groups with the *T* test.
RESULTS. Overall, there was no difference observed between patients with delirium and those without delirium by logarithmically transformed means (SD) of HRV indices LF (2.8 ± 1.9 vs. 3.1 ± 1.9, $p = 0.76$), HF (3.7 ± 1.7 vs. 3.4 ± 2.1, $p = 0.74$) and LF/HF ratio (-0.7 ± 1.0 vs. -0.1 ± 1.1, $p = 0.16$).
CONCLUSIONS. Our study suggests that HRV is not strongly different between ICU patients with and without delirium. This might be due to an already altered sympathetic-parasympathetic balance in patients admitted to the ICU [2].
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0763
IT MUST SEDATE PATIENTS ON EXTRA CORPOREAL LIFE SUPPORT (ECLS)

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INTRODUCTION. Extra corporeal life support (ECLS) for the management of cardiogenic shock or after cardiac arrest (CA) [1] is a frequently used technique but mortality remains high [2]. Patients are usually sedated during ECLS [3]. The purpose of this study was to identify risk factors for death in patients treated with ECLS and to investigate whether extubation during ECLS was associated with a decreased mortality.
METHODS. One hundred and thirty-two consecutive patients treated with ECLS in our unit were retrospectively studied. All the patients who were sedated received morphine in association with either propofol for 97 patients, or midazolam for 16 patients.19 patients had no sedation. Sedation was discontinued routinely as soon as possible. Risk factors of death at discharge were investigated by an univariate analysis and the factors associated with death ($p < 0.10$) were included in a logistic regression.
RESULTS. Mean age of patients was 54 ± 17 years. The mean duration of ECLS for the whole population of patients was 103 ± 96 h, 84 ± 84 h for the 97 (74 %) non extubated patients, 158 ± 108 h for the 35 (26 %) extubated patients ($p < 0.0001$). 28 patients were not extubated because of neurologic status, 31 because of multiorgan failure, seven because of hypoxemia, three because of repeated surgeries. For 18 patients, there was no medical reason that could explain the absence of extubation. Overall mortality was 59 % for the whole cohort, 80 % in CA patients, 72 % in non extubated patients, 23 % in extubated patients. Mortality rate after 121 ± 90 h of ECLS for the 18 non extubated patients for whom no medical reason prevented ventilation weaning, was 39 % as compared to 23 % for the extubated patients ($p = 0.22$). Risk factors for death in the whole population were the etiology of ECLS (CA versus other), the absence of extubation, norepinephrine dosage and age. Complications during ECLS (bleeding, groin infection, pneumonia, blood transfusion) were not associated with mortality. Using a multivariate analysis for the whole cohort, factors associated with death were the norepinephrine dose [$p = 0.03$, OR 1.005, (1.000 to 1.009)] and the absence of extubation during ECLS [$p = 0.01$, OR: 16.8, (1.8 to 152.8)]. In the non CA patients, the same factors were associated with death: norepinephrine dose [$p = 0.04$, OR 1.007, (1.000 to 1.014)] and the absence of extubation during ECLS [$p = 0.045$, OR 15.8, (1.1 to 235.8)].
DISCUSSION. Extubation of patients undergoing ECLS is possible in selected cases and seems to be associated with a decreased mortality despite a longer assistance duration. Extubation may avoid complications associated with sedation and long-term ventilation. Moreover, this strategy was well tolerated by patients and no direct complications were reported.

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0764

RESPIRATORY TOXICITY OF BUPRENORPHINE RESULTS FROM THE BLOCKAGE OF P-GLYCOPROTEIN-MEDIATED EFFLUX OF NORBUPRENORPHINE AT THE BLOOD–BRAIN BARRIER IN MICE

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INTRODUCTION. Deaths due to asphyxia as well as following acute poisoning with severe respiratory depression have been attributed to buprenorphine (BUP) in opioid abusers. However, in human and animal studies, BUP exhibited ceiling respiratory effects, while its metabolite, norbuprenorphine (N-BUP), was assessed as being a potent respiratory depressor in rodents. Recently, N-BUP, in contrast to BUP, was shown in vitro to be a substrate of human P-glycoprotein (P-gp), a drug-transporter involved in all steps of pharmacokinetics including transport at the blood–brain-barrier (BBB).
OBJECTIVES. Our objectives were to assess P-gp involvement in N-BUP transport in vivo and study its role in the modulation of BUP-related respiratory effects in mice.
METHODS. Respiratory effects were studied using plethysmography in wild-type and P-gp knockout female FVB mice and the P-gp role at the BBB using in situ brain perfusion. BUP and N-BUP concentrations were measured using gas chromatography-mass spectrometry. AUC values for each studied parameter were calculated and compared using a one-way analysis of variance, followed by two-by-two comparisons using Bonferroni's tests.
RESULTS. N-BUP ($\geq$ 1 mg/kg) and to a lesser extent BUP ($\geq$ 10 mg/kg) were responsible for dose-dependent respiratory depression combining increased inspiratory (T_I) and expiratory times (T_E). PSC833, a powerful P-gp inhibitor, significantly enhanced BUP-related effects on T_I ($p < 0.01$) and T_E ($p < 0.05$) and N-BUP-related effects on minute volume (V_E, $p < 0.05$), T_I, and T_E ($p < 0.001$). In P-gp-knockout mice, BUP-related effects on V_E ($p < 0.01$), T_E ($p < 0.001$), and T_I ($p < 0.05$) and N-BUP-related effects on V_E ($p < 0.05$) and T_I ($p < 0.001$) were significantly enhanced. Plasma N-BUP concentrations were significantly increased in PSC833-treated mice ($p < 0.001$), supporting a P-gp role in N-BUP pharmacokinetics. Brain N-BUP efflux was significantly reduced in PSC833-treated and P-gp-knockout mice ($p < 0.001$), supporting P-gp-mediated N-BUP transport at the BBB.
CONCLUSIONS. P-gp plays a key-protective role in BUP-related respiratory effects, by allowing N-BUP efflux at the BBB. Our findings suggest a major role for drug–drug interactions that lead to P-gp inhibition in BUP-associated fatalities and respiratory depression.

Optimising tissue oxygenation: 0765–0777

0765

VARIABILITY OF DIFFERENTIAL INVASIVE BLOOD PRESSURE MEASUREMENTS AT RADIAL AND FEMORAL SITES IN HIGH DOSE NOREPINEPHRINE-REQUIRING SEPTIC SHOCK

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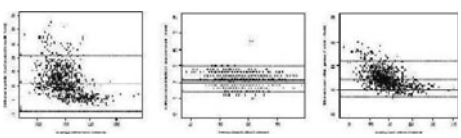
INTRODUCTION. Distal pulse amplification [1] results in differences in invasive blood pressure (BP) readings at different sites. Sensitivity of this effect to acute changes in vascular tone has been described in small heterogenous groups of mixed medical and surgical patients in various disease states [2] with inconsistent gradients [3]. Discrepancies may be clinically significant [4]. Little published data exist about the relationship between invasive radial (RBP) and femoral (FBP) BP gradients in septic shock and the complex interplay of vascular beds/receptors in the presence of vasoactive agents. Our group (CVBCI), aims to investigate the clinical, molecular and mathematical behaviour of the vasculature in various diseases. We present the pilot clinical data in preparation of a larger body of work.
OBJECTIVES. To investigate differences in invasive systolic (SBP), mean (MAP) and diastolic BP (DBP) at RBP vs FBP in adult septic shock patients requiring high dose vasopressor therapy.
METHODS. LREC approval was waived for this observational study. Routinely collected data from patients admitted to General ICU requiring high dose norepinephrine (NE) therapy (>0.2 mcg/kg/min) and cardiac output monitoring via PiCCO was statistically analysed offline. The radial artery catheter was left in situ for simultaneous recording of RBP vs FBP. Real time data was captured electronically via S/5 Collect software at 10 s intervals alongside anonymous demographic and clinical data. Hourly readings were collated and statistical analyses performed. Clinical management was not altered. Patients with known local vessel stenosis, aortic regurgitation and arrhythmias were not included. Repeated measures limits of agreement method was performed to assess overall agreement between the RBP and FBP measurements. Kendall's tau correlations were calculated.
RESULTS. Data from 11 patients with mean age 69 (61–82), five males with APACHE II mean 23, median 23 (18–32) were obtained over a 3 month period. Three patients were post-op, and source of sepsis was chest (seven) and abdomen (four). All patients received low dose steroid therapy. The mean duration of NE 60 h (32–136) with mean total dose 44 mg (27–96). Total number of observations was 658 (32–136). Statistical analyses are as shown. The FBP-RBP gradients show agreement between DBPs, but lack of agreement between SBP and MAPs; with mean gradients of 12.5 and 4.8 mmHg (higher FBP) respectively.



Bland–Altman plot on radial and femoral BP agreement

Kendall's tau correlation coefficients—Pt 1–6

Patient	SBP	DBP	MAP
Patient 1 (N = 46)	0.44 (p = 0.0001)	0.17 (p = 0.15)	0.43 (p = 0.0002)
Patient 2 (N = 136)	0.49 (p < 0.0001)	0.09 (p = 0.15)	0.39 (p < 0.0001)
Patient 3 (N = 53)	0.77 (p < 0.0001)	-0.27 (p = 0.01)	0.59 (p < 0.0001)
Patient 4 (N = 49)	0.79 (p < 0.0001)	0.16 (p = 0.13)	0.69 (p < 0.0001)
Patient 5 (N = 78)	0.72 (p < 0.0001)	-0.05 (p = 0.56)	0.64 (p < 0.0001)
Patient 6 (N = 32)	0.65 (p < 0.0001)	0.17 (p = 0.21)	0.54 (p < 0.0001)

Kendall's tau correlation coefficients—Pt 7–11

Patient	SBP	DBP	MAP
Patient 7 (N = 64)	0.41 (p < 0.0001)	0.04 (p = 0.65)	0.26 (p = 0.005)
Patient 8 (N = 53)	0.81 (p < 0.0001)	−0.01 (p = 0.90)	0.58 (p < 0.0001)
Patient 9 (N = 71)	0.66 (p < 0.0001)	0.07 (p = 0.32)	0.50 (p < 0.0001)
Patient 10 (N = 34)	0.75 (p < 0.0001)	−0.17 (p = 0.22)	0.53 (p < 0.0001)
Patient 11 (N = 42)	0.79 (p < 0.0001)	0.10 (p = 0.43)	0.71 (p < 0.0001)

CONCLUSIONS. Differential SBP and MAP readings between femoral and radial sites are statistically and clinically significant in septic shock with high NE requirements. Gradients are higher than in previously published data and influence of site of BP measurement on clinical decisions in septic shock may prove to be important. Forthcoming work from our group will look to investigate these issues in more detail.
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0766

INCREASED HEPATIC ARTERIAL BLOOD FLOW COMPENSATION FOR PORTAL FLOW REDUCTION (HEPATIC ARTERIAL BUFFER RESPONSE) WITH ANGIOTENSIN II DESPITE DECREASED HEPATIC ARTERIAL CONDUCTANCE

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INTRODUCTION. Angiotensin II and the angiotensin converting enzyme inhibitor Enalapril have been used to increase blood pressure and flow in preliminary trials in septic humans and animals [1].
OBJECTIVES. The aim of this study was to assess potential interactions of the two compounds with hepatic blood flow regulation, first in non-septic conditions.
METHODS. 13 healthy anesthetized pigs, 41 ± 2 kg were randomized to Angiotensin II (n = 5) from 5 to 61 ng/kg/min, Enalapril (n = 6) from 3 to 24 μg/kg/h, or Placebo (saline; n = 2) in equivalent volumes in four steps, after repeated fluid challenges to optimize stroke volume. Flow probes were placed around carotid, renal, and hepatic arteries, and around portal vein, vascular occluders around celiac trunk and portal vein, and catheters in portal, hepatic and renal veins, and in carotid and hepatic arteries. The hepatic arterial buffer response (HABR) was assessed by occluding portal vein and calculating (1), the increase in hepatic arterial flow (ΔQha) in relation to the decrease in portal vein flow (ΔQpv) (2), the hepatic arterial conductance (Qha during occlusion of portal vein divided by the difference between hepatic arterial pressure at unaltered and at zero blood flow).
RESULTS. The control animals remained hemodynamically stable with intact HABR. Angiotensin increased and enalapril decreased blood pressure, while heart rate was not affected and cardiac output decreased similarly in both groups (Table). Carotid and hepatic arterial blood flows remained stable in both groups, while portal vein and renal artery flows decreased in the Angiotensin group (Table). HABR data from one animal in the Enalapril group was discarded because of absent HABR as a result of technical problems during surgery. ΔQha/ΔQpv increased in the Angiotensin group from 9 ± 8 to 25 ± 10 (p = 0.001), and did not change in the Enalapril group (9 ± 10 to 12 ± 12, p = 1.0). However, hepatic arterial conductance decreased in the Angiotensin II group (from 5.4 ± 2.4 to 3.3 ± 1.7 ml/mmHg; p = 0.031) and remained unchanged in the Enalapril group (4.5 ± 1.8 vs. 5.1 ± 2.1 ml/mmHg; p = 0.131).

Hemodynamic variables

Variable	Group	BL	T4	p (time-effect)	p (time*group)
MAP (mmHg)	ENAL/ ANGII	67.15 (8.47)/ 68.20 (8.53)	57.11 (7.20)/ 123.81 (27.59)	0.001	<0.0001
HR (bpm)	ENAL/ ANGII	113.83 (33.35)/ 105.20 (27.03)	93.50 (14.45)/ 102.60 (14.64)	0.398	
CO (ml Kg^{-1} min^{-1})	ENAL/ ANGII	118.96 (14.11)/ 132.79 (25.38)	105.07 (20.69)/ 95.66 (17.36)	0.003	0.097
Carotid flow (ml/min)	ENAL/ ANGII	247.56 (44.34)/ 253.09 (80.15)	235.26 (69.60)/ 297.39 (119.53)	0.478	0.223
Hepatic art. flow (ml/ min)	ENAL/ ANGII	81.53 (47.98)/ 116.20 (62.94)	88.89 (36.86)/ 125.17 (79.81)	0.663	0.966
Portal vein flow (ml/min)	ENAL/ ANGII	818.31 (216.92)/ 855.39 (60.39)	769.97 (109.59)/ 623.22 (25.35)	0.002	0.024
Renal artery flow (ml/min)	ENAL/ ANGII	198.86 (61.60)/ 314.69 (182.27)	228.49 (69.60)/ 160.89 (98.95)	0.012	0.001

CONCLUSIONS. Angiotensin II infusion is associated with decreased renal artery and portal vein flow and hepatic arterial conductance. Despite this, hepatic arterial flow compensation increases when portal flow is acutely reduced. The effect of increasing systemic blood pressure on HABR should be further evaluated.
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0767
MYCOPHENOLATE MOFETIL REDUCED RENAL INFLAMMATION AND PROTECTED RENAL CORTICAL OXYGENATION AFTER ISCHEMIA/ REPERFUSION INJURY

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INTRODUCTION. One of the main causes of acute renal failure (ARF) is ischemia/ reperfusion (I/R) injury. Studies have suggested that white blood cell (WBC) recruitment to the site of injury is a central event in the pathogenesis of I/R-induced AKI. The generation of reactive oxygen species (ROS) enhances the local expression of adhesion molecules and promotes WBC chemotaxis during reperfusion.

OBJECTIVES. As mycophenolate mofetil (MMF) is an immunosuppressant commonly used in transplant medicine to stop WBCs from attacking healthy cells, we tested in the present study whether treatment with MMF could reduce I/R-induced inflammation and protects renal oxygenation and function.

METHODS. To this end, rats were subjected to 30 min suprarenal aortic clamping with (n = 6) or without (n = 6) intravenous MMF treatment (20 mg/kg bolus given orally 120 min before ischemia). Additionally, one group of sham operated animals was included (n = 6). Systemic and renal hemodynamics, renal microvascular oxygenation in the cortex and medulla, and renal vein oxygenation and renal oxygen consumption were measured continuously. After the experiments, kidneys were isolated and prepared for assessment myeloperoxidase (MPO) expression in glomerular and peritubular areas.

RESULTS. At the end of the protocol, renal blood flow was 4.7 ± 1.2 mL/min in the sham group, 1.6 ± 0.9 mL/min in the I/R group, and 3.2 ± 1.2 mL/min in the MMF-treated group. This was mirrored by the changes in renal vascular resistance which was 16 ± 3, 51 ± 22, and 24 ± 9 dyn s/cm^5 in these groups, respectively. Renal microvascular oxygenation in the cortex and medulla were decreased in the group treated with MMF (67 ± 2 and 50 ± 2 mmHg) and the group that did not receive MMF (59 ± 5 and 47 ± 5 mmHg) compared to the sham group (80 ± 6 and 56 ± 6 mmHg), although this decrease in cortical oxygenation was more extensive in the group receiving no MMF. Renal oxygen consumption was lower in the I/R-subjected rats (0.14 ± 0.08 mL/min both groups) compared to in the sham group (0.30 ± 0.13 mL/min). Sodium extraction was significantly elevated in the I/R group receiving no MMF (17.5 ± 7.3 %) compared to the group receiving MMF (12.3 ± 8.8 %) and the sham group (13.5 ± 7.6 %). Creatinine clearance rate was reduce in both I/R-subjected groups rats (8 ± 4 mmol/min in the MMF-treated group and 5 ± 3 mmol/min in the untreated group) compared to in the sham group (16 ± 5 mmol/ min). MPO expression in the glomerular en peritubular areas was significantly elevated in the I/R group receiving no MMF (0.94 ± 0.24 and 0.77 ± 0.42, respectively) compared to the group receiving MMF treatment (0.87 ± 0.34 and 0.49 ± 0.50, respectively) and the sham group (0.81 ± 0.39 and 0.52 ± 0.50, respectively).

CONCLUSIONS. Our results demonstrate that pretreatment with MMF successfully reduced renal inflammation and recovered in oxygenation of the renal cortex following I/R injury.

0768
HYPOTHERMIA IMPROVES MICROVASCULAR OXYGENATION DURING HEMORRHAGIC CONDITIONS

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INTRODUCTION. Hypothermia is known to improve tissue function at a lot of different organs during physiological and pathological conditions like hemorrhage [1]. On the other hand it exerts various negative effects, e.g. reduction of cardiac output and vasoconstriction [1]. The impact of hypothermia on gastric mucosal microvascular oxygenation (μHbO_2) during physiological and hemorrhagic conditions is unknown.

METHODS. The effects of normothermia (37.5°, blood temperature) and mild hypothermia (34°) on μHbO_2 were studied in repetitive experiments on five dogs anesthetized with sevoflurane. In an additional series dogs underwent hemorrhage (loss of 20 % of the estimated blood volume) either during normo- or hypothermia.

Systemic hemodynamics, gastric mucosal microvascular oxygenation (reflectance spectrophotometry) and blood temperature were recorded continuously. Arterial blood was sampled intermittently for blood gas analysis and calculation of systemic oxygen delivery (DO_2). Data are presented as mean ± SEM. *t* test, $p < 0.05$.

RESULTS. Hypothermia alone did not influence μHbO_2. Additional hypovolemia strongly reduced μHbO_2 from 76 ± 1 to 51 ± 7% during normothermia; however, this effect was attenuated during hypothermia (from 74 ± 1 to 60 ± 6%). In contrast, systemic oxygen transport was reduced during hemorrhagic shock without differences between normothermia and hypothermia.

CONCLUSIONS. Hypothermia does not affect μHbO_2 during physiological conditions, but attenuates the effects of hemorrhage on μHbO_2. This effect does not result from differences in oxygen delivery and thus mainly depends on local conditions.

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0769
HYPEROXIA ALTERS MUSCLE MICROVASCULATURE AND METABOLISM IN HEALTHY INDIVIDUALS

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INTRODUCTION. The administration of oxygen at high concentrations have potentially harmful effects. Several studies have shown increases in vascular resistance and changes in oxygen consumption in hyperoxic conditions. However data on the consequences of hyperoxia on human microvasculature are still scarse.

OBJECTIVES. To study the muscular microvascular and metabolic effects of hyperoxia in healthy volunteers.

METHODS. Thenar muscle oxygen saturation (StO2) and muscle tissue hemoglobin index (THI) were continuously measured by a tissue spectrometer (InSpectra^{TM} Model 650, Hutchinson Technology Inc, MN) in ten healthy volunteers. Vaso-occlusive tests (VOT) (upper limb ischemia induced by a rapid pneumatic cuff inflation around the upper arm) were performed at each study point. The following variables were recorded: THI, the slope of the decrease in StO2 during the occlusion (desc slope; %/min), the slope of the increase in StO_2 following the ischemic period (asc slope; %/s), and muscle O2 consumption (NIRS VO2) expressing in arbitrary units using the following formula: −(Descending slope) × [(Basal THI + Min THI/2)]. On day one, after two baseline measurements (T1 and T2) on room air (FiO_2 21 %), the volunteers were exposed for 30 min to almost 100 % oxygen via a tightly fitted non-rebreathing facial mask (T3). Thereafter, a final measurement was obtained after 30 min without supplemental oxygen (T4) (hyperoxic group). On day two, the same volunteers were studied using the same protocol, but remaining on room air (control).

RESULTS. Mean baseline values ± SD of SpO_2, hemoglobin concentration, StO_2 and THI were 98.6 ± 1.2 %, 13.6 ± 1.7 mg/dl, 78.4 ± 2.6, 13.5 ± 1.6, respectively. During the exposition to FiO_2 100 % values resulted altered compared to control ones (Table).

Hyperoxia-NIRS

Measure	T3 O_2 21 %	T3 O_2 100 %	p
SpO_2	98.8 ± 0.8	100 ± 0	0.03
Basal StO_2	79.0 ± 1.8	80.8 ± 5.7	0.62
Basal THI	13.5 ± 0.8	13.6 ± 1.2	0.84
Desc slope	−10.6 ± 1.56	−7.6 ± 1.07	0.01
Asc slope	4.8 ± 1.1	3.8 ± 0.6	0.09
NIRS VO_2	140 ± 7.0	108.6 ± 16.9	0.03

CONCLUSIONS. In healthy humans, exposition to high concentration of oxygen is associated with alteration of the microvascular reactivity and a decrease in muscle oxygen consumption.

0770
METHYLENE BLUE IN HYPOTENSIVE CRITICALLY ILL PATIENTS. A META-ANALYSIS OF RANDOMIZED CONTROLLED STUDIES

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INTRODUCTION. Hypotension associated to inadequate tissue oxygenation is a common problem in critically ill patients and can result in organ system dysfunction and increased mortality if not promptly treated. Conventional treatments include fluids, vasopressors and inotropes. These treatments have side effects and refractory hypotension exist. Used for many years in the treatment of methemoglobinemia, methylene blue also has been found to oppose nitric oxide induced effects by inhibiting soluble guanylate cyclase, NOS, and iNOS and its administration can result in an increase of systemic blood pressure.

OBJECTIVES. We performed a meta-analysis of randomized controlled trials to evaluate the efficacy of methylene blue to raise mean arterial pressure in hypotensive patients.

METHODS. BioMedCentral, PubMed, Embase and the Cochrane Central Register of clinical trials were searched for pertinent studies. Inclusion criteria were random allocation to treatment and comparison of methylene blue versus any comparator. Exclusion criteria were: duplicate publications, non-adult studies and no data on main outcomes.

RESULTS. Data from 174 patients in five randomized controlled studies (four with data on mean arterial pressure) were analyzed. Mean arterial pressure (Fig. 1) raised in patients receiving methylene blue (WMD = 6.93 mmHg, 95 % IC 1.67–12.18, p for effect = 0.01, p for heterogeneity = 0.17, I2 = 41 %). The overall mortality rate was 16 % (14/88) among methylene blue treated patients and 26 % (22/86) in the control group (OR = 0.59, 95 % IC 0.16; 2.15, p for effect = 0.4).

CONCLUSIONS. Methylene blu increases mean arterial blood pressure in hypotensive critically ill patients without deleterious effect on survival. Its use could be suggested in patients with refractory hypotension and large randomized trials should be performed to evaluate its role in the reduction of the need of vasopressors in hypotensive patients.

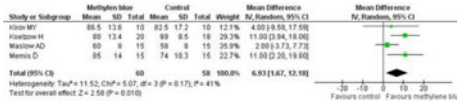

Figure 1

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0771
THE CARDIOVASCULAR EFFECTS OF SODIUM HYDROGEN SULFIDE (NAHS) IN ANESTHETIZED MECHANICALLY VENTILATED PIGS

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INTRODUCTION. Hydrogen sulfide (H_2S) is an endogenous gasotransmitter known to produce a wide range of physiological effects. In the rodent cardiovascular system, exogenous H_2S elicits strong bradycardia, vasorelaxation, and decreased cardiac output [1, 2]. However, despite prominent cardiovascular hypometabolic effects in rodents, the effects of H_2S on the cardiovascular system in large mammalian models remains largely unknown.
OBJECTIVES. The aim of the present study was to determine the in vivo effects of systemic infusions with NaHS (H_2S donor) on the macro- and microcirculation in anesthetized mechanically ventilated pigs.
METHODS. Eight female Landrace pigs with a mean weight of 49.4 ± 2.2 kg were randomly allocated into two treatment groups receiving 4 h of IV infusions with either NaHS (5 mg/kg; 10 mL/h) or 0.9 % NaCl 10 mL/h. After instrumentation and following a 30 min stabilization period, macrohemodynamic parameters (HR, MAP, CO, and SpO_2) were recorded at baseline and sequentially at every hour. Continuous noninvasive measurements of sublingual microcirculation perfused vessel density [PVD (%)] and microvascular flow index [MFI (AU)] were obtained every hour using sidestream dark-field (SDF) imaging.
RESULTS. All macrohemodynamic parameters remained unchanged between the two groups with no statistically significant differences. After 3 h of NaHS infusion, a significant increase in microcirculatory PVD of 35 % ($p < 0.05$ vs. control, 2-way ANOVA) was observed between the two groups. Comparison within and between the control and NaHS groups revealed no significant differences in MFI.

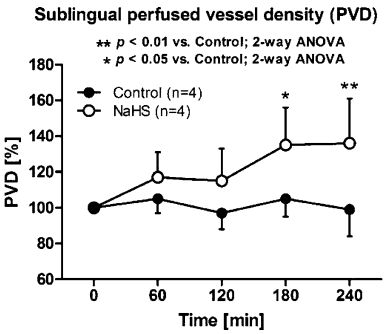

Figure 1
Figure 1 illustrates microcirculation PVD for the control and NaHS groups. Robust vasodilation and PVD are depicted in SDF images in Fig. 2.

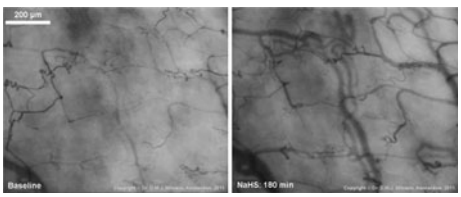

Figure 2
CONCLUSIONS. The cardiovascular effects of NaHS in pigs manifest primarily at the microcirculatory and not the macrocirculatory level. Our results demonstrate that NaHS robustly recruits tissue microcirculation while maintaining steady cardiac performance.
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0772
NO AGREEMENT OF MIXED VENOUS AND CENTRAL VENOUS PCO_2-GAP IN SEPSIS

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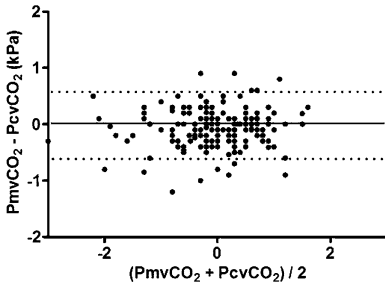
INTRODUCTION. The venous to arterial pCO_2 difference (pCO_2-gap) is proposed as a prognostic marker in sepsis [1]. However, the origin of the venous blood samples, i.e. mixed venous versus central venous, is different in various studies.
OBJECTIVES. To evaluate whether mixed venous pCO_2-gap ($P(mv\text{-}a)CO_2$) and central venous pCO_2-gap ($P(cv\text{-}a)CO_2$) are interchangeable in patients with severe sepsis or septic shock.
METHODS. This post hoc analysis of a prospective observational study was performed on 54 patients, from two Dutch hospitals, with sepsis or septic shock according to international criteria [2]. Arterial, central venous and mixed venous blood samples were collected every 6 h during the first 24 h after admission to the ICU. The interchangeability between mixed and central venous pCO_2-gap was assessed by the mean bias and 95 % limits of agreement (mean bias ± 1.96 SD) described by Bland and Altman.
RESULTS. A total of 256 paired blood samples were obtained. Figure 1 shows the Bland and Altman plot of the agreement between $P(cv\text{-}a)CO_2$ and $P(mv\text{-}a)CO_2$. The $P(mv\text{-}a)CO_2$ underestimated the $P(cv\text{-}a)CO_2$ by a mean bias of 0.03 kPa ± 0.32 kPa in all paired measurements. The 95 % limits of agreement ranged from −0.62 to 0.58 kPa while the cut-off point for pCO_2-gap is 0.8 kPa.



Bland and Altman plot
CONCLUSIONS. The 95 % limits of agreement between mixed and central venous pCO_2-gap are too wide in relation to the clinical relevant cut-off point of 0.8 kPa. Therefore there is no agreement between mixed venous and central venous pCO_2-gap in sepsis.
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0773
HYPERCAPNIA IMPROVES MICROCIRCULATORY OXYGENATION IN SEPTIC RATS BY RESTORING FLOW-OXYGENATION RELATIONSHIP

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INTRODUCTION. Mixed-venous oxygen saturation is regarded as an indicator of global perfusion and oxygen supply [1] during sepsis. In this context alterations and heterogeneity of microcirculatory blood flow are important diagnostic and therapeutic targets [2] and acute hypercapnia has been shown to improve microcirculatory oxygenation [3]. However, the relationship of regional blood flow and post-capillary oxygenation is yet unknown.
OBJECTIVES. Evaluation of the effect of acute hypercapnia on the relationship between splanchnic microcirculatory blood-flow and simultaneously assessed regional post-capillary oxygen saturation in a polymicrobial sepsis animal model.
METHODS. The data derive from a total of 40 experiments on rats studied with approval of the local animal care and use committee. Prior to the experiments a laparotomy and either colon ascendens stent peritonitis surgery or sham operation were performed. 24 h later the animals were once again anaesthetized and received ongoing fluid replacement. Pressure-controlled ventilation for 120 min maintained a target pCO_2 of either 35–40 mmHg in the normocapnic group or induced a moderate hypercapnia (pCO_2 65–75 mmHg) by exogenous CO_2 application. Systemic macrohaemodynamic variables and ventilation pressures were recorded continuously, microcirculatory blood flow of the colonic wall was measured via laser Doppler and post-capillary venous oxygen-saturation was measured simultaneously via tissue reflectance spectrophotometry. Data are presented as mean ± SEM, unpaired *t* test, linear regression analysis (Pearson r).
RESULTS. Splanchnic microcirculatory laser Doppler blood flow correlates with post-capillary oxygenation (μHbO_2) in normocapnic-sham animals ($r = 0.5$; $p < 0.0001$). However, there was no significant relationship between flow and oxygenation in normocapnic-septic animals ($r = -0.07$; $p = 0.65$). The flow-oxygenation relationship was restored with acute hypercapnic ventilation in septic animals ($r = 0.6$; $p < 0.0001$), with a significant overall improvement of post-capillary oxygenation (μHbO_2 70 ± 1 vs. 56 ± 2; $p < 0.0001$). Mean arterial pressure and heart rate were stable over time within all four groups.
CONCLUSIONS. Post-capillary oxygenation is flow-dependent under physiological conditions. During sepsis, however, this relationship is severely impaired. Acute hypercapnia increased post-capillary venous oxygen saturation by restoring flow-oxygenation relationship and might thus improve microcirculatory dysfunction in critical illness.
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0774
THE RULE OF LTB4/BLT1 SIGNALING IN THE ISCHEMIA REPERFUSION INJURY OF LIVER

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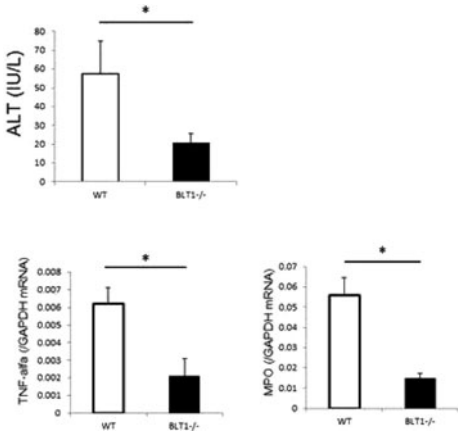
INTRODUCTION. Leukotriene B_4 (LTB_4) is a chemoattractant for leukocytes and plays a focal role in the mechanism of inflammatory and immune diseases. LTB_4 is a 5-lipoxygenase (5-LOX) metabolic product of arachidonic acid and is a potent chemotactic factor for granulocytes. LTB_4 exerts its biological activities through two distinct LTB receptors: BLT1 and BLT2. We have demonstrated that LTB4/BLT1 signaling contributes hepatic microcirculatory dysfunction during endotoxemia.
OBJECTIVES. We hypothesized cardiac arrest damages hepatic parenchymal cell through the LTB4/BLT1 signaling.
METHODS. All animal experiment procedures were performed in accordance with the guidelines for animal experimentation of Kitasato University School of Medicine. We made two groups, ovarectomized (OVX) wild type (WT) female (n = 7), OVX BLT1 −/− female (n = 8). OVX were performed 7 days before CA/CPR. The mice were subjected to CA induced by intravenous (IV) KCL. After 8 min of CA, we reopened their ventilation with 100 % oxygen, and the chest compressions were started at a rate of 300 bpm. Moreover, the resuscitation was initiated with IV epinephrine (8–16 µg in 0.5–1.0 ml 0.9 %

saline). During surgery, the rectal temperature was maintained at 37.0 ± 0.5 °C. At the 24 h after CA, we measured their Alanine aminotransferase (ALT; IU/L) in the serum. In addition, TNF-alfa and Myeloperoxidase (MPO) were quantified by real-time reverse transcriptase polymerase chain reaction (RT-PCR) analysis. Statistical analysis was performed by using one-way *t* test, and statistical significance was set at $p < 0.05$.
RESULTS. There were no significant differences in time to resuscitate, mortality or epinephrine dose between WT and BLT1$^{-/-}$ groups. ALT was significantly Lower in BLT1$^{-/-}$ group compared with WT group (20.6 ± 4.9 versus 57.6 ± 17.2). Also, the TNF-alfa and MPO mRNA expression in the liver that were determined by real-time RT-PCR were suppressed in the BLT1$^{-/-}$ group compared with WT group.



Hisae Saito ESCI2012
CONCLUSION. The mechanism of LTB4/BLT1 pathway in the ischemic liver is unclear. These results suggested that blockade of LTB4/BLT1 signaling may suppress liver tissue damage through inhibiting effect of the neutrophil recruitment.

0775
SIGNIFICANCE OF AN ABNORMALLY LOW OR HIGH RESTING STO2 VALUES IN PREDICTING HIGH RISK OF MORTALITY IN CRITICALLY ILL PATIENTS

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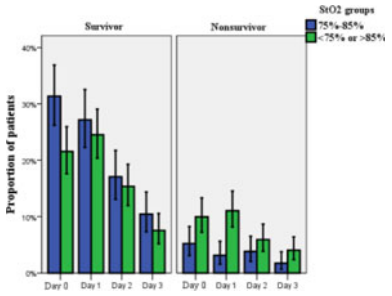
INTRODUCTION. Near-infrared spectroscopy (NIRS) provides a direct measurement of tissue O_2 saturation (StO_2) in the microcirculation of a volume of tissue. It assists clinicians to monitor peripheral circulation to early detect peripheral tissue hypoperfusion. The device shows a trended real-time display of StO_2 and a value lower than 75 % is usually indicative of inadequate perfusion. However, inadequate tissue perfusion may be also related to high StO_2 values, since it can reflect impaired cellular utilization of oxygen. Considering the normal variation in healthy population (75–85 %), StO2 values out of this range may be considered abnormal. Therefore, StO_2 may be classified as normal (75–85 %), abnormally low (<75 %) or abnormally high (>85 %).
OBJECTIVES. The objective of this study was to propose the discretization of StO_2 values in these three groups and to investigate if it can more adequately predict ICU mortality.
METHODS. StO_2 was continuously monitored over the thenar eminence using InSpectra Model 650 probe (Hutchinson Technology Inc.) at ICU admission and every 24 h thereafter until day three. After we stratified StO_2 values as normal (75–85 %), abnormally low (<75 %) or abnormally high (StO_2 > 85 %), we performed a generalized mixed-model analysis to estimate odds ratio for mortality at each combination of days with abnormally high and low StO_2 values.
RESULTS. We prospectively studied 221 consecutive critically ill patients (age: 57 ± 16 years; 146 male/75 female) during three consecutive days. Fifty-eight patients had circulatory shock (septic:20; nonseptic:38). No difference in resting StO_2 values was seen between survivor and nonsurvivors: mean (SE), 82 % (0.6) vs. 81 % (1.1). Table 1 shows odds ratio for mortality at each day stratified by groups. We found that the presence of an abnormally low or abnormally high StO_2 significantly predict mortality. Figure 1 shows the proportion of normal and abnormal StO_2 values in survivors and nonsurvivors.
CONCLUSIONS. Patients with abnormally low as well as patients with abnormally high StO_2 values had significantly higher odds of mortality than patients with normal StO_2 values.

Odds ratio for mortality when StO_2 is abnormall

	Odds ratio (OR)	OR 95 % CI	*P* value
Admission	2.8	1.4–5.4	0.003
Day 1	3.9	1.8–8.5	0.001
Day 2	1.7	0.8–3.9	0.19
Day 3	3.2	1.1–9.8	0.03



Normal and abnormal StO_2 in survivors/nonsurvivors

0776
WHAT PART OF CARDIAC FUNCTION IS REPRESENTED BY CENTRAL VENOUS OXYGEN SATURATION?

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INTRODUCTION. Central venous oxygen saturation ($ScvO_2$) is a crucial part of hemodynamic monitoring in critical ill patients (pt). In the well established early goal directed therapy-concept central venous pressure represents preload, mean arterial pressure respresents afterload and $ScvO_2$ represents cardiac contractile function. Little is known about which part of cardiac function $SCvO_2$ really is a marker of.
OBJECTIVES. The aim of he following study is to answer the question what special part of cardiac contractile function is represented by $ScvO_2$.
METHODS. 46 pt underwent coronary angiography and right heart catheterization due to clinical indication. In addition to the routine procedure $ScvO_2$ is obtained by placing the RIght-heart catheter into the superior caval vein. Besides proof of coronary artery disease left ventricular (LV) angiography and pressure of LV, aorta, right atrium, right ventricle, pulmonary artery and pulmonary capillary wedge pressure was recorded. LV ejection fraction (EF) was calculated by planimetry in RAO 30° angle. Contractility was calculated automatically during the recordings. Furthemore cardiac output (CO) was calculated according to the method of Fick. Cardiac Power Index (CPI) was calculated as described elsewhere. Correlation (Corr) calculations were performed, sensitivity and specificity were calculated by means of contingency tables. Area under the curve (AUC) was calculated by means of Reciever Operating Curves. *P* value < 0.05 indicates statistic significance.
RESULTS. 46 pt, mean age 65 years, mean values ± SD: hemoglobin 0.78 mmol/l (14.2 g/dl), EF 52 % ± 17.7, $ScvO_2$ 67.1 % ± 10, CO 4.5 l/min ± 1.3, Contractility 1,313.2 mmHg/s ± 425.2, CI 2.3 l/min/m^2 ± 0.7, CPI 0.53 ± 0.2. Corr: $ScvO_2$/SvO_2 r = 0.57, p < 0.0005. $ScvO_2$/LVEF r = 0.53, p < 0.0005. $ScvO_2$/CO r = 0.61, p < 0.0005. $ScvO_2$/CI r = 0.6, p < 0.0005. $ScvO_2$/Contractility r = 0.34, p = 0.01. $ScvO_2$/CO (cut-off 4.5 l/min) sensitivity 70 %, specificty 35 %, AUC 0.765. $ScvO_2$/EF (cut-off 40 %) sensitivity 73 %, specificty 47 %, AUC 0.76. $SCvO_2$/CI (cut-off 2.2 L/min/m^2) sensitivity 82 %, specificty 32 %, AUC 0.84. $ScvO_2$/CPI (cut-off 0.47) sensitivity 75 %, specifictiy 63 %, AUC 0.74.
CONCLUSIONS. $ScvO_2$ is an easy to obtain and helpful parameter fort he interpretation of circulatory failure in shock. In pt without shock it shows poor correlation with numerous parameters reflecting a specific part of cardiac function. Using established cut-off values for some parameters of cardiac function $ScvO_2$ shows a good sensitivity combined with poor specificity. $ScvO_2$ can be used for estemating a specific cardiac function when it is interpreted in the light of preload, afterload and oxygen demand and consumption.

0777
VENOUS TO ARTERIAL PCO_2 DIFFERENCE (PCO_2-GAP) CANNOT BE USED AS PREDICTOR OF CARDIAC INDEX IN SEPTIC PATIENTS

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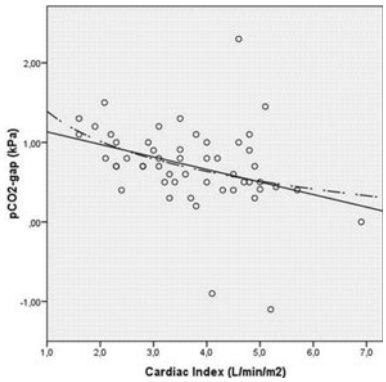
INTRODUCTION. pCO_2-gap has been used as surrogate for cardiac index in patients admitted to the ICU. [1] However, it also has been suggested that in septic patients the origin of the pCO_2-gap may be due to alteration in microcirculatory blood flow, so pCO_2-gap cannot be used a predictor for cardiac index.
OBJECTIVES. To evaluate whether pCO_2-gap can be used as a predictor for cardiac index in patients with severe sepsis or septic shock.
METHODS. This post hoc analysis of a prospective observational study was performed on 54 patients, from two Dutch hospitals, with sepsis or septic shock according to international criteria [2]. Arterial and central venous blood samples were collected every 6 h during the first 24 h after admission to the ICU. The correlation between pCO_2-gap and cardiac index was assessed with Pearson's correlation coefficient.
RESULTS. A weak but significant correlation between pCO_2-gap and cardiac index was seen at T0 ($P = 0.011$, $R^2 = 0.123$). The logarithmic regression line in Fig. 1 shows the relation between low flow states and increased pCO_2-gap.



Linear and logarithmic regression

CONCLUSIONS. The pCO_2-gap cannot be used as a predictor for cardiac index in patients with severe sepsis or septic shock.

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Pneumonia in the ICU: Prevention & treatment: 0778–0791

0778

COMMUNITY ACQUIERED PNEUMONIA IN THE ICU: SOMETHING TO FEAR?

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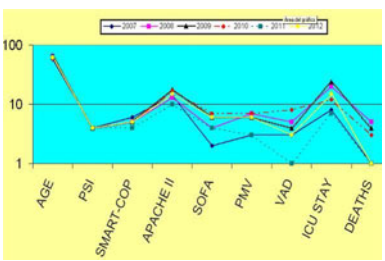
INTRODUCTION. Community acquired pneumonia (CAP) is a common infectious disease with high morbidity and mortality despite advances in antimicrobial therapy. Hospitalization rate: 22–61 % (Spain), 10–36 % admitted in an intensive care unit (ICU) with mortality rates of 20 to 50 %. Etiological diagnosis only established in 40–60 % of cases, *S. pneumoniae* being the most common causing germ worldwide. In our case, an 11 ICU-beds of a second level Hospital, we had the impression there have been an increase of ICU admissions and poorer outcome of patients with CAP especially pneumococcal the late autumn–winter (2011–2012) and we try to find out that feeling.

OBJECTIVES. The purpose of this study was to check whether there was an increased incidence and severity of patients with CAP admitted to the ICU over the past 5 years.

METHODS. A retrospective cohort study was conducted. Data were collected from patients admitted to the ICU from January 1, 2007 to March 30, 2012 with clinical or radiological criteria of CAP. Severity was stratified based on the scores: PSI, SMART-COP, APACHE II and SOFA. We evaluated the results of microbiological tests and administered antibiotics. Outcome was assessed by the need of vasoactive drugs (VAD), prolonged mechanical ventilation (PMV), extended ICU-stay and deaths. All data were analyzed and processed on SPSS Version 11.0 for Windows. Categorical variables were compared using Xhi-cuadrado or Fisher exact test. The level of statistical significance was set at $p = 0.05$.

RESULTS. 1. Sample: 49 patients (35 men/14 women. 71.4/28.65 %). 2. Mean age: 62.6 ± 14.9 years. 3. Mortality rate: 26.5 %. No deaths in 2011–2012. 4. Causative organisms identified in 61.2 %. *S. pneumoniae*: 43 % of them. 5. Antimicrobial therapy: beta-lactam + quinolone, in 58 % of cases.



TRENDS

CONCLUSIONS. 1. There were no significant changes in the incidence or the severity of pneumococcal CAP in the years under study. 2. Neither more severity nor poor outcome found regardless of the causative pathogen. 3. However a statistically significant increase in the overall severity measured by the SOFA score at ICU-admission was encountered ($p = 0.024$). 4. Further studies are required to clarify the causes of the referred increase.

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0779

PROCALCITONIN AND D-DIMER IN PREDICTING CLINICAL OUTCOMES AND PROGNOSIS IN SEVERE COMMUNITY-ACQUIRED PNEUMONIA (SCAP) PATIENTS

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INTRODUCTION. Early prognostic assessment is crucial for the optimized care and treatment of patients with SCAP.

OBJECTIVES. We analyzed prognostic accuracy of procalcitonin (PCT), plasma D-dimer (D-d) in predicting mortality and disease severity assessment in CAP patients, relationship between their levels and in-hospital outcomes (in-hospital mortality (IHM) and length of in-hospital stay (LOS)), need for invasive mechanical ventilation (IMV) and vasopressor support (VS).

METHODS. 20 ICU patients with proven SCAP CURB-65 class 3, 4 were enrolled to the study. Serum PCT and D-d values were measured within the first 24 h after admission.

RESULTS. Increasing CAP severity was associated with increased PCT and D-d values($r = 0.74$; $p = 0.05$ and $p = 0.0004$, $r = 0.62$ respectively).PCT in CURB-65 3 and 4 class patients was 0.73 (0.56; 5.8) vs 5.94 (4.6; 37.1) ng/ml, respectively ($p = 0$ 03). PCT and D-d values demonstrated statistically significant correlation with IHM ($r = 0.74$; $p = 0.005$ and $r = 0.48$; $p = 0.03$) and were higher in non-survivors than those in survivors (median) (5.94 vs 0.73 ng/ml, $p = 0.01$) and (1.63 vs 1.19 mg/mL, $p = 0.02$) respectively. Both PCT and D-d levels correlated with need for VS ($r = 0.74$; $p = 0.0005$ and $r = 0.54$; $p = 0.02$ respectively) and showed higher concentrations in patients requiring VS compared with those with stable haemodynamics (102 vs 0.73 ng/ml, $p = 0.01$) and (1.9 vs 0.87 mg/mL, $p = 0.002$] respectively.

CONCLUSIONS. PCT is more reliable biomarker than D-d in predicting prognosis and clinical outcomes in SCAP pts.

GRANT ACKNOWLEDGMENT. We disclose any relationship with manufacturers or providers of any commercial products or survices relevant to this research.

0780

THE DIAGNOSIS OF HOSPITAL ACQUIRED PNEUMONIA (HAP) IN A CARDIOTHORACIC HIGH DEPENDENCY UNIT (HDU)

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INTRODUCTION. HAP is defined as pneumonia that occurs 48 h or more after admission to hospital. It causes significant increases in morbidity, mortality, hospital length of stay and costs [1]. HAP has been investigated in level 3 [2] but not in level 2 post-operative cardiothoracic patients. The diagnosis of HAP is difficult. The ATS recommend commencement of empirical antibiotics when patients have new radiographic infiltrates plus two of fever, leucocytosis or leucopaenia and purulent secretions [1].

OBJECTIVES. We aimed to define the clinical predictors of death or ICU admission and hospital length of stay and compare our practice to standard guidelines.

METHODS. We reviewed the notes, bloods, chest X-rays (CXRs) and observations of all patients treated for HAP on the cardiothoracic HDU at the Royal Brompton Hospital over a 3 month period.

RESULTS. Twenty-five patients were diagnosed with HAP (19 males: six females). Four underwent thoracic procedures, 14 had bypass grafts and seven had valve replacements with or without grafts. Mean hospital length of stay was 12.2 (7.2) days. This is 4 days more than the average length of stay. Five patients were re-admitted to ICU and two died. In our cohort no single clinical, laboratory or radiological characteristic was able to accurately predict death or re-admission to ICU or hospital length of stay. All patients had an abnormal chest Xrays. Ten patients had definite consolidation, whereas the rest had changes that could have been consistent with infective or post-operative changes. Overall six patients met ATS clinical diagnostic criteria for HAP. Only one patient re-admitted to ICU and neither patient that died met these diagnostic criteria.

CONCLUSIONS. Our results suggest that post operative cardiothoracic patients in a level 2 environment may need different diagnostic criteria for starting empirical antibiotics compared to other patients at risk of nosocomial infection.

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0781

EFFICACY OF IMPLEMENTING A CARE BUNDLE TO PREVENT VENTILATOR-ASSOCIATED PNEUMONIA (VAP)

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INTRODUCTION. VAP is the most frequent ICU-adquired infection. There are some simple measures that have demonstrated their usefulness to prevent VAP when used as a bundle.

OBJECTIVES. To reduce the incidence of VAP in a 25 % by implementing a care bundle. Starting from an incidence of 11.84 cases/1,000 MV days in 2009, this supposes to achieve an incidence of 8.88 cases/1,000 MV days. The secondary endpoints were the reduction in duration of mechanical ventilation (MV) and of mortality.

METHODS. Before-and-after study, including all patients ventilated more than 48 h in two periods of six months (July to December 09 and March to August 10). Between those periods we gave education sessions to all the staff. Measures monitored were head-up position, endotracheal cuff pressure and the adherence to the sedation protocol. In the post-intervention period endotracheal tubes with subglottic secretion drainage and polyurethane cuff were introduced. Data were recoded for 28 days or till extubation. Variables are expressed as mean (SD) o median (interquartilic range) as required when quantitative and as n (%) when qualitative. Statistical test used were Chi-square and Mann–Whitney.

RESULTS. One hundred and twelve patients were studied. Population in both periods is described in Table 1.There were no differences in baseline characteristics between periods.

Table 1

Factor	Pre-intervention	Post-intervention	p
n	61	51	
Male n (%)	44 (72.1)	29 (56.9)	0.091
Age mean (SD)	64.99 (16.51)	58.95 (17.12)	0.051
SAPS III mean (SD)	59.90 (14.34)	57.88 (16.90)	0.369
Reintubation n (%)	13 (21.3)	5 (9.8)	0.099
Polyurethane cuff n (%)	0	20 (39.2)	

In the post-intervention period we found a greater proportion of cuff pressures under 20 mmHg, but there were no differences in compliance of the other variables. The incidence of VAP in the pre-intervention period was 8.68 cases/1,000 MV days and in the post-intervention one 6.77 cases/1,000 MV days. That shows an attributable prevention fraction of 0.22 (−1.25 to 0.73) (p 0.645). There were no differences in length of stay, duration of MV, antibiotic consumption or mortality (Table 2).

Table 2

Factor	Pre-intervention	Post-intervention	p
MV length median (IQR)	7 (4–14)	9 (5–24)	0.202
Time to NAV median (IQR)	13 (3–24)	14 (9–22)	0.805
NAV n (%)	8 (13.1)	6 (11.8)	0.803
ICU LOS median (IQR)	13 (9–20.5)	16 (8–31)	0.586
Antibiotic DDDs median (IQR)	38 (12.5–50.5)	40 (17–80)	0.172
Beadhead > 30° mean (SD)	0.62 (0.32)	0.65 (0.31)	0.699
Sedation compliance mean (SD)	0.39 (0.31)	0.38 (0.33)	0.778
Cuff > 20 mmHg mean (SD)	0.59 (0.30)	0.48 (0.29)	0.045
Exitus n (%)	21 (34.4)	16 (31.4)	0.732

CONCLUSIONS. Though the post-intervention incidence was below the endpoint, we didn't found significant differences when compared with the previous period. That can be due to the loss of potency caused by starting with an incidence below the initial endpoint or to the lack of improvement in the compliance of the bundle items. However the low incidence of VAP encourages us to perseverate and try to lower even more the cases of VAP by improving the compliance of the bundle.

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0782

APPLICATION OF A SELECTIVE DECONTAMINATION OF THE DIGESTIVE TRACT PROTOCOL IN A MIXED UNIVERSITY HOSPITAL ICU DURING 6 MONTHS: PRELIMINARY RESULTS

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INTRODUCTION. Several studies have suggested that the use Selective Decontamination of the Digestive tract (SDD) can reduce the incidence of respiratory tract infections in ICU patients. Despite of the evidence the use of SDD remains controversial.

OBJECTIVES. To prospectively evaluate the preliminary effects of a SDD protocol in a mixed ICU for 6 months.

METHODS. This study was performed in a 30-bed-medical-surgical ICU Nursing staff were specifically trained to prevent nosocomial infections. From April 1 to September 30, 2011 (group A) we applied the following measures: maintaining head of the bed 30 to 45 ° and every 8 h, mouthwash with chlorhexidine 0.12% before controlling the tube cuff pressure. These items were registered on a daily check list. From October 1, 2011 to March 31, 2012 (group B) we used a SDD protocol. All consecutive patients admitted to the ICU who were expected to require tracheal intubation for longer than 48 h were given 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 a week. If the patient had a tracheotomy, infected pressure ulcers or surgical wounds, we also obtained swabs and applied SDD paste on them..We choose from two types of SDD: standard or mixed DDS with vancomycin according to criteria.An application SDD check-list protocol was used Diagnostic samples were obtained if clinically indicated. In each of the study 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 of the infections (catheter-related and other secondary bacteremia, pneumonia and urinary infection) 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 $p = 0.05$.

RESULTS. We had 43 patients in group A and 36 in de group B. There were no significant statistical differences in demographic data between both groups. The Check-list was performed in 100 % of the patients.We had two patients with antibiotic-resistant bacteria (ARB) colonization treated and solved with paromomycin enteral solution. There was neither an increased incidence of ARB nor any Clostridium difficile infections. We also found a significant reduction in nosocomial pneumonia rates (p = 0.009).

Tabe1 DDS

DDS	NO GROUP A N = 43	YES GROUP B N = 36	P
MALE/FEMALE	67.9/32.6	66.7/33.3	0.942
AGE, YEARS	59.9 ± 18.4	63.9 ± 13.3	0.302
APACHE II SCORE	20.6 ± 7.7	23.6 ± 8.8	0.107
DAYS IN ICU	28 (16–48)	35 (20–52)	0.197
DEATHS, N (%)	13 (30.2)	14 (38.9)	0.419
SEPTIC SHOCK, N (%)	18 (41.9)	22 (13.3)	0.373
NOSOSCOMIAL PNEUMONIA, N (%)	25 (58.1)	13 (36.1)	0.051
RENAL REPLACEMENT THERAPY, N (%)	11 (26.6)	17 (42.2)	0.045

Table 2 Rate of infection

DDS	NO N = 43	YES N = 36	P	RR (95 %CI)
Catheter bloodstreams/ 1,000 days of CVC		1.999	0.998	1.001 (0.363; 2,761
Other secondary bloodstreams/ 1,000 days in ICU	4.93	3.17	0.178	0.643 (03,337; 1,223)
Nosocomial pneumonia/ 1,000 days of MV	9.40	4.06	0.009	0.432 (0.230; 0.812)
Urinary infections/1,000 days of urinary catheter	1.52	2.12	0.496	1.390 (0.539; 3,586)

CONCLUSIONS. SDD given with a rigorous protocol which included a check-list showed a significant reduction in nosocomial pneumonia rates after six months without an increase of ARB infections or any other significant adverse effects.

0783

HYPERBARIC OXYGEN THERAPY: A FORGOTTEN TOOL IN THE TREATMENT OF SEVERE SOFT TISSUE INFECTIONS?

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INTRODUCTION. Hyperbaric Oxygen Therapy (HBO) consists in delivering 100 % oxygen in an environment with pressures two or three times above the atmospheric pressure. There are several accepted effects with potential benefits: increases oxygen delivery to the tissues; it has bacteriostatic/bactericidal properties, optimizes the immune response and enhances the effect of the antibiotics; anti-edematous and anti-ischemic properties, modulates the inflammatory response and enhances angiogenesis and wound healing.

HBO has a validated role in the treatment of severe soft tissue infections, with impact in outcome, and can therefore be an important tool in the treatment of these critically ill patients.

OBJECTIVES. To review all cases of skin and soft tissue infection admitted in the ICU and submitted to HBO, from June/2006 to March/2012.

METHODS. Retrospective analysis of 31 cases, using ICU and HMU clinical records.

RESULTS. The average age was 55 years (27–79), 55 % male. Sixty-one percent of the patients were referred from other hospitals. All admitions were due to septic shock (94 %) or severe sepsis (6 %). The average APACHE II severity score was 16 (7–40) and SAPS II was 41 (22–69). HBO was used as adjunctive treatment for necrotizing fasciitis (71, 26 % being Fournier's gangrene), cellulitis (13 %), miositis (13 %) and gas gangrene (3 %). Most of the patients (77 %) had at least one risk factor for the severity of the disease, mainly obesity (45 %) and diabetes (36 %). On average, HBO was initiated 2.7 days (6 h–10 days) after the diagnosis; 94 % of the patients underwent surgery with an average of seven interventions per patient (1–13). Apart from cardiovascular dysfunction (94 %), 97 % of patients required mechanical ventilation (15 days average), 94 % had hematological dysfunction, 42 % coagulopathy and 58 % acute renal injury. At least one microbial agent was identified in tissue, pus or blood culture in 77 % of the patients, from which 88 % had *Streptococcus* spp., 76 % *Staphylococcus* spp., 20 % *Bacteroides* spp, 20 % *Escherichia coli*, 16 % *Enterococcus* spp and 4 % *Clostridium perfringens*. Appropriate initial antimicrobial choice was documented in 71 % of all cases. No relevant adverse events occurred with HBO. Nine patients died (29 %).

CONCLUSIONS. HBO is an important adjunctive tool for the treatment of severe infections, together with antibiotics, and surgery. Its clinical value in the treatment of severe skin and soft tissue infections justifies the early referral to a center with an HMU. We believe that the patients reviewed in this sample are a small fraction of those that could benefit from HBO and that a consistent and continued work needs to be done in order to increase the number of patients benefiting from this important intervention.

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0784

THE ROLE OF C-REACTIVE PROTEIN AND THE SOFA SCORE AS PARAMETER FOR CLINICAL DECISION MAKING IN SURGICAL PATIENTS DURING THE INTENSIVE CARE UNIT COURSE

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INTRODUCTION. Trends in C-reactive protein (CRP) levels are used to determine if diagnostic or therapeutic interventions are required to identify complications in patients admitted into the Intensive Care Unit (ICU). An increase in CRP levels has been described as a crucial indicator for the diagnosis of postoperative complications such as infection, SIRS, sepsis, anastomotic leakage or mesenterial ischemia [1, 2]. However, the question remains if this parameter is correctly interpreted in clinical decision making in surgical patients in the ICU.

OBJECTIVES. Our purpose was to assess the predictive value of CRP as parameter for clinical decision making measured by performing (re)interventions. Furthermore, we wanted to determine the value of CRP in detection of surgical complications in critically ill general surgical patients in the ICU and its interpretation in adjunct to a clinical scoring system, the Sequential Organ Failure Assessment Score (SOFA).

METHODS. In a prospective observational study, we daily calculated the SOFA score and CRP levels in 174 general surgical patients admitted into the ICU. Diagnostic and therapeutic interventions defined as events (CT-scan, ultrasonography, flexible endoscopy or (re)laparotomy) and their outcome were registered. Surgical complications such as intra-abdominal abscess, anastomotic leakage, mesenterial ischemia, ileus, perforations and bleeding were recorded. Then the relationship between SOFA score, CRP levels, events and complications were analysed.

RESULTS. CRP in patients with an event showed a 7.5 % higher CRP level compared to patients with no event on the same day ($p = 0.040$). However there was no difference in CRP levels between patients with and without complications ($p = 0.73$). Each 10% increase in CRP resulted in a 3.5 % increase in the odds of an first event ($p = 0.028$). However, an increase in CRP levels did not lead to a significantly higher probability of complications (OR 0.983; $p = 0.52$). When adjusting for the SOFA score the effect of CRP on the probability of an event remained significant but low (OR 1.033; $p = 0.046$), and again did not significantly affect the probability of a complication (OR 0.980; $p = 0.46$).

CONCLUSIONS. More diagnostic procedures or therapeutic (re)-interventions are carried out in patients with an increased CRP. Both CRP and the SOFA score are poor predictors for complications in the critically ill surgical patient in the ICU.

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0785

CLINICAL AND MICROBIOLOGICAL FEATURES OF INFECTIONS DURING POST-OPERATIVE PERIOD AFTER HEART TRANSPLANTATION

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INTRODUCTION. Infections are a frequent cause of mortality after heart transplantation (HT).

OBJECTIVES. To determine the incidence, clinical features and microbiology of infections in the inmediate postoperative period after HT.

METHODS. Retrospective study of HT medical records from a single institution (1991 to 2009). Nosocomial infection, sepsis and multiorgan dysfunction were defined according to CDC, SSC criteria and SOFA score respectively.

RESULTS. In 594 HT, there were 97 infectious episodes in 75 patients (12.6 %); 85 (14.3 %) died during hospitalization. Infection is the second cause of mortality during post-operative period (17.9 % of dead patients). More common location of infections were pneumonia (n = 31, 31.9 % of infection episodes), blood stream (n = 24, 24.7 %: 18 catheter associated bacteremia (18.5 %), six primary bacteremia (6.2 %)), urinary tract (n = 14, 14.4 %), surgical site (n = 13, 13.4 %; eight mediastinitis (8.2 %), five wound infection (5.1 %) and intraabdominal infection (n = 13, 13.4%; four colitis (4.1 %), two cholecystitis (2.1 %) and seven peritonitis(7.2 %)). Etiology was identified in 62 cases (82.7 %). The most common microorganisms were enterobacteria (n = 20, 20.6 %) and coagulase-negative stafilococcus (n = 19, 19.6 %). Opportunistic germs were isolated in 16 episodes (16.5%). 18 (18.7 %) patients were afebrile, 21 (21.9 %) had not leukocytosis and 8 (8.1 %) had none of those signs. Nine patiens (9.3 %) had severe sepsis and 26 (26.8 %) septic shock. 34 (34.7 %) patients developed multiorgan failure with median duration 6 days four (15.5 %). Average SOFA score was 13.72 (4.41). Surgical intervention was needed in 22 (22.7 %) of the infections.

CONCLUSIONS. In our series the incidence of nosocomial infections after HT is 12.6%. Most frequent locations were pneumonia (31.9 %), bacteremia (24.7 %) urinary tract (14.4 %), surgical site (13.4 %) and intraabdominal (13%). Etiology was identified in 82.7 % being bacteria the most frequent microorganisms. Septic multiorgan failure developed in more than one-third of infections.

0786

AUTONOMIC DYSFUNCTION IN INFANTS WITH RSV INFECTION

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BACKGROUND. Apnea can be a presenting symptom in respiratory Synctial Virus (RSV) infection. The incidence of apnea in RSV infected infants varies between 16 and 25% with a particularly high risk associated with young age (<3 months) and prematurity. Apnea is frequently observed in early RSV infection when symptoms are still confined to the upper airways, suggesting inflammatory response induced autonomic dysfunction.

OBJECTIVE. The aim of the study is to assess autonomic dysfunction as indexed by Heart Rate Variability (HRV) in severe RSV infection. The secondary parameter is to analyze the effect of other viral pathogens on autonomic function in infants with LRTI requiring mechanical ventilation.

METHODS. Prospective observational study in a tertiary PICU in infants with viral LRTI requiring mechanical ventilation. Controls were age matched infants without signs of infection. Autonomic function was assessed via HRV, monitoring low frequency (LF) and high frequency (HF) indices of short time recordings (5 min).

RESULTS. In seven patients and 13 controls 36 recording were analyzed. Total HRV, LF and LF/HF ratios were significant lower in RSV patients versus controls ($p < 0.0045$, $p < 0.0002$ and $p < 0.0001$ respectively). In ventilated infants with LRTI caused by other respiratory viruses no significant differences in HRV versus controls were observed. These data indicate RSV related reduced sympathetic activity.

CONCLUSION. RSV infection in infants is associated with autonomic dysfunction of central origin. This may be correlated with an increased risk for serious apnea or ALTE, for which prolonged cardio respiratory monitoring is indicated.

0787

HEALTHCARE-ASSOCIATED BACTEREMIA IN A UNIVERSITY HOSPITAL IS DIFFERENT FROM COMMUNITY-ACQUIRED BACTEREMIA

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INTRODUCTION. Community-acquired bacteremia (CAB) and healthcare-associated bacteremia (HCAB) both refer to bacteremia acquired in the community, but in the latter category, patients have recent or ongoing exposure to the nosocomial environment. Consequently, the microbial etiology of HCAB may mirror that of hospital-acquired bacteremia (HAB), and antimicrobial resistance may be more pronounced than in CAB.

OBJECTIVES. We aimed to compare microbial etiology of HCAB to that of CAB and HAB. In addition, we compared rates of resistance to commonly empirically prescribed antibiotics.

METHODS. Bacteremia diagnosed within the first two days of hospitalization was not categorized as CAB but as HCAB if the patient had one or more of the following risk-factors: 1. residence in nursing home/long-term care facility. 2. hospitalization two or more days in the preceding 6 months. 3. treatment with renal replacement therapy or. 4. receipt of home wound care or outpatient intravenous therapy.

Bacteremia occurring from day three to day five of hospitalization was considered as early-onset HAB, and beyond 5 as late-onset HAB. We analyzed data from January 2009 until May 2011 and excluded coagulase-negative staphylococci and probable contaminants.

RESULTS. Pathogens (n = 1,132) found in CAB, HCAB, early-onset HAB and late-onset HAB are compared in Table 1. (Overall Pearson Chi-square $p < 0.001$; HCAB versus any other category in 2-by-2 Pearson Chi-square $p < 0.001$). Rates of resistance (R) in Gram-positive and Gram-negative pathogens are detailed in table 2.

CONCLUSIONS. In our hospital, microbial etiology of HCAB was distinct from that of other categories of bacteremia. As compared with CAB, HCAB yielded higher rates of methicillin resistant *S. aureus* and of fluoroquinolone resistant Gram-negative pathogens.

Bacteremia pathogens

	CAB (%)	HCAB (%)	Early-onset HAB (%)	Late-onset HAB (%)
Staphylococcus aureus	8 (6)	56 (15)	13 (15)	45 (9)
Streptococci	59 (42)	70 (18)	9 (10)	63 (12)
Enterococci	4 (3)	18 (5)	8 (9)	71 (14)
Escherichia coli	48 (34)	153 (40)	21 (24)	105 (20)
Other enterobacteriaceae	16 (11)	58 (15)	26 (29)	124 (24)
Non-fermenters including Pseudomonas aeruginosa	3 (2)	24 (6)	5 (6)	49 (10)
Candida sp.	3 (2)	8 (2)	7 (8)	58 (11)
Total	141	387	89	515

Resistance (R) rates of pathogens

	CAB (%)	HCAB (%)	*p* value (HCAB vs. CAB)	Early-onset HAB (%)	Late-onset HAB (%)
Gram-positive					
Methicillin R (S. aureus)	0	30	0.09	8	20
Gram-negative					
Fluoroquinolone R	18	31	0.04	27	29
Cefuroxime R	27	28	NS	52	47
Ceftazidime R	11	11	NS	21	22
Piperacillin-tazobactam R	3	8	NS	19	23
Meropenem R	2	2	NS	4	8

0788

UTILITY OF MONITORING PROCALCITONIN, INTERLEUKIN-6 AND COMPLEMENT-5A IN THE PREDICTION OF ANASTOMOTIC LEAKAGE AFTER ABDOMINAL SURGERY

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INTRODUCTION. Infections and sepsis remains a major complication after surgery, especially abdominal surgery. Clinical symptoms of the anastomotic leakage and infection can occur several days after surgery when the process is already advanced. Due to this, there is persistent need for a reliable biomarker which could early indicate a high risk of infection

in the patient. Procalcitonin (PCT), interleukin-6 (IL-6) and activated complement-5 (C5a-desArg) are proteins which are produced during infection what makes them candidates for being such biomarkers.
OBJECTIVES. To evaluate the utility of monitoring concentrations of IL-6, C5a-desArg and PCT for prediction of the anastomotic leakage after elective intestinal surgery.
METHODS. This case–control study enrolled 29 patients (ASA I and II) who underwent the elective major surgery on the intestine. Main cause of the surgery was cancer (16 pts), other indications included: Crohn disease, perforation and obstruction of the intestine. All patients underwent standard antibiotic prophylaxis treatment. Serum samples were obtained directly before the surgery (D0), 24 h (D1) and 5 days (D5) after the surgery. The PCT was measured by chemiluminescence assay. IL-6 and C5a-desArg concentrations were measured applying the Enzyme-Linked Immunosorbent Assay. Statistical analyses were done using Statistica10 software and comparisons between groups were performed applying the Mann–Whitney U-test and Wilcoxon signed-rank test.
RESULTS. 51 % of the patients developed post-surgical infection due to the anastomotic leakage, while 49 % of patients did not suffered any major complication. Of the three measured parameters, only PCT concentration increased significantly between D0 and D1 ($p = 0.0002$). PCT on D1 and D5 also differed significantly between patients who developed infection and those who did not ($p = 0.017$ and 0.0015, respectively). Area under the ROC curve (AUC) for PCT on D1 was 0.766 (95 % CI 0.51–0.93) and on D5 0.904 (95 %CI 0.782–1).The sensitivity and specificity in the prediction of an infection were 67 % and 66 % for PCT on D1 higher than 1.42 ng/ml, respectively. Patients who developed septic complication had not-significantly higher GM-CSF concentrations on D1 ($p = 0.07$) and IL-6 on D1 ($p = 0.28$). No significant differences in the concentration of C5a-desArg were found.
CONCLUSIONS. This study confirms that the surgical trauma increases the serum PCT concentration. The concentration of PCT on D1 and D5 can predict the infectious complications after the intestine surgery, however for suggested cut-off this parameter is not very specific nor sensitive. Also a tendency towards increased production of IL-6 and GM-CSF in patients who developed complications can be observed. Also, the applied antibiotic prophylaxis in these surgical patients was not fully effective.

0789
APPLICATION OF CHARLSON COMORBIDITY INDEX IN ICU PATIENTS WITH BACTERAEMIA AND MORTALITY PREDICTION

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INTRODUCTION. Infection in patients admitted to ICU care is a significant complication and is associated with increased morbidity, mortality, and health care expenses. Associated with medical progress, older patients are nowadays admitted to ICU units. Uncertainty regarding comorbid illness, and ability to tolerate aggressive therapy can lead to substandard treatment. Increasingly, comorbid illness scales have proven useful in identifying subgroups of patients who are more likely to tolerate and benefit from aggressive therapy. Unfortunately, the use of such scales has yet to be widely integrated into either clinical practice or clinical trials research.
OBJECTIVES. The purpose of this study was to retrospectively examine the applicability of the Charlson comorbidity índex (CCI) and to examine whether it predicts short- term outcome in ICU Patients with Bacteraemia.
METHODS. A retrospective review of 58 adult ICU patients with bloodstream infection (BSI) was performed. Bacteraemia was defined according to Centers for Disease Control and Prevention criteria. We used a Microsoft Excel (MS Excel) Macro for the calculation of CCI score already described and validated for oncology patients. Multiple logistic regression was performed to determine which variables were independent predictors of mortality.
RESULTS. We analyzed a total of 58 patients with a first episode of bacteraemia. Mean age was 62 years. 62 % were male. Diabetes was present in 17.2 %, heart Failure in 13.8 %, renal disease in 17.2 %, chronic lung disease in 19.0 %, chronic liver failure in 6.9 %, cerebro-vascular disease in 12.1 %, other neurological disease in 8.6 %, immune deficiency in 15.5 % and neoplasia in 10.3 %. ICU and hospital mortality were 37.9 % and 53.4%, respectively.The mortality rates for the different CCI scores were: "0", 37.5 %; "1–2", 57.1 %; "3–4", 62.5 %; and "greater than or equal to five", 66.7 %. On multivariate analysis, Charlson Comorbidity Index score was a significant predictor of mortality.
CONCLUSIONS. BSI in ICU patients is frequently associated with poor outcomes. The method of classifying comorbidity by CCI provides a simple, readily applicable and valid method to predict mortality from comorbid disease for use in future longitudinal studies and in outcomes research from administrative databases in bacteraemic patients.
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0790
"IF YOU CANNOT MEASURE IT, YOU CANNOT IMPROVE IT": A SURVEY OF DATA COLLECTION SYSTEMS TO MONITOR AND GUIDE INFECTION PREVENTION EFFORTS ICUS

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INTRODUCTION. Up to 10 % of in-patients in the ICU who stay at least 2 days will acquire a severe nosocomial infection (NI) such as blood stream infection (BSI) or ventilator-associated pneumonia (VAP) [1]. A significant proportion of these (NIs) is preventable. The assumption made in this study is "if you cannot measure it, you cannot improve it": Measuring infections (outcomes) and processes (compliance with guidelines) with use of data at the local level to monitor and guide improvement efforts is a prerequisite for infection prevention [2, 3].
OBJECTIVES. The objective of this survey is to document knowledge, attitudes, and practices with regard to prevention of NIs, and use of data for improvement in ICUs. This survey uses an international perspective.
METHODS. For pragmatic reasons, the questionnaire was kept as simple and short as possible. VAP-related measures were used as a proxy for a more complete data collection system. Target group was ICU medical doctors. To insure large dissemination, the survey was made available online in six languages (English, French, Spanish, Portuguese, German, Italian), and support was sought from international and national ICU societies (it was endorsed by the ESICM), and key opinion leaders in the field.
RESULTS. The survey was launched early April and will close on July 31, 2012. In the first week, 34 responses from ten different countries were submitted. Reported care for intubated patients (selected indicators) included no ventilatory circuit change unless specifically indicated (47 %), daily interruption of sedation and weaning protocol (38 %), oral care with chlorhexidine (62 %). Less than half respondents reported measuring compliance to these VAP prevention guidelines at least once a year; 44 % reported measurement of a VAP outcome measure (such a as VAP incidence); 66 % of respondents agreed with the statement that "monitoring of VAP-related measures stimulates quality improvement".
CONCLUSIONS. The quick response within only 1 week after launching the survey is encouraging. Final results of the survey will be available soon and be presented at the ESICM congress. The early results point towards the need to encourage objective measures of infection prevention efforts in the ICU.
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0791
CATHETER-RELATED BLOODSTREAM INFECTION (CRBSI) ERADICATION: A FAILED TRY

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INTRODUCTION. Central venous catheters (CVC) are commonly used in our institution in intensive care unit (ICU) and in general ward (GW) as well.
CRBSI are associated with increased morbi-mortality and additional medical cost that justifies multimodal prevention strategy.
As part of our quality program, we have defined a strategy to prevent CRBSI all over the institution establishing a continuous monitoring of all CVCs from insertion until return of the culture results, according to current guidelines [1].
OBJECTIVES. Prospective hospital-wide measurements of CRBSI rate before and after implementation of modified care bundle.
METHODS. Prospective data collection is performed for each CVC. The following variables are collected: age, sex, insertion site, type of CVC, patient comorbidities, indication of use, duration of use in ICU and GW, removal indication, culture results, antibiotic used in case of CRBSI. Two periods are analyzed: 01/01 to 31/12/2009: determination of exposed population and risk factors of CRBSI; 01/01 to 31/12/2011: control audit after modification of insertion protocol and outcome. The changes include: skin preparation and maintenance care of CVC with 0.5 % chlorhexidine, use of impregnated single or multilumen CVC (chlorhexidine-sulfadiazine), predilection for subclavian route, warning call at day 14 post-insertion. Cultures were performed according to the quantitative Brun-Buisson technique. CVC colonization and CRBSI were defined according to published criteria [2] and expressed per 1,000 catheter-days (KTD). The two periods are compared by Chi 2 ($p < 0.05$).
RESULTS. The number of CRBSI increased from 19 in 2009 to 2 in 2011. Main results are summarized in Table 1.

Table 1

	2009	2011	p
Patients (n)	816	979	
Mean age (years)	65.8	65.1	NS
CVC (n)	1,245	1,450	
Indwelling time (days)	7.55	6.98	0.02
Colonization (n/1,000 KTD)	95/10.15	24/2.41	<0.0001
CRBSI (n/1,000 KTD)	19/2.03	2/0.20	<0.0001
Jugular (n/1,000 KTD)	14/2.53	1/0.24	<0.0001
Subclavian (n/1,000 KTD)	5/1.44	1/0.19	0.02
Multilumen(n/1,000 KTD)	12/2.36	2/0.30	0.005

CONCLUSIONS. In our institution, after the analyze of 19,000 KTD: 1. The use of CVC outside ICU does not represent an infectious risk. 2. The use of impregnated catheter is synergistic with skin preparation modifications on CRBSI rate decrease. 3. We performed the eradication of CRBSI in ICU. 4. Unnecessary catheterization days detection and limitation of indwelling time could further decrease our CRBSI rate. Although conducted on a specific patient population (elective surgery:78%), the significant reduction of CRBSI observed in this study allows consideration on CRBSI eradication, currently discussed [3, 4].
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0792

THE CRITICAL ILLNESS POLYNEUROPATHY IN SEPTIC PATIENTS WITH PROLONGED WEANING FROM MECHANICAL VENTILATION. IS THE DIAPHRAGM ALSO AFFECTED? A PILOT STUDY

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INTRODUCTION. Critical illness myopathy and/or neuropathy (CRIMYNE) is a common alteration seen in the intensive care unit (ICU). The currently available bedside methods of measuring respiratory and peripheral muscle function in critically ill patients are somewhat inadequate.

OBJECTIVES. The objective of this study was to evaluate the presence of diaphragmatic and peripheral CRIMYNE in septic patients with prolonged weaning from MV.

METHODS. Cohort prospective study with an entry period of 6 months. Two Brazilian medical-surgical ICUs. Septic patients ≥18 years of age, dependent on MV ≥ 14 days, requiring prolonged weaning from MV, awake [Richmond Agitation Sedation Scale (RASS) ≥ −2], and with no previous history of polyneuropathy or myopathy were included. Electrophysiological studies of the limbs and also of the respiratory system by phrenic nerve conduction and needle electromyography of the diaphragm were performed in all patients.

RESULTS. Twelve patients were enrolled during six months of study. The electrophysiological signs of peripheral CRIMYNE occurred in nine patients, seven of whom died in the ICU. Three patients developed critical illness polyneuropathy (CIP), four critical illness myopathy (CIM), and two both. Only one patient that developed peripheral CRIMYNE did not present diaphragmatic involvement, whereas no patient developed diaphragm involvement alone. Thus, electrophysiological signs of diaphragmatic CRIMYNE occurred in eight patients, and in nine of the patients with peripheral CRIMYNE. Upon clinical examination, eight patients were not able to moves their limbs against gravity; and these findings were related to the presence of peripheral and diaphragmatic dysfunction.

CONCLUSIONS. Our pilot findings suggested that CRIMYNE is common in septic patients with prolonged weaning from MV (MV ≥ 14 days).The inability to move limbs against gravity is frequently associated with peripheral and diaphragmatic CRIMYNE; and the findings of CRIMYNE in peripheral electrophysiological tests are associated with diaphragmatic involvement.

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0793

NEUROLOGICAL DISEASE IN HIV-INFECTED PATIENTS—A 20-YEAR RETROSPECTIVE STUDY IN AN ICU

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INTRODUCTION. The spectrum of neurological conditions that require intensive care for persons with HIV/AIDS includes all the causes seen in the general population in addition to HIV-associated opportunistic infections and neoplasms.

OBJECTIVES AND METHODS. Retrospective and comparative study of HIV-infected patients admitted with neurological disorders in an ICU between 1991 and 2011.We applied the Mann–Whitney and Chi-square test (with continuity correction) to determine predictors of outcome.

RESULTS. From the 311 admissions of HIV-infected patients to the ICU, during the described period, a total of 58 patients (18.6 %) were admitted with neurological disease. 74.9 % were male aged between 10 and 73 years old (mean = 38; SD = 14). Only one patient was infected with HIV-2. At admission, and concerning the HIV stage, 82.9 % were asymptomatic and 17.1 % had previous AIDS diagnosis.

The risk for HIV transmission was intravenous drug use in 31 patients (53.4 %), sexual in 23 (39.6 %), mother to child in one (1.7 %), transfusional in three (5.2 %) and unknown in one patient (1.7 %).

Mortality related risk factors

	Group 1—survivors n = 40	Group 2—non-survivors n = 18	p
Age/median (P25;P75)	34 (28; 42)	40 (32; 46)	0.112
SAPS II/median (P25; P75)	40 (30; 51)	56 (44; 66)	0.002
CD4 lymphocyte count (cells/mm^3)/median (P25; P75)	n = 36/61 (17; 185)	n = 15/26 (5; 158)	0.247
Lymphocyte count/median (P25; P75)	n = 30/680 (337; 1.230)	n = 17/550 (141; 916)	0.245
HIV risk factor/sexual/ IV drug use	n = 38/36.8/ 63.2 %	n = 16/56.3/ 43.8 %	0.310
Newly diagnosed HIV infection	17.5 %	n = 17/29.4 %	Not applicable
AIDS in ICU	30.0 %	55.6 %	0.118
Prior HAART at hospital admission	n = 37/56.8 %	n = 14/21.4 %	0.052
Mechanical ventilation	20.0 %	55.6 %	0.016

10 % of the patients had shock in group 1 and in group 2 the percentage was of 33.3 %

Diagnosis of CNS infection was done in 34 patients (58.6 %): *Cryptococcus neoformans* meningitis in 11, *Mycobacterium tuberculosis* meningitis in eight, *Toxoplasma gondii* encephalitis in six, herpetic meningoencephalitis in one, brain abscess in four and meningitis by other agents in four. In 24 patients (41.4 %) was established an non-infectious diagnosis: epilepsy in six, CNS lymphoma in four, space occupying lesions in four, stroke in three, substance intoxication in three, hepatic encephalopathy in two, trauma and hyponatremia in one each. The survival rate was of 69 %.

CONCLUSIONS. A higher SAPSII and the need of invasive ventilation were associated with the risk of death. A mortality trend, although not statistically significant, was associated with older age, AIDS'diagnosis in the ICU, presence of shock, steroid administration and lower prior proportion of HAART.

The main HIV-associated neurological opportunistic infections include *Cryptococcus neoformans* and *Toxoplasma gondii*. Neurological presentation of tuberculosis is an important consideration. The main HIV-associated neoplasm is primary CNS lymphoma.

0794

USE XANTHINE OXIDASE ACTIVITY IN OPTIMIZATION OF TREATMENT PATIENTS WITH ACUTE CEREBRAL STROKE

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INTRODUCTION. Among the significant risk factors for stroke include high blood levels of uric acid (UA). It is known that the only one producer of endogenous uric acid—the enzyme xanthine oxidase(XO), and the production of UA usually accompanied by synthesis of cytotoxic free radicals. Investigation of the XO activity in the "acutest" period of stroke can improve outcomes in patients.

OBJECTIVES. To analyze the effectiveness of pharmacotherapy of stroke on the prolongation of coma and the onset of death, depending on the initial activity of XO.

METHODS. In 626 adult patients (in first 7 day of stroke—"acutest" period) of the stroke care unit n the initial development of the disease (regardless of type, variant), along with the standard instrumentation and laboratory tests, the samples of CSF and venous blood was performed spectrophotometric determination of concentration of adenine, guanine, hypoxanthine, xanthine, uric acid. The XO activity was calculated as the ratio of the concentrations UA and hypoxanthine.

RESULTS. Corticosteroids (RR = 3.2) and osmodiuretiks (RR = 2.3) help prolong coma in the presence of XO hyperactivity at the beginning of stroke. Osmodiuretiks contribute to (RR = 2.5), and xanthines (RR = 0.5) counteract the prolongation of coma in the absence of the XO hyperactivity. Corticosteroids (RR = 1.9) and haemostatics (RR = 1.8) contribute to, derivatives of succinic acid (RR = 0.4) and antiplatelet agents (RR = 0.4) counteract the lethal outcome in the presence of hyperactivity of the XO. Osmodiuretiks contribute to lethal outcome in the absence of hyperactivity of XO (RR = 1.8).

CONCLUSIONS. Focus on the activity of serum XO allows use antiplatelet agents and xanthines in the absence of XO hyperactivity, and in the presence of XO hyperactivity use derivatives of succinic acid (high activity of XO is a sign of "good" oxygen balance and may therefore be associated with effectiveness of derivatives of succinic acid).

0795

SEVERE CEREBRAL VENOUS THROMBOSIS IN ICU: 32 PATIENTS IN A RETROSPECTIVE COHORT STUDY

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INTRODUCTION. Severe cerebral venous thrombosis (CVT) are rare but with high unknown mortality (1).

OBJECTIVES. Analysis of clinical presentation and management in severe patients requiring ICU.

METHODS. Retrospective analysis of 32 patients admitted in ICU for severe alteration of consciousness between 2002–2011, in a university hospital, reference centre for CVT. Data were expressed as median [25–75th percentiles], statistics used non parametric tests.

RESULTS. **Cohort** included 75 % women, age 47 yo [31–54], SAPS II 41 [32–47], lowest GCS 8 [6–10], and 53 % (17 patients) presented at least one mydriasis episode. **Location of thrombosis**: 78 % lateral sinus; 56 % superior longitudinal sinus; 81 % intracerebral hematoma. **Treatment**: all patients were treated with heparin (72 % partial thromboplastin time ratio > 2 within 48 h), intubation and mechanical ventilation in 91 %, norepinephrine for cerebral perfusion in 56 %, osmotherapy in 50 %.

Interventions: 34 % (11) decompressive craniotomy, 19 % (6) thrombectomy ± thrombolysis, 19 % (6) craniotomy for hematoma and 16 % (5) CSF drainage. Three intracerabral bleeding were observed during the acute phase under heparinotherapy. **Outcome**: 34 % (11) patients died along the first year: 64 % (7) of them on or before day eight, who presented a lower GCS at admission (5 [5-8]) than survivors (9[7–10], p = 0.036), and all experienced a mydriasis episode compared to 40 % in survivors (p < 0.01). At ICU discharge [at 12 days (4.5–18.75)], 6 patients (25 %) of were Rankin (mRS) 0–2 (19 % of global population). After one year, 11 patients (65%) were mRS 0–2 (34 % of global population), 6 (27 %) of them without sequellae (19 % of global population).

None of the clinical or biological items were associated with outcome.

CONCLUSIONS. Even with a severe clinical presentation, only one-third of patients died within the first year, and another third had a very good prognosis. We did not find clinical or radiological criteria associated with prognosis. Clinical improvement along the first year has to be considered to motivate intensive rehabilitation. Aggressive management of these patients might ameliorate their outcome.

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0796
INCIDENCE AND OUTCOME OF PATIENTS DIAGNOSED OF ICU-ACQUIRED WEAKNESS

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OBJECTIVES. To describe the incidence and outcomes of patients with ICU-acquired weakness (IAW) in patients underwent mechanical ventilation.

METHODS. A secondary analysis of the Third International Study of Mechanical Ventilation that included 7,199 patients who underwent mechanical ventilation at least during 12 h. The ICU-acquired weakness (IAW) was diagnosed as the presence of clinical signs of symmetric and flaccid weakness associated with an impairment or absence of osteotendonous reflex. *Statistical analysis.* Comparison with Chi square tets, *T* test or non parametric U Mann–Whitney test was performed as were needed.

RESULTS. 211 (3 %) patients met clinical criteria and/or electromyographic of IAW. The IAW was more frequent in patients with ARDS (OR 2.0), non COPD patients (OR 2.5), patients with sepsis (OR 2.0), treatment with insulin (OR 2.3), use of steroids (OR 6.3), use of neuromuscular blockers (OR 3.3) and use of sedatives (OR 3.2).

Median time from orotracheal intubation and the diagnosis of IAW was 9 days (interquartile range 6–15). The main clinical outcomes are presented in the table.

Table 1

	No IAEW	IAW	P value
Duration of mechanical ventilation, median (P25, P75)	4 (3, 9)	18 (11, 27)	<0.001
Duration of weaning, median (P25, P75)	1 (1, 2)	1 (1, 5)	<0.001
Reintubation rate (%)	13	44	<0.001
Tracheostomy rate (%)	12.5	56	<0.001
Length of ICU stay, median (P25, P75)	7 (4, 14)	27 (18, 40)	<0.001
ICU mortality (%)	30	35	<0.001

CONCLUSIONS. In our study, the incidence of IAW is not frequent. The patients with IAW had a worse clinical outcome.

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0797
LONG TERM PROGNOSIS OF PATIENTS WITH ACUTE STROKE TREATED WITH SYSTEMIC THROMBOLYSIS. A REPORT OF 6 YEARS OF EXPERIENCE IN A COMMUNITY HOSPITAL

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INTRODUCTION. Intravenous administration of recombinant tissue plasminogen activator (rt-PA) remains the most beneficial proven intervention for emergency treatment of stroke. After discharge from ICU, the treatment continues with neuroprotection and rehabilitation.

OBJECTIVES. To describe the clinical characteristics of patients with acute stroke admitted in ICU for systemic trombolysis, to analyze the long term prognosis assessed by Barthel and modified Rankin scales and to study its relationship with the NIHSS at admission in ICU.

METHODS. Descriptive study in a 17-beds medical-surgical ICU of community hospital during a time of study of 6 years. An evaluation of disability applying Barthel and modified Rankin one year after ICU admission was performed. Age, gender, APACHE II and NIHSS at ICU admission, vascular risk factors, ICU length of stay and mortality were collected.

RESULTS. 79 patients were included, 50 men and 29 women, mean age was 62 years. Most of the patients (86 %) had at least one vascular risk factor, 50.6 % were hypertensive, 45.6 % smokers, 32.9 % dyslipidemia and 16.5 % diabetes mellitus Mean APACHE II was 9 ± 3.5 points and the NIH score at admission was 13.1 ± 5.19. ICU length of stay was 4.43 ± 3.31 days. 11 patients died, four during ICU admission, and seven after acute phase outside ICU. Long-term disability was assessed with the Barthel scale with the following results: 8.9 % presented high dependence for basics activities (score < 40), 24.1 % were completely independent (score > 60) and 77 % resulted with 40–60 score. Modified Rankin scale resulted: 11.4 % patients require continuing care due to high degree of dependence and 26.6 % can perform normal activities almost independently. The disability rate obtained by these scales was higher in the subgroup with NIHSS score > 15 obtained during the acute phase (Barthel < 40 in 18.5 % and Rankin 5–6 in 44.4 %) compared with subgroup of NIHSS score <15 (Barthel <40 in 4.3 % and Rankin with 5–6 points in 17.4 %).

CONCLUSIONS. Systemic thrombolysis in acute ischemic stroke is associated with a good long-term functional prognosis NIHSS at admission was directly related to the degree of long-term disability assessed with Barthel and modified Rankin scale.

0798
CLINICAL CHARACTERISTICS, RISK FACTORS ASSOCIATED WITH MORTALITY AND OUTCOMES IN A COHORT OF ADULT ICU PATIENTS WITH REFRACTORY STATUS EPILEPTICUS

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INTRODUCTION. Refractory status epilepticus (RSE) is a medical emergency associated with significant morbidity and mortality, in which seizures do not respond to first- and second-line anticonvulsant drug therapy. [1, 2].Moreover, it carries significant medical complications among survivors and prolonged hospitalization. Current information dealing with clinical characteristics, risk factors associated with mortality and outcomes are poorly defined.

OBJECTIVES. We aimed to assess the incidence, risk factors associated with mortality, and outcomes of a cohort of ICU hospitalized patients with RSE.

METHODS. All episodes of RSE prospectively documented in hospitalized ICU adult patients in a tertiary university hospital from January 2009 to February 2012 were analyzed. Demographic variables, pathological history, causes, diagnosis, monitoring, treatment, ICU complications and mortality were recorded.

RESULTS. A total of 93 episodes fulfilled criteria of RSE. The median age of patients was 60 yr (20–86) and 58 % were males. Median ICU stay was 13 days (interquartile range 21) and median hospital stay was 27 (interquartile range 50). Twenty-seven percent of RSE patients had a previous history of epilepsy, whereas 21.5 % of patients had a cerebral tumor, 15 % stroke, 14 % postanoxic coma, 7.5 % traumatic brain injury, 7.5 % meningitis and 2.2 % had children cerebral palsy. As possible causes of RSE, we only identified 14 % of previous hypoxia, 11 % of drug toxicity, 8.6 % of treatment modifications and 1.1 % of non adherence to treatment. Seventy-two percent of patients had convulsive status and 73 % had Glasgow Coma Scale (GCS) less than nine points. Twenty-one percent of these episodes needed induced barbituric coma. Mechanical ventilation was required in 92.5 % of SE patients. Ventilator-associated pneumonia was the most frequent complication (38.7 %) followed by renal impairment (27 %) and hepatobiliar disfunction (22.6 %). Overall ICU mortality was 40 %. In the univariant analysis, hypoxic encephalopathy, myoclonic status, hypotension, vasoactive amine requeriment, cardiac arrhythmia and hemodyalisis were more frequent in RSE patients who died. In the logistic regression analysis, variables associated with mortality were age (OR = 9.62; CI 1.02–1.11) GCS < 9 (OR = 6.5; 95 % CI 1.4–29), hypotension (OR = 5.2; 95 % CI 1.57–19.9) and acute kidney injury (OR = 4.6; 95 % CI 1.03–21.3).

CONCLUSIONS. In this study, RSE in ICU patients causes significant morbidity, with high hospitalization rates and mortality, mainly associated with age, GCS < 9, hypotension and renal impairment.

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0799
BRAIN ABSCESSES IN ICU. EPIDEMIOLOGICAL STUDY AND ANALYSIS OF MORTALITY DETERMINANTS

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INTRODUCTION. Brain abscesses are an uncommon pathology but serious and often nosocomial.

OBJECTIVES. Analysis of demographic, clinical and therapeutic management of patients with brain abscesses in an intensive care unit (ICU). Evaluation of mortality terms.

METHODS. Retrospective study carried out in a tertiary hospital general critical care unit. Patients admitted from January 2006 to November 2011 with brain abscess or patients who developed brain abscesses during ICU stay were included. Demographic and clinical data as well as additional tests were recorded. Complications during ICU stay and ICU mortality were also studied. Univariate analysis regarding mortality was done with T-student and Chi-square (significant if $p < 0.05$).

RESULTS. A total of 16 patients were included with a mean age of 59.63 ± 14.74. Most of them were men (75 %). 62.5 % had no known immunodeficiency. 25 % had previous neoplasia, 6.3 % solid organ transplant and 6.3 % immunosuppressed by agents. No patient was HIV. 62.5 % were admitted to ICU in relation to the brain abscess, 25 % due to other neurological problems (none traumatic brain injury) and 12.5 % due to other infectious diseases. 18.8 % had undergone neurosurgery, 31.3 % were carriers of external ventricular drainage (EVD) and 6.3 % of intraparenchymal ICP catheter. Half of the patients had pathological cerebrospinal fluid (CSF). 12.5 % showed bacteremia and infectious endocarditis was only demonstrated in 6.3 % of the cases. 50 % of brain abscesses were considered nosocomial. Most were diagnosed after admission to the ICU (68.8 %). The most common clinical presentation was low level of consciousness (87.5 %), fever (81.3 %) and seizures (37.5 %). 81.3 % were diagnosed by CT with contrast and 18.8 % required MRI. 31.3 % underwent brain biopsy. The abscesses were single in 68.3 % of patients and temporal (12.5 %), occipital (12.5 %) and cerebellar (12.5 %) were the most frequent localizations. The germ was confirmed in 31.3 %, being Streptococcus the most common (18.9 %), followed by Staphylococcus (12.5 %). Most of patients received only medical treatment (62.5 %). 25 % underwent additional surgical drainage and 12.5 % EVD. Regarding ICU medical treatment, 81.3 % received anticonvulsants, 62.5 % sedation, analgesia and neuromuscular blockade. Moreover, ICP was monitored in 68.8 %. The median ICU stay was 19.5 days. ICU mortality and overall mortality were 18.8 and 37.5 %, respectively.In univariate analysis, we found statistically significant relation with mortality for APACHE II ($p = 0.04$) and GCS at admission (0.043).

CONCLUSIONS. Brain abscesses are serious pathologies and often nosocomial in neurocritical. The presence of low level of consciousness, fever and convulsions were the most common manifestations. Most of them required ICP monitoring and management. GCS at admission and APACHE II are related to mortality.

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0800
POSTERIOR REVERSIBLE ENCEPHALOPATHY SYNDROME (PRES) AFTER LIVER TRANSPLANTATION: A STUDY OF SEVEN CASES

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INTRODUCTION. Posterior reversible encephalopathy syndrome (PRES) is a clinico-neuroradiological entity, characterized by typical neurological deficits, distinctive magnetic resonance imaging (MRI) features, and a usually benign clinical course. PRES is associated

with reversible vasogenic edema on neuroimaging. We herein present seven cases of PRES due to sepsis that developed after liver transplantation.
METHODS. Retrospective consecutive case series.
RESULTS. Seven patients were identified in this series (six females and one male), with a mean age of 44.7 years. Liver transplantations were performed in all seven patients due to fulminant hepatitis and liver cirrhosis. The symptoms at the time of onset were petit mal seizures in two patients, secondary generalized tonic–clonic seizures in two, clonic convulsions in one, conjugate deviation in one, encephalopathy in one patient, and septic conditions in seven patients. The mean tacrolimus concentration in the serum of these seven patients was 4.92 ng/ml, which was in the therapeutic range. The atypical neuroimaging features included hemorrhage in one patient, recurrence in one, and a unilateral lesion in one patient. The patients experienced a full recovery with no sequelae, except one patient. All of the patients had sepsis at the time that PRES was diagnosed.
CONCLUSIONS. When patients are diagnosed to have PRES, they also tend to have sepsis. Thsensrefore, PRES may occur in association with septic conditions. Attention should therefore be paid by intensivists and emergency medicine teams to ensure that a patient does not have PRES when they are diagnosed with sepsis.
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0801
RISK FACTORS FOR DEATH IN STROKE PATIENTS WITHOUT SUPRANORMAL LEVEL OF URIC ACID IN BLOOD AND/OR CEREBROSPINAL FLUID

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INTRODUCTION. Hyperuricemia is a strong risk factor for brain ischaemia and stroke. It is known that exogenous administration of uric acid, shows obvious antiradical, antioxidant and neuroprotective effects whereas endogenous increased its production, with a side of xanthine oxidase synthesis of oxygen free radicals, reflecting the severity of brain ischemia and reperfusion injury.
OBJECTIVES. Explore the risk factors of death in patients with brain ischaemia in the acutest period of stroke without supranormal uric acid levels in venous blood and/or cerebrospinal fluid (CSF) in the debut of the disease.
METHODS. In 362 adult patients (in first 7 day of stroke—"acutest" period) of the neurointensive care unit without hyperuricemia and/or hyperuricorrhahia in the initial development of the disease (regardless of type, variant), along with the standard instrumentation and laboratory tests, the samples of CSF and venous blood was performed spectrophotometric determination of concentration of adenine, guanine, hypoxanthine, xanthine, uric acid, corticosteroid and thyroid hormones.
RESULTS. Significantly associated (Generalized Yule Coefficient above 0.6) with followed by the onset of death elevated guanine (0.65), hypoxanthine (0.69) in blood serum on 1st day of stroke. The relative risk (RR) of occurrence of death is high in the development of pneumonia (RR = 3.8), using osmodiuretics (RR = 3.6).Most are high chances of occurrence of fatal complications of a stroke in the development of shock (OR = 8.7), pneumonia (OR = 12.5), supranormal ratio of the concentrations of uric acid in the venous blood serum/CSF on 1st day of stroke (OR = 9.6).
CONCLUSIONS. In patients without hyperuricemia and/or or hyperuricorrhahia in the initial period of the stroke parameters of purine metabolism are highly informative predictors of death. The most prognostic powerful metabolic parameter is the ratio of the concentrations of uric acid in the venous blood serum/CSF.

0802
INFRATENTORIAL STROKES: AN ALTERNATIVE APPROACH

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INTRODUCTION. The posterior cerebral circulation is commonly affected by stroke, and 20% of ischemic and hemorrhagic subtypes occur in this area [1]. Papers published on the therapeutic approach of these patients consist of sets with small numbers which do not distinguish supra and infratentorial pathology. As a consequence the treatment is often inferred from supratentorial guidelines. Some studies suggest that hospitalization in the ICU does not change the morbidity and mortality [2], particularly in comatose patients upon admission [3]. The indications for surgical treatment of infratentorial hemorrhagic lesions are well established. However there are no guidelines for the surgical treatment of ischemic lesions.
OBJECTIVES. The purpose of this work is the analysis of a sample of patients with ischemic and hemorrhagic infra-tentorial stroke, admitted to a Neurocritical care ICU of a major teaching Hospital during the period between January 2010 and December 2011.
METHODS. We elaborated a retrospective study of primary spontaneous hemorrhagic and ischemic infratentorial strokes. We assessed demographic variables, ICU and hospital length of stay, severity scores at admission (APACHEII, SAPSII and SAPSIII), GCS on admission and GOS at the time of discharge and 90 days after. It was reported the need for invasive mechanical ventilation, surgical drainage, decompressive craniectomy or placement of EVD.
RESULTS. During the referred period, there were 15 patients with infra-tentorial ischemic and hemorrhagic pathology. Eleven (74 %) were hemorrhagic and four (26 %) were ischemic. The mortality rate of the sample was 33 % (four hemorrhagic strokes and one ischemic stroke). The average GCS was 8 upon admission, with an average GOS upon discharge of three. Patients with hemorrhagic stroke had a worse outcome (average GOS of two at 90 days after disharge). Considering ischemic strokes (average GOS of four at 90 days after discharge), two underwent posterior fossa decompressive craniectomy (average GOS of five at 90 days after discharge), while the non-operated had worse outcome (average GOS of two at 90 days after discharge).
CONCLUSION. The improvement of neuromonitoring, allowing earlier and more aggressive interventions may alter the prognosis of worst cases. Posterior fossa decompressive craniectomy in infratentorial ischemic stroke may improve the outcome of these patients. This hypothesis raises the need for further studies with larger samples in order to draw conclusions.
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0803
FUNCTIONAL OUTCOME AFTER DECOMPRESSIVE CRANIECTOMY IN MALIGNANT MIDDLE CEREBRAL ARTERY INFARCTION

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INTRODUCTION. Large hemispheric infarctions of the middle cerebral artery (MCA) are a major cause of severe morbidity and mortality. Decompressive craniectomy (DC) is proposed as a measure to control cerebral edema and improve cerebral perfusion, to increase survival rates.
OBJECTIVES. To evaluate the functional outcome after DC in patients with MCA infarction.
METHODS. Study of DC performed in 8 patients with MCA infarction. We recorded anthropometric data, GCS at admission and before DC, brain tomography (CT), ICP, cerebral hemisphere affected, and outcome (GOS and Barthel) at discharge and six months later.
RESULTS. The eight patients (six male) had MCA infarction between 01/01/06 and 12/01/12. Their mean age was 48.75 ± 12.08 years. The cause of the MCA infarction was an ischemic stroke in the MCA territory in five patients, an aneurysm that bled and was complicated by ischemia in two patients, and traumatic brain injury to the MCA territory in one patient. The initial Glasgow score was 10.25 ± 3.92. The Glasgow score in the hospital was 8 ± 2 and the Glasgow score on discharge was 8.7 ± 3.71. The mean ICU stay was 15.75 ± 6.61 days. The time before DC was 18.5 ± 13.3 h. The ICP post DC (measured in just five of the eight cases) was 20.20 ± 12.13. In two patients the initial ICP was 26 ± 5.66. The non-dominant hemisphere (right side) was involved in all the patients, who were all right-handed. The type of DC was fronto-temporo-parietal. Fibrinolysis was given in 3 patients, one of whom died. The GOS on discharge was 1 (dead) in 1 patient, 2 (persistent vegetative state) in 2 (25 %), and 3 (severe disability) in 5 (62.5 %). The GOS at six months has only been possible to assess in 6 patients so far, of whom 3 had GOS 1 (dead) and the other 3 had a GOS of 3 (conscious but with severe disability). The other 2 patients have yet to reach the 6-month point. At 12 months, 3 patients had died (GOS 1) and the other 3 still have a GOS of 3 (the remaining 2 patients have yet to reach the 12-month point). The Barthel on discharge (6 cases) was 23.33 ± 2.58, at6 months (3 cases) it was 33.33 ± 11.55, and at 12 months it was 40 ± 28.20 (of the 8 initial patients, 3 died before 12 months and 2 have yet to reach the 12-month point).Mortality in the ICU was 12.5 % and mortality at the 6-month follow-up point was 50 % (for those who have reached this point).
CONCLUSIONS. This study shows that patients with MCA infarction treated with DC have a not very high mortality on discharge from the ICU. This mortality rises later, and the patients have important functional involvement at 6 and 12 months. Their long-term situation remains to be determined.

0804
MUCORMYCOSIS AFTER SEVERE TRAUMA

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INTRODUCTION. Mucormycosis is a rare invasive fungal infection, associated with very low rates of survival. Severe traumatic disease is considered, based on isolated cases, a risk factor for the occurrence of this type of invasive fungal infections, not being fully elucidated the true incidence.
OBJECTIVES. The aim of this study is to analyze the relationship between severe traumatic disease (injury severity score > 15) and mucormycosis, as well as potential risk factors related to its appearance.
METHODS. Retrospective, descriptive study of all severe trauma patients (ISS > 15) admitted during the years 2005–2011, who had, at some point in their evolution, documented mucormycosis. Patient clinical records were then reviewed for selected factors.
RESULTS. Six acute trauma patients were identified; 100 % male; median age 39 years (32-41) All injuries were due to blunt impact, and two of six injuries were motor-vehicle-associated. Median ISS was 36 (32–44); Median SOFA score at 48 h was 17 (14–19). Median ICU stay was 33 days (27–37), with an overall mortality of 50 %. All patients needed invasive mechanical ventilation; Five patients developed hemodynamic failure, requiring three of them corticosteroid therapy. Four patients received continuous renal replacement therapies. Four patients developed coagulopathy, requiring two of them politransfusion and the other two, the activation of the center massive transfusion protocol. In five patients, the fungus was reported in soft tissues, with a median AIS of 4 (3–5). All of them received antifungal therapy associated with surgery. In one patient, the fungus grew in respiratory secretions, only receiving antifungal treatment.
CONCLUSIONS. This review presents a subgroup of patients with traumatic disease and mucormycosis, characterized by high severity and soft tissue involvement, probably trauma-related immunosuppression in addition to corticosteroid therapy, blood products and prolonged support therapies. It is essential in these patients make an early diagnosis and appropriate and aggressive treatment, based on a combination of antifungal agents and surgery.
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0805
PELVIC BONE FRACTURES ASSOCIATED WITH INTRA-ABDOMINAL SOLID ORGAN INJURY

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INTRODUCTION. Early detection for the intra-abdominal solid organ injury is critical in patients with pelvic bone fractures.
OBJECTIVES. This study analyzed the characteristics of pelvic bone fractures associated with intra-abdominal solid organ injury.
METHODS. Medical records were retrospectively reviewed from January 2000 to December 2010 for patients with pelvic bone fractures. Pelvic bone fracture were divided into stable and unstable type; unstable pelvic bone fracture defined as lateral compression types II and III antero-posterior compression types II and III, vertical shear and combined type by young classification. Subjects were divided into two groups, with (injured group) and without (non-injured group) intra-abdominal solid organ injury. Data included demographics, mechanism of injury, initial hemodynamic status, laboratory results, revised trauma score (RTS), injury severity score (ISS), amount of transfusion, admission to the intensive care unit (ICU), and mortality.
RESULTS. Of all 363 study subjects, injured group were 60 patients (16.5 %). Most common injured intra-abdominal solid organs were liver and spleen. Mean age of injured group was younger than non-injured group (37 vs 45 years old, p-0.005). Male patients was 56 % in non-injured group and 70 % in injured group (p-0.048). Mechanism of injury and stability of pelvic bone fracture were not different between two groups, however fall from height was higher in injured group (7.4 vs 4.1 m, p-0.002). Initial blood pressure at emergency department (ED) and RTS in injured group was lower than non-injured group. Shock at ED was more presented in injured group. For bivariate logistic regression test with significant factors from univariate analysis, early factors associated with intra-abdominal solid organ injuries for pelvic bone fracture was fall from height. Clinical outcomes including ISS, the amount of transfusion, the rate of invasive treatment, ICU stays and mortality was more severe in injured group.
CONCLUSIONS. Higher fall from height was early factors associated with intra-abdominal solid organ injures for pelvic bone fractures. There is a need to decide on a early diagnostic and therapeutic plan regarding the possibility of intra-abdominal solid organ injury for patients with pelvic bone fractures.

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0806
RECOMBINANT FACTOR VIIA (RFVIIA) IN A PIG MODEL OF COAGULOPATHY WITH BLUNT LIVER INJURY UNDER SEVERE HYPOTHERMIA

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INTRODUCTION. rFVIIa is a haemostatic agent, which has been shown to be effective in massive bleeding refractory to conventional haemostatic therapy. In current clinical practice, there is an urgent need for monitoring the treatment effects of rFVIIa but for the moment, there is no reliable assay available to assess local thrombin generation or fibrin clot formation and stability upon administration of rFVIIa.
OBJECTIVES. To compare several common as well as additional advanced coagulation parameters in plasma of treated pigs in order to monitor the correction of coagulopathy with rFVIIa after blunt liver injury.
METHODS. In 28 pigs, a grade III blunt liver injury was induced preceded by splenectomy and haemodilution. Animals received 90, 180 or 360 µg/kg rFVIIa or placebo 10 min after injury. Several coagulation parameters were determined in pig plasma's and whole blood at different time points. 120 min after trauma, animals were sacrificed and total blood loss was determined.
RESULTS. Total blood loss was significantly reduced in all rFVIIa treatment groups (1,268 ± 45 mL) as compared to placebo (2,689 ± 121 mL, mean ± SD). PT as well as aPTT prolonged at 10, 60, and 120 min after trauma compared to baseline. At 120 min after trauma, PT as well as aPTT was prolonged in the placebo group compared to the rFVIIa treatment groups. TAT levels were not altered between placebo and rFVIIa administration. In the placebo as well as rFVIIa treated animals, fibrinogen levels were decreased at different time points after trauma compared to baseline. No effects on fibrinogen levels were observed between the placebo and rFVIIa treatment groups. In the ROTEM analysis, clotting time (CT) was prolonged in the placebo group compared to the 3 rFVIIa treatment groups after 120 min of trauma, whereas clot formation time (CFT) and maximal clot firmness (MCF) only differed in the 360 µg/kg treatment group compared to placebo. Overall, ROTEM parameters did not show differences between the 3 doses of rFVIIa administered. In the CAT analysis, lag time was shortened and velocity index was increased upon rFVIIa administration in three different doses compared to placebo at 30, 60, 90, and 120 min after trauma. Neither lag time nor velocity index varied between the different rFVIIa doses. Other parameters as peak height or endogenous thrombin potential were not influenced upon rFVIIa administration.
CONCLUSIONS. rFVIIa administration in pigs undergoing blunt liver injury and haemodilution reduced blood loss and improved several coagulation parameters. From these data, the CAT method was shown to be the most effective method to monitor rFVIIa administration as lag time as well as velocity index were improved upon rFVIIa administration at all time points. Varying the dose of rFVIIa did however not influence blood loss or CAT parameters.
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0807
NOT ONLY ADMISSION HYPERGLYCEMIA BUT BLOOD GLUCOSE VARIABILITY ARE RELIABLE OUTCOME PREDICTORS IN SEVERE TRAUMATIC PATIENTS

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INTRODUCTION. Although glycemic control is an important aspect of patient care in intensive care unit (ICU), glycemic variability might be an influential factor in mortality.
OBJECTIVES. The purpose of this study was to investigate the relationship between not only blood glucose (BG) but BG variability, and outcomes of severe trauma ICU patients.
METHODS. A retrospective analysis of BG levels was conducted in patients with severe traumatic injury which was defined as 16 or more of Injury Severity Score (ISS) admitted to ICU between January 1, 2009 and December 31, 2011. The patients were collected blood samples at least five times for 3 days after injury. Hyperglycemia was considered for a cut off value of >150 mg/dL (hyperglycemia group), based on literature. The BG variability was defined as the difference of the highest BG (BG max.) and the lowest BG (BG min.). Outcome was measured with the length of ICU stay and hospital stay. Death was also analyzed as the outcome measure.
RESULTS. Ninety patients were enrolled of this study. Glycemic and clinical data were reviewed for 90 patients (62 men/28 women; mean age 46 years; mean ISS 25.7 ± 8.2; mortality rate 2.2% (2/90); mean initial BG at admission 166 ± 59.8 mg/dL; hyperglycemia group 50.0%). Hyperglycemia group was associated with significantly higher ISS (28.0 vs. 23.3, $p = 0.004$), and longer ICU stay (7.8 vs. 2.0, $p = 0.039$) and hospital day (19.8 vs. 28.0, $p = 0.042$). There was a better significant positive correlation between ICU stay and the BG variability ($r = 0.48$, $p < 0.001$) than the initial BG at admission ($r = 0.43$, $p < 0.001$), and BG max. ($r = 0.42$, $p < 0.001$). There was no significant positive correlation between ICU stay and the BG min. Because of low mortality rate, analysis of the relationship between BG and mortality was not carried out this time.
CONCLUSIONS. In this study, not only admission hyperglycemia but BG variability was reliable outcome predictors in severe traumatic patients. So we suggest that the stabilization of the BG variability in early stages of hospitalization may shorten the length of ICU stay and contribute to the early social rehabilitation in severe traumatic patients.

0808
EVALUATION OF CENTRAL VENOUS AND ARTERIAL CATHETERIZATION FOR SEVERE TRAUMA PATIENTS IN THE TRAUMA BAY

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INTRODUCTION. Central venous and arterial catheterization (CVAC) is part of the initial management of severe trauma patients upon admission in the trauma bay in many European centres to allow continuous monitoring of arterial pressure and/or to provide a reliable vascular access for administration of vasopressors. Situations with haemorrhagic shock (HS) or active haemorrhage or severe traumatic brain injury (TBI) could be considered as theoretical indications in favour of CVAC in the trauma bay (1). However, this approach remains controversial.
OBJECTIVES. The objective of the study was to evaluate the discordance between these theoretical indications and actual use of CVAC and to determine the incidence of associated complications.
MATERIALS AND METHODS. This retrospective study included patients admitted for severe trauma over 2 years in two trauma centres in the Paris Area. Demographic, epidemiologic, clinical and radiological data were collected. For all patients with CVAC in the trauma bay, infectious (blood and catheter cultures) as well as local complications (searched by a systematic review of at least one post CVAC CT scan by a radiology consultant) were assessed. Following clinical situations were considered as theoretical indications for CVAC: TBI (GCS < 8), active haemorrhage (initial prehospital capillary haemoglobin—capillary haemoglobin on arrival, Δ Hb Cap, ≥ 3 g/dL) or HS (systolic arterial pressure ≤ 90 mmHg on admission and/or transfusion of more than four units of blood in the first six hours). Results were expressed as median and interquartile range [IQR] and percentages; non-parametric variables were compared with a Chi2 test, a $p < 0.05$ was considered as significant.
RESULTS. 692 trauma patients in the trauma bay [age: 33 (24.47), IGS2: 22 (12.45), ISS: 17 (9.29)] were included. CVAC was performed in 246 patients, 97 % in femoral vessels. Concordance between theoretical indications and actual use of CVAC was 59.7 % for patients with a theoretical indication and 72.9 % for all patients. Patients with CVAC spent 16 [10.25] more minutes, in the trauma bay. Catheters were removed at day 3 (2.4). 23 venous (9.3 %) and 18 (7.3 %) arterial catheters were colonized, two catheters related blood stream infections occurred. CT scans revealed femoral hematoma in 26 (10.6 %), venous thrombosis in 26 (10.6 %) and air in the sub-hepatic veins in 30 (12.2 %) cases of CVAC.
DISCUSSION. Actual management was concordant with theoretical indications in approximately more than 50 % of cases. Overall, complications remained low and mild (2.3). The observed discordance suggests that a prospective evaluation of the strategy of CVAC on arrival in the trauma bay in severe trauma patients would be appropriate to determine its optimal use.

Theoretical Indications vs actual use of CVAC

	Sub-group (%)	TBI (%)	HS (%)	ΔHbCap > 3 (%)
CVAC + Indication +	**179** (25.9)	96 (61.5)	127 (71.3)	55 (55.6)
CVAC-Indication −	325 (47)	–	–	–
CVAC* Indication −	**67** (9.7)	–	–	–
CVAC-Indication +	121 (17.4)	60 (38.5)	51 (28.7)	44 (44.4)
Total	692	156 (22.3)	178 (25.7)	99 (14.3)

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GRANT ACKNOWLEDGMENT. Study exclusively funded by internal funding.

0809
IS THE RENAL ANGIOEMBOLISATION AN AGGRAVATING FACTOR OF RENAL FUNCTION FOR TRAUMA PATIENTS WITH HIGH-GRADE RENAL TRAUMAS?

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INTRODUCTION. The incidence of acute renal failure (ARF) has been well reported after high-grade renal traumas (HGRT) [1]. In some of these cases, renal angioembolisation

(RAE) has proved to be an effective non-operative procedure but at the risk of sacrificing renal areas.
OBJECTIVES. The purpose of this study was to examine the impact of RAE on renal dysfunction in HGRT.
METHODS. In a recently published cohort of 101 patients with renal trauma [2] between January 2008 and December 2009 in our level 1 trauma center, the evolution of renal function has been evaluated in HGRT patients treated by non-operative management. Patients were classified in two groups: RAE and NO RAE groups. We specifically studied the maximum percentage of serum creatinine (Cr) rise, Rifle criteria [3] and the need of renal replacement therapy (RRT).
RESULTS. 52 patients met inclusion criteria and were distributed by OIS grades as: 18 grades III, 22 IV, 12 V. The mean age was 39.9 ± 18.6 years old, the mean ISS 22.2 ± 15.6, the mean IGS2 22.2 ± 18.4. During the first 48 h-period, 13 patients underwent RAE. The mean Cr level at admission were not statistically different between RAE group and NO RAE group: 108 µmol/l [IQR 91–125.5] vs 98 µmol/l [IQR 75–113] $p = 0.16$. Similarly, the maximum percentage of serum Cr rise did not differ significantly between the 2 groups: 4 % [IQR 1–42] vs 9 % [IQR 0–41] $p = 0.75$. A linear multiple regression model including different risk factors of ARF was used to predict the maximum percentage of serum Cr rise; in this model, the RAE did not stand out as a significative factor.($r^2 = 0.48$, $p = 0.001$). The RRT need between the 2 groups were also comparable 1(15 %) vs 3 (5 %), $p = 0.2$. No RRT were required at hospital discharge.

Incidence of ARF according to Rifle criteria

Stage	48 h		96 h	
	AER Group	NO AER Group	AER Group	NO AER Group
0	10 (77%)	34 (87%)	10 (77%)	35 (88%)
Risk	2 (15%)	2 (5%)	2 (15%)	2 (5%)
Injury	1 (8%)	0	0	0
Failure	0	3 (8%)	1 (8%°)	2 (5%)

CONCLUSIONS. The RAE doesn't seem to be an aggravating factor of renal dysfunction after HGRT. These results have to be taken with caution considering the study size, even if it is the most important comparative study of HGRT evaluating the influence of RAE on alteration of renal function.
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0810

TETRATHIOMOLYBDATE, A SLOW RELEASE SULPHIDE DONOR, IMPROVES SURVIVAL IN A RAT MODEL OF HAEMORRHAGE/REPERFUSION INJURY

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INTRODUCTION. Hydrogen sulphide (H_2S) blocks cytochrome c oxidase and mitochondrial respiration. As such, exogenous H_2S administration offers therapeutic potential by induction of a 'suspended animation'-like state. Standard H_2S donors such as NaHS, though effective in mice, have not generally shown metabolic effects in larger species including, in the experience of ourselves and others, the rat. We recently discovered that the copper chelating agent, tetrathiomolybdate (TTM) acts as a slow-release sulphide donor and is far more metabolically active than NaHS in both healthy and shocked rats.
OBJECTIVES. To assess the survival benefit of TTM in a rat model of haemorrhage/reperfusion injury.
METHODS. Male Wistar rats were anaesthetized with isoflurane for 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 to receive either TTM (n = 7) or placebo (n = 6; n-saline) treatment. TTM (10 mg/kg) was administered as an i.v. bolus (2 ml/kg). 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; total dose 12.5 mg/kg. Placebo (n-saline) 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 and were monitored up to 6 h post-resuscitation.
RESULTS. Animals receiving TTM showed a significant ($p < 0.05$) improvement in 6 h survival. Core temperature fell in TTM-treated animals, albeit not significantly ($p = 0.19$).

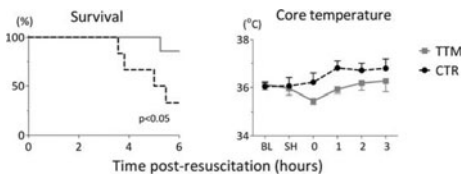

Figure 1
Post-resuscitation survival shown as a Kaplan–Meier curve ($p < 0.05$, Log-rank test). Core temperature shown as mean ± SEM (statistics: 2-way RM ANOVA + Dunnett's test). CTR, control; BL, baseline; SH, post-shock.
CONCLUSIONS. TTM administration improves outcome following severe haemorrhage/reperfusion injury. This beneficial effect is potentially mediated by modulation of metabolism.
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0811

CID SCORE IN TRAUMATIC AND NON-SCHEDULED SURGICAL PATIENTS ON ADMISSION OF A GENERAL INTENSIVE CARE UNIT HAS PROGNOSTIC VALUE

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INTRODUCTION. Acute disseminated intravascular coagulopathy (DIC) is a serious clinical condition affecting a significative number of patients admitted in intensive care units.[1]In trauma and post surgical patients DIC is known as an independent factor that contributes to a higher morbidity and mortality [2,3].
OBJECTIVES. The aim of this study was to analyze and compare the incidence and impact of DIC in trauma and non-scheduled surgical patients, admitted in a general intensive care unit.
MATERIALS AND METHODS. Observational retrospective cohort study enrolling the data of patients with diagnosis of trauma and non-scheduled surgery, admitted in the ICU from January 2010 to December 2011. DIC was defined according to the score proposed by the International Society on Thrombosis and Haemostasis.[4]We exclude hypocoagulated, chronic liver failure or cancer patients. In addition to the score of coagulopathy, we analyze the demographic data, severity scores on admission (SOFA, SAPSII and SAPSIII) and biomarkers as International normalized ratio (INR) albumin and lactates.
RESULTS. From a total of 736 admissions, 80 patients (10.8 %) were included in the study: 30 (37.5 %) in the trauma group and 50 (62.5 %) in the post-surgical group. Mean age 59 years (range 18–87). The overall mortality rate was 8.75 % (7), with no deaths in the trauma group. 31 patients (38.75 %) met the DIC criteria on admission—17 % (5) trauma, 52 % (26) post surgical. Comparing the two groups on admission we found statistically significant differences for age ($p < 0.001$), mean length of stay (LOS) ($p = 0.007$), SOFA score ($p = 0.009$), SAPS II ($p < 0.0001$) and SAPSIII ($p < 0.0001$), DIC score ($p < 0.001$), INR ($p < 0.001$) and albumin ($p < 0.001$) levels. When comparing the deceased and the survived groups, we found significant differences in SOFA on admission ($p = 0.001$), SAPS II ($p < 0.001$), INR ($p = 0.003$) and lactate ($p = 0.001$) values. Mortality in the DIC post-surgical group was 19 %, versus 8 % in those without DIC.
CONCLUSIONS. The incidence of DIC on admission was higher in the non-scheduled surgical group. We found statistical significance and correlation for DIC and severity on admission. We propose the inclusion of evaluation of CID score as a factor of prognosis in trauma and surgical UCI admitted patients.
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0812

USING THE INTRA-OSSEOUS ACCESS IN ADULT PATIENTS IN 2012: WHAT ABOUT TWO YEARS AFTER THE RECOMMENDATIONS OF ILCOR 2010?

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INTRODUCTION. The intraosseous route is the remedy in case of difficult venous access in the management of cardiac arrest, according to the recommendations of the AHA and ERC (1.2). This relatively unknown access is increasingly used in critically ill patients.
OBJECTIVES. The aim of this questionnaire is to evaluate the use of intra-osseous access in the context of the emergency in adults 2 years after the recommendations.
METHODS. An automated online quiz was developed to evaluate the theoretical and practical knowledge on intraosseous devices for seniors and residents serving in anesthesia and intensive care services, emergency and EMS in France.
RESULTS. After 1,261 responses, 28 % of practitioners have used an intraosseous kit mainly in case of cardiopulmonary arrest in adults (59 %) and children (36 %). The number of used catheters increases with years of experience (12 % for residents, 25 % for assistants and 36 % for hospital practitioners) as well as insurance of operators (36 % under 5 years of experience are not comfortable against 8 % for over 15 years). With no trouble placing a peripheral vein (66 %) and unfamiliarity with the equipment and technology (30 %), 72 % of respondents have never asked for intraosseous device. 54 % of practitioners have been trained, it was both theoretical and practical for 64 % of them. 85 % of untrained doctors believe that training is necessary. The systems available are: EZ-IO® (75 %), percussion (BIG ®) (16 %) and handbooks (25 %); 45% of practitioners who have not or unaware of the device referenced. The main site chosen was the first proximal tibial (94 %) but humerus (22 %) and distal tibial (12 %) are not forgotten. The second place occupied by the intra-osseous access in the management of emergent access was known by 49 % of practitioners (33 % put it in third position). The majority of respondents had a good knowledge of the timing of implementation (<60 s for 54 % and <120 s for 26 %), the means of verifying the proper positioning of the catheter (53 % aware of the need for a backflow of blood) and the maximum duration of use (<24 h to 52 %). But the achieved flow remained unclear for doctors: 36 % not knowing, 30 % evaluating like a 16-gauge catheter and 32 % like a 18 to 20 G catheter. The intra-osseous access did not exclude any solute and drug for 57 % of respondents.
CONCLUSIONS. Despite international recommendations, only 28% of French respondent practitioners have already used an intraosseous catheter. A theoretical and practical training is essential for the development of the technique.
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0813

USE OF INTRACRANIAL PRESSURE MONITORING IN FRANCE: PHRC FIRST DESCRIPTIVE DATA

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INTRODUCTION. Intracranial pressure (ICP) monitoring and external ventricular derivations (EVDs) are associated with clearly established indications. The FIRST study has collected pre- and intra-hospital (D30) epidemiological data for patients with severe trauma, who benefited from this monitoring during their stay in one of the 14 French University Hospitals that participated[1].

OBJECTIVES. The aim was to conduct a preliminary descriptive study of the use of intracranial pressure monitoring by ICP and/or EVD, from the FIRST patients.

METHODS. The study population was comprised of all patients having suffered severe blunt force trauma included in the FIRST study. The following variables: epidemiological, lesional (Injury Severity Score ISS, Abbreviated Injury Scale AIS), Initial Glasgow Coma Scale GCS, general hospital GH stay, hemostasis or neurosurgical procedures and mortality at D30, were compared using Chi2, Student or Fischer tests. A threshold of $p < 0.05$ was considered significant.

RESULTS. Of the 2703 patients included in the FIRST study, 17.9 % (n = 484) underwent ICP/EVD.

Table 1

	ICP/EVD n (%)	No ICP/EVD n (%)	p
Men n (%)	379 (78)	1,684 (76)	0.2570
First GH stay	147 (30.4)	504 (22.7)	<0.001
Death before D30	125 (25.8)	371 (16.7)	<0.001
GCS < 8	340 (71)	591 (27.5)	<0.001
AIS head > 3	435 (89.9)	766 (34.5)	<0.001
Hemostasis surgery	46 (9.5)	302 (13.6)	0.0150
Neurosurgery	131 (27.1)	123 (5.5)	<0.001

Gender did not influence the use of ICP/EVD. Insertion was more frequent in patients with a GCS < 8, but nearly 30 % of ICP/EVD patients had an initial GCS higher than 8. This results could be related to the time progression of brain trauma. In the other side, nearly 30 % of the No ICP/EVD have an initial GCS < 8 meaning that guidelines are probably not always followed. Transfer for neurosurgical reasons to a university hospital could explain the higher rate of ICP/EVD procedures in the group initially admitted to a GH. As expected the crude mortality rate was higher in the ICP/EVD group. Associated lesions and surgical management were different between the two groups.

CONCLUSIONS. It would be interesting to analyze the data of this descriptive study to assess the impact of ICP/EVD on mortality at 30 days.

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0814

INSULIN RESISTANCE IN SEVERE TRAUMA WITHOUT HEAD INJURY AS EARLY PREDICTOR OF ICU LENGTH OF STAY: A PROSPECTIVE, PILOT STUDY

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INTRODUCTION. Hyperglycemia following major trauma is a well know phenomena related to the stress-induced systemic reaction. However, in major trauma with head injury a tight glucose control might be not appropriate, since the risk of hypoglycemia results dangerous as much as uncontrolled hyperglycemia for injured brain. In this contest, studies available cannot clarify if early hyperglycemia, as epiphenomena of stress-induce insulin resistance, can be considered as outcome parameters in politrauma without head injury, in which tight glucose control can be made more properly. The aim of this study was therefore to investigate if ICU admission trauma-induced insulin resistance can be used as outcome parameter in patients with severe trauma without head injury.

METHODS. This is a prospective, pilot study in which all patients consecutively admitted in the Emergency Department ICU of a tertiary referral center (Careggi Teaching Hospital, Florence, IT) for major trauma without head injury (Jan-Dec 2010) were studied.

Patients with a previous diagnosis of diabetes mellitus requiring insulin therapy or metabolism alteration were excluded in the analysis. The Internal Review Board approved and informed consent for study participation and data publication was obtained.

Patients were divided in "insulin resistant" and "non-insulin resistant" based on the HOMA model calculated for each individual. Subjects whose values exceeded the sex-specific 75th percentile (i.e. 1.80 for women and 2.12 for men) were considered to have insulin resistance (Homeostasis Model Assessment—HOMA-IR).

RESULTS. Among 175 trauma patients admitted to the ICU during the whole study period, a total of 54 patients without head trauma were considered for the study, 37 of which met the inclusion criteria. Demographic and clinical characteristic are shown in Table 1. Based on HOMA index, 23 patients were classified as "insulin resistant", whereas 14 patients were included in the non-insulin resistant group. Groups resulted comparable in demographic characteristics and severity of trauma (ISS score). On the contrary, groups significantly different in BMI (25.7 vs 23.5 kg/m^2) and in ICU length of stay (8 vs 4.5 days). Groups resulted comparable in all laboratory parameters, except for C-reactive protein (140.5 vs 83 mg/l, $p = 0.0265$), and for leucocytes cont, (11,100 vs 8,200 cells/ml, $p = 0.0301$), both higher in insulin resistant patients. Confirming the acute state of insulin resistance, C-peptides was significantly higher in insulin resistant patients (0.95 vs 0.43 mmol/l, $p = 0.0061$), whereas glycated hemoglobin resulted comparable among groups.

CONCLUSIONS. We found that a large part of major trauma patients without head injury develop insulin resistance after accident as result of systemic stress reaction.

0815

SEDATION, VENTILATION AND CARDIOVASCULAR SUPPORT IN BURNS INTENSIVE CARE UNIT PATIENTS

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INTRODUCTION. Burns intensive care unit (BICU) patients often require sedation. The effect of sedation on ventilatory and cardiovascular (CV) support (noradrenaline (NA) use and fluid resuscitation) in this population has not been widely investigated.

OBJECTIVES. This study aimed to investigate the relationship between level of sedation, mode of ventilation and CV support in the first 72 h of BICU stay.

METHODS. In accordance with clinical governance guidelines, we completed a retrospective review of nursing observation charts for all BICU admissions in two groups (Group A: 01/05/05-30/04/06; Group B: 01/05/10-30/04/11). Patients included were those with total burn surface area (TBSA) ≥ 15 % admitted less than 24 h post-burn injury. Level of sedation, as measured by standardised scoring (RASS or Bloomsbury) was converted into a composite score to allow comparison of patients in the two groups. Mode of ventilation (own airway/tracheostomy/tracheal tube spontaneous or pressure/volume controlled), NA use and fluid balance in the first 72 h was collected. Statistical analysis was performed on Stata Statistical Software: Release 10 (College Station, TX: StataCorp LP) using *t* tests, Chi-squared and Mann–Whitney U tests where appropriate.

RESULTS. Twenty-four patients met inclusion criteria, 12 in each group. Median age (A vs. B) was 49 years and 39 years respectively ($p = 0.26$), TBSA 37.5 and 31.5 % ($p = 0.36$) and inhalational injury 75 and 41.7 % ($p = 0.098$). The relationship between sedation, ventilation and CV support was identical across both groups. Sedation score showed a statistically significant relationship ($p < 0.001$) with mode of ventilation, with those more heavily sedated (score −3 or −2) tending towards more controlled ventilation (Table 1). The use of NA also related to sedation score ($p < 0.001$), patients scoring −3 or −2 requiring NA support more commonly (Table 2). No correlation between sedation score and total fluid resuscitation in the first 72 h was shown.

CONCLUSIONS. BICU patients who are more heavily sedated require higher levels of ventilatory and noradrenaline support. This has remained unchanged for the last 7 years. Fluid resuscitation in the first 72 h of hospital admission is not affected by level of sedation. Further studies are required to assess the influence of sedation on outcome in burns ICU patients.

Table 1 Sedation score and ventilation mode in the first 72 h of BICU admission. Values are total (%) patient hours

Sedation score	Spontaneous	Controlled	Total
−3	0 (0)	532 (100)	532
−2	4 (1.2)	331 (98.8)	335
−1	18 (10.4)	155 (89.6)	173
0	146 (85.9)	24 (14.1)	170
1	125 (99.2)	1 (0.8)	126
2	19 (79.2)	5 (20.8)	24
3	1 (25)	3 (75)	4

Table 2 Sedation score and noradrenaline use in the first 72 h of BICU admission

Sedation score	No	Yes	Total
−3	64 (12)	468 (88)	532
−2	167 (49.9)	168 (50.1)	335
−1	73 (42.2)	100 (57.8)	173
0	153 (90)	17 (10)	170
1	111 (88.1)	15 (11.9)	126
2	19 (79.2)	5 (20.8)	24
3	1 (25)	3 (75)	4

Values are total (%) patient hours

0816

MORTALITY IN EXTRADURAL HAEMATOMAS—IS TIME TO THEATRE A FACTOR?

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INTRODUCTION. Extradural haematoma (EDH) is potentially fatal and easily remedied surgically. Time to surgery (TTS) may be an important and changeable factor influencing outcome. Many studies have looked at TTS and mortality, but not independently from other factors such as injury severity.

OBJECTIVES. To identify influences on mortality in operative isolated EDH, particularly TTS.

METHODS. Data on patients with isolated EDH was collected by the Trauma Audit and Research Network (TARN) database between 1997 and 2003. The effect of age, gender, GCS at presentation, haematoma size, skull fracture and injury-to-operation time were measured and analysed against outcome (alive or dead), using a Chi-squared test. Multiple logistic regression was used to identify any independent factors.

RESULTS. 197 patients were operated on for 'isolated' EDH. The mortality rate was 2% (4 patients). Chi-squared analysis only showed GCS ($p = 0.027$) and 6-hour cut-off for injury-to-operation time to be significant ($p = 0.007$). Multiple logistic regression did not demonstrate any factors independently affecting outcome.

CONCLUSION. An independent effect of TTS on outcome has not been established, due to the low number of deaths in the study. The time from injury to theatre was considerably longer in survivors compared to non-survivors (table 1), likely to be due to the better condition of survivors (median GCS 14 vs 5) leading to delay in surgery/transfer to the neurosurgical unit. A better starting time to examine may be time of *deterioration* to identify an independent effect on mortality.

Table 1 Survivors vs. deaths

	Survivors (193)	Deaths (4)
Median Age (years)	18	33
% Male	81	100
Median GCS (any available)	14	5
% skull fracture	44	25
% AIS 5* haematoma	59	100
Median TTS (h)	15.00	4.71

*Abbreviated Injury Scale [1,2,3] 5 classification—large, massive, extensive: volume > 50 cc if over 10 years, >25 cc if under 10 years, or thickness > 1 cm

The mortality rate of 2 % in England and Wales is lower than previous UK studies (Table 2). TARN is the largest European trauma registry, so this is likely to represent improvement in practice.

Table 2 UK studies

	Mendelow et al. 1979 [4]		Jamjoon 1992 [5]
Years studied	1951–60	1968–77	1975–87
Mortality (%)	33.3	9	7
No. of cases	27	56	88

There was also a low non-operative mortality rate (3 %, 95 % CI 0.9–5), possibly due to conservative management in asymptomatic patients.

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0817

A RETROSPECTIVE REVIEW OF SURGICAL AIRWAY MANAGEMENT IN MAJOR TRAUMA PATIENTS ON THE INTENSIVE CARE UNIT (ICU)

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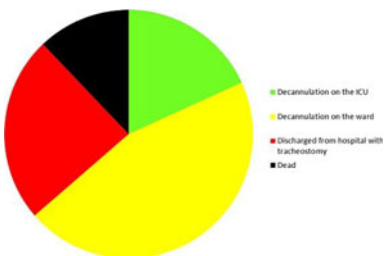
INTRODUCTION. St Mary's Hospital, London recently opened as a Major Trauma Centre at the end of 2010. The ICU cared for 75 trauma patients between September 2010 and May 2011 (25 % of all ICU admissions). Tracheostomies have a vital role in the management of many critically ill patients on the ICU, and major trauma patients often have a prolonged need for a surgical airway [1].

OBJECTIVE. To assess the number of major trauma patients who remained dependent on a tracheostomy following both ICU and Hospital discharge.

METHODS. A retrospective review was performed of all trauma patients admitted to the ICU who required a tracheostomy between 29/9/10 and 29/5/11. Data was collected on the nature of their injuries and the time to decannulation. All patients with a tracheostomy were registered in a database at the time of their procedure. These patients were then followed by our ICU physiotherapists until discharge, allowing data collection on their subsequent care.

RESULTS. 44 % of all trauma patients admitted to the St Mary's ICU received a tracheostomy and this represented 43% of all tracheostomies performed on the ICU. In contrast, only 20 % of all other non-trauma ICU admissions required a tracheostomy.

64 % of trauma patients who required a tracheostomy had a CT head scan that demonstrated traumatic brain injury. Since opening as a major trauma unit there has been a 27 % increase in the number of patients who received a tracheostomy when compared to the same 8 month period from the preceding year. The outcomes of all trauma patients with a tracheostomy are shown in figure 1. 45 % of trauma patients with a tracheostomy were decannulated on the ward after ICU discharge, and 24 % of patients were discharged or transferred from St Mary's Hospital with their tracheostomy still in situ.



Tracheostomy outcomes in trauma patients

Median No. of days from admission to tracheostomy (min - max)	8 (0-23)
Median No. days from Tracheostomy to Decannulation (min - max)	20 (8-58)
Median Length of patient stay on the ICU (min - max)	23 (5-54)
Number of Surgical Tracheostomies	15 (45%)
Number of Percutaneous Tracheostomies	18 (55%)

Trauma patients with tracheostomies

CONCLUSIONS. The majority of trauma patients who are dependent on a tracheostomy have sustained serious head injuries. These individuals are frequently discharged from the ICU and hospital with an on-going need for their surgical airway, and the management of their tracheostomy following discharge will often benefit from specialist follow-up[2]. This has important implications for the training of ward staff in the care of patients with tracheostomies. Repatriation to local hospitals, subsequent placement in appropriate environments, and ensuring appropriate follow-up of their surgical airway after hospital discharge are often problematic issues for these patients. This review highlights an important aspect of patient care that could be addressed in an ICU follow-up clinic for the survivors of major trauma.

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0818

EVALUATION OF CARE IN TRAUMATIC SEVERE ILLNESS BY TRAUMA SCORE (TS) - INJURY SEVERITY SCORE (ISS) (TRISS). EXPERIENCE IN ONE TRAUMA CENTRE IN SPAIN DURING 9 YEARS

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INTRODUCTION. Registries are considered to be an essential component of mature trauma system. Severity adjustments is an important part of these registries and are very useful to evaluate care of this patients.

OBJECTIVES. Evaluation of care in traumatic severe illness by TRISS methodology in one trauma centre in Spain.

METHODS. Observational, cohort, retrospective study in consecutive cases with inclusion criteria (IC): severe trauma ISS > 15 and/or RTS < 12), patient aged > 14, and within 48 h from the trauma during 9 years (2003–2001). Application of TRISS methodology.

RESULTS. 2874 patients were admitted with IC:1676. 78.6 % men. Age 40.5 ± 17.9. ISS 30 ± 12. Global mortality 19.1 % and estimated mortality by TRISS 25.3 %. Global additive effect +6.2 survivors than predicted by 100 patients treated (s/100t) ($p < 0.05$). More significative results($p < 0.05$) by TRISS are shown in the next table.

Significative results by TRISS

Type of trauma	OM (%)	EM (%)	s/100t
Age < 55	23.6	14.7	+8.9
Blunt	28	19.5	+8.5
Head AIS > 4	52.3	43.5	+8.8
Thorax AIS > 3	38.5	21.7	+16.8
Abdominal AIS > 2	29.8	20.5	+9.3
Orthopedic AIS > 2	29.6	17.1	+12.5
ISS > 35	56.6	36	+20.6

The mortality benefit was maintained throughout the study period significantly and is independent of gender

OM observed mortality, EM expected mortality, AIS abreviated injury score

CONCLUSIONS. This methodology shows the benefit of the care of these patients in an ICU specialist over time. This benefits are greater in young patients, blunt trauma with high leve of severity and different anatomic injuries.

0819

IN-HOSPITAL PAEDIATRIC TRAUMA DEATHS: EPIDEMIOLOGY, TRAUMA MECHANISM, SEVERITY, LOCATION, TYPE OF INJURY, SURVIVAL PROBABILITY, PRE-HOSPITAL CARE AND EMERGENT MANAGEMENT

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INTRODUCTION. Trauma is a leading cause of death in paediatric population worldwide. Lithuania has the highest trauma-related mortality in the EU.

OBJECTIVES. Our aim was to analyze mechanism, severity, location, type of injury, survival probability, pre-hospital care and emergent management in fatal paediatric trauma.

METHODS. All traumatic deaths, including burns, in children aged <18 years, occurring during 10-year period from 2001 to 2010, and who had been admitted to the Vilnius University Children′s Hospital, were included into the study.

RESULTS. During the 10-year period, there were 16 in-hospital paediatric deaths following trauma admitted to the Vilnius University Children′s Hospital. The majority of patients was of male gender (87.5 %). The median age was 12.5 years (25th; 75th percentiles: 3.8; 15.0). The dominating type of injury was blunt injuries (62.5 %). The main mechanism of injury was traffic accidents (56.3 %). The dominating location of injury was head (81.3 %). Pre-hospital cardiac arrest (asystolia) was documented for 2 patients (12.5 %), GKS 3 was in 4 cases (25 %), 8 (50 %) were in respiratory distress (RR < 10 or >29/min), and four patients (25 %) were hypotensive (SBP < 90 mmHg). 12 patients (75 %) were transported to hospital by ambulance and 4 (25 %) using private transport. Pre-hospital airway management by intubation was applied for 5 patients (31.3 %). The mean time from alarm until hospital arrival was 51 min (min 20 min, max 2 h 16 min). For all trauma patients (except for 2 burn cases) CT scan was performed. The mean time until the first CT scan in hospital was 1 h 57 min (min 40 min, max 5 h). Life-saving emergency interventions were performed for 12 patients (75 %). The mean time from arrival to hospital until the first key emergency intervention was 4 h ((min 1 h 20 min, max 9 h). Probability of survival (Ps) was calculated according to TRISS methodology. The median Ps was 65.5 % (CI 50.7–81.0). Out of the 16 died patients reaching hospital before the death, 4 patients had <50 % probability of survival, and for the other Ps was >50 %. All patients were stratified to the two equal groups according to their median of survival probability, and the groups were compared with regard to time and level of pre-hospital care and emergent management. No statistically significant differences between the groups were found.

CONCLUSIONS. Fatal paediatric trauma is prevalent in boys, mostly caused by traffic accidents, associated with severe head injuries and severe physiological derangement at trauma scene. Most of the patients had relatively high probability of survival. There were no statistically significant differences in pre-hospital and emergent management in hospital between the two patient groups stratified according to their median of survival probability.

Indicators of cost, quality & outcome: 0820–0833

0820

THE PHYSIOTHERAPY SERVICE MODEL USED IN A SURGICAL INTENSIVE CARE UNIT AFFECTS NURSING WORKLOAD: A PRELIMINARY STUDY

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INTRODUCTION. Uncertainty regarding the optimal physiotherapy service model in a surgical intensive care unit (ICU) exists.

OBJECTIVES. To compare the physiotherapy service provided in a surgical ICU and explore the ability of the TISS-28-score to reflect a change in nursing workload over time when comparing two physiotherapy service models.

METHODS. Controlled clinical trial. Level three surgical unit in South Africa. All patients admitted to the unit consecutively over a 3 month period were allocated to usual- or protocol-care based on admission date. Usual-care was provided by clinicians from the hospital department offering intermittent care as part of a clinical rotation. Decisions related to activities and frequencies of interventions were based on clinical decisions of the therapist responsible for patient care. Protocol-care was provided by clinicians appointed as locum tenens offering a dedicated physiotherapy service to the unit. Decisions related to activities and frequencies of interventions were guided by a validated evidence based protocol. A standardized physiotherapy documentation form replaced other physiotherapy documentation forms used in the unit for the duration of the study. TISS-28 data was extracted daily from unit documentation systems for each patient by two ICU qualified nursing sisters blind to intervention.

RESULTS. During protocol-care treatment sessions were provided at a rate of 1.38/unit day compared to 0.57/unit day during usual-care ($p < 0.001$). Patient waiting time before first contact with the therapist was shorter during protocol-care ($p < 0.001$). It was more likely for a rehabilitation (OR 2.34 95 % CI 1.66–3.43; $p < 0.001$) and less likely for a chest physiotherapy management option (OR 0.14 95 %CI 0.09–0.22; $p < 0.00$) to be included into a treatment session during protocol-care. There was no difference in the risk of an adverse event ($p = 0.34$). The mean difference in daily unit TISS-28 score was 1.99 (95 % CI 0.65–3.35) points ($p = 0.04$), and mean decrease in score was 0.68 (95 % CI −1.3; −0.7) units more per shift during protocol-care ($p = 0.03$). It was less likely for the following nursing activities to be included in TISS-28 score during protocol-care: mechanical ventilation (RR 0.71 95 % CI 0.64–0.84; RRR 0.29; NNT 4.5; $p < 0.000$), care for artificial airways (RR 0.85 95 % CI 0.74–0.97; RRR 0.15; NNT 10 $p = 0.02$), or drains (RR 0.76 95 % CI 0.65–0.88; RRR 0.23; NNT 6.59 $p = 0.001$) and fluid replacement (RR 0.78 95 %CI 0.66–0.93; RRR 0.22; NNT 7.79; $p = 0.004$).

CONCLUSIONS. This is the first study to compare two physiotherapy service models. Protocol-care was significantly different form usual care. The TISS-28 score is sensitive to measure change in physiotherapy service models. This information can now be considered by administrators to optimize the physiotherapy service provided in ICU.

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0821

MOBILITY STATUS AT ICU DISCHARGE PREDICTS HOSPITAL DISCHARGE DESTINATION IN LONG-TERM INTENSIVE CARE UNIT (ICU) PATIENTS

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INTRODUCTION. Long-term ICU patients consume significant health resources and ICU survivors have adverse long term functional outcomes particularly in the physical domain [1,2]. Recently early mobilisation has been proposed in ICU patients to improve respiratory function, reduce muscle wasting, decrease ICU and hospital length of stay [3,4,5] and reduce hospital readmission and mortality post discharge[6]. However, little is known about the relationship between mobility status at ICU discharge and ultimate functional outcome and discharge destination.

OBJECTIVES. This study aimed to establish baseline data on long-term patients in a medical-surgical tertiary ICU, including the relationship between mobility status at ICU discharge and ultimate discharge destination.

METHODS. A retrospective audit of all ICU patients aged ≥ 16 years admitted over 12 months with ICU length of stay (LOS) ≥ 7 days was performed. Data collection included ICU and hospital LOS, mobility status at ICU discharge, ICU and hospital survival and hospital discharge destination. Mobility status was defined as rest in bed (medically indicated or not medically indicated), passive mobilisation (sling transfer to sit-out-of-bed), active mobilization (stand transfer, sit-to-stand, March-on-spot, mobilise >5 m). The ACT Health Human Research Ethics Committee approved the study (ETHLR12.004).

RESULTS. 180 patients, median age 60.5 years (range 16–87), met the inclusion criteria, comprising 190 ICU admissions. 122 (68 %) were male, and median APACHE III score was 65 (range 20–158). 170 (94 %) were mechanically ventilated, 157 (87 %) invasively. Median ICU LOS was 10 (range 7–99) days. At ICU discharge 23 patients (12.8 %) had died. Of the remainder, 87 (55 %) patients met the criteria for active mobilisation and 45 (29 %) for passive mobilisation. 25 patients remained resting in bed, 9 (36 %) of whom had no medical indication for bed rest. Neurological status was the main reason for passive mobilisation (71 %). Median hospital LOS was 34 (range 7–436) days. 20 patients died after initial ICU discharge, giving an overall hospital mortality of 23.8 %. Although there was a trend for inability to March on the spot or mobilise >5 m at ICU discharge to predict death in hospital this was not statistically significant (RR 2.4, 95 % CI 0.8–6.9). However, patients who could mobilise >5 m or March on the spot at ICU discharge were more likely to be discharged home (LR 1.8; 95 % CI 1.3–2.4).

CONCLUSIONS. More than half of long stay ICU patients were actively mobile at the time of ICU discharge and ability to March on the spot or mobilise >5 m predicted discharge home rather than to another facility.

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0822

IN-HOSPITAL CARTOGRAPHY OF CARDIAC ARREST

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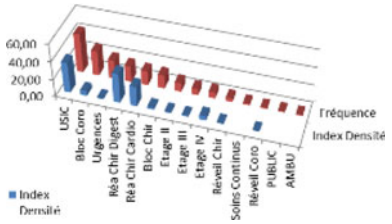
INTRODUCTION. In-Hospital cardiac arrest (IHCA) remains undereported in Europe with definition, incidence and prognosis varying between institutions [1,2]. We created an internal emergency committee in our 240 beds medico-surgical institution with the objective of systematic recording of all IHCA. Establishing overall incidence and prognosis of IHCA [3], prevented us from implementation of targeted corrective strategies.

OBJECTIVES. Analyzing IHCA by a cartographic approach to assess the differences in incidence and prognosis between care units.

METHODS. The dedicated IHCA follow-up form allows recording of : demographic datas, location of occurrence, time to rescue unit call, initial cardiac rythm, first treatment attempt, duration of chest compression, number of electric shocks, type of IV treatment, IGS II score at ICU admission, duration of ICU stay, outcome. For each care unit the overall incidence and the incidence density (ID) for 1000 stays are calculated. Care units with more than 5 IHCA over 36 months are compared using the Chi 2 test ($p < 0.05$). IHCA is defined by presence of chest compression and/or external electric shock.

RESULTS. From 01/01/2009 to 12/31/2011, 173 IHCA (162 patients) are treated. Overall incidence is 0.3 IHCA per bed per year or 4.9 IHCA/1,000 stays. Sex ratio M/F is 70/30 and mean age is 71 ± 13 years. Immediate overall survival is 67 % and survival at discharge is 32 %. IHCA occured in 13 among 15 care units (no cases in cardiac stress test and radiology. 41 % of cases occured in CICU and coronary catheterisation lab. One case occured in the public area of the institution. Immediate survival rate varies from 28.5 % (Level III) to 75 % (Coronary cath lab) ($p < 0.05$). 3-years incidence varies from one case (Ambulatory day care) to 44 cases (CICU). ID is over 10/1,000 stays in three units : CICU, Cardiac surgery ICU and Abdominal surgery ICU (Fig. 1).



Cartography of IHCA—incidence and density

CONCLUSIONS. Our analysis confirms the high incidence and the ubiquitous characteristics of IHCA in our institution. Frequence cartography shows the high number of IHCA in the CICU/Cath lab facilities. ID cartography allows characterization of 2 sub-groups of units with either ID less or over 10/1,000 stays. The high ID sub-group contains the 2 ICU and CICU, while low ID sub-group contains all other care units. Sub-group characterization allows implementation of 2 intervention strategies targeting either staff members access and CPR initiation (High IDs) or risk detection and preventive intervention (low IDs). Cartographic analysis reveals that healthcare risk of IHCA (cath lab, operating or recovery room) is located in low ID units. Buiding a risk matrix (Incidence X Mortality) of IHCA allows prioritization of interventions to increase immediate survival of IHCA.

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0823

THE ECONOMIC IMPACT OF CRITICAL CARE FELLOWSHIP TRAINING

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INTRODUCTION. Rising medical student tuition and changes in physician reimbursement patterns are requiring residents to carefully examine their return on investment for fellowship training. At the same time, there is a growing shortage of intensivists, especially surgical intensivists.

OBJECTIVES. Our goal was to apply standard financial techniques to analyze the return on investment for critical care fellowship training.

METHODS. Using survey data from the Association of American Medical Colleges and the Medical Group Management Association, we calculated the return on investment over the course of a physician's career and compared intensivists that completed either a two-year acute care surgery fellowship, a three-year pediatric critical care fellowship, or a three-year medical critical care fellowship to practicing general surgeons, pediatricians, and internists. Our financial model calculated the net present value (NPV) (discount rates of 5, 7.5 and 10 %, hourly-adjusted) and the internal rate of return (IRR) of the various career paths.

RESULTS. Over 17,000 specialty specific responses were included in the analysis. Non-fellowship trained general surgeons enjoyed higher hourly-adjusted NPVs (discounted at 5, 7.5, and 10 %) when compared to surgical intensivists. In addition, surgical intensivst NPVs were disproportionately lower when compared to those of pediatric and medical intensivists.

CONCLUSIONS. Our results demonstrate an irreconcilable financial loss following a two-year acute care surgery fellowship originating in part from a disproportionately lower salary increase relative to general surgeons. Furthermore, the return on investment from an acute care surgery fellowship is less than that obtained by additional training in pediatric or medical critical care, which are only marginally better than that of their generalist colleagues. Resolving the intensivist shortage will require further analysis of the financial implications of critical care training when compared to alternative career paths.

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0824
CRITICAL CARE OUTREACH TEAMS: A REVIEW OF CRITICAL CARE OUTREACH SERVICE PROVISION IN THE NHS

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INTRODUCTION. Despite the rapid expansion of critical care outreach teams in the UK, they have not been conclusively shown to affect either admission rates to the Intensive Care Unit, or reduce re-admission after discharge from the ICU[(3)]. Previousal efforts to explain this have found a wide variability in the type of service used[(8)].
OBJECTIVES. We undertook this survey to try to establish the prevalence of critical care outreach teams in the NHS today and to gain a greater awareness of the roles that these teams are playing in the NHS. We hoped to better our understand some of the factors that have made the published research into this area of critical care conflicting.
METHODS. We surveyed 211 National Health Service trusts that delivered an intensive care service. We telephoned each Intensive Care unit and found out whether they offered an outreach service. In the hospital trusts that did have a critical care outreach team we attempted to establish the size of the team, and their working patterns.
RESULTS. We found the out of the 211 trusts we reviewed 70 % ($n = 173$) supplied a critical care outreach service. The other 30 % ($n = 74$) did not offer this service. When looking at the patterns of work we found substantial variability. 138 Hospitals could definitely tell us the working hours of their nurses. We found that 30 % ($n = 43$) had a 24 h service, 7 days a week. 48 hospitals (34 %) operated on a 12 h service. The rest of the participating hospitals delivered a service between 8 to 18 h. There is also inconsistency in the amount of nurses in each hospital the delivers a critical care outreach service. We found that most teams ($n = 127/178$) operate with between three and eight nurses, with the most common size of an outreach team being made up of 4 nurses ($n = 28$ teams). However other teams operate with up to18 staff members.
CONCLUSIONS. There are wide variations in service provision of Critical Care Outreach in the U.K. This is one of the factors which could explain why the evidence in this area in inconsistent.
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0825
DOES THE CANCER DIAGNOSIS MATTER ON EMOTIONAL DISTRESS IN AN ICU POPULATION?

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INTRODUCTION. Intensive care medicine often enables the survival of critically ill patients but can be associated with psychological distress. There are few data comparing psychological distress among oncologic and non-oncologic patients.
OBJECTIVES. The aim of this study was to identify emotional distress on cancer and non-cancer patients at the ICU discharge and after one and three months.
METHODS. A prospective study of adults patients admitted to a general adult ICU for >48 h in a tertiary Brazilian hospital. Patients are invited to complete the hospital anxiety and depression scale (HADS) during ICU stay, 30 and 90 days after discharge. Post-traumatic stress disorder (PTSD) was confirmed when impact of event scale (IES) scored ≥ 30 points at 30 and 90 days. Symptoms of Anxiety and depression were considered if HADS scored ≥ 10.
RESULTS. 119 patients were interviewed (40.3 % oncologic) The age was 60.74 ± 16.6 years (52.9 % male and 69.2 % married). The admission SAPS III was 45 ± 14.4 points. Median ICU LOS was 4 ± 9.93 days. The overall prevalence of symptoms of anxiety, depression or both during ICU stay was 19.3, 10.9 and 9.2 %, respectively. These symptoms decreased significantly after 30 (2.4, 3.5, 1.2 %) and 90 days (3.8, 1.3, 1.3 %) after discharge.IES at 30 days was 7.45 ± 14.0 points and decrease to 3.14 ± 7.11 at 90 days, $p < 0.0001$.No differences in oncologic or non-oncologic patients were found ($p = 0.6$). Mechanical ventilation (OR12.5, 95 % CI 2.9 to 54.2) and anxiety at admission (OR 11.0, 95 % CI 2.5 to 46.6) were associated with symptoms of post-traumatic stress at 30 days.
CONCLUSIONS. At least one-fifth of patients suffer from symptoms of anxiety during ICU stay and this condition is associated with PTSD after discharge as well as the use of mechanical ventilation. Our data showed that cancer is not related to mental health distress in an ICU population.
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0826
VARIABLE, INDIVIDUALIZED COST OF A GREEK ICU

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INTRODUCTION. Medical cost can be divided in a fixed part, consisted of personnel and accommodation expenses, and in a variable part, determined by each patient's needs(medications, consumables and laboratory tests). Variable medical cost is usually estimated by dividing annual expenditures by days of hospitalization and number of patients. In order to rationalize medical cost, estimations of variable expenses must be real and individualized, focused on every single patient's needs.
OBJECTIVES. The aim of the study was to determine the real, variable cost per ICU day, in a new, 7-bed, general ICU. Data presented here are preliminary.
METHODS. From all the 140 patients that were treated during 2011, the first year of ICU's function, 40 patients, with a length of stay (LOS) of at least 24 h, were randomly selected. Data were derived from patients' records and included demographics, cause of admission, Acute Physiology and Chronic Health Evaluation (APACHE) II score at admission, LOS, outcome and meticulous cost collection. Specifically, cost was recorded for every day and for every patient, based on a hospital-specific cost catalogue and on national agreements (bottom-up analysis). Analysis of data was carried out using Graph Pad Prism 5.0.
RESULTS. Age of participants (22 ♂ and 18 ♀, 15 medical and 25 surgical) ranged from 30–104 years, APACHE II score from 3-31, LOS from 1-40 days, whereas mortality was 15 %. All but one patient were mechanically ventilated. The total days of ICU stay were 388 and total variable cost mounted to 238,924€ (238,924€/388 = 615,784€ per patient and per day). Medication cost (including drugs, fluids, blood products, nutrition) was 145,018€, representing the highest ICU expenditure (60.69 %). Exams' cost (including laboratory, microbiological exams and diagnostic procedures) mounted to 55,636€ (23.28 %) and consumables to 35,947€ (15.04 %). As for medication cost, the largest part was comprised of antibiotics (52.00 %), followed by sedation-analgesia drugs (11.76 %), cardiovascular drugs (8.75 %) and fluids (5.53 %). Mean variable cost per patient, mean cost for medication, mean cost for exams, and mean cost for consumables amounted to $5,973 \pm 1,224$€ (mean ± SEM), $3,625 \pm 844.9$€, $1,391 \pm 236.1$€ and 898.7 ± 163.8€, respectively. All costs had a positive correlation with disease severity: $p = 0.0205$, $p = 0.0014$, $p = 0.0353$, $p = 0.0063$ and $p = 0.0072$ concerning total cost, cost per day, cost for drugs, cost for exams and cost for consumables, respectively. No relation was found between age and costs. Costs for medical patients were higher than the ones for surgical patients.
CONCLUSIONS. The total variable average cost per patient and per day was found to be 615,784€. Medication's expenditure was the highest variable cost of intensive care treatment, with 60.69 % on average overall. Among drugs, antibiotics accounted for the largest part (52 %). Medical reason for admission and more severe illness were correlated with higher costs.
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0827
CORRELATION OF QUALITY OF LIFE INSTRUMENTS AND FUNCTIONAL STATUS INSTRUMENTS IN CRITICALLY ILL PATIENT

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INTRODUCTION. There are several scores to evaluate quality of life in population, and some of them were validated in ICU patients. But the ideal instrument for this evaluation is still not clear.
OBJECTIVES. To evaluate the correlation between two quality of life instruments (EuroQoL and PAEEC (project of epidemiological analysis of intensive care) and two functionalism instruments (Barthel and daily life activities score from PAEEC), at ICU admission and 6 months after ICU discharge.
METHODS. Prospective observational study, during 20 months, in a polyvalent ICU in an academic hospital. Patients admitted in ICU more than 24 h were included. We evaluated the quality of life at admission and 6 months after ICU discharge through EuroQoL instrument (EQ-5D + EQVAS) and PAEEC or Rivera quality of life score. We also evaluated the functionalism through Barthel index. We compared EuroQoL with Rivera score and Barthel index with daily life activities score from Rivera score. The correlation between these instruments was expressed as Pearson coefficient, with $p < 0.05$ as statistically significant.
RESULTS. We included 466 patients, but only 330 patients could complete the questionnaire after 6 months (103 patients died and 33 patients were lost during the follow-up). Pearson correlation between EQ5D and Rivera score at admission was 0.793 ($p < 0.001$) and after 6 months of ICU discharge was 0.847 ($p < 0.001$). We compared EQVAS with Rivera score, and Pearson coefficient was 0.589 ($p < 0.001$) at admission and 0.637 ($p < 0.001$) after 6 months. The correlation between Barthel index and daily life activities score from Rivera score was 0.728 ($p < 0.001$) at admission and 0.804 ($p < 0.001$) after 6 months of ICU discharge.
CONCLUSIONS. The correlation between both quality of life instruments is high. The correlation between EQ-5D and Rivera score is better than EQVAS. The daily life activities score from Rivera score could be a good instrument to evaluate the functionalism in critically ill patient, in a fast and simple way than the use of Barthel index and as an instrument created by intensive care specialists.

0828
EVALUATION OF STRESS LEVELS IN INTENSIVE CARE DOCTORS IN INDIA

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INTRODUCTION. Intensive care Doctors have long been considered at risk of occupational stress.
OBJECTIVES. To record the prevalence of stress and its characteristics in intensive care doctors working in Indian ICUs, factors contributing and influencing stress.
METHODS. A survey initiated at 18th Annual Congress of the Indian society of Critical Care medicine (ISCCM) and International Congress 2012, February, Pune, India, through a Questionnaire distributed to delegates regarding professional status, hospital and ICU details, workload assessment, alcohol and drugs usage, stressors pertaining to ICU, job satisfaction and related issues. These questions were selected from General Health Questionnaire-12 (GHQ-12) and Symptom Checklist-Depression (SCL-D). Following are primary analysis of the ongoing survey.
RESULTS. 200 responses were valid for study. 71 % of responders were in age group of 20-40 years. Nearly 43 % were managing 10–20 bedded ICUs and 23 % were managing 20-30 bed ICUs. Around 67% of ICU's are open or semi-open. Around 37 % are working for 50–60 h/week and 20 % for 70–80 h/week in ICU. 60 % of responders are doing 4–5 night duties/week. Only 76 % receive compensation for overtime worked beyond contracted hours. 10–20 % of responders are consuming alcohol or other medication to relieve stress. According to 60 % of responders aspects of work responsible for stress in ICU were: 1.Too much responsibility at times 2.Making the right decision alone 3.Bed allocation when ICU is full 4.Being over-stretched at times 5.Work with inexperienced juniors 6.Managing VIP patients 7.Counselling distressed relatives and regarding patient's death. More than 65–75 % of responders had no stress in dealing with management, senior colleagues or nursing staff. Surprisingly, 60 % of responders are slightly or not stressed at all about committing mistakes, delivering inappropriate treatment, and inability to spend time for research. Dissatisfaction with career correlated highly with level of stress in 55 % of responders. Though, only 35 % are receiving good remuneration, 70 % of responders are satisfied working as intensivists.
CONCLUSIONS. Factors related to the patients and occupation, but not organizational factors appeared to be more associated with stressful condition. The results of this survey can point to remedial measures of reducing stress in ICU doctors in India, thereby improving their performance.

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0829
QUALITY OF CARE AND OUTCOME IN PATIENTS ADMITTED TO ICU WITH ACUTE KIDNEY INJURY

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INTRODUCTION. Acute Kidney Injury (=AKI) in ICU patients is an independent predictor of mortality(1)A recent national UK survey(2) showed deficiencies in care in 50% of patients admitted with AKI. Improved care prior to ICU admission may improve outcome in these patients.

OBJECTIVES. Benchmark local care quality indicators against national audit data. Evaluate care quality indicators and patient risk factors as predictors of mortality.

METHODS. Retrospective case note survey of patients admitted to ICU with AKI between Jan 2009 and August 2011.Definition of AKI: Stage 1: 1.5–2 fold increase in creatinine levels over ≤48 h (or with ≥ 26.4 umol/l), Stage 2: 2–3 fold increase in creatinine values, Stage 3: threefold or more increase in creatinine values (or with creatinine >354 umol/l or with an increase of ≥44 μmol/l). Local outcomes benchmarked against national outcomes: early warning system scoring, review by senior doctor, referral to nephrologist, performance of urinalysis, insertion of urinary catheter, recording of hourly fluid balance, review by outreach team. Quality care indicators tested as predictors of mortality: assessment of electrolytes on admission, performance of urinalysis, performance of ultrasound of kidneys <12 h of admission, use and triggering of early warning scores, review by outreach team, review by senior doctor <12 h of admission, catheterisation performed, prescription of intravenous fluids, recording of hourly fluid balance, withholding of nephrotoxic drugs, prescription of new nephrotoxic drug, referral to a nephrologist. Predictors of mortality assessed: diabetes mellitus, hypertension, hypovolaemia, hypotension, sepsis or obstruction, APACHE scores on ICU admission. Outcome: hospital mortality. Statistics: Chi Square test used to test for differences in categorical variables. *T* test used to test for differences between continuous variables. P value < 0.05 taken as significant.

RESULTS. N = 31.Against national benchmarks our hospital performed significantly worse for performance of urinalysis: 74.2 vs. 91.8 % ($p = 0.0027$), fluid balance recording: 20 vs. 78.3 % ($p < 0.0000001$) and significantly better in early warning system scoring: 83.9 vs 64.9 % ($p = 0.01373$) and referral rates to nephrologists: 61.3 vs 30.8 % (0.00041). In the subgroup of patients dying with AKI compared with national data we found in significantly less local senior review: 63.6 vs 75.6 % ($p = 0.01625$). Patient risk factors and care quality indicators significantly associated with hospital mortality: age ($p = 0.0328$), recording of fluid balance ($p = 0.02285$), ward origin of ICU admission ($p = 0.03957$) and length of stay in hospital prior to ICU admission ($p = 0.028$).

CONCLUSIONS. Basic measures of care may improve outcome in patients admitted to hospital with AKI.

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0830
EVIDENCE AS A BASIS FOR CLINICAL PRACTICE GUIDELINES ON MECHANICAL VENTILATION IN INTENSIVE CARE IN SWEDEN

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INTRODUCTION. Evidence based practice is essential for quality in patient care, and includes adhering to research and clinical experience but also to convey patient experiences [1]. Mechanical ventilation, MV, is a common yet advanced procedure in intensive care, suggesting a need for evidence based clinical practice guidelines, CPGs. However, the state of evidence based CPGs for MV is not known.

OBJECTIVES. To explore the prevalence of MV-CPGs and the use of evidence for CPG development and revision in Swedish Intensive Care Units, ICUs.

METHODS. In a national survey, all general ICUs were contacted. For ICUs consenting to partake, managers responded to a questionnaire on the occurrence of CPGs for MV and the CPGs were sent to the researchers. CPGs were reviewed using four questions from the AGREE instrument regarding the use of scientific literature for development and inclusion of patient preferences [2]. Further, semi-structured telephone interviews were conducted with head nurses and physicians. All data were analyzed with descriptive statistics.

RESULTS. 85 % of the ICUs (n = 55) participated in the study; all had CPGs for various aspects of MV, ranging from 1–24 per unit. 245 documents were considered a CPG and thus reviewed; none of the CPGs included a description of a systematic method for searching evidence while 54 (22 %) included a list of references. In 4 % (n = 11) of the CPGs, references were linked to the recommended management of MV. None of the CPGs included information on having taken into account patients' experiences, yet one CPG pointed out the necessity to include patient preferences in managing MV. For the ICUs that reported having MV-CPGs, 62 % of the managers described the CPGs being used in daily practice, while 38 % reported that the CPGs were not or more seldom used.

CONCLUSIONS. Despite the extensive literature and professional expertise on MV, the CPGs used in Swedish ICUs could most likely improve; by including a robust evidence base, with patients' preferences, CPGs could support quality of care if implemented in daily practice [3].

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0831
COMPARATIVE ANALYSIS BETWEEN PATIENTS WITH LONG ICU STAY DEPENDING ON A YEAR SURVIVAL

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INTRODUCTION. The influence of prolonged ICU stay in prognosis has been studied by several authors and some found higher mortality among patients with prolonged stay compared to those who require a shorter stay in the ICU, although some authors found in their population a substantial number of these patients survive long term. Some authors define prolonged length of stay of their patients to those that exceed the 95th percentile of the overall stay, although most of the work referred to it when ≥14 days and other authors refer to stays ≥28 days.

OBJECTIVES. To study differences between patients with long ICU stay, according to their survival.

METHODS. Retrospective observational study of data collected prospectively on patients admitted to the ICU from January 2004 to December 2010, with prolonged stay (≥14 days), according to their survival in the ICU, at the time of hospital discharge and one year later.

RESULTS Table figure

CONCLUSIONS. Patients who die in the ICU or a year later, were not admitted with higher APACHE II. However, patients transferred from the ICU to hospitalization ward are more likely to die because of were admitted with a higher APACHE II. The previous stay to the ICU or the stay in it, is significantly higher in patients who die in the ICU or in ward hospitalization, with no significant differences after a year. Also we show that the provenance or type of patient, are factors that only affect mortality in the ICU.

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0832
GLOBAL AND HIDDEN MORTALITY OF PATIENTS ADMITTED AFTER CARDIAC ARREST UNDER THERAPEUTIC HYPOTHERMIA

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INTRODUCTION. Therapeutic hypothermia has been shown to reduce mortality in patients with cardiac arrest, and is currently a critical part in the treatment of these patients.

OBJECTIVE. To assess overall mortality and hidden mortality of patients admitted after suffering a cardiac arrest.

METHODS. Prospective observational study performed from July 2009 to April 2012, in an 8 bed-coronary care unit, in a 3rd. level university hospital. Therapeutic hypothermia was realized with patches, target temperature of 33° C, maintained for 24 h and a slow warming to 0.2° C/h. During this period data was recorded from all patients admitted with cardiac arrest treated with therapeutic hypothermia to following the evolution of the patients to hospital discharge or death. Data were analyzed using SPSS v19, 1.

RESULTS. During this period, 58 patients with a mean age of 59.4 (SD 13.9), 77.6 % male, 50 % with two or more cardiovascular risk factors. 72.4 % were non-hospital cardiac arrest, 76.8 % with initial defibrillable rhythm and a mean PCR of 18.2 min (SD 10.4). Hypothermia was started on ICU arrival, with a median time from the PCR to the target temperature (33 °C) of 426.6 min (SD 168.1). Mechanical ventilation mean duration was 15.6 days (SD 14.0).

Relevant complications: ventilator-associated pneumonia 25.9 %, catheter-related bacteremia 25.9 %, urinary tract infection 19 %, acute renal failure 10.5 %, seizures 17.5 % and encephalopathy anoxia 27.6 %. 19.3 % needed a tracheostomy and 13.8 % had critical illness polyneuropathy. Factors associated with mortality after multivariate analysis were age ($p < 0.02$), time of PCR ($p = 0.04$) and anoxic encephalopathy ($p < 0.01$). ICU length of stay (LOS) was of 18.6 days (SD 15.7). Hospital LOS was of 40.4 (SD 86.7). At discharge from ICU patients had a GCS 14.1 (SD 2.2) and a GOS 4.0 (SD 2.1). The main cause of death was anoxic encephalopathy in 42.9 %.Overall mortality was 29.3 %, with a hidden mortality of 5.2 %.

CONCLUSIONS. 1. Overall mortality of patients with therapeutic hypothermia after cardiac arrest was less than 30 % with a hidden mortality of 5 %. 2. The survivors had a good neurological status at ICU discharge, based on the GCS and the GOS. 3. Mortality associated factors include age, length of PCR and secondary anoxic encephalopathy.

0833
INDICATORS OF REINSTITUTION OF VENTILATORY SUPPORT AFTER EXTUBATION FAILURE

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INTRODUCTION. Unsuccessful extubation is associated with poor outcomes [1]. Early reinstitution of ventilatory support is reported to have potential for reducing the increased mortality associated with unsuccessful extubation [2]. However, clear indications are not available regarding reinstitution in cases of unsuccessful extubation.

OBJECTIVES. To determine whether increases in respiratory rate (RR), heart rate (HR), and systolic blood pressure (sBP) and abnormalities in breathing patterns within 1 h after extubation can predict extubation failure.

METHODS. We retrospectively studied 260 adult patients who had been extubated after passing a spontaneous breathing trial in the ICU during a 1-year period. We analyzed the RR, HR, sBP, and breathing patterns within 1 h after extubation. We considered the findings abnormal if the RR was more than or equal to 30 breaths/min, the HR increased to more than 20 % of that before extubation, or the sBP increased to more than 20 % of that before extubation. We also examined the time to reinstitution of ventilatory support after unsuccessful extubation.

RESULTS. Twenty-three patients showed abnormal findings within 1 h after extubation. Of these, 17 patients required ventilatory support, with a sensitivity of 85 % and specificity of 97.5 % (Fig. 1). The median time to reinstitution of ventilatory support was 8.5 h (interquartile range, 0.8–23 h).

	Unsuccessful extubation (n)	Successful extubation (n)
Abnormal findings (+)	17	6
Abnormal findings (-)	3	234

Figure 1

CONCLUSIONS. Although failure of extubation cannot be predicted before extubation, it can be determined within 1 h after extubation on the basis of changes in hemodynamic features and an obvious increase in respiratory rate. We think rapid assessment and intervention will improve outcomes of unsuccessful extubation.

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Septic shock: Metabolic markers, organ dysfunction & therapy: 0834–0847

0834
ENDOTHELIAL-SPECIFIC ARGININOSUCCINATE-SYNTHETASE KNOCK-OUT MICE HAVE IMPAIRED ARGININE DE NOVO SYNTHESIS, NO PRODUCTION AND MICROCIRCULATION DURING ENDOTOXEMIA

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INTRODUCTION. Sepsis is characterized by an impaired microcirculation and is related to a diminished endothelial NO-synthesis. Depressed arginine (Arg) levels, the main substrate for endothelial NO-synthase (eNOS) derived NO-production underlie these microcirculatory disturbances. Arg de novo synthesis, by conversion of citrulline (Cit) into Arg by Argininosuccinate synthetase (ASS) is critical for sufficient Arg levels for eNOS-derived NO-production. During sepsis, or endotoxemia, both reduced Ass function and Cit deficiency contribute to diminished Arg de novo synthesis. Therefore, improving the Arg de novo synthesis is an interesting therapeutic option to rescue the microcirculation during endotoxemia. We have previously demonstrated beneficial effects of Cit supplementation on the microcirculation of wild type (WT) mice during endotoxemia. To test the role of Ass related Arg de novo synthesis in endotoxemia, an endothelial cell (EC) specific Ass knock-out mouse was used to analyze the effect of depressed Arg-availability for eNOS-related NO synthesis.

OBJECTIVES. To assess the role of EC specific Ass deficiency on Arg availability, NO synthesis and the microcirculation.

METHODS. WT and EC deficient Ass mice ($Ass^{-/-}$) received a continuous iv LPS (200 μg total) infusion for 18 h alone or combined with Cit (37.5 mg) for the last 6 h. After infusion, mice were sacrificed, blood was sampled and jejunum and carotid arteries (CA) were collected. Amino-acid concentrations were measured by HPLC. Ex vivo NO production in CA was measured with 2-photon fluorescence microscopy using a fluorescent copper-based NO probe. NO production in jejunal tissue was determined by in vivo NO spin trapping and quantified by EPR-spectrometry. SDF-imaging was used to evaluate the microcirculation in jejunal villi. For model verification results were compared to $eNOS^{-/-}$ mice.

RESULTS. WT and $Ass^{-/-}$ mice both exhibited enhanced plasma and tissue Arg concentrations in LPS-Cit treated mice compared to LPS treated mice ($p < 0.01$), resulting in an increased jejunal NO production. The WT + LPS-Cit exhibited an enhanced microcirculation compared to LPS treated mice alone ($P < 0.05$). However, the microcirculation in the $Ass^{-/-}$ LPS-Cit group did not benefit from the enhanced NO-production and Arg availability. Moreover, in vivo LPS-Cit treatment did not result in detectable ex vivo NO production in CA-EC of $Ass^{-/-}$ mice, indicating ASS to be essential for the intracellular NO production. Indeed, enhanced plasma Arg availability in LPS-Cit supplemented $eNOS^{-/-}$ mice did not result in an enhanced microcirculation and ex vivo NO production in $eNOS^{-/-}$ EC, suggesting an adequate Cit-Arg-NO cycle to be prerequisite for eNOS function.

CONCLUSIONS. Beneficial effect of Cit supplementation during endotoxemia depends on endothelial ASS activity. Furthermore, endothelial ASS deficiency impairs the Cit-Arg-NO pathway and results in an insufficient eNOS-derived NO production during endotoxemia.

0835
NOREPINEPHRINE VERSUS ANGIOTENSIN-II AS VASOPRESSORS IN SEPTIC SHOCK: EFFECTS ON INFLAMMATORY RESPONSE, TISSUE PERFUSION AND ORGAN FUNCTION IN A PORCINE MODEL OF FECAL PERITONITIS

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INTRODUCTION. Angiotensin-II is a powerful endogenous vasoconstrictive hormone that may be used to increase systemic vascular resistence during septic shock [1].

OBJECTIVES. To evaluate the effects of angiotensin-II (AII) in comparison to norepinephrine (NE) on systemic inflammation, tissue perfusion, and pattern of organ dysfunction in a long-term model of fecal peritonitis.

METHODS. In 16 anesthetized and mechanically ventilated pigs [41.0 ± 2.4 kg, (mean ± SD)] fecal peritonitis was induced by instillation of 2 g/kg autologous feces. After 12 h of untreated peritonitis, animals were randomly assigned ($n = 8$ per group) to receive either NE or AII as the initial vasopressor. During a 48-hour period of protocolized resuscitation, animals received Ringer's lactate and glucose 50 % (in total 3 mL/kg/h) and additional boluses of 150 mL Ringer's lactate and 6 % hydroxyethyl starch (130/0.4), norepinephrine or angiotensin-II and dobutamine when necessary to reach a mean arterial blood pressure between 75 and 85 mmHg, mixed venous oxygen saturation ≥ 50 %, urine output ≥0.5 mL/kg/h and arterial lactate level <2.0 mmol/L.

RESULTS. One animal randomized to AII and none to NE died during the study. The median (IQR) doses administered were 0.57 mcg/kg/min (0.26 to 1.31) for NE and 194 ng/kg/min (0.1 to 582) for AII. The median (IQR) time under vasopressors was 44 h (41 to 45) for NE vs. 44 h (36 to 45) for AII ($P = 0.9$) and the mean (SD) amount of fluid boli administered was 1.6 ± 0.5 for NE vs. 1.3 ± 0.7 ml/kg/h for AII ($P = 0.4$). Mean arterial blood pressure, central venous pressure, cardiac index, mixed venous oxygen saturation, carotid and femoral artery blood flow index, urinary output, creatinine, base excess, platelets, white blood cell count, arterial lactate, oxygenation index, total bilirubin, TNF-alpha and IL-6 did not differ between the groups (Table 1).

Inflammatory markers and arterial lactate levels

Variables	Group	Baseline	EOP	End	P value*
IL-6 (pg/ml)	NE	23 ± 5	616 ± 329	101 ± 30	0.8
	AII	15 ± 14	547 ± 601	97 ± 52	
TNF-alpha (pg/ml)	NE	92 ± 30	257 ± 98	104 ± 36	0.7
	AII	74 ± 21	242 ± 160	115 ± 34	
Arterial lactate (mmol/L)	NE	0.8 ± 0.1	1.9 ± 1.2	1.0 ± 0.2	0.2
	AII	1.0 ± 0.4	1.5 ± 0.7	1.0 ± 0.5	

Values are mean ± SD
EOP end of observation period
*P value for Time-group interaction with repeated measures ANOVA

CONCLUSIONS. In our model of fecal peritonitis, early sepsis resuscitation with angiotensin-II was as effective as early resuscitation with norepinephrine in maintaining arterial blood pressure, and hemodynamic and inflammatory profiles and incidence of organ dysfunction were similar between groups.

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0836
CHANGES IN HEPATIC AND RENAL PERFUSION DURING SEPSIS IN ICU PATIENTS

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INTRODUCTION. Hemodynamic changes during sepsis and vasopressor therapy may cause organ perfusion impairment contributing to organ dysfunction and failure.

OBJECTIVES. The aim of this study was to investigate changes in hepatic and renal perfusion in ICU patients with septic shock and vasopressor therapy.

METHODS. Consecutive patients admitted to the ICU were prospectively included. Hepatic and renal perfusion were investigated by Doppler ultrasound on admission day, or at the onset of shock, as well as after 48 h and on day of discharge. Changes of velocity of the portal vein, as well as pulsatility index (PI) and resistive index of the hepatic (HA) and renal artery (RA) were analysed. Additionally, indocyanine green-plasma disappearance rate (ICG-PDR), intraabdominal pressure (IAP), as well as routine laboratory parameters were assessed.

RESULTS. Thirty patients (80 % male, median age: 55.5 years, range: 19–87) were included, and received a total of 71 ultrasound investigations (mean ± SD: 2.3 ± 0.7).At the time of investigation, in 30 % (21/71) of investigation time points septic shock, and in 27 % (19/71) cardiogenic shock was present. In septic shock, independent of vasopressor therapy, PI of the RA was significantly higher (2.32 ± 0.91 vs. 1.83 ± 0.72, $p < 0.05$), whereas ICG-PDR was significantly lower (12.5 ± 8.9 vs. 19.4 ± 11.0, $p < 0.05$) compared to investigations without shock. In cardiogenic shock no significant differences were observed.A significant decrease of the PI of the HA was observed in patients requiring norepinephrine only (19/71). At investigation time points with norepinephrine >0.1 μg/kg/min (9/71), the PI of the HA (1.19 ± 0.40 vs. 1.85 ± 0.8, $p < 0.05$), and the RI decreased significantly (0.64 ± 0.12 vs. 0.74 ± 0.11, $p < 0.05$). In contrast, the PI of the RA increased (2.41 ± 1.04 vs. 1.82 ± 0.68, $p < 0.05$). IAP was significantly higher (21 mmHg ± 6.9 vs. 15.6 mmHg ± 4.5) in patients with norepinephrine >0.1 μg/kg/min. IAP ≥ 18.5 mmHg was additionally associated with a higher PI and RI of the RA ($p < 0.05$). The PI of the RA was significantly correlated with a higher SAPS III score, as well as BUN ($p < 0.05$).

However, these effects diminished, if norepinephrin was given in combination with dobutamin (9/71). No significant effects on portal vein perfusion were found.
CONCLUSIONS. These preliminary data indicate significant changes in hepatic and renal perfusion during septic shock and vasopressor therapy with norepinephrin. Their impact on the development of organ dysfunction is subject of this ongoing trial.

0837
INFLAMMATION-INDUCED INCREASE IN WHOLE BLOOD VISCOSITY DURING HUMAN ENDOTOXEMIA

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INTRODUCTION. Disturbances in microcirculation are key to the development of multiple organ failure during septic shock [1]. One of the factors contributing to a disturbed microcirculation is the increase of acute phase proteins which leads to a rise in whole blood viscosity (WBV). WBV is determined by three major factors: haematocrit, aggregating proteins and shear rate [2]. It is not exactly known how these factors are influenced by systemic inflammation.
OBJECTIVES. To examine the effects of systemic inflammation on WBV and to correlate changes in WBV with cytokine levels during experimental human endotoxemia.
METHODS. After obtaining informed consent, 17 healthy male volunteers received and arterial canulla for monitoring and blood sampling. After the administration of 1.5 L NaCl 0.45 %/glucose 2.5 % prehydration solution, 2 ng/kg *E. Coli* endotoxin was administrated intravenously (T = 0 h). WBV, haematocrit and cytokines were measured before the administration of prehydration solution (T = −1 h) and at 0, 1, 1.5, 2, and 4 h after endotoxin administration. Viscosity measurements were performed at 37 °C and at shear rates 0.5 and 5 s^{-1}. Data are expressed as Mean ± SEM. Since data were normally distributed, statistics were performed using Student's *t*-test and Pearson correlation coefficients.
RESULTS. At baseline mean WBV at shear rates 0.5 and 5 s^{-1} was 25.8 ± 1.7 and 10.3 ± 0.7 m Pa s^{-1} respectively. Mean hematocrit was 0.42 ± 0.01 l/l. After hemodilution, hematocrit decreased to 0.39 ± 0.01 l/l ($p < 0.001$) and WBV decreased to 20.8 ± 1.7 ($p = 0.01$) and 9.0 ± 0.5 m Pa s^{-1} [1] ($p = 0.04$), respectively. After LPS infusion, viscosity increased from 20.8 ± 1.7 to 25.0 ± 2.2 m Pa s^{-1} at shear 0.5 s^{-1} at T = 1.5 h ($p = 0.04$). This increase in WBV correlated with the concentration of TNF-α ($r = 0.90$, $p = 0.037$), but not with IL-6, IL-10 and IL1ra.
CONCLUSIONS. During experimental human endotoxemia, blood viscosity significantly increases at low and intermediate shear rates and correlated with TNF-alfa induction, indicating that inflammation-induced increases occur in humans in vivo that may play a role in the observed microcirculatory changes.
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0838
RED BLOOD CELL TRANSFUSION AND MORTALITY IN PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK

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INTRODUCTION. Red blood cell (RBC) transfusions form a part of the sepsis resuscitation bundle and early goal directed therapy (EGDT), targeting physiological parameters including central venous pressure, mean arterial pressure, hematocrit and central venous saturation.
OBJECTIVES. In this study we aimed to determine the association between RBC transfusions and mortality in patients admitted to the medical intensive care unit with severe sepsis and septic shock.
METHODS. This observational cohort study consisted of consecutive adults (≥ 18 years) with severe sepsis and septic shock admitted to a medical ICU of a tertiary care academic hospital from years 2007–2009. Patients presenting with mixed shock states, patients who received blood product transfusion other than RBCs and lack of research authorization were excluded. All patients underwent an institutional protocol for EGDT. Severe sepsis and septic shock were defined based on the International Sepsis Conference definitions. Primary outcome measured was all-cause 28-day mortality.
RESULTS. A total of 651 patients were identified as having severe sepsis and septic shock. Out of which, 133 patients were excluded because of receiving other blood products. From remaining 518 patients, a total of 181 received only RBC transfusion during their ICU course. The age {median (interquartile range (IQR)} of this cohort was 71 (59–81) years and 57 % were male. The median (IQR) Acute Physiologic and Chronic Health Evaluation III score (APACHE III) was 56 (42–69). A total of 51 (28 %) patients who received RBCs died within 28 days of hospitalization compared to 60 (18 %) of patients who did not receive any transfusions, Odds ratio (CI) = 1.8 (1.2–2.8); P < 0.006). When adjusted for Age, Gender, APACHE III and EGDT, RBC transfusion was found to be associated with increased mortality (Odds ratio (CI) = 1.75 (1.13–2.7); P = 0.013).
CONCLUSIONS. In an observational cohort study of severe sepsis and septic shock patients undergoing EGDT, red blood cell transfusion is independently associated with increased mortality.
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0839
CLINICAL ASSESSMENT OF THE ENDOTHELIAL GLYCOCALYX TO MONITOR VASCULAR DYSFUNCTION IN SEPTIC SHOCK PATIENTS

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INTRODUCTION. Endothelial dysfunction contributes to multiple organ failure and vascular pathophysiology of septic shock. The endothelial glycocalyx is essential for protection of the vascular wall against pathogenic challenges and it is hypothesized that loss of glycocalyx marks the pathogenesis of endothelial dysfunction in septic shock. In physiological conditions, an intact glycocalyx shields the endothelial surface from circulating blood cells. Validation studies have demonstrated that experimentally induced loss of glycocalyx results in increased radial movement of erythocytes (RBCs) towards the luminal endothelial membrane, as reflected by corresponding increases in the dimension of the blood perfused boundary region (PBR). Monitoring the glycocalyx may therefore be a promising tool to determine the vascular health in sepsis.
OBJECTIVE. To determine whether clinical measurement of glycocalyx loss can be used to monitor the progression of vascular vulnerability in septic shock patients.
METHODS. A sidestream dark field (SDF) clinical videomicroscope connected to a GlycoCheck ICU glycocalyx measurement system was used to measure the PBR of sublingual vessels. On-line quality controlled videorecordings of sublingual microvessels were analyzed automatically to determine PBR in at least 3,000 vascular segments per patient per measurement to monitor loss of glycocalyx in resuscitated septic shock patients (SEPSIS, n = 28), ICU-control patients (ICU; n = 5). Patients were compared to normal healthy persons (HEALTHY; n = 31). Septic shock was defined according to the Consensus. 11 patients with sepsis did not survive. Patients were included from ICU′s in Exeter (17 SEPSIS) and Maastricht (11 SEPSIS, 5 ICU, 31 HEALTHY).
RESULTS. Dimensions of the RBC perfused boundary regions (PBR) averaged from 1.86 (SD 0.18) microns in HEALTHY, 2.22 (SD 0.17) microns in ICU, 2.55 (SD 0.39) microns in surviving SEPSIS to 2.89 (SD 0.47) microns in nonsurviving SEPSIS patients. Compared to HEALTHY individuals, these findings indicate that glycocalyx dimension is reduced by 0.33 microns in ICU (P = 0.0003), 0.67 microns in surviving SEPSIS (P = 9.64015E–11) and by 1.03 microns in nonsurviving SEPSIS (P = 7.2799E–13), with a significant difference between the surviving and non-surviving SEPSIS patients (P = 0.045).
CONCLUSIONS. Glycocalyx loss is significantly greater in nonsurviving SEPSIS patients. Measurement of changes in glycocalyx dimension might allow clinical monitoring of pathogenic vascular processes in SEPSIS and provide a tool to measure vascular consequences of therapeutic interventions.

0840
HISTOLOGIC INDICATORS OF CATECHOLAMINE-INDUCED CARDIOTOXICITY IN SEPTIC SHOCK

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AIM. Depression of cardiac function in sepsis is frequent, associated with adverse outcome, and its pathophysiology is complex. A potential pathomechanism which received little attention so far is catecholamine-induced toxicity. We assessed the incidence and extent of catecholamine-induced histologic myocardial alterations in patients dying from septic shock.
METHODS. In this prospective, observational, combined clinical and post-mortem study, conducted in a 22-bed surgical and 10-bed medical intensive care unit of a tertiary university hospital the incidence and extent of histologic lesions indicative of catecholamine-induced cardiotoxicity were assessed. Exclusion criteria were <18 years, pregnancy, open heart surgery or cardiopulmonary resuscitation, acute neurologic diseases, presence of pheochromocytoma, and need for forensic autopsy. A systematic macro- and micropathologic evaluation was performed in all subjects. Nine predefined heart sections were screened for the following histologic alterations: myocytolysis, interstitial fibrosis, contraction band necrosis, mononuclear infiltrates, interstitial edema, and tissue hemorrhage. Clinical and laboratory data during the intensive care unit stay were collected and statistically evaluated.
RESULTS. Twenty patients were included. Right ventricular dilatation occurred more frequently than left ventricular dilatation (85 vs.15 %; $p < 0.001$). The histologic analysis revealed catecholamine-associated pathologies in 90–100 % of patients in all heart sections, with mononuclear infiltrates occurring predominantly in atrial, apical and right ventricular sections ($p = 0.06$, Chi^2). The following histopathologies were found in percentage of patients: myocytolysis 100 %, interstitial fibrosis 100 %, contraction band necrosis 95 %, mononuclear infiltrates 90 %, interstitial edema 90 %, and tissue hemorrhage 30 %. The incidence and extent of contraction band necroses, mononuclear infiltrates, and myocytolyses did not differ between genders, patients with or without chronic ß-blocker, calcium-antagonist and/or statin premedication, or between the binary use of catecholamines (all comparisons $p > 0.05$). The maximum epinephrine dose correlated with the overall extent of mononuclear infiltrates (Spearman-Rho, $r = 0.704$; $p = 0.05$) and myocytolysis (Spearman-Rho, $r = 0.933$; $p = 0.001$). Maximum norepinephrine doses correlated with the extent of mononuclear infiltrates in the left ventricle (Spearman-Rho, $r = 0.519$; $p = 0.02$).
CONCLUSIONS. Histologic lesions compatible with catecholamine-induced cardiotoxicity were found in the majority of patients succumbing to septic shock. A correlation between maximum epinephrine and norepinephrine doses as well as mononuclear infiltrates and myocytolyses suggests a relationship between catecholamine therapy and cardiac lesions in septic shock. Our data indicate that catecholamine-induced toxicity may play a role in the pathophysiology of septic cardiomyopathy.

0841
ESMOLOL EFFECTS ON HEART RATE VARIABILITY IN SEPTIC SHOCK

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INTRODUCTION. During septic shock, alterations in the $\sum/P\sum$ balance exist and are reflected by changes in heart rate variability (HRV). Beta-blockers could, as they do in non-septic heart disease, increase overall HRV and participate in prognosis improving. Our objectives were to test whether esmolol, a $ß_1$ selective adrenergic blocker, restore the global cardiovascular variability in septic shock and to describe their effects on $\sum/P\sum$ balance.
METHODS. Ten pigs were challenged with intravenous LPS. Heart rate was continuously recorded throughout the 260-min study period. The overall variability was approached by the standard deviation of RR interval (RR-SD) and spectral powers of low frequency (LF) and high frequency (HF) bands were calculated to approximate the $\sum/P\sum$ balance. The experimental protocol consisted of three phases: "SEPSIS LPS" (T0 − + 30 min) defines as the LPS infusion; "SEPSIS" (T + 30 − + 60 min) defines as sepsis that follows up the LPS infusion. Pigs were then randomized to placebo (LPS-P group) or esmolol (LPS-BB group) group. Esmolol was then titrated to decrease heart rate by 20 %. In both groups, fluid therapy was standardized and none of the animals received inotropic drugs.
RESULTS. In LPS-BB group, the RR-SD was significantly increased compared to placebo ($p < 0.001$). The values of the spectral power in the LF band are significantly lower in LPS-BB compared with LPS-P group ($p < 0.001$). In contrast, values in the HF band are significantly higher in LPS-BB ($p < 0.001$).
CONCLUSIONS. Continuous infusion of esmolol seems to restore a higher cardiovascular variability and causes a paradoxical increase of parasympathetic activity in a septic shock model.
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0842
LEUCO-DEPLETED BLOOD TRANSFUSION DOES NOT PRODUCE AN INFLAMMATORY RESPONSE IN CRITICALLY ILL ADULTS: RESULTS FROM A RANDOMISED CONTROLLED TRIAL

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INTRODUCTION. Blood transfusion is a common intervention during the management of critically ill patients. Exposure to more red cell transfusions is associated with worse outcomes in certain patient groups [1], but mechanisms for an adverse effect from transfusion are unclear. There are concerns that blood may have immunomodulatory and pro-inflammatory effects [2]. We report the first randomised study exploring the effect of leucocyte depleted red cell transfusion on inflammatory biomarkers in a general adult critical care patient population.
OBJECTIVES. To determine whether blood transfusion results in a pro-inflammatory response in critically ill patients.
METHODS. Patients were recruited as part of RELIEVE (Restrictive vs. Liberal Transfusion Strategies in Intensive Care), a multicentre randomised controlled feasibility study comparing restrictive and liberal transfusion strategies using leuco-depleted blood in critically ill patients (Clinicaltrials.gov NCT00944112). Following randomisation plasma was taken for analysis from 43 transfused and 41 non- transfused patients at baseline, 6 and 24 h. Levels of IL-1-beta, IL-2, IL-4, IL-5, IL-6, IL-8, IL-10, IL-12-p70, IFN-gamma and TNF-alpha were measured using cytokine bead array analysis. Levels of vWF, human neutrophil elastase (HNE), L-selectin and CRP were measured using enzyme-linked immunosorbent assay (ELISA).
RESULTS. Patients were well matched at baseline with regards to gender, age, disease severity and co-morbidities. No significant difference was found in pro- and anti-inflammatory cytokine levels, vWF (a marker of endothelial function); HNE and soluble L-selectin (markers of neutrophil activation); and CRP (a marker of the acute phase response) between patients who were transfused compared to those not transfused, following randomisation at 6 and 24 h (p values > 0.05, by repeated-measures ANOVA). Baseline levels of inflammation, measured following randomisation and prior to intervention, were increased in both groups.
CONCLUSIONS. Inflammatory cytokine levels and biomarkers of endothelial function, neutrophil activation and the acute phase response are not increased during the first 24 h following leuco-depleted blood transfusion in critically ill patients. Unsurprisingly for this population, at baseline there is already evidence of increased systemic inflammation, and patients who are transfused do not have a subsequent detectable change in inflammatory biomarker levels compared to those who are not transfused. Therefore, these data do not support the contention that leuco-depleted red cell transfusion is associated with a pro-inflammatory response in critically unwell patients.
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0843
VASOPRESSIN IMPACT IN MICROCIRCULATORY FLOW IN SEPTIC SHOCK PATIENTS

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INTRODUCTION. Previous studies showed that vasopressin could reduce the requirements of noradrenaline in septic shock patients and also mortality in the less severe ones [1–3]. However, it's effects in microcirculatory flow are not well known.
OBJECTIVE. To analyze the impact of vasopressin in the microcirculatory flow index in septic shock patients and to correlate it with severity of disease.
METHODS. Prospective interventional study including patients with septic shock over 18 years-old and signed informed consent. We collected hemodynamic data before and after infusion of a fixed dose of 0.03 µg/min of vasopressin. Sublingual microcirculation was assessed through sidestream dark field videomicroscopy (Microscan®). At each time-point, three to five images of 10–20 s were recorded for determination of microcirculatory flow index (MIF). Values before and after infusion were compared using Wilcoxon paired test. The variation of MFI (deltaMIF) was calculated as percentage of the initial levels and correlated with baseline variables using Pearson test. Results were considered significant if p value was ≤0.05.
RESULTS. We included 14 patients (50.0 % male) with a mean age of 62.5 ± 4.8 years and mean baseline SOFA score of 11.1 ± 1.2. Mean baseline IC and lactate levels were 4.4 ± 0.38 L/min and 30.8 ± 18.0 mg/dL. All patients were receiving noradrenaline (median dose: 0.35 µg/k/min) and only two were also using adrenaline. All patients were considered non-responsive to fluid with the highest pressure pulse variation of 12. After infusion, noradrenaline doses significantly decreased from 0.47 ± 0.31 to 0.38 ± 0.32, $p < 0.0001$. Cardiac index also decreased significantly (4.39 ± 1.32 to 3.73 ± 0.91, $p = 0.01$) with a mean change of 23.9 ± 6.4 % in the 8 patients with worsening index. However, no patients worsened lactate levels and there was no significant change in extraction fraction or venous-arterial CO_2 levels. Although MIF did not change significantly after vasopressin infusion (2.48 ± 0.35 to 2.61 ± 0.25, $p > 0.05$), 6 patients had an increase over 10 % and only 2 patients had a decrease (11 %). The change in MFI was significantly correlated with baseline lactate levels ($r = -763$, $p = 0.001$). No correlation was found with baseline noradrenaline dose, extraction fraction, venous-arterial CO_2, hemoglobin levels or cardiac index and its change.
CONCLUSION. Vasopressin increased flow in the microcirculation in some patients and this seems to be related to the baseline lactate levels. Although it decreased cardiac index this change was not associated with worsened perfusion parameters.
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0844
TRANSFUSION REQUIREMENTS IN SEPTIC SHOCK (TRISS) TRIAL: PROTOCOL OF AN ONGOING SCANDINAVIAN MULTICENTER, RANDOMISED CLINICAL TRIAL OF THE EFFICACY AND SAFETY OF RED BLOOD CELL TRANSFUSION IN PATIENTS WITH SEPTIC SHOCK

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INTRODUCTION. Transfusion of red blood cells (RBC) is recommended in septic shock (1). The majority of these patients receive RBC transfusion in the intensive care unit (ICU), but the efficacy and safety of RBCs has not been established in patients with septic shock.
OBJECTIVE. To conduct a pragmatic trial to assess the intervention effects of two different Hb-trigger values for RBC transfusion on mortality, organ failure, severe adverse reactions (SAR) and ischaemic events in ICU patients with septic shock.
METHODS. The TRISS trial is a multicenter trial with assessor-blinded outcome assessment, randomising septic shock patients in 25 Scandinavian ICUs to RBC transfusion at Hb of 7 g/dl or 9 g/dl, stratified by the presence of haematological malignancy and centre.
Inclusion criteria: Adult patients with septic shock (2) and anaemia with Hb equal to or less than 9 g/dl.
Exclusion criteria: Patients who refuse transfusion, had previous SAR with blood products, have ongoing myocardial ischaemia or life threatening bleeding, have acute burn injury and patients who have received RBCs in the ICU before randomisation.
Intervention: Patients will receive one unit of leuko-depleted RBC suspended in Saline-Adenine-Glucose and Mannitol (SAGM) when they reach their assigned trigger value followed by renewed point-of-care Hb measurement.
Primary outcome: Mortality at 90 days after randomisation.
Secondary outcomes: Organ failure, ischaemic events and SARs. With 2 × 500 patients we will be able to show a 9 % absolute risk difference in 90-day mortality based on a mortality of 45 %(3), alpha of 0.05 (two-sided) and power 80 %. An interim-analysis will be performed when 500 patients have been followed-up in 90 days.
RESULTS. The 1st patient was randomised December 3rd 2011and 9 centres have in April 2012 screened 119 patients and randomised 72 patients. The number of trial sites will reach 25 in June 2012.
CONCLUSION. To bridge the gap between clinical practice and the lack of evidence on efficacy and safety of RBC transfusion in septic shock patients we conduct the TRISS trial, a large pragmatic trial randomising patients with septic shock to RBC transfusion at two different Hb-trigger levels.
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0845
SHOCK INDEX (SI) IS THE BEST PREDICTOR OF MORTALITY IN SEPTIC SHOCK

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INTRODUCTION. Cardiovascular deterioration leads to the development of tissue hypoperfusion, which is an important factor in the development of multiple organ failure

and death in septic shock. The goal is to restore perfusion and tissue oxygenation avoiding disoxia. The optimization of SI (cardiac rate/systolic pressure) during resuscitation may be associated with improved myocardial function.
OBJECTIVES. Analysis of the shock index in relation to mortality in patients with septic shock.
METHODS. Retrospective, transversal, observational study of patients with shock requiring advanced hemodynamic monitoring with pulmonary artery catheter for continuous cardiac output measurement and end-diastolic volume index of the right ventricle (EDVIRV).
RESULTS. A total of 36 patients were included in the study. They were divided into 2 groups based on mortality (group A survivors, n = 18 and B non-survivors group, n = 18). Baseline variables with significant difference are, the mean age group A = 52 ± 16, group B = 66.72 ± 15.31, P < 0.05. SOFA Group A = 11.8 ± 2. 8, group B = 18 ± 0.3, p < 0.05. $SVmO_2$ (%) (mixed venous saturation) = 63.17 ± group A 14.23, B = 66.72 ± 11.1, p < 0.05, lactate (mmol/L) group A = 2,894 ± 2.99, group B 5.1 ± 3.6, p = < 0.05. The rest of the baseline variables was not statistically significantly different. Variables with significant difference at 24 h, SI Group A = 0.65 ± 0.23, B = 1.0 ± 0.33, p = < 0.05. SOFA group A = 10.72 ± 3.14, group B = 18 ± 11.72, p < 0.05. $SVmO_2$ group A = 73.83 ± 9.84, group B = 72.17 ± 8.69, p < 0.05, lactate group A = 1,589 ± 1.08, group B = 4,139 ± 3.14, p = < 0.05. EDVIRV group A = 133 ± 32, group B = 138 ± 52, p < 0.05. The SI presented an area under the curve 0.818, with a cutoff of 0.8 for a sensitivity of 80 % and a specificity of 80 % with p < 0.05 for predicting mortality. Not achieve a SI < 0.9 increased odds of mortality up to 2-fold relative to those they caught. In group A, the optimization of SI < 0.8 was associated with significant lower mortality.
CONCLUSIONS. Probably the shock index <0.9 is the best goal hemodynamics in patients with septic shock.
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0846
EFFECTS OF HYDROXYETHYLSTARCHES WITH DIFFERENT CONCENTRATIONS AND MOLECULAR WEIGHTS ON HEMODYNAMICS AND RENAL FUNCTION IN A PORCINE TWO HIT MODEL OF SHOCK

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INTRODUCTION. One of the therapeutic essentials in severe sepsis and septic shock is an adequate fluid replacement to restore and maintain circulating plasma volume and improve organ perfusion.
OBJECTIVES. Using a porcine two hit model combining a hemorrhagic and septic shock we tested the effects of hydroxyethylstarches with different concentrations and molecular weights on volume balance, hemodynamic and renal function.
METHODS. Prospectively randomized, controlled animal study in a university animal laboratory. 30 anesthetized and ventilated female German Landrace pigs (31 ± 2 kg) were randomized (6 in each group) to volume replacement therapy using 6 % hydroxyethylstarch 130/0.42 (6 % HES130), 6 % hydroxyethylstarch 200/0.5 (6 % HES200), 10 % hydroxyethylstarch 130/0.42 (10 % HES130) and 10 % hydroxyethylstarch 200/0.5 (10 % HES200), all solved in saline, compared to normal saline (NS). Animals were bled until reaching half of their baseline mean arterial pressure (MAP) for 45 min. As second hit sepsis was induced using an E. Coli laden clot placed into the abdominal cavity 6 h after hemorrhagic shock. Infusion rate was titrated to maintain a central venous pressure of 12 mmHg, starting 2 h after sepsis induction. Measurements were performed before hemorrhagic shock (bl), before sepsis induction (sl) and every 2 h after induction of sepsis, totally 12 h. Statistics were performed with ANOVA.
RESULTS. At the end of the study the cardiac output (ml/kg BW) (6 % HES130 124 ± 43; 6 % HES200 156 ± 40; 10 % HES130 129 ± 30; 10 % HES200 141 ± 41; NS 139 ± 48), as well as mean arterial pressure did not differ between all groups. 12 h after sepsis induction volume balance (ml/kg BW) was significant higher in the NS group (346 ± 90; p ≤ 0.05) compared to all other groups (6 % HES130 125 ± 26; 6 % HES200 105 ± 15; 10 % HES130 114 ± 17; 10 % HES200 96 ± 23). Creatinine clearance (ml/min) was significant lower in the 6 % HES200 (26 ± 33) and 10 % HES200 (15 ± 18) groups compared to the NS group (104 ± 46; p ≤ 0.05) at the end of the study (6 % HES 130 64 ± 51; 10 % HES130 58 ± 38). 12 h after sepsis induction N-acetyl-beta-D-glucosamidase (U/g creatinine) was higher in the 6 % HES200 (280 ± 375) and 10 % HES200 (285 ± 403) groups compared to all other groups (6 % HES130 45 ± 44; 10 % HES130 28 ± 10; NS 37 ± 23), however, not significantly.
CONCLUSIONS. In this porcine two hit model of shock, despite similar maintenance of hemodynamic, volume replacement with HES 200/0.5 compared to NS led to a significantly reduced creatinine clearance whereas there was no difference between HES 130/0.42 and NS. These results suggest that molecular weight and degree of substitution are more important for HES induced renal damage than the concentration of HES.
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0847
IS LACTATE THE CULPRIT IN SEPSIS ASSOCIATED METABOLIC ACIDOSIS?

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INTRODUCTION. Conventional thinking is that metabolic acidosis in sepsis is due to an accumulation of lactate. Furthermore, hyperlactemia is promoted as a sensitive marker of severity, used to both guide resuscitation and predict outcome [1, 2]. Central to this theory is the belief that hyperlactemia results from a failure of oxidative phosphorylation due to cellular hypoxia and cytokine mediated inhibition of metabolic pathways. We have observed however that lactate fails to correlate with the severity of acidosis (assessed by base excess) seen in severely septic patients. Our hypothesis is that lactate is not the sole causative anion in sepsis associated acidosis and that its value in treatment and prognosis is overstated.
OBJECTIVES. To determine the contribution of lactate to metabolic acidosis in sepsis.
METHODS. We analysed blood gas results taken on admission to ICU from 259 patients with severe sepsis and correlated lactate and base excess.
RESULTS. The mean APACHE II score was 20.5 and the mortality rate was 42 %.
Figure 1 shows a scatter gram of lactate versus base excess.

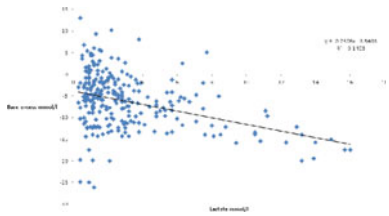

Figure 1

The Pearson correlation coefficient was −0.374 and the coefficient of determination (r^2) was 0.1403.
DISCUSSION. Lactate makes a minor contribution to the magnitude of metabolic acidosis in this study of patients with severe sepsis. It is our belief that currently unmeasured Krebs cycle anions, such as succinate or malate, are likely to be as significant as lactate [3] and may be more sensitive as markers of disease severity than lactate. We feel further work is warranted upon this subject and the exact role lactate plays in the critically ill patient.
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0848
PICC: PASSPORT TO DISCHARGE? NURSE LED PERIPHERALLY INSERTED CENTRAL CATHETERS CAN PROVIDE EFFECTIVE VASCULAR ACCESS ASSESSMENT AND PLACEMENT, WITH THE CAPACITY TO SUPPORT PATIENTS' ACCESS NEEDS TO DISCHARGE

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INTRODUCTION. Peripherally Inserted Central (PICC) Catheters under USS guidance are becoming increasingly used in Intensive Care units in our institution by a designated nurse led Vascular Access Team. PICCs have the advantage of ease of insertion and a lower rate of insertion-related mechanical complications (Bernardi et al. 2001). PICC lines are increasingly used as a safe alternative when the need for central access is prolonged, at first line change or non-emergent basis(Tan et al. 2009; Finch et al. 2010). Discharge from ICU the 1st step in recovery from critical illness often still requires ongoing access for nutriton, multiple drug therapy and phlebotomy. Repeated cannulation causes pain, distress and the potential for delayed or missed medications for recovering patients. PICC placement has the capacity to safely span the recovery period to discharge.
OBJECTIVES. PICC insertion rate, dwell time and incidence of adverse events reported to identify patients may benefit from PICC placement towards their hospital discharge.
METHODS. Data from PICC line insertions were prospectively recorded onto dedicated databases over a four year period (2008–2012) in adult general ICU with an annual throughput of 880 patients. No. of PICCS, indication for use, dwell time and adverse events interrogated for all patients.
RESULTS. Over this period 320 lines were placed by the nurse led Vascular Access Team within the ICU setting. Of these 287 were PICC lines in adults for more than 24 h. Reasons for placement included TPN, multiple IV therapy and difficult cannulation. Total line days were 5166: 2551 ICU line days, 2615 between ICU discharge and removal on an average unit patient stay of 21 days. PICC average dwell time was 8 days in ICU and 10 days post ICU discharge, creating an average total dwell time of 18 days. Lines removed for suspected infection 10 %, [29/287] confirmed infection 0.69 % [2/287]. Suspected thrombus based on leaking, oedema or unable to aspirate lines in 1.3 % [4/287].
CONCLUSIONS. Our results show timely placement of PICC lines provide safe, effective vascular access for both the ICU period and post discharge to the ward. These findings suggest nurse led assessment and placement of PICC lines can support patients not only in their ICU period but in the transition to ward care providing quality access and patient comfort .
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0849
THE QUALITY OF NURSING PRACTICE IN THE DETECTION AND INITIAL MANAGEMENT OF THE DETERIORATING WARD PATIENT

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INTRODUCTION. Nurses are struggling to detect and adequately manage deteriorating ward patients. Studies have reported that patients' vital signs can be inadequately monitored, and there is poor adherence to early warning scoring (EWS) protocols (NPSA 2007[a], Odell et al. 2009). However, evidence to describe and enumerate the scale of the problem is lacking. As part of a larger study of nursing practice, evidence was sought to illustrate the scale of the phenomenon of 'deterioration not recognised or acted upon' (NPSA 2007[b], p 16), and to explore and describe the quality of nursing practice.
OBJECTIVES. To explore nursing actions, and to measure the quality of nursing practice when caring for deteriorating ward patients.
METHODS. Using a Critical Realist approach, data were extracted from the available records of all general ward patients who suffered a cardiac arrest in a UK district general hospital during one year. Using cardiac arrest as a surrogate marker of patient deterioration, the quality of nursing practice in recording observations, and referring according to a EWS

protocol during the 12 h preceding the cardiac arrest were evaluated according to eleven pre-determined standards of practice. Three levels of practice standards were determined: poor, standard or good.
RESULTS. Data were available for 123 out of 211 cardiac arrests that met the study inclusion criteria. The maximum standard for nursing observation practice was achieved in less than a third (30.1 %) of the study cases, while more than a third (36.6 %) failed to meet the minimum standard for observation practice. Appropriate referral decisions were made in 58.5 % of cases. When observation and referral practice standards were combined, poor quality practice was evident in 50.4 % cases, which was compounded by an inaccuracy or ineffectiveness of the EWS in 36.5 % of cases.
CONCLUSIONS. The detection and appropriate management of deteriorating ward patients is a highly complex process that involves experience, skill and multi-disciplinary communication and team working. In presenting a set of standards, nursing practice can be evaluated. The findings show that practice has room for improvement in the study hospital, and the research findings from the larger study suggest factors that may hinder or enhance quality practice.
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0850
USE OF PHYSICAL RESTRAINT IN DUTCH INTENSIVE CARE UNITS: PREVALENCE AND MOTIVES

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INTRODUCTION. There is increasing evidence that the use of physical restraint may be harmful and may have negative effects on patient autonomy. However, research on physical restraint is scarce and studies on the use in Intensive Care Unit (ICU) patients are absent.
OBJECTIVES. To estimate the use of physical restraint in Dutch ICUs and the conditions under which restraint is applied.
METHODS. Fifteen ICUs ranging from local hospitals to academic centres participated in this study and each ICU was visited twice by a researcher. We included 227 patients, who were admitted to the ICUs during the visit. We recorded the Confusion Assessment Method adapted for the ICU (CAM-ICU) score, medication use over the last 24 h and the possibility of verbal communication. The following outcome parameters were collected: use and methods of physical restraint, motives for applying the restraint, the acquaintance of the medical personnel with a protocol concerning physical restraint and the number of physicians who knew the number of restrained patients in their ward.
RESULTS. Physical restraint was used in 48 (22 %) patients, ranging from 0 to 54 % for different hospitals. The physical restraints were mostly (88 %) bilateral upper limb restraint. In all cases, professional restraint materials were used. Frequent motives for restraint use were 'possible threat to airway' (42 %) and 'pulling lines/probes' (24 %). Restrained subjects had, compared to non-restrained patients, more often a positive CAM-ICU (35 vs. 16 %, $p < 0.0005$), could less frequently verbally communicate (13 vs. 45 %, $p < 0.0005$), and received more often antipsychotics (48 vs. 26 %, $p < 0.004$), or benzodiazepines (65 vs. 41 %, $p < 0.003$). The use of physical restraint was registered in the patient's record in 29 % of cases. All included hospitals had a physical restraint protocol of which 33 % were specific for the ICU. Of the 166 interviewed nurses, 114 (69 %) was familiar with the protocol and 38 (23 %) used it in any situation. 29 % of the 31 questioned physicians were aware of physical restraint status of their patients.
CONCLUSIONS. Physical restraint is frequently used in Dutch ICUs, but physicians are often not aware of the number of restraint patients on their ward.

0851
EFFECTIVENESS OF A REGIMEN OF REPOSITIONING EVERY 2 HOURS VERSUS EVERY 4 HOURS USING ALTERNATING PRESSURE MATTRESSES IN PREVENTING PRESSURE ULCERS IN PATIENTS ON MECHANICAL VENTILATION. THE PUPPAS RANDOMIZED CONTROLLED TRIAL

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INTRODUCTION. The need to provide repositioning to patients requiring mechanical ventilation (MV) to prevent the development of pressure ulcers (PUs) is accepted, although the optimal regimen of repositioning when using pressure-relieving support modern surfaces remains debated.
OBJECTIVES. To compare the effectiveness of repositioning every 2 h versus every 4 h in the prevention of PUs using alternating pressure air mattress (APAM) in patients requiring MV $\geq$24 h in intensive care unit (ICU).
METHODS. A randomized, pragmatic, open-label, controlled Trial with blinded end point assessment. We included consecutive patients requiring $\geq$24 h of MV in an ICU of a tertiary care center, which has APAM, between February 2009 and January 2011. Patients were assigned to receive randomly repositioning every 2 h (2-h group, n = 165) or every 4 h (4-h or control group, n = 164). The primary outcome was the incidence of grade 2 or higher PU up to ICU discharge. The secondary outcomes were the incidence of unplanned extubation, severe artificial airway obstruction, and mortality in ICU.
RESULTS. The incidence of PUs in the group with repositioning every 2 h was 10.3 % (n = 17) vs. 13.4 % (n = 22) in the 4-h group (hazard ratio, 0.89 [95 % confidence interval, 0.46–1.71], P = 0.73). The incidence of unplanned extubation in the 2-h group was 11.5 % (n = 19) vs. 6.7 % (n = 11) in the 4-h group (hazard ratio, 1.77 [95 % confidence interval, 0.84–3.75], P = . 13). The incidence of severe artificial airway obstruction was respectively 36.3 % and 30.4 % (hazard ratio, 1.44 [95 % confidence interval, 0.98–2.12], P = 0.065). ICU mortality was 36.4 % vs. 31.1 % (HR 1.16 [95 % confidence interval, 0.80–1.69], P = 0.44).
CONCLUSIONS. The implementation of a regimen of repositioning every 2 h was not superior to that of every 4 h in the prevention of pressure ulcers in patients with mechanical ventilation in ICU.
REFERENCE(S). Trial Registration: Clinicaltrials.gov Identifier: NCT00847665.
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0852
VISUAL Q-CPR® FEEDBACK DURING CPR BY EXPERIENCED ICU NURSES INCREASES CONSISTENCY OF RATE OF CHEST COMPRESSIONS

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INTRODUCTION. Chest compressions are the essential part of basic life support. Outcome of CPR is related to the quality of chest compressions. Quality of chest compressions is judged by frequency, depth and relaxation. The Q-CPR® device by Laerdal/Philips can be used to give visual and auditory feedback of quality of chest compressions during basic life support.
OBJECTIVES. To determine whether an objective feedback system during CPR improves quality of chest compressions.
METHODS. A HeartSim4000® resuscitation manikin by Laerdal was placed on a resuscitation board in a standard hospital bed. Registered ICU nurses (n = 11) administered 3 periods of chest compressions (duration 2 min) according to the 2010 CPR guidelines. The first period was performed without any further instruction or feedback. During the second period feedback (auditory and visual on the defibrillator screen) using Q-CPR® was provided. After the second period a standardized instruction was given to the nurses followed by a third period with Q-CPR® feedback. Between periods participant were giving time for recuperation. Quality of chest compressions during the three periods was compared.
RESULTS. Frequency of compressions was 116 $\pm$ 9, 108 $\pm$ 5 and 109 $\pm$ 5 (mean $\pm$ SD) in the three periods. The percentage of correct depth of compressions was 56 $\pm$ 28, 53 $\pm$ 40 and 64 $\pm$ 32 in the three periods. Deep compressions were only found in the first period (without Q-CPR feedback) in 15 $\pm$ 24 % of compressions. Shallow compressions were registered in 27 $\pm$ 34, 46 $\pm$ 40 and 34 $\pm$ 32 % of compressions in the three periods. Relaxation between compressions as measured by the HeartSim4000® was perfect in all subjects in all periods. Q-CPR, however, demonstrated leaning on the chest in several cases. This was unfortunately not quanticated. Subjects described that the visual feedback helped to increase consistent performance of chest compressions. The auditory feedback was found to be confusing by most of the participants.
CONCLUSIONS. Depth of chest compressions during CPR performed by experienced ICU nurses was adequate in 58 % and deep in another 15 % of compressions (total 73 %) without feedback. The mean frequency of chest compressions during CPR performed by experienced ICU nurses was within the guideline range with and without feedback, however without feedback some nurses used too high frequencies. There was a trend towards more shallow compressions when feedback was giving during CPR. Relaxation between compressions was adequate with and without feedback. Visual feedback is accepted better then auditory feedback but more research is needed to confirm this finding. We conclude that objective visual feedback of quality of chest compressions by Q-CPR® during CPR performed by experienced ICU nurses leads to a more consistent rate of compressions but possibly also to more shallow compressions.

0853
EVALUATION TO STUDY THE EFFECT OF A SPECIAL MATTRESS ON THE INCIDENCE OF SACRAL PRESSURE ULCER

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INTRODUCTION. Pressure ulcers (PUs) occurs frequently, especially in intensive care unit (ICU) patients because of their severity of illness and prolonged immobility. PUs are associated with prolonged hospital stay and reconstruction surgery due to infections, and even increased mortality. Especially sacral PUs are often serious wounds with serious consequences.
OBJECTIVES. The aim of our study was to evaluate whether a special visco elastic mattress with removable sacral part results in reduction of sacral PUs.
METHODS. In this case control study the mattress with removable sacral part was evaluated during a 3 months period for all adult ICU patients with a BMI <30 and an expected length of ICU stay >1 d. Patients received PU preventive care according to the ICU protocol. Data were collected of patient characteristics and PU related data. Patients were daily screened for the presence or absence of sacral PU. Data of the evaluation period were compared with data from the same period in 2010 in which patients received the same PU prevention.
RESULTS. A group 116 patients were included in the intervention period using the special visco elastic mattress. The control group consisted of 265 patients. Patients in the intervention group were younger, sicker on admission and more urgently admitted (Table 1). We found no difference in sacral PUs incidence, and also not per PU category, between the intervention group and control group., even after adjusting for covariates. No high level sacral PU occurred in the intervention group. However, it appears that it takes longer before sacral PUs occur when using the special mattress; 7 days to 11 days in the control group ($p = 0.052$).
CONCLUSIONS. In this case control evaluation study we found no effect using a special visco elastic foam mattress with removable sacral part in preventing sacral pressure ulcers. However, there is a trend that it takes longer before sacral PUs occur. It is suggested to optimize the positioning of the removable sacral part to suit the beds used when applying Fowler's position. More research is needed.

Table 1 Patient and outcome characteristics

	Control group (n = 265)	Intervention group (n = 116)	Difference
Age (mean, SD)†	63 ± 16	59 ± 18	0.03
APACHE-II score (mean, SD)†	17 ± 7	19 ± 7	0.003
Male (n, %)†	145 (55 %)	78 (67 %)	0.02
BMI (mean, SD)	24 ± 4	24 ± 3	0.65
Urgent admission (n, %)†	209 (79 %)	111 (96 %)	<0.0001
Admission category† Surgical/Medical/ Trauma/Neurology/	95 (36 %)/142 (54 %)/11 (4 %)/13 (5 %)	4 (3 %)/76 (66 %)/ 5 (4 %)/9 (8 %)	<0.0001
Sacral PU (n, %) category; 1–4/2–4/3–4/	16 (6.0 %)/ 8 (3.0 %)/ 2(0.8 %)/	7 (6.0 %)/6 (5.2 %)/ 0 (0 %)/	0.52*/0.63*/0.99*
Days till onset of sacral PU (median, IQR)	6.8 [2.6–7.7]	11.2 [7.2–26.5]	0.052
LOS-ICU (days) (median, IQR)†	3.0 [1.8–6.9]	4.1 [1.5–11.0]	0.41

* Adjusted for covariates†

0854
THE IMPLEMENTATION OF A NURSE DRIVEN GLUCOSE REGULATION INTENSIVE CARE PATIENTS (GRIP) AS A FULLY-AUTOMATED FEATURE OF METAVISION

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INTRODUCTION. GRIP has proven to be a successful and safe tool for intensive insulin therapy. At our Intensive Care Unit (ICU) we explored the application of GRIP programmed into our PDMS (Metavision, iMDsoft®, Israël) in order to achieve automated glucose regulation incorporating relevant metabolic and nutritional parameters already available in PDMS. This GRIP-PDMS algorithm enables ICU nurses to strictly regulate the glucose level in a uniform way, aiming at a preset target and avoiding hypoglycaemia.

METHODS. We programmed the GRIP-algorithm as an application within our PDMS. GRIP needs to be activated by ICU nurses. The GRIP advice (insulin dose and next glucose measurement) depends on glucose intake, continuous insulin administration and glucose values from the previous four hours. GRIP targets at a glucose of 6.5 mmol/l. GRIP has built-in safety features and risk analysis. When glucoses are below 3 mmol/l, GRIP advices to start hypoglycaemia treatment. Below 4 mmol/l and above 15 mmol/l the intensivist needs to be consulted. The majority of glucose samples were measured using arterial blood gas analysis (ABL800 Flex), automatically recorded in PDMS and directly available to be used by the GRIP algorithm. We studied all GRIP data during the first year after implementation and training of ICU staff (2011) and compared those with a 12-month period (2010) of data using conventional simple nurse-driven glucose management.

RESULTS. Blood glucoses measured during the periods with and without the use of GRIP were categorized according to different glucose levels (Table). The use of GRIP resulted in less hypoglycaemia's, but showed less strict regulation.

GRIP results

Glucose mmol/l	No GRIP (n)	GRIP (n)	*P* value
<2, 2	31 (0.06 %)	14 (0.03 %)	0.011
≥2,2 < 4,0	817 (1.6 %)	402 (0.8 %)	<0.0001
≥4,0 < 6,0	10,120 (10 %)	6,582 (13 %)	<0.0001
≥6,0 < 8,0	24,276 (47 %)	24,655 (50 %)	0.087
≥8,0 < 10,0	10,537 (21 %)	11,999 (24 %)	<0.0001
≥10,0	5,174 (10 %)	5,858 (12 %)	<0.0001

Chi-square test used for statistical analysis

CONCLUSIONS. GRIP as a built-in application for PDMS appeared to be a nurse driven, self controlled algorithm within the boundaries of nurse competence. By using GRIP, ICU nurses were more aware of hypoglycaemia as GRIP combines warning, prompt advice and intervention. This enabled ICU nurses to act autonomously and in a uniform manner. Furthermore, our first year experience with GRIP demonstrated significantly less hypoglycaemia's at the cost of somewhat less strict regulation. Future studies should focus on GRIP-adherence and different glucose targets.

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0855
CRITICAL CARE OUTREACH: CHANGING THE GAME

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INTRODUCTION. In July 2010 the Royal Glamorgan Hospital set up and launched a Critical Care Outreach Team. Its main aim was improve the care for the deteriorating patient. The CCOT consists a small team of 3 nurses, 2 part time, giving 2.1 whole time equivalent. It was planned to provide a daylight hour's service, 7 days a week. Alongside this it ensured the hospital was compliant with the National Institute for Clinical Excellence, (NICE) Clinical Guideline 50, the NHS Wales Saving 1000 + campaign and the Rapid Response to Acute Illness Learning Set, (RRAILS). A call criteria was designed use a modified early warning score which was already in use throughout the hospital. We selected a score of four, with the caveat of referral if staff were concerned. Referrals could be made by any member of staff who was concerned.

OBJECTIVES. To review the effectiveness and impact of CCOT. The impact of CCOT was measured on positive and negative outcomes.

METHODS. Retrospective analysis of prospectively collected data. After each CCOT visit to a newly referred patient positive outcome was defined if the patients' MEWS score decreased or stayed below 4, if the patient was admitted to ICU/HDU or if resuscitation status has been reviewed. Negative outcome was defined if the patients' MEWS score stayed or increased above 4 or the patient suffered cardiac arrest after CCOT visit.

RESULTS. During the first 12 months of the service the CCOT received 437 new referrals, a total of 1186 visits were performed (totalling 884 h of direct patient care). Average 2.7 visits per patient (2–3 days). Maximum during this data collection period was 13 visits (over 10 days). Based on our criteria out of the 437 initial visits 372 resulted in a positive outcome (85 %) whereas in 65 patients despite CCOT intervention the patients' condition deteriorated. 73 of our patients were admitted to Level 2 or 3 care. Of these 45 were accepted at the time of CCOT referral to ITU. The intervention of CCOT helped to avert an admission in 100 patients, either by early intervention (60 pts) or by reviewing admission status i.e. Treatment limitations being discussed and documented (40 pts). All patients discharged from ITU/HDU are followed. Visits take place the following day unless required sooner (e.g tracheostomy in situ) A total of 367 patients followed up in 1,071 visits (1–2 visits per day) resulting in 571 h direct patient contact. Average number of visits per patient is greater for follow-ups than for referrals: 2.9 visits per patient. 95 % of follow-up visits resulted in a positive outcome based on our criteria.

CONCLUSIONS. Even the less than full time CCOT service could positively change the outcome in 85 % of the new referrals helping to avoid 100 unnecessary ICU/HDU admissions. Based on these results we put together a business case to increase the CCOT cover to 24/7.

REFERENCE(S). NICE Clinical Guidance 50, 2007.

0856
INTERMITTENT ASPIRATION OF SUBGLOTTIC SECRETIONS AND TRACHEAL MUCOSA DAMAGE

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INTRODUCTION. Intermittent or continuous aspiration of subglottic secretions is recommended for prevention of ventilator-associated pneumonia. Aspiration failure has been reported in up to 50 % of patients treated with the continuous technique [1]. This is mostly due to prolapse of tracheal mucosa into the suction port and may expose the patient to significant tracheal injury [2].

OBJECTIVES. We investigated whether intermittent subglottic aspiration could also cause tracheal injury.

METHODS. Six consecutive patients, aged 64 ± 9 years were studied. Patients were sedated, curarized, and intubated with the Mallinckrodt Taperguard Evac™ endotracheal tube. Correct tube placement was confirmed by lung auscultation and chest X-ray. Tracheal cuff pressure was kept between 20 and 30 mmHg. A flow sensor was placed between the vacuum regulating system and the mucus collector. The oral cavity was carefully cleansed from secretions. Intermittent suctioning was performed at a pressure of −125 mmHg with a 25 s interval and duration of 15 s. After 24 h, a CT scan of the tracheal region was performed.

RESULTS. In all patients, secretions could be aspirated for only 2 ± 0.5 s. This was mirrored by a concomitant fast drop in aspiration flow to zero. Air could still be injected without resistance into the Evac lumen, excluding significant mucus plugging of the circuit. When manually aspirating the Evac lumen with a 10-mL syringe, secretions became slightly blood-tinged. Secretions accumulating in the evacuation line underwent important "swinging" movements consistent with a negative pressure impact. Subsequent instillation of antiseptic mouthwash in the oral cavity restored normal aspiration flow and secretion mobility. CT imaging showed marked attraction of tracheal mucosa into the suction lumen in all patients.

CONCLUSIONS. In patients with little oropharyngeal secretions, intermittent subglottic aspiration may result in significant and probably harmful prolapse of tracheal mucosa into the suction lumen. We postulate that a critical amount of fluid must be present in the oral cavity to allow adequate and safe aspiration.

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0857
ENHANCING EARLY CRITICAL ILLNESS RECOVERY THROUGH THE USE OF A 'USER CENTRED CRITICAL CARE DISCHARGE INFORMATION PACK'

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INTRODUCTION. Patients often have little understanding of their stay in critical care and may suffer significant psychological and physical problems [1], factors which impact on their recovery. Effective information has the potential to reduce relocation stress and optimize early critical illness recovery [2].

OBJECTIVES. This pilot study investigated the feasibility and effectiveness of providing patients and their relatives with a 'User Centred Critical Care Discharge Information Pack' (UCCDIP) [3] prior to their transfer to a ward.

METHODS. A single centre cluster (by discharge day) RCT compared outcomes for participants receiving UCCDIP to those receiving either a standard discharge information leaflet or usual practice (ad-hoc verbal information). A questionnaire survey elicited the views and experiences of patients, relatives and nurses, and identified feasibility issues.

RESULTS. Data collection is ongoing until May 2012. To date, 133 of the 1035 patients discharged from one of two critical care units to ward environments (8 August 2011–21 March 2012) have met the inclusion criteria (>72 h in critical care, >18 years, able to read and understand English), and been recruited into one of three study groups. In addition, 74 relatives have agreed to take part.

Current data show no significant differences in Hospital Anxiety and Depression Scores (HADS) between groups, however, participants in the UCCDIP group were sicker, and had a longer ICU stay than those in either other group. Further, many participants were unable to recall the transition period and/or were unaware that they had been given any information regardless of the group to which they were allocated. Despite these challenges, UCCDIP, and in particular a lay discharge summary, written by critical care nurses, was reported to have helped early recovery in 13 (86 %) of those who remembered receiving it.

CONCLUSIONS. Psychological well-being during critical illness recovery is a complex issue, likely to be helped by a variety of interventions. This study sheds light on how to approach one of the key modalities identified in the UK NICE rehabilitation guidelines [2]—the provision of information.

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0858
LOWERING OF SINUSITIS INCIDENCE BY INTRODUCTION OF A SINUSITIS PROPHYLAXIS

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INTRODUCTION. Nosocomial sinusitis is a relatively common complication in mechanically ventilated patients. We decided to prospectively document cases of nosocomial sinusitis in mechanically ventilated patients. After the introduction of a registration system for ventilator associated pneumonia (VAP) we added the registration of nosocomial sinusitis.
OBJECTIVES. To determine the incidence of nosocomial sinusitis in a university centre ICU and to evaluate the effect of a sinusitis prevention program.
METHODS. The incidence of sinusitis was measured during 6 months in 2001 and 2003 by daily review of patient charts by a dedicated ICU infection control nurse. Patients with an ICU stay of at least 48 h were included, with a follow-up of maximally 56 days. Between April 2005 and October 2007, sinusitis registration was performed with a semi-automated registration system linked to the Patient Data Management System (PDMS) of the ICU. In January 2006, a sinusitis prophylaxis program was introduced, which consisted of treatment of all patients with an expected duration of ventilation >48 h with xylomethazoline and fluticasonpropionate. Charts of patients suspect of sinusitis were reviewed and discussed by the infection control nurse with the intensive care physician. Diagnosis of sinusitis was established according to CDC criteria.
RESULTS. In the two six-months periods in 2001 and 2003 the incidence of sinusitis was 7.3 and 6.8 sinusitis/1,000 patient days, respectively. In the period of semi-automated infection registration in 2005 the incidence of sinusitis was 4,5 (first 6 months) and 6,2 (second 6 months) per 1,000 patient days. After introduction of the sinusitis prophylaxis in January 2006, the incidence of sinusitis fell to 1.7 (first 6 months) and 0.7 sinusitis (second 6 months)/1,000 patient days.
CONCLUSIONS. The introduction of nosocomial sinusitis prophylaxis in mechanically ventilated patients lowered the incidence of these infections to almost zero.

Audit & assessment of critical care practice: 0859–0872

0859
OVERESTIMATION OF MORTALITY AFTER APPLYING THE EUROSCORE TO ELDERLY PATIENTS. ANALYSIS OF THE DATABASE ARIAM OF CARDIAC SURGERY

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INTRODUCTION. The EuroSCORE is one of the prognostic scales most commonly used in cardiac surgery, although there are studies that indicate that coull overestimate the risk of death in elderly patients.
OBJECTIVES. Our goal is to analyze whether the risk of death in elderly patients undergoing cardiac surgery is properly quantified by the EuroSCORE.
METHODS. Observational, prospective, multicenter study of patients included in the database ARIAM adult cardiac surgery between March 2008 and March 2011. We analyzed the clinical variables, the surgical variables and the postoperative complications included in the EuroSCORE and the hospital mortality.
RESULTS. We enrolled 4548 patients with an age of 64.10 ± 2.12 years and a EuroSCORE of 5.60 ± 2.95. The hospital mortality was 10.32 %.
The EuroSCORE quantifies age as a continuous variable. Assigs to 59 years or less the value 1 and adds 1 unit on each year, so to 60 years assigns the value 2, etc. We conducted a multivariate analysis with logistic regression. Mortality is the dependent variable and the independent variables are all components of the EuroSCORE (forcing entry into the equation despite there was no statistical significance) getting the *B* coefficient for coded age a value of 0.067 ± 0.008, exactly the same value of coefficient in the original equation. Then we created three new variables of age, following the same model that follows the EuroSCORE to encode the age, but with cut off points at 70, 75 and 80 years, calling them age70, age75 and age80. We repeated the analysis including all components of the EuroSCORE (forcing entry into the equation despite there was no statistical significance) and using the stepwise method we added the variables age70, age75 and age80, becoming part of the model only the variable age75 but not the rest. The *B* coefficient of this equation was 0.087 ± 0.011 for age encoded at EuroSCORE and was -0.112 ± 0.043 for age75. The negative sign means that after 75 years does not increase the surgical risk.
CONCLUSIONS. Our results say that from 59 years old the risk of death after cardiac surgery does not vary equally in all age ranges: increases between 50 and 75 years and from 75 years it does not increase more.
We believe these findings may explain why many authors have found that the EuroSCORE overestimates the risk in elderly patients.

0860
ASSESSING OUTCOME AFTER CRITICAL ILLNESS BY USE OF A NATIONAL INTENSIVE CARE REGISTRY (SIR)

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INTRODUCTION. Sweden has several established quality registries and one of these is the Swedish Intensive care Registry (SIR), established in 2001. Today it comprises of all but two general intensive care units (ICU) in Sweden (n = 83).The Swedish government advocates to include patient reported outcome measures (PROM) variables in such registries, amongst which health-related quality of life (HRQoL) is thought most important. Since 2009 SIR has used the HRQoL questionnaire, SF-36, and registering the patient perceived HRQoL data 2, 6 and 12 months after discharge from ICU together with socioeconomic factors such as employment- and independence before and after the ICU period.
OBJECTIVES. To assess and describe HRQoL data from a nationwide ICU population and depict changes over time up to one year after discharge from the ICU.
METHODS. HRQoL data (SF-36) from SIR where examined at 2, 6, and 12 months after discharge from the intensive care unit (ICU). Data from a random sample of the Swedish population were used as control (n = 10.000). Socioeconomic factors where examined as before the ICU period compared with 2, 6 and 12 months after discharge from the ICU.
RESULTS. Data included 413 patients on all three occasions (mean age 63 years). At 2 months HRQoL were significantly decreased in all 8 dimensions compared with the reference group, with highest difference in the role physical function. HRQoL increased between 2 and 6 months except for the dimension general health (GH). No further increases in HRQoL were registered at 12 months. At 12 months 43.6 % of the patients who had an employment at least more than 50 % before ICU were back to work as compared with only 14.8 % at the 2 months measure. For those patients who were independent before ICU 57.9 % were independent at 2 months and 74.8 % at the 12 months measure.
CONCLUSION. The results show that the decreases in HRQoL, particularly in the role physical function for ICU patients is significant. Less than 50 % are back to work after 12 months and 25 % of the patients who were independent before the critical care are dependent 12 months after discharge. This knowledge is of importance for the development of future intensive care at a national level as well as for the local intensive care unit.

0861
MODIFIED EARLY WARNING SCORE (MEWS) IS A POOR DISCRIMINATOR IN ONCOLOGY PATIENTS OF THE NEED FOR CRITICAL CARE ADMISSION AND 30 DAY MORTALITY

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INTRODUCTION. Track and trigger systems, such as the Modified Early Warning Score (MEWS), have been demonstrated to have some utility in identifying these patients particularly among general medical and surgical patients. Early recognition of acutely unwell Oncology patients at risk of clinical deterioration is important not only to instigate treatment but also to facilitate decisions regarding whether escalation of care and cardiopulmonary resuscitation is appropriate. As continued improvements in Oncology treatment occur these decisions will become more challenging and the demand for Critical Care beds in this cohort is likely to increase.
OBJECTIVES. To determine the effectiveness of MEWS and the proposed NHS early warning score (NEWS) for Oncology patients and aimed to identify the key physiological parameters predicting catastrophic deterioration in this population.
METHODS. We performed a retrospective analysis at a specialist Oncology hospital in England. The outcome measures were Critical Care admission and 30 day mortality. Receiver operator characteristic curves (ROC) were calculated. Logistical regression analysis to identify the key physiological parameters in predicting these two outcomes was also performed.
RESULTS. 840 patients between April 2009 and January 2011 were analysed. Both MEWS and NEWS had poor predictive discriminatory value. The ROC score of MEWS to predict CCU admission was 0.55 and for NEWS was 0.59. The 30 day mortality ROC score of MEWS equalled 0.60 and for NEWS 0.62. The key physiological predictors of both outcomes were respiratory rate, FiO_2, capillary refill time and temperature ($p < 0.01$). Disease group was statistically significant of the need for Critical Care admission ($p < 0.01$).
CONCLUSIONS. MEWS has poor discriminatory value in identifying Oncological patients at risk of deterioration and requiring Critical Care admission. An adapted score more focused upon the key predictive physiological parameters in this population needs to be developed to produce a more effective tool.
REFERENCE(S). Royal College of Physicians. Standardising the assessment of acute illness severity in the NHS: Recommendations for a NHS Early Warning Score (NEWS). March 2011.

0862
EARLY ADMISSION IMPROVES LONG TERM OUTCOME IN PATIENTS DIAGNOSED WITH ACUTE PANCREATITIS ADMITTED TO ICU

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INTRODUCTION. Early admission is related with better outcome in critically ill patients. However, it is not clear if early admission improves the outcome of patients diagnosed with Acute Pancreatitis (AP) admitted to ICU.
OBJECTIVES. Our objective is to study the impact of early ICU admission in patients Acute Pancreatitis on their outcome.
METHODS. We perform a retrospective study. We analyzed patients diagnosed with AP admitted to a 24 beds ICU between January 2000 and December 2009. Post-cardiopulmonary bypass pancreatitis and readmissions were excluded. Early admission (EA) was defined as admission from emergency room (ER). APACHE II at admission, resources consumption, ICU and hospital length of stay and mortality were analyzed and compared between early and late admitted (EA and LA, respectively) patients.
RESULTS. 122 patients diagnosed with AP were admitted to our ICU between January 2000 and December 2009, 31.1 % EA vs. 68.9 % LA. There were no statistically significant differences between both groups in comorbidities (sex: 63.2 % EA men, 71.4 % LA men, p = 0.361; age: 59.7 ± 13.43 vs. 60.88 ± 14.54 years, p = 0.674; heart disease: 21.1 % vs. 15.5 %, p = 0.450; hepatic disease: 0 % vs. 8.3 %, p = 0.067, respiratory disease: 13.2 % vs. 13.1 %, p = 0.992; chronic renal insufficiency: 10.5 % vs. 8.3 %, p = 0.695; malignancy: 2.6 % vs. 14.3 %, p = 0.053), etiology (39.5 % EA biliary vs. 52.4 % LA, p = 0.186) or severity (APACHE II: 17.88 ± 7.40 vs. 15.57 ± 7.68, p = 0.149). 68.4 % EA and 56.0 % LA (p = 0.193) had no organ dysfunction at admission. 52.6 % EA and 48.8 % LA (p = 0.696) needed vasopressors (mean duration: 89.4 ± 62.7 vs. 105.66 ± 98.97 h, p = 0.505). 57.9 % EA and 56.0 % LA (p = 0.841) needed mechanical ventilation (mean duration: 15.23 ± 16.83 vs. 19.52 ± 21.82 days, p = 0.419). 44.7 % EA and 36.9 % LA (p = 0.412) needed renal replacement (mean duration: 7.73 ± 7.58 vs. 11.43 ± 14.18, p = 0.325). ICU LOS was 15.81 ± 18.54 days in EA vs. 17.5 ± 22.98 in LA (p = 0.692), hospital LOS: EA: 37.26 ± 32.54 days vs. LA: 49.10 ± 49.96 (p = 0.184). ICU mortality: 18.4 % EA vs. 33.3 % LA (0.092), hospital mortality: 23.7 % EA vs. 45.2 % LA (p = 0.023), 6-months mortality: 24.3 % EA vs. 45.7 % (p = 0.027), 1-year mortality: 27.0 % EA vs. 48.1 % LA, (p = 0.031).
CONCLUSIONS. There are not differences between comorbidities and AP etiology of EA and LA patients. EA patients have a slightly higher admission APACHE II, but a similar need for organ support with a trend to a shorter duration of support (catecholamines, mechanical ventilation, and renal replacement) and hospital LOS. EA patients have a lower hospitalary, 6 months and 1 year mortality.

0863
AN AUDIT ON VENOUS THROMBOEMBOLISM PROPHYLAXIS PRESCRIPTION IN HIGH RISK PATIENTS

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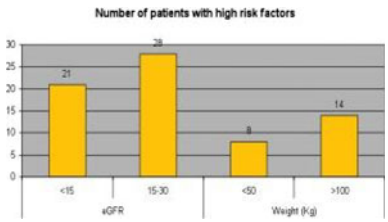
INTRODUCTION. Homerton University Hospital is situated in East London within a low socioeconomic area where there is a high prevalence of obesity and chronic illness. The purpose of our audit was to review all pharmacological prescriptions for venous thromboembolism (VTE) prophylaxis in intensive care patients with extremes of body weight (<50 or >100 kg) and in patients with renal dysfunction, as defined by an estimated glomerular filtration rate (eGFR) of 15–30 or <15 ml/min/1.73 m^2. The prescription doses were based on the hospital's VTE prophylaxis guidelines, as detailed in.

Our Hospital VTE prophylaxis prescription guide

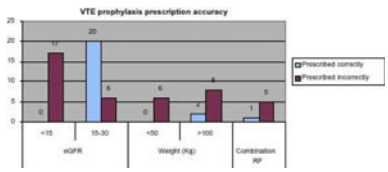
Weight	<50 kg	50–100 kg	>100 kg
eGFR < 15 ml/min/ 1.73m2	Enoxaparin 20 mg od or Unfractionated Heparin (UFH) 5000 units bd	UFH 5000 units bd	Enoxaparin 20 mg bd or UFH 7500units or UFH 10,000 units bd
eGFR 15–30 ml/min/ 1.73m2	Enoxaparin 20 mg od	Enoxaparin 20 mg od	Enoxaparin 20 mg bd

OBJECTIVES. Whether VTE prophylaxis in patients with eGFR <30 ml/min/1.73 m^2 and or weigh >100 kg or <50 kg were prescribed correctly.
METHODS. We performed a retrospective analysis of all critical care VTE chemoprophylaxis prescriptions from August 2010 to September 2011.
RESULTS. We identified 122 high risk patients, 65 were prescribed VTE prophylaxis. Of these, 8 (12 %) had a weight <50 kg and 14 (22 %) had a weight >100 kg. Abnormal renal function was present in 49 patients, 21 patients (32 %) had an eGFR <15 and 28 (43 %) had an eGFR between 15–30. Of all the patients prescribed VTE prophylaxis, 6 had a combination of high risk factors; 2 patients had both a weight <50 kg and an eGFR <15, 2 patients had a weight >100 kg and an eGFR <15 and 2 patients had a weight >100 kg and an eGFR of 15–30.



Number of patients with high risk factors

Of 65 high risk patients, only 23 (35 %) had the correct dose prescribed. Patients with a weight >100 kg and normal renal function, 2 patients (20 %) had the correct dose prescribed. For those with a weight >100 kg and renal dysfunction, patients who weighed <50 kg, and patient with normal weight and an eGFR <15 had inappropriate dosing for VTE prophylaxis. However for the patients with an eGFR <15 and weight <50 kg 1 patient (50 %) was prescribed the correct dose.



VTE prophylaxis prescription accuracy

CONCLUSIONS. The percentage of correct prescriptions was lower than expected, only 35 % of prescriptions for high risk patients were correct. This can be expected, as most doctors are aware that a dose reduction is required when a patient's renal function becomes impaired. Correct prescription rates were low for all of the other high risk factors, suggesting that most doctors are unaware of hospital guidelines for dosing in patients with the extremes of weight or with severe renal impairment. However, this may also represent a lack of national guidelines and large research trials on this subject.
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0864
CHANGING PATTERNS OF CRITICAL INCIDENTS IN A UK HOSPITAL CRITICAL CARE UNIT: 2010–2012

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INTRODUCTION. A critical incident is 'any event or circumstance that caused or could have caused unplanned harm, suffering, loss or damage[1]. Chester Hospital Critical Care Unit has eight High Dependency (level 2) and up to six Intensive Care (level 3) beds, with approximately 750 High Dependency and 250 Intensive Care admissions per annum. Critical incidents are recorded online using 'DatixWeb', then reviewed, analysed and actioned by risk management, parent speciality and critical care teams.
OBJECTIVES. To analyse the frequency, severity and type of critical incidents in our Critical Care Unit.
METHODS. A list of all critical incidents reported from the Critical Care Unit at Chester Hospital between 1st April 2010 and 29th February 2012 was obtained. These were then categorised according to potential harm and category as suggested by the National Patient Safety Agency (NPSA) [1, 2].
RESULTS. A total of 641 critical incidents were reported (15 % near miss, 27 % insignificant, 39 % minor, 19 % moderate and no major or catastrophic events).

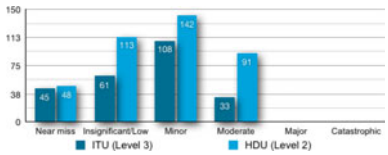

Figure 1 Incidents According To Potential Harm

Top five incident types were related to infection control (18 %), infrastructure (13 %), pressure sores (13 %), medication (12 %) and disruptive behaviour or organic confusion from the patient (7 %).

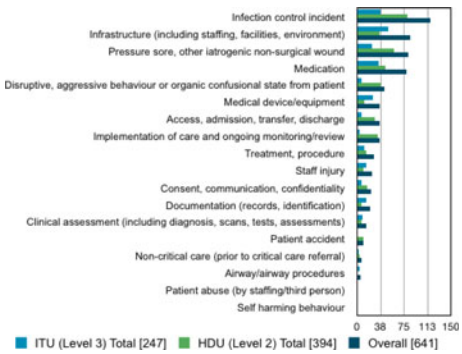

Figure 2 Incidents According To NPSA Category

CONCLUSIONS. Critical incident identification and reporting is increasing in our unit; approximately one incident is reported per three patients. The majority are near misses or have insignificant or minor harm.
Analysis of our data over time reveals changing themes. Following actioning of incidents regarding transfers with inadequately labelled intravenous infusions, no such events have re-occurred. Similar results have been demonstrated following introduction of protocols for nasogastric tube insertion, identification of correct tube placement and improved documentation, secondary to a previous major incident and 'table-top' meeting. Future reviews should hopefully identify fewer medication incidents following recent implementation of electronic prescribing within our unit [3].
A key factor noted on reviewing this data was that the potential harm score assigned by reporters (clinical staff) is too subjective. We recommend that severity should be re-categorised by an independent person post-report.
Lastly, it is important to recognise that safety improvements occur following analysis and implementation of system changes, not simply by critical incident reporting.
REFERENCES. 1. Intensive Care Society Standards. Standards for critical incident reporting in critical care, 2005. 2. Thomas AN, Panchagnula U, Taylor RJ. Review of patient safety incidents submitted from Critical Care Units in England & Wales to the UK National Patient Safety Agency. Anaesthesia. 2009;64(11):1178–85. 3. Ammenwerth E, Schnell-Inderst P, Machan C et al. The effect of electronic prescribing on medication errors and adverse drug events: a systematic review. J Am Med Inform Assoc. 2008;15(5):585–600.

0865
CHEST X RAY INDICATIONS AND DOCUMENTATION IN INTENSIVE CARE: REAUDIT AND PROGRESS

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INTRODUCTION. Chest X-ray (CXR) is a commonly used imaging modality in the intensive care unit (ITU). Its roles include confirming correct placement of vascular lines, endotracheal and feeding tubes and as an investigative tool. Accurate documentation [1] of the CXR indication and subsequent review by a qualified professional is strongly advised. Recently, with regards to enteral feeding tube insertion, the National Patient Safety Agency has issued recommendations to enhance patient safety and avoid never events [2]. Here we present findings of our re-audit evaluating the use and documentation of CXRs in the ITU, completing the audit cycle from our initial 2010 study.
OBJECTIVES. 1. To determine the extent of CXR indication evidence and documentation. 2. To assess the degree and quality of CXR reviewing. 3. To assess the time taken for formal CXR reporting.
METHODS. Data was collected prospectively on 24 ITU patients over a 3 month period (December 2011–March 2012). The iCM system (investigation requesting software) was used to review the indications. The CDA system (electronic record archive) was used to obtain the time of reporting. Patient notes were analysed for the evidence and quality of documentation following the CXRs.
RESULTS. 110 CXRs were reviewed during our data collection period. Of the indications for CXR, acute clinical deterioration (30 %) and confirmation of feeding tubes (28 %) were the most common reasons. This is consistent with the 2010 audit in which 49 patients with 118 CXR documentations were analysed. In that audit, 57 % of the CXRs were undocumented in the notes. Since the 2010 audit, the introduction of electronic prescribing resulted in all CXRs audited in 2012 having substantial electronic evidence of the indications on

iCM, with fewer than 11 % having no indication documented in the notes. As a consequence of the 2010 audit, the use of a stamp in the patient notes to aid and prompt documentation has resulted in 72 % of CXRs having documented evidence of a review compared with only 43 % in 2010. Foundation year two doctors most commonly documented CXR reviews. In 2010, 32 % of the CXRs were unreported by radiology. In 2012, the time until the official radiology report was available varied considerably (range 1–47 days).
CONCLUSIONS. An improvement in CXR reviewing and documentation was highlighted in comparison to 2010. We suggest organising a radiologist to report ITU CXRs on a daily basis. This would improve patient care by minimising reporter errors and also form the basis for a teaching module. Subsequent to the 2012 reaudit, a sticker has been introduced to confirm and document safe placement of enteral feeding tubes.
REFERENCE(S). 1. Good Medical Practice: Providing good clinical care. GMC. 2009. 2. Patient Safety Alert NPSA/2011/PSA002: Reducing the harm caused by misplaced nasogastric feeding tubes. National Patient Safety Agency 2011.

0866
TRANSFUSION PRACTICE IN THE INTENSIVE CARE UNIT

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INTRODUCTION. More than 35 % of critically ill patients receive a transfusion of blood components during their ICU stay. These transfusions should be aimed at increasing oxygen consumption and/or to diminish blood loss in bleeding patients. However many patients may receive unnecessary transfusions, which are not risk-free interventions.
OBJECTIVES. The aims of our study were to describe current transfusion practices in a medical surgical ICU.
METHODS. We conducted a prospective, single-center, observational study of all patients sequentially admitted to ICU from January to March 2011. Patient with acute ischemic heart disease, post cardiac surgery and trauma were excluded. Demographic and clinical data including severity of illness at ICU admission, primary ICU admitting diagnosis, threshold and consumption of blood products, complications and mortality during ICU stay was collected. Descriptive analysis of the results was performed using SPSS 18. Incidence of inadequate transfusion was estimated following Spanish Society of Critical Care (SEMICYUC) 2006 indicators for appropriate elective blood transfusion.
RESULTS. A total of 90 patients admitted to the ICU were included. 41 patients (45.56 %) received at least 1 unit of blood components. 70.1 % were bleeding at the time of the transfusion while 29.9 % were electively transfused. None bleeding patients had a mean pretransfusion hemoglobin of 7.0 ± 0.7 g/dl, mean threshold for platelet concentrate transfusion (PCT) of $44 \times 10^3 \pm 28 \times 10^3$ cell/ml and a mean activated partial thromboplastin time of 53 ± 13 s. The overall incidence of inadequate transfusion episodes of red blood cells (RBC) was 4.5 %, reaching 6.9 % in septic patients. A mean of 2 RBC units were transfused per patient. The overall incidence of inadequate PCT was 2.9 %. The overall incidence of inadequate fresh-frozen plasma was 0 %.
CONCLUSIONS. RBC transfusion in septic patients and PCT in none bleeding did not meet published SEMICYUC criteria. Although an important percentage of current recommendations are followed, there are areas that may be improved by the application of a transfusion protocol based on evidence.
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0867
EFFECTIVE EYE CARE PREVENTS CORNEAL COMPLICATION IN VENTILATED PATIENTS IN MEDICAL INTENSIVE CARE UNIT

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INTRODUCTION. Eye care is an important part of ICU care. The ICU presents an environment which lead to exposure of the ocular surface to mechanical injury, microorganisms in ventilated patients. Meticulous eye care is required to minimize the development of iatrogenic corneal complications.
OBJECTIVES. To observe the comparison of old and new practice of corneal care in terms of safety and reduction in corneal complication in ventilated patients.
METHODS. This study was done in two phases. First six month of phase-one study period, the current ongoing practice of corneal care was observed. New practice guideline was introduced that include open chamber care for ocular surface in the unit. All nursing staffs were educated and make compliant with this new policy. Follow-up audit was done after six month for monitoring the effectiveness of eye care.
RESULTS. In first phase of audit, number of ventilated patients was 40. Total ventilator days were 240 in this period. The total rate of corneal complications was 72 out of 1000 ventilator days. Rate of corneal dryness was 40, haziness and ulceration was 16 per 1000 ventilator days. In second phase, number of ventilated patients was 91. Total ventilator days were 1114. Total rate of corneal complications was significantly reduced to 6.28. Likewise, rate of corneal dryness 2.69, haziness and ulceration was 1.79 each.
CONCLUSIONS. Protocolled eye care can reduce the risk of ocular surface complications in ventilated patients.

0868
SEQUENTIAL AUDIT OF VENTILATOR CARE BUNDLE COMPLIANCE IN A UK GENERAL ICU

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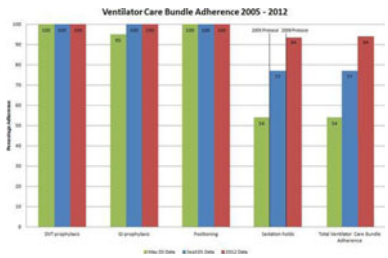
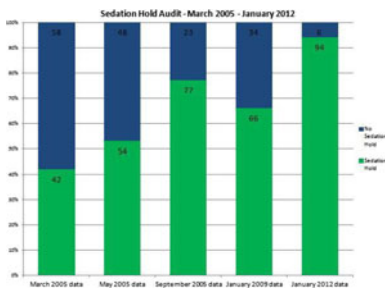
INTRODUCTION. Use of the ventilator care bundle has been shown to significantly reduce the number of days ventilated and the length of patient stay on the Intensive Care Unit. Its use is associated with a reduction of the incidence of ventilator-associated pneumonia. The ventilator care bundle was introduced into the intensive care unit of a large UK General hospital in 2003. Sequential audit of its use is presented in this paper [1–3].
OBJECTIVES. Three audits done over a period of 7 years looked at adherence to the ventilator care bundle, with two further audits looking at sedation holds alone. Compliance to the ventilator care bundle should be 100 % for all mechanically ventilated patients on the ICU.
METHODS. The ventilator care bundle consists of four components: • Deep vein thrombosis prophylaxis. • GI haemorrhage prophylaxis. • Daily cessation of sedation (sedation hold). • Elevation of the patient's head and chest to 30°. In keeping with standard bundle approach an item was considered complete if either in place or excluded by a local exclusion. A total of 440 ventilated patient days were audited over a 7 year period.
RESULTS.



Ventilator Care Bundle Adherence 2005–2012

There has been an improvement in total ventilator care bundle adherence from 2005 to 2012. As sedation holds were found to have the poorest compliance, sedation protocols were introduced after both the 2005 and the 2009 audits. As a result of this, there has been an improvement in the management of sedation and therefore overall adherence to the bundle.



Sedation Hold Audit March 2005–Jan 2012

CONCLUSIONS. The audits undertaken over the 7 year period have shown improvement in adherence to the ventilator care bundle. The identification of problems with sedation holds, implementation of new sedation protocols and staff education have all had a positive impact on compliance, and therefore on patient care.
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0869
CAN A CERTIFIED INTENSIVIST AND ICU RENOVATION IMPROVE PATIENT OUTCOMES AFTER CARDIAC SURGERY?

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INTRODUCTION. Adequate intensive care after cardiac surgery is needed to improve clinical outcomes. Our ICU was renovated and a certified intensivist began working on June 1, 2009. We compared patients' outcomes before and after the renovation to estimate what factors contributed to outcome differences.
OBJECTIVE. Can a certified intensivist and ICU renovation improve patients' outcomes after cardiac surgery?
METHODS. Patients' clinical data after elective cardiac surgery were retrospectively compared between one-year periods before and after ICU renovation. Patients receiving hemodialysis or second operations for surgical complications were excluded. After renovation, patient care was changed from surgeon-led care (open ICU) to combined care by surgeons and an intensivist (semi-closed ICU). Respiratory care for intubated patients with respiratory failure was changed from low PEEP (<5 cmH2O) and high FiO_2 to adequate PEEP (> 5 cm H2O) and FiO_2 with recruitment maneuvers. Respiratory care for patients after extubation was also changed by using NPPV. Sedation for patients on ventilators was changed from sedative only to sedative with analgesic. The intensivist, assigned to the anesthesiology department, initiated education for residents on anesthesiology and ICU nursing staff, primarily on respiratory care. ICU facilities were renovated by increasing beds from 4 to 6, and adding 14

high care unit beds as transition beds to general wards. Primary endpoints were days on oxygen and hospital stays after surgery. Secondary endpoints were ventilation days and ICU stays.
RESULTS. Of 247 patients who underwent cardiac surgery during the two-year study period, 75 met the inclusion criteria (before, n = 40 vs. after, n = 35). Thirty-two patients had off-pump CABG surgeries (OPCAB: n = 19 vs. 13), and 43 had valve replacements (VALVE: n = 21 vs. 22). EURO scores, duration of cardio-pulmonary bypass (CPB), and APACHE II scores did not differ between groups. There were no significant differences in days on oxygen (all: 6.6 vs. 7.2; OPCAB: 5.7 vs. 6.7; VALVE: 7.4 vs. 7.5) and hospital stays after surgery (26.6 vs. 24.8 days; 25.8 vs. 25.9 days; 27.3 vs. 24.1 days, respectively). Ventilation days did not differ before and after renovation; however, ICU stays were significantly longer after renovation (4.1 vs. 5.1 days; p = 0.016). For patients who had valve replacements and had respiratory failure (P/F < 250) at ICU admission (n = 5 vs. 12), days on oxygen after surgery tended to be fewer (12.8 vs. 7.8; p = 0.15), hospital stays after surgery were significantly shorter (34.0 vs. 21.9 days; p = 0.005), and ICU stays were longer (3.6 vs. 5.8 days) after renovation; however, ventilation days were not different (2.8 vs. 2.6).
CONCLUSIONS. Respiratory management by a intensivist and renovating ICU facilities may contribute to improve patients' outcomes after cardiac surgery, particularly those with severe conditions like respiratory failure after CPB.
GRANT ACKNOWLEDGMENT. No conflicts of interest.

0870
CRITICAL CARE FACTORS AFFECTING POST OPERATIVE MORTALITY IN ABDOMINAL AORTIC ANEURYSMS(AAA): A FIVE YEAR RETROSPECTIVE ANALYSIS

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INTRODUCTION. In June 2010, a major freedom of information trawl by leading U.K newspaper, Guardian [1] found the death rates around the country subsequent to AAA surgery very variable with the national average of 4 %.The mortality rates were lower in well equipped centres with multidisciplinary team input.
OBJECTIVES. There are several scoring systems to predict mortality after AAA surgeries. Our objective was to ascertain critical care factors affecting outcome in our institution.
METHODS. Retrospective analysis of 99 patients admitted to Intensive Care Unit (ICU) post repair of AAA over 5 years (2006–2010). Data collected included the nature of admission (planned or emergency), underlying cause(rupture/dissection/traumatic or leaking); APACHE II probability, APACHE II scoring, number of organ systems supported; LOS and Mortality in ICU and Hospital. The descriptive characteristics of the sample were stratified by outcome.
RESULTS. Sex distribution did not vary between groups (dead and alive) however the deceased group was five years older (76.86 years vs. 72.00) and had greater proportion of emergency surgeries. There were more AAA ruptures, aortic or iliac and traumatic dissections/ruptures in deceased group and when collapsed across conditions, a significantly higher proportion of ruptured aneurysms were seen in the deceased group (42.9 vs. 15.3 %).APACHE II scores were significantly higher on average for those who died (19.93 vs. 13.89).Patients who ultimately died had more organs supported (2.64 vs. 1.73 organs) and were on ICU for longer duration (16.71 vs. 6.88 days) than patients who survived. Total days in hospital did not differ between groups. Independent samples *t* tests were used to assess whether there were differences in each continuous variable according to outcome. Chi-square tests of independence were used for categorical variables. Data were analyzed using logistic regression. Inspection of individual parameter estimates revealed that only APACHE II score was a significant individual predictor of mortality (p < 0.05) which had an odds ratio of 1.24. The estimates for having ruptured aneurysm, number of organs supported and ICU LOS were all non-significant.
CONCLUSIONS. Though various scoring systems such as POSSUM, SAPS II, Hardman′s Index, Glasgow Aneurysm Score, Vancouver and APACHE II-AAA exist, APACHE II scores predicted the mortality after AAA surgery in our population. Other factors such as ruptured aneurysm, number of organs supported, and ICU LOS were all non-significant. The mortality rates in our hospital were average compared to hospitals across England.
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0871
H1N1: ONE YEAR FOLLOW UP STUDY

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INTRODUCTION. Twelve patients were admitted to our ICU with H1N1 infection in December 2010/January 2011. All required respiratory support; ten required invasive ventilation and four patients received HFOV. Three patients went on to receive ECMO. Six required renal replacement therapy. All survived and were discharged home after prolonged ICU stay.
OBJECTIVES. There are studies looking at the respiratory [1–3] and neurocognitive [3, 4] functions of survivors of ARDS. These studies showed reduced neurocognitive with a definitive reduction in the quality of life and restrictive lung function changes.
This is a prospective study, evaluating the respiratory, cardiac, renal function, neurocognitive assay and the quality of life in this cohort of patients after a year of H1N1 infection. Most of these patients were young or middle aged with no prior intensive care admissions before the influenza infection.
METHODS. After ethical approval, we sent letters with information leaflets and requested them to attend our clinic. In the clinic they were assessed by performing pulmonary function testing, 6 min walk test, pulse oximetry, blood pressure, ECG, chest X-ray, echocardiography, neurocognitive and psychological assays and CT thorax.
RESULTS. Seven patients participated in our study. All patients had normal renal function based on blood urea and electrolytes. Two out of the seven had reduced respiratory and cardiac functions. Nobody suffered from depression. Two had slightly reduced neurocognitive functions and three had decreased feeling of well being. Four out of seven had gone back to work within the preceding 6 months.
CONCLUSIONS. This is a small follow up study of a sick cohort of patients with HINI. Given the initial severity of their respiratory function we were pleased that this small group did not seem to suffer chronic respiratory disease. Renal recovery was within our expectation. These seven patients did not show marked decrease in their vital functions and quality of their life. A larger cohort or a nation wide study is needed to outline if any, significant residual effects exist as a sequel of H1N1 infection.
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0872
A SERVICE ANALYSIS OF ROUTINE PATHOLOGY INVESTIGATIONS ON A CRITICAL CARE UNIT

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INTRODUCTION. The UK's NHS must become more efficient whilst continuing to deliver the highest quality of care. Our practise must be scrutinized to ensure we minimise waste without compromising our patient's needs. Our critical care unit uses a profile of routine blood tests, which are performed daily on all patients. This enables routine bloods to be sent without delay to ensure results are available for medical review early in the day. However this practise can cause a number of tests to be done unnecessarily. We wanted to reduce unwarranted investigations to reduce cost to the department and prevent misleading results from altering patient management.
OBJECTIVES. To rationalize our routine blood test ordering, and thereby improve cost effectiveness and ensure patient safety by preventing inappropriate investigations.
METHODS. We used a two-week period to document all routine blood tests that were ordered on all patients admitted to our critical care unit and calculated the cost of these. We used this data to extrapolate the cost of our routine blood ordering for the year. We correlated the tests we ordered with those that we felt were required for the ongoing management of the patients. We were able to identify certain tests that if performed routinely on all patients rarely added to patient management and others that were only required by the sickest patients. We developed two profiles one for those patients receiving level three care and one for those receiving lower levels of care.
RESULTS. The cost to our institution for our routine blood profile was £48.92. This can be extrapolated into a predicted yearly cost of £217 000 based on the data from our two week collection period. By removing amylase, LDH and AST from the level three profile we reduced the cost to £41.39. For the level two profile we removed clotting, CRP, urinary creatinine, amylase, LDH and AST and were able to reduce the cost to £22.87. This reduced the yearly predicted cost of routine pathology ordering to £150 000 a saving of 31 %.
CONCLUSIONS. We have developed two new profiles for routine blood test ordering: one for level three patients and one for patients receiving lower levels of care. We predict that this will reduce the amount our unit spends on routine pathology by up to 31 % and reduce the risk to our patients by preventing unnecessary investigations. We understand that routine pathology ordering cannot be absolute and that the individual needs of the patient must be considered on a daily basis whilst being managed on a critical care unit.

Oral Sessions
ARDS: Defining, monitoring and outcome: 0873–0877

0873
IMPACT OF INFLAMMATION BIOMARKERS ON THE ARDS DEFINITION

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INTRODUCTION. ARDS has a clinical definition according to the criteria of the American-European Consensus Conference (1994). This definition inconveniently applies to a lot of patients with acute respiratory failure. Lung morphology in ARDS influences response to PEEP and recruitment maneuvers [1, 2]. Our group had recently shown that only patients with non-focal ARDS had an increased sRAGE level, biomarker of type I lung cell[3].
OBJECTIVES. The objective of this study was to compare plasmatic concentrations of biomarkers specific to the lung injury in ARDS according to CT-Scan lung morphologies: focal (F) and non-focal (NF).
METHODS. Prospective, multicenter, observational study including patients with ARDS. Plasmatic levels of sRAGE, PAI-1, sICAM-1 and SP-D and a chest CT scan were performed within 24 h after diagnosis of ARDS. The ARDS were classified as F or NF. The primary endpoint was the comparison of plasma concentrations of these 4 biomarkers between the two lung morphologies. The secondary endpoints were the comparison of two groups in duration of mechanical ventilation and mortality at D28 and D90.
RESULTS. 119 patients were included from November 2010 to August 2011. 28 % of patients had a focal form of ARDS and 72 % a non-focal. General characteristics of patients were comparable between the F and NF groups. Plasma concentrations of sRAGE and PAI-1 were higher in the NF group than in group F (Respectively, 3695 ± 2788 pg/ml and 13.3 ± 17 ng/ml vs. 1024 ± 959 pg/ml and 8.9 ± 19 ng/ml, p = 0.0001 and p = 0.03), independently of the sepsis. The ROC curve of sRAGE predicted the focal or non-focal ARDS for a cut-off of 1188 pg/ml with Se of 94 % and Sp of 89 % (AUC 0.928, [95 % CI : 0.85–1.0]). Plasma concentrations of sICAM-1 and SP-D were comparable between the 2 groups. sICAM-1 was also statistically different between septic and non septic patients (p = 0.02). The duration of mechanical ventilation was 10 (6–18.5) days in group F and 11 (5–20) days in the NF group but was not statistically significant. Mortality at day 28 and day 90 was greater in group NF than in group F (34 and 48 vs. 11 and 23 %, p = 0.02 and p = 0.04). Moreover, plasmatic levels of sRAGE were higher in nonsurvivors than in survivors at D90 (p = 0.04).
CONCLUSIONS. Only patients with NF lung morphology have an increase in sRAGE levels associated with endothelial damage (PAI-1), as described in ARDS pathophysiology. sRAGE fit very well with 90 day mortality. Patients with F lung morphology respond probably to another type of lung injury. Due to the impact in terms of management of these patients, lung morphology and/or sRAGE should be taken in account in design of future clinical trials and recommendations for ventilator setting.

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GRANT ACKNOWLEDGMENT. Grant from the University Hospital of Clermont-Ferrand, France.

0874
MINIMALLY INVASIVE SHUNT ESTIMATION USING VOLUMETRIC CAPNOGRAPHY

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INTRODUCTION. Shunt is one of the most important variables for assessing lung function. For its calculation a simultaneous arterial and mixed venous blood samples are required which restricts its use in most patients. An estimation of shunt could theoretically be obtained using variables derived from volumetric capnography (VCap) avoiding the need of mixed venous gases.

OBJECTIVE. To compare the performance of two different methods for the estimation of shunt using VCap derived parameters with the classical shunt calculation.

METHODS. Retrospective analysis of pooled data from different studies using an experimental model of acute lung injury (ALI) including a total of 48 pigs. A wide range of shunt levels were obtained by using different levels of PEEP before and after lung recruitment. After several minutes of stabilization at every PEEP step a set of data was obtained including arterial and venous blood gases, VCap variables and cardiac output (Qt). We evaluated two VCap derived methods for shunt estimation: 1) The dead space fraction due to shunt (VDS) calculated as $(PaCO_2\text{-}PACO_2)/PaCO_2$) where $PACO_2$ is the mean alveolar partial pressure of CO_2 obtained from the mid portion of phase III of the capnogram, and 2) The VCap Shunt (VCS) derived from the classical shunt formula expressed as a function of CO_2 content obtained from a modification of an equation proposed by Mecikalski et al [1] as $\{SQt(PaCO_2\text{-}PACO2)\}/\{SQt(PaCO_2\text{-}PACO_2)\text{-}VCO_2\}$ where S is the CO_2 solubility and VCO_2 is the CO_2 production per minute. We compared the different VCap shunt estimation with the classical shunt estimation using the arterial, venous and capillary oxygen content.

RESULTS. Both formulas had a good correlation and agreement with the CS that was highest for VCS (Table 1, Fig 1). Performance of the VCap methods tended to overestimate the CS value at low shunt levels and VDS to underestimate it at very high shunt levels (Figure 2).

CONCLUSIONS. The two VCap derived methods to estimate shunt performed as good as the CS over a wide range of conditions. If confirmed in prospective studies this minimally invasive estimation of shunt requiring VCap and an arterial blood sample could become a useful clinical tool.

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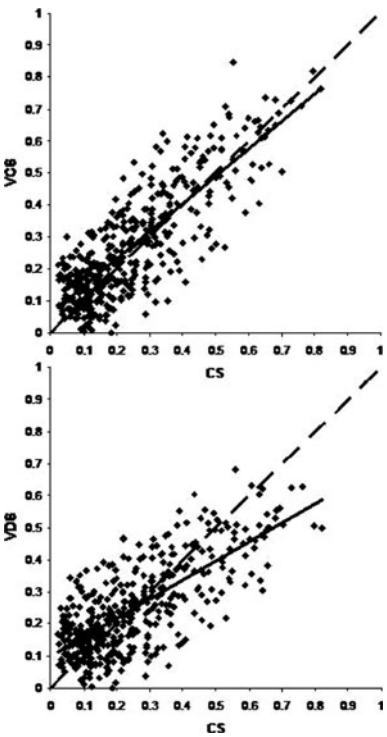
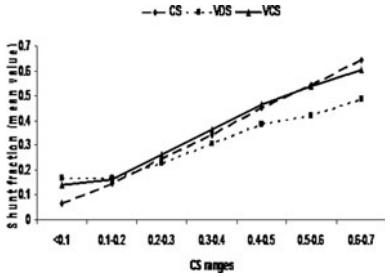
Comparison of VDS and VCS against CS

	r	bias	Limits of agreement	p	Regression equation
VDS	0.73	0.00	−0.23 to 0.23	<0.00	y = 0.595x + 0.097
VCS	0.83	0.02	−0.18 to 0.22	<0.00	y = 0.8615x + 0.058



Correlation of VDS and VCS against classical shunt



Comparison of shunt esimation methods

0875
VENTILATORY RATIO A BEDSIDE TOOL TO MONITOR VENTILATORY EFFICIENCY- PHYSIOLOGICAL ANALYSIS AND CLINICAL USE IN ARDSNET DATABASE

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INTRODUCTION. Deadspace ventilation has repeatedly been shown as a useful predictor of mortality in ARDS [1, 2]. Due to the difficulties associated with its measurement deadspace is seldom used in ICU practice. Ventilatory Ratio (VR) a new bedside index has been described to monitor ventilatory efficiency using commonly collected variables. $VR = (V[dot]_{E\ measured} \times PaCO_{2\ measured})/(V[dot]_{E\ predicted} \times PaCO_{2\ ideal})$ where $V[dot]_{E\ predicted}$ is 100 $ml.Kg^{-1}.min^{-1}$ of predicted body weight and $PaCO_{2ideal}$ is 5 kPa. Physiological analysis shows that VR is influenced by physiological dead space and CO_2 production ($V[dot]CO_2$) [3].

OBJECTIVES. To validate the physiological analysis of VR in an ICU population and to examine its clinical use in an ARDS population.

METHODS. Prospective observational study in 48 mechanically ventilated ICU patients. Daily simultaneous readings were made of $V[dot]CO_2$, $V_D/V_{T\ phys}$, and VR to assess the influence of the 2 variables on VR in various modes of ventilation. Secondary analysis of multicentre prospectively collected ARDSnet database was used to examine the clinical use of VR. Database contained information on demographics, aetiology of lung injury, shock, APACHE III score, and mortality outcomes. VR was calculated for all patients.

RESULTS. Validation Study: In 168 pooled data readings there was significant positive correlation between VR and $V_D/V_{T\ phys}$ (modified $r_p = 0.71$) but poor correlation with ($V[dot]CO_2$)($r_p = 0.14$). The correlation in the 2 variables was stronger in patients in mandatory modes of ventilation (modified $r_p = 0.76$). Linear regression modeling showed VR is influenced by $V[dot]CO_2$ and $V_D/V_{T\ phys}$, with the latter exerting more of an influence on VR in the model. VR showed good concordance with ordinal categories of $V_D/V_{T\ phys}$. Clinical study: Mean values for VR was significantly higher in the non-survivors(2.07 CI 2.00–2.15) compared to the survivors(1.96, CI 1.92–2.00; $p = 0.01$). Univariate analysis showed an increase in VR was associated with increased mortality at day 1 (OR 1.18; CI 1.04–1.35), day 2 (OR 1.33; CI 1.16–1.53) and day 3 (OR 1.39; CI 1.22–1.60). At day 2 and 3 VR independently predicted mortality after adjusting for APACHE score and shock. Adjusting for 6 respiratory variables in a multivariable logistic regression model VR remained independently associated with increased mortality (OR 1.43). Ordinal groups with higher VR appear to be significantly associated with increased mortality (Chi^2 for trends; Day 1 $p = 0.05$; Day 3 $p < 0.01$). Positive predictive value for in-hospital mortality for those patients in whom there was an increase in VR between day 1 and day 3 was 57.6 %.

CONCLUSIONS. VR is a simple bedside tool to monitor ventilatory efficiency at the bedside. It is influenced by dead space and CO_2 production. VR is an idependent predictor of moratlity and a rising value of VR is associated with increased mortality.

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0876
QUANTIFICATION OF DEAD SPACE AS A PREDICTOR OF MORTALITY IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME IN EARLY STAGE

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OBJECTIVE. To evaluate if the quantification of physiologic dead space (Vd) expressed as a percentage of tidal volume (Vd/Vt) or related to patients predicted body weight (PBW) measured in the early phase of acute respiratory distress syndrome (ARDS) may be a useful tool to predict ICU mortality.

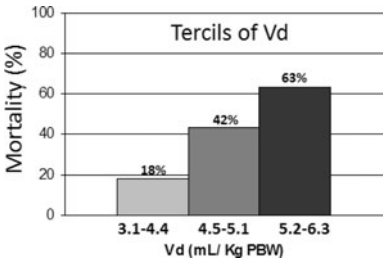
METHODS. It is a prospective open clinical study including patients who met the ARDS criteria of the American-European conference [1]. All of them invasively ventilated for less than 72 h. The baseline ventilatory settings were selected by their physician as our clinical routine practice. We collected expired gas directly from the expiratory port of the ventilator with the Douglas bag during 3 min, and measuring the concentration of CO_2 by the analyzer Radiometer ABL815Flex. For the Vd/Vt calculation we use the modified Bohr equation by Enghoff: $Vd/Vt = (PaCO_2\text{-}PECO_2)/PaCO_2$ [2]. The values of Vd/Vt were expressed as a percentage and in mL/kg of PBW, using the following formulas: [men 50 + (0.91 × (cm-152. 4); women 45.5 + (0.91 × (cm-152. 4)]. We also obtained demographic data, SAPS II, clinical, respiratory, blood gas and hemodynamic parameters. Results are expressed as mean ± standard deviation and percentages.

RESULTS. We included 33 patients with ARDS (pulmonary: 58 %, extrapulmonary: 42 %), aged 55.4 ± 16 years (18 men/15 women), SAPS II 57 ± 15; studied at 32 ± 21 h of ventilation, with a PaO_2/FiO_2 127 ± 40. Overall mortality in the ICU was 39 %. All variables were compared between patients who died and those who did not. No significant differences were observed in terms of SAPS II, type of ARDS, or other variables. The Vd expressed in mL/Kg PBW mostrated significant differences between both groups (Table).

The ROC curve of the Vd as a predictor of mortality showed an area under the curve of 0.725 ($p = 0.031$), with a sensitivity of 85 % and a specificity of 50 % for values of Vd > 4.5 mL/kg PBW; the relative risk of death over this value was 1.69 (CI 1.03 to 2.78, $p = 0.043$). The figure shows the observed mortality grouped by tercils of Vd (mL/kg PBW).
CONCLUSION. The measure of Vd adjusted to the PBW is a useful and noninvasive tool to predict mortality of ARDS patients in the early phase of mechanical ventilation.

Variables (Death-Alive)

Variable	Alive N = 20	Death N = 13	P
FiO_2	0.7 ± 0.2	0.7 ± 0.1	0.795
PaO_2 (mmHg)	81 ± 17	92 ± 31	0.267
$PaCO_2$ (mmHg)	42 ± 6	44 ± 4	0.303
PEEP (cmH2O)	10 ± 2	10 ± 2	0.766
P. Plateau (cmH2O)	24 ± 4	25 ± 4	0.579
Compliance (mL/cmH2O)	30 ± 10	31 ± 13	0.778
Vd/Vt (%)	67 ± 7	71 ± 8	0.096
Vd ml/kg PBW	4.4 ± 0.8	5.0 ± 0.7	0.020
Vt ml/kg PBW	6.5 ± 1.3	7.1 ± 0.6	0.124



Tercils of Vd respect to mortality

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0877
INCREASED MORTALITY IN PATIENTS OVER 75 YEARS WITH MECHANICAL VENTILATION FOR MORE THAN 7 DAYS

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OBJECTIVE. To identify differences in mortality between older and younger than 75 years, in patients requiring mechanical ventilation (MV) for more than 7 days in an intensive care unit (ICU).
METHODS. Prospective cohort study in patients with VM for more than 7 days in a medical-surgical ICU during 2 years (2008–2009). It is considered the main variable the hospital mortality. Other variables studied were: age categorized (age 75 or under 75 years), sex, delta SOFA (SOFA total 7 th day–SOFA total 1 st day), Apache II score, cause surgical or medical, neoplasia, respiratory distress syndrome, MV duration and others. We performed a descriptive analysis, bivariate (Chi square and t-test) and multivariate logistic regression analysis.
RESULTS. We analyzed 330 patients with VM, of whom 183 (55.45 %) had been with VM for more than 7 days. In patients < or = 75 years with MV > 7 days (156 patients) mortality was 35, 3 % (55 patients) compared to a mortality of 63 % in patients > 75 years (17 of 27). The RR of mortality over 75 years was 3.12 (95 % CI 1.34 to 7.29, $p = 0.007$). The multivariate logistic regression identified as predictors of mortality at age > 75 years, with an OR = 3.22 (95 % CI 1.26 to 8.21, $P = 0.015$), and the delta SOFA, with a OR = 1.14 (95 % CI 1.04 to 1.26, $P = 0.007$).
CONCLUSION. In patients requiring MV for more than 7 days, mortality increases over time in patients with age over 75 years.

Adequate and appropriate treatment of ICU infections: 0878–0882

0878
EVIDENCE-BASED RECOMMENDATIONS TO INCREASE THE APPROPRIATE USAGE OF ANTIBIOTICS IN ICU PATIENTS: A 5-DAY BUNDLE

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INTRODUCTION. Inappropriate antibiotic (AB) use is associated with poor patient outcomes, especially in intensive care units (ICUs). A set of quality indicators (QIs) was developed and tested to be included in a bundle, in order to reduce inappropriate antibiotic (AB) use in ICU.
METHODS. A set of potential QIs for proper AB therapy in ICU was derived from the literature and sent to a multidisciplinary 11-member expert panel from 6 European countries on behalf of the IMPLEMENT project. Experts were selected through the ESCMID study groups and the European Society of Intensive Care Medicine. A two round RAND-modified Delphi-method to select relevant QIs with regard to patient's health benefit, development of bacterial resistance, and healthcare costs using a 9-point Likert scale. Every indicator was considered "relevant" if the median score was ≥8 and if consensus was reached (i.e. ≥70 % of respondents in the 7/8/9 category). The adherence to the QIs was measured by an independent observer over the first 5 days of AB therapy in a 18 bed mixed ICU of a tertiary care hospital in Rome (I) and a 11-bed mixed ICU of a large teaching hospital in Nijmegen (NL).
RESULTS. Six QIs were found relevant: QI1. Clinical rationale of starting AB documented in the chart (day 1); QI2. Appropriate microbiological cultures according to local and/or international guidelines (day 1); QI3. Choice of empiric therapy according to local and/or international guidelines (day 1); QI4, Review of diagnosis according to microbiological results (day 2, 3, 4, 5); QI5. De-escalation therapy to be considered in patients with microbiological diagnosis according to the susceptibility pattern of the isolate (day 2, 3, 4, 5); QI6. Withdrawal of therapy to be considered in patients with a definitive non-infectious diagnosis (day 3, 4, 5). Overall, 270 empirical AB courses of therapy in 220 ICU patients were evaluated. Patient groups had comparable age, co-morbidities and severity of illness scores on admission to the ICU (table 1). Adherence results showed similar rates between the two groups for the majority of indicators. Documentation of rationale of starting AB therapy and adherence to local guideline indication for the choice of AB were reduced in the Italian ICU but appropriateness of collecting cultures the first day of therapy was superior respect to the Netherland. In the Netherlands, in patients admitted with pneumonia, in 73.5 % a sputum culture was performed, in 55 % of cases Legionella Ag and in 50 % Pneumococcal Ag testing was performed. Serology for respiratory viruses and atypical pathogens was performed in 44 % of relevant cases.
CONCLUSIONS. A 5 day bundle to improve antibiotic use in ICU's was developed and tested. The bundle proved easy-to-use and good performance in different international ICU settings. Many aspects of the bundle were amenable to improvement. This bundle needs validation in a larger cohort of European ICUs before it can be adopted in daily practice.

0879
THE ANTI-INFLAMMATORY EFFECT OF PENTOXIFYLLINE IN LPS-INDUCED ACUTE LUNG INJURY IS A_{2A}-DEPENDENT

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INTRODUCTION. A central pathomechanism of acute pulmonary inflammation is the excessive transmigration of polymorphonuclear neutrophil granulocytes (PMNs) into the different compartments of the lung. The phosphodiesterase inhibitor Pentoxifylline (PTX) exhibits anti-inflammatory effects in experimental acute lung injury (ALI) through unknown mechanisms [1]. In vitro, PTX induces the expression of adenosine receptor 2a (A_{2a}) [2], that is also a critical mediator in ALI.
OBJECTIVE. This study was designed to reveal whether the protective effects of PTX in a murine model of endotoxin-induced ALI are A_{2a}-mediated.
METHODS. PTX was injected intraperitoneally 1 h before LPS inhalation. Wildtype- and A_{2A}-deficient mice ($A_{2a}^{-/-}$) inhaled LPS for 30 min. After 24 h, PMNs were detected in all lung compartments (intravascular–interstitial–alveolar), using a flow cytometry-based technique. Chemokines were measured in the BAL (ELISA), microvascular leakage was determined using the Evans blue extravasation technique. The effect of a pharmacological A_{2a}-antagonist was evaluated in vivo and in vitro. In addition, in vitro transmigration assays were performed to study the effects of PTX on human PMNs migrating through a monolayer of human endothelial or epithelial cells.
RESULTS. PTX reduced the migration of PMNs into the interstitium of the lung and the alveolar space in wildtype mice. Genetic or pharmacological blockade of A_{2a} abolished this protecting effect. Importantly, PTX was even effective when given after LPS-exposure, highlighting its clinical potential. PTX treatment reduced TNFα and IL6 production in the BAL of wildtype mice, but had no effect on chemokine release in $A_{2a}^{-/-}$ mice. LPS-induced microvascular permeability was attenuated after PTX in wildtype but not in $A_{2a}^{-/-}$ mice. In vitro, transepithelial migration of human PMNs was reduced after PTX treatment of PMNs whereas treatment of the epithelium only had no effect. In addition, PMN migration was reduced when endothelial cells were treated with PTX. This effect abolished when A_{2a} was blocked.
CONCLUSION. In our model, PTX was effective in attenuating relevant characteristics of acute lung injury including PMN migration, microvascular permeability, and chemokine release. Our studies identified A_{2a} as one key receptor that mediates protective effects of PTX.
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0880
CURRENT TREATMENT FOR SEVERE COMMUNITY-ACQUIRED PNEUMONIA: LESSONS FROM THE N1H1 PADEMIC

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INTRODUCTION. The pandemic H1N1 influenza virus emerged in 2009, with a high rate of intensive care unit (ICU) admissions and severe diseases among patients [1]. From this moment the treatment protocol for severe community-acquired pneumonia (CAP) include important changes like the preventive respiratory isolation of patients and empiric treatment with Olsetamivir until the influenza infection was ruled out. Seasonal flu in 2011–2012 have been caused by influenza A H3N2 virus.
OBJECTIVES. To determine if the H1N1 pandemia has influenced the management of severe CAP in the ICU during influenza epidemic period. To analyze differences between patients admitted to our ICU due to severe CAP during the H1N1 pandemic periods and 2011–12 H3N2 epidemic period.
METHODS. Prospective, observational study carried out in a polyvalent university ICU. We included all adults admitted with severe CAP, with or without influenza-like illness, during the H1N1 pandemic periods (from September 1, 2009 to February 1, 2010 and from September 1, 2010 to February 1, 2011) and during the H3N2 epidemic period (from September 1, 2011 to February 1, 2012. Data were analysed using SPSS Version 19.0.Quantitative variables were expressed in means and standard deviations (SD). Qualitative variables were expressed as percentages. The estimated incident cases in each period was calculated by one way χ^2. Critically ill patients with CAP during H1N1 periods were compared with CAP during H3N2 period. Statistical significance was set at $p < 0.05$.
RESULTS. 50 patients with severe CAP were admitted to the ICU, 41 during the H1N1 period and 9 during H3N2 period. All the patients were isolated and treated with Olsetamivir until rule out the influenza respiratory infection etiology. Severe CAP in the ICU was cause by influenza during 12 patients (29,3 %) in the H1N1 period and in 5 (55,5 %) during the H3N2 period. The patient characteristics are summarised in table 1. There were not

statistically significant differences between groups in patients' demographics, comorbidities, illness severity, ICU mortality or length of stay (LOS) except in Barthel scale at ICU discharge and incident cases of CAP that was 40 % higher in the H1N1 periods. Severe CAP ICU patients admitted during the H3N2 period had non-significant more % of septic shock, higher ICU and Hospital LOS and lower pO_2/FiO_2 at ICU discharge.
CONCLUSIONS. Since 2009 our protocol for treatment of CAP during the seasonal Influenza period has changed, the patients were isolated, empirically treated with Oltamivir and viral etiologic diagnosis was achieved. During the last epidemic period the main cause of severe CAP in our ICU was influenza A H3N2 with a tendence to have higher morbidity and mortality than severe CAP during H1N1 pandemic periods.
REFERENCE(S). 1. Louie JK, et al. California Pandemic H1N1 Working Group. Factors associated with death or hospitalization due to pandemic 2009 influenza A (H1N1) infection in California. JAMA. 2009;302(17):1896–902

Table 1

Variables	H1N1 (n = 41)	H3N2 Period (n = 9)	p value
Age (years)	56 (SD = 16,6)	63,5 (SD = 18,6)	0,23
Male Gender (%)	65,8	50,6	0,15
SOFA	6,4 (SD = 3,8)	5,7 (SD = 2,7)	0,64
$pO2/FiO_2$ ICU discharge	319,9 (SD = 117,1)	221 (SD = 126,2)	0,29
Barthel ICU discharge	88,7 (SD = 25,5)	38,75 (SD = 34,12)	<0,05
Septic Shock (%)	44,4	66,1	0,51
ICU LOS (days)	8,32 (SD = 7,5)	12,1 (SD = 5,2)	0,15
Hospital LOS (days)	15,1 (SD = 10,3)	19,5 (SD = 4,8)	0,24
ICU Mortality (%)	17	22	0,52

0881
LUNG ULTRASONOGRAPHY FAILS DETECTION OF NON-SUBPLEURAL COMMUNITY ACQUIRED PNEUMONIA

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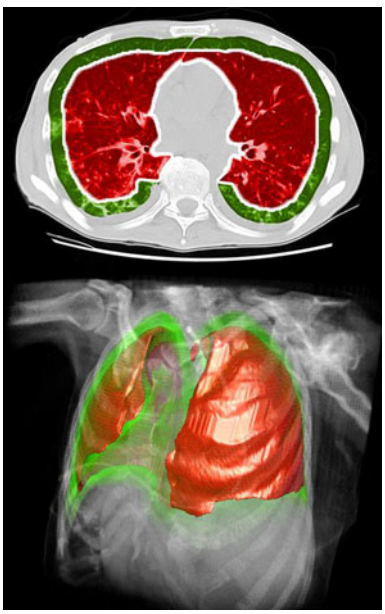
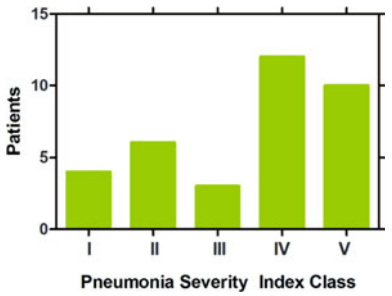
INTRODUCTION. Lung Ultrasonography (LUS) plays an emerging role in bedside assessment of different pulmonary pathologies. In community acquired pneumonia (CAP) and pleuritic chest pain, LUS has been proposed in the emergency department as complementary to chest X-ray (CXR), even in CXR-negative patients [1]. However, lung computed tomography (CT) still remains the most sensible imaging tool in patients showing clinical signs of pneumonia.
OBJECTIVES. The aim of this study is to assess the value of bedside *LUS* in the diagnosis of *CAP*, focusing on patterns of lung injury associated with *LUS* false negatives.
METHODS. This prospective study was approved by the local ethics committee. In 35 consecutive emergency room patients with clinical signs of suspected *CAP, Pneumonia Severity Index* class was assessed, *CXR* routinely performed, *CT* performed in case of strong clinical suspect of radio-occult *CAP* even in case of non-diagnostic CXR. *LUS* was performed using a convex probe and a *LogiQ-E* (GE Medical Systems, US), and reported as positive in presence of the following criteria: sectorial interstitial syndrome with pleural line abnormalities and/or alveolar consolidation with or without pleural effusion. Sensitivity, specificity, positive and negative predictive values of *LUS* were calculated, and agreement with conventional (*CXR* plus *CT*) diagnosis was assessed with a Cohen's Kappa test. Lung injury pattern was classified by a radiologist as *subpleural* or *non-subpleural* if the inflammatory process was reaching or sparing, respectively, the juxta-parietal lung parenchyma in the *CXR,* and *CT* when performed. Different distribution of *LUS* false negatives in such groups was assessed with Fisher's test.



Tercils of Vd respect to mortality

Image 1 shows subpleural (green) and non-subpleural (red) lung regions in axial CT section and 3D reconstruction.
All statistical analysis was performed with SPSS 20 (IBM corp.), and statistical significance set to $p < 0.05$.
RESULTS. Final clinical diagnosis of *CAP* was confirmed in 28 patients while excluded in 7 patients, by spiral *CT* scan (n = 14 pts) or follow-up (n = 21 pts).

Patient data	
Sex	18 M (51.4 %), 17 F (48.6 %)
Age (years)	67.09 ± 20.84 SD
E.D. Admission	Dyspnea/Cough/ARF 17 (48.6 %)
	Fever 7 (20.0 %)
	Pleuritic Chest Pain 4 (11.4 %)
	Hemoptysis 3 (8.6 %)
	Acute Abdominal Pain 3 (8.6 %)
	Syncope 1 (2.9 %)
Previous Antibiotic Therapy	30 No (85.7 %), 5 Yes (14.3 %)
PSI Class Index	3.51 ± 1.38 SD

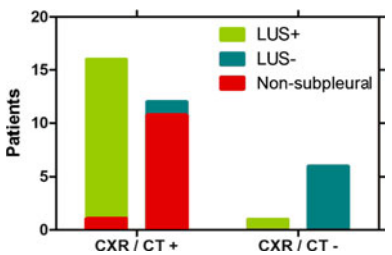


PSI class distribution

CXR/CT vs. LUS contingency table

Location			LUS NEG	LUS POS	Total
CXR/CT, Subpleaural		***POS***	1	15	16
CXR/CT, Non-Subpleaural		***POS***	11	1	12
Total	CXR/CT	***POS***	12	16	28
	CXR/CT	***NEG***	6	1	7
	Total		18	17	35

LUS showed acceptable specificity (85.7 %) and positive predictive value (94.1 %), but poor sensitivity (57.1 %) and weak negative predictive value (33.3 %).Overall concordance between *CXR + CT* and *LUS* was poor (Kappa = 0.27, p = 0.09).



CXR/CT versus LUS concordance

LUS recognized 15 in 16 (91.7 %) subpleural *CAP* and only 1 in 12 (8.3 %) non-subpleural *CAP* (Fisher's $p < 0.0001$).
CONCLUSIONS. In this preliminary study *LUS* confirmed its usefulness in bedside assessment of *CAP*, but systematically failed in cases where inflammatory lesion did not involve subpleural lung parenchyma.
REFERENCES. 1. Volpicelli G, et al. Diagnosis of radio-occult pulmonary conditions by real-time chest ultrasonography in patients with pleuritic pain. Ultrasound Med Biol. 2008. 34(11):1717–23.

0882
EFFICIENCY OF A PNEUMATIC DEVICE IN CONTROLLING CUFF PRESSURE OF POLYURETHANE-CUFFED TRACHEAL TUBES: A RANDOMIZED CONTROLLED STUDY

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INTRODUCTION. Recent studies reported reduced microaspiration and nosocomial pneumonia rates in patients intubated with polyurethane (PU)-cuffed tracheal tubes. However, underinflation (<20 cmH_2O) and overinflation (>30 cmH_2O) of tracheal cuff

frequently occur, resulting in increased risk for microaspiration and tracheal ischemic lesions.
OBJECTIVES. Primary objective was to determine the efficiency of a pneumatic device in controlling cuff pressure (P_{cuff}) in patients intubated with PU-cuffed tracheal tubes. Secondary objectives were to determine the impact of continuous control of P_{cuff}, and the impact of cuff shape on microaspiration of gastric contents.
METHODS. Prospective randomized controlled study. All patients requiring intubation and mechanical ventilation ≥48 h were eligible. Patients were randomized to receive tapered (T) PU-cuffed (n = 32) or cylindrical (C) PU-cuffed (n = 32) tracheal tubes. In addition, patients randomly received 24 h of continuous control of P_{cuff} using a pneumatic device (Nosten®), and 24 h of routine care of P_{cuff} using a manometer. During the two 24 h-periods, target P_{cuff} was 25 cmH_2O. P_{cuff} was continuously recorded, and pepsin was quantitatively measured in all tracheal aspirates during these periods. McNemar, and Wilcoxon tests were used to compare qualitative and quantitative data during the two 24 h-periods; respectively. Subgroup analysis (TPU vs. CPU-cuffed tracheal tubes) was performed using chi2 or Fischer exact test, and Mann–Whitney *U* test, as appropriate.
RESULTS. Patient characteristics were similar during the two 24 h-periods, and in patient subgroups (TPU vs. CPU). The pneumatic device was efficient in controlling P_{cuff} (med [IQ] 26 [24, 28] vs. 22 [20, 28] cmH_2O, during continuous control of P_{cuff} and routine care, respectively; p = 0.017). In addition, percentage of patients with overinflation (53% vs. 100 %) or underinflation (31 % vs. 68 %) of tracheal cuff, and percentage of time spent with overinflation (0 [0, 2] vs. 32 % [9, 54]) or underinflation (0.9 [0, 17] vs. 14 % [4, 30]) were significantly (p < 0.001) reduced during continuous control of P_{cuff} compared with routine care. Pepsin was measured in 623 tracheal aspirates. No significant difference was found in pepsin level (185 [113, 296] vs. 203 ng/mL [120, 338], p = 0.171), and percentage of tracheal aspirates positive for pepsin (29 % [0, 74] vs. 45 % [0, 100], p = 0.162) during continuous control of P_{cuff} compared with routine care. Similarly, no significant difference was found in pepsin level (167 [121, 226] vs. 285 [125, 512] ng/mL, p = 0.069) and percentage of tracheal aspirates positive for pepsin (30 % [0, 52] vs. 40 % [8, 92], p = 0.16) between patients intubated with TPU-cuffed tracheal tubes compared with those intubated with CPU-cuffed tracheal tubes; respectively.
CONCLUSIONS. The pneumatic device was efficient in controlling P_{cuff} in critically ill patients intubated with PU-cuffed tracheal tubes.

Difficult infections in the ICU: 0883–0887

0883

IMPAIRED VIRULENCE OF A CLINICAL STRAIN OF *ACINETOBACTER BAUMANNII* RESISTANT TO COLIMYCINE IN A RAT MODEL OF ACUTE PNEUMONIA

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INTRODUCTION. The extensive use of antibiotics in intensive care units (ICU) has been associated with the emergence of multidrug resistant Gram negative bacteria. Resistance may induce a "fitness cost" leading to an impaired virulence.
OBJECTIVES. Compare the fitness and the pathogenicity of 3 strains of *A.baumannii:* the AYE reference strain and two clinical strains issued from the same patient, one susceptible (AbS) and the other resistant (AbR) to colimycine.
METHODS. The first part of our experiments was designed to compare the 24 h in vitro growth curves of the 3 strains by optical density at 600 nm. In the second part (n = 48 rats), we determined the lethal dose corresponding to 50 % of mortality (LD50) of each strain in a model of acute pneumonia. Animals were inoculated intra-tracheally with a solution containing each strain of *A.baumannii* plus mucine porcine (50–50 % mix). In the 3 groups, series of animals received 1.5×10^5 (n = 5), 2×10^6 (n = 5) or 5×10^9 (n = 6) CFU/animal. In a third part, additional rats were infected with AbR (n = 30) or AbS (n = 30) at a bacterial amount corresponding to the lowest LD50 previously determined and observed for 48 h. After sacrifice or spontaneous death, blood and lungs were sampled and right lung was weight. Bacterial cultures were performed on lung and blood samples. Mortality rates were compared using Chi_2 test. Lung weight and bacterial growth were compared using a non parametric Kruskall Wallis test. The slopes of the time growth curves were compared using paired t test.
RESULTS. A slower bacterial growth curve was measured for AbR compared to AbS (a = 0.141 ± 0.0038 vs. 0.180 ± 0.053; p = 0.01) and to AYE (a = 0.141 ± 0.0038 vs. 0.233 ± 0.0066; p = 0.003). The mortality rate in animals receiving 1.5×10^5, 2×10^6 and 5×10^9 CFU were respectively 0 %, 0 % and 17 % in the group receiving AbR strain; 0 %, 17 % and 50 % in the group receiving AbS strain and 0 %, 17 % and 67 % in the group receiving AYE strain. Rats infected with an incoculum of 10^9 CFU (corresponding to the LD50 of AbS) had less pronounced weight loss in the AbR group than in the AbS one (mean weight at D2 for AbS : 263 ± 39 g vs. 295 ± 55 g for AbR; p = 0.029). Right lung weight indexed to body weight was lower in the AbR group than in AbS group (7 ± 2.66 g/kg vs. 10.52 ± 3.84 g/kg; p < 0.001) traducing a less intense lung injury. Median lung bacterial count adjusted to lung weight measured at the time of death was significantly lower in the AbR group than in AbS group (1.4×10^6 [5.3×10^5–1.1×10^7] vs. 1.6×10^9 [8.5×10^6–$2{,}6 \times 10^{10}$]; p = 0.007). In the AbR group, 15 % of the animals had systemic dissemination (blood positive cultures) versus 63 % in the ABs group (p < 0.001).
CONCLUSIONS. Clinical AbR strain showed a lower in vitro growth and less pathogenicity in a rat model of acute *A.baumannii* pneumonia. These results confirm the lower virulence of this strain and question the mechanisms involved.

0884

IMPROVING HAND HYGIENE IN INTENSIVE CARE UNITS: A MULTI-CENTER INTERVENTION STUDY

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INTRODUCTION. Intensive care patients are at high risk of developing nosocomial infections. Improved hand hygiene reduces the incidence of nosocomial infections, but is generally low in these wards.
OBJECTIVES. To assess feasibility and effectiveness of the World Health Organization's "My 5 Moments for Hand Hygiene" program in intensive care units.
METHODS. As part of a multi-center cluster-randomized trial, we implemented a hand hygiene program (interrupted time-series design) in 13 European intensive care units.
The study consisted of 6-month baseline phase (P1), followed by a 6-month implementation phase (P2) and a 12-month continuation phase (P3) of the "5 Moments" program. In all phases compliance was observed directly through trained monitors, at randomly selected time-intervals and bed-spaces. Effects of the intervention on compliance were determined per unit, for different healthcare worker (HCW) categories, workload categories and types of activities.
RESULTS. In all, 41558 hand hygiene opportunities were observed. At baseline, compliance varied from 6 % to 90 % (mean 52 %). In P2 and P3, average compliance per unit was 69 % and 77 % (OR 2.68 and 3.78) respectively. There was a small but significant increase in compliance in P3 compared to P2 (OR 1.41). In all study phases, nurses' compliance was higher than that of physicians. In baseline, compliance was better for "after" compared to "before" indications (OR 2.04), this difference increased in P2 (OR 5.34) and P3 (OR 6.96). In P1 and P2 there was a negative correlation between compliance and workload (r = −0.05 (p = 0.03) and r = −0.06 (p < 0.01), respectively), which reversed in P3 (r = 0.09, p = 0.99) (Figure 1).Thus, there was a changing effect of the intervention on the relation between workload and compliance, and in P3 high compliance was maintained even at extremely busy periods.
CONCLUSIONS. Implementation of the "My 5 Moments for Hand Hygiene" program in thirteen European intensive cares rapidly increased hand hygiene compliance from 52 % to 69 % and even higher during the ensuing twelve months. The relatively poor performance of physicians and the poor improvement of compliance in "before" indications offer specific aspects for further improvement. In P3, compliance was maintained even at extremely high workload levels.
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0885

RANDOMIZED CONTROLLED TRIAL OF CHLORHEXIDINE DRESSING AND HIGHLY ADHESIVE DRESSING FOR PREVENTING CATHETER-RELATED INFECTIONS IN THE ICU

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INTRODUCTION. Most vascular catheter-related infections (CRIs) occur extraluminally in ICU patients. Chlorhexidine-impregnated and strongly adherent dressings may decrease catheter colonization and CRI rates.
METHODS. In a 2:1:1 assessor-blinded randomized trial in patients with vascular catheters inserted for an expected duration of 48 h or more in 12 French ICUs, we compared chlorhexidine dressings, highly adhesive dressings, and standard dressings, from May 2010 to July 2011. Co-primary endpoints were major-CRI with or without catheter-related bloodstream infection (CR-BSI) with chlorhexidine vs. non-chlorhexidine dressings and dressing detachment with highly adhesive vs. standard dressings. Catheter-colonization, CR-BSIs and skin reactions were secondary endpoints.
RESULTS. Main outcome and measures: 1879 patients (4163 catheters, 34,339 catheter-days) were evaluated. With chlorhexidine dressings, the major-CRI rate was 67 % lower (0.7/1,000 vs. 2.1/1,000 catheter-days; hazard ratio [HR], 0.328; 95 % confidence interval [95 % CI], 0.174–0.619 P = 0.0006) and the CR-BSI rate 60 % lower (0.5/1000 vs. 1.3/1,000 catheter-days; HR, 0.402; 95 %CI, 0.186–0.868, P = 0.02) than with non-chlorhexidine dressings; decreases were noted in catheter colonization and skin colonization rates at catheter removal. The contact dermatitis rate was 1.1 % with and 0.29 % without chlorhexidine. Highly adhesive dressings decreased the detachment rate to 64.3 % vs. 71.9 % (P < 0.0001) and the number of dressings per catheter to 2 (1–4) vs. 3 (1–5) (P < 0.0001) but increased skin colonization (P < 0.0001) and catheter colonization (HR = 1.650; 95 % CI, 1.21–2.26; P = 0.0016) without influencing CRI or CR-BSI rates.
CONCLUSIONS. A second large randomized trial demonstrated that chlorhexidine-impregnated dressings decreased the CRI rate in ICU patients with intravascular catheters. Highly adhesive dressings decreased dressing detachment but increased skin and catheter colonization. Trial registration. Clinicaltrials.gov number, NCT01189682.
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0886

TDM BASED DOSE OPTIMIZATION OF PIPERACILLIN AND MEROPENEM: A RANDOMIZED CONTROLLED TRIAL

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INTRODUCTION. There is considerable variability in pharmacokinetics (PK) of antimicrobials in critically ill patients, which may lead to under- or overdosing of antibiotics (AB). Therapeutic drug monitoring (TDM) could overcome this individual variability and allow tailored antibiotic dosing.
OBJECTIVE. To analyze the effect of a dose adaption strategy with piperacillin (PTZ) and meropenem (MER) using daily TDM, on the target attainment of predefined PK parameters.
METHODS. This was a prospective, partially blinded, randomized controlled trial. Criteria for inclusion were need for antibiotic treatment with PTZ or MEM, age >18 years and normal kidney function. Patients in the control group received conventional treatment. The intervention group underwent daily TDM, followed by dose adjustment if concentration was below the predefined PK target (see below). Antibiotic levels in the control group were also measured, but used for data analysis only. Clinical data were drawn from the Electronic Patient File. The predefined PK target was 100 % >4–10× MIC. Until MIC of the causative organism was available, the MIC of wild type Pseudomonas was used (2 for MER and 16 for PTZ). All patients received AB in a 3 h extended infusion after a loading dose (1 g each for MER, 4 g each for PTZ). MER was administered TID, PTZ QID. When the trough level was

inadequate, the dosing frequency was increased to QID for MER, and 6 per day for PTZ; when this was still insufficient, the dose was increased to 1.5G QID for MER, dose for PTZ was left unchanged at 4 g every 4 h. Primary endpoint was the proportion of patients that reached the predefined target of 100 % >1–4× MIC at 48 and 72 h, as well as time above 1–4× MIC.
RESULTS. Forty-one patients (6 females) were included in the study, median age was 56 (IQR 46–68.5). Pneumonia was the primary infectious diagnosis. 17 patients received daily TDM based AB therapy, 18 conventional therapy. 85 % of the patients in the intervention group needed dose adaptation, 5 of them required an additional increase in dose. At baseline, the target of 100 % T > 4× MIC was achieved in 21 % of the PTZ and 0 % of the MEM patients. The median time above 4× MIC was comparable between both antibiotics with 45 % for PTZ (IQR 17.25–86.25) and 49.5 % for MEM (IQR 0–59). In the control group, 17 % of PTZ and 14 % of MEM patients attained 100 % Ft >4× MIC after three days of treatment. The median fT > 4× MIC changed from 57 % to 36 % to 58 % over day 1, 2 and 3 for PTZ and from 53 % to 11 % to 71,5 % for MEM. In the intervention group, target attainment within the first 72 h of treatment was higher with 58 % of the patients reaching 100 %T > 4× MIC compared to 16 % in the control group (p = 0,007). Also the % T >× MIC was higher than in the control group for different MIC thresholds (2–4× MIC).
CONCLUSIONS. A strategy of dose adaptation based on daily TDM lead to an increase in PK target attainment compared to conventional dosing in critically ill patients with normal kidney function.

0887
CLINICAL FEATURES AND OUTCOMES OF CRITICALLY ILL PATIENTS WITH SHIGATOXIN-INDUCED HEMOLYTIC UREMIC SYNDROME

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INTRODUCTION. In spring 2011 an unprecedented outbreak of *Escherichia coli* serotype O104:H4 Shiga-toxin associated haemolytic uremic syndrome (STEC-HUS) occurred in Northern Germany [1].
OBJECTIVE. The aim of this study was to describe the clinical characteristics, treatments, and outcomes of critically ill patients with STEC-HUS during this outbreak.
METHODS. Multicenter, retrospective, observational study of critically ill adult patients with STEC-HUS in 6 hospitals in Hamburg, Germany between May and August 2011.
RESULTS. During the study period, 106 patients with STEC-HUS were admitted to the intensive care units (ICU). The median age was 40 years (range 18–83) with a f:m ratio of 3:1. The median time from onset of clinical symptoms to hospital admission was 3 days and from hospital to ICU admission an additional 3 days. 101 patients (95.3 %) had acute renal failure, 80 (75.5 %) required renal replacement therapy. Intubation and mechanical ventilation was required in 38 patients (35.8 %) and noninvasive ventilation in 17 patients (16 %). The median duration of invasive ventilation was 7 days (range 1–32 days) and the median ICU stay was 10 days (range 1–45 days). 39 (36.8 %) patients developed severe sepsis or septic shock. 66 patients (62.3 %) presented with neurological symptoms. 97 of the 106 patients (91.5 %) were treated with plasma exchange and 46 patients (43.4 %) received eculizumab (monoclonal anti-C5 antibody). The overall 28-day mortality was 3.8 %.
CONCLUSIONS. During the 2011 STEC-HUS outbreak in Germany, critical illness developed rapidly after hospital admission, often in young women. The infection was associated with severe neurological and renal symptoms, requiring mechanical ventilation and renal replacement therapy in a substantial proportion of patients. Overall, recovery was much better than expected.
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Sepsis, trauma and kidney injury: Epidemiology and outcome: 0888–0892

0888
PROSPECTIVE EXTERNAL VALIDATION OF RISK PREDICTION MODELS FOR ACUTE TRAUMATIC BRAIN INJURY IN UK CRITICAL CARE UNITS: THE RAIN STUDY

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INTRODUCTION. Acute traumatic brain injury (TBI) is the leading cause of death and disability in adults aged under 40 years. Statistical models have been developed to predict the risk of mortality or unfavourable outcome (death or severe disability) at 6 months following acute TBI but to date these risk prediction models have only been validated using existing data sources.
OBJECTIVES. The Risk Adjustment In Neurocritical care (RAIN) Study aimed to prospectively validate risk prediction models for acute TBI among adult patients admitted to UK critical care units.
METHODS. Ten risk prediction models were identified: four for mortality at six months (the Hukkelhoven model and IMPACT Core, Extended and Lab models); and six for unfavourable outcome at 6 months (as mortality plus CRASH Basic and CT models). Risk factor data were collected from 67 UK critical care units (including 90 % of regional neuroscience centres) from August 2009 to March 2011. Patients were followed up to 6 months for mortality, by linkage with death registration, and unfavourable outcome (death or severe disability on the extended Glasgow Outcome Scale, administered by postal or telephone questionnaire). The risk prediction models were validated for calibration (c index), discrimination (Hosmer–Lemeshow test and Cox calibration regression) and overall fit (Brier score). Missing data were handled with multiple imputation.
RESULTS. Data were collected for 2,975 eligible patients admitted to critical care following acute TBI. 97 % of patients were followed-up for mortality and 81 % for unfavourable outcome at 6 months. Following multiple imputation, mortality and unfavourable outcome at 6 months were 26 % and 57 %, respectively. All risk prediction models had good discrimination for mortality at 6 months (c index 0.75–0.78). The Hukkelhoven and IMPACT Lab models were well calibrated, but the IMPACT Core and Extended models over-predicted mortality. All models for unfavourable outcome at 6 months had worse discrimination (c index 0.69–0.71) and they substantially under-predicted risk of unfavourable outcome. The best performance overall was found for the IMPACT Lab model, which was the most complex model, incorporating laboratory measurements. Models of the next level of complexity (Hukkelhoven, CRASH CT, IMPACT Extended) all performed similarly.
CONCLUSIONS. Risk prediction models for acute TBI had acceptable discrimination among a large, representative sample of patients admitted to UK critical care units. Calibration was good with respect to mortality but poor for unfavourable outcome, and these models therefore require recalibration for use in this setting.
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0889
NATIONAL TRENDS IN SEVERE SEPSIS HOSPITAL INCIDENCE IN SPAIN: A POPULATION BASED STUDY, 1999–2009

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INTRODUCTION. Recent epidemiological studies have shown in the last few years a progressive increase in the incidence of hospitalizations of severe sepsis in the US. There is very limited information about the temporal changes in the incidence of severe sepsis in Spain.
OBJECTIVES. To examine population-based trends in the incidence of hospitalizations of severe sepsis in Spain.
METHODS. Analysis of the national registry of hospital discharges (1999–2009). Cases were identified by combining the specific ICD-9 codes for sepsis and acute organ dysfunction. Estimation of crude and standardised incidence rates was carried out by standard methods. Percentage annual change (PAC, 95 % CI) was calculated using Poisson log-linear regression models.
RESULTS. We analyzed 38,207,958 hospital discharges in Spain during the period 1999–2009. Hospital incidence of severe sepsis has gone from 290.16 cases/100.000 hospitalisations in 1999 to 1.100 cases/100.000 hospitalisations in 2009. Jointpoint regression analysis shows an increase, without inflection points, throughout the entire study period in hospital incidence adjusted by sex and age with a PAC of 15.9 % (95 % CI: 13.6, 18.3). The analysis by sex, shows similar figures with a PAC of 15.9 % (95 %CI: 13.6, 18.3) in men and of 15.6 % (95 %CI: 13.3, 18.0) in women. With regards to age, an increasing trend is evident in all age groups, except those under the age of 1 year [PAC-8.2 % (−13.0, −3.2)] being particularly pronounced in the age group of over 74 years of age [PAC: 20.4 % (17.6, 23.2)].
CONCLUSIONS. In Spain, the hospital incidence of severe sepsis between 1999 and 2009 has suffered a notable increase in both sexes and age groups, except in infants, but particularly in those over the age of 74 years. There is an urgent need to implement both preventive and healthcare policies and programmes in order to reduce these trends in the face of an ageing population.
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0890
SEPTIC ACUTE KIDNEY INJURY IN THE CRITICALLY ILL

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INTRODUCTION. The incidence and morbidity of severe sepsis are increasing in critically ill patients [1]. Severe sepsis is associated with acute kidney injury (AKI) in up to 48 % of cases in intensive care units (ICUs) with mortality from 49 % to 70 % [2, 3].
OBJECTIVES. We aimed to evaluate the incidence and outcome of severe sepsis associated AKI in Finnish ICUs.
METHODS. In the FINNAKI study we prospectively screened all adult admission in 17 Finnish adult ICUs between 1 September, 2011 and February 1,2012 for severe sepsis and AKI for 24 h before ICU admission and during the first five days in the ICU. Severe sepsis was defined according to the initial ACCP/SCCM criteria and AKI using the Acute Kidney Injury Network (AKIN) criteria.
RESULTS. Of 2353 patients, 723 (30.7 %, 95 % CI 28.8 to 32.6 %) fulfilled the severe sepsis criteria. Severe sepsis associated AKI was present in 425 (58.8 %, 95 % CI 55.1 to 62.4 %) patients. Of these AKI patients, 133 (18.4 %) belonged to AKIN stage 1; 60 (8.3 %) to AKIN stage 2, and 232 (32.1 %) to AKIN stage 3. RRT was administered in 129 (17.8 %, 95 % CI 15.0 to 20.1 %) patients. The population-based incidence of septic AKI was 311 (95 % CI 292 to 331)/patients per million population/year. The characteristics and outcome data of severe sepsis patients with or without AKI are presented in the table. AKI patients were older, had higher SAPS II score, and greater body mass index (BMI). They had arteriosclerosis (ASO) and chronic kidney disease (CKD) more often than those without AKI.

Patients characteristics and the main outcome

	No AKI (n = 298)	AKI (n = 425)	*p* value
Age (yr)	63 (47–79)	66 (51–81)	0.01
BMI (kg/m2)	26 (20–32)	27 (17–37)	<0.001
ASO (n, %)	34/298 (11.4 %)	74/425 (17.4 %)	0.03
CKD (%)	7/298 (2.3 %)	44/425(10.4 %)	<0.001
SAPS II score	37 (24–50)	48 (31–65)	<0.001
LOS ICU (d,mean)	3.6 (± 4.3)	4.3 (± 7.0)	<0.001
Hospital mortality (%)	50/298 (17.1 %)	117/425 (27.7 %)	0.001

Patients with severe sepsis associated AKI had higher hospital mortality and longer length of stay (LOS) in ICU than those without AKI. In logistic regression, SAPS II and BMI were independently associated with increased risk for hospital mortality in septic patients.
CONCLUSIONS. AKI was present in 59 % of critically ill patients with severe sepsis.AKI-patients were older and had higher BMI than those without AKI. Patients with severe sepsis and AKI had longer ICU stay and higher hospital mortality.
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0891
EARLY TRACHEOSTOMY INCREASES HOSPITAL MORTALITY AFTER TRAUMATIC BRAIN INJURY

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INTRODUCTION. Several studies about the ideal time point of tracheostomy in patients with TBI (Traumatic Brain Injury) exist. Some of them recommend an early tracheostomy (e.g. Lesnik et al. [1] or Ahmed et al. [2]) whereas others found no benefits (e.g. Sugerman et al. [3] or Imperiale et al. [4]), but there are no large studies with more than 100 patients with isolated TBI so far.
OBJECTIVES. With this study we tried to find an answer to the question whether the time point of tracheostomy has an influence on the outcome, using a large dataset of patients.
METHODS. This is a retrospective cohort study of data, prospectively collected by the Austrian Centre for Documentation and Quality Assurance in Intensive Care Medicine (ASDI) [5], on all patients continuously admitted to 87 Austrian ICUs between 1998 and 2010.
RESULTS. During the observation period 6,8714,735 patients had a diagnosis of TBI, identified by "TBI" as the "main reason for admission" and an AIS (Abbreviated Injury Scale) score >1 for the region "head". 677 of these patients received a tracheostomy tube. We divided the cohort by the day of tracheostomy into three groups: early (day 0 to day 7), intermediate (day 8 to day 14) and late (> day 14) (see Figure 1). There were no significant differences within the groups with respect to the GCS (Glasgow Coma Scale) scores on admission (7 [3–11] vs. 7 [4–11] vs. 7 [3–11], p = 0.99). The median severity of illness, given by the predicted mortality, was different with a higher severity in patients who had an early tracheostomy (36.84 % vs. 35.01 % vs. 31.06 %, p = 0.02). Raw mortality rates were significantly higher in the group with early tracheostomy (19.34 %) than in both other groups (12.02 % and 7.98 %, p = 0.002). Risk adjusted mortality rates [observed-to-expected (O/E) ratios] were higher in the group with early tracheostomy (0.83 [Confidence Interval 0.66 - 0.99]) compared to the intermediate (0.63 [CI 0.47 - 0.78]) and late group (0.56 [CI 0.40 - 0.72]) but did not reach statistical significance.
CONCLUSIONS. To the best of our knowledge this is the largest retrospective study on the effects of tracheostomy in patients with isolated traumatic brain injury and it shows that if a tracheostomy is performed too soon after the event it may deteriorate the prognosis of the patient.
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0892
INCIDENCE, RISK FACTORS, AND MORTALITY OF ACUTE KIDNEY INJURY IN FINNISH INTENSIVE CARE UNITS: THE FINNAKI STUDY

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INTRODUCTION. Acute kidney injury (AKI) frequently complicates the course of critical illness and is associated with a substantial increase in mortality (1). No prospective population-based studies on the intensive care unit (ICU) incidence of AKI defined by the RIFLE or Acute Kidney Injury Network (AKIN) criteria exist.
OBJECTIVES. We aimed to determine the incidence, risk factors and outcome of AKI in Finnish ICUs.
METHODS. This prospective, observational, multicentre study included all adult emergency ICU admissions and elective patients whose stay exceeded 24 h during a five-month period (1.9.2011–1.2.2012) in 17 ICUs in Finland. We defined AKI by the AKIN criteria using both hourly urine output and daily creatinine measurements and screened the patients' AKI status and risk factors up to 5 days in the ICU. We obtained the number of adult population of the participating hospital districts on 31.12.2011 from Statistics Finland (http://www.stat.fi) and extracted patients on chronic dialysis.
RESULTS. Our preliminary results (2353 patients) showed that the incidence (95 % confidence interval) of AKI was 42.3 (40.2–44.3) % (Stage 1 16.1 [14.6–17.6] %, Stage 2 5.7 [4.8–6.7] %, Stage 3 20.4 [18.8–22.1] %). Of the 2,353 patients, 272 [11.6 (10.2–12.9) %] received renal replacement therapy. The total reference population for the incidence calculations was 3,278,477 (76 % of the Finnish adult population) and the population-based incidence (95 % CI) of AKI was 728 (699–757) per million population/year.Advanced age, chronic kidney disease, and arteriosclerosis were the most common underlying co-morbidities for AKI (Table 1). Severe sepsis was present in 35 % of the AKI patients prior to AKI onset (table 2).Hospital mortality (95 % CI) for AKI patients was 24.2 (21.4–26.9) % and for stage 3 patients 31.2 (26.9–35.4) %. The 90-day mortality for AKI patients was 29.7 (26.0–33.5) % (available for 1446 patients).

Characteristics

	Data available (n)	No-AKI (1358)	AKI (995)
Age, year*	2,353	63 (50–72)	66 (56–75)
Baseline Creatinine, μmol/l*	1,489	74 (59–90)	78 (65–101)
SAPSII*	2,353	33 (26–44)	43 (33–58)
Chronic Kidney Disease*	2,342	52/1,354 (3.8)	117/988 (11.8)
Arteriosclerosis*	2,325	163/1,339 (12.2)	175/986 (17.7)

SAPS II = Simplified Acute Physiology Score. Values are expressed as median (IQR) or count and percentage. Comparison between AKI and no-AKI patients, *P < 0.001

Risk factors during admission or within 48 h

	No-AKI	AKI
Severe sepsis	298/1,357 (22.0)	345/976 (35.3)
Hypotension	240/1,345 (17.8)	321/867 (37.0)
Hypovolemia	321/1,353 (23.7)	373/877 (42.5)
Emergency surgery	290/722 (40.2)	216/465 (46.5)

Values are expressed as count and percentage

CONCLUSIONS. The incidence of AKI in the critically ill in Finland was higher compared to previous studies. Hospital mortality in patients with AKI in Finland appeared lower than in previous European studies.
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End of life care: Ethics of research 2: 0893–0897

0893
PREDICTION OF DEATH IN LESS THAN 60 MINUTES FOLLOWING WITHDRAWAL OF CARDIO-RESPIRATORY SUPPORT IN INTENSIVE CARE UNITS: THE PREDICT STUDY

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INTRODUCTION. Intensive Care physicians routinely discuss advanced directives when treatments are considered inappropriate or futile [1–3]. The time frame between withdrawal of cardio-respiratory support (WCRS) and death needs to be predicted with a high degree of certainty so families can have real expectations of the palliative care process, intensive care units can allocate resources appropriately and organ donation and procurement can be initiated [4].
OBJECTIVES. The aims of the study was to develop a tool using independent predictor variables of death <60 min after WCRS.
METHODS. This prospective study was conducted in 28 intensive care units across Australia. The study was a longitudinal cohort design. All adult, critically ill mechanically ventilated patients, in intensive care units in whom a decision for WCRS had been made were included. A random split-half method to separate the cohort into two, the first set for the development of the multivariable models and predicting indices; and the second set for testing the indices in an independent sample was used.
RESULTS. 766 patients included in the study. Death within 60 min after WCRS occurred for the whole sample in 377 (49.2 %). Variables significantly associated with death <60 min were ICU days and ventilation days, systolic blood pressure (SBP), pH, Spontaneous respiratory rate, Positive End Expiratory Pressure (PEEP) and arterial oxygen saturation (SaO_2). Abnormal liver function test (LFTs), Chest X-Ray, urea and creatinine, presence of sedation and vasopressor/inotrope were also significantly associated with death <60 min. Staff Specialist Opinion of death <60 min was the strongest categorical variable having an OR 15.42 (CI 95 % 9.33–25.49).In the logistic regression models death <60 min was independently associated with 6 variables: Staff Specialist Prediction, analgesia, pH, SBP, Glasgow Coma Scale Total, and PEEP.
CONCLUSIONS. In patients that are withdrawn from cardio-respiratory support in general intensive care units, systolic hypotension, poor spontaneous respiratory drive, high PEEP levels, low pH and low GCS were independently associated with the likelihood of death within 60 min.
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0894
PRACTICES IN LIFE-SUSTAINING TREATMENT AND PERCEPTIONS OF CAREGIVERS: A FRENCH SURVEY

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INTRODUCTION. A French law in 2005 gave the right of withdrawing life-sustaining treatment (LST) in case of "unreasonable obstinacy". The French Intensive Care Society (SRLF) developed in 2009 recommendations on decision making process (DMP) at end-of-life.

OBJECTIVES. The objective of this study was to assess how caregivers currently experience the procedures of withdrawing LST in French ICUs.

METHODS. A close-ended questionnaire was developed by the SRLF Nurse Committee. The questionnaire was sent to caregivers via the SRLF mailing list from June to September 2011. The questionnaire was also online on the website of the Society. Any ICU caregivers could complete anonymously the questionnaire. Data were collected on the ICU and the respondent's characteristics, the DMP, the procedures of LST withdrawal and the perceptions of caregivers. Only the results concerning the withdrawal of LST are detailed here. Data were descriptive and were analyzed per ICU and per responders.

RESULTS. Of the 768 French respondents, 45.7 % were physicians, 42.8 % were nurses (others 11.5 %), working in 341 ICU's. The mean patient-to-nurse ratio was 2.8. Visiting hours were not restricted in 17.5 % of the ICUs and were restricted but increased for relatives of end-of-life patients in 80.5 %. The procedure used to implement ventilation withdrawal consists in extubation for 36.8 % of the respondents and in weaning ventilation with leaving the tube in place (WV) for 67 %. 84 % of the respondents thought that extubation was acceptable and 7.7 % thought it was illegal. WV was considered as acceptable for 89.9 % and as illegal for 5 %. According to caregivers, extubation versus WV clarifies the therapeutic goals for 60.6 % of the respondents versus 54.3 %, improves patient's comfort for 24.1 % versus 34.5 %, is well experienced by relatives for 35.2 % versus 47.7 % and by caregivers for 31.9 % versus 63.4 %. Withdrawing vasoactive drugs and renal dialysis was considered as acceptable for almost all respondents. At the opposite, withdrawing nutrition and intravenous fluids was considered as acceptable for only 67.4 % of the respondents and considered as illegal for 18.4 % of them. 41.2 % of the nurses but 85.2 % of the physicians reported that withdrawal of LST was usually performed by the nurse and the physician together. After withdrawing of LST, sadness is experienced by 34.2 % of the respondents, relief by 26.9 %, feeling of failure by 19.6 %, burnout by 12.4 %, sense of isolation by 7.4 % and sense of guilt by 3.1 %. Only slight differences were observed between nurses and physicians.

CONCLUSIONS. Despite legal statements and SRLF guidelines, a minority of caregivers still considers ventilation support, nutrition and hydration withdrawal as illegal. Extubation was thought to be worse experienced by caregivers than weaning ventilation. Much more physicians than nurses stated that the withdrawal was implemented by both physicians and nurses rather than by nurses alone.

0895
END OF LIFE CARE IN THE ICU: CAN A GUIDELINE FOR WITHHOLDING AND WITHDRAWING THERAPY IMPROVE INTERDISCIPLINARY COLLABORATION AND PATIENT CARE?

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INTRODUCTION. End-of-life decisions are common in intensive care units (ICUs). The involved healthcare professionals have different roles in the decision-making process and may not always assess the situation in the same way. This entails a need to clarify, describe and attain consensus on standards for decision-making and end-of-life care.

OBJECTIVES. To develop, implement and evaluate a guideline for withholding and withdrawing therapy in the ICU.

METHODS. A guideline for withholding and withdrawing therapy was developed based on literature, interviews, questionnaire survey, interdisciplinary audits, inspirations from other guidelines, and a hearing among relevant health care professionals. The guideline was implemented in two regional Danish ICUs in May 2011 and evaluated in November/December 2011 by: 1) A questionnaire survey regarding different aspects of end-of-life practices (including usability of the guideline) among nurses ($n = 122$), intensivists ($n = 43$), and primary physicians ($n = 116$). Results were compared with results from a similar survey conducted in 2010 (1). 2) Hospital record review of all patients admitted to the ICUs from 1 June 2011 to 30 November 2011 ($n = 897$). Results were compared with a simelar review conducted in 2009 (2).

RESULTS. *Questionnaire:* The response rate was 81 %. In total 75 % of nurses, 83 % of intensivists, and 38 % of primary physicians had read all or part of the guideline. Of those who had participated in end-of-life decisions in the evaluation period 40 % ($n = 54$) had used the guideline in connection with the decision. Hereof 65 % to high or very high extent and 31 % to some extent found the guideline usable. Regarding end-of-life decision-making 41 % at baseline found the interdisciplinary collaboration very or extremely satisfactory compared to 48 % at time of guideline evaluation (paired analysis; $p = 0.19$). No decrease was found in experiences of withholding or withdrawing decisions being either changed or unnecessarily postponed.

Hospital record review: For patients, who died after therapy had been withdrawn, median time from admittance to first consideration on level of therapy decreased from 1.1 to 0.4 days ($p = 0.03$), and from admittance to withdrawal-decision from 3.1 to 1.1 days ($p = 0.02$).

CONCLUSIONS. The study indicates that a guideline for withholding and withdrawing therapy at the ICU may be a help towards improved interdisciplinary collaboration and patient care.

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0896
CHANGES IN END-OF-LIFE DECISION MAKING IN A CENTRAL LONDON ADULT INTENSIVE CARE UNIT FOLLOWING THE INTRODUCTION OF THREE END-OF-LIFE INTERVENTION TOOLS. ENRICH INVESTIGATORS

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INTRODUCTION. End-of-life practice (EOLP) in the setting of critical illness has been extensively studied and we have previously reported data regarding EOLP within the general intensive care unit (ICU) of our institution [1, 2]. Following this baseline assessment, 'the development, and initial evaluation of an intervention to improve end-of-life care in adult intensive care units (ENRICh) study' was conducted within this ICU. This led to the development of three intervention tools: the King's psycho-social and communication evaluation (K-PACE); an enhanced concise end-of-life pathway; and a fax proforma for contacting general practitioners, when end-of-life decision making had taken place.

OBJECTIVES. To report the effect of the ENRICh intervention tools on end-of-life practice within the adult ICU.

METHODS. Two mechanisms were used to assess the impact of the ENRICh interventions on end-of-life practice using two 24 month periods pre- and post- interventions. These were the *Medtrack* clinical information system (MASH Ltd) and the monthly ICU mortality and morbidity multidisciplinary meeting at which all deaths were analysed, discussed and study data confirmed. End-of-life categories were based on those used in the 'Ethicus' study [1], although no 'active shortening of the dying process' was included and patients admitted for purely palliative care were removed prior to analysis. The year 2009/10 was removed from the statistical analysis because it was potentially influenced by the presence of the ENRICh investigators, prior to interventions, although figure 1 shows all data in a time series sequence.

RESULTS. During the intervention phase, there was a greater tendency to admit emergency patients with higher chronic disease burden (36.2 % post versus 27.2 % pre), but with subsequent more rapid limitation of life-prolonging treatments (4.4 days post vs. 6.2 days pre-intervention; $p < 0.001$) with an increase in the proportion of patients where pathophysiological futility was the primary justification as shown in figure 1 (28.5 % vs. 38.4 %; $p < 0.001$). One consequence of this earlier decision making was a reduced use of both analgesics and hypnotics between the decision to limit treatment and death, although this did not lead to prolongation of the palliative phase of treatment. There was also an increased referral to palliative care during the intervention phases.

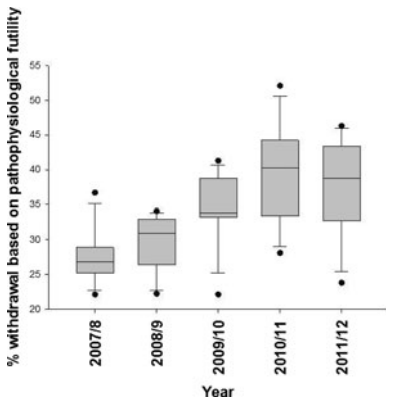

Figure 1 Limitation (pathophysiological futility)

CONCLUSIONS. These data demonstrate a novel association between insertion of end-of-life intervention tools, designed to improve the quality of care in the critical care setting, and changes to end-of-life practice. However, the mechanism underpinning this association is uncertain and important potential confounders from the presence of the research team; the critical care casemix and the organisation of the intensive care unit may have influenced this result.

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0897
OPIOIDS AND SEDATIVES DO NOT SEEM TO CONTRIBUTE TO TIME TILL DEATH AFTER WITHDRAWAL OF LIFE SUSTAINING THERAPY IN DUTCH CRITICALLY ILL ICU PATIENTS

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INTRODUCTION. In end of life management on the intensive care, various ethical issues are relevant. One of the most mentioned controversies is the so-called "double-effect doctrine". Because of the presumed contribution of opioids and sedatives to the progression of the dying process, many intensivists are restrained in the prescription of these medications. Although there is a growing body of evidence that opioids and sedatives even might prolong the dying process in general, for intensive care medicine however still only one study is available on this subject. We show here the results of a prospective study analyzing the effect of opioids and sedatives on time till death after withdrawal of ICU-treatment.

OBJECTIVES. To describe and analyze the different factors influencing the time till death after treatment is withdrawn in critically ill ICU patients in the Netherlands focussing on the dosages of opioids and sedatives.

METHODS. A prospective and observational study in 2 non-academic hospitals for a one year period, including all patients in whom ventilation and/or vaso-active medication was withdrawn for reason of futility. ICU nurses took care of patient inclusion and data collection. Dosages of fentanyl were recalculated to sufentanil using the factor 0,1. Factors potentially contributing to the time till death were identified and used in a stepwise multiple regression model. Analysis and tables were made using IBM SPSS statistics 19.0.
RESULTS. In the study period 139 patients were included. Mean SOFA score on admission was 10 and 12 on the day of withdrawal ($p < 0.05$). All but three patients were ventilated and in 93 % the ventilation was ceased. Ninety-three percent of the patients received vaso-active medication. Mean dosage of nor-adrenaline was 0,5 mcgram/kg/min. Vaso-active drugs were withdrawn in 93 % of the patients. Most patients ($n = 63$) were sedated with propofol. Sufentanil was the most used ($n = 62$) opioid with a mean dosage of 15 µg/h. Stepwise multiple regression analysis showed no significant contribution of both opioids and sedatives to the time till death. The determining factors for time till death in this population were SOFA score on the last day ($p = 0.004$) and the dosage level of norepinephrine ($p = 0.026$) at the time of treatment withdrawal.
CONCLUSIONS. Dutch patients in whom treatment is withdrawn are severely ill, and generally do not show improvement as indicated by their high levels of norepinephrine and high and even increasing SOFA scores at time of withdrawal. In this population the levels of opioids and sedatives are within the internationally accepted ranges for palliation and do not seem to attribute to the time of death, adding further proof to the literature showing that the "double effect doctrine" is no more than a myth in end-of-life care for severely ill ICU patients.

Acute kidney injury: 0898–0902

0898
COMBINATION OF RENAL BIOMARKERS PREDICTS ACUTE KIDNEY INJURY IN CRITICALLY ILL ADULTS

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INTRODUCTION. The incidence of acute kidney injury (AKI) in critically ill patients is currently rising, with a mortality rate of 50 % which has remained constant during the last decades. The lack of an early biomarker is an obstacle for the development of new preventive strategies and timely interventions against AKI. Most studies so far have focused on the performance of individual biomarkers to detect early AKI in the adult ICU patients; however, they have not determined the predictive ability of their combinations. Because AKI represents a complex, multi-factorial and heterogeneous clinical condition, we hypothesized that a panel of AKI biomarkers would be superior to each biomarker alone.
OBJECTIVES. The aim of the present study was to compare the predictive abilities of plasma neutrophil gelatinase-associated lipocalin (pNGAL), urine neutrophil gelatinase-associated lipocalin (uNGAL), plasma cystatin C (pCysC), serum creatinine (sCr) and their combinations, in detecting AKI in an adult general ICU population.
METHODS. This was a prospective observational study of adult patients admitted to a 30-bed general Critical Care Department A total of 100 consecutive ICU patients were included in the analysis. AKI was defined according to RIFLE criteria. Biomarker predictive abilities were evaluated by area under the curve (AUC), net reclassification improvement (NRI), and integrated discrimination improvement (IDI).
RESULTS. Of the 100 patients enrolled, 36 developed AKI within 7 days, 10 needed renal replacement therapy (RRT) during ICU stay, while their ICU mortality rate was 33 %. All three novel biomarkers as well as sCr had moderate predictive abilities for AKI occurrence. The most efficient combinations (pNGAL + sCr and pNGAL + uNGAL + sCr) were selected to participate in the subsequent analyses. Both combinations, when added to a reference clinical model, increased its AUC significantly (0.858, $p = 0.04$). Their NRI (0.78, $p = 0.0002$) was equal to that of pNGAL, but higher than that of the other three biomarkers, whereas their IDI was higher than that of any individual biomarker (0.23, $p = 0.0001$). Both combinations had better specificities (Sp), positive likelihood ratios ((+) LR) and positive predictive values (PPV) than those of any individual biomarker.
CONCLUSIONS. When we assessed the predictive performance with modern indices of reclassification improvement, namely the category-free NRI and the IDI, the two combinations were superior not only to sCr, but also to the other three novel biomarkers. Regarding each biomarker individually, pNGAL was superior to the other three. Early AKI detection by a combination of renal biomarkers could lead to timely interventions (e.g. avoidance of nephrotoxic drugs, early RRT initiation) to prevent the detrimental effects of AKI in critically ill patients.
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0899
PREDICTIVE VALUE OF NEUTROPHIL GELATINASE-ASSOCIATED LIPOCALIN (NGAL) FOR ACUTE KIDNEY INJURY IN INTENSIVE CARE PATIENTS: A SYSTEMATIC REVIEW

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INTRODUCTION AND OBJECTIVES. Serum creatinine has for many years been the principal marker of acute kidney injury (AKI). It is however widely acknowledged that serum creatinine is an unreliable indicator during acute changes in kidney function. A real-time marker of AKI may allow earlier and more effective institution of renoprotective therapies. Neutrophil gelatinase-associated lipocalin (NGAL) may be such a marker, but is also elevated in a wide range of systemic diseases. Because intensive care patients have high levels of systemic disease, our objective was to conduct a systematic review of the literature to evaluate the value of plasma and urinary NGAL to predict AKI in these patients.
METHODS. We conducted a systematic electronic literature search of MEDLINE through PubMed, EMBASE, and Cochrane Library for all English language research publications evaluating the predictive value of plasma and/or urinary NGAL for AKI in adult intensive care patients. Two authors independently extracted data using a standardized extraction sheet on study characteristics, type of NGAL measurements and type of outcome measures. The primary summary measure was area under receiving operating characteristic curve (AuROC) for NGAL to predict study outcomes.
RESULTS. Nine studies with a total of 2415 (range 20–632) participants were included; in seven studies urinary NGAL was assessed and in four plasma NGAL was assessed. The included studies had great variation in study design, including observation period from NGAL sample to AKI (range 12 h to 7 days), definition of baseline creatinine and urinary NGAL quantification method (normalizing to urinary creatinine or absolute concentration). AuROC values for prediction of AKI ranged from 0.54 to 0.98. Four studies reported AuROC for use of renal replacement therapy (RRT) ranging from 0.79 to 0.89 and four studies reported AuROC for mortality ranging from 0.63 to 0.83. Two studies reporting AuROC stratified for severity of AKI showed increasing AuROC with increasing severity. For studies conducting sensitivity analysis excluding patients with reduced kidney function at baseline, AuROC only changed marginally. There was no apparent difference in the predictive value of urinary and plasma NGAL.
CONCLUSIONS. The heterogeneity in study design and results made it difficult to evaluate the value of NGAL to predict AKI in intensive care patients. NGAL seems to have reasonable value in predicting use of RRT, but not mortality.

0900
LOWER MEAN ARTERIAL BLOOD PRESSURE AND SYSTEMIC OXYGEN DELIVERY ON DAY OF EARLY AKI ARE ASSOCIATED WITH INCREASED RISK OF PROGRESSIVE AKI AND MORTALITY

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BACKGROUND. Acute kidney injury (AKI) is common in critically ill patients and associated with increased morbidity and mortality. Treatment is limited to haemodynamic and fluid resuscitation and avoidance of further nephrotoxic insults. There are no data on the role of haemodynamic monitoring and optimisation to prevent progression and death in critically ill patients with early AKI.
OBJECTIVES. Our aim was to investigate the association between haemodynamic parameters at time of early AKI and outcome (risk of progression to severe AKI and hospital mortality) in critically ill patients in the Intensive Care Unit (ICU).
METHODS. We retrospectively reviewed the electronic medical records of all patients admitted to the ICU in a tertiary care centre between June 2007 - June 2009. We identified patients with AKI according to the AKI Network criteria who had had haemodynamic monitoring within 12 h of the diagnosis of AKI stage I. Patients who died or were discharged on the day of diagnosis of AKI and patients with AKI stage III on admission to ICU were excluded. Haemodynamic parameters on the day of AKI stage I were recorded and logistic regression analysis was employed to determine independent predictors of poor outcome.
RESULTS. During the 24 months period, 2186 patients were admitted to ICU of whom 49.5 % fulfilled criteria for AKI during their stay in ICU. 205 patients (mean age: 66 years; 138 male) underwent haemodynamic monitoring within 12 h of the diagnosis of AKI I of whom 41.5 % progressed to AKI III and 43.3 % died in hospital. Univariate analysis showed that patients who progressed to AKI III had alower cardiac index (median 2.82 vs. 3.35 l/min/m^2; $p = 0.004$), lower indexed systemic oxygen delivery (DO_2I) (median 342.3 vs. 405.0 ml/min/m^2; $p = 0.006$), lower mean arterial blood pressure (MAP) (median 71 vs. 74 mmHg; $p = 0.011$) and a higher central venous pressure (median 13 vs. 11 mmH_2O, $p = 0.043$) on the day of AKI I, compared to patients who did not develop AKI III. Adjustment for demographic factors and severity of illness in a multivariate analysis showed that DO_2I [Odds ratio (OR) 0.86 per 50 ml/min/m^2 increase; 95 % CI 0.82–0.95], and MAP (OR 0.80 per 5 mmHg increase; 95 % CI 0.66–0.99) on the day of AKI I were independently associated with a reduced risk of progression to AKI III. Only MAP in the first 12 h after the diagnosis of AKI was independently associated with hospital mortality (OR 0.95 per 1 mmHg increase; 95 % CI 0.91–0.99, $p = 0.022$).
CONCLUSIONS. A higher DO_2I and MAP on the day of AKI I are associated with a significantly lower risk of progression to AKI III and lower hospital mortality.

0901
HUMAN ALBUMIN VERSUS ISOTONIC SODIUM BICARBONATE IN PREVENTION OF CONTRAST INDUCED NEPHROPATHY IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Contrast-induced nephropathy (CIN) is an acute kidney injury associated with both short and long term adverse outcomes. Patients with pre-existing renal insufficiency, diabetes mellitus and congestive heart failure are at highest risk. Modifiable risk factors for CIN include hydration status, the type and amount of contrast, use of concomitant nephrotoxic agents and recent contrast administration. Several strategies to prevent contrast-induced nephropathy are currently advocated, including use of alternative imaging techniques, use of the lowest possible amount of iso-osmolar or low-osmolar contrast agents instead of high-osmolar contrast agents, hyper hydration, administrations of N-acetylcysteine and peri-procedural haemofiltration/haemodialysis [1, 2].
OBJECTIVES. The aim of this study was to compare the effect of the use of human albumin versus isotonic sodium bicarbonate in the prevention of CIN in critically ill patients with moderate chronic renal insufficiency.
METHODS. The study was carried out on 40 adult critically ill patients with moderate chronic renal insufficiency admitted to the Alexandria University Main Hospital subjected to intravenous contrast administration. The patients were randomly devided to two groups the first group received intravenous isotonic sodium bicarbonate plus N- acetyl cysteine orally. The second group received human albumin solution with the administration of NAC. Baseline creatinine clearance as estimated by Modification of Diet in Renal Disease (MDRD), blood urea, serum creatinine, serum Na, and serum albumin level were compared to those at 24, 48 and 72 h after contrast administration. Non-ionic contrast medium with low osmolality was used in the study. CIN was defined as an increase of at least 25 % over the baseline value of serum creatinine within 48 h after contrast administration.
RESULTS. The incidence of CIN in the bicarbonate group was the same as the incidence of CIN in the albumin group = (5 %). Serum blood urea level increased in the albumin group over the 72 h than the baseline level. Serum sodium level increased in the isotonic sodium bicarbonate over the 72 h than the baseline and than its level in the albumin group.
CONCLUSIONS. Contrast induced nephropathy (CIN) is common following contrast administration in patients with moderate chronic renal insufficiency having MDRD between

30–50 ml/min/1.73 m^2. Human albumin protected critically ill patients with moderate chronic renal insufficiency having MDRD between 30–50 ml/min/1.73 m^2 from developing CIN just as isotonic sodium bicarbonate did.

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0902

PREVALENCE OF KIDNEY DYSFUNCTION IN THE ICU. RESULTS OF THE COFRADE MULTICENTRE STUDY

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INTRODUCTION. Data regarding the real impact of kidney dysfunction in the ICU patient are confusing because the different definitions and methods of detection employed. As to date, the real prevalence of this problem has not been determined.

OBJECTIVES. To measure the prevalence of kidney dysfunction (KD) in the Intensive Care Unit and evaluate the use of nephrotoxic drugs in patients with undetected KD.

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 (sCr) and urine creatinine in a two hours sample of urine volume but did not ask investigators to calculate it by themselves. Significant KD was defined as a CrCl < 60 mL/min/1.73m2. Nephrotoxic drugs administered this day were registered. This study was approved by the ethics committee of each centre and informed consent was required for all patients. X square and T Student test were used with a signification of 95 %.

RESULTS. We included 919 patients (40,5 % admitted for medical problems, 36,4 % surgical, 10.1 % cardiac, 8.7 % trauma and 1.2 % transplant) with 59.8 ± 16.1 years, 62,2 % males, APACHE II 15.6 ± 7.9 and SOFA 5.6 ± 3.9 the day of the screening. Antecedents: 45 % hypertensive, 23.2 % diabetics and 7.1 % chronic renal failure. Median delay from admission to day of screening was 8 (2–23) days. In 827 patients CrCl could be calculated and was over 90 mL/min in 37,8 % and between 60–90 ml/min in 20,1 %. Prevalence of significant KD (CrCl < 60) was 42,1 % (348 cases) in our population. When RIFLE system was calculated acording to sCr (not CrCl), 454 patients did not show dysfunction but among them 32.3 % already had a CrCl < 60. Analysed separately, KD patients had more morbidity (hypertension, cardiac disease or diabetes, $p < 0.05$) and higher ICU (29,6 % with KD vs. 12,3 % without, $p < 0,001$) and hospital mortality (7,1 with KD vs. 4,2 %, $p < 0,05$). Selecting 143 patients of this group with Crs > 1.2mgr/dL and no RIFLE (67 cases), we found that 46,9 % where receiving some potentially nephrotoxic drug (37,1 % just one, 7,7 % two and 2,1 % three or more).

CONCLUSIONS. Prevalence of kidney dysfunction is very high, with over half of the patients admitted showing some degree of dysfunction. Even when RIFLE scale improves the capability of creatinine for detection, the percentage of undetected cases by this mean is still high and we must be aware that almost half of these undetected cases (precisely those in which secondary prevention could be of more significance) suffer some kind of aggression to the kidney.

Therapeutic hypothermia: 0903–0907

0903

BRAIN DAMAGE IN NON-SURVIVORS AFTER CARDIAC ARREST AND THERAPEUTIC HYPOTHERMIA

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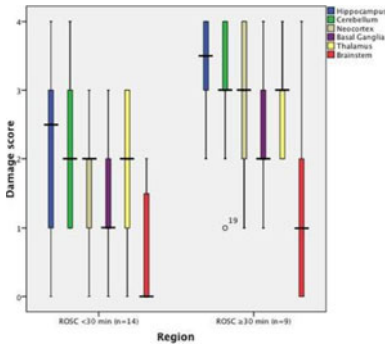
INTRODUCTION. Following cardiac arrest (CA), the brain often exhibits selective neuronal necrosis (SNN), the degree of damage correlating with length of short-term survival after CA [1]. Therapeutic hypothermia (TH) after CA has been clinically shown to reduce neurological sequels and death [2]. Although earlier described in normothermic animal studies, [3] the neuropathology is yet not systematically described in humans treated with TH after CA.

OBJECTIVES. In this study we aimed to systematically describe the ischemic brain damage in CA patients who died after completed TH and who later underwent autopsy. Furthermore, we wanted to correlate the neuropathological findings to time to return of spontaneous circulation (ROSC).

METHODS. Brain autopsy microscopic slides and clinical data were gathered from 23 deceased patients with previous CA and treatment with TH at the University Hospital in Lund 2004–2010. Of the 23 patients 18 (78 %) were men and 5 (22 %) were women. Mean age was 61,6 ± 14,7 years, median time to ROSC was 25 (20–35) minutes and median time to death was 127 (107–150) hours. Based on the percentage of devitalized, eosinophilic neurons (SNN), a damage score 0–4 was given for the hippocampus, cerebellum, neocortex, basal ganglia, thalamus and the brainstem and a total damage score for each case was calculated. The level of damage was also correlated versus time to ROSC. All microscopic evaluation was made blinded to clinical data.

RESULTS. The region with the highest damage score was the hippocampus with a median of 3 (2–4) whereas the brainstem had the lowest damage score with a median of 0 (0–2). The sum of all regions' damage scores showed the best correlation to time ROSC (Rho = 0.66) followed by that of the hippocampus (Rho = 0.54).



Boxplot regional damage score in two ROSC groups

CONCLUSIONS. This is the first systematic study on acute brain damage after CA and hypothermia treatment. The hippocampus was the region most susceptible to ischemia whereas the brainstem was the most resistant. Since total damage score correlated best with time to ROSC, we suggest that all regions mentioned above should be evaluated to optimally assess the ischemic brain damage in CA individuals victims treated with TH.

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0904

USE OF THERAPEUTIC HYPOTHERMIA IN THE ICU PREDICTS SURVIVAL IN UNCONSCIOUS OUT-OF-HOSPITAL CARDIAC ARREST PATIENTS INDEPENDENT OF AGE, ORIGIN AND INITIAL RHYTHM

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INTRODUCTION. While therapeutic hypothermia (TH) in out-of-hospital cardiac arrest (OHCA) patients with cardiac origin and shockable rhythms has become standard of care [1], its use with non-cardiac origin, non-shockable rhythms or in older patients has remained controversial [2].

OBJECTIVES. To study which patient, origin of cardiac arrest and treatment factors that predicted survival to hospital discharge in unconscious OHCA patients admitted to ICU.

METHODS. This retrospective cohort study was performed in three Norwegian post resuscitation care (PRC) centres which adopted TH use early (year 2002–2003). All patients have been consecutive registered in their in hospital registries. Unconscious OHCA patients older than 18 years admitted to the ICUs in the PRC centres from January 2004 to January 2008 were examined. Patients with traumatic OHCA origin were excluded. Patients, pre-hospital data (Utstein style) and hospital data were used in uni- and multivariate analysis of survivors versus (vs.) non-survivors, with a propensity score for factors linked to TH use included as an independent covariate.

RESULTS. Seven hundred fifteen unconscious OHCA patients were admitted to the ICUs. The overall use of TH was 70 %, with a better survival in TH treated patients (Figure 1).

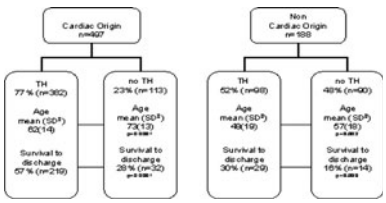

Figure 1

Compared to survivors, non-survivors had significantly lower length of mechanical ventilation (mean 5 vs. 8 days; $p < 0.01$) and length of ICU stay (mean 5 vs. 8 days; $p < 0.01$). After correcting for confounders, use of TH remained a significant independent predictor of good outcome (Table 1). Adding the propensity score for factors linked to TH use did not change the result of the multivariate analysis.

Table 1 Predictors of survival to discharge

	Odds ratio	95 % confidence interval	p
Age (one additional year)	0.96	0.94–0.97	<0.0001
Female gender	0.58	0.36–0.92	0.022
Shockable rhythm	6.5	3.77–11.38	<0.0001
Cardiac origin	2.64	1.36–5.10	0.001
Diabetes Mellitus	0.35	0.19–0.65	0.001
TH treatment	1.91	1.18–3.06	0.007

CONCLUSIONS. Our study seems to support the liberal use of TH in unconscious survivors of OHCA in the ICU, independent of age, cause and initial rhythm. The ICU resource use was lower in non-survivors compared to survivors.

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0905
CHANGES OF INFLAMMATORY MEDIATORS DURING REWARMING PERIOD AFTER MILD THERAPEUTIC HYPOTHERMIA

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INTRODUCTION. One of the most important treatment targets for cardiac arrest victim care is the control of inflammatory response due to ischemic-reperfusion injury [1]. Therapeutic hypothermia is the one of the most important treatment strategies for controlling these overwhelming inflammatory reactions [2]. It is well known that rapid rewarming is related with the poor outcome, but few are known that what kinds of inflammatory processes are occurred during rewarming period [3].

OBJECTIVES. We want investigate changes of inflammatory mediators during rewarming period after completion of therapeutic hypothermia for cardiac arrest victims.

METHODS. This study was conducted in an emergency intensive care unit (ICU) of a tertiary referral hospital. After informed consent, patients' blood samples were collected at on admission and 0 h, 2 h, 4 h, and 8 h after the start of rewarming. Inflammatory mediators (E-selectin, soluble ICAM, interleukin-10, interleukin-1ra, interleukin-6, interleukin-8, monocyte chemotactic protein-1 and tumor necrosis factor-α) were measured using simultaneous Luminex Assay. Therapeutic hypothermia was applied for 24 h at 32 °C. Rewarming after hypothermia was done for 8 h at the rate of 0.5 °C.

RESULTS. Fifteen patients were enrolled and completed schedule of 24 h hypothermia and 8 h rewarming. Levels of IL-10 showed significant change. During rewarming period IL-10 levels were decreased.(Basal: 30.5 ± 61.0 pg/ml, rewarming 0 h: 4.3 ± 8.8 pg/ml, rewarming 2 h: 4.4 ± 10.6 pg/ml, rewarming 4 h: 3.6 ± 8.8 pg/ml, rewarming 8 h: 2.7 ± 3.7 pg/ml, p value 0.042) Levels of MCP-1 showed tendency of increasing during rewarming period but not statistically definite. (Basal:133.0 ± 61.0 pg/ml, rewarming 0 h:41.8 ± 31.9 pg/ml, rewarming 2 h: 46.6 ± 34.0 pg/ml, rewarming 4 h: 45.3 ± 8.8 pg/ml, rewarming 8 h: 83.6 ± 3.7 pg/ml, p value = 0.06) E-selectin, s-ICAM, IL-6, IL-8 and TNF- α showed no significant different levels during rewarming period. All levels of IL-1ra were under detectable value. There were no inflammatory mediator level differences between good CPC (CPC1, 2) and poor CPC (CPC 1–3) group.

CONCLUSIONS. During rewarming period levels of IL-10 are increased. Levels of other markers were not changed during rewarming period. Further studies are needed for more understanding rewarming mechanism.

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0906
MONITORING OF BACTERAEMIA IN POST-CARDIAC ARREST PATIENTS TREATED WITH MILD THERAPEUTIC HYPOTHERMIA

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INTRODUCTION. Mild therapeutic hypothermia (MTH) is a worldwide used therapy to improve neurological outcome in patients who have been successfully resuscitated after cardiac arrest (CA). Suppression of harmful inflammatory response after CA is one of the mechanisms through which hypothermia may exert its positive effects. However, in vitro and clinical studies showed that this protective mechanism is also an increased risk for nosocomial infections.

OBJECTIVES. Retrospective determination of incidence rates of bacteraemia in post-CA patients treated with MTH.

METHODS. The presence of bacteraemia in post-CA patients, non-invasively cooled using body wraps (Medi-Therm®, Gaymar), in the period 2008–2010 was documented. Patients were treated according to standard MTH protocol aiming at target temperature of 32.0 °C and maintained for 24 h after which the patient was gradually warmed to normothermic temperature at a rate of ~0.5 °C/h. Data from post-CA patients who survived the cooling period were compared to a dataset in which all positive blood cultures were recorded from all the patients admitted to the ICU during the period 2008–2010. Selective decontamination of the digestive tract was used in all patients.

RESULTS. During the 3-year period 172 post-CA patients survived the cooling period. Ten out of 172 (5.8 %) patients acquired bacteraemia in the period after recovering from CA at the ICU (median = 8.5 days after ICU admission (IQR:5.0–18.5)). Mainly three different micro-organisms were detected in fourteen positive blood cultures, namely *Enterococcus faecium*, *Enterococcus faecalis* and *coagulase-negative staphylococci*. The incidence of these micro-organisms was 36, 21 and 29 % respectively.

In total 4,428 patients were admitted to the ICU in this period, of which 216 patients (4.9 %) developed bacteraemia during their ICU stay. Compared to post-CA patients, less infections with *E. faecium*, *E. faecalis* and *Coagulase negative staphylococcus* were detected (Table 1) compared to post-CA patients. However, due to the limited number of patients this difference did not reach statistical significance.

Infection numbers and percentages

	Post-CA patients (n)	All patients (n)
Enterococcus faecium	5 (36 %)	40 (12 %)
Enterococcus faecalis	3 (21 %)	8 (8 %)
Coagulase negative staphylococcus	4 (29 %)	121 (35 %)

CONCLUSIONS. Bacteraemia in post-CA patients is mainly caused by *E. faecium* and *E. faecalis*. This interesting observation can be explained by possible ischemia-induced damage to the intestine during CA. As a result of this impaired barrier, micro-organisms from the intestine can migrate easier into the bloodstream. In patients admitted to the ICU without a history of CA, we found statistically not significant, less infections with these micro-organisms. Further investigation is needed to increase the number of patients and to unravel the way these micro-organisms invade the bloodstream easier in post-CA patients.

0907
COMPARISON OF TWO DIFFERENT COOLING TECHNIQUES TO ACHIEVE MILD THERAPEUTIC HYPOTHERMIA IN POST-CARDIAC ARREST PATIENTS

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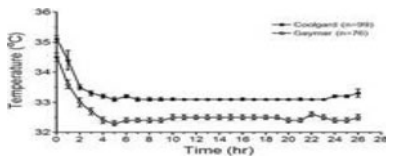
INTRODUCTION. Mild therapeutic hypothermia (MTH) is an established treatment to limit neurological injury and improve survival in patients after cardiac arrest (CA) and successful resuscitation. Preclinical data strongly suggest that timing and speed of induction of MTH are related to reduced secondary brain damage and improved outcome. While several methods of cooling are currently applied, there is no proof of superiority of any cooling method above others.

OBJECTIVES. Investigate effectiveness of inducing and maintaining MTH using a non-invasive surface- and invasive intravascular cooling device.

METHODS. According to Dutch legislation, no approval of the research ethics committee is required for this standard treatment. In two university hospitals in the Netherlands consecutive post-CA patients were included and treated using non-invasive surface cooling (Medi-Therm, Gaymar, USA) at VUMC Amsterdam or an invasive intravascular method (CoolGard, Zoll, USA) at ErasmusMC Rotterdam. In the non-invasive Gaymar group (GM), body wraps were placed around the patients body, while an external temperature control unit adjusts the temperature of the water circulating through the wraps. Target temperature was set at 32.0 °C and maintained for 24 h. For the invasive CoolGard group (CG) an intravascular catheter (Quattro, Zoll, USA) was inserted in the femoral vein. Temperature-adjusted sterile saline flows within heat-exchange balloons, located near the distal end of the catheter, and exchanges heat with the blood as it passes by. The target temperature in this group was set at 33.0 °C and maintained for 24 h.

RESULTS. 76 GM and 99 CG patients were included of which respectively 72 % and 78 % were male (ns). Mean age was 62 ± 2 (GM) and 66 ± 2 years (CG; ns). Body weights of GM patients were significantly lower compared to CG patients (76 ± 13 vs. 83 ± 14 kg respectively; $P = 0.001$). Starting temperature was lower in the GM group compared to the CG group (34.5 ± 11.2 vs. 35.1 ± 1.2 °C respectively; $P = 0.005$). Time to reach target temperature and cooling rates were not different between both groups (Figure), note the different defined target temperatures between the groups. During the 24 h maintenance phase mean core temperature in the GM patients was 32.45 ± 0.08 °C (range:32.32–32.61 °C) and in CG patients 33.11 ± 0.03 °C (range:33.07–33.18 °C), indicating more steady temperature control in the invasive CG group compared to GM group. Also the coefficient of variation for temperature during the maintenance phase was lower in the CG group (VC:0.5 %) compared to GM group (VC:1.1 %). Survival was not different between both cooling methods (60 % CG vs. 53 % GM).

CONCLUSION. Using the invasive Coolgard or non-invasive Gaymar cooling systems to achieve MTH in post-CA patients results in equal time to reach target temperature and cooling speed, but the invasive method offers a more controlled and precise cooling in terms of less temperature variation during the maintenance phase.



Mean temperature per hour during MTH

Molecular mechanisms in sepsis: 0908–0912

0908
ASSESSMENT OF THE SAFETY AND FEASIBILITY OF ADMINISTERING ANTI-PYRETIC THERAPY IN CRITICALLY ILL ADULTS: A RANDOMIZED CLINICAL TRIAL

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INTRODUCTION. Fever is one of the most commonly observed abnormal signs in patients admitted to an intensive care unit (ICU). However, there is a paucity of evidence to guide the management of febrile critically ill patients without acute brain injury.

OBJECTIVE. The primary objective of this study was to assess the safety and feasibility of treating febrile critically ill adults (without acute brain injury) with an aggressive as compared to permissive fever control strategy.

METHODS. We performed a pilot, randomized, parallel-group, open-label clinical trial (ClinicalTrials.gov, number NCT01173367) that employed block randomization to assign febrile patients to an aggressive or permissive fever control strategy. Fever was defined as two consecutive measures of core temperature of ≥38.3 °C or one temperature >39.5 °C. Eligible patients were ≥18 years of age, and expected to stay in the ICU for ≥48 h. For the aggressive fever control group, acetaminophen and physical cooling were administered when the temperature was ≥38.3 °C, whereas such therapy was not provided until the temperature was ≥40.0 °C in the permissive control group. The primary outcome was 28-day mortality with secondary outcomes focused on safety and feasibility.

RESULTS. During the study period there were 1,312 admissions to the two participating ICUs, among which 200 patients had a fever (58 % of the originally projected number of patients with fever). Fourteen patients were randomized to the aggressive group and 12 to the permissive group. All study participants were followed to hospital discharge. Patients in the aggressive group received a greater median (inter-quartile range) dose of acetaminophen (2,275 [650–3,900] mg vs. 0 [0–0] mg, $p = 0.0001$) and more frequently received physical cooling than patients in the permissive group (57 % vs. 8 %, $p = 0.01$). The mean (standard deviation) daily temperature during a febrile episode in the aggressive group was 37.8 °C (0.7 °C), compared to 38.0 °C (0.8 °C) for the permissive group ($p = 0.02$) There was no difference in the primary outcome of 28-day mortality (21 % in the aggressive group vs. 17 % in the permissive group, $p = 1.0$) or in any of the pre-defined safety outcomes between the two treatment groups.
CONCLUSIONS. This pilot clinical trial demonstrated the safety and feasibility of administering an aggressive compared to a permissive fever control strategy in critically ill adults without acute brain injury. The most important finding from this study was a lower than expected number of patients with fever during the study period. The reasons for this need to be determined as it will significantly influence the feasibility of conducting a larger phase III evaluation of this important clinical question.
GRANT ACKNOWLEDGMENT. This study was funded by an operating grant from the Canadian Intensive Care Foundation.

0909
TIMING OF INTUBATION IN SEPTIC SHOCK PATIENTS: THE BREATHE SURVEY

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INTRODUCTION. No clear guidelines are available to guide timing to intubation in septic shock patients.
OBJECTIVE. To record intensivists beliefs on indications and modalities of ventilator support in critically ill patients with septic shock.
METHOD. The instrument is a 23-items questionnaire (either yes/no answers or semi-linker answers ranging from from 1: strongly disagree to 7: strongly agree. The questionnaire was sent to all members of the Systemic Inflammation and Sepsis section of the ESICM.
RESULTS. 186 intensivists from 30 countries completed the survey. 68 % of physicians were working in teaching hospitals and 74 % in a mixed medical-surgical ICU. Most of responders were full time attending physicians in the ICU for on average 11 ± 4 years. For 90 % of responders, intubation should be performed in patients with neurological or respiratory failure. There was much less consensus about cardiovascular failure as a reason for initiation of invasive mechanical ventilation. However, in patients with sustained hemodynamic instability despite adequate symptomatic and etiologic treatment, 64 % of responders proposed to initiate mechanical ventilation in severe sepsis patients and 76 % in septic shock patients. Accordingly, main reasons for intubation and invasive ventilation were a lung source for sepsis or the presence of neuromuscular weakness in more than 50 % of surveyed physicians. Clinical criteria for initiation of mechanical ventilation were scored from 1 (minor role in the decision) to 7 (strong argument for). Among the 8 hemodynamic criteria proposed, a lactates level greater than 4 was associated with the willingness to intubate the patient (score of 5 ± 2). Signs of respiratory distress were scored 6.3 ± 1 and a Glasgow score of less than 8 was scored 6.4 ± 1. Strikingly, 67 % of surveyed physicians believed that invasive mechanical ventilation may worsen patients with severe sepsis, and 51 % of them believed it may also be deleterious in septic shock patients. For 58 % of responders, initiation of mechanical ventilation may worsen patient's hemodynamic status. Interestingly, 97 % of responders reported that noninvasive ventilation may be initiated in patients with severe sepsis; 65 % still believed so in case of septic shock.
CONCLUSION. This survey highlights the general belief that intubation and mechanical ventilation may worsen hemodynamic status in patients with severe sepsis/septic shock. Surveyed physicians agreed with the mandatory need to initiate mechanical ventilation in patients with respiratory failure and coma, but not in other situations. Last, the finding that in septic shock patients noninvasive ventilation (which is not recommended) is being used by most intensivists, warrants the need for further appraisal.

0910
THE EFFECTS OF ANTI-PYRETIC THERAPY ON THE IMMUNOLOGY OF FEVER IN CRITICALLY ILL ADULTS: SECONDARY ANALYSIS FROM A RANDOMIZED CLINICAL TRIAL

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INTRODUCTION. It is unknown whether fever should be treated in critically ill patients. Treatment may reduce the metabolic demand imposed by pyrexia, yet it may also abrogate the adaptive inflammatory cascade that is known to accompany fever.
OBJECTIVE. The primary objective of this study was to assess the effect of anti-pyretic treatment of fever on the expression of inflammatory mediators in critically ill patients.
METHODS. This study was conducted in parallel to a phase II pilot clinical trial designed to assess the safety and feasibility of administering anti-pyretic therapy in febrile critically ill adults (ClinicalTrials.gov, number NCT01173367). Fever was defined as two consecutive measures of core temperature ≥38.3 °C or one temperature ≥39.5 °C, and eligible patients were randomly assigned to an aggressive (acetaminophen and physical cooling for temperatures ≥38.3 °C; n = 14) or permissive (acetaminophen and physical cooling for temperatures ≥40.0 °C; n = 12) fever control strategy. Plasma was isolated from all patients upon study admission and at 12, 24, and 48-h after randomization. The levels of 48 pre-specified inflammatory mediators were examined using Luminex technology. The primary unit of analysis was a comparison of the change in mediator concentration for each time point relative to baseline between the two treatment groups.
RESULTS. Patients in the aggressive group received a greater median (inter-quartile range) dose of acetaminophen (2,275 [650–3,900] mg vs. 0 [0–0] mg, $p = 0.0001$) and more frequently received physical cooling than patients in the permissive group (57 vs. 8 %, $p = 0.01$). The mean (standard deviation) daily temperature during a febrile episode among patients in the aggressive group was lower than those in the permissive group (37.8 °C [0.7 °C] vs. 38.0 °C [0.8 °C], $p = 0.02$). Among all study patients (n = 26), baseline levels of inflammatory mediators were similar, and GCSF (granulocyte colony stimulating factor), IL (interleukin)-10, IL-6, and RANTES (Regulated upon Activation, Normal T cell Expressed, and Secreted) decreased significantly ($p < 0.05$) within 12-h of randomization. The levels of classic mediators of inflammation (e.g. IL-6, and IL-17) did not differ between the treatment groups. Patients in the permissive group had higher levels of IL-1β, MIP(macrophage inflammatory protein)-1α, and interferon(IFN)-γ, and lower levels of GCSF throughout the 48-hour assessment period; however the change in concentration over time for any molecule did not differ between the two study groups.
CONCLUSIONS. This study is the first to demonstrate that different temperature control strategies have little effect on the underlying biology of fever. Furthermore, the finding that GCSF, IL-10, IL-6, and RANTES generally decrease during the early phase of pyrexia in humans is novel.
GRANT ACKNOWLEDGMENT. This study was funded by an operating grant from the Canadian Intensive Care Foundation.

0911
A POSITIVE FLUID BALANCE AND USED LOOP DIURETICS AMOUNT ARE ASSOCIATED INCREASED MORTALITY IN INTENSIVE CARE UNIT

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INTRODUCTION AND OBJECTIVES. Fluid resuscitation is an important initial treatment strategy in septic shock. But, fluid overload is associated with increased mortality. Control of fluid balance and restriction of fluid is important after initial fluid resuscitation in sepsis and critically ill patients. Diuretics are commonly used in control of overloaded fluid balance. The aim of this study is to test correlation of intensive care unit (ICU) mortality with fluid balance and used loop diuretics amount in ICU.
METHODS. We reviewed medical records of 650 adult patients in medical and emergency ICU at Yonsei University Wonju Christian Hospital from March 2011 to August 2011. We compared fluid balances and used loop diuretics amount in the groups of patients deceased (Group D) and discharged alive (Group A) from the ICUs.
RESULTS. Ninety seven patients (14.9 %) were died and among these patients, 61 (62.9 %) were male. The most common causes of death were septic shock (25.8 %) and pneumonia (21.6 %). Fluid balance during ICU management and the first admission day of Group D and A were 7,007 ± 814 ml, 1,777 ± 215 ml ($p < 0.001$) and 1,608 ± 281 ml, 864 ± 78 ml ($p = 0.057$). Loop diuretics amounts during ICU management, the first day, and daily average in group D and A were 769.1 ± 166.8 mg, 373.7 ± 52.3 mg ($p = 0.002$), 48.7 ± 12.6 mg, 23.8 ± 3.2 mg ($p < 0.001$), and 103.4 ± 15.4 mg, 38.4 ± 4.0 mg ($p < 0.001$). APACHE II score correlated with total fluid balance($r = 0.180$, $p < 0.001$), first day ($r = 0.138$, $p = 0.001$), second day ($r = 0.112$, $p = 0.007$), and third day fluid balance ($r = 0.146$, 0.001). Also, it correlated with loop diuretics amount in ICU, total amount ($r = 0.369$, $p < 0.001$), first day used amount ($r = 0.268$, $p < 0.001$) and daily average amount ($r = 0.319$, $p < 0.001$). ICU mortality were influenced by age, hemoglobin, blood urea nitrogen, creatinine, albumin, hospital day in ICU and continuous renal replacement therapy.
CONCLUSIONS. In our study, deceased patients in ICU had more positive fluid balance and more diuretics use than survivors. Those were related with patients' severity. But, out of control fluid balance may make increasing loop diuretics use and possibility of mortality. The correlation of ICU mortality with a positive fluid balance and used loop diuretics amount is needed more observation.
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0912
OXYGEN DELIVERY AND DEMAND DURING FEVER AND NORMOTHERMIC CONDITIONS IN SEPTIC PATIENTS

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INTRODUCTION. Sepsis is characterized by abnormal delivery of oxygen DO_2. International guidelines report that DO_2 should be in normal limits in order to avoid organ insufficiency and to have better patient outcome. SvO_2 is saturation of venous blood taken from the pulmonary artery and is a measurement of DO_2 and of total body oxygen demand VO_2. The SvO_2 is 60–80 % and correlate well with $ScvO_2$ which has a normal limit about 2–3 % lower very low values of $ScvO_2$ represent high VO_2 which surpasses the DO_2 and very high values of $ScvO_2$ represent either increased DO_2 or very low VO_2 due to low tissue metabolic rate or inability to use the oxygen.
OBJECTIVES. Objective of this study was to verify the changes in VO_2 and DO_2 in febrile septic patients that are demonstrated in international studies which state that during fever VO_2 is increased and during the normothermy VO_2 is decreased.
METHODS. 20 patients were included. All patients were under active cooling with Coolguard system which was turned on when the temperature was 39.2 C and switched off at 37 C. Each patient had a $ScvO_2$ catheter which was connected with the Vigileo/Flotrack system or a Swan-Ganz with a COset. During the fever and in normothermy the following parameters were recorded: temperature, $ScvO_2$ or SvO_2 accordingly, obtained with arterial blood sample SpO_2, VO_2, DO_2, DO_2I, OER, CVP, MAP, CO, CI,SV,SVR,SVRI. The statistical analysis was done with paired samples *T* test.
RESULTS. All patients (pts) had DO_2 at least twice as much as critical DO_2. 7 pts were in group A with an increase in VO_2 during the febrile episode and 8 pts with decrease were placed in group B, 5 pts were in group C with no change. There was a difference of $p = 0.03$ in group A and $p = 0.001$ in group B VO_2. There was a difference in VO_2 in fever between the pts in group A and group B with a $p = 0.005$. Group B had a significant difference in OER $p = 0.007$.
Accordingly the pts were in Group D if there was an decrease in DO_2 (9 pts) and group E if there was a increase in DO_2 (10 pts) during the febrile episode. In one patient DO_2 was not recorded. group D did not have differences.Group E had a difference in DO_2 with $p = 0.02$.
CONCLUSIONS. This study presents the absence of a way to predict which pts will decrease the DO_2 and increase the VO_2 during a febrile episode in relation with the DO_2 and VO_2 in normothermic condition.About 45 % of our patients reacted differently than what it is described. This is attributed that in those patients there was an inability to use oxygen.
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Oral Sessions
Inflammatory pathways in ARDS: 0913–0917

0913

ANGIOGENIC FACTORS AND THEIR SOLUBLE RECEPTORS IN ACUTE LUNG INJURY (ALI)/ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS) IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Acute lung injury (ALI) and acute respiratory distress syndrome (ARDS) are characterized by a disruption of the endothelium and alveolar epithelial barriers involving increased microvascular permeability, resulting in protein-rich pulmonary edema. Angiogenic factors and their receptors, including the vascular endothelial growth factor (VEGF)/VEGF-receptor (VEGFR) and angiopoietin (Ang)/Tie2 signaling pathways, play pivotal roles in angiogenesis and microvascular permeability. In our previous study, we demonstrated that VEGF may play a role through the expression of VEGFR in LPS-induced ALI (1).
OBJECTIVE. To assess the relationship between angiogenic factors, their soluble receptors and ALI/ARDS associated with sepsis, severe trauma, and post-cardiac arrest syndrome.
METHODS. One hundred fifty-nine critically ill patients, including 50 patients with sepsis, 57 patients with severe trauma and 52 resuscitated after out-of-hospital cardiac arrest, were divided into three subgroups: including 25 ALI patients, 101 ARDS patients and 22 non-ALI/ARDS patients. The serum levels of angiogenic factors were measured at the time of admission (day 1), day 3, and day 5 and were compared among the ALI, ARDS and non-ALI/ARDS groups. Thereafter, their predictive values for developing ALI/ARDS were evaluated.
RESULTS. There were higher levels of sVEGFR1 and Ang2 in ALI and ARDS patients than non-ALI/ARDS patients during the whole study period. The Ang2/Ang1 ratio in the ARDS group during the study period was also significantly higher than that in the non-ALI/ADRS group. In addition, the sVEGFR2 levels in the ARDS group on day 1 were significantly lower than those of the non-ALI/ADRS group. The VEGF, Ang1 and sTie2 levels were not significantly different among the three groups. There were significant correlations between the prevalence of ALI/ARDS and sVEGFR1, sVEGFR2 and Ang2 on day 1. A logistic regression analysis showed that sVEGFR2 and Ang2 were independent predictors of developing ALI/ARDS. The receiver operating characteristics (ROC) curves for Ang2 was a good predictor of the prevalence of ALI/ARDS (area under the ROC curve; 0.762, $p < 0.001$, 95 %; CI 0.671–0.832, optimal cutoff point; 3,451 (pg/ml), sensitivity; 0.738, specificity; 0.727).
CONCLUSION. These data support the pathophysiological relationship between ALI/ARDS associated with critical ill and angiogenic factors and their receptors, particularly sVEGFR2 and Ang2. Ang2 is a strong predictor for the development of ALI/ARDS.
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GRANT ACKNOWLEDGMENT. This study was supported in part by a Grant-in-Aid for Scientific Research from the Ministry of Education, Science, Sports and Culture of Japan (2009-21249086).

0914

USEFULNESS OF PROCOLLAGEN III IN THE DIAGNOSIS OF BIOPSY-PROVEN LUNG FIBROSIS COMPLICATING ARDS

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INTRODUCTION. The diagnosis of post-aggressive pulmonary fibrosis is difficult to establish. The gold standard remains lung biopsy histological exam. The use of corticosteroids in this context remains controversial. It has been shown that nearly 50 % of the ARDS patients in whom corticosteroids were indicated did not exhibit histological hallmarks of fibrosis [1]. The use of a highly specific biomarker of lung fibrosis could be useful in the early identification of patients who could benefit from corticosteroids. However, to our knowledge, procollagen III (PC III) was never compared to the lung histological gold standard in ARDS patients.
OBJECTIVES. To evaluate the diagnostic performance of blood and alveolar PC III using lung histological examination in non-resolving ARDS patients as the reference method.
METHODS. This prospective observational study was conducted in the medical ICU from a teaching hospital. All consecutive patients presenting a non-resolving ARDS were included if all the following criteria were fulfilled: ARDS lasting for at least 5 days with a PaO_2/FiO_2 ratio (P/F ratio) <200 with a PEEP of at least 5 cmH2O, lung biopsy performed, and blood and alveolar determinations of procollagen III obtained within 1 week prior lung biopsy. A BAL was performed during the first 48-h period following admission for extensive microbiological investigations. Blood and alveolar (on BAL) PC III were measured at the same time. If after at least 5 days P/F ratio remained <200 (with a PEEP level of at least 5 cm H2O), blood and BAL samplings (with PC III measurements) were renewed. Lung biopsy was performed in the following 7-day period if blood and BAL microbiological results were not contributive. Blood and alveolar measurements of procollagen III were done using a radioimmunological assay. Biopsies were read by two independent pathologists and fibrosis was assessed according to a semi-quantitative previously described method [2].
RESULTS. Thirty-two patients were included. Nineteen patients presented a fibrosis confirmed by lung biopsy. In the samples performed prior lung biopsy, PC III was higher in the BAL fluid from patients presenting a fibrosis as compared to patients without fibrosis [26 mcg/L (14.3–34.6 mcg/L) vs. 1.6 mcg/L (1.1–7.9 mcg/L), respectively, $p < 0.001$] [median (IQR)]. In blood samples obtained prior lung biopsy, PC III was also higher in patients presenting a lung fibrosis ($p < 0.02$). Using a threshold at 9 mcg/L, alveolar PC III presented a sensitivity at 89.5 % and a specificity at 92.3 % for the diagnosis of lung fibrosis with an area under the ROC curve at 0.90 (CI95 % from 0.80 to 1.0, $p < 0.01$).
CONCLUSIONS. Procollagen III evaluated in BAL fluid provided a very good diagnostic accuracy as compared with histological assessment of fibrosis and could guide corticosteroids therapy in non-resolving ARDS.
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GRANT ACKNOWLEDGMENT. AORC APHM 2004.

0915

CISATRACURIUM DECREASES IN VITRO PRODUCTION OF PROINFLAMMATORY MEDIATORS

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INTRODUCTION. We recently reported that the adjusted 90-day survival rate and time off the ventilator were greater in patients presenting acute respiratory distress syndrome (ARDS) and receiving cisatracurium [1]. ARDS is an inflammatory disease and we have also showed that the early use of cisatracurium decrease the proinflammatory response associated with ARDS and mechanical ventilation [2]. No persuasive mechanism is defined and a direct antiinflammatory effect of cisatracurium could have contributed to our results [3].
OBJECTIVES. To determine in vitro the direct inflammatory effect of cisatracurium on Human Umbilical Vein Endothelial Cells (HUVEC) and Adherent Cells (AC).
METHODS. We analyzed the effects of cisatracurium (1 or 10 µmol/mL) on HUVEC and AC (obtained from peripheral blood mononuclear cells after adhesion) with or without LPS stimulation. HUVEC and AC were preincubated (30 min) with 1 or 10 µmol of cisatracurium. HUVEC and AC were stimulated with 2 ng/mL of LPS (*E. coli* serotype 055/B5 Sigma). After 24 h, cultures were centrifugated and supernatants were conserved at −20 °C until cytokine evaluations. Each experiment was realized 9 times. Interleukine (IL)-1β, IL-8, IL-10, TNF-α and MCP-1 levels were measured (duplicate) using specific Elisa kits (R&D systems). The sensitivity of the assay were IL-1β = 3, IL-8 = 3,5 IL-10 = 3,TNF-α = 5 and MCP-1 = 5 pg/mL. IL-6 was measured with a Elisa kit (Beckman Coulter), the sensitivity was 6 pg/mL. Non parametric Wilcoxon tests were used to assess the differences in cytokine levels between the various experimental conditions: No LPS stimulation (controls), No LPS stimulation with cisatracurium (1 or 10 µmol/mL), LPS stimulation (LPS controls), LPS stimulation and cisatracurium (1 or 10 µmol/mL). Results are presented as median [IQR].
RESULTS. In HUVEC without LPS stimulation treated with cisatracurium 10 µmol/mL, we observed a lower production of IL-6 (39 [37–46] vs. 48 [47–49] pg/mL; $p = 0.008$) and MCP-1 (2,270 [1,767–2,714] vs. 5,732 [5,055–9,130] pg/mL; $p = 0.001$) as compared to controls. Conversely, no significant effect of cisatracurium was observed in AC without LPS stimulation. The table summarizes the main results for the LPS stimulated cells (p: comparison of cisatracurium 1 µmol/mL vs. LPS controls, p*: comparison of cisatracurium 10 µmol/mL vs. LPS controls).

HUVEC after LPS stimulation

	LPS Control	Cisatracurium 1	Cisatracurium 10	p	p*
MCP-1 (n = 9)	16,962 [12,812–19,121]	13,002 [10,996–15,459]	5,658 [5,264–9,023]	0.001	0.001
IL-6 (n = 9)	102 [92–109]	80 [61–99]	62 [60–84]	0.066	0.015
IL-8 (n = 9)	2,380 [1,389–4,310]	2,463 [1,043–4,059]	1,289 [657–2,062]	ns	0.002

Adherent cells after LPS stimulation (n = 9)

	LPS Control	Cisatracurium 1	Cisatracurium 10	p	p*
MCP-1	2,635 [1,374–2,840]	2,242 [1,156–2,362]	866 [440–1,067]	0.066	0.066
IL-1	134 [49–325]	112 [28–284]	37 [19–108]	0.006	<0.001
IL-6	1,024 [607–2,935]	833 [609–3,462]	581 [421–1,221]	ns	< .001
IL-8	12,298 [6,709–21,675]	8,688 [6,732–17,015]	7,458 [3,374–12,144]	ns	0.01
TNF-α	1,458 [568–2,329]	835 [523–2,443]	537 [137–1,682]	ns	0.003

CONCLUSIONS. Cisatracurium reduces the production of proinflammatory mediators of Human Umbilical Vein Endothelial Cells (HUVEC) and Adherent Cells (AC) notably after LPS stimulation.
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0916

THE ROLE OF PROCALCITONIN IN DISCRIMINATING BETWEEN SEPTIC AND NON-SEPTIC CAUSES OF ARDS AND ASSESSING CLINICAL PROGNOSIS

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INTRODUCTION. The role of procalcitonin (PCT) as a biochemical marker for differentiating bacterial infection from other non-infectious causes of systemic inflammatory

response syndrome has been widely studied in critical care setting, but findings still remain controversial.
OBJECTIVES. The aim of this study was to evaluate the clinical usefulness of an early single PCT measurement in plasma and bronchoalveolar lavage fluid (BALF) in discriminating between septic and non-septic causes of ARDS and assessing clinical prognosis.
METHODS. 100 consecutive patients with ALI/ARDS were enrolled within 48 h of recognition of ALI/ARDS. Demographic, clinical data and severity indices were recorded upon study enrollment. At the same time, blood samples were collected and PCT and IL-6 concentrations were measured both in plasma and BALF. The primary outcome was mortality at 28 and 90 days, while secondary outcomes included ventilator-free days, days without renal failure and days without cardiovascular failure over the 28 days after enrollment.
RESULTS. PCT and IL-6 plasma values were statistically significant higher in septic compared to the non-septic individuals ($p = 0.001$ and 0.0005 respectively), while there were no differences in the respective BALF values. According to Youden's index, a cut-off point of 0.815 (ng/mL) and 201.6 (pg/mL) for plasma PCT and IL-6, respectively, were accompanied with the higher sensitivity and specificity combinations in identifying septic patients. Plasma PCT measurements were associated with 74.1 % sensitivity and 97.6 % specificity in this regard. In linear regression multivariable analysis a statistically significant relation of plasma PCT with SOFA score in septic ARDS patients was disclosed ($p < 0.001$), while the association of plasma IL-6 with SOFA score was significant in the septic ($p = 0.002$).Neither mortality nor other secondary outcomes were found to be related with plasma or BALF PCT or IL-6 levels in the multivariate analysis.
CONCLUSIONS. Early PCT plasma levels can discriminate between septic and non-septic ARDS causes. Furthermore they are associated with the severity of multiple organ dysfunction syndrome as assessed by the SOFA score in septic ARDS patients and are capable of complementing clinical signs and routine laboratory variables that are indicative of sepsis in ARDS patients without, however, carrying any prognostic value.

0917
LUNG INJURY INDUCED EX VIVO BY HIGH TIDAL VOLUME VENTILATION. EFFECTS OF THE PRESENCE OF BLOOD ELEMENTS

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INTRODUCTION. Ex vivo models of ventilator-induced lung injury, either non-perfused or perfused with asanguineous fluids, help understand the mechanisms involved in pulmonary injury. In the present study we tested the hypothesis that lung injury is modulated by the presence of blood elements in the perfusate.
OBJECTIVES.
(i) To define pulmonary changes induced by high tidal volume (V_T) mechanical ventilation ex vivo.
(ii) To demonstrate that adding blood to the perfusate solution modifies the pulmonary response to high V_T mechanical ventilation.
METHODS. Ex vivo ventilated and perfused lungs (Harvard Apparatus, MA) from male Sprague–Dawley rats (325–375 g) were subjected to two ventilatory strategies ($V_T = 6$ mL/kg + PEEP = 5 cm H_2O; or $V_T = 25$ mL/kg + PEEP = 0 cm H_2O) for 2.5 h. Lungs were perfused (4 mL/min) with Krebs solution (KS) + 4 % albumin (aireated with 5 % CO_2 and 20 % O_2) with or without autologous blood ($\approx$10 % hematocrit, BL). Four groups were studied (n = 7 per group): 1. low V_T perfused with KS; 2. high V_T perfused with KS; 3. low V_T perfused with KS + BL; 4. high V_T perfused with KS + BL. Peak airway pressure (Paw) and pulmonary artery pressure (PAP) were continously recorded. At the end of the experiment BAL fluid was obtained using 10 mL of sterile saline, and AST, ALT and LDH activites, and total protein concentration were measured. Pulmonary tissue was frozen for the analysis of the expression of MCP-1, TNFα, IL-6, MIP-2, IL-4 and IL-10, by rt-PCR. The left lung was preserved in formalin for histological analysis and immunofluorescence (IF) for 3-nitrotyrosine and dihydroethidium (markers of peroxynitrite formation and oxidative stress, respectively). Means were compared by ANOVA.
RESULTS. High V_T mechanical ventilation was associated with an increase in AST, ALT and LDH activities, and in total protein concentration in BAL fluid; an increase in Paw; diffuse alveolar damage; and up-regulation of MCP-1, IL-6, IL-4 and IL-10 (2–3×), accompanied by down-regulation of TNF-α. Adding blood to the perfuse resulted in a greater increase in AST, ALT and LDH activities and in protein concentration in BAL fluid; and attenuation of the up-regulation of MCP-1, IL-6, L-4 and IL-10. The high V_T group perfused with KS + BL, but not the group perfused with KS, showed protein nitration and oxidate stress by IF.
CONCLUSIONS.
(i) High V_T mechanical ventilation induces cellular damage and alveolocapillary hyperpermeability. (ii) The presence of blood elements is associated with greater cell injury and nitro-oxidative stress, and modulates the inflammatory response.
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DALI and MOSAR studies: 0918–0922

0918
DALI: DEFINING ANTIBIOTIC LEVELS IN INTENSIVE CARE UNIT PATIENTS: PIPERACILLIN MULTI-CENTRE POINT PREVALENCE PHARMACOKINETIC STUDY

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INTRODUCTION. The pharmacokinetic exposures and corresponding clinical effects antibiotics in infected critically ill patients are poorly described, with most data from single centre studies.
OBJECTIVES. The primary objective of this report is to describe the pharmacokinetics of piperacillin and whether contemporary antibiotic dosing for critically ill patients achieves concentrations associated with maximal activity.
METHODS. This report is part of the multi-national DALI study which included 73 intensive care units throughout Europe. Patients were recruited and sampled on a single day (September 2011) with blood samples taken at both the mid-point of the dosing interval and the end. Non-compartmental methods were used to determine pharmacokinetic parameters. Individual patient results were compared with outcome and pharmacodynamic targets.
RESULTS. 69 patients (62 % males) were administered piperacillin with a median (IQR) age of 61 (49–73) yrs, weight 75 (68–85) kg, urinary creatinine clearance 56 (30–80) mL/min and SOFA Score 5 (2–9). Six patients were receiving renal replacement therapy. The piperacillin half-life was 2.3 (1.8–3.3) h, volume of distribution was 33.0 (18.9–66.5) L and clearance was 7.4 (5.4–13.9) L/h. The lung was the most common source of infection (51 %) with *Pseudomonas aeruginosa* the most commonly identified pathogen (38 %) for all infections. Duration of therapy was 10 (7–14) days and 71 % of patients achieved clinical cure. 80 % of patients achieved 50 % T > MIC (time concentration maintained above minimum inhibitory concentration), 51 % achieved 50 % T > 4× MIC, 38 % achieved 100 % T > MIC and 19 % achieved 100 % T > 4× MIC. In the sub-set of patients with a creatinine clearance >20 mL/min (n = 39), a failure of piperacillin/tazobactam therapy was associated with lower piperacillin exposures. The concentration:MIC ratio at 50 % of dosing interval was 1.7 (1.0–5.0) in the patients that failed therapy compared with 4.0 (1.4–7.4) for the patients with clinical cure.
CONCLUSIONS. This is the first prospective study to correlate T > MIC exposure of piperacillin with clinical outcome. Although most patients achieve standard empiric pharmacodynamic targets, the presence of significant piperacillin pharmacokinetic variability in critically ill patients prevents all patients from achieving higher pharmacodynamic targets which were associated with increased rates of clinical cure.
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0919
DALI: DEFINING ANTIBIOTIC LEVELS IN INTENSIVE CARE UNIT PATIENTS: MEROPENEM MULTI-CENTRE POINT PREVALENCE PHARMACOKINETIC STUDY

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

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INTRODUCTION. The pharmacokinetic exposures and corresponding clinical effects antibiotics in infected critically ill patients are poorly described, with most data from single centre studies.
OBJECTIVES. The primary objective of this report is to describe the pharmacokinetics of meropenem and whether contemporary antibiotic dosing for critically ill patients achieves concentrations associated with maximal activity.
METHODS. This report is part of the multi-national DALI study which included 73 intensive care units throughout Europe. Patients were recruited and sampled on a single day (September 2011) with blood samples taken at both the mid-point of the dosing interval and the end. Non-compartmental methods were used to determine pharmacokinetic parameters. Individual patient results were compared with outcome and pharmacodynamic targets.
RESULTS. 90 patients (64 % males) were administered meropenem with a median (IQR) age of 61 (48–71) yrs, weight 75 (70–85) kg, urinary creatinine clearance 48 (25–101) mL/min and SOFA Score 5 (3–8). Seventeen patients were receiving renal replacement therapy. The meropenem half-life was 3.1 (2.3–4.6) h, volume of distribution was 36.6 (19.6–54.0) L and clearance was 6.5 (3.9–15.4) L/h. The lung was the most common source of infection (51 %) with *Klebsiella pneumoniae* (12 %), *Escherichia coli* (10 %) and *Pseudomonas aeruginosa* (10 %) the most commonly identified pathogens for all infections. Duration of therapy was 11 (5–15) days and 54 % of patients achieved clinical cure (46 % failure or indeterminate). 96 % of patients achieved 50 % T > MIC, 69 % achieved 50 % T > 4× MIC, 74 % achieved 100 % T > MIC and 44 % achieved 100 % T > 4× MIC. In the sub-set of patients with a creatinine clearance >20 mL/min (n = 39), a failure of meropenem therapy was associated with lower meropenem exposures. The ratio of the measured concentration to MIC midway (50 %) through the dosing interval was higher in patients with clinical cure 10.8 (1.9–15.6) compared with the patients that failed therapy 4.5 (2.8–7.4).
CONCLUSIONS. This is the first prospective study to correlate T > MIC exposure of meropenem with clinical outcome. Although most patients achieve standard empiric pharmacodynamic targets, the presence of significant meropenem pharmacokinetic variability in critically ill patients prevents all patients from achieving higher pharmacodynamic targets which were associated with increased rates of clinical cure.
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0920
DALI: DEFINING ANTIBIOTIC LEVELS IN INTENSIVE CARE UNIT PATIENTS: CEFEPIME MULTI-CENTRE POINT PREVALENCE PHARMACOKINETIC STUDY

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INTRODUCTION. The pharmacokinetic exposures and corresponding clinical effects of antibiotics in infected critically ill patients are poorly described, with most data from single centre studies.

OBJECTIVES. The primary objective of this report is to describe the pharmacokinetics of cefepime and whether contemporary antibiotic dosing for critically ill patients achieves concentrations associated with maximal activity.
METHODS. This report is part of the multi-national DALI study which included 73 intensive care units throughout Europe. Patients were recruited and sampled on a single day (September 2011) with blood samples taken at both the mid-point of the dosing interval and the end. Non-compartmental methods were used to determine pharmacokinetic parameters. Individual patient results were compared with outcome and pharmacodynamic targets.
RESULTS. 14 patients (10 males) were administered cefepime with a median (IQR) age of 55 (41–64) yrs, weight 78 (71–87) kg, urinary creatinine clearance 92 (88–109) mL/min and SOFA Score 3 (2–10). Two patients were receiving renal replacement therapy. The cefepime half-life was 3.9 (3.1–8.3) h, volume of distribution was 73.8 (36.1–94.7) L and clearance was 8.0 (5.8–13.1) L/h. The lung was the most common source of infection (61 %) with *Pseudomonas aeruginosa* the most common pathogen (38 %) for all infections. Duration of therapy was 10-days (7–14) and 71 % of patients achieved clinical cure. 71 % of patients achieved 71 % T > MIC, 36 % 50 % T > 4× MIC, 64 % 100 % T > MIC and 0 % 100 % T > 4× MIC.
CONCLUSIONS. The pharmacokinetics were significantly different to that reported in non-critically ill patient studies and as such the achievement of pharmacodynamic targets was low with none of the targets being achieved by at least 90 % of patients. The small patient numbers make it not possible to measure relationships between clinical outcome and pharmacokinetic exposure for cefepime.
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0921
DALI: DEFINING ANTIBIOTIC LEVELS IN INTENSIVE CARE UNIT PATIENTS: VANCOMYCIN MULTI-CENTRE POINT PREVALENCE PHARMACOKINETIC STUDY

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INTRODUCTION. The pharmacokinetic exposures and corresponding clinical effects of antibiotics in infected critically ill patients are poorly described, with most data from single centre studies.
OBJECTIVES. The primary objective of this report is to describe the pharmacokinetics of vancomycin in critically ill patients and whether contemporary antibiotic dosing for critically ill patients achieves concentrations associated with maximal activity.
METHODS. This report is part of the multi-national DALI study which included 73 intensive care units throughout Europe. Patients were recruited and sampled on a single day (September 2011) with blood samples taken at both the mid-point of the dosing interval and the end. Non-compartmental methods were used to determine pharmacokinetic parameters. Individual patient results were compared with outcome and pharmacodynamic targets.
RESULTS. 43 patients (65 % males) were administered vancomycin with a median (IQR) age of 59 (43–69) yrs, weight 75 (65–87) kg, urinary creatinine clearance 84 (60–106) mL/min and SOFA Score 5 (3–8). Nine patients were receiving renal replacement therapy. 26 patients (60 %) were administered vancomycin using continuous infusion. The vancomycin half-life was 8.2 (5.5–19.5) h, volume of distribution was 75.0 (45.8–126.8) L and clearance was 3.6 (1.9–5.8) L/h. The lung was the most common source of infection (16 %) with *coagulase-negative Staphylococci* and *Staphylococcus aureus* (7 %) the most commonly identified pathogen (19 %) for all infections. Duration of therapy was 8 (6–12) days and 65 % of patients achieved clinical cure. In the intermittent infusion group, only 42 % of patients had a trough concentration > 15 mg/L (median 10.1 mg/L; IQR 6.9–16.7). For the continuous infusion group, 88 % of patients achieved an AUC/MIC ratio (area under concentration time curve to minimum inhibitory concentration; MIC of 1 mg/L assumed) >400 (812; IQR 461–937). In the intermittent infusion group, only 45 % achieved an AUC/MIC >400 (median 409; IQR 278–631). Clinical cure was 58 % in the intermittent infusion group and 70 % in the continuous infusion group. No relationship between clinical cure and pharmacokinetic exposure was evident in this study.
CONCLUSIONS. This study demonstrated that continuous infusion is widely used to administer vancomycin in intensive care units and that this modality more consistently achieves pharmacodynamic targets associated with optimal activity. This study did not show a relationship between vancomycin exposure and clinical outcome, although few patients had confirmed infections for which vancomycin was the predominant therapy.
GRANT ACKNOWLEDGMENT. European Society of Intensive Care Medicine's European Critical Care Research Network (ESICM ECCRN) and Royal Brisbane and Women's Research Foundation.

0922
MASTERING HOSPITAL ANTIBIOTIC RESISTANCE (MOSAR): A EUROPEAN CLUSTER-RANDOMIZED TRIAL ON REDUCING ACQUISITION OF RESISTANT BACTERIA IN INTENSIVE CARE UNITS

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INTRODUCTION. Intensive care units (ICUs) are high-risk areas for transmission of antimicrobial resistant bacteria (AMRB) such as methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *enterococci* (VRE) and highly-resistant *Enterobacteriaceae* (HRE). Effective control of AMRB is urgently needed.
OBJECTIVES. To quantify effects of different infection control interventions on acquisition of MRSA, VRE and/or HRE in ICUs.
METHODS. We conducted a cluster-randomized trial in 13 European ICUs, consisting of a 6 months baseline phase (P1), followed by unit-wide chlorhexidine body-washing (CBW) combined with a hand hygiene improvement program (P2; 6 months). In phase 3 (P3; 12–15 months) ICU's were randomized to molecular- (MA) or chromagar- (CA) based screening with subsequent contact precautions of identified carriers. Carriage was determined by screening cultures on admission and twice weekly. Results were only disclosed to caregivers in P3. Effects on stepwise changes in AMRB incidence density and trends were determined by multilevel Poisson regression.
RESULTS. We included 14390 patients, of whom 8,976 stayed >=3 days. Of these, 95 % had surveillance data for assessment of colonization status. Hand hygiene compliance improved from 52 % to 69 % and 77 % from P1 to P2 and P3. Median proportions of patients receiving CBW were 0 % in P1 and 100 % in P2 and P3. Median turn-around times for CA and MA screening were 24 h and 2.5 h, respectively. There was an immediate 55.4 % relative increase in contact precautions ($p = 0.005$) mainly in MA (91.8 %; $p = 0.002$) and not in CA (21.5 %; $p = 0.387$).In baseline, AMRB acquisition increased by 1.4 % per week. Following P2 there was a reduction in trend (weekly incidence rate ratio (IRR) 0.98). In P3 neither CA nor MA was associated with further changes in trend and no difference between the arms could be demonstrated ($p = 0.06$, likelihood ratio test).For MRSA, weekly acquisition increased during P1 by 4.2 %. This trend reversed in P2 to give a net 3.6 % weekly decrease. In P3, MRSA acquisition plateaued, an increase in trend relative to P2 (weekly IRR 1.05 (CA) and 1.04 (MA)). For HRE and VRE, no significant changes in trend, and no difference between the arms, were demonstrated. Length of ICU stay (LOS) decreased by 1.2 % per week in P2, a net reduction of about 26 % at the end of that phase. In P3, LOS increased by 18 % in MA, no significant increase was *demonstrated in CA.*
CONCLUSIONS. In this multi-center study unit-wide CBW combined with a hygiene improvement program reduced AMRB acquisition by reducing MRSA acquisition. There was no incremental effect of screening and isolation of identified carriers in either arm on reduction of AMRB acquisition, and no difference between the arms could be demonstrated.
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Therapeutic cooling and outcome after cardiac arrest: 0923–0927

0923
TARGET TEMPERATURE MANAGEMENT AFTER OUT-OF-HOSPITAL CARDIAC ARREST, AN INTERNATIONAL, MULTI-CENTRE, RANDOMISED, PARALLEL GROUPS, ASSESSOR BLINDED CLINICAL TRIAL: NCT01020916

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INTRODUCTION. Experimental studies and previous clinical trials suggest an improvement in mortality and neurological function with induced hypothermia after out-of-hospital cardiac arrest (OHCA). Previous trials have included highly selected populations and the optimal target temperature is not known.
OBJECTIVES. To evaluate differences in efficacy and safety with target temperature management at 33 and 36 °C for 24 h after OHCA of presumed cardiac cause.
METHODS. Intervention: Patients are managed with 24 h of temperature control at 33 °C versus 36 °C according to randomisation. The total intervention time is 36 h including induction and rewarming to normothermia. Temperature control is delivered with temperature management equipment at the discretion of the trial sites.
DESIGN. Randomised trial with 1:1 concealed allocation of 850–950 OHCA patients to temperature control for 24 h at 33 °C versus 36 °C with blinded outcome assessment. Inclusion criteria: Age ≥18 years, OHCA of presumed cardiac cause, sustained return of spontaneous circulation (ROSC), unconsciousness (Glasgow Coma Score < 8) after sustained ROSC. Exclusion criteria: Conscious patients, pregnancy, in-hospital cardiac arrest, OHCA of presumed non-cardiac cause, known bleeding diathesis, suspected or confirmed acute intracranial bleeding or stroke, unwitnessed asystole, persistent cardiogenic shock, known limitations in therapy and "do not resuscitate" order, known disease making 180 day survival unlikely, known pre-arrest cerebral performance category 3 or 4. Primary outcome: All-cause mortality at maximal follow-up (at least 180 days). Secondary outcomes: Composite outcome of all-cause mortality and poor neurological function (Cerebral Performance Category (CPC) 3 and 4) at hospital discharge and at 180 days. Best neurological outcome during trial period. Cognitive status at 180 days. Biomarkers of brain damage at 24, 48 and 72 h. Bleeding, pneumonia, sepsis, electrolyte disorders, hyperglycaemia, hypoglycaemia, cardiac arrhythmia, renal replacement therapy.
RESULTS. At present 491 patients are randomised in the trial from 34 sites in 10 countries (figure 1). With the present inclusion rate the trial will finish randomisation in the end of 2012 with a subsequent 180-day follow-up period. The present study population has a mean age of 64 (range 24–94), 80 % are male. VF or non-perfusing VT was present in 75 % of the cases and the mean time to ROSC was 25 min (interquartile range 15–40).
CONCLUSION. The TTM-trial will broaden the base for a well-founded judgement of the efficacy of temperature managment after OHCA in a broad and pragmatic population.
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0924
EFFECTS OF HYPOTHERMIA ON CEREBRAL MICROCIRCULATION

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INTRODUCTION. Therapeutic hypothermia (TH) can improve neurological outcome after cardiac arrest. Nevertheless, TH may also contribute to alter peripheral microcirculation and potentially alter tissue perfusion.
OBJECTIVES. The aim of this study was to evaluate the effects of cooling on brain microcirculation (BMC) in healthy animals.

METHODS. The study included 10 anesthetized, invasively monitored and mechanically ventilated domestic pigs. A combination of Ringer's lactate and 6 % hydroxyethyl starch solution was administered to maintain normovolemia. Pigs were randomized into two groups of 5: normothermia (NT) and TH (34–35 °C). Hypothermia was induced using rapid IV infusion of 30 mL/kg of cold saline in 30 min, trans-nasal evaporative cooling (Rhinochill, Benechill Inc, USA) and surface cooling with external blanket device (Medi-Therm II, Gamar, USA) and was maintained for 6 h, followed by spontaneous re-warming to the starting temperature. Intraparenchymal probes were used to measure brain temperature (Licox CC1.SB, Integra, NeuroSciences Ltd., Hamphsire, UK), brain flow (laser Doppler MNP100XP, Oxyflow, Oxford Optronix, Oxford, UK) and metabolism (microdialysis, CMA20, CMA, Sweden) hourly. After left craniectomy the microvascular network of the frontal cortex was evaluated using Sidestream Dark-Field videomicroscopy (Microscan, MicroVision Medical, The Netherlands) at baseline, after 1 h from cooling induction, at the end of hypothermia and after rewarming. Cerebral perfused capillary density (FCD), the proportion of perfused small vessels (PPV) and the mean flow index (MFI) were calculated using standard formulas.
RESULTS. The microvascular perfusion was significantly altered during TH and progressively improved, without returning to baseline (Table 1, *$p < 0.05$). The lactate-pyruvate ratio (LPR) was not altered during the study period.

Table 1

Time	Baseline		Early Cooling		End of Cooling		Rewarming	
Study Group	NT	TH	NT	TH	NT	TH	NT	TH
Body Temperature, °C	39.4 ± 0.8	38.8 ± 0.7	40.0 ± 1.1	34.9 ± 1.0*	40.8 ± 0.1	34.2 ± 0.7*	40.7 ± 0.3	38.7 ± 0.5
Brain Temperature, °C	38.8 ± 1.0	37.8 ± 0.5	38.8 ± 1.7	32.6 ± 0.5*	39.1 ± 1.1	33.0 ± 1.4*	39.0 ± 1.2	37.6 ± 0.7
FCD, n/mm	3.7 ± 0.5	3.4 ± 0.4	3.6 ± 0.6	3.0 ± 0.7*	3.2 ± 0.4	1.8 ± 0.6*	3.5 ± 0.3	2.6 ± 0.2
PPV, %	86 ± 4	80 ± 6	84 ± 8	66 ± 13*	78 ± 11	40 ± 8*	76 ± 9	58 ± 6*
MFI	2.8 ± 0.1	2.8 ± 0.1	2.8 ± 0.2	2.3 ± 0.4*	2.8 ± 0.1	1.8 ± 0.1*	2.7 ± 0.2	2.2 ± 0.1*
Laser Doppler (%/baseline)	100	100	103 ± 21	72 ± 17*	87 ± 12	61 ± 13*	98 ± 7	100 ± 25
LPR	20 ± 4	19 ± 6	20 ± 7	17 ± 10	25 ± 9	19 ± 7	26 ± 7	28 ± 7

CONCLUSIONS. Cerebral microcirculation is significantly impaired during TH in healthy animals without alteration in local metabolism. This may reflect an adaptive response to decreased metabolic needs.
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0925
PROCALCITONIN AS A PREDICTOR OF POSTRESUSCITATION DISEASE AND OUTCOME AFTER CARDIAC ARREST

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BACKGROUND. Serum procalcitonin (PCT) is produced during systemic inflammatory states and sepsis. Postresuscitation disease after cardiac arrest (CA) involves a whole-body ischemia and reperfusion syndrome that triggers an intense systemic inflammatory response.
AIM OF THE STUDY. To analyze whether PCT is associated with 1) the severity of post-resuscitation disease and 2) the outcome of patients with coma after CA treated with induced hypothermia (IH).
PATIENTS AND METHODS. Prospective single-center database of comatose CA patients treated with IH (target core temp 33 ± 1 °C for 24 h, using cold saline + surface cooling device) between December 2009 and July 2011. Serum PCT was measured at 24 and 48 h. The SOFA score was used to assess the severity of post-resuscitation disease. Primary outcome endpoint was 90-day mortality.
RESULTS. 68 consecutive patients (median age 65 years, median time to ROSC 21 min) were studied. Peak serum PCT correlated with time to ROSC ($P = 0.001$) and with SOFA scores on admission, and at day 1 and day 2 (all $P < 0.001$). Median peak serum PCT was higher among non-survivors than in survivors (median 3.9 [IQR 1.0–16.8] vs. 1.4 [IQR 0.6–6.2] ng/ml, $P = 0.032$). An association also was found between peak serum PCT levels and 3-month neurological recovery ($P = 0.067$).
CONCLUSIONS. Elevated serum PCT levels correlate with increased severity of post-resuscitation disease and are associated with worse 90-day outcome in comatose cardiac arrest patients treated with induced hypothermia. Larger studies are warranted to confirm the prognostic value of PCT after cardiac arrest.

0926
A PROSPECTIVE INTERVENTION STUDY TO COMPARE EFFICACY AND RELIABILITY OF DIFFERENT COOLING TECHNOLOGIES FOR FEVER CONTROL

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BACKGROUND. Symptomatic fever control is becoming an increasingly accepted therapeutic goal in patients with neurocritical illness. Various mechanical cooling devices are available to achieve control of a patients' core temperature. Few comparative data are available on the efficacy of these cooling devices. Previous studies have not always used cooling devices in optimal patient populations and/or at optimal capacity.
OBJECTIVE. To compare the efficacy and safety of three established temperature management systems.
DESIGN. Multi-center prospective intervention study.
SETTING. Three university teaching hospitals (tertiary referral centers).
INTERVENTIONS. Mechanical cooling for fever control (aiming at normothermia) was induced by one of three cooling systems: external water circulating cooling blankets (Medi-Therm), water-circulating gel-coated adhesive pads (Arctic Sun) or intravascular cooling catheters (ThermoGard).
RESULTS. A total of 98 patients with various types of brain injury were enrolled. A total of 113 cooling interventions were performed and analyzed for time to target temperature and fluctuations during the maintenance phase. Gel-coated cooling pads were found to have the fastest induction rate at 0.624 °C/h compared to 0.449 °C/h for endovascular cooling and 0.325 °C/h for Medi-therm ($p < 0.02$). The time within target range was 86.4 % ($p = 0.01$) for the Arctic Sun system, 72.3 % for the ThermoGard system, and 73.0 % for Medi-Therm blankets. There were significantly more sedated patients (81.0 %, $p < 0.05$) in the ThermoGard group then the Arctic Sun group (73.9 %). There were differences within the endovascular group between different types of cooling catheters, with the lowest time within target range (67.3 %) for the Cool Line catheter and the highest time within range (98.3 %, $p = 0.01$) for the Quattro catheter. No major complications/adverse events associated with cooling occurred in any of our patients.
DISCUSSION. The new generation of cooling devices provide fairly accurate temperature control for fever when used as indicated. In our study endovascular cooling had the fastest induction rate while gel-coated cooling pads had the highest proportion of time within the target range. Our study is a significant improvement in size and implementation of cooling therapy compared to previous studies. However, several aspects still need optimization, especially concerning standardization of use of accessory cooling methods such as cold fluid infusion and management of side effects such as shivering.

0927
PREDICTORS OF POOR NEUROLOGICAL OUTCOME IN PATIENTS AFTER CARDIAC ARREST TREATED WITH THERAPEUTIC HYPOTHERMIA: SYSTEMATIC REVIEW AND EVIDENCE BASED GUIDELINES

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INTRODUCTION. Cardiac arrest results in approximately 350,000 deaths each year. Failure to awaken from subsequent coma is a common and leading cause of death in cardiac arrest survivors admitted to a critical care setting. Current Ontario data suggests that almost 70 % of patients die in hospital after return of spontaneous circulation due to withdrawal of life-sustaining therapies by physicians for a variety of reasons including family wishes, ongoing hemodynamic instability, prior expressed advanced directives, and importantly, physician driven prognostication of the cardiac arrest survivor with the ensuing family discussion regarding goals of care. Unfortunately, the prognostication that occurs is no longer driven by evidence based medicine, as the body of literature supporting prognostic markers that originally lead to the validated practice parameters and American Academy of Neurology (AAN) guidelines occurred prior to the introduction of therapeutic hypothermia.
OBJECTIVES. Dependency following survival from cardiac arrest is common and current prognostic tools are outdated since the implementation of therapeutic hypothermia. Our objective was to systematically review the available prognostic screening tools to help identify cardiac arrest survivors who will have unfavorable neurological outcomes, as defined by functional dependency.
METHODS. We searched MEDLINE, EMBASE, CINAHL, and CENTRAL to February 2012 for randomized and quasi-randomized controlled trials, cohort studies, and observational trials for any screening tests performed to help identify patients with unfavorable neurological outcomes. Two reviewers independently extracted data on study population; characteristic of screening tests such as brainstem reflexes, electroencephalograms, somatosensory evoked potentials, and computed tomography; false positive rates of each test; and information related to study quality. A multidisciplinary guideline committee then made recommendation as per the GRADE guideline criteria.
RESULTS. Of 670 citations, 10 trials ($N = 853$) met selection criteria. Systematic review and guideline committee recommendations could not identify any single prognostic screening tool that reliably identified unfavorable neurological outcomes. There were no physical examination tests (level 1C recommendation), combination of physical examination tests (level 2C recommendation), or neuromonitoring modalities (level 1C recommendation) that were accurate enough to predict cardiac arrest survivors with unfavorable neurological outcomes.
CONCLUSIONS. No single screening examination tool currently exists to help identify cardiac arrest survivors, that are treated with therapeutic hypothermia, who will develop unfavorable neurological outcomes. Clinical judgment and discussions with family members regarding goals of care remains of paramount importance. On-going research is required and our committee has made recommendations for key areas of interest.

Understanding ICU delirium: 0928–0932

0928
SEDATION AND ANALGESIA IN PATIENTS WITH NON-INVASIVE VENTILATION. OBSERVATIONAL, MULTICENTRE AND INTERNATIONAL STUDY

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INTRODUCTION. Non invasive ventilation (NIV) is a common procedure in patients admitted in the Intensive Care Units (ICUs) due to acute respiratory failure. However, the use of sedative and analgesic drugs during the application of NIV has not yet evaluated.
OBJECTIVES. To estimate the use of sedatives and analgesics (sedo-analgesia) drugs in patients with non invasive ventilation (NIV).
METHODS. Secondary analysis of the Third International Study of Mechanical Ventilation that included 1,169 patients (14 % of the total of patients recruited in the study) who initially received non invasive ventilation. The use of sedatives and analgesics drugs was recorded during the time of NIV. *Statistical analysis:* A comparison with Chi square test or

T test of studied variables was performed. To estimate the associated variables to receive sedo-analgesia drugs a logistic regression was performed.
RESULTS. 215 patients received a sedative drug or a analgesic drug during NIV: 54 patients only received sedation, 116 only analgesia and 45 patients received both drugs. The more frequently used drugs were: morphin (49 %), fentanil (21 %), midazolam (20 %) and propofol (13 %). The patients that did not receive sedo-analgesia had a higher $PaCO_2O_2$ and a better PaO_2/FiO_2 ratio than those who received sedo-analgesia (table 1):

Table 1

	No	Yes	P value
Inspiratory pressure, mmHg (SD)	14 (4)	14 (5)	0.31
Espiratory pressure, mmHg (SD)	6 (2)	7 (2)	0.01
Respiratory rate (bpm)	23 (7)	23 (8)	0.44
ph	7.37	7.36	0.77
$PaCO_2$, mmHg (SD)	51 (14)	47 (14)	<0.001
PaO_2/FiO_2 ratio	217 (14)	200 (74)	<0.001

In a multivariable analysis the variables associated with the use of sedo-analgesia were: SAPS score, reason to start NIV, grade of hypercapnia and hypoxemia and use of CPAP. The patients that received sedo-analgesia were likely to fail NIV, had a higher length of ICU stay and higher ICU mortality (table 2).

Table 2

	No	Yes	P value
Time of NIV, hours (P25, P75)	24 (9, 55)	23 (7, 65)	0.85
Failure of NIV (%)	27	39	<0.001
Length of ICU stay days (P25, P75)	4 (2, 9)	6 (3, 10)	<0.001
Mortality (%)	19	29	<0.001

CONCLUSIONS. In our study, 20 % of patients with NIV received sedo-analgesia. Patients more frequently associated with the use of sedo-analgesia were patients with hypoxemia secondary to ARDS, trauma, community-acquired pneumonia and those patients. Patients that received sedo-analgesia were more likely to fail NIV.
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0929
ICU PAIN RECALL AND COGNITIVE DYSFUNCTION IN ICU SURVIVORS: THE MEMORY STUDY

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INTRODUCTION. Pain in adult ICU patients has numerous sources and may have negative long-term physical and psychological consequences.
OBJECTIVES. As part of a large study of procedural pain (Europain®), we performed a follow-up survey of post-ICU patients to characterize the recall of their ICU pain as well as the risk for post-traumatic-stress-disorder (PTSD).
METHODS. Multicenter cross-sectional study of critically ill adult patients who had undergone procedures and potentially other painful events. Patients discharged alive from the 34 French-speaking ICUs were approached for consent to undergo a telephone interview. Two trained researchers performed the phone surveys 3–6 months after the ICU procedure. The Memory tool used for the phone surveys was developed for this study and pilot tested. The Impact of Events Scale (IES) was used to assess cognitive dysfunction and to report on patients with significant risk for PTSD.
RESULTS. Of 466 patients who consented to participate, 236 (51 %) patients were able to be surveyed. Mean age was 55 + 17 and 60 % were male. Most patients remember being admitted to hospital (85.5 %) and to being in ICU (77 %). Eighty-five patients (36 %) remembered having pain and fewer patients remembered having the procedure. At the time of the phone interview, 14 % of 232 patients remembered having pain during the past week that they didn′t have before ICU admission. In-ICU procedural pain intensity and distress were rated at 5.4 + 2.4 and 4.6 + 2.7, on a 0–10 numeric rating scale, respectively. Current pain intensity and distress were rated at 5.2 + 2.3 and 5.2 + 2.6, respectively. Median IES score was 3 (0–11), with no significant difference between patients having recall of ICU pain intensity or distress and those who didn′t have recall of ICU pain. Forty-one percent of the patients had an IES score of zero. However, patients with residual pain had higher IES scores than other patients [8.5 (4–24) vs. 2 (0–10), P = 0.004]. The higher the pain intensity and distress, the higher the IES score.
CONCLUSIONS. Most ICU survivors remember the time of ICU admission and being in the ICU. One third remember in-ICU procedural pain at day 90–180, and 14 % still experience pain that was not present prior to ICU admission. The finding that this post-ICU pain is associated with increased cognitive dysfunction warrants qualitative studies to understand specific pain sources and to identify targets for improvements.
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0930
ACTIVE NOISE REDUCTION ON INTENSIVE CARE UNITS

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INTRODUCTION. Intensive Care Units (ICU) are characterized by high noise levels, caused by medical intervention and continuous use of technical equipment.
On the one hand these procedures are useful to treat patients; on the other hand several studies showed that noise causes stress for the patients and needs to be avoided [1].
OBJECTIVES. The aim of the study was to evaluate the effectiveness of methods on active noise reduction concerning patients′ stress on ICUs.
METHODS. Three settings to reduce noise imposed stress on 72 postoperative patients in ICUs were compared after approval of the study by our local ethics committee and written informed consent of recruited patients. Each patient was equipped with an MP3 player (Intenso Music Walker) combined with noise-canceling earplugs (Philips SHN2500/37) and then randomly, single-blindly assigned to one of the following groups: active noise reduction (NR), active noise reduction with sound masking (NRM), or switched off device as a control group. We gathered acoustic data and vital parameters at the same time during a overnight period of 10 h. On the environmental side, noise was measured by installing iPods (Apple iPod touch) with microphones (Sennheiser KE4) and a self-developed App (MATLAB, The MathWorks) based on the *ITA-Toolbox* [2]. This toolbox is capable of recording the sound level, and psychoacoustic parameters like A-scale sound level, loudness and sharpness. From recorded data the number of "loud" (respectively "very loud") events was calculated, which was defined as the 5 % (2 %) percentile of loudness values. On the patient's side, we measured both, the subjective perception by questionnaires (Hospital Anxiety and Depression Scale (HADS), State Trate Anxiety Inventory (STAI), and a self-developed sheet, and objective physiologic parameters like cortisol, vital parameters and skin conductance.
RESULTS. The analysis exhibited no significant difference in skin conductance and cortisol level among the three groups. Both groups with active noise reduction experienced an increase of blood pressure. Depression score decreased in the NRM group (p = 0.012).
Anxiety score raised in the NR group (p = 0.013).
Nevertheless, most of the patients estimated the feature NRM as pleasant.
CONCLUSION. Noise is a pressing subject in ICUs. It is important to train staff to avoid unnecessary noise. Technical methods to reduce noise continue to be challenging.
In the future, the development of further strategies for reducing patients′ stress should be encouraged, to improve patients′ recovery.
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0931
SLEEPMONITORING BY POLYSOMNOGRAPHY AND DELIRIUM ASSESSMENT WITH THE CONFUSION ASSESMENT METHOD FOR THE INTENSIVE CARE UNIT (CAM-ICU) IN UN-SEDATED, MECHANICALLY VENTILATED PATIENTS: DELIRIOUS PATIENTS DO NOT SHOW ELECTROPHYSIOLOGIC SLEEP-CHARACTERISTICS

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INTRODUCTION. Polysomnography (PSG) is the only reliable sleep assessment in Intensive care unit (ICU) patients [1]. Studies show poor sleep quality in moderately diseased patients. When disease is more advanced or sedation is increased, the normal EEG signs of sleep are not found [1]. Delirium and poor sleep quality co-exist, but no causative relation has been proven.
OBJECTIVES. The aim of the study was to assess the sleep quality of mecanically ventilated ICU-patients who were not sedated, and to study the relation between sleep and delirium.
METHODS. Observational study performed in a mixed ICU. Mechanically ventilated patients (pts) ≥18 years, and without structural neurological illnesses were included. Pts were not sedated with Propofol or benzodiazepines, but received opioids. The study was approved by the Ethics Committé.
24 h PSGs was performed on 14 pts: 4 pts had two PSGs done with ≥7 days interval and 10 pts had one PSG leaving a total of 18 PSGs for analysis.
RESULTS. All PSGs could be analyzed. In 8 PSGs (44 %) one or more electrodes were intermittently defect or the signal was lost in part of the recording. PSGs were grouped according to the delirium assessment: 1: "No delirium" (CAM-ICU negative): 6 pts were delirium free, easily arousable and with a low sequential organ failure assessment (SOFA)-score of 3–4 during PSG. 3 of those showed disrupted electrophysiologic sleep. They received no steroids, high-dose opioids or sedatives 24 h before the PSG. The other half had atypical EEGs with widespread delta-theta activity and signs of wakefulness. They received relatively high doses of opioids or steroids. 2: "Delirium" (CAM-ICU positive): 8 pts with delirium but easily arousable during PSG. Median SOFA scores were 7 (3–12). No electrofysiologic sleep was found, besides isolated REM sleep seen in two recordings. Reactivity was found in all, besides one patient, who was clinically awake for 10 h. Another patient had epileptiform activity in the first part of the recording, where he clinically was very sedated. 3: "Unassessable": 4 patients were hardly arousable, but clinically awake for ≥2 h during PSG. Median SOFA-scores were 11.5 (10–18). All PSGs were atypical but without reactivity and 3 showed epileptiform activity. Epileptiform EEG activity was seen in 4 pts: This subgroup had higher SOFA-score (10–16) and lower GCS (3–10) and received sedatives in the days prior to PSG. 3 of 4 lived at the 6 months follow-up without subsequent findings of epilepsy.
CONCLUSIONS. Only 50 % of un-sedated, alert, delirium-free patients show electrophysiologic sleep on PSG.
No un-sedated patients with delirium showed electrophysiologic sleep on PSG.
In this study epileptiform activity were seen in 4 CNS-depressed, un-sedated patients. No relation to outcome was found. The significance of the seen epileptiform activity needs further investigation.
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0932
COSTS OF ICU-DELIRIUM

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INTRODUCTION. Delirium prolongs ICU stay and increases treatment costs. Patients with delirium need intensified surveillance and they benefit from activating measures such as physiotherapy. This increases individual workload or need for more staff. In the DRG-

system, longer length of stay and increased nursing workload may lead to increased revenues from the health payer, but also produce higher costs.
OBJECTIVES. To evaluate the effect of delirium on financial proceeds.
METHODS. Revenues of 160 patients, who were prospectively studied for the prevalence of delirium during a two-months period were retrieved from the hospital patient management system. Nursing workload was determined during the study with the TISS-28. TISS-10, which is part of the basis of assessing nursing workload within the German DRG system, was also retrieved from the databank. Costs were assessed with a calculation tool provided by the German Society of Anesthesiology and Intensive Care (DGAI).
RESULTS. Data sets of 153 patients were eligible for analysis. Patients with delirium in ICU (41.2 %) produced costs of 1,321 €/d [1,225–1,373] vs. 1,277€/d [1,239–1,289] without delirium ($P = 0.038$, Mann *U* test). Costs were not covered by proceeds, which were 1,136 €/d [723–1,737] vs. 693 €/d [446–1,297], respectively ($P = 0.006$). Neither TISS-28 (ever delirium, 40 pts [37–45] vs. never delirium 39 [34–43]; $P = 0.188$) nor TISS-10 (16 pts [13–19] vs. 16 [10–20]; $P = 1.0$) indicated the raised nursing workload.
CONCLUSIONS. Raised costs associated with delirium were not covered by increased revenues, delirium increased negative balances. Delirium was not associated with raised TISS-28 or TISS-10 scores. Further investigations should be directed towards scores that better reflect nursing workload and towards measures to cost-effectively prevent and treat delirium.
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Future therapies of systemic inflammation: 0933–0937

0933
EFFECTIVE TREATMENT OF EDEMA AND ENDOTHELIAL BARRIER DYSFUNCTION WITH IMATINIB

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INTRODUCTION. Endothelial barrier dysfunction and vascular leak are significant pathogenic phenomena. Although contributing to life-threatening conditions like sepsis, they currently lack specific therapy. In a recent case-report we reported fast resolution of pulmonary edema upon treatment with the tyrosine kinase inhibitor imatinib. We hypothesize that imatinib protects against vascular leak and edema formation by enhancing endothelial barrier integrity.
METHODS AND RESULTS. The effect of imatinib on endothelial barrier function was assessed by macromolecule passage and electrical resistance over human endothelial monolayers during endothelial activation with thrombin or histamine. Pretreatment with imatinib dose-dependently (optimal concentration 10 μM) attenuated the thrombin-induced macromolecule passage over endothelial monolayers (40 % reduction, $P < 0.001$), and reduced the maximal drop in electrical resistance during thrombin and histamine stimulation (24 % reduction, $P < 0.001$, and 37 % reduction, $P = 0.01$, respectively) in macro- and microvascular endothelial cells. To find out via which kinase imatinib exerts its protective effect, we performed a systematic siRNA knock-down of the imatinib-sensitive kinases (c-Abl, Abl-related gene [Arg], PDGFR, DDR-1 and c-KIT). Only Arg knock-down mimicked the barrier-protective effects of imatinib during thrombin stimulation (22 % reduction of macromolecule passage, $P < 0.01$; 22 % reduction of the maximal drop in electrical resistance, $P = 0.01$). Because c-Abl, PDGFR, DDR-1 and c-KIT depletion did not affect the thrombin response, and imatinib had no additive protective effect in Arg depleted cells, imatinib exerts its protective effects predominantly via inhibition of Arg. Measuring Arg activity by phosphorylation of CrkL at Tyr207 (as surrogate parameter for Arg) revealed that thrombin stimulation led to fast (within 2 min) Arg activition. Similarly, endothelial stimulation with the permeability factors VEGF and histamine enhanced Arg activity. Imatinib limited Arg-mediated endothelial barrier dysfunction by enhancing Rac1 activity and enforcing adhesion of endothelial cells to the extracellular matrix, demonstrated by enhanced formation of focal adhesions at the cell periphery. In vivo, imatinib attenuated VEGF-induced vascular leakage in murine skin as measured by Evans Blue extravasation (50 % reduction, $P < 0.001$), and inhibited edema formation in the lung (66 % reduction, $P < 0.01$), as measured in the isolated perfused mouse lung model.
CONCLUSION. These data demonstrate that imatinib protects against endothelial barrier dysfunction and vascular leakage at clinically relevant concentrations. The tyrosine kinase Arg was identified as an entirely novel mediator of endothelial barrier dysfunction. Altogether, this study indicates imatinib as a potential candidate for future treatment of vascular leakage and edema. Supported by NHF grants #2003T3201 (JA) and the ESICM/ECCRN Young Investigator Award 2011.

0934
REVERSAL OF IMMUNOPARALYSIS IN HUMANS IN VIVO, A DOUBLE-BLIND PLACEBO-CONTROLLED RANDOMIZED PILOT-STUDY

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INTRODUCTION. Reversal of sepsis-induced immunoparalysis may reduce the incidence of secondary infections and improve outcome. While Interferon-gamma (IFN-γ) and Granulocyte Macrophage-Colony Stimulating Factor (GM-CSF) restore immune competence of ex vivo stimulated leukocytes of septic patients, effects on immunoparalysis in vivo are not known.
OBJECTIVES. To investigate the effects of IFN-γ and GM-CSF on immunoparalysis in vivo in humans.
METHODS. We performed a double-blind placebo-controlled randomized study in 18 healthy male volunteers that received *E. coli* endotoxin (LPS, 2 ng/kg, intravenously) on days 1 and 7 (visits 1 and 2). On days 2, 4 and 6 subjects received subcutaneous injections of IFN-γ (100 μg/day, n = 6), GM-CSF (4 μg/kg/day, n = 6), or placebo (NaCl 0.9 %, n = 6).
RESULTS. In the placebo group, immunoparalysis was illustrated by a 60 % [48–71] reduction of LPS-induced TNF-α plasma concentrations during visit 2 ($p = 0.03$), whereas the anti-inflammatory IL-10 response was not significantly attenuated (39 % [2–65], $p = 0.15$). In contrast, in the IFN-γ group, TNF-α concentrations during visit 2 were not significantly attenuated (28 % [1–47], $p = 0.09$), while the IL-10 response was significantly lower (reduction of 54 % [47–66], $p = 0.03$). Compared with the placebo group, the reduction in the LPS-induced TNF-α response during visit 2 was significantly less pronounced in the IFN-γ group ($p = 0.01$). Moreover, compared with placebo, treatment with IFN-γ increased monocyte HLA-DR expression ($p = 0.02$). GM-CSF exerted similar effects, albeit to a lesser extent.
CONCLUSIONS. We demonstrate that IFN-γ reverses immunoparalysis in vivo in humans. These results suggest that IFN-γ is a promising treatment option to reverse sepsis-induced immunoparalysis.
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0935
EFFECTS OF A BRADYKININ-B2 RECEPTOR ANTAGONIST ON PLASMA VOLUME, INFLAMMATORY RESPONSE AND PULMONARY EDEMA IN A SEPTIC ANIMAL MODEL

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INTRODUCTION. Sepsis is a state of disrupted inflammatory response that is initiated by an infection. The development of new approaches to reduce the inflammatory response and the following capillary leackage and volume shifts are rare.
OBJECTIVES. Using a faecal peritonitis model we tested the effects of a bradykinin-B2 receptor antagonist (BKA) (Firazyr™, Jerini AG, Berlin, Germany) on plasma volume, inflammatory response and pulmonary edema.
METHODS. Prospective randomized, controlled animal laboratory study in a university animal laboratory. 24 anaesthetized, ventilated pigs (29.8 ± 2.1 kg) received 1 g/kg/body weight faeces into abdominal cavity to induce sepsis and were observed over 8 h. Animals were randomized (6 in each group) to therapy with 0.5 mg/kgBW/h BKA started 1 h after sepsis induction (post group), 0.5 mg/kgBW/h BKA started 1 h before sepsis induction (pre group), 0.5 mg/kgBW/h BKA started 1 h after sepsis induction with a bolus of 0.25 mg/kgBW (bolus group) or control group with sepsis induction but no treatment with BKA. Infusion rate was titrated after 4 h without volume substitution to maintain the initial baseline central venous pressure. PV was determined using chromium-51-tagged erythrocytes. Inflammatory response was measured by CD-45 expression in the histology of the lung and TNF-α Levels in serum. Measurements were performed before (Pre) and 8 h after induction of sepsis. Statistics were performed with ANOVA.
RESULTS. 8 h after sepsis induction volume balance (ml/kgBW) was significant higher in the control group (46 ± 18, $p \leq 0.05$) compared to pre and bolus group (pre: 35 ± 3; bolus: 27 ± 7, post: 35 ± 3). Wet to dry ratio of the right lung [g] was significant higher in the control group (5.74 ± 0.23) than in all other groups (post: 4.85 ± 0.38; pre: 4.46 ± 0.36; bolus: 4.58 ± 0.24). In the histological analysis of the lung the CD45 positive cells were significant elevated in the control group compared to all other groups. There were no differences in the TNF-α Levels and interleukin 6 levels between the groups. Plasma volume as percentage of baseline [%] was significantly higher in the pre group (106 ± 13, $p \leq 0.05$) compared to control and bolus group (91 ± 7; 91 ± 7) at study end.
CONCLUSIONS. In this porcine sepsis model the treatment with a bradykinin-B2 receptor antagonist could reduce inflammatory response and edema in the lung and maintain plasma volume.
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0936
INTERLEUKIN-7 RESTORES LYMPHOCYTE FUNCTIONS IN SEPTIC SHOCK PATIENTS: A PRECLINICAL REPORT

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INTRODUCTION. Septic syndromes are the leading cause of mortality in intensive care units (ICUs) and are characterised by the development of a stage of profound immunosuppression associated with delayed mortality and risk of nosocomial infections [1–2]. Sepsis-induced lymphocyte dysfunctions include increased apoptosis leading to lymphopenia, anergy and increased percentage of naturally regulatory T cells [2]. Interleukin-7 (IL-7) is an homeostatic cytokine for resting lymphocytes and is involved in peripheral expansion in lymphopenic hosts. Recombinant human IL-7 (rhIL-7) is currently tested in phase I and II clinical trials in other diseases with no major side effect observed so far [3].
OBJECTIVES. In septic shock patients, we investigated ex vivo the capacity of recombinant human IL-7 (rhIL-7) to restore normal lymphocytic functions.
METHODS. After mononuclear cell purification and T Cell Receptor (TCR) stimulation, the effect of rhIL-7 on cell proliferation, IFN-γ production, Bcl-2 expression and STAT-5 phosphorylation were measured by flow cytometry in patients in comparison with healthy volunteers.
RESULTS. After T cell stimulation, septic shock patients presented with marked lymphocyte dysfunctions: decreased $CD4^+$ and $CD8^+$ T cell proliferation, decreased IFN-γ production by $CD8^+$ T cells, decreased Bcl-2 and pSTAT5 expressions in T cells in comparison with healthy volunteers. Importantly, these sepsis-induced lymphocyte alterations were totally reversed after incubation with rhIL-7.
CONCLUSIONS. Our results show for the first time that rhIL-7 is able to restore ex vivo sepsis-induced lymphocyte alterations in patients. These observations suggest that rhIL-7 therapy could promote functional T cell responses after sepsis. Upon patients' stratification, rhIL-7 may improve survival of patients with septic shock.

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0937

INFLAMMATORY RESPONSE AND IMMUNOMODULATION DURING COUPLED PLASMA FILTRATION ADSORPTION IN SEPTIC SHOCK PATIENTS: CHARACTERIZATION OF CYTOKINE ADSORPTION

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INTRODUCTION. Coupled plasma filtration adsorption (CPFA) is an extracorporeal therapy that utilises a resin cartridge for adsorption of inflammatory mediators and cytokines produced during sepsis in addition to hemofiltration.
OBJECTIVES. The purpose of this study was to observe whether adsorption could influence plasma cytokine concentration and patient immunoresponsiveness to stimulation by endotoxin.
METHODS. Seven consecutive septic shock patients (4F/3M) were treated according to septic shock management guidelines and with CPFA. Prescribed CPFA parameters were: Qb 201 ± 23 ml/min, Qp18,4 ± 3 ml/min, mean plasma volume of 20.2 ± 3.4 L, a treated plasma dose/kg body 0.26 ± 0.08 L/kg/session, mean duration 9.1 ± 1.3 h. For cytokines profiles, samples were obtained: from the circuit blood line and the plasma line (before and after the cartridge), and stored at −18 °C for cytokine analysis. For immunostimulation experiments, a 2 ml aliquot of whole blood time "0" (before starting treatment), Time "1" at the end of first CPFA session, and at times "2" and "3" at the start and at the end the second session, Time 4 at the start of third session. They were incubated with or without endotoxin (E.Coli 055:B5) 100 ng/ml for 24 h at 37 °C. After the 24 h incubation, plasma was separated from the cellular components and both fractions were stored at −18 °C until cytokine analysis. Cytokines were analyzed by either an ELISA assay (IL1, IL6, IL8 and IL10, BioSource Europe S.A., Nivelles, Belgium) or multianalyte protein array analysis using luminex technology. (Rules Based Medicine, Texas). Seventy different proteins were analyzed by this method.
RESULTS. The plasma concentrations of IL1β were always found to be quite low for all patients (less than 50 pg/ml except for 1 patient at the end of the first CPFA session). The concentrations of IL6 were quite variable and often much higher than the normal range of 50 pg/ml. The concentration of IL6, IL8 and IL 10 decreased over the first two days of CPFA treatment. We did not find significant adsorption of albumin, IgG, IgM, IgE, IgA, endotoxin, heparin or citrate by the resin cartridge.In immunostimulation tests we noted: 1) Whole blood incubated with LPS showed a strong response to produce both IL6 and IL10 after the 24 h incubation which tended to decrease over time. 2) at the start of the first CPFA treatment, there was considerable intracellular IL1β, but low plasma levels IL1β, even after stimulation with high concentrations of LPS. 3) After incubation with LPS the plasma IL1β progressively increased during CPFA treatments. 4) At T = 0 very little plasma and intracellular IL6 was produced, however there was a increase in intracellular IL-10. 5) High levels of intracellular IL10 decreased due to CPFA treatments.
CONCLUSIONS. CPFA adsorbed a wide array of many cytokines and mediators associated with severe sepsis and septic shock. CPFA could play a role in immunoresponsiveness.

Predictors of outcome in critical illness: 0938–0942

0938

THE ASSOCIATION OF RED CELL DISTRIBUTION WIDTH AT HOSPITAL DISCHARGE AND MORTALITY FOLLOWING CRITICAL ILLNESS: A COHORT STUDY

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INTRODUCTION. Red Cell Distribution width (RDW) is associated with mortality and bloodstream infection risk in the critically ill.
OBJECTIVES. We hypothesized that an increase in RDW at hospital discharge in patients who received critical care would be associated with mortality.
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 in quintiles as ≤13.3 %, 13.3–14.0 %, 14.0–14.7 %, 14.7–15.8 %, and >15.8 %. 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. Adjusted odds ratios were estimated by multivariable logistic regression models with inclusion of covariate terms thought to plausibly interact with both RDW and mortality. Adjustment included age, race, gender, Deyo-Charlson Index, patient type (medical versus surgical), sepsis and number of organs with acute failure.
RESULTS. In patients who received critical care and survived hospitalization, the RDW at discharge was a robust predictor of all cause mortality and remained so following multivariable adjustment. Patients with a discharge RDW of 14.0–14.7 % have an OR for mortality in the 30 days following hospital discharge of 2.86 (95 % CI, 2.25–3.62; P < 0.0001) and an adjusted OR of 1.63 (95 %CI, 1.27–2.07; 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 mortality in the 30 days following hospital discharge of 4.57 (95 % CI, 3.66–5.72; P < 0.0001) and an adjusted OR of 2.36 (95 % CI, 1.87–2.97; P < 0.001) relative to patients with a discharge RDW ≤13.3 %. Patients with a discharge RDW >15.8 %, have an OR for mortality in the 30 days following hospital discharge of 8.80 (95 %CI, 7.15–10.83; P < 0.0001) and an adjusted OR of 4.18 (95 %CI, 3.36–5.20; P < 0.001) relative to patients with a discharge RDW ≤13.3 %. Similar significant robust associations post multivariable adjustments are seen with death by days 90 and 365 post-discharge. Estimating the receiver operating characteristic AUC shows that discharge RDW has moderate discriminative power for mortality 30-days following hospital discharge (AUC = 0.79; SE = 0.005; 95 % CI 0.78–0.80; P < 0.0001).
CONCLUSIONS. In patients treated with critical care who survive hospitalization, an elevated RDW at the time of discharge is a robust predictor of subsequent all cause patient mortality. Increased RDW reflects the presence of inflammation, oxidative stress, or arterial underfilling which may explain the observed impact on patient survival.

0939

INCIDENCE, CHARACTERISTICS AND OUTCOMES OF PREGNANCY-RELATED CRITICAL ILLNESS OVER TIME IN CANADA

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BACKGROUND AND PURPOSE. There are little data on the incidence, characteristics, risk factors and outcomes of pregnancy-related critical illness.
MATERIALS AND METHODS. A population-based cohort study using health administrative data from the Canadian Institute for Health Information and Statistics Canada on all pregnant and postpartum patients discharged from Canadian hospitals April 2004–March 2010 (except one province Quebec). The demographics and characteristics of all patients admitted to intensive care units (ICUs) were described, using median (and interquartile range, IQR), counts (and proportions) and incidence rates. T-tests and Chi-square or exact tests were used to describe and compare data as appropriate.
RESULTS. From 1,957,098 records, 308 were excluded after date and age range confirmations leaving 1,956,790 pregnant or post-partum patients admitted and discharged to hospital (Table 1). 12,399 patients (11,002 pregnant, 1,397 postpartum) were admitted to all ICUs, for an incidence rate of 7.36 cases of pregnancy-related critical illness per 1,000 live births in the population per year (3.17 cases to highest acuity ICUs per 1,000 live births). One-fifth of critically ill females were over age 35 years; 31 % had cesarean sections; and 10 % received invasive ventilation in ICU. Median stay was 4 days and the mortality rate was 0.6 %. Women with post-partum critical illness had more ICU interventions and a higher mortality rate than those developing critical illness pre- or peri-partum. At the population level, maternal mortality was stable at 4 cases per 100,000 deliveries per year over the study period (Table 2).

Characteristic of Pregnancy-related critically ill

Characteristic N (%) or Median (IQR)	All (N = 12,399)	Pregnant (N = 11,002)	Postpartum (N = 1397)	P value
Age, years	30 (25–34)	29 (25–34)	31 (26–35)	<0.01
Medical-surgical unit admission	4,798 (38.7 %)	3,808 (34.6 %)	990 (70.8 %)	<0.01
Cardiac or step-down unit admission	7,601 (61.3 %)	7,194 (65.4 %)	407 (29.2 %)	<0.01
Invasive ventilation	1,069 (8.6 %)	759 (6.9 %)	310 (22.2 %)	< 0.01
Red Blood Cell Transfusions	2,465 (19.9 %)	2,023 (18.4 %)	442 (31.6 %)	<0.01
Cesarean-section	3,789 (30.5 %)	3,709 (33.7 %)	80 (5.7 %)	<0.01
Length of ICU Stay (h)	39 (20–78)	38 (19–75)	47 (24.5–95)	0.28
Length of Hp. Stay (days)	4 (2–8)	4 (2–-7)	5 (3–9)	< 0.01
Death	76 (0.6 %)	50 (0.45 %)	26 (1.9 %)	< 0.01

Temporal Trend in Pregnancy-related critically ill

Fiscal year (April 1 to March 31)	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	Total
Live births, N	263, 851	267, 600	277, 808	288, 046	292, 188	295, 385	168, 4878
Age, years	30 (25–34)	29 (25–34)	29 (25–34)	29 (25–33)	30 (25–34)	30 (25–34)	30 (25–34)
Gestational Age, weeks	37 (34–39)	37 (34–39)	34 (29–38)	35 (30–38)	35 (30–38)	36 (30–38)	36 (31–38)
Admission/ 1,000 live births	7.27	7.25	7.11	7.39	7.46	7.64	7.36
Incidence Highest Acuity ICU Admission/ 100,000 live births	3.17	3.33	3.10	2.96	3.12	3.39	3.18
ICU mortality/100,000 live births	3.41	2.99	5.40	3.82	4.45	3.05	4.00
Hospital Mortality/ 100,000 live births	4.55	2.99	6.48	4.17	5.13	3.72	3.72

CONCLUSIONS. This is first contemporary study to determine national Canadian trends in pregnancy-related critical illness and death. There has been a stable incidence of pregnancy-related critical illness and maternal mortality rate over time. The requirement for any ICU admission of 7/1000 deliveries in this population study is higher than reported in smaller hospital-bases studies and deserves further investigation. Next steps include examining risk factors for critical illness and death for both mothers and neonates.

0940
CHRONIC CRITICAL ILLNESS: SHORT TERM OUTCOME IN A LARGE COHORT OF PATIENTS

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INTRODUCTION. The term "chronic critical illness" has been used to describe the experience of patients with a prolonged length of stay (>21 days) in the Intensive Care Unit (ICU) (MacIntyre et al. 2005). This situation bears important physiological consequences thought to be associated with negative impacts on prognosis (Carson et al. 2008).

OBJECTIVES. This study has been conducted to evaluate two short-term outcomes after a prolonged ICU length of stay (LOS), namely hospital mortality and orientation at hospital discharge.

METHODS. An observational retrospective cohort study including 5 730 consecutive patients admitted from June 1st 2008 to March 31st 2011, to the ICUs of the Centre Hospitalier de l'Université de Montréal (CHUM) was conducted. The CHUM is an 800-bed academic hospital from which 50 are dedicated to ICU patients. We extracted the following variables from our institution's administrative database: age, sex, hospital and ICU LOS, ICD-10-M codification admission diagnosis, mortality and orientation at discharge. We compared patients according to their maximal consecutive ICU LOS by categorizing them into short (<21 days) and prolonged (≥21 days) stay. Chi-square and T-test were used to compare the two groups. A p value <0.05 was considered significant.

RESULTS. Patients experiencing a prolonged ICU stay represent 3.5 % of all admissions, but account for 26.4 % of the occupancy rate. They also show higher mortality (38.5 vs. 13.9 %, $p < 0.001$), which is directly proportional to the ICU LOS. However, an inverse relationship is observed for some subgroups, especially for neurosurgical patients. The prolonged-stay patients demonstrate higher ICU readmission rates (13.5 vs. 2.9 %, $p < 0.001$) and mean hospital LOS (71.6 vs. 17.4 days, $p < 0.001$). Finally, prolonged ICU stay is associated with lower rate of discharge home (21.0 vs. 65.5 %, $p < 0.001$) and higher rate of discharge to rehabilitation centers (14.0 vs. 3.9 %, $p < 0.001$) or long-term care facilities (8.0 vs. 2,4 %, $p < 0,001$).

CONCLUSIONS. Patients with a prolonged ICU stay face particularly reserved prognosis, with higher mortality and lower rates of discharge home. However, some exceptions apply such as neurosurgical patients. Further studies are needed to better characterize the chronically critically ill, which monopolize a quarter of our institution's ICU beds. Identifying predictive factors leading to such poor outcomes might shed light on specific interventions, which could alleviate the significant burden imposed by chronic critical illness.

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0941
GASTROINTESTINAL (GI) SYMPTOMS DURING THE FIRST WEEK OF INTENSIVE CARE ARE ASSOCIATED WITH POOR OUTCOME

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INTRODUCTION. Critically ill patients often present GI symptoms and intra-abdominal hypertension (IAH). The impact of simultaneous presence of different GI symptoms on outcome is not clarified.

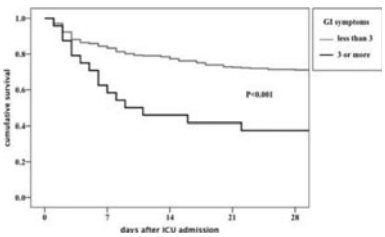
OBJECTIVES. To describe the incidence and investigate the impact of GI symptoms and IAH on ICU outcome.

METHODS. Prospective observational multicenter study included adult patients requiring mechanical ventilation (MV) for at least 6 h, during 2–4 weeks in 40 sites. If intra-abdominal pressure (IAP) measurements were not possible for any reason, patients were excluded. GI symptoms and IAP were documented on days 1, 2, 4 and 7. The following GI symptoms were defined: Absent bowel sounds; Vomiting/regurgitation; Diarrhoea = loose or liquid stool ≥ 3 times/day; Bowel distension = suspected or radiological confirmed bowel dilatation in any bowel segment; GI bleeding = visible appearance of blood in vomits, nasogastric aspirate or stool; High gastric residual volume (GRV) = GRV > 500 ml in at least one measurement; IAH was defined as mean IAP ≥ 12 mmHg. Primary endpoint was 28 day mortality.

RESULTS. The study population was 377 patients from 40 ICUs. The associations of different GI symptoms and IAH with mortality are presented in Table 1. The number of simultaneously occurring GI symptoms was higher in non-survivors. Patients with three or more GI symptoms had 28 day mortality of 62.5 % compared to 28.9 % in patients with less GI symptoms ($P = 0.001$), cumulative survival curves are presented on Figure 1. None of the GI symptoms were independent predictors of mortality.

Incidence of GI symptoms and IAH

	Total number of pt (%)	Survivors, %	Non-survivors, %	P value
Absent bowel sounds	142 (37.7)	33.8	46.2	0.022
Diarrhoea	81 (21.5)	20.4	23.9	0.498
Bowel distension	78 (20.7)	18.5	25.6	0.129
GI bleeding	24 (6.4)	4.2	11.1	0.020
Vomiting/regurgitation	31 (8.2)	8.5	7.7	1.000
High GRV	28 (7.4)	5.8	11.1	0.086
IAH	163 (43.2)	43.1	43.6	1.000
Number of GI symptoms, mean (SD)	0.91 (0.94)	0.81 (0.85)	1.15 (1.08)	0.001
Combination of 3 or more GI symptoms	24 (6.4)	3.5	12.8	0.001



Cumulative survival according to GI symptoms

CONCLUSIONS. GI symptoms and IAH are frequent in ICU patients. Absent bowel sounds and GI bleeding, as well as increasing number of simultaneously occurring GI symptoms are associated with higher 28 day mortality.

0942
WHAT IS THE BEST DEFINITION OF CHRONIC CRITICAL ILLNESS? A MULTICENTRIC STUDY IN SOUTH OF BRAZIL

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INTRODUCTION. Chronic critical illness (CCI) has been recognized as a new paradigm in the intensive care unit (ICU) and its definition is variable and unclear.

OBJECTIVES. Our goal was to describe prevalence and compare characteristics, clinical profiles and outcomes of some definitions of CCI patients.

METHODS. Prospective multicenter cohort study in 4 ICUs in Brazil, including all consecutive patients older than 15 years admitted during 26 month. The CCI definitions are showed at Table 1.

RESULTS. During study 6,245 patients were admitted in ICUs. Of these 4,573 (73.2 %) not fulfilled any CCI-criteria. Table 1 summarizes the differences between definitions of CCI patients, characteristics and outcomes. Dependency of mechanical ventilation (MV) ≥21 days was associated with higher mortality at ICU and hospital mortality (52.5 and 58.2 %, respectively). Although patients identified by tracheotomy (MV ≥10 days + tracheotomy or simply tracheotomy) had higher rates of length of stay-hospital (LOS) after ICU discharge (21 ± 34 and 22 ± 35 days, respectively) no difference between the other defintions without tracheotomy.

CONCLUSIONS. We studied some definitions of CCI and founded differents clinical features and outcomes. We can use these informations to identify at-risk CCI patients and to institute proactive care to minimize burden and dis- tress experienced by patients and their caregivers. Tables 1, 2 and 3: a, b = $p < 0.0001$ between groups.

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CCI patients at ICU admission

DEFINITIONS	ICU ≥ 21 DAYS	ICU ≥ 14 DAYS	MV ≥ 4 DAYS	MV ≥ 14 DAYS	MV ≥ 21 DAYS	MV ≥ 10 DAYS AND TRACHEOTOMY	TRACHEOTOMY
AT ADMISSION							
SOFA	4.77 ± 3.39	4.79 ± 3.32 a	5.52 ± 3.38 a	5.43 ± 3.5	5.42 ± 3.68	4.95 ± 3.1	4.75 ± 3.12
APACHE II	19.73 ± 6.98 a	19.85 ± 7.21 a	21.33 ± 7.39 a	21.29 ± 7.06	21.17 ± 7.06	19.99 ± 6.5	19.55 ± 6.64
COMA GLASGOW SCORE	11.96 ± 3.96	11.86 ± 4.03	11.38 ± 4.45	11.40 ± 4.43	12.13 ± 4	11.64 ± 4.24	11.34 ± 4.36
TISS 24H	25.52 ± 8.4 a	25.33 ± 8.24 a	27.52 ± 8.01 a	27.33 ± 7.72	27.22 ± 7.66	26.38 ± 7.34	26.06 ± 7.69

CCI patients at ICU discharge

DEFINITIONS	ICU ≥ 21 DAYS	ICU ≥ 14 DAYS	MV ≥ 4 DAYS	MV ≥ 14 DAYS	MV ≥ 21 DAYS	MV ≥ 10 DAYS AND TRACHEOTOMY	TRACHEOTOMY
AT ICU DISCHARGE							
SOFA	2.56 ± 3.53 a	2.65 ± 3.7 b	3.8 ± 4.66 a,b	3.96 ± 4.63 a,b	3.63 ± 4.43	3.16 ± 3.83	3.01 ± 3.69
TISS	11.56 ± 9.49	11.57 ± 9.45	12.34 ± 11.16	12.39 ± 11.2	12.5 ± 11.35	12.02 ± 9.56	12.14 ± 9.47
COMA GLASGOW SCORE	10.16 ± 6.24	11.07 ± 5.77 a	9.10 ± 6.66 a	8.38 ± 6.83 a	7.22 ± 7.08	9.09 ± 6.35	9.48 ± 6.11
LOS-HOSPITAL AFTER ICU	18.42 ± 33.16	17.69 ± 32.34	13.38 ± 24.85	15.66 ± 30.04	16.01 ± 31.76	21.63 ± 34.91	22.04 ± 35.08
ICU STAY (days)	42.25 ± 39.46	31.03 ± 32.33	21.21 ± 18.59	35.42 ± 22.12	45.25 ± 24.23	40.15 ± 24.77	36.69 ± 25.89

CCI patients outcomes

DEFINITIONS	ICU ≥ 21 DAYS	ICU ≥ 14 DAYS	MV ≥ 4 DAYS	MV ≥ 14 DAYS	MV ≥ 21 DAYS	MV ≥ 10 DAYS AND TRACHEOTOMY	TRACHEOTOMY
MORTALITY							
AT ICU	204 (33.4 %)a	347 (32.2 %)	602 (46.5 %)a	227 (50 %)a	128 (52.5 %)a	117 (39.5 %)	127(34.6 %)a
AT HOSPITAL	261 (42.8 %)a	430 (39.9 %)b	663 (51.2 %)a,b	251 (55.3 %)a,b	142 (58.2 %)a,b	147 (49.7 %)	166 (45.2 %)

Exploring hypoperfusion: 0943–0947

0943

AMINISTRATION OF INSULIN LIMITS NO REFLOW PHENOMENON AND IMPROVES CORONARY BLOOD FLOW IN A PORCINE ISCHEMIA–REPERFUSION MODEL

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INTRODUCTION. Early reperfusion is widely applied to limit infarct size, preserve left ventricular function and improve survival in patients with acute myocardial infarction. However, even if restoration of blood flow to previously ischemic tissue does occur after reperfusion, limited perfusion is observed in some parts of the injured myocardium. This is known as no reflow phenomenon [1], remains a hidden enemy in the modern management of acute coronary syndromes and considerably lessens the benefits from reperfusion strategies [2].

OBJECTIVES. To examine if and in what extent insulin [3, 4] affects, if administered during reperfusion, coronary blood flow and no reflow phenomenon in a porcine ischemia–reperfusion preparation.

METHODS. Twenty-four pigs, 29–35 kg, were anesthetized, intubated and mechanically ventilated. Their heart was exposed by mid sternotomy and proximal left anterior descending artery (LAD) was isolated and instrumented by surgical snare and transit time ultrasound flowmeter. All animals underwent occlusion of LAD for 60 min, followed by reperfusion for 120 min and were randomized in order to receive during reperfusion, normal saline (group 1, n = 11) or normal saline plus regular insulin 0,05 U/ml (group 2, n = 9) at a rate of 2 ml/kg/h. At the end of reperfusion all animals were euthanized, no reflow area was delineated by thioflavin S and calculated by planimetry. The coronary blood flow was monitored throughout reperfusion period.

RESULTS. Coronary blood flow values, normalized to myocardium mass at risk were significantly higher ($p < 0,05$ 60–120 min of reperfusion period) and no reflow phenomenon as percentage of myocardium at risk was significantly lower in the group that received insulin in comparison with the control group (41,5 ± 17 % vs. 60,8 ± 19 %, $p = 0,009$).

CONCLUSIONS. Insulin administered during reperfusion effectively reduced no reflow phenomenon and improved coronary blood flow in a porcine ischemia–reperfusion model. These findings are reflecting a protective role of insulin on the microcirculation, implying beneficial effects of tight glycaemic control in ICU and suggesting for its use in clinical practice.

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0944

NORMOBARIC HYPEROXIA ALTERS THE MICROCIRCULATION IN HEALTHY SUBJECTS

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INTRODUCTION. Excessive oxygen administration, at high concentrations, may result in an increase of vascular resistances, changes in the cellular metabolism and reabsorption atelectasis. However in some recent animal studies, oxygen improved neuronal outcome in animal stroke models, decreased the endothelial-neutrophil interactions and prevented atelectasis during protective ventilation. The data on the effects of hyperoxia on human microcirculation are scarse.

OBJECTIVES. To evaluate the effects of hyperoxia on the sublingual microcirculation in adult healthy volunteers.

METHODS. Five adult healthy volunteers were studied. After a period of rest, two baseline measurements at room air (RA 1 and RA 2) were obtained 30 min before oxygen was administered with a non-rebreathing mask (FiO_2 close to 1.0) for 30 min and a third measurement (O_2) was obtained. A last measurement was obtained after 30 min (RA3) of breathingon room air. The sublingual microcirculation was monitored using a Sidestream Dark Field Imaging (SDF) device (Microvision Medical BV, Amsterdam, the Netherlands). The analysis was based on the criteria previously established by De Backer et al. [1].

RESULTS. PPV, PVD and SPVD all decreased at FiO_2 1.0 and only partially recovered 30 min after return to room air (Table).

SDF-Hyperoxia challenge

Time	PPV	PVD	SPVD	MFI
AR 1	91.6 ± 2.8	11.7 ± 0.8	10.1 ± 0.8	2.8 ± 0.8
AR 2	92.5 ± 1.6	11.8 ± 1.0	10.2 ± 0.9	2.8 ± 0.9
O_2	70.2 ± 5.6 (a)	7.6 ± 1.4 (a)	6.4 ± 1.3 (a)	2.2 ± 0.1 (a)
AR 3	83.4 ± 12.7	10.1 ± 2.7 (b)	8.7 ± 2.2 (c,b)	2.5 ± 0.3

a = $p < 0.05$ comparing O_2 and AR1, b = $p < 0.05$ comparing AR3 and O_2, c = $p < 0.05$ comparing AR3 and AR1

CONCLUSIONS. Normobaric hyperoxia alters the microcirculation, and these alterations are more than transient.

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0945

ASCORBIC ACID PROTECTS RENAL OXYGENATION AND OXIDATIVE STRESS AFTER ISCHEMIA/REPERFUSION INJURY

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INTRODUCTION. One of the main causes of acute kidney injury (AKI) is ischemia/reperfusion (I/R) injury, a complex event involving activation of neutrophils and excessive generation of reactive oxygen species (ROS).
OBJECTIVES. As L-ascorbic acid (AA; vitamin C) is an important antioxidant in biological systems, we tested in the present study whether treatment with AA could reduce I/R-induced oxidative stress and protects renal oxygenation and function.
METHODS. To this end, rats were subjected to 60 min high aortic clamping with (n = 6) or without (n = 6) intravenous AA treatment (100 mg/kg bolus 15 min before ischemia and 50 mg/kg/h continuously after reperfusion for 2 h). Additionally, one group of sham operated animals was included (n = 6). Systemic and renal hemodynamics, renal microvascular oxygenation in the cortex and medulla, and renal vein oxygenation and renal oxygen consumption were measured continuously. After the experiments, kidneys were isolated and prepared for assessment of malondialdehyde (MDA), inducible nitric oxide synthase (iNOS), neutrophil gelatinase-associated lipocalin (NGAL), fatty acid binding protein (FABP), interleuking 6 (IL-6), and myeloperoxidase (MPO) expression in glomerular and peritubular areas.
RESULTS. Renal blood flow decreased from 4.6 ± 1.0 mL/min at baseline to 0.6 ± 0.2 mL/min 120 min after reperfusion in the group without AA treatment and to 1.2 ± 0.4 mL/min in the group with AA treatment. These results were mirrored by changes in renal vascular resistance which was 54 ± 10 dyn.s/cm^5 at the end of the protocol without AA treatment and 34 ± 6 dyn.s/cm^5 with AA treatment. At the end of the protocol renal microvascular oxygenation in the cortex and medulla were higher in the group treated with AA (42 ± 8 and 25 ± 7 mmHg) compared to the group that did not receive AA (21 ± 8 and 12 ± 4 mmHg). Renal oxygen consumption was higher in the AA-treated group (0.15 ± 0.09 mL/min) compared to in the untreated group (0.05 ± 0.03 mL/min). The MDA levels were lower in the AA-treated group (5.3 ± 0.9 mmol/g) compared to in the untreated group (7.6 ± 1.3 mmol/g). All rats suffered from anuria after I/R. Furthermore, iNOS, NGAL, FABP, IL-6, and MPO levels were all significantly lower in the animals receiving AA.
CONCLUSIONS. Our results demonstrate that treatment with AA successfully protected renal oxygenation and oxidative stress following I/R injury. Nonetheless, all rats suffered from anuria after I/R, probably due to the severe I/R model of 60 min of high aortic clamping.

0946

COMPARISON OF THE HEMODYNAMIC EFFECT OF TWO "ENDOTHELIN-LIKE" PEPTIDES DERIVED FROM VENOM OF SNAKES OF THE GENUS *ATRACTASPIS*

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INTRODUCTION. Sarafotoxin b (sftx b) derived from the venom of *Atractaspis engaddensis* is a 21 amino acids peptide structurally and functionnally close to endothelin-1 (ET-1) produced by mammals endothelial cells. Its toxicity is due to a coronary vasoconstrictor effect by interaction with smooth muscle cells receptors (ETA-R and ETB-R). Recently, a 24 amino acids peptide, sarafotoxin m (sftx m) was found in the venom of *Atractaspis microlepidota*. Sftx m has the same conformation as sftx b and ET1 but a longer C-terminal extension. Sftx m interacts with 3–4 orders of magnitude lower affinity on ET-1 receptors as compared with sftx b or ET-1. Nevertheless, its toxicity remains high (LD50 = 30 ng/g).
OBJECTIVES. The aim of this study is to compare the in vivo hemodynamic effects of sftx b with sftx m.
METHODS. After approval by the local ethics committee, Wistar male rats were anesthetized and mechanically ventilated. Echocardiographic measurements of left (LV) (cardiac output (CO), Tei index, fractional shortening area (FSA)) and right ventricular (RV) function (S-wave velocity (SWV) of the tricuspid annulus, ventricular end-diastolic area ratio (RVEDA/LVEDA)) were performed. Rats were divided into 2 groups to receive either sftx b or m intravenously (1LD50). Measurements were done at baseline (T0), 1 (T1) and 6 min (T2) after injection. They were compared using a Wilcoxon rank sum test. Results are shown as median [interquartile range] in the table.
RESULTS. 16 rats were studied, 8 in each group.

	T0	T1	T2
HR (bpm)			
Sftx b	440 [390-462]	380 [353-462]	420 [361-463]
Sftx m	400 [394-413]	360 [344-394]	361 [343-438]
LVFSA (%)			
Stx b	79 [71-82]	62 [50-73]*	54 [44-68]†
Sftx m	68 [61-71]	66 [62-73]	54 [41-55]†
Tei index			
Sftx b	0.26 [0.14-0.4]	0.5 [0.3-0.6]	0.5 [0.4-1.2]
Sftx m	0.29 [0.15-0.5]	0.29 [0.15-0.5]	0.8 [0.4-2.5]
CO (ml/min)			
Sftx b	79 [63-87]	62 [50-73]	47 [40-78]
Sftx m	68 [61-71]	66 [62-73]	31 [16-45]
S wave velocity (m/s)			
Sftx b	0.08 [0.07-0.07]	0.09 [0.06-0.08]	0.09 [0.02-0.15]
Sftx m	0.08 [0.08-0.09]	0.06 [0.05-0.07]	0.06 [0.05-0.07]†
RVEDA / LVEDA			
Sftx b	0.5 [0.4-0.6]	0.4 [0.4-0.5]	0.4 [0.4-0.5]
Sftx m	0.4 [0.3-0.4]	0.7 [0.6-0.8]*	0.7 [0.6-0.8]†
Airway P(cm H_2O)			
Sftx b	15 [12-17]	15 [12-18]	16 [13-17]
Sftx m	14 [13-16]	18 [17-23]*	30 [20-42]†

Hemodynamic measurements

*p < 0.05:T0 vs. T1; †p < 0.05:T0 vs. T2. HR = heart rate, Airway P = airway pressure.
CONCLUSIONS. The decrease in SWV and the increase in RVEDA/LVEDA ratio show a RV dysfunction. Sftx m has a marked effect on the RV and airway pressures. It does not appear with sftx b. The C-terminal extension of these "endothelin-like" peptides seems to influence their pharmacological effect.
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0947

PROPOFOL MAY REDUCE FLUID LOADING AND FLUID EXTRAVASATION DURING TEPID CPB, COMPARED TO ISOFLURANE- AN EXPERIMENTAL STUDY IN PIGS

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INTRODUCTION. Cardiopulmonary bypass (CBP) can be associated with capillary fluid leak and edema generation. This is often explained by the hemodilutation and the general inflammatory reactions seen during CPB. Studies and volume kinetics analysis [1] have shown that Isoflurane is associated with an increase in extravascular fluid and third space losses. Other studies show no differences in extravascular retention during surgery using Propofol vs. Isoflurane [2].
OBJECTIVES. To which extent the anesthesia per se could influence the fluid shifts seen during cardiac surgery is not well understood. Will a volatile anesthetics like Isoflurane, influence the fluid shifts differently compared to an intravenous anesthetic like Propofol?
METHODS. 14 immature domestic pigs were randomized into two groups, one group receiveing Isoflurane and the other group receiveing Propofol. Both groups were given 60 min of stabilization, followed by 120 min of tepid CPB (drifting 38–>35 °C). Ringer solution was used as CPB prime and for fluid supplementation. Fluid input/losses, plasma volume, colloid osmotic pressures in plasma and interstitial fluid, hematocrit, serum-proteins and total tissue water (TTW) were measured and fluid extravasation rates were calculated.
RESULTS. Hemodilutation was about 25 % after start of normothermic cardiopulmonary bypass in both groups, with no between group differences after to hours on CBP. We found no significantly differences in the hemodynamics parameters like mean arterial pressure (MAP), central venous pressure (CVP) and systemic vascular resistance (SVR) in the two groups. There were no significant changes in the colloid osmotic pressure in both interstitium and plasma. Neither did the two groups different, compared to protein mass and total tissue water content. According to fluid shifts, we found a significantly difference between the Propofol and the Isoflurane-group. Both the net fluid balance (0.5 ml/kg/min (Propofol) and 1.0 ml/kg/min (Isoflurane)), and the fluid extravasation rate (0.4 ml/kg/min (Propofol) and 1.2 ml/kg/min (Isoflurane)), were significantly lower in the Propofol group during CPB. (P = < 0.05).
CONCLUSIONS. In our study, pre-liminary results indicate that giving Propofol during CPB, reduce the fluid extravasation rate and the net fluid balance, compared to the group receiving Isoflurane. The mechanisms behind the differences in fluid shifts are not fully understood. Both anti-inflammatory mechanisms and properties with the anesthetics per se have been discussed. More studies have to be done.
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Poster Corner Sessions
ARDS: New trends in treatment 2: 0948–0961

0948

METABOLOMIC ANALYSIS AS A DIAGNOSTIC TOOL FOR ACUTE RESPIRATORY DISTRESS SYNDROME CAUSED BY VIRAL OR BACTERIAL PNEUMONIA IN HUMANS

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BACKGROUND. Despite the crucial importance of early and specific diagnosis, there are no specific biomarkers for the diagnosis of acute respiratory distress syndrome (ARDS). The integrated analysis of changes in the metabolic profile could be critical for the discovery of accurate biomarkers of lung damage, and also for generating new pathophysiological hypotheses and designing novel therapeutic targets for ARDS.
OBJECTIVES. This study aimed at developing a nuclear magnetic resonance (NMR)-based metabolomic approach for the diagnosis of ARDS in two heterogeneous populations of patients with the diagnosis of pneumonia by H1N1 influenza virus or by pneumococcal pneumomia.
METHODS. Twenty two serum samples from patients with the diagnosis of H1N1 influenza pneumonia (12 with the diagnosis of ARDS), and 23 from patients with the diagnosis of pneumococcal pneumomia (15 with ARDS) were obtained on the day of hospital admission and later analyzed by high-resolution magic angle spinning 1H NMR spectroscopy. Unsupervised principal components analysis (PCA) and supervised partial least squares (PLS) analysis were performed on the processed spectra to highlight diagnostic biomarkers. The biomarkers detected were used to develop predictive models by partial least squares (PLS) that allow discrimination for the diagnosis of infection and ARDS.
RESULTS. NMR-based metabolomic profiling discriminated characteristics between all groups. Elevated methylguanidine, phenylalanine and acetone serum concentrations, and decreased alanine, glutamine, methylhistidine, creatinine and formate serum concentrations discriminated patients with ARDS versus patients without ARDS. Changes in lactate, alanine and aminopiruvate serum concentrations separated patients according the etiology of the pneumomia (H1N1 influenza versus pneumococcal). A predictive model developed based on these biomarkers using PLS classified ARDS samples with a success rate of 89 % (sensitivity 86 % and specificity 92 %), and H1N1 pneumonia samples with a success rate of 93 % (sensitivity 94 % and specificity 97 %).
CONCLUSIONS. This pioneer study demonstrates that the serum metabolomic profile obtained by NMR spectroscopy is a biomarker able to discriminate samples from patients with and without ARDS, or samples from patients with H1N1 versus pneumococcal pneumonia.

0949
NEUTROPHIL PHOSPHOLIPID PROFILING IN PATIENTS WITH ARDS

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INTRODUCTION. Acute respiratory distress syndrome (ARDS) is characterised by neutrophil mediated inflammatory response. Activated neutrophils produce oxidised membrane inflammatory mediators (oxylipins) such as prostaglandins and leukotrienes. Oxylipins are generated from arachidonic acid which is found esterified to phospholipids including phosphatidylcholines (PC) in cell membranes. Cellular membrane PC compositions are cell-specific, different cell types in particular inflammatory cells have varying potential substrate availability for oxylipin synthesis. Consequently characterisation of neutrophil membrane PC composition and synthesis is imperative in inflammatory conditions such as ARDS. Phospholipid precursors labelled with stable isotopes and analytical methods using electrospray ionisation mass spectrometry (ESI/MS), enable dynamic quantification of specific molecular species among phospholipid subclasses.

OBJECTIVES. To assess neutrophil phospholipid composition and turnover in patients with ARDS.

METHODS. ARDS patients and healthy controls were infused with methyl-D_9-choline chloride [3.6 mg/kg] for 3 h. Consecutive blood samples were collected until 96 h after the choline infusion. CD15 + neutrophils were extracted from whole blood using the magnetic cell sorter. Neutrophil phospholipids were extracted and analysed by ESI/MS with nanoflow infusion. The endogenous PC species were identified with collision gas induced dissociation of PC head group fragments with m/z = + 184 and subsequent newly produced PC species with m/z =+193. Dedicated excel spread sheets were used to quantify the mass ion peaks.

RESULTS. Nine patients with ARDS and five healthy volunteers were recruited. For both cohorts, the major neutrophil PC species are PC16:0/18:1, PC18:0/18:2, PC16:0/18:2, PC18:0/18:1 and to a lesser extent arachidonyl (20:4) species. 1-alkyl-2-acyl moiety accounted for 23 % of total PC in patients and 28 % in controls. In patients, there were significant alterations in relative proportions of several PC species (Figure 1). The newly synthesised PC fraction at 24 h reflected endogenous composition for both patients and controls. However the synthesis of PC18:0/18:2 was higher in patients. The total incorporation of D_9-choline into neutrophil PC is much higher for patients (1.05 ± 0.13 %) than controls (0.75 ± 0.06 %) and was maximal at 72 h for both groups (Figure 2).

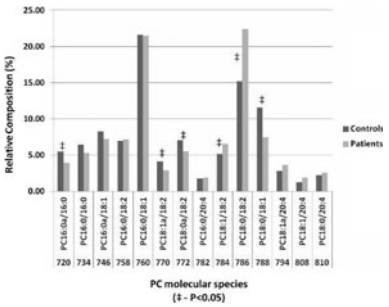

Figure 1 Neutrophil PC composition

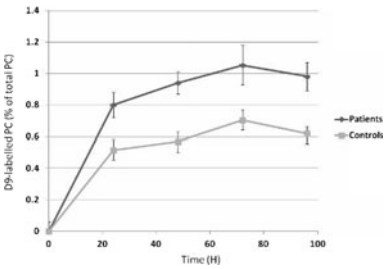

Figure 2 Total neutrophil PC incorporation

CONCLUSIONS. Patterns of PC composition and turnover are significantly altered in neutrophils from patients with ARDS. Further studies are needed to identify the roles of individual PC molecules in inflammatory diseases such as ARDS. This methodology may be utilised to assess dynamic cellular phospholipid alterations and the cellular capability of oxylipin synthesis after therapeutic manipulation.

0950
PHENOTYPIC CHARACTERISATION OF PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS) ACCORDING TO SURFACTANT SYNTHETIC FUNCTION

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INTRODUCTION. ARDS imposes significant health burden. Mortality remains high despite advances in therapeutic strategies. Human surfactant is composed of a mixture of phospholipids and proteins. Phosphatidylcholines (PC) account for about 80 % of total phospholipids and among the PC species, PC16:0/16:0 or dipalmitoyl PC (DPPC) is the main PC with surface tension reducing characteristics. Surfactant abnormalities are well recognised in patients with ARDS. However, replacement strategies remain unhelpful in improving mortality. In adult ARDS, several mechanisms such as impaired synthesis, functional inhibition, and increased breakdown (hydrolysis or oxidation) lead to surfactant dysfunction. Existing diagnostic definitions identify a heterogeneous population and this lack of clairty in phenotyping patients according to surfactant biology, may in part explain the absence of therapeutic benefit from exogenous replacement. PC is synthesised from choline via CDP-choline pathway. By labelling choline a surfactant PC precursor, with a non-radioactive isotope (deuterium), it is possible to trace PC synthesis and metabolism.

OBJECTIVES. To assess surfactant PC synthesis and metabolism by the incorporation of methyl-D_9-choline chloride in patients with ARDS.

METHODS. ARDS patients were identified according to American European Consensus Conference (AECC) diagnostic criteria. Patients were infused with 3.6 mg/kg methyl-D_9-choline. Small volume bronchoalveolar lavages were performed via a fibre optic bronchoscope at serial time points. Samples were filtered and centrifuged at 445 g for 10 min to remove cells. The phospholipids were extracted by Bligh and Dyer method. The chloroform rich layer was dried under nitrogen and mixed with a solution of methanol, butanol, water and concentrated ammonia (6:2:1.6:0.4 v/v) to be analysed in elecrospray ionisation mass spectrometry.

RESULTS. Six patents with ARDS with a mean age of 60, mean APACHE II score of 22.5 and mean $Pa0_2/Fi0_2$ of 14 were recruited. The composition of endogenous surfactant PC species consisted of PC16:0/16:0, PC16:0/18:1, PC18:0/18:2, PC16:0/18:2 PC16:1/16:0 and to a lesser extent of arachidonyl (20:4) species. The relative proportion of endogenous DPPC (PC16:0/16:0) to total PCs showed significant variation among patients ranging between 17–40 % of total PC. The proportion of D_9-choline labelled DPPC ranged between 15–41 % of total D-9 labelled PC, a reflection of synthetic variation among patients (Figure 1).

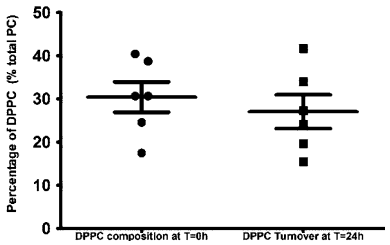

Figure 1 DPPC composition and turnover

CONCLUSIONS. By labelling surfactant PC precursors, it is possible to study surfactant kinetics in patients with ARDS. The patterns of D_9-choline incorporation in surfactant PC is variable among the patients studied. This may be a reflection of alveolar surfactant synthetic function. The methodology may be utilised to phenotype patients with impaired surfactant synthesis as the primary reason for surfactant dysfunction.

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0951
ADHERENCE TO A PROTECTIVE VENTILATION STRATEGY FOR PATIENTS AT RISK OF ACUTE LUNG INJURY

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INTRODUCTION. Patients diagnosed with acute lung injury (ALI) and acute respiratory distress syndrome (ARDS), have a poor outcome with high airway pressures and large tidal volumes (1, 2). This audit assessed compliance with a protective ventilation protocol for patients at risk of ALI and ARDS. We re-audited after implementing recommendations and found a significant improvement in the delivery of tidal volumes (V_t) as part of a protective ventilation strategy.

OBJECTIVES. To assess compliance with a protective ventilation protocol, in accordance with ARDS clinical network guidelines (ARDSnet), for patients at risk of ALI and ARDS.

METHODS. A prospective audit was carried out in a district general hospital over a 4 week period in 2011 and re-audited 12 months later. Our ventilation protocol was based on international ARDSnet guidelines. These recommend tidal volumes of 6 ml/kg of ideal body weight (IBW) and plateau airway pressures below 30 cm water. Data was collected and analysed using SPSS. Inclusion criteria for patients at risk of ALI were those mechanically ventilated for over 48 h on intensive care.

RESULTS. Mean daily V_t's were recorded for 141 ventilated days in the first audit with an overall mean TV of 9.5 ml/kg of IBW. Daily mean V_t's were recorded for 125 ventilated days for the re-audit with an overall mean (V_t) of 6.6 ml/kg IBW. The initial audit demonstrated large (V_t)'s close to conventional ventilation strategies of 10 ml/kg. This is not in keeping with ARDSnet guidelines. The re-audit showed lower V_t's close to ARDSnet guidelines. ARDSnet recommend plateau airway pressures below 30 cm water. Average mean plateau airway pressures were 29.5 cm water for the first audit and 30.2 cm water for the re-audit.

CONCLUSIONS. The standards for this audit are internationally recognised and evidence based. The first audit falls below these standards with large V_t's. However mean plateau airway pressures met with the standard, and were similar for both audits. Recommendations to improve compliance to a safe ventilation protocol were implemented. Education on protective lung ventilation was targeted at junior doctors and intensive care nurses. Laminates with recommended ventilation parameters were made visible on ventilators in intensive care. The re-audit demonstrated lower V_t delivery in patients at risk of ALI. This suggests better compliance with ARDSnet standards after our recommendations were implemented.

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0952
RESCUE ECMO THERAPY IN THE TREATMENT OF REFRACTORY ARDS: 35 PATIENTS IN A FRENCH HOSPITAL

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INTRODUCTION. Despite optimal treatment of severe ARDS (NO, prone position, Almitrine…) the mortality is still very high. The ECMO technic (Extra Corporal Membrane Oxygenation) is used as a rescue therapy in refractory ARDS.

OBJECTIVES. The aim of our study was to describe our patients and to explore mortality risk factors in patients treated with ECMO for refractory ARDS.

METHODS. Prospective study, including all patients treated with a refractory ARDS treated with rescue ECMO, in our surgical intensive care unit of a university hospital, from January 2008 to December 2011. Clinical and biological parameters were collected before, during and after ECMO therapy. Patients were separated in two groups: survivors (S) and non survivors (D).

RESULTS. Thirty five patients suffering from refractory ARDS were treated with rescue ECMO therapy. Twelve patients died (35 %). No significant differences were reported between the S and D groups in SAPS II (47 ± 18 vs. 51 ± 14; p = 0.44) or SOFA score (13.0 ± 2.8 vs. 14.0 ± 1.6; p = 0.14). Other parameters are shown in the table below.

Table

	Survivors (n = 23)	Non survivors (n = 12)	p
Age	41 ± 13	59 ± 8	<0.0001
BMI (kg.m-2)	32 ± 9	28 ± 5	0.3
Corticotherapy before ECMO	0 (0 %)	4 (11.4 %)	0.009
Delay (d) between ventilation and ECMO, (median [IQR])	6 [1–24]	11 [1–40]	0.123
P.plat before ECMO (cmH2O)	36 ± 6	35 ± 6	0.548
P/F before ECMO	48 ± 8	49 ± 9	0.93
Lactate before ECMO (mmol.l-1)	3.1 ± 2.7	3 ± 1	0.161
P.plat D1 ECMO (cmH2O)	28 ± 5	26 ± 4	0.073
Lactate D1 ECMO (mmol.l-1)	2.3 ± 1.0	3.4 ± 2.3	0.132

CONCLUSIONS. In this study, the mortality of patients with refractory ARDS treated with rescue ECMO was 35 %. The advanced age is clearly associated with higher mortality, as well as the long term corticotherapy. ECMO implantation in older patients have to hold in account this increase of the mortality, and the physiological age of the patient.

REFERENCE(S). Intensive Care Med. 2012;38(4):542–556.

0953
PROGNOSTIC FACTORS DURING EXTRACORPOREAL MEMBRANE OXYGENATION FOR ARDS: INTEREST OF THE SEQUENTIAL ORGAN FAILURE (SOFA) SCORE

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INTRODUCTION. Extracorporeal membrane oxygenation (ECMO) has been suggested to improve outcome of severe ARDS patients. However, tools are required to better precize ECMO indications.

OBJECTIVES. The goal of the this study was to determine the factors associated with hospital mortality in severe ARDS patients treated with ECMO for severe ARDS and to notably evaluate the interest of the Sequential Organ Failure Score (SOFA) before and during the early phase of ECMO.

METHODS. A prospective study was conducted in one ICU (North Hospital, Marseille, France) between November 2009 and August 2011. ECMO therapy was indicated if patients presented with a PaO_2 to FiO_2 ratio of less than 70 mmHg under a FiO_2 of 1 for at least 2 h, or a PaO_2 to FiO_2 ratio of less than 100 mmHg associated with a plateau pressure above 35 cmH2O, or a respiratory acidosis with a pH ≤ 7.15 despite a respiratory rate ^{3} 35/min. ECMO was initiated in our ICU or in a referral hospital admitting the patient who was immediately transferred to our ICU. ECMO was done in veno-venous mode using a surgical cannulation (Bio-console 560, Medtronic perfusion systems, Minneapolis, MN, USA) but an arterio-venous cannulation was performed initially or secondary in patients presenting with echographic left heart failure. We recorded usual clinical and biological data as well as demographic parameters and SOFA score before ECMO and daily during the first 3 days of ECMO. The influence of these parameters on hospital mortality were studied using univariate and multivariate analysis using a Cox model.

RESULTS. 47 patients with a median [IQR] age of 50 [36–57] y were included. 80 % presented pulmonary ARDS. The duration of mechanical ventilation before ECMO was 3 [1–8] d. Before ECMO, $Pa02/FiO_2$ ratio was 63 [45–72] mmHg, pH was 7.2 [7.1–7.3], $PaCO_2$ was 66 [59–75] mmHg and plateau pressure was 32 [29–36] cmH20. ECMO was in veno-venous mode in 40 patients (85 %), for duration of 9 [7–13] d. Hospital mortality was 60 % (28/47). SOFA score before ECMO was 8 [6–10]. Factors associated with mortality after univariate analysis were a higher SOFA score before ECMO (7 [6–8] vs. 9 [7–14]) and until day 7 of ECMO (8 [5–8] vs. 11 [8–15] on day 1, 8 [6–10] vs. 12 [9–15] on day 3 and 7 [4–9] vs. 10 [8–14] on day 7), a higher PEEP level before ECMO and a higher lactate level on day 1 of ECMO. The SOFA score on day 1 of ECMO was associated with hospital mortality after multivariate analysis (OR = 1.29; 95 %CI [1,016–1,651], p = 0,037). A SOFA score of at least 10 before ECMO treatment was associated with a mortality of 100 % whereas a stable or decreasing SOFA between the time preceding ECMO and day 3 of ECMO was associated with a survival rate of 83 %.

CONCLUSIONS. The SOFA value on day 1 of ECMO is significantly associated with mortality in ARDS patients. It could be useful to identify patients in whom prognosis is poor despite ECMO treatment.

0954
CAN INITIAL INFLAMMATORY AND COAGULATION PARAMETERS PREDICT DURATION AND OUTCOME OF VV-ECMO THERAPY IN ADULTS?

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INTRODUCTION. Venovenous extracorporeal membrane oxygenation (VV-ECMO) is often applied in patients with various degrees of inflammatory activity associated with alteration of coagulation system.

OBJECTIVES. We hypothesized that initial inflammatory markers and selected coagulation parameters might be related to duration of previous IPPV, time on VV-ECMO therapy and associated degree of ecmo induced systemic injury having also an impact on patients survival.

METHODS. Days of IPPV prior to VV-ECMO, length of ECMO therapy, inflammatory and coagulation parameters and patients outcomes were retrospectively monitored in relation to levels of positive acute phase proteins at the beginning of VV-ECMO. Number of blood, fresh frozen plasma (FFP) and platelet transfusion units on VV-ECMO were also recorded.

RESULTS. Our ECMO centre has treated 68 patients since 2008, 28 of those were VV-ECMO (Maquet, PLS), 20 of those 28 were adults (18 severe ARDS, 1 lung oedema, 1 haemoptysis). Patients with elevated fibrinogen (> 4.0 g/l, n = 10, 6.9 ± 2.1 g/l) at start of VV-ECMO had longer time of IPPV prior to VV-ECMO (6.3 ± 5.2 vs. 1.9 ± 2.3 day, p < 0.01), longer need for VV-ECMO therapy (12.1 ± 8.1 vs. 6.3 ± 4.4 day, p = 0.07) than those with normal fibrinogen (n = 9, fib 2.9 ± 1.1 g/l, p < 0.01). Both groups had similar baseline parameters (age 43.5 ± 16 vs. 41.2 ± 18 p > 0.05, APACHEII 31 ± 6 vs. 28 ± 10, p > 0.05; SOFA 11.6 ± 2.2 vs. 14.4 ± 2.9, p > 0.05; paO_2/FiO_2 68 ± 12 vs. 67 ± 15, p > 0.05; Murray LIS 3.75 ± 0.5 vs. 3.6 ± 1.0, p > 0.05) and did not differ in consumption of blood (5.0 IQR 0.0–14 vs. 7.0 IQR 3.8–15.8, p > 0.05),fresh frozen plasma (3.0 IQR 0.0–35 vs. 3.0 IQR 0.0–14, p > 0.05) and platelet transfusion units (4.0 IQR 0.0–11.0 vs. 4.0 IQR 1.75–7.25, p > 0.05) while on ECMO. Comparison of other parameters at start of therapy found significant difference only for leucocyte count (17.6 ± 7.2 vs. 10.3 ± 6.1 10^3/ul, p < 0.05; CRP 252 ± 145 vs. 144 ± 83 mg/l, p = 0.05; PCT 8.6 ± 20 vs. 10.8 ± 18 ug/l, p > 0.05; D-dimers 2129 ± 1401 vs. 2636 ± 2039 mg/l, p > 0.05; platelets 207 ± 141 vs. 117 ± 55 10^3/ul, p > 0.05). CRP correlated with fibrinogen levels (r = 0.63, p < 0.02) but PCT did not (p > 0.05). The ICU mortality was not significantly worse in high fibrinogen group (5/10, i.e. 50 % vs. 3/10, i.e. 30 %), 180 day mortality was 8/10, i.e. 80 % vs. 4/10, i.e. 40 %, p = 0.28.

CONCLUSIONS. Our limited number of adult VV-ECMO patients shows that levels of fibrinogen, CRP, leucocyte count and duration of IPPV prior to ECMO might differentiate patients who require longer therapy often with change of circuit and oxygenator and attract more expenses. Those patients are likely to have worse long term outcomes than those with less elevated acute phase proteins regardless of the same baseline respiratory parameters.

0955
RECRUITED VOLUME INDUCED BY POSITIVE END-EXPIRATORY PRESSURE IN SUPINE AND PRONE POSITION IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME

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INTRODUCTION. Positive end-expiratory pressure (PEEP) may maintain lung volume recruitment and usually improves oxygenation in acute respiratory distress syndrome (ARDS) patients. It is unknown, if the recruited volume induced by PEEP (Vrec) varies with the change from supine to prone position.

OBJECTIVES. The aim of this study was to analyze the variation of Vrec in supine and prone position in ARDS patients.

METHODS. We included patients with ARDS according to the definition of American-European Conference. Before study was started, we increased the FiO_2 to 80 % to avoid hypoxemia after PEEP removal. The study was performed in two phases: The first phase (supine position), we made: (a) Measurement of end-expiratory lung volume (EELV): with the nitrogen washout/washin technique available in Engström Carestation ventilator with FRC INview^{TM} software. (b) Measurement of delta EELV (ΔEELV): Measuring the total expiratory volume immediately after PEEP removal (VExp); so: ΔEELV = VExp-Tidal volume. (c) Measurement of Tidal volume (Vt) without PEEP (VtZEEP): it is the necessary Vt to obtain a Plateau Pressure (Pplat) equal to basal PEEP. (d) Calculation of Vrec: Vrec = ΔEELV-VtZEEP. (e) Measurement of functional residual capacity (FRC) with the nitrogen washout/washin technique. For the second phase (prone position), we put the patients in prone position for 1 h and we performed the same measurements and calculations. The continuous variables were compared with Wilcoxon test. The results are expressed in mean and standard deviation.

RESULTS. We studied 8 patients with mean age of 70 ± 8 years, SAPS III 84 ± 14, in the 3 ± 2 day of mechanical ventilation. The mean respiratory rate was 25 ± 5 bpm and the mean PEEP was 10 ± 0 cmH_2O. The main variables and lung volumes are summarized in the table.

Table

Variable	Supine	Prone	p
PaO_2/FiO_2	240 ± 103	320 ± 126	0,04
$PaCO_2$ (mmHg)	42 ± 6	42 ± 5	0,48
P. Plateau (cmH2O)	23 ± 4	23 ± 4	0,48
Compliance (mL/cmH2O)	34 ± 13	34 ± 12	0,50
ΔEELV (mL)	616 ± 209	605 ± 151	0,89
VtZEEP (mL)	318 ± 107	355 ± 107	**0,02**
Vrec (mL)	299 ± 119	250 ± 100	0,40
EELV (mL)	1610 ± 501	2005 ± 793	**0,02**
CRF (mL)	988 ± 447	1282 ± 600	**0,03**

CONCLUSIONS. In ARDS patients, the oxygenation and the lung volumes (EELV and CRF) increases significantly with the change from supine to prone position; but this change of position, doesn't modify the recruited volume by PEEP.
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0956
VARIATION IN FUNCTIONAL RESIDUAL CAPACITY AND END-EXPIRATORY LUNG VOLUME WITH THE CHANGE OF SUPINE TO PRONE POSITION IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME

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INTRODUCTION. In acute respiratory distress syndrome (ARDS) the functional residual capacity (FRC) and the end-expiratory lung volume (EELV) decrease, and its measure, can help to guide the ventilatory strategy. However, we don't know if the prone position changes these lung volumes.
OBJECTIVES. The aim of our study is to analyze the variation of FRC and EELV induced by turning ARDS patients from supine to prone position.
METHODS. We included patients with ARDS according to the definition of American-European Conference. The lung volumes were measured with the nitrogen washout/washin technique available in Engström Carestation ventilator with FRC INview™ software. Before study was started, we increased the FiO_2 to 80 % to avoid hypoxemia after positive end-expiratory pressure (PEEP) removal. The study was performed in two phases. First phase (supine position): we measured the EELV, and afterwards PEEP was removed, the FRC was measured. Second phase (prone position): we put the patients in prone position for 1 h and we performed the same measurements (EELV and FRC). The continuous variables were compared with Wilcoxon test. The results are expressed as means, standard deviations and percentages.
RESULTS. We studied 15 patients with mean age of 62 ± 15 years, SAPS III 80 ± 15, in the 4 ± 3 day of mechanical ventilation. The tidal volume per kilogram of predicted body weight was 7,19 ± 1,50 ml/kg PBW, the mean respiratory rate was 24 ± 3 bpm and the mean PEEP was 10 ± 1 cmH_2O. The main variables and lung volumes are summarized in the table. We estimated the theoretical FRC in supine position with the Ibañez and Raurich [1] formula, and it's mean value was 2358 ± 490 mL; we calculated a decrease in FRC in the ARDS patients respect to the theoretical of 60 ± 14 % (965 ± 436 mL; p = 0,01).

Table

Variable	Supine	Prone	p
PaO_2/FiO_2	218 ± 57	265 ± 89	0,12
$PaCO_2$ (mmHg)	43 ± 7	45 ± 8	0,28
P. Plateau (cmH2O)	23 ± 4	23 ± 3	0,22
Compliance (mL/cmH2O)	34 ± 11	36 ± 10	0,33
EELV (mL)	1533 ± 493	1854 ± 776	**0,009**
FRC (mL)	965 ± 436	1169 ± 526	**0,03**
Delta EELV (mL)	567 ± 193	685 ± 292	0,12

CONCLUSIONS. In the ARDS patients, the FRC decreases significantly respect to their theoretical. The change from supine to prone position induces a significant increase in both, FRC and EELV.
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0957
ACUTE RESPIRATORY DISTRESS SYNDROME, AND PRONE POSITION: INCREASED $PACO_2$ AS EARLY PREDICTOR OF MORTALITY

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INTRODUCTION. The prone position currently only recommended in severe cases of ARDS. It is important to determine the prognostic factors in these patients. We propose that the increase in dead space as evidenced by the increase in $PaCO_2$ levels could identify patients with more mortality in the subgroups of ARDS treated with the prone position.
OBJECTIVES. Determine whether the increase in $PaCO_2$ in the first hour of the prone position is predictive of mortality in patients with ARDS.
METHODS. Prospective and observational study of patients admitted to the ICU with a diagnosis of ARDS according to the criteria of the American-European Consensus, which were treated with prone. The study was conducted in the period January 2010 to December 2011. Was measured at admission, age, gender and SOFA. The $PaCO_2$ was measured 1 h before the prone position, and after the same time. We calculate the fraction of dead space before the prone position, and after prone, with the following equation: Vd/Vt [(0.86 × VCO_2est)/(VE × PaCO 2)]. The VCO_2est was calculated using the formula of (Faysi × 0.8)/6.8644. We determined the sensitivity, specificity and area under the curve, Chi square was used to determine statistically significant value, p ≤ 0.005.
RESULTS. We studied 15 cases, 56 % men. Age 58.29 ± 15.9, SOFA 13 ± 1.038, PaO_2/FiO_2 76 ± 18.36. Before the prone position, $PaCO_2$ 52 ± 18.12 and the fraction of Vd/Vt: 0.92 ± 0.24. After prone position: $PaCO_2$: 50 ± 13.38 and Vd/Vt: 0.92 ± 0.2. Delta $PaCO_2$ had an AUC = 0.970, p = 0.016, an increase of 5.5 mmHg had a sensitivity of 100 % and a specificity of 91 % for predicting mortality. Delta Vd/Vt: AUC 0.939, p = 0.024, an increase in the fraction of Vd/Vt of 0.004 had 100 % sensitivity and 82 % specificity to predict mortality.
CONCLUSIONS. The Delta of $PaCO_2$ in the treatment of ARDS, identifies patients in high risk of mortality. The Delta $PaCO_2$ is a useful tool to establish a prognosis and identify patients who would benefit from more agresive therapy like high frequency ventilation or extracorporeal oxygenation.
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0958
PROGNOSTIC FACTORS OF MORTALITY IN PATIENTS WITH ACUTE RESPIRATORY DISTRES SYNDROME

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INTRODUCTION. Acute Respiratory Distress Syndrome (ARDS) is a common entity in critical care. Despite intense ongoing research on the pathophysiology and treatment, mortality remains high.
OBJECTIVES. To identify the variables associated with mortality in patients who develop acute respiratory distres syndrome.
METHODS. Retrospective study of a cohort of patients with diagnosis of ARDS in ICU between 2005 and 2011. Epidemiological data, comorbidities, severity scores, reason for ICU admission, etiology, complications during ICU stay, oxigenacion index (PaO_2/FiO_2) and mechanical ventilation parameters during ARDS evolution were collected.Chi-square analysis was used to compare categorical data. Continuous data were compared using univariate logistic regression simple analysis. We performed a multivariate analyses using logistic regressions with a maximum model that included those variables with statistical significance in the univariate analysis and others with clinical relevance.
RESULTS. 145 patients were studied. 71 % were male. Their mean age was 52 ± 15 years. 60 % had comorbidities, Charlson Index >3 points in 45.5 % of patients. Severity scores: APACHE II 22.3 ± 8.4, SOFA 8.5 ± 8.3. Patology for ICU admission: respiratory 64 %, neurology 9.7 %, abdominal 9 %. The most frequent etiology was pneumonia in 88 % of patients (community-acquired pneumonia 50.8 %, nosocomial pneumonia 27.3 %, aspiration pneumonia 21.9 %). ARDS was the only organic failure in 40 % of cases. The most frequent complications were mechanical ventilation associated pneumonia (31.78 %), cateter related sepsis (10.6 %) and barotrauma (2.8 %). At the beginning of the ARDS, mechanic ventilation parameters were: PaO_2/FiO_2 97 ± 38, Vt 475 ± 70, FR 25 ± 8, PEEP 12 ± 5, Vm 12 ± 4, Compliance 18 ± 6, LIS 3.3 ± 0.5. Duration of ARDS in patients who survived was 19.8 ± 13.5 days, 71 % presented neuromuscular disease requiring traqueotomia in 36.5 % of them. Mean stay was 28 days in hospital (17–46) and 21 days in ICU (13–32). Mortality rate was 64 % in ICU and 64.8 % in hospital. Univariable analysis showed that factors related to mortality were: age (OR 1.04; 95 % CI 1.01–1.06), Charlson Index > 3 points (RR 2.29; 95 % CI 1.13–4.65), SOFA (OR 1.13, 95 % CI 1.03–1.25), pneumonic etiology (RR 2.92, 95 % CI 1.04–8.22), multiple organic disfunction associated (RR 7.96; 95 CI 3.69–17.14), PaO_2/FiO_2 on 3° day (OR 0.99; 95 % CI 0.97–0.99), minute volume on 3° day (OR 1.16; 95 % C1.01–1.33) and compliance on 7° day (OR 0.91; 95 % CI 0.84–0.99). A multivariable logistic regression analysis showed that the mortality-related factors were: age (OR 1.05, 95 % CI 1.02–1.08), SOFA (OR 1.13; CI 95 % 1.01–1.27), pneumonic etyology (OR 3.22; 95 % CI 1.02–11.03) and PaO_2/FiO_2 on 3 day (OR 0.98; 95 % CI 0.97–0.99).
CONCLUSIONS. In our experience, ARDS still has a high morbidity and mortality. Age, pneumonia as etiology, and severity measured by SOFA and by oxigenation index, were the factors related to mortality.

0959
CLINICAL AND ECONOMIC OUTCOME OF MECHANICALLY VENTILATED PATIENTS UNDER DRG 475: ANALYSIS OF A NATIONAL DATABASE

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INTRODUCTION. Knowledge of clinical outcomes and financial aspects of mechanical ventilation for respiratory failure is becoming increasingly important in the determination of resource allocation among the critically ill. Outcome studies of these patients group are usually based on relatively small samples. DRG 475 unifies patients with different disease processes needing mechanical ventilation and primarily applies to patients with respiratory failure that does not result in tracheostomy.
OBJECTIVES. To examine the relationship between age and outcome in a population of patients undergoing mechanical ventilation under DRG 475 and to analyse the economic impact of this DRG in terms of hospital outcome.
METHODS. Retrospective analysis of a national database.All patients aged ³16 years discharged from hospitals during 2004 with a final diagnosis related group (DRG) coding of 475. Measurements: clinical and epidemiological characteristics; the impact of age on mortality adjusted for other variables (comorbidities, primary cause of hospital admission); the economic impact of DRG 475 on hospital resources. To depict the amount of resources spent to procure a given level of desired outcome (hospital survival) we also determined the cost per survivor based in the average National Health Service Charges.
RESULTS. A total of 4267 cases (mean age 64 yr; 71 % men) were identified and eligible for analysis. According to Charlson index, 45 % of cases had no associated comorbidity. Overall 36 % of cases required prolonged mechanical ventilation. In-hospital mortality was 39 %. Median LOS was 14 days. Total hospital costs were € 42,581,929. Multivariate logistic regression showed that age significantly correlated with in-hospital mortality after adjusting for comorbidities, principal cause of hospital admission and duration of mechanical ventilation. An inverse relationship between survival rate and age was observed and this resulted in an age-related increased cost per survivor.
CONCLUSIONS. Age has a significant impact on outcomes in patients under DRG 475 both from clinical and economic perspectives. These analyses will help inform health care decision-making and resource planning in the face of an ageing population.
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0960
HIGH FREQUENCY OSCILLATORY VENTILATION AND MINIMALLY INVASIVE EXTRACORPOREAL CO_2 REMOVAL IN SEVERE ARDS PATIENTS

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INTRODUCTION. In severe ARDS patients, high frequency oscillatory ventilation (HFOV) is a possible rescue therapy to optimize gas exchange and provide protective

mechanical ventilation. Higher frequencies should be achieved to reduce tidal volume and minimize VILI. However, this ventilation setting may be associated with the development of respiratory acidosis. In this case series, we evaluate the feasibility of a combined HFOV and minimally invasive extracorporeal CO_2 removal (Decap) ventilation strategy.
METHODS. Five patients (3 pneumonia, 2 sepsis) with severe ARDS and life threating hypoxemia, refractory to conventional mechanical ventilation (CMV), underwent to HFOV followed by HFOV plus Decap to correct severe respiratory acidosis.
RESULTS. Results are expressed as mean ± SD. Patients were ventilated with the following ventilator settings during CMV: Tidal volume (ml/kg PBW) was 6.7 ± 1, RR (breaths/min) was 28 ± 5, PEEP (cmH_2O) 13 ± 2, P_{plat} (cmH_2O) 28 ± 1. The resulting gas exchange was: PaO_2/FiO_2 90 ± 23, pH 7.26 ± 0.1, $PaCO_2$ (mmHg) 72 ± 34, PaO_2 (mmHg) 80 ± 15, HCO_3 (mEq/L) 30 ± 10. Hemodynamic was similar in all conditions. Ventilator settings and gas exchanges during HFOV and Decap are shown in Table 1.
* $p < 0.05$ HFOV + Decap 3 h vs. HFOV 3 h.

Table 1

	HFOV after 1 h	HFOV after 3 h	HFOV + Decap after 1 h	HFOV + Decap after 3 h
mPaw (cmH2O)	34 ± 4.7	33 ± 6	33 ± 6	33 ± 5
Hz	6 ± 1.4	5 ± 0	5 ± 0	6.2 ± 0.5 *
Delta-P (cmH2O)	59 ± 1	63 ± 5	62 ± 5	61 ± 6
Decap blood flow (ml/min)			300 ± 82	350 ± 58
PaO_2/FiO_2	132 ± 45	105 ± 38	113 ± 45	127 ± 66
pH	7.26 ± 0.1	7.22 ± 0.1	7.29 ± 0.1	7.37 ± 0 *
$PaCO_2$ (mmHg)	70 ± 27	81 ± 20	62 ± 16	51 ± 10 *
PaO_2 (mmHg)	112 ± 43	79 ± 15	81 ± 29	86 ± 33
HCO3 (mEq/L)	33 ± 8	33 ± 6	29 ± 5	30 ± 5

CONCLUSION. In severe ARDS patients treated with HFOV, minimally invasive extracorporeal CO_2 removal significantly reduced $PaCO_2$ levels, increased pH, and allowed to increase HFOV frequency.
HFOV plus Decap combined ventilation strategy may be a valid approach to enhance lung protection.

0961
USE OF VENO-VENOUS EXTRACORPOREAL MEMBRANE OXYGENATION (V.-V. ECMO) TO ENSURE THE LUNG PROTECTIVE VENTILATION IN TRAUMA PATIENTS

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INTRODUCTION AND OBJECTIVES. Posttraumatic systemic inflammatory response syndrome (SIRS) is one of the feared complications in severely injured patients, which can lead to multiple organ failure. Our treatment includes the strict lung protective ventilation regime to counteract the volu- and barotrauma. V.-v. ECMO is used here to avoid the aggressive mechanical ventilation and resulting biotrauma.
METHODS. We report retrospectively trauma patients treated on surgical intensive care unit from 1.1.2009 to 15.03.2012. The including criteria for the v.-v. ECMO were mechanical ventilation more than 6 h outside the lung protective area: peak pressure Pp >32 mbar, tidal volume TV >6 ml/kg ideal BW, Horowitz-index <200 mmHg, PEEP according to the guideline of ARDS Network study group.
RESULTS. In the above-mentioned period 281 patients with ISS > 16 were treated. 17 patients (ISS > 35) had severe SIRS with acute lung injury and fulfilled the inculding criteria for ECMO. 15 patients received ECMO within the first 5 days after trauma. Average ECMO duration was 12 days (6–21 days). Within the first 3 days on ECMO percutaneous tracheostomy has been performed. The patients have been weaned simultaneously from respirator and ECMO in continuous positive airway pressure modus. Mean length of stay in the ICU was 28 days (7–72), hospital length of stay 45 days (7–123). 13 patients have be weaned from ECMO, 11 patients were discharged from the ICU and the hospital.
CONCLUSIONS. V.-v. ECMO ensure strict lung protective ventilation regime. Thus influence positively the course of the SIRS. This will result in reduced catecholamine, reversibility of acute renal failure and shorter weaning time from mechanical ventilation. That might reduce the mortality rate associated with post-traumatic multiple organ failure. Early decision for implantation of the system is decisive for therapeutic success.

Renal replacement therapy in the ICU: 0962–0975

0962
EDUCATION OF NURSES ON PRACTICAL ASPECTS OF CONTINUOUS RENAL REPLACEMENT TREATMENT CAN LEAD TO AN INCREASED CIRCUIT LIFE SPAN

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INTRODUCTION. The nursing staff of our two-unit 30-bed university-based Intensive Care department is fully trained to perform continuous renal replacement therapy (CRRT). However, the circuit life span leaves room for improvement. A failing CRRT system is extremely laborious, due to frequent alarms and the need to replace the tubing system. Moreover, interrupted CRRT is less effective, leads to blood loss and is more expensive due to the consumption of circuit and filter disposables.
OBJECTIVES. Circuit survival is increased by an optimal combination of circuit blood flow, pressures and anticoagulation [1]. Therefore, we hypothesized that education in practical problem solving on these aspects can lead to an increased circuit life span.
METHODS. Retrospectively, we evaluated circuit life span from all patients (>18 years) receiving continuous venovenous hemofiltration from January 2009 to January 2010 (pre-training) and from January 2011 to January 2012 (post-training). In the first period, a CRRT working group was already active, consisting of 1–2 intensive care nurses per unit. Since 2010, this working group increased its presence at the units. From October 2010 to January 2011, the complete nursing staff received a training on practical aspects of CRRT. During this training, the benefits of a long circuit life were stressed. It was explained how collected details from pressure-measurements and alarms, in combination with clinical observations during the treatment, can lead to a solution of different problems.
RESULTS. The training contributed to an improved awareness of optimally handling CRRT. This was noticed by the working group due to the increased amount of questions received either in person or by e-mail. Objective results came from the Patient Data Management Systems (PDMS), in which all CRRT sessions are recorded. In 2009, 492 CRRT sessions took place. The mean circuit life was 33,9 h and the number of sessions that ran less than 3 h was 35. In 2011, the year after the training, in a comparable number of sessions, namely 519, the mean circuit life span increased to 39,8 h, an increase of 17 %. The number of sessions that ran less than 3 h in 2011 dropped to 25, a reduction of 28 %.
CONCLUSIONS. Education of nurses on practical aspects of continuous renal replacement treatment can lead to an increased circuit life span. This is a three-times-winning-situation: The first winner is the patient who is treated better, the second winner is the nurse whose contribution to CRRT will become more satisfying and the third winner is the intensive care unit by using less disposables.
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0963
PHARMACOKINETICS OF GANCICLOVIR DURING CONTINUOUS VENOVENOUS HEMODIAFILTRATION

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INTRODUCTION. Ganciclovir is an antiviral agent against members of the herpes group and first of all against human cytomegalovirus (CMV). Continuous venovenous hemodiafiltration (CVVHDF) is a common extracorporeal renal replacement therapy in intensive care patients.
OBJECTIVES. Aim of this study was to investigate the pharmacokinetics of ganciclovir during CVVHDF in critically ill patients.
METHODS. Pharmacokinetic analysis was performed in six intensive care patients, with proven or suspected CMV infection, who received 5 mg/kg ganciclovir intravenously once daily. Due to their anuric state, all patients were treated with CVVHDF. The concentration of ganciclovir in serum and ultrafiltrate was performed by high performance liquid chromatography (HPLC).
RESULTS. Mean peak and trough pre-filter ganciclovir concentrations were 12,37 ± 3,61 mg/L and 2,29 ± 0,8 mg/L (after 1440 min). Mean elimination half-life was 9,55 ± 2,25 h, volume of distribution was 62,99 ± 24,3 L and mean sieving coefficient was 0,83 ± 0,08. Total clearance was 4,89 ± 2,52 L/h and clearance of CVVHDF was 1,66 ± 0,16 L/h. Total removal of ganciclovir was 79.77 ± 10.47 % and the removal via CVVHDF was 41.2 ± 17.6 %.
CONCLUSIONS. CVVHDF is highly effective in eliminating ganciclovir. Elimination half-life was prolonged and total clearance was reduced in comparison to healthy volunteers.

0964
PLASMA CONCENTRATIONS AND SIEVING COEFFICIENT OF PROCALCITONIN DURING CONTINUOUS VENO-VENOUS HEMODIALYSIS WITH HIGH CUT OFF MEMBRANES IN SEPTIC PATIENTS: A PRELIMINARY REPORT

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INTRODUCTION. Continuous veno-venous hemodialysis with high cut off membranes (HCO-CVVHD) may be suitable for treatment of patients with severe sepsis/septic shock and acute kidney injury. Procalcitonin (PCT) levels has been shown to be closely correlated with the course and the outcome of patients with several bacterial infections and sepsis. A rapid decline of concentrations is highly correlated with a good prognosis of the disease and randomized-controlled trials have shown a benefit of using PCT to guide decisions about initiation and/or discontinuation of antibiotic therapy [1]. However, there are no data on whether PCT is removed from plasma and found in ultrafiltrate during HCO-CVVHD. In case of alterations of PCT plasma levels by HCO-CVVHD, therapeutic and diagnostic decisions might be influenced. For instance, this may be important to avoid an incorrect suspension of antibiotic therapy in septic patients. Therefore, we determined the elimination of PCT during continuous veno-venous hemodialysis with high cut off membranes (HCO-CVVHD) and the effects on PCT plasma levels.
OBJECTIVES. The aim of this study was to measure whether PCT is removed from plasma during HCO-CVVHD and whether plasma concentrations of the patients are altered during this therapy.
METHODS. We conducted a preliminary study in patients with severe sepsis/septic shock and AKI (AKIN ≥ 1) treated with CVVHD with a high cut off membrane (SepteX, Gambro Lundia AB, Svezia). The criteria of sepsis are established according to Surviving Sepsis Campaign (SCC) guidelines.PCT was measured in plasma and ultrafiltrate at 0, 12, 24, 48 h after initiation of HCO-CVVHD and sieving coefficient (SC) was calculated. We expressed the SC as the ratio between procalcitonin in ultrafiltrate and procalcitonin in plasma.
RESULTS. The obtained media for SC results as 0,64 ± 0,33 after 12 h; 0,66 ± 0,11 after 24 h and 0,75 ± 0,17 after 48 h.PCT plasma levels decreased during HCO-CVVHD in all patients. The calculated SC for PCT was 59–95 % after 48 h of HCO-CVVHD. Thus, our preliminary results indicates that more than 59 % of PCT has been filtered by the membrane pores. This may be due the molecular weight of PCT (14.5 kDa).
CONCLUSIONS. Our preliminary data show that HCO-CVVHD influence PCT plasma concentrations in a way that could prevent the use of PCT for diagnostic and therapeutic purposes. In particular, during HCO-CVVHD, a decrease in PCT may be due to PCT filtration through the hemofilter rather than sepsis-related. Thus, other markers, like C-reactive protein, should be used as a diagnostic and therapeutic parameter in patients with sepsis undergoing HCO-CVVHD for AKI.
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0965
ACUTE KIDNEY INJURY AND RENAL REPLACEMENT THERAPY IN CRITICALLY ILL PATIENTS WITH HYPOXIC HEPATITIS

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INTRODUCTION. Hypoxic hepatitis (HH) is a potentially life threatening event occurring in up to 10 % of patients admitted to the medical ICU, typically as a consequence of hemodynamic impairment in cardiogenic or septic shock.[1] Acute kidney injury (AKI) has been observed in 40–80 % of patients with acute liver failure [2, 3]. However, there is a lack of data dealing with the incidence and outcome of AKI in HH. Furthermore, the role of renal replacement therapy in these patients has not been elucidated so far.

OBJECTIVES. Aim of the study was to assess the incidence of AKI in patients with HH and to evaluate the use of renal replacement therapy in these patients.

METHODS. Two hundred ninety-five patients with hypoxic hepatitis admitted to ICU between January 2005 and December 2010 were studied. Incidence of AKI was assessed in all patients in accordance with the current criteria suggested by the Acute Kidney Injury Network (AKIN). Laboratory and clinical features were analyzed and impact of AKI and RRT on 28-day-mortality was evaluated.

RESULTS. AKI (stage 1–3) was found in 64 % of all HH patients, 61 % of whom showed AKI stage 3. Presence of AKI was significantly associated with 28-day-mortality in HH patients (OR = 4.53 (2.72–7.56); $p < 0.0001$). 28-day-mortality rate in HH patients with AKI was 71 %. 60 % of all HH patients with AKI underwent RRT during their stay at the ICU. RRT was an independent risk factor for 28-day-mortality in the univariate analysis ($p < 0.001$), but that effect was abolished after correction for AKI. In patients with AKI, there was no significant difference in 28-day-mortality rate between patients with and without RRT (74 % vs. 65 %; $p = 0.17$). Requirement for RRT in HH was associated with male sex (OR = 1.80 (1.08–3.01); $p < 0.05$) and septic shock (OR = 2.60 (1.60–4.24); $p < 0.001$). SAPS II score was significantly higher in patients requiring RRT (74 (58–85) vs. 65 (39–94); $p < 0.001$). In severely ill patients (SAPS II < 65 & AKIN 3), Kaplan–Meier-Analysis revealed a survival benefit for patients undergoing RRT (Figure 1, $p < 0.05$).

CONCLUSIONS. AKI is a frequent accompaniment of HH in the ICU population and is associated with worse outcome. Although renal impairment per se is an indicator for worse prognosis, RRT improves outcome in the most severe cases of HH.

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0966
RENAL REPLACEMENT CATHETER PLACEMENT ON A GENERAL INTENSIVE CARE UNIT

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BACKGROUND. This audit was conducted in response to work conducted by Kam et al. [1] analysing tracer uptake from adjacently positioned central venous catheters (CVC) and haemofiltration (HF) lines. They found that if the CVC was positioned less than 2 cm distal to the tip of the HF catheter, or proximal to it, then notable tracer (creatinine) uptake was observed. In clinical practice this would result in under dosing.

OBJECTIVE. To establish the rate of relative misplacement occurring on the critical care unit at Whiston University Teaching Hospital, Liverpool. The standard for the audit was that all line placements meet the criteria described by Kam.

METHOD. A retrospective data collection was performed using the hospital's electronic data management system (EDMS) and radiology viewer. An eighteen month period (1st June 2009–30th November 2010) was chosen and a list of all patients receiving renal replacement therapy (RRT) during this time obtained from ongoing audit data. Admissions were analysed on EDMS and the patients receiving long term dialysis through fistulae, Hickman lines, or peritoneal dialysis catheters were excluded from data collection. Those non-dialysis patients needing acute RRT had the point of HF line insertion identified. Those patients with a HF line then had their records checked for the concurrent use of a CVC and its insertion site. If the patient had both lines positioned in the superior vena cava, then chest radiographs were examined to ascertain whether relative placement of each was deemed acceptable according to Kam's criteria. Occasions of bifemoral placement were also sought.

RESULTS. Data collection identified 136 separate incidences when RRT was offered. Of these, 27 patients received long term RRT and were excluded. 1 further case had insufficient data evident for inclusion. 1 case had a HF inserted without the presence of a CVC. Of the remaining 107 incidences, 11 cases were highlighted with radiological confirmation of inappropriate line positioning in the superior vena cava (both internal jugular and subclavian approaches). One case was also deemed inappropriate based on bifemoral catheterisation without documented tip insertion distances. In no circumstance did repositioning occur. Critical care unit mortality was 5/12 (41.7 %) in those with misplacement compared with 32/94 (34.0 %).

CONCLUSIONS. The audit revealed a relative misplacement rate of 11.2 % which was above the desired standard. This was likely given that the research was very recent, and was yet to be disseminated. There was no significant mortality difference given the small numbers although the absolute risk reduction observed was 7.7 %.

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0967
PREDICTION OF ICU-MORTALITY AND REQUIREMENT OF RENAL REPLACEMENT THERAPY BY RIFLE, AKIN AND SERUM CREATININE ON ADMISSION IN MEDICAL ICU PATIENTS

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INTRODUCTION. Acute renal failure (ARF) markedly contributes to morbidity and mortality in ICU-patients. The last decade resulted in two major consensus ARF-definitions: RIFLE and AKIN. However, studies on the advantages of AKIN over RIFLE provided conflicting results regarding prediction of outcome in ICU-patients. Both scores are -at least in part- based on relative changes to baseline creatinine values. These changes consequently depend on baseline creatinine levels which are neither included in AKIN nor in RIFLE.

OBJECTIVES. Therefore, it was the aim of our study to compare prediction of outcome by RIFLE, AKIN and baseline creatinine on ICU-admission.

METHODS. We analysed a one-year-period of admissions to a medical ICU regarding renal failure and outcome. Serum creatinine was determined at least once per day during the ICU-stay. Due to different normal ranges for women (0.3–1.1 mg/dl) and men (0.5 mg–1.3 mg/dl) we also used corrected creatinine values adjusted for this 0.2 mg-gender-difference. A total of 321 patients (177 m, 144 f) were finally analysed after correction for repeated admissions of the same patient ($n = 25$) and exclusion of patients with chronic renal replacement therapy (RRT; $n = 16$) and kidney-transplant-patients ($n = 10$).

RESULTS. Age 62.2 ± 16.1 years, ICU-stay 9.1 ± 15.3 (1–127) days. RRT 65 patients (20.2 %). RIFLE: No 217 (67.6 %), "R" 40 (12.5 %), "I" 22 (6.9 %) and "F + L+E" 42 (13.1 %). AKIN: No 197 (61.4 %), "1" 72 (22.4), "2" 18 (5.6 %) and "3" 34 (10.6 %). Creatinine on admission: 1.71 ± 1.55 (0.3–10.1) mg/dl. Elevated creatinine on admission 140/321 (43.6 %). Maximum creatinine within 24 h after admission 1.71 ± 1.54 mg/dl. ICU-mortality: 70/321 (21.8 %). ROC-analysis regarding ICU-mortality (primary endpoint) demonstrated significant ($p < 0.001$ for all predictors) prediction by creatinine on ICU-admission (AUC 0.721; 95 % CI 0.655–0.786), RIFLE (0.722; 0.649–0.795), maximum creatinine within 24 h (0.733; 0.670–0.795), AKIN (0.739; 0.671–0.807) and maximum creatinine during ICU-stay (0.795; 0.743–0.847). Correction of creatinine for gender further improved predictive capabilities of creatinine: creatinine on admission corrected (0.726; 0.661–0.792), maximum creatinine within 24 h corrected (0.739; 0.677–0.800) and maximum creatinine during ICU-stay (0.798; 0.748–0.849). Regarding "requirement of RRT", AKIN (AUC 0.825; 95 % CI 0.763–0.887) and RIFLE (0.831; 0.767–0.894) provided smaller ROC-AUCs compared to corrected creatinine on admission (0.847; 0.796–0.897) and corrected maximum creatinine within 24 h (0.868; 0.823–0.914). Again gender-adjusted creatinine values resulted in improved predictive capabilities compared to un-adjusted creatinine.

CONCLUSIONS. 1. AKIN and RIFLE do not provide better prediction of ICU-mortality and requirement of RRT than maximum serum-creatinine within 24 h after admission. 2. Simple correction for gender-specific normal ranges further improves prediction by creatinine.

0968
THE SAFETY OF FEMORAL VEIN INSERTION OF CRRT DIALYSIS CATHETERS

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INTRODUCTION. Continuous renal replacement therapy (CRRT) requires catheterisation of a large central vein. As compared to other locations (e.g. the internal jugular, subclavian veins), femoral vein insertion is considered to be associated with an increased risk of thromboembolic complications. Such concern has not been extensively investigated in a large cohort of patients.

OBJECTIVES. To determine the incidence of clinically recognised thromboembolic events following femoral venous catheterization for CRRT in critically ill patients.

METHODS. Retrospective single centre study. Data on critically ill patients who had a dialysis catheters inserted in the femoral vein from December 2005 to February 2011 were extracted from the hospital vascular access database. Their discharge diagnostic codes were screened for thromboembolic events. Medical chart review was performed for each patient with thromboembolic events.

RESULTS. During the study period, 483 dialysis catheters were inserted in the femoral vein in 380 patients. The cohort had a median age of 64 years (IQR 52–74), a median ICU length of stay of 6.5 days (IQR 3.1–13.0) and mortality of 39 %. Five patients had clinically recognised thromboembolic events (1.3 %) occurring after insertion of the dialysis catheter: two deep venous thrombosis and three pulmonary embolism. Of these patients, two (0.5 % of the total cohort) died before hospital discharge (both due to septic shock).

CONCLUSIONS. The incidence of clinically significant thromboembolic complications, after catheterisation of the femoral vein for CRRT, is 1.3 % in this large cohort. None of the patients died as a result of these complications.

0969
NOVEL LACTATE BUFFERED DIALYSIS AND SUBSTITUTION FLUID FOR CITRATE ANTICOAGULATED CONTINUOUS RENAL REPLACEMENT THERAPY

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INTRODUCTION. Our study [1] has shown good tolerance of lactate buffer in combination with citrate anticoagulation of CRRT. Calcium free lactate buffered solution designed for citrate anticoagulation which would replenish losses of magnesium and phosphate is not commercially available.

OBJECTIVES. The authors hypothesized that novel fluid might provide homeostatic stability within standard range of blood flows (Qb), dosage of trisodium citrate (4 % TSC), dialysis (Qd) and filtration. The fluid might prevent losses of magnesium and hypophosphataemia. Reduced level Na-lactate as a buffer may not influence plasmatic lactate levels maintaining lactate as a marker of oxidative metabolism.

METHODS. In this pilot cross over designed observational study we have tested our original solution ("Lactocitrate", Na130,K2.0,Cl116,Mg1.5,P1.0,glucose5.5,Na-lactate18 mmol/l) for 18 h in patients with established haemodiafiltration (CVVHDF, Baxter Aquarius, polysulfone filters Aquamax 1.9 m^2) on 4 %TSC with reduced level bicarbonate bags (Na133,K2.0,Cl116.5,Mg0.75,glucose5.6,bicarbonate20 mmol/l). All patients starts "Lactocitrate" at Qb100 ml/min, Qd1500 ml/h, postdilution 500 ml/h. At 9 h the Qb is increased to 150 ml/min with corresponding increase of 4 %TSC which is titrated in increments to maintain the postfilter Ca^{2+}less than 0.4 mmol/l. Monitoring consists of plasmatic ions, blood gas analysis, strong ion gap (SIG), lactate levels taken in 3 h intervals.

RESULTS. So far 5 patients have been included, APACHE II 28.7 ± 6, SOFA 10.7 ± 6. The mean flow of 4 %TSC was increased to 241 ± 52 from 190 ± 42 ml/h ($p < 0.01$) after increasing Qb to 150 ml/min. All patients kept initial setting of Qd1500 and postdilution of 500 ml/h throughout the 18 h of the study. We have not observed any significant changes of Na (144 ± 2.6 vs. 144.5 ± 2.8 vs. 144.7 ± 3.0 mmol/l,$p > 0.05$), Ca_{tot} (2.41 ± 0.08 vs. 2.36 ± 0.08 vs. 2.27 ± 0.16 mmol/l,$p > 0.05$), arterial Ca^{2+}(1.00 ± 0.04 vs. 1.02 ± 0.07 vs. 1.01 ± 0.08 mmol/l,$p > 0.05$), pH (7.38 ± 0.05 vs. 7.39 ± 0.03 vs. 7.41 ± 0.04,$p > 0.05$), BE (1.45 ± 2.68 vs. 0.51 ± 2.99 vs. 1.27 ± 3.58 mmol/l,$p > 0.05$), lactate (1.43 ± 0.28 vs. 1.77 ± 0.35 vs. 1.98 ± 0.50 mmol/l,$p > 0.05$), SIG (14.7 ± 3.6 vs. 15.2 ± 2.2 vs. 15.1 ± 2.4 mmol/l,$p > 0.05$) between bicarbonate buffered modality versus the first 9 h and second 9 h of CVVHDF on "Lactocitrate". Mg_{tot} increased (1.24 ± 0.25 vs. 1.31 ± 0.18 vs. 1.38 ± 0.15 mmol/l, $p < 0.05$), phosphorus remained stable (1.21 ± 0.35 vs. 1.21 ± 0.27 vs. 1.21 ± 0.35 mmol/l, $p > 0.05$).

CONCLUSIONS. The solution performed as well as the reduced level bicarbonate fluid within commonly applied blood flows, associated TSC dosage and fixed CRRT dosage of 2.0–2.5 l/h. No significant change of arterial lactate level was observed, magnesium mildly increased as well as the phosphate level stabilised with no extra substitution.

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0970

HIGH VOLUME HEMOFILTRATION AND VERY HIGH VOLUMEN IMPROVES HEMODYNAMICS AND RESPIRATORY VARIABLES AND PROBABLY INCREASE SURVIVING IN SEPTIC SHOCK PATIENTS

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INTRODUCTION. Mortality rates in Septic Shock remain unacceptably high despite advances in our standing of the Syndrome. The Mortality associated with this disorder ranging from 40 to 60 %. (SDMO, ARDS). During Hemofiltration (Plasma Water Exchange) can remove humoral mediators and circulating Cytokines. HVHF and VHVHF can removes Levels of this Factors and improves Hemodynamics and Respiratory parameters and potentially improves Clinical Outcomes.

OBJECTIVES. We are going to explore if HVHF and VHVHF can improve clinical evolution in Septic Shock patients, 28-day survival, Hospitality Survival and Quality of life 90-day (Barthel,s index). We compare our results with predict mortality by Apache II.

METHODS. Our Prospective and Observational Study including 102 Patients Hospitalized Septic Shock; treated with HVHF and Pulse of VHVHF between 2008 and 2010 in the Medical UCI of a Teaching Hospital in Malaga. Demographic Data, RIFLE Classification, APACHE II and SOFA Score, Organ Support Needed, Hemodynamics and Respiratory variables, Levels of Procalcitonin and Prognosis were prospectively collected. We propose two Groups: One of them with HVHF (35 Ml/kgr/h) and another with VHVHF (55 Ml/kgr/h). There were no differences in baseline hemodynamics, respiratory, metabolic and Apache II between both groups.

RESULTS. We treated 102 Critically ill patients (mean age 57.63 years, weight 75,66 Kgrs, APACHE II 26,63, Lactato 5,64 mmol//l, PaO_2/FiO_2 166,88, Norepinefrine dose 1.75 µg/kg/m, Creatinine level at the entrance 2.10 mg/dl, urine in the first 24 h 1334,80 ml/24 h, SvO_2 59,96, mean arterial pressure 61,76 and mean PCT levels of 38,08. The Observed 28-day survival was 84 % (VHVHF group) Vs. 76.9 % (HVHF group) versus 56 % predicted mortality by APACHE II. The Observed Hospitality survival was 74 % in VHVHF group Vs. 69.2 % in HVHF Group. In the group of surviver patients 90-day (74 %), 75.6 % of them, presented barthel,s index superior to 90 (improving quality of life).

CONCLUSIONS. The Biological rationale includes issues related to Double Peak Citokynes Concentration Hypotesis and Alexander,s concept. Animal Studies clearly show benefits in Survival. Increasing the dose is a viable option in altering the course of sepsis. Factors associated with survival were time interval from UCI admission to initiation of HVHF, dose and body weight. This Later condition (Grade of Severity) can be seen as the best indication for Very High Volumen Hemofiltration Early initiation of Therapy an adequate dose may improve hemodynamic response and 28-day survival, Hospitality survival like that quality of life.

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0971

INDICATIONS AND OUTCOMES FOR PATIENTS RECEIVING HAEMOFILTRATION ON THE INTENSIVE CARE UNIT AT GOOD HOPE HOSPITAL

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INTRODUCTION. Acute kidney injury (AKI) is common in patients admitted to ITU and is a risk factor for mortality. The kidneys are the first organs to suffer during acute illness, apart from the initial insult itself, this is often reversible however with early intervention. Continuous veno-venous haemodiafiltration (CVVHD) has become the mainstay in acutely ill patients and is recommended in sepsis guidelines, particularly for patients who are haemodynamically unstable.

OBJECTIVES. An observational audit was conducted to assess the indications and outcomes of patients receiving haemofiltration in the intensive care unit in Good Hope Hospital.

METHODS. 56 patients were identified as having received haemofiltration between 1/1/2011 and 31/12/2011 on the intensive care unit at Good Hope hospital. Indications, organ support and outcomes were examined.

RESULTS. 56 patients required haemofiltration during this time. The main indication was for AKI secondary to septic shock with 32 patients (57 %), 5 patients (9 %) had AKI secondary to cardiogenic shock, 4 patients (7 %) had AKI secondary to haemodynamic compromise of unspecified cause and 7 patients (13 %) had AKI of unspecified cause, as well as other indications including chronic renal failure. Patients stayed in ITU for between 1–63 days with the majority, 25 patients (45 %) required organ support for 4 or more organs. 22 patients (39 %) did not survive beyond ITU admission with a further 6 patients (11 %) not surviving beyond their hospital admission and 6 patients (11 %) not surviving beyond 1 year.

CONCLUSIONS. The majority of patients required haemofiltration for AKI secondary to septic shock and required multiorgan support. Mortality is still high for patients requiring RRT however there were no complications related to CVVHD in our unit.

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0972

INTERMITTENT HAEMODIALYSIS VERSUS CONTINUOUS VENO-VENOUS HAEMOFILTRATION: POTENTIAL COST SAVINGS FOR THE INTENSIVE CARE UNIT

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INTRODUCTION. Renal replacement therapy is a standard treatment initiated in the intensive care unit (ICU) for the treatment of severe renal failure. Most units in the UK deliver this therapy through continuous veno-venous haemofiltration (CVVHF) for better haemodynamic stability. Continuous therapy requires the patient to be attached constantly to the haemofiltration machine throughout the duration of the therapy, needing on-going anticoagulation, and limiting patient movement and rehabilitation while being expensive and labour intensive. Intermittent haemodialysis (IHD) while not widely used in UK ICUs, is an alternative renal therapy which can be instituted safely particularly in haemodynamically stable patients [1], with time spent attached to the machine reduced significantly from 168 h per week to 12 h per week.

OBJECTIVES. Identify patients suitable for transition from CVVHF to IHD in the ICU setting and quantify the potential cost savings of this strategy.

METHODS. The audit was conducted prospectively for 4 weeks. Data on cardiovascular, respiratory, and neurological status were collected daily on patients dependent on CVVHF. Those who were haemodynamically stable (minimal or no vasopressors), on minimal respiratory support or in the process of respiratory weaning were considered suitable for IHD. All patients with underlying neurological illness (traumatic brain injury, strokes and space-occupying lesions) were excluded. The suitability of IHD in these patients was then independently verified by the ICU and nephrology consultants.

RESULTS.

Potential cost savings

	Quantity	Cost per unit (EUR)	Total Cost (EUR)
a. Total Number of CVVHF filters used	108	€157	€16,956
b. Number of CVVHF filters that would be used if IHD was applied to suitable patients	43	€157	€6,751
c. Number of IHD sets that would have been needed	50	€36	€1,800
Potential cost saving if IHD was initiated in suitable patients on ITU (i.e. (a − (b + c))) = €8,405 per month			
Potential saving of €100,860 per year			

* Costs quoted for CVVHF are inclusive of haemofiltration fluid

CONCLUSIONS. 1. Transition to IHD from CVVHF in selected haemodynamically stable patients could result in significant financial cost savings. 2. Other potential benefits of IHD such as more effective physiotherapy and rehabilitation and therefore reduction in length of stay need further investigation.

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0973

EARLY TIMING IN SEPTIC SHOCK PATIENTS

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INTRODUCTION. Septic shock patients with acute renal failure requiring continuous renal replacement therapies (CRRT) present high mortality. No intervention in terms of dose and timimg according to RIFLE score have improved outcome.

OBJECTIVES. Demonstrate that early initiation of CRRT in terms of time from admission to intensive care unit (ICU) improves outcome of septic shock patients with acute renal failure.

METHODS. Prospective, observational study. 244 patients were analyzed, all of them presented septic shock condition and acute renal failure requiring CRRT. Time from ICU admission to CRRT initiation was independent factor related to mortality. Therefore we classified patients in Early group (CRRT was initiated maximum 48 h after admission to ICU) and Late group (CRRT after 48 h from ICU admission).

RESULTS. Baseline parameters (Early vs. Late): number (135 vs. 109); Mean age (61,7 years vs. 61,7 years); Creatinine at ICU admission (330 umol/L vs. 230 umol/L); Lactate at ICU admission (6.5 mmol/L vs. 3.7 mmol/L); SOFA (12 vs. 11); APACHEII (27 vs. 24); Creatinine at CRRT (343 umol/L vs. 310 umol/L); Lactate at CRRT (6,7 vs. 4,2); urine output at CRRT (0.34 ml/kg/h vs. 0.46 ml/kg/h). Outcome results: 90 days mortality (52.6 % vs. 71.6 %).

CONCLUSIONS. Early initiation of CRRT within the first 48 h from admission improves survival in septic shock patients with acute renal failure despite baseline differences between populations.

0974

PROADRENOMEDULLIN LEVELS CHANGES AND CONTINUOUS VENOVENOUS HEMOFILTRATION IN CRITICALLY ILL PATIENT WITH SEPTIC SHOCK AND ACUTE RENAL FAILURE OR MULTIPLE ORGAN FAILURE THAT INVOLVES THE RENAL SYSTEM

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INTRODUCTION. Proadrenomedullin (proadr) has a protective function in sepsis with mechanisms yet unexplored and unvalidated. Proadr prevents the transition of tissue hypoperfusion in septic shock through a decrease in vascular permeability. in septic shock the concentration of proaddr is increased as it has been shown in various studies but this is not an increase per se and its derived from renal dysfunction. Vasopressors which are used in septic shock patient may also contribute through positive feedback to that increase. Studies showed that levels of proadr are increased before hemofiltration and decreased after 20 h from the end of CVVH.

OBJECTIVES. This study was designed to answer this question:
(1) What is the relationship of proadr and sepsis in patients undergoing CVVH with acute renal failure (ARF) or MODS including renal failure in ICU and changes consequently in APACHE II and SOFA score. (2) What is the effect of CVVH for 24 h in proadr levels in septic patients and if there is a change in APACHE II and SOFA score.

METHODS. Prospective study with 19 septic shock patients (by the international sepsis criteria) under vasopressor support. The proadr serum levels were obtained right before the start of CVVH and after 24 h of CVVH. The hemodynamic parameters recorded were cardiac index stroke volume systemic vascular resistance. SOFA and APACHE II were recorded on 0 h and 24 h also. The statistical analysis was performed with Ttest.

RESULTS. The mean of PROADR on 0 h and 24 h was 3.54 and 1.91 nmol/l the values are different with a level of significance $p < 0.05$. SOFA mean values before and after CVVH was 14 and 12 respectively and were different with a $p < 0.01$. APACHE II mean score was 30 before and 26 after the CVVH these values are statistically different with level of significance $p < 0.01$. Cardiac index mean was 5 l/min before and 3 liter/min after the CVVH which are statistically different with level of significance $p < 0.01$. SV and SVR changes were not significant.

CONCLUSIONS. In patients with ARF and septic shock or MODS affecting the kidneys and septic shock the value of proadr is tenfold of the normal limits. There is a positive relationship between proadr levels and APACHE II and SOFA score. CVVH decreases both APACHE II and SOFA score in these patients as well as proadr levels. The decrease in both APACHE II and SOFA score is attributed in the decrease of proadr levels with CVVH and is accompanied with decreased mortality and severity of sepsis. The change of proadr levels has clinical value in septic patients with ARF.

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0975

IL-6 IL10 AND CRP LEVELS ON PATIENTS WITH SEPTIC SHOCK AND RENAL FAILURE UNDERGOING CONTINUOUS VENOVENOUS HEMOFILTRATION

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INTRODUCTION. Interleukins 6 and 10 are pro and anti-inflammatory cytokines and are measured in numerous studies along with CRP. In septic patients there are very high levels of both interleukins and CRP.

OBJECTIVES. The purpose of this study was to determine the change in immune functions in plasma resulting from CVVH by measuring the concentrations of IL-6 IL-10 and CRP.

METHODS. Prospective study with 22 septic shock patients enrolled under vasopressor support with renal dysfunction. The IL-6 IL-10 and CRP plasma levels were obtained right before the start of CVVH and after 24 h of CVVH. The statistical analysis was performed with Student test.

RESULTS. Plasma from septic patients led to a markedly decreased concentration of IL-6 $p = 0.022$. At the same time, levels of IL-10 and CRP failed to show a significant decrease in statistical terms and the p value was 0.18 and 0.44. We did not find significant differences pre- and post filter in the potential to decrease IL-10 or CRP production. The mean values of IL 6 IL 10 and CRP were 127.89 pg/ml 67.77 mg/ml and 166.8 mg/L respectively.

CONCLUSIONS. Plasma in patients with renal failure and septic shock shows increased secretion of IL-6 and IL-10 as well as CRP. Moreover, CVVH withdraws triggering mediators from plasma in resulting in a fall of anti inflammatory and proinflammatory cytokines. In these patients the values of cytokines were tenfold or more of the normal limits moreover the CRP values were 80-fold of the normal limits.

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0976

TO EXTUBATE OR NOT TO EXTUBATE: A PROSPECTIVE OBSERVATIONAL STUDY OF FAILURE TO EXTUBATE DESPITE SUCCESSFULLY PASSING SPONTANEOUS BREATHING TRIALS (SBT)

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INTRODUCTION. Weaning from mechanical ventilation (MV) comprises multiple steps which include the assessment of readiness to wean to the actual liberation from MV. During and after a spontaneous breathing trial (SBT), clinicians often utilise their clinical judgement, in addition to objective SBT parameters, to determine if a patient can be actually liberated from MV. In some occasions based on clinical grounds, clinicians may opt not to extubate a patient despite a successful SBT.

OBJECTIVES. The aim of this study is to look at the proportion of patients who are not extubated despite passing SBTs and the reasons behind such practice.

METHODS. We conducted a seven-month prospective observational study in our university hospital's 12-bed medical intensive care unit (MICU) from August 2010 to February 2011. All mechanically ventilated patients were enrolled and assessed daily for suitability for SBT. The conduct of SBTs was standardised and patients who satisfied pre-defined criteria for haemodynamic, respiratory and neurological parameters including reversal from the underlying medical conditions which necessitated intubation were entered into a SBT.

RESULTS. We enrolled 197 patients (male 43.7 %) into this study. The mean age was 61.1 (±15.8, 17–95 years).The number of days of intubation ranged from 2 to 17 (mean 4.25 ± 2.52) days. There were 397 SBT sessions, resulting in 323 SBT passes (81.4 %) but only 214 extubations (214/323, 66.2 %). Of these 214 extubations, there were 17 re-intubations (7.9 %). 33.8 % (109/323) of successful SBTs were not followed by extubation based on clinical grounds. These clinical grounds are tabulated as follows.

Reasons for failure of extubation

Category	Frequency	Percentage	95 % Confidence interval (%)
Logistical reasons (including diagnostic imaging, surgeries, conduct of family conferences)	24	22.0	14.22–29.78
Fluid balance (including positive fluid balance)	23	21.1	13.44–28.76
Respiratory (including copious amounts of secretions)	18	16.5	9.53–23.47
Neurological (including poor mentation and inability to protect airway)	16	14.7	8.05–21.35
Cardiovascular (including arrhythmias, acute myocardial ischaemia)	13	11.9	5.82–17.98
Leak-test related (absence of a positive leak)	11	10.1	4.44–15.76
Gastrointestinal (including on-going bleed)	4	3.7	0.16–7.24
Total	109	100	

CONCLUSIONS. 1. Clinicians do not extubate patients 33.8 % of the time despite successful SBTs. 2. Logistical reasons and positive fluid balance predominate as concerns. These should be taken into account when deciding if a patient should be liberated from mechanical ventilation.

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0977

EVALUATION OF A NEW TOOL TO MEASURE PATIENT'S HEIGHT DURING MECHANICAL VENTILATION: IMPACT ON PROTECTIVE VENTILATION IMPLEMENTATION

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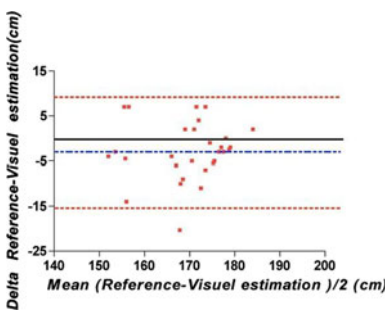
INTRODUCTION. Protective ventilation implementation requires the predicted body weight (PBW) calculation, based on gender and patient's height. Consequently, height inaccuracy may be a limiting factor to adequately reduce the tidal volumes.

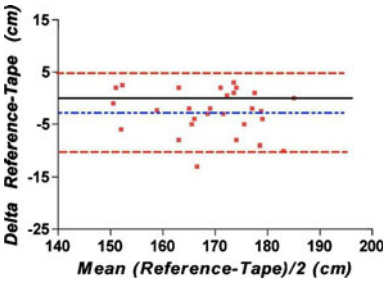
OBJECTIVES. The main objective of this study was to evaluate a method for measuring the patients while on mechanical ventilation. We compared the bias and precision of this new method with visual estimation of height and with measuring tape.

METHODS. Patients were included in the study before cardiac surgery and after informed consent. Reference heights of patients were obtained with a height gauge while patients were standing up (gold standard). Measures were also taken according to the Chumlea method (modified method for bedridden patients). After the surgery, at ICU arrival, patient's heights were visually estimated by a nurse, a respiratory therapist and then measured by a nurse with a measuring tape. In addition, the patient's height was measured with an optical method (iphone camera) by an algorithm (iAnthropometer 2) developed for this study based on analysis of a leg's picture.

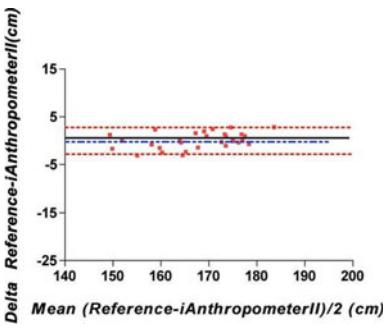
RESULTS. We present here the results for 30 patients (23 men and 7 women). Mean age was 62.3 ± 10 years; actual weight was 66.7 ± 5.0 kg. Mean height measured with gauge before the surgery was 171 ± 8 cm (reference). Mean height measured with camera was 171 ± 8 cm. Mean height measured with a tape was 170 ± 15 cm. The median difference between the reference and height found with iAnthropometer 2 was 0.27 cm with a maximum error of 3 cm. The median difference between reference and estimated height was 3.41 cm with a maximum error of 20 cm. The median difference between reference and the tape-measured height was 3 cm with a maximum error of 13 cm. The median difference between the PBW based on reference height and iAnthropometer 2 was 0.05 kg with a maximum error of 2.6 kg. The median difference between the PBW based on actual height and the estimated height was 3.3 kg with a maximum error of 17 kg.
Bland and Altman comparisons are presented below:



Visual estimation vs. reference



Mesauring tape vs. reference



Anthropometer 2 vs. reference

CONCLUSION. This study demonstrates that our new method to provides acceptable results, at least equivalent to the measure with a tape when patients are lying in bed under mechanical ventilation and better than the visual estimation. This technique could be useful to optimize the implementation of protective mechanical ventilation.

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0978

THE COMPARISON OF SPONTANEOUS BREATHING AND MUSCLE PARALYSIS IN TWO DIFFERENT SEVERITIES OF EXPERIMENTAL LUNG INJURY

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INTRODUCTION. The various benefits of spontaneous breathing (SB) over muscle paralysis have been proven mainly in mild lung injury and the plateau pressure (P_{plat}) applied in such clinical studies was relatively low (normally <25 cmH_2O). No one has yet evaluated the effects of SB in severe lung injury requiring high P_{plat}.

OBJECTIVES. To test the hypothesis that (1) when lung injury was mild and a low P_{plat} could be maintained, SB would favor alveolar recruitment over muscle paralysis and (2) that in severe lung injury requiring a high P_{plat}, stronger SB could generate an injuriously high transpulmonary pressure (P_L) and patient-ventilator asynchrony that worsens lung injury.

METHODS. Twenty-eight rabbits were randomly divided into the mild lung injury (surfactant depletion) group or severe lung injury (surfactant depletion followed by injurious mechanical ventilation) group and ventilated with 4-h low tidal volume ventilation with or without SB. Inspiratory pressure was adjusted to control tidal volume to 5–7 mL/kg, maintaining a P_{plat} < 30 cmH_2O. Dynamic computed tomography was used to evaluate changes in lung aeration and cyclic collapse before and after the protocol. Lung images were bisected into nondependent halves and dependent halves to assess the regional distribution of tidal volume.

RESULTS. In mild lung injury, SB resulted in the most favorable oxygenation and best lung aeration through the redistribution of tidal gas to dependent lung regions. In contrast, in severe lung injury, we found that SB caused a significant increase in atelectasis with cyclic collapse. Due to the severity of lung injury, this group had higher P_{plat} and more excessive SB effort, resulting in the highest P_L, the highest driving pressure, the highest respiratory rate and patient-ventilator asynchrony. Although no improvements in lung aeration were observed, muscle paralysis with severe lung injury resulted in better oxygenation and less histological lung injury with a homogeneous distribution of tidal gas.

CONCLUSIONS. In mild lung injury, SB was beneficial to lung recruitment; however, with severe lung injury requiring a high P_{plat}, SB could worsen lung injury and muscle paralysis might be more protective for injured lungs by preventing injuriously high P_L and patient-ventilator asynchrony.

0979

PREVALENCE OF PATIENT-VENTILATOR ASYNCHRONY IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Incidence of patient-ventilator asynchrony during mechanical ventilation (MV) is high. It is associated with a longer duration of MV, higher risk of tracheostomy and unsuccessful weaning. Moreover, deeper sedation level is associated with more expiratory asynchronies.

OBJECTIVES. To assess: (1) the prevalence of asynchrony in mechanically ventilated patients; and (2) the relationship between sedation level and patient-ventilator asynchrony.

METHODS. We prospectively included all consecutive patients admitted in 4 beds of a medical and surgical Intensive Care Unit (ICU) of a teaching hospital. All patients underwent MV for more than 24 h and were studied during the total time of MV. These 4 beds are equipped with Better Care™ system. This software acquires, synchronizes, analyzes, and records waveforms from the ventilator continuously 24 h a day. The software is capable of detecting main asynchronies (ineffective effort, double-triggering, long cycling and short cycling) and ventilatory mode (constant flow, decelerate flow, pressure support and CPAP). We defined asynchrony index (AI) as the total number of asynchronies divided by the number of total breaths (ventilator's triggered breaths, patient's triggered breaths and ineffected triggered). AI was calculated hourly along the total time of MV. We also collected sedation level (SAS) every four hours. Data are expressed as median and interquartile range. We used Mann–Whitney *U* test to compare sedation level and AI. A $p < 0.05$ was considered statistically significant.

RESULTS. We studied 50 patients all admission long. A total of 7046 h of MV and 8.882.691 breaths were analyzed and the 124 h in CPAP were excluded. Median prevalence of AI per hour was 3.4 % [2.0–5.8]. The most common asynchrony was ineffective effort with a median prevalence of 2.4 % [1.4–3.6]. Asynchronies were less frequent at early morning (1.7 % [0.5–4.8]) than in the morning (2.1 % [0.7–5.5]; $p < 0.0001$) or in the afternoon (2.0 % [0.7–5.2]; $p = 0.0012$). In patients who triggered most of the breaths and with an AI > 10 %, AI was higher in patients with SAS < 3 compared with patients with SAS ≥ 3 (30.8 % [19.8–41.2] vs. 18.2 % [13.1–35.5]; $p = 0.003$).

CONCLUSIONS. Asynchronies are common during MV and can be under diagnosed. The most common asynchrony is ineffective effort. Asynchronies occur all day long but more frequently during daytime. Deeper sedation level favours asynchrony.

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0980

PATIENT–VENTILATOR ASYNCHRONY DURING CONVENTIONAL OR AUTOMATED PRESSURE SUPPORT VENTILATION IN DIFFICULT-TO-WEAN PATIENTS

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INTRODUCTION. Patient-ventilator asynchrony occurs in nearly 25 % of intubated patients and is associated with higher incidence of weaning failure, prolonged mechanical ventilation and tracheostomy. Over-assistance is one of the most frequent causes of asynchrony. Automated pressure support ventilation (PSV) optimizes the management of PSV, allowing to keep the patient in a respiratory comfort zone with the least level of ventilator assistance.

OBJECTIVES. To compare the asynchrony rate during conventional and automated PSV in difficult-to-wean patients.

METHODS. Prospective, crossover study in patients requiring up to 3 spontaneous breathing trial or as long as 7 days to achieve successful weaning. Patients were ventilated for 2 consecutive 3-h periods applied in randomized order, administered both in the afternoon (3 pm–9 pm) and in the night (12 pm–6 am): (1) with conventional PSV (PSVc) managed by the attending physicians, and (2) with automated PSV (PSVauto) managed by SmartCare (Dräger). In both periods, the starting PS level was the basal level before enrollment. Arterial blood gases were measured at the end of each period. During each period, airway pressure, flow and volume signals were continuously recorded in a PC connected to the ventilator using a dedicated software (VentView). These signals were analyzed offline by 2 clinicians. The asynchrony index (AI) was defined as the number of asynchronies (wasted efforts, double cycles, premature cycling off) divided by the patient's respiratory rate, multiplied 100.

RESULTS. Seventeen patients were enrolled (age 67 ± 13 y; SAPSII 49 ± 19; COPD 41 %; days of mechanical ventilation before enrollment 8 ± 4; RASS −1/+1). AI was lower with PSVauto (8.6 ± 9.1 % vs. 11.2 ± 11.1 %, $p = 0.01$), but not different between afternoon and night. Number of patients having an AI > 10 % was lower with PSVauto (29 % vs. 35 %, $p = 0.01$). As compared with PSVc, number of asynchronies was lower with PSVauto (147 ± 170 vs. 188 ± 222, $p = 0.01$), particularly during afternoon (176 ± 216 vs. 227 ± 245, $p = 0.03$). Mean PS level was lower with PSVauto (12.3 ± 3.3 vs. 14.5 ± 2.9 cmH2O, $p = 0.08$), particularly during night (12.2 ± 3.1 vs. 14 ± 2.8 cmH2O, $p = 0.04$). The coefficient of variability of PS level was higher with PSVauto (19 % vs. 0 %, $p < 0.01$). With PSVauto, ventilator respiratory rate was higher (21 ± 3 vs. 19 ± 5 breaths/min, $p = 0.02$) and $PaCO_2$ was lower (37.7 ± 9.1 vs. 40.2 ± 11.7 mmHg, $p = 0.04$). No differences were observed in patient's respiratory rate (23 ± 4 vs. 21 ± 5 breaths/min, with PSVauto and PSVc, respectively), P0.1 (1.7 ± 0.7 vs. 1.5 ± 0.9 cmH2O), and PaO_2 (100.2 ± 25 vs. 99.8 ± 26.5 mmHg).

CONCLUSIONS. As compared with conventional PSV, automated PSV may reduce asynchronies in difficult-to-wean patients, likely because of lower level of ventilator assistance and greater variability of PS level.

0981

COMPARISON OF SETTINGS AUTOMATICALLY DETERMINED BY A FULLY CLOSE LOOP VENTILATION MODE WITH CLINICIAN MANUAL SETTINGS IN ICU PATIENTS

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INTRODUCTION. IntelliVent-ASV® is a closed loop ventilation mode that automatically selects ventilation and oxygenation settings in passive and active breathing patients. Minute

volume is adjusted according to end tidal CO_2 (E_TCO_2) information in passive breathing patients and respiratory rate in active breathing patients. FiO_2 and PEEP are adjusted according to SpO_2 information (1).
OBJECTIVES. This study compared settings automatically determined by IntelliVent-ASV® with clinician's manual settings using conventional ventilation mode in ICU patients.
METHODS. This prospective, observational study included 100 patients invasively ventilated using IntelliVent-ASV® from inclusion to weaning or death. Patients were categorized in different lung conditions: normal lung, ALI/ARDS, or COPD. Settings automatically selected and delivered ventilation parameters were collected once a day. Clinician in charge of the patients determined every morning the settings that he/she would have adjusted in conventional ventilation mode (volume control or pressure support mode for passive and active breathing patients, respectively) with the information of medical history, actual settings and blood gas analysis results. Comparisons used a Mann–Whitney rank sum test.
RESULTS. Patients were ventilated using IntelliVent-ASV® for a median duration of 3.0 [2.0–7.0] days which allowed 375 "clinicians-to-Intellivent-ASV®" comparisons for each setting. Minute volume, PEEP, and FiO_2 automatically selected by IntelliVent-ASV® were not statistically different as compared to clinician's manual settings (8.2 [6.6–9.8] versus 8.2 [6.8–9.8] L/min, 6 [5–10] versus 5 [5–10] cmH_2O, and 30 [30–35] versus 30 [30–35] %, respectively, $p > 0.05$). Tidal volume/kg of predictive body weight (V_T/kg) delivered by IntelliVent-ASV® was higher than clinician's manual settings in all patients (8.2 [7.6–9.3] versus 8.0 [7.7–9.0] mL/kg, $p = 0.04$), and in the subgroup of active breathing patients (8.5 [7.8–9.5] versus 8.0 [8.0–9.0] mL/kg PBW, $p = 0.04$) but not in the subgroup of passive ventilated patients (8.0 [7.3–9.0] versus 8.0 [7.0–8.4] mL/kg PBW, $p = 0.26$). Subgroup analysis in patients with normal lungs, ALI/ARDS, and COPD showed no difference between automatic settings and clinician's manual settings for minute volume, tidal volume, PEEP, and FiO_2.
CONCLUSIONS. In 100 patients ventilated more than 24 h, automatic settings from IntelliVent-ASV® were not different from clinician's manual settings in conventional ventilation mode. The difference found for tidal volume in actively breathing patients might not be clinically relevant. In most cases, clinician would have accepted the ventilator automatic settings.
REFERENCE(S). Arnal. Intensive Care Med. 2012.
GRANT ACKNOWLEDGMENT. This study was promoted by the Centre Hospitalier Intercommunal de Toulon La Seyne sur Mer.

0982
CAN WE EARLY IDENTIFY PATIENTS WITH A HIGH RISK OF PROLONGED MECHANICAL VENTILATION IN INTENSIVE CARE UNIT?

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INTRODUCTION. Patients admitted to the ICU usually receive mechanical ventilation. If prolonged mechanical ventilation (PMV) is expected, tracheostomy is generally proposed in order to improve respiratory weaning. Early recognition of these patients could help physicians to anticipate indications of tracheostomy. The objective of this study is to determine risk factors of PMV and build a predictive risk score of PMV.
METHODS. After approval by the local ethics committee, a prospective observational study was performed in the 16 beds medico-surgical ICU of an university hospital. All patients admitted to the ICU who underwent mechanical ventilation more than 24 h were included. VMP was an intubation requirement for more than 10 days. Demographic data, comorbidities, reason for admission and intubation, SAPS2 score were recorded. Clinical and biological data were also collected on admission and on day 5. Univariate analysis was performed to determine variables associated with PMV. They were entered in a logistic regression to find independent risk factors of PMV. A score was created using multivariate analysis odds ratio. A ROC curve was plotted to determine the best threshold for predictive risk of PMV.
RESULTS. Between November 2010 and October 2011, 446 patients were admitted and 165 were included. Mean age was 58 ± 19 years, mean SAPS2 was 49 ± 17, reason for admission was medical : 52.7 % and surgical : 47.3 %. Ninety three patients (56.4 %) underwent mechanical ventilation for 10 days or less, whereas 72 patients (43.6 %) were ventilated more than 10 days. Logistic regression on admission revealed 5 independent risk factors of PMV: restrictive pulmonary disease (Odds-ratio (OR) = 2.76; 95 % confidence interval (95CI) [1.11–6.91]; $p = 0.03$), chronic alcoholism (OR = 2.29; 95CI [1.07–5.38]; $p = 0.03$), admission for polytrauma (OR = 4.82; 95CI [1.64–14.13]; $p = 0.004$), renal replacement therapy (OR = 2.57; 95CI [1.12–5.93]; $p = 0.03$), $PaO_2/FiO_2 < 200$ (OR = 2.21; 95CI [1.11–4.44]; $p = 0.02$) and 2 independent factors on day 5: ongoing sedation (OR = 2.48; 95CI [1.13–5.47]; $p = 0.024$) and multiple organ failure (OR = 2.77; 95CI [1.20–6.36]; $p = 0.016$). The score was then constructed from 0 to 20. A risk score higher than 3 on day 5 predicts PMV with a sensitivity of 75 %; 95CI [63–84], specificity of 76 %; 95CI [66–84], positive predictive value of 71 %; 95CI [60–81] and negative predictive value of 80 %; 95CI [70–87]. Positive and negative likehood ratios are respectively 3.17; 95CI [2.7–3.8] and 0.33; 95CI [0.2–0.6]. Area under the ROC curve is 0.812; 95CI [0.74–0.87]; $p < 0.0001$.
CONCLUSIONS. Almost half of the admitted patients received PMV. Seven independent risk factors of PMV were found. The easy score could help physicians to early identify patients at risk of PMV. However, this score has to be validated in a large prospective cohort.

0983
CURRENT OXYGENATION PRACTICE IN MECHANICALLY VENTILATED PATIENTS IN AN AUSTRALIAN TEACHING HOSPITAL

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Concerns have been raised recently regarding safety of oxygen exposure and SaO_2 targets in ICU patients. According to current researches, high FiO_2 may alter the outcome of ventilated patients. High PaO_2 has been linked to an increase risk of death after myocardial infarction, cardiac arrest and in COPD patients. Recommendations by scientific societies are based on level III evidence while the current practice remains poorly evaluated.
METHODS. We screened 154 patients who spend more than 48 h on mechanical ventilation (MV) at the Alfred ICU (Melbourne, Australia). We excluded 53 patients for imminent death (26), transfer from other ICU (13), ECMO treatment (8), severe COPD (4), and records non available (2). Finally 101 ventilated patients, 40 consecutive multi-trauma, 41 medical and 20 consecutive surgical patients were included. Oxygen data were collected hourly during the first 7 days, demographic data, SOFA, APACHE II, outcome were extracted and calculated from the hospital records and daily collected data. Analysis was performed using SAS version 9.2 (SAS Institute Inc, Cary, NC, USA).
RESULTS. 101 patients are analysed with a mean age of 56.7 (20.5), 40 trauma, 41 medical and 20 surgical. 95 % of the patients were emergency admission, APACHEII score was 19.3 (7.6) with a non-GCS SOFA score of 6.5 (3.4). Hospital length of stay was 20 (10.1–37.8) and MV free days in hospital was 9.1 (1.9–20.5). Mortality was 49 %. Total FiO_2 h studied per patient-mean (std) 143 (36.5) with Hours on FiO_2 0.81–1.00 [median & IQR] 3 [1–5], Hours on FiO_2 0.61–0.80 [median & IQR] 2 [1–7], Hours on FiO_2 0.41–0.60 [median & IQR] 25 [10–64], Hours on FiO_2 0.21–0.40 [median & IQR] 91 [57–132], Total SpO_2 h studied per patient mean (std) 142 (36.4), Hours on SpO_2 88–91 % [median & IQR] 1 [0–4]], Hours on SpO_2 96–100 % [median & IQR] 108 [77–140], 7 days wt-average SpO_2-mean (CI) 97.1 (96.8–97.4) %, 7 days cumulative oxygen exposure dose units was 3,380 (*×2 normal*). Patients had around 25 ABG's during the first 3 days. According to their ALI score, patients spent between 20.3 (3.3) and 32.7 (2.6) hours with a PaO_2 >100 and between 0 [0–1.8] and 6.8 [4.2–10.6] hours with a PaO_2 >200 mmHg in the first 72 h. The P/F ratio difference between day 0–3 and day 0–6 was significantly higher in patients who have been exposed longer to PaO_2 >100 or 200 mmHg. Patients are exposed during prolong period of time to FiO_2 higher than 0.21 while their PaO_2 and SaO_2 are supranormal. Patients with mild ALI spend more time on PaO_2 >100 or >200 mm Hg during the first 72 h of ventilation compared to moderate or severe ALI. Patients with mild ALI were also observed to have a greater reduction (from baseline on day 0) in the mean PaO_2/FiO_2 ratio compared to moderate or severe ALI on day 3 and day 7 of ventilation. The impact of FiO_2 and PaO_2 targets in ICU patients and the safe thresholds remain to be demonstrated.

0984
ACCEPTABLE VENTILATOR SETTING AND MONITORING PARAMETER RANGES FOR INITIATION OF CONTROLLED MECHANICAL VENTILATION: A CLINICIAN SURVEY

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INTRODUCTION. Current evidence fails to guide clinicians on many aspects of mechanical ventilation. There is a paucity of guidance on acceptable initial settings and parameter ranges for conditions other than acute respiratory distress syndrome (ARDS). In an effort to inform bedside clinicians on acceptable practice we set out to characterize standard practices for initiation of controlled mechanical ventilation in patients with ARDS and chronic obstructive pulmonary disease (COPD) exacerbation, and no lung pathology.
OBJECTIVES. To characterize clinician-accepted ventilator settings and monitoring parameter ranges for 3 patients scenarios: ARDS, COPD and no lung pathology. These data will be used to inform the development of a web-based ventilation simulator and an educational assessment tool to evaluate learners' ability to safely initiate mechanical ventilation.
METHODS. Scenarios and survey items were iteratively developed by the investigators and assessed for clinical sensibility by 10 clinicians with expertise in mechanical ventilation. For the 3 scenarios, survey respondents selected their preferred mode of ventilation (pressure control [PCV] or volume control [VCV]), identified parameter values they would initially select/target when commencing mechanical ventilation, and identified monitoring targets (e.g. minimum and maximum oxygen saturation and pH). The survey was sent via email to members of the Canadian Society of Respiratory Therapists (CSRT) in Feb 2011, with two reminder emails in March 2011.
RESULTS. Total evaluable surveys were 363. We were unable to calculate the response rate due to inability to confirm the number of CSRT members working in intensive care. More participants selected PCV as the preferred mode for ARDS (77 %), than for COPD (50 %) and for no lung pathology (32 %) ($P < 0.001$). Median tidal volumes were lower for the ARDS scenario than COPD and no lung pathology (6 vs. 7 vs. 7 mL/kg, $P < 0.001$). Median set respiratory rate (18 vs. 14 vs. 14), plateau pressure ($30cmH_2O$ for all scenarios), PEEP (12 vs. 7 vs. $5cmH_2O$) and FiO_2 (1.0 vs. 0.5 vs. 0.3) were also higher for the ARDS scenario (all P values < 0.001). Median set inspiratory time was shortest for the COPD scenario (0.8 vs. 1.0 vs. 1.0 s, $P < 0.001$). Lowest acceptable SpO_2 was 92 % for normal lungs vs. 88 % for ARDS and COPD ($P < 0.001$). Lowest acceptable pH was 7.20 for ARDS vs. 7.30 for COPD and lung pathology ($P < 0.001$).
CONCLUSIONS. In this survey of RTs PCV was favoured for the ARDS scenario despite use of VCV in the previous ARDSnet trial of low tidal volume ventilation[1]. Respondents selected low tidal volume ventilation for all scenarios. Distinct differences in ventilation styles, initial settings and monitoring goals were evident for the 3 scenarios.
REFERENCE(S). ARDSnet, N Engl J Med, 2000. 342: 1301–8.
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0985
DELIVERY OF TIDAL VOLUME FROM FOUR ANAESTHESIA VENTILATORS DURING VOLUME-CONTROLLED VENTILATION: A BENCH STUDY

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INTRODUCTION. Tidal volume (VT) must be accurately delivered by anaesthesia ventilators in volume-controlled mode (VCV) for lung protective ventilation to be effective. However, the impact of fresh gas flow (FGF) and lung mechanics on VT delivery with the most recent anaesthesia ventilators has not been reported.
OBJECTIVES. To assess the impact of FGF across anesthesia ventilators on delivered VT.
METHODS. We evaluated delivered VT (VTI) from four anaesthesia ventilators (Aisys, Flow-i, Primus and Zeus) on bench by using pneumatic test lung simulating three lung compliance (C, ml cm H_2O^{-1}) and resistance (R, cm H_2O L^{-1} s^{-2}) (C60R5, C30R5, C60R20). For each CR, 3 FGF rates (0.5, 3, 10 L min^{-1}) were investigated at 3 set VT (300, 500, 800 ml) and 2 levels of positive end-expiratory pressure (PEEP) (0 and 10 cm H_2O).

The volume error = [(VTinspired-VTset)/VTset]*100 was computed in body temperature and pressure saturated conditions and compared by using ANOVA.
RESULTS. For each CR and each set VT, absolute volume error significantly declined from Aisys to Flow-i, Zeus and Primus (figure 1).

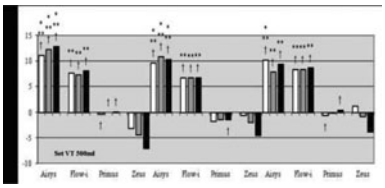

Figure 1

The values were 12.5 % for Aisys, 5 % for Flow-i and Zeus and 0 % for Primus for C60R5. With increase in FGF, absolute volume error increased only for Aisys and Zeus. However, in C30R5 volume error was minimal at middle FGF for Aisys. The results were similar at PEEP10.
CONCLUSIONS. In present experimental conditions, VT delivery from new anaesthesia ventilators: (1) differed significantly between them; (2) was influenced by FGF but this effect may not be clinically relevant. Lung protective ventilation can be accurately delivered by the anaesthesia ventilators tested.

0986
CAN LUNG ULTRASONOGRAPHY HELP IN WEANING FROM MECHANICAL VENTILATION?

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INTRODUCTION. Accurate bedside detection of thoracic disorders with lung ultrasonography at ICU has been increased.
OBJECTIVES. The objective of our study is to assess the reliability of lung ultrasonography as a predictor of weaning failure.
METHODS. This prospective study of 96 MV-patients >48 h, with f/VT <105, that undergone spontaneous breathing trial (SBT) with T-tube, were evaluated with lung ultrasound before 30-min SBT. Three or more B lines in a single view were called B+ lines. B profile was defined as B + lines on at least one anterior chest wall view (zone 1 or 2).
RESULTS. Weaning failure (WF) occurred in 16 (15.8 %) patients. Seventy-two (71 %) patients meeting criteria of simple weaning. Mean age was 70 ± 18 years, mean Apache II was 20.5 ± 6.8, admission SOFA 5.7 ± 4.0, and MV-days before SBT was 6.6 ± 5.7. Fluid balance 48 h before SBT was positive 1,004 ± 3,292. B profile was found in 44(55 %) weaning success patients, and in 13 (81.2 %) WF patients. B profile predicting WF showed a sensitivity 81 % [95 %CI 53–95 %], specificity 45 % [95 %CI 33–56 %], NPV 92 % [95 %CI 78–97 %], PPV 7 % [95 %CI 2–21 %].
CONCLUSIONS. Absence of B profile during MV-weaning immediately before 30-min of SBT can help to predict weaning success. However, these results don't modify our daily clinical practice.
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0987
REDUCTION IN THE DURATION OF MECHANICAL VENTILATION THROUGH BIESPECTRAL INDEX MONITOR. PRELIMINARY STUDY

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OBJECTIVES. Determine if there is a reduction of duration on mechanical ventilation in patients in which the monitor BIS® is used for monitoring the depth of sedation. Secondary objectives: reduction of ICU stay and hospital stay, reduction of early and late VAP, to decrease the doses (mg) of sedatives used, costs and other complications.
METHODS. Clinical, prospective and observational study that compared two groups of patients: with and without monitoring of sedation by BIS®. We included patients admitted to medical-surgical ICU who required mechanical ventilation for a period exceeding 24 h. Hemodynamic variables were collected, respiratory, renal function, liver function, as well as the doses of sedatives, analgesics and neuromuscular blockers, RASS and BIS® values on admission and 24 h.
RESULTS. Of a total of 85 patients enrolled, 31 were monitored sedation by BIS® (case group) and the remaining 54 (control group) only through clinical scales of sedation (RASS). 100 % of patients had BIS values >40 <60 both at admission and at 24 h, according to the established sedation protocol. There were no significant differences in the duration of mechanical ventilation 4 (1–10) days in patients with BIS®, and 4 (2–10) days in non-BIS®, p = 0.33. There were also no differences in early VAP decreased (10 % vs. 13.5 % BIS® no BIS® p = 0.46) or late (9.7 vs. 21.2 % BIS® BIS® p = not 0.147). The total dose of sedatives was lower in the BIS group but no significant differences. The ICU and hospital stay was similar in both groups.
CONCLUSIONS. Monitoring of sedation using biespectral analysis monitor does not decrease the duration of mechanical ventilation, ICU and hospital stay, or mortality. There is a tendency to decrease the dose of sedatives and the associated complications.

0988
ICU CLINICIAN UNDERSTANDING OF PLEURAL PATHOPHYSIOLOGY AND MANAGEMEMNT OF INTERCOSTAL CHEST DRAINS ARE SUB-OPTIMAL

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INTRODUCTION. Intercostal chest drainage is an important therapy for managing air or fluid in the pleural cavity. Apart from its regular post cardiac surgery use, chest trauma patients and those with pneumothorax and hydro-, hemo- or pyothorax regularly require tube thoracostomy. Optimal understanding of pleural physiology and effective utilisation of intercostal chest drainage systems are integral to safe and proficient critical care.
STUDY OBJECTIVES. To determine the ICU trainee doctor's understanding of the fundamentals of pleural physiology, pleural pathology in common critical illnesses, principles of intercostal chest drainage, troubleshooting in common chest drainage systems and advanced clinical issues with safe management of chest drains, we conducted a survey amongst a cohort of advanced clinical trainees working as Registrars and Fellows in the Australasian health system and training for the Fellowship of the College of Intensive Care Medicine in Australia (http://www.cicm.org.au).
METHODS. 78/98 registrants at a recent ANZICS ICM Course focused on the ICU care of the critically ill (http://www.easternhealth.org.au/media/events/icm.aspx) voluntarily completed a 23-question single-page survey. The respondents were all active clinicians from Australia and New Zealand, all of whom had completed at least 5 years of post-graduate clinical work and many of them already possessed a Fellowship in Medicine, Anaesthesiology or Emergency Medicine and were training for their second fellowship in critical care medicine.
RESULTS. The results of the survey from 78 respondents are shown in the following table.

Table 1 Response to survey on chest drain management

Number	Question/ideation	Correct answer %	Wrong answer %
1	Normal Pleural Pressure -4 to +8 cm H2O	60	40
2	Transpulmonary Pressure is equal to the elastic recoil pressure	14	86
3	Water Seal column is a diagnostic manometer for the patient's intrathoracic pressure	60	40
4	water seals rises in inhalation and falls in exhalation in spontaneous respiration	36	64
5	In IPPV water seal column falls during inhalation and rises during exhalation	38	62
6	Disconnecting Suction leads to higher negative intrapleural pressure	10	90
7	post-pneumonectomy suction should not be applied	51	49

CONCLUSION. The ICU clinician understanding of pleural patho-physiology is sub-optimal. Basics of pleural drain management are poorly understood and the practice of chest drains is variable but largely inadequate. The fundamentals of monitoring an intercostal chest drainage system and troubleshooting such a system as well as response to common therapeutic situations are incredibly sub-optimal.

0989
UTILITY, SAFETY AND COMPLICATIONS OF ULTRASOUND-AIDED PLEURAL ASPIRATION AND CHEST DRAIN INSERTION IN MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. Pleural aspiration and chest drain insertion in Intensive Care Unit patients are important procedures required in the management of pleural disease as well as to improve ventilatory compliance. However the intensivist rightly hesitates about using a blind procedure in a ventilated patient, especially when the pleural effusion is small or there is positive end-expiratory pressure, because of the potential risk of pneumothorax.
OBJECTIVES. The aim of the study was to evaluate feasibility, safety and the complications of ultrasound guided pleural aspiration and chest drain insertion in mechanically ventilated patients.
METHODS. Between December 2009 and March 2012 a total of 64 pleural procedures were performed in 38 consecutive patients. 18 males, 20 females, mean age 60 years old but ranged from 22 to 85 years. Their body mass index was 30 ± 8 kg/m^2. The inclusion criteria were: (1) procedure clinically required, (2) mechanically ventilated patient, and (3) pleural effusion visible on ultrasound. Pleural effusions were defined on ultra sound as a collection of fluid between parietal and visceral pleura leading to variations in intrapleural distance during breathing. Identification of the lung behind the pleural effusion was necessary before any invasive procedure was attempted. An interpleural distance of at least 15 mm was required to perform the thoracocentesis and visible over three intercostals for a chest drain insertion. The puncture was either lateral in a supine patient or posterior in a patient in lateral decubitus, depending on the amount of fluid. For thoracocentesis we used a 40 mm 21-G needle for thin patients and a 60 mm 16-G catheter in obese patients. All chest drains inserted were 12F.
RESULTS. 64 separate pleural procedures were performed on 38 patients-54 (84 %) pleural aspirations, 10 (16 %) chest drains insertions. All chest drains insertions and all thoracocenthesis required one attempt. During 24 h patient monitoring, we encountered two complication, one bleeding (n = 1; 1,56 %) from a chest drain insertion, and one

pneumothorax from pleural aspiration (n = 1; 1,56 %). Fluid was obtained in 63 of 64 procedures. The mean acquisition time of the pleural space was 76 s. In 63 cases where fluid was obtained, only 35 bedside radiographs revealed sings of effusion.
CONCLUSIONS. Complication rate from pleural aspiration and chest drain insertion performed under ultrasound guidance is lower than that reported for non guided thoracocentesis. If basic rules are followed, ultrasound localization makes thoracocentesis and chest drain insertion a safe and easy procedure in patients with mechanical ventilation.

Technology for the failing heart & kidney: 0990–1003

0990
LEFT VENTRICLE DISCHARGE DURING ECLS BY IMPELLA® MICROAXIAL PUMP IN CARDIOGENIC SHOCK PATIENTS

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INTRODUCTION. Extracorporeal life support (ECLS) is used as short-term circulatory support in cardiac arrest or severe cardiogenic shock [1]. In the ECLS circuit, the reinjection generate backward flow into the aorta which increases left ventricle (LV) afterload and preload. To facilitate LV discharge a microaxial impeller can be inserted across the aortic valve [2].
OBJECTIVES. We observed LV overload symptoms under ECLS and there evolution during unloading therapy with Impella®.
METHODS. Patients who experienced cardiogenic shock and were treated with ECLS and Impella® have been retrospectively studied. Impella® LP 2.5 (Abiomed Lab., USA) was inserted through the femoral artery in cases of pulmonary oedema, no LV ejection or LV enlargement with sludge on echocardiography. Patients characteristics, haemodynamics, pump flow rate, inotrope or vasopressor treatment, serum lactate, creatinine, bilirubin, cardiothoracic ratio (CTR) on chest X ray over the first 4 days after Impella®, and mortality (day 28 and month 6) have been recorded. Analysis of variance, parametric or non parametric statistic test were used.
RESULTS. Ten patients, age 17 to 65 years, have been studied. 5 were after cardiac arrest. Impella® was inserted within the first 48 h after ECLS implantation. Mean Impella® pump flow was 2 L min^{-1} (1.8 to 2.2). Under ECLS and Impella®, mean dobutamine and noradrenaline doses were reduced significantly ($p = 0.004$) with complete inotrope weaning in 7 patients. Serum lactate tended to decrease (from 6.1 ± 8.0 to 2.8 ± 2.9 mmol/L, $p = 0.05$) and CTR decreased significantly from 0.55 ± 0.07 to 0.49 ± 0.06 ($p = 0.002$). Five patients survived at day 28, and 3 at month 6.
CONCLUSIONS. These results suggest that Impella® may contribute to a reduced risk of left ventricle overload under ECLS. Reduction of inotrope doses or complete weaning may also facilitate myocardial recovery.
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0991
MANAGEMENT OF HEMODYNAMICALLY COMPROMISED PATIENTS USING THE IMACOR CLARITEE PROBE: A FEASIBILITY STUDY

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INTRODUCTION. Parameters to guide hemodynamic management in intensive care (ICU) patients generally consist of measurements of blood pressures and flow which might not accurately represent cardiac preload and contractility. Transesophageal echocardiography (TEE) offers the advantage of direct measurement of cardiac function. However, conventional TEE is not always readily available in an ICU setting and requires extensive training. The use of a new miniaturized probe for TEE—ImaCor ClariTEE (hTEE)—potentially provides a more simplified approach to monitoring cardiac function than conventional TEE.
OBJECTIVES. To assess the technical feasibility and quality of hemodynamic monitoring using hTEE in a large ICU setting by operators not formally trained in TEE during the introduction of hTEE.
METHODS. Thirteen ICU staff specialist received 6 h of one-to-one bedside training as hTEE operators. None had received formal training in TEE before the study. ICU-patients with hemodynamic instability were included. After positioning of the hTEE probe, three standard views were acquired and assessed: - Transgastric midesophageal short axis view (TG mid SAX): Measurement of fractional area change (FAC) of left ventricle (LV) and rating of systolic LV function as normal, moderately decreased or severely decreased. - Midesophageal four chamber view (ME 4 chamber): rating of right ventricular (RV) size as dilated or not dilated. - Midesophageal ascending aortic short axis view (ME asc aortic SAX): rating of collapsibility of superior vena cava for presence or absence of hypovolemia. All recorded hTEE views and measurements were assessed off line by an independent cardiologist blinded to the patients and the hTEE operators' identity. Pearsons r and Cohens Kappa were used to grade inter-rater reliability. All hTEE examinations performed within the first five week after introduction of hTEE were analysed.
RESULTS. During the study period 89 examinations were performed in 23 patients. The quality of the acquired loops was rated as sufficient in 74 of 89 views (83 %) for TG mid SAX and ME asc aortic SAX and 76 (85 %) for ME four chamber by the independent cardiologist. Inter-rater reliability of measurements by ICU operators versus cardiologist was 0.802 (Pearsons r) for FAC; 0.614 (Kappa) for rating of systolic LV function and 0.632 (Kappa) for rating of RV dilatation (all $p < 0.0001$). Hypovolemia was not detected in any examination by ICU specialists or by the cardiologist.
CONCLUSIONS. Echocardiographic examinations by operators using hTEE after brief bed-side training were feasible and of sufficient quality in a majority of examined ICU patients. Inter-rater reliability between hTEE operators and a trained cardiologist was substantial. Further studies are required to assess the impact of hemodynamic monitoring by hTEE on relevant patient outcomes.
GRANT ACKNOWLEDGMENT. The hTEE probes used for this study were provided by ImaCor Inc., USA.

0992
LINEAR CORRELATION BETWEEN THE ACCURACY OF CARDIAC OUTPUT MEASUREMENT WITH FLOTRAC/VIGILEO SYSTEM AND SYSTEMIC VASCULAR RESISTANCE

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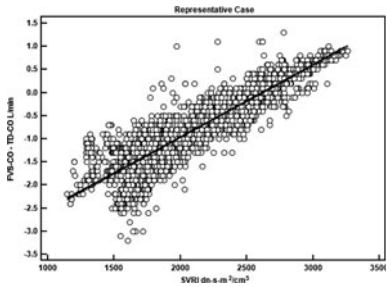
INTRODUCTION. Less invasive cardiac output (CO) monitoring with FloTrac/Vigileo system (FVS.) is widespread recently. However the accuracy of FVS. is controversial, and the gold standard of hemodynamic measurement in the perioperative period still remains a thermodilution technique (TD) with pulmonary artery catheter (PAC).
METHODS. We managed consecutive 30 patients (67 ± 10 years old (Mean ± SD), 20 mens) after cardiac surgery in our ICU with FVS. (Edwards Lifesciences, ver.3.02) and TD with PAC simultaneously from June 2011 to January 2012. The measurements of hemodynamic data were performed in every 20 s continuously by FVS. and TD with PAC. We evaluated the relationship between systemic vascular resistance and the difference of CO between FVS. and TD with PAC.
RESULTS. A total of 109,706 hemodynamic measurements were performed in 30 patients. $3{,}657 \pm 1{,}732$ hemodynamic data were obtained from each patient. In all patients, the difference between FVS.-CO and TD-CO correlates linearly with systemic vascular resistance (Correlation coefficient $r = 0.762 \pm 0.084$, $p < 0.0001$) regardless of any administration of catecholamines and vasodilators.
CONCLUSIONS. The accuracy of FVS. (ver. 3.02) correlates linearly with systemic vascular resistance without relation to cardiovascular agent.
GRANT ACKNOWLEDGMENT. This research was partially supported by Edwards Lifesciences.



Representative Case

0993
CHANGES IN SKELETAL MUSCLE NADH REDOX STATE, TISSUE OXYGENATION AND MICROVASCULAR BLOOD FLOW DURING GRADED HAEMORRHAGE

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INTRODUCTION. Adequate tissue perfusion implies sufficient delivery of oxygen and substrate to meet cellular metabolic needs. The reduced form of nicotine adenine dinucleotide hydride (NADH) provides electrons to the mitochondrial electron transport chain (ETC.). A rise in the NADH:NAD + ratio (redox state) occurs with a downstream block in the ETC., e.g. due to insufficient oxygen provision. This can be tracked non-invasively by following changes in NADH fluorescence intensity.
OBJECTIVES. To examine the relationship between changes in skeletal muscle NADH fluorescence intensity, tissue oxygen tension and microcirculatory blood flow with concurrent measures of global tissue perfusion and haemodynamics during graded haemorrhage.
METHODS. Anaesthetised male Wistar rats (300–400 g) underwent left common carotid and right jugular venous cannulation and tracheostomy. Changes in mitochondrial NADH were determined by excitation of the surface of the left gracilis muscle and detection of fluorescence intensity measured at 420 nm (MitoViewer, Prizmatix, Israel). Tissue PO_2 and microvascular blood flow were determined using a combined fibreoptic sensor utilizing fluorescence quenching and laser Doppler flowmetry (Oxylite, Oxford Optronix, UK) placed into the right gracilis muscle. Controlled haemorrhage was achieved by sequential removal of 10 % estimated circulating blood volume (based on a total of 70 ml/kg) from the arterial line at 15 min intervals, from which blood gas analyses were also undertaken. Echocardiography was performed 11 min after each haemorrhage.
RESULTS.

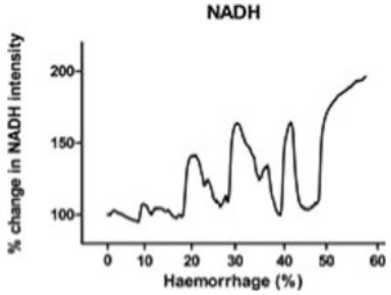

Figure 1 Changes in skeletal surface NADH fluorescence intensity following incremental haemorrhage in an individual animal. Due to physiological compensation, the NADH:NAD + ratio recovers until 50 % of blood volume had been removed

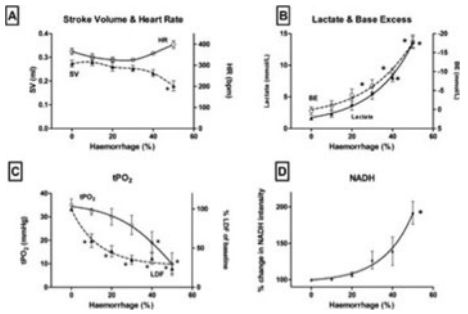

Figure 2

Effects of graded haemorrhage on haemodynamic, tissue PO_2 (tPO_2), microvascular flow, NADH levels and blood gas biochemical variables. SV, Stroke volume; HR, heart rate, BE, arterial base excess; LDF, laser Doppler flow. Data expressed as mean ± SEM. n = 6. *p < 0.05 vs. baseline (1-way RM-ANOVA followed by Dunnett's Multiple Comparison Test).
With each successive haemorrhage, NADH fluorescence intensity rose to a greater peak and then declined, due to haemodynamic/metabolic compensation, until haemorrhage became so severe that compensation was not possible. In contrast, laser Doppler blood flow and tissue PO_2 both decreased with a rising arterial base deficit and lactate. Stroke volume and heart rate were maintained until blood loss became too severe.
CONCLUSIONS. Changes in NADH fluorescence, tissue oxygen tension and laser Doppler flow represent a useful multi-parameter approach for continuous monitoring of the energetic state of tissues during a circulatory insult.
REFERENCE(S). Clavijo J, et al. Med Sci Monit. 2008;14(9):BR175–82.
GRANT ACKNOWLEDGMENT. Medical Research Council (UK).

0994

PROGNOSIS VALUE OF TISSUE OXYGEN SATURATION RECOVERY SLOPE DURING A VASCULAR OCCLUSION TEST IN CARDIOGENIC SHOCK PATIENTS

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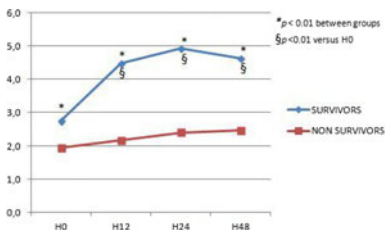
INTRODUCTION. Cardiogenic shock results in microcirculatory regulation disorder that may be involved in the development of multiorgan failure (MOF) and death [1]. Tissue oxygen saturation (StO_2) reperfusion slope impairment after vascular occlusion test (VOT) in septic shock patients is associated with a poor outcome [2].
OBJECTIVES. To evaluate the prognosis value of dynamic thenar oxygen saturation response using a VOT during severe cardiogenic shock.
METHODS. A retrospective clinical observational analysis was performed on adult patients treated for severe cardiogenic shock in a surgical ICU. The non-invasive InSpectra™ near infrared spectrometer was used to assess the effect of VOT on thenar eminence StO_2. The inclusion occured within the first 24 h after ICU admission and VOT was repeated during 48 h. StO_2, resaturation rate after VOT, serum lactate and haemodynamics parameters were compared between ICU survivors and non survivor, at inclusion, 12, 24 and 48 h.
RESULTS. 38 patients suffering from cardiogenic shock (mean ± SD: age 54.9 ± 13.8 years; APACHE score 20.5 ± 11.1) were treated with inotropes (n = 28; 74 %) and/or circulatory mechanical assistance (12 IABP, 10 ECLS) and vasopressors (n = 33; 87 %) without significant difference between groups. Mortality in ICU was 47 % (n = 18). The SOFA score was more important in non survivors (12.4 ± 3.3 vs. 9.7 ± 2.1, $p < 0.01$). Haemodynamic and metabolic parameters were not different between survivors and non survivors except for SvO_2 that is lower in non survivors (57.5 ± 14 vs. 68.3 ± 11; $p = 0.02$). Post-VOT recovery slope was low at the inclusion but faster in survivors than in non survivors (2.7 ± 0.9 vs. 1.9 ± 1; $p = 0.02$). Then, the recovery slope increased in survivors (from 2.7 to 4.5 at H12 $p < 0.001$, 4.9 at H24 $p < 0.001$, 4.6 at H48 $p < 0.001$) and not in non survivors (from 1.9 to 2.2 at H12 $p = 0.59$, 2.4 at H24 $p = 0.15$, 2.5 at H48 $p = 0.24$). The SOFA score remains different at H48 (13.9 ± 2.9 in non survivors vs. 9.8 ± 2.7; $p < 0.001$).



StO_2 recovery slope&&&

CONCLUSIONS. Our results suggest that, in patients treated for cardiogenic shock, the post-VOT StO_2 recovery slope within the first 24H after ICU admission indicates a poor outcome if very low. Rapid improvement of this parameter is associated with a better prognosis.
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0995

THE PAC STRIKES BACK. A STUDY OF PULMONARY ARTERY CATHETER (PAC) USE IN THE SOUTH WEST REGION OF THE UK

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INTRODUCTION. The PAC has been used for over 35 years [1]. Despite being considered as the "clinical standard" for cardiac output assessment [2], PAC use has declined in general Intensive Care Units (ICUs) [3]. This decline is likely to have been influenced by the debate surrounding the Connors study [4] and PAC-Man trial [1] and the increase in the number of techniques available for measuring cardiac output.
OBJECTIVES. Determine the number of PACs inserted between 2006 and 2011 in the South West region of the UK.Survey all the Intensivists in the region regarding their attitudes towards PACs.
METHODS. Each ICU in the South West region of the UK was asked how many PACs they inserted each year between 2006 and 2011. Of the 15 ICUs in the region only 5 were able to supply this data. In light of this BD Medical provided data on the number of PACs sold to each ICU. A survey was sent to every Intensivist in the region asking their age, PAC experience, indications for PAC use and which technology they most often use for calculating cardiac output.
RESULTS. Between 2006 and 2011 PAC use in 11 of the ICUs of District General Hospitals (DGHs) in the South West region of the UK declined from 33 to 0.PACs are still being used in the 2 Tertiary Hospitals and in 2 DGHs. In 2008 PAC use and supply in the Tertiary Hospitals reached a nadir. PAC supply to 1 of the DGHs still using PACs reached a low point a year later. In all 3 of these hospitals, PAC use has increased since 2009.The other DGH still using PACs inserted 67 in the 5 year period but were unable to give a yearly use. 58 out of 134 Intensivists replied to the survey.42 had placed between 10 and 100 PACs with 44 saying they had not inserted a PAC in over a year. 58.6 % stated that PACs have a place in their clinical practice. The most common indications for PAC use were to assess right heart function (73.5 %), to calculate cardiac output (70.6 %) and to guide inotropic or vasoactive drug treatment (70.6 %). The most favoured technology for calculating cardiac output was the PiCCO (58.2 %). Only 1 Intensivist favoured the PAC.5 people said they use a PAC in patients with an intra-aortic balloon pump.
CONCLUSIONS. Most DGH ICUs within the South West region of the UK no longer use PACs. In these hospitals the PiCCO is the most popular method of assessing cardiac output. In contrast to this, PAC use and supply are increasing in the Tertiary Hospital ICUs. The PAC still has a place in clinical practice, especially in assessing right heart function.
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0996

THE ESTIMATION OF CARDIAC OUTPUT BY THE NEXFIN DEVICE IS OF POOR RELIABILITY FOR TRACKING THE EFFECTS OF A FLUID CHALLENGE

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INTRODUCTION. The Nexfin device estimates arterial pressure by the volume clamp method through a finger pneumatic cuff. It also allows to estimate cardiac index (CI_{noninv}) by pulse contour analysis of the non-invasive arterial pressure curve.
OBJECTIVES. We evaluated the ability of the device to track changes in cardiac index induced by a standardized fluid challenge.
METHODS. We included 45 patients for whom a volume expansion (500 mL of saline infused over 30 min) was planned. The changes in cardiac index measured by transpulmonary thermodilution (CI_{inv}, PiCCO device) and in CI_{noninv} induced by volume expansion were recorded.
RESULTS. In seven patients, the Nexfin could not record the arterial curve due to finger hypoperfusion. In the 38 remaining patients, fluid administration increased CIinv ≥ 15 % in 16 "responders". Considering both the values obtained before and after volume expansion (n = 152 pairs of measurements), the bias [lower–upper limits of agreement] between CI_{inv} and CI_{noninv} were 0.2 [−1.8 to 2.2] L/min/m^2. The percentage of error of CI_{noninv} was 57 %. The correlation between the changes in CI_{inv} and CI_{noninv} observed during volume expansion was significant ($p = 0.0002$) with an $r^2 = 0.31$. The concordance rate between the changes in CI_{inv} and CI_{noninv} induced by volume expansion was 76 %, meaning that in 76 % of instances, CI_{inv} and CI_{noninv} changed in the same direction. When excluding changes lower than 12 %, the concordance rate was 83 %.
CONCLUSIONS. The estimation of CI by the Nexfin device in critically ill patients is not reliable, neither for estimating absolute values of CI, nor for tracking its changes during volume expansion.

0997

THE PLETH VARIABILITY INDEX IS A WEAK PREDICTOR OF FLUID RESPONSIVENESS IN PATIENTS RECEIVING NOREPINEPHRINE

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INTRODUCTION. The pleth variability index (PVI), an automatic measurement of the respiratory variation of the oximeter plethysmographic waveform, has been shown to predict fluid responsiveness in the peri-operative setting.
OBJECTIVES. We assessed the reliability of PVI for predicting fluid responsiveness in patients with acute circulatory failure receiving norepinephrine and compared it with pulse

pressure variation (PPV) and respiratory variation of the pulse contour analysis-derived stroke volume (SVV).
METHODS. We included 42 patients with circulatory failure receiving norepinephrine. Patients with arrhythmias, spontaneous breathing, tidal volume <8 mL/kg and respiratory system compliance <30 mL/cmH_2O were excluded. We measured the response of cardiac index (transpulmonary thermodilution) to fluid administration (500 mL saline). Before fluid administration, we recorded PPV and SVV (PiCCO_2) and PVI (Masimo Radical-7).
RESULTS. In seven patients, the plethysmographic signal could not be obtained. Among the 35 remaining patients (SAPSII = 77 ± 17), fluid increased cardiac index ≥15 % (35 ± 24 %) in 15 "responders". A PVI at baseline ≥16 % predicted fluid responsiveness with a sensitivity of 47 [21–73] % and a specificity of 90 [68–99] %. The area under the ROC curve was significantly lower for PVI (0.68 ± 0.09) than for PPV and SVV (0.93 ± 0.06 and 0.89 ± 0.07, respectively). Considering all the pairs of measurement performed during the study, PVI was correlated with PPV ($r^2 = 0.27$). The fluid-induced changes in PVI and PPV were not significantly correlated.
CONCLUSIONS. The prediction of fluid responsiveness by PVI was less reliable than PPV and SVV in critically ill patients with circulatory failure receiving norepinephrine. In addition, the plethysmographic signal could not be obtained in a non-negligible proportion of patients.

0998
REPRODUCIBILITY OF TRANSPULMONARY THERMODILUTION CARDIAC OUTPUT MEASUREMENTS IN CLINICAL PRACTICE: A SYSTEMATIC REVIEW

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INTRODUCTION. The measurement of cardiac output (CO) is an integral part of the diagnostic and therapeutic strategy in critically ill patients [1]. Over the last decade, the single transpulmonary thermodilution (TPTD) technique was implemented in clinical practice [2].
OBJECTIVES. The purpose of this paper is to systematically review and critically assess the existing data related to the reproducibility of CO measured by TPTD (CO^{TPTD}).
METHODS. Studies were identified by a Medline search (1965–2011) using the following keywords: "TPTD AND reproducibility"; "TPTD AND precision"; "TPTD AND CO" with an additional computerized search "ISI Web of Knowledge". 14 studies were identified as having the potential to be included in our study with the required information allowing the calculations of the reproducibility of CO^{TPTD} measurements.
RESULTS. In total, 2722 averaged CO values (8385 TPTD boluses) were analyzed with a maximum of 455 CO values (1365 TPTD boluses) and a minimum of 25 CO values (100 TPTD boluses) per study. The overall reproducibility of CO^{TPTD} was 6.1 ± 2 % from the fourteen selected studies. The reproducibility is significantly improved if 3 boluses are averaged to obtain a value of CO ($p = 0.02$), however, it is not better beyond 3 bolus ($p = 0.2$) (Figures).
CONCLUSIONS. The present results highlight that TPTD is a highly reproducible technique for monitoring critically ill patients' CO. Our findings suggest that an average of 3 measurements for determining CO is recommended.

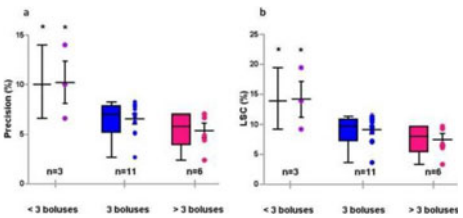

Figure a, b Box & Whiskers and aligned plots representing the precision (a) and the least signification change (LSC)(b) whether less than 3 boluses, 3 boluses and more than 3 boluses were administered to realize the transpulmonary thermodilution. * : $p = 0.02$
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0999
GLUTAMYL AMINOPEPTIDASE IS A PREDICTIVE MARKER OF EARLY ACUTE RENAL FAILURE IN PATIENTS UNDERGOING CARDIAC SURGERY

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OBJECTIVE. Studies in experimental animals have found that aminopeptidases are early markers of Acute kidney injury (AKI). This study examines whether the glutamyl aminopeptidase (GluAP) is an early marker of AKI compared with other renal markers in patients undergoing cardiac surgery.
METHODS. Prospective study conducted in patients undergoing cardiac surgery and admitted to ICU over a period of 4 months (September-December 2011). Urine samples were collected serially and was determined the GluAP activity (pmol/ml min) by the kinetic fluorimetric method at different times (before surgery, ICU admission, 12 h, 24 h, 48 h). We also collected: urine creatinine, microalbuminuria (normal range <3 mg/dl), proteinuria (normal range <14 mg/dl) and serum creatinine. AKI was defined as an increase in serum creatinine of 50 % in the first 48 h after surgery. Statistical analysis: descriptive, Mann–Whitney test, Fisher exact test, Spearman correlation analysis and receiver operating characteristic curve conventional and the area under the curve (AUC).
RESULTS. 15 patients (61 ± 15 years, BMI 29 ± 3.9 kg/m^2). The GluAP before surgery, ICU admission, 12 h, 24 h and 48 h were respectively: 62 ± 29, 285 ± 354, 167 ± 154, 120 ± 119 and 60 ± 35. Proteinuria was 16 ± 24, 92 ± 254, 43 ± 43, 31 ± 32 and 13 ± 13. Microalbuminuria was 2.4 ± 4.9, 1.6 ± 2.05, 1.6 ± 1.48, 2.3 ± 2.7 and 2.1 ± 3.30. One third of patients developed AKI (5/15). The GluAP in the group with and without AKI was respectively 65 ± 41 and 60 ± 17 (Mann–Whitney test p = 0.12). The GluAP at admission is correlated with creatinine measured at 48 h (r = 0.63, p = 0.040). The AUC GluAP at admission was 0.92 ± 0.09.
CONCLUSIONS. With the limitation of our study sample, enzymatic GluAP activities could be early urinary biomarker of renal dysfunction in the patients undergoing cardiac surgery.

1000
COMPARING INVASIVE AND LESS-INVASIVE CARDIAC OUTPUT MEASUREMENT DEVICES DURING EXTERNAL LEG COMPRESSION

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INTRODUCTION. The circular, inflatable external leg compression (ELC) from lower to upper legs may increase cardiac output (CO) [1]. We compared changes in CO, which was invasively measured with thermodilution and with less invasive methods based on arterial pressure wave analysis (ModelflowTM) or transoesophageal Doppler ultrasound (HemoSonicTM).
OBJECTIVES. To compare hemodynamic responses during ELC measured by thermodilution, ModelflowTM, and HemosonicTM.
METHODS. Sixteen mechanically ventilated patients in the intensive care unit after major cardiac surgery were studied. ELC was inflated to 30 cmH2O for 15 min. Hemodynamics were recorded by thermodilution (COtd), ModelflowTM (COmf) and HemosonicTM (COhs) prior, during and after each intervention.
RESULTS. The ELC increased COtd from 6.4 ± 1.8 to 6.7 ± 1.9 L.min-1 (P = 0.001) and COmf from 6.9 ± 1.7 to 7.1 ± 1.8 L.min-1 (P = 0.021). There was no increase in COhs. There were good correlations between COtd and COmf before/during ELC ($r = 0.70$, $P < 0.001$). COtd and COhs before/during ELC were less correlated ($r = 0.46$, $P = 0.008$). Conversely, the correlation between COmf and COhs before/during ELC was r = 0.54, P = 0.003.

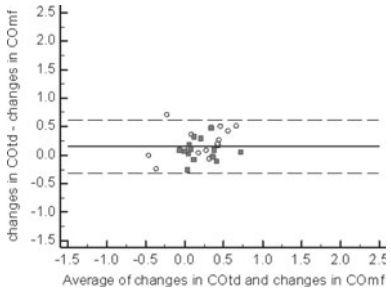

Figure 1. COtd and COmf

Bland–Altman analysis (Figure 1 and Figure 2) showes lower limits of agreement with changes in COtd for COmf (bias 0.15 L.min-1 and limits of agreement -0.3 to 0.6 L.min-1) than for COhs (bias 0.09 L.min-1 and limits of agreement -0.9 to 1.1 L.min-1).

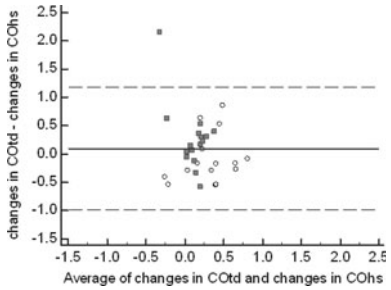

Figure 2. COtd and COhs

CONCLUSIONS. These results suggest that the less invasive CO measurement by ModelflowTM can detectthe changes of CO as by thermodilution during circular ELC.
REFERENCE(S). 1. de Wilde R et al.: Anaesthesia. 2009;64:762–9.

1001
HEMODYNAMIC ASSESSMENT IN CRITICALLY ILL DURING ALBUMIN DIALYSIS

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INTRODUCTION. In modern intensive care, there is a tendency to substitute invasive procedures with minimally invasive procedures, which are equally effective as former, as far as measurements are concerned.
OBJECTIVES. The objective of our study was to assess usefulness of bedside echocardiography monitoring in critically ill during MARS treatment.
METHODS. In the period of 2006 - 2011 albumin dialysis was performed in 72 patients. Mean age of patients was 51 years, the average SAPS II score was 35 points. Indications for albumin dialysis were: acute liver failure in 7 patients (9,1 %) and acute on chronic liver failure in 65 patients (90,9 %). All patients had dialysis catheter introduced which was used for treatment and for measuring CVP. Systemic blood pressure was measured noninvasively with blood pressure cuff. Cardiac index (CI) was measured with bedside echocardiography.

Doppler examination of portal circulation was not performed. Hemodynamic parameters and metabolic data were compared before and after albumin dialysis. Patients were qualified into 2 groups: group I with ALF (Acute Liver Failure) and group II with AoCLF (Acute on Chronic Liver Failure). Results are presented below. For comparing variables Chi^2 test was used. P value was statistically significant when < 0.05.
RESULTS. Results are presented in the table below.

Final results

	AoCLF		ALF		p	
	Before treatment	After treatment	Before treatment	After treatment	AoCLF	ALF
CI l.min-1.1.73m2	10,7	8,2	6,2	5,8	p < 0,05	p < 0,05
SVRI dynnes.s.cm-5.mmHg.s.l-1	620	910	720	890	p < 0,05	ns
MAP mmHg	58	72	60	74	p < 0,05	ns
CVP mmHg	8	6	8	7	ns	ns
HR	120	92	110	95	ns	ns
Billirubin in mg %	25	16	5	3	p < 0,05	ns
F V in %	25	42	30	45	p < 0,05	ns
Ammonia µmol/l	120	80	110	85	p < 0,05	ns

CONCLUSIONS. In authors opinion, hemodynamic assessment with bedside echocardiography in patients during albumin dialysis is very interesting alternative for invasive methods. Comparative studies concerning this problem have not been published yet, but literature review shows similar results with our study.
REFERENCE(S). 1. Horster S, Crit Care Res Pract. 2012;270631. Epub 2011 Nov 29.

1002

NON-INVASIVE CONTINUOUS DETERMINATION OF MEAN ARTERIAL BLOOD PRESSURE USING THE T-LINE TL-200PRO DEVICE IN CRITICALLY ILL MEDICAL PATIENTS

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INTRODUCTION. The T-Line TL-200pro device (Tensys Medical Inc., San Diego, CA, USA) is the most recent version of the T-Line system measuring arterial blood pressure (BP) based on radial artery tonometry. This non-invasive, continuous BP monitoring device measures mean arterial pressure (MAP) and subsequently provides a BP waveform.
OBJECTIVES. To evaluate the accuracy of MAP measurements using this non-invasive technique for continuous BP monitoring in medical intensive care unit (ICU) patients.
METHODS. MAP measurements obtained using the T-Line TL-200pro system were compared with invasively assessed MAP values (femoral arterial catheter placed in the abdominal aorta) in 25 medical ICU patients (German university hospital). We simultaneously recorded 32,110 pairs of beat-to-beat MAP values using the T-Line TL-200pro system and the arterial catheter. BP values were analyzed and compared in 3,211 averaged 10-beat epochs.
RESULTS. MAP obtained using the T-Line TL-200pro device and invasively assessed MAP were highly significantly correlated (between subject correlation 0.948; within subject correlation 0.575; $p < 0.001$ for both). The percentage error for MAP determination was 13 %. For MAP measured based on radial artery tonometry a mean 10-beats average difference of $+0.72 \pm 5.60$ mmHg was observed when compared to invasively assessed MAP.
CONCLUSIONS. In medical ICU patients, the T-Line TL-200pro technique is able to determine MAP with a low mean difference and a percentage error of 13 % compared with MAP values obtained using a femoral arterial catheter.
GRANT ACKNOWLEDGMENT. Tensys Medical Inc. provided the monitoring equipment and a computer for data recording.

1003

A NOVEL COMPUTER-CONTROLLED HIGH RESOLUTION VIDEO MICROSCOPY IMAGING SYSTEM ENABLES MEASURING MUCOSAL SUBSURFACE FOCAL DEPTH FOR RAPID ACQUISITION OF ORAL MICROCIRCULATION VIDEO IMAGES

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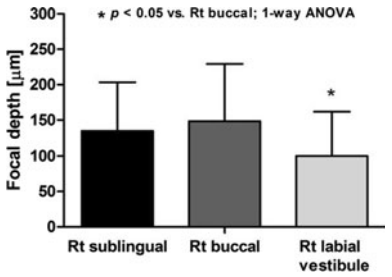
INTRODUCTION. The oral mucosa is prone to variations in epithelial thickness due to edema as a result of fluid imbalances or treatment related procedures. However, a baseline distance between the subepithelial microcirculation and the epithelial surface has never been reported before in real-time noninvasively.
OBJECTIVES. The aim of this study was to measure and compare mucosal focal depths in vivo in three regions in the oral cavity using a novel computer-controlled high resolution video microscopy imaging system.
METHODS. Seven healthy subjects (3 females, 4 males) with a mean age of 29 ± 5 years with no history of systemic disease or diseases in the oral cavity were recruited. In each participant noninvasive mucosal focal depth measurements for optimal microvascular imaging quality in 5 areas in three locations (i.e. right sublingual, right buccal, and right labial vestibular mucosa) were obtained using a video microscopy imaging apparatus (Braedius Scientific BV, Huizen, The Netherlands) equipped with a precision-controlled focal depth measuring system. A one-way analysis of variance (ANOVA) was used to compare the measured tissue depths for all three locations.
RESULTS. Mean sublingual, buccal, and labial vestibular mucosa focal depth for achieving optimal image quality were 134.7 ± 68.6 µm, 148.4 ± 80.9 µm, 100.1 ± 61.8 µm respectively.



Figure

Large variations in buccal measurements were observed while sublingual and labial vestibular areas shared relatively common deviations. A statistically significant difference in focal depth was observed between labial vestibular and buccal mucosa ($p < 0.05$).
CONCLUSIONS. We describe for the first time in vivo real-time quantifications of focal depth positions for achieving proper microcirculatory image quality in three separate oral regions. Our results indicate that the narrow variations in the sublingual and labial vestibular areas reveal these locations to be the most stable for microcirculatory assessments. With the introduction of this innovative high resolution video microscopy system, the advantage of gauging focal depth positioning may provide a rapid way of maintaining a margin of focus in a region of interest and thereby decreasing the time necessary to obtain high quality images in a rapid paced intensive care setting.

Bundles for ICU infections: 1004–1017

1004

SOME STRAINS OF HOSPITAL-ASSOCIATED METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* HAVE POTENTIALITY TO DAMAGE PRIMARY HUMAN KERATINOCYTE TO INDUCE RECURRENT INFECTIONS

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INTRODUCTION. Lethal nosocominal infections caused by multiple-antibiotic-resistant bacteria are still world-wide concerns and HA-MRSA (hospital-associated methicillin-resistant staphylococcus aureus) is one of the most frequently causative pathogens in healthcare facilities. The mechanism of acquiring antibiotic resistance has been gradually elucidated, whereas there are few reports about the cytotoxicity of HA-MRSA. Generally, HA-MRSA is regarded as not menace for healthy individuals and its risk is confined to patients with predisposing risk factors. Furthermore, the spread of community-associated (CA)-MRSA which induce severe connective-tissue infections to even healthy young individuals draws much attentions to the virulence of CA-MRSA.
OBJECTIVES. The aim of this study is to find a clew of answer for following questions, Does HA-MRSA have any cytotoxicity to host tissue cells? Is obtaining antibiotic resistance free of virulence to host tissue cells?
METHODS. Several *S.aureus* strains were co-incubated with cultured primary human host-tissue cells (keratinocyte, fibroblast, etc.) and evaluated following issues. (1) host-tissue cell damages, (2) cytokine productions from host-tissue cells, and
(3) expressions of neutrophil adhesion molecules on dermal microvascular endothelial cells.
RESULTS. Some strains of *S.aureus* with multiple-antibiotic-resistance including vancomycin caused more damages to keratinocyte by invading host cells, cytokine productions from keratinocyte and expressions of neutrophil adhesion molecules on dermal microvascular endothelial cells. Additionally, we obtained new indications that plasmid responsible for gentamicin resistance is correlated with these observed phenomena.
CONCLUSIONS. Some strains of HA-MRSA have potentiality to damage keratinocyte by facilitating bacterial internalization and may partly contribute to recrudescent infections. Obtaining antibiotic resistance may accompany cytotoxicity to host cells and modulation of host-immune responses. HA-MRSA may have unrecognized other aspects than multiple antibiotic resistance.
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GRANT ACKNOWLEDGMENT. This work is supported in part by a Grant-in-Aid for Scientific Research Project for Private Universities from the Ministry of Education, Culture, Sports, Science and Technology of Japan.

1005

OPTIMIZATION OF PREVENTIVE INSULATION IN INTENSIVE CARE UNIT

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INTRODUCTION. The administrative segregation is the application of contact isolation measures in patients highly suspected of being colonized by multiresistant pathogens. Currently, its aplicability in Intensive Care Unit (ICU) is not well standarized.
OBJECTIVES. Assess the impact of an intervention program based on the application of a Preventive Isolation Protocol (PIP) on admission to an ICU of a general hospital.
METHODS. Descriptive and comparative analysis of two cohorts of patients. A historical retrospective that included patients who were scheduled preventive isolation prior to commencement of PIP (January 2010 to November 2010) and other prospective patients including those who applied the PIP (December 2010 to November 2011). The PIP included the identification and dissemination of preventive isolation criteria, the methodology to be followed regarding the taking of samples (rectal swabs), assessment of results and criteria for withdrawal of the insulation. Developed a case report including demographic data, severity at admission (APACHE II), criteria to indicate the administrative segregation, duration, surveillance samples requested and results thereof. For comparison of results we used the "Chi square test" for qualitative variables and "Student t test" for quantitative variables. Accepted as significant differences with $p < 0.05$.
RESULTS. Indicated a total of 199 isolates preventive, 96 (48.2 %) in the run and 103 (51.8 %) in the aftermath of PIP. No differences were detected in age, APACHE II, risk

factors intrinsic or extrinsic, or vital status between the two periods. The implementation of the PIP has led to: a) Reduce the number of no indicated isolations (31.25 % vs. 8.73 %, $p < 0.0001$), b) Reduce the time for taking samples (1.61 days vs. 0.53 days, $p < 0.0001$), and c) Reduce the day of isolation (4.71 days to 3.81 days, $p < 0.0001$). In 10 patients, in the first period, no samples were taken from surveillance. In 85 patients (42.71 %) has been isolated a germ, being 31 (16.4 %) identified as multiresistant pathogens (contact isolation required). The isolation rate of multiresistant pathogens was 15.6 % in the first period and 18.4 % in the second ($p < 0.790$).

CONCLUSIONS. The application of an intervention program consisting of a multidisciplinary team and monitored by the nursing team has optimized preventive isolates in a general ICU of a general hospital. After the start of PiP have been reduced preventive isolates not indecated, has reduced the time between isolation and sample collection and isolation reduced the time where you do not need.

1006
IMPROVING ICU DOCUMENTATION AND REDUCING BLOOD STREAM INFECTIONS

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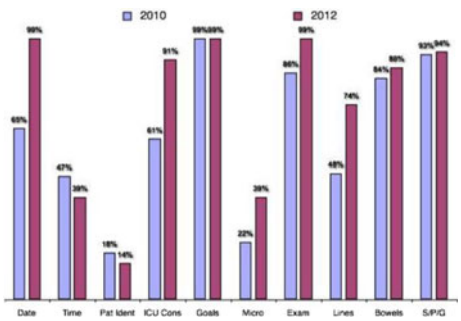
INTRODUCTION. Accurate case note documentation is vital for excellent patient care. Patient notes are a legal document. They are also required for audit and research to aid service improvement. The GMC make reference to 'clear, accurate & legible records' in the Good Medical Practice document.[1] Catheter-related bloodstream infections (CRBSI) carry a significant morbidity and mortality[2]. VIP (Visual Infusion Phlebitis)[3] scores are an important system of monitoring line insertion site and may suggest when lines need to be changed. This audit examined whether improving documentation would have an impact on the incidence of bacteraemias in general and specifically CRBSIs.

OBJECTIVES. To audit case note documentation within the ICU daily review sheet and compare to a previous audit (Oct 2009–Jan 2010). The prevalence of bacteraemias for these time periods were also compared.

METHODS. Daily review sheets were inspected for completion of 10 components in. These included: date, time, patient identifier, ICU Consultant, daily goals, microbiology review, examination, line review, bowel protocol/prokinetic use, signature/name/grade of person completing review. The line review had to include type and site of line as well as the VIP(Visual Infusion Phlebitis) score.[3]

RESULTS. There were improvements in 7 out of 10 components compared to the previous audit and one duplicate result of 99 % for documentation of daily goals (see graph). Some parts of documentation remain poor, but large increases in compliance (greater than 15 %) can be seen in over half of the improved components (4 out of 7).



Comparison of documentation compliance

Of particular interest there was a notable increase in the documentation of line reviews from 48 % to 74 %. This improvement was accompanied by a decrease in the total number of bacteraemias which was 28.2/1,000 patient days in the first time period and 7.2/1,000 patient days in the second.

CONCLUSIONS. The increased awareness and emphasis on documentation within the daily review sheets correlated with a reduction in the rate of bacteraemias. Although there may be additional factors, the daily review sheet acts as a regular reminder for line reviews and a stimulus for the question 'should this line be removed or replaced?' and is a simple and effective improvement measure.

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1007
FUNGAL INFECTION IN GASTROINTESTINAL PERFORATION

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INTRODUCTION. Gastrointestinal perforation is a frequent entity in a Polyvalent Intensive Care Unit. Given its severity it is essential an early intervention with empiric antibiotic therapy and therefore it is also crucial knowing the spectrum of most frequent agents. Fungal intraabdominal infection is common, with an estimated prevalence of 5–33 %, but the pathogenic role of *Candida* in these situations is debatable. International guidelines show controversy about whether the empiric antifungal should be used in all critically ill patients or only in certain groups associated with a higher risk.

OBJECTIVES. To estimate the prevalence of fungal intraabdominal infections in surgical patients with gastrointestinal perforation and to characterize this population.

METHODS. A retrospective study of a period of 2 years and 3 months through consultation of medical records of patients diagnosed with gastrointestinal perforation admitted to the Unit.

RESULTS. We identified 78 cases of peritonitis or mediastinitis secondary to gastrointestinal perforation, which corresponds to 6.3 % of all admissions. Mycological examination of pleural or ascitic fluid was performed in 47.4 % of these patients (n = 37). *Candida* was isolated in 24.3 % of these 37 cases, namely *Candida albicans* (n = 7) and *glabrata* (n = 2). This infection was more frequent in some specific groups: esophageal or gastric perforations; elderly patients; patients who had received broad-spectrum antibiotics; inpatient setting. Although the isolation of *Candida* showed no association with increased mortality in the Unit, it was associated to a higher percentage of septic shock and to intraabdominal complications. All patients with *Candida* isolation had a high risk for this infection according to guidelines and thus had a formal indication for empirical antifungal therapy.

CONCLUSIONS. The isolation of *Candida spp* after gastrointestinal perforation is not uncommon. It is especially frequent in groups with higher risk for intraabdominal fungal infection. These data justify the development of a prospective study to confirm the relevance of empirical use of antifungal in all critically ill patients with gastrointestinal perforation.

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1008
EPIDEMIOLOGICAL TRENDS OF FUNGAL INFECTIONS IN ADULT ICU PATIENTS

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INTRODUCTION. Fungi are the 4th most commonly isolated microorganisms in ICU patients after *St. aureus, Ps. aeruginosa* and *E. coli* [1].

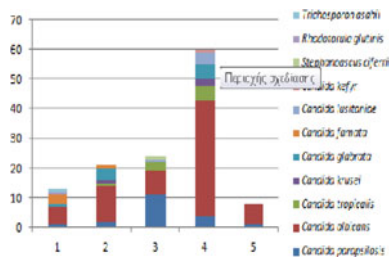
OBJECTIVES. The aim of this ongoing study is to explore the epidemiology of fungi positive cultures from adult ICU patients in a tertiary hospital.

METHODS. In an ongoing observational study we recorded every positive culture for fungi since 1/1/2008 in our 10 bed polyvalent ICU. This corresponded to a total of 1,432 patients and 10,900 ICU days. The current results refer to a 50 month period (1/1/2008 till 29/2/2012) and were recorded and categorized with MS Office Excel 2007. Positive cultures prior ICU admission were excluded.

RESULTS. Out of the 126 positive cultures recorded 98.4 % were *Candida spp.. Non-albicans* were isolated in 54 samples (42.8 %), the most common species being *C.parapsilosis, C.glabrata and C.Tropicalis*. Candidemias accounted for 11.12 % (n = 13) and related CRI for 0.5 % (n = 2) of cases. No resistance to anti-fungal agents was detected. Detailed results are seen in graph 1 and table 1.

Fungi distribution and localization

2008–2012*	Protected tracheal specimen	Urine	Blood	Surg. wound	Ascites	Redon	CVC	Pus	Other
Candida parpsilosis	1	12	5	0	0	1	0	0	0
Candida albicans	10	35	5	4	7	0	5	1	3
Candida tropicalis	1	5	1	0	1	0	1	0	0
Candida krusei	0	2	0	1	0	0	0	0	0
Candida glabrata	2	4	3	1	0	0	0	0	0
Candida famata	3	0	0	0	0	0	0	0	1
Candida lusitaniae	1	3	0	1	0	0	0	0	0
Candida kefyr	0	1	0	0	0	0	0	0	0
Other	1	3	0	0	0	0	1	0	0



Graph 1

CONCLUSIONS. In this ongoing observational single-center study we found that *Candida spp.* is the main pathogen in our ICU patients. The shift towards *non-albicans Candida spp.* as cause for invasive candidiasis reported from other studies, was not recorded [2]. Furthermore, the CVC related candidemia seems to be a minor problem in our unit. On the contrary a shift from *C.parapsilosis to C.albicans* is spotted. All isolated microorganisms were susceptible to currently available antifungal agents. Nevertheless, the tendency towards the continuous rising of fungal infections in ICU patients poses a challenge for the years to come.

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1009
CAN BIOMARKERS (CRP, WBC) DETECT INFECTION DURING MILD THERAPEUTIC HYPOTHERMIA?

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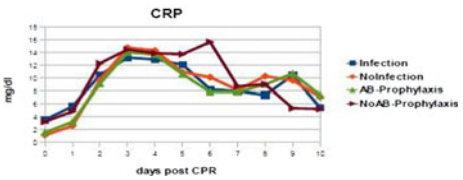
INTRODUCTION. The ILCOR-Guidelines recommend that unconscious adult patients with a spontaneous circulation after cardiac arrest should be cooled to 32–34 °C for 24 h to improve outcome parameters. However, the rate of infections during mild therapeutic hypothermia is significant elevated [1, 2]. Body temperature and hemodynamic parameters (HR, BP) seem to be weak criteria for infection in cooled and sedated patients.

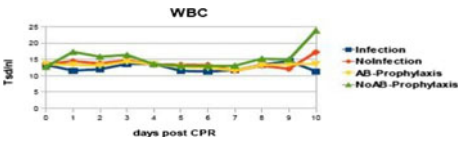
OBJECTIVES. To describe the time course of biomarkers (CRP, WBC) during mild therapeutic hypothermia and the influence of antibiotic prophylaxis.

METHODS. In this single-hospital study patients after cardiac arrest and mild therapeutic hypothermia were retrospectively investigated. Data collected: age, gender, initial rhythm, ICU-LOS, Hospital-LOS, CRP/WBC time course (admission >day 10), signs of infection (infiltrate on X-ray, positive urine sample, positive blood culture), outcome (poor outcome defined as death, vegetative state or severe disability).

RESULTS. 36 patients were included between January 2010 and July 2011. The median age of the patients was 64 (43–84) with 69 % male. Initial rhythm was ventricular fibrillation in 69 % of all cases. Infections during the hypothermia period were observed in 36 %. Antibiotic agents were prescribed in 72 % due to prophylactic intention. The time course of biomarkers CRP and WBC showed no significant difference between the groups infection/No Infection and AB-Prophylaxis/No AB-Prophylaxis. CRP rises up to the peak value at day 3/4 with a slow decrease until day 10, whereas WBC-values stayed in a smaller range.



CRP



WBC

CONCLUSIONS. CRP and WBC are unspecific biomarkers and mirrors rather an inflammatory reaction or reperfusion damage than true underlying infection, limiting the diagnostic potential for early antibiotic stewardship in these patients, especially in the first 5 days.

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1010
COMPLIANCE WITH GUIDELINES ON ANTIBIOTIC USAGE IN SEVERE ACUTE PANCREATITIS AND ASSOCIATED OUTCOMES

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INTRODUCTION. Infection in Severe Acute Pancreatitis (SAP) is a late presentation that develops in 30–50 % of patients with necrosis [1]. It occurs after 1 week in 25 % of patients with SAP and 75 % after 3 weeks, leading to sepsis and multi organ failure with 5-10 times higher mortality rate. Previous meta-analyses have demonstrated that prophylactic antibiotics do not reduce the risk of infection of necrotic pancreatic tissue [2] and is associated with an increase in pancreatic fungal infection [1].

OBJECTIVES. Measure compliance with current guidelines of avoiding prophylactic antibiotics in patients with SAP. Secondary objectives including investigating the relationship between white blood cell count (WCC), C-reactive protein (CRP) and patient outcomes.

METHODS. This is a retrospective case notes review of SAP patients requiring ICU admission during the period of 2008-2011 at the Royal Blackburn Hospital. Data collection included age, sex, WCC, CRP, antimicrobial management, length of stay (LOS) and mortality.

RESULTS. 43 SAP case notes were reviewed. There were 28 (65 %) female patients.

Cases characteristics (*mean [SD]; ^median [range])

	No prophylaxis (n = 6)	prophylaxis (n = 37)
Age (years)*	53 [28]	58 [17]
APACHE 2*	21 [11]	18 [8]
LOS (days)^	3 [1–26]	5 [1–74]
Mortality (n, %)	2 (33 %)	20 (54 %)

Prophylactic antibiotics were given in 35 (81 %) patients while treatment was commenced in two patients with positive blood cultures in the first week. The most common antibiotic combination was metronidazole, gentamycin and amoxicillin (12 patients). Metronidazole was the most commonly used combination antibiotic (27) followed by gentamycin (16) and amoxicillin (15). Tazobactam/piperacillin was the most common monotherapy (6). Other antibiotics used were cefuroxime, co-amoxiclav and meropenem. Thirteen (30 %) patients had positive blood cultures, most commonly enteric organisms (8), staphylococci (3) and candida (2). The relationship between WCC (10^9/L), CRP (mg/L) and SAP is shown in the table below. WCC peaked within 1 week from hospital admission, while CRP peaked in the third week. WCC and CRP trended higher in non-survivors.

WCC and CRP analysis (*mean [SD]; ^median [range])

	WCC (10^9/L)	CRP (mg/L)
Peak value (n = 43)*	25 [12]	376 [146]
Day of peak value (days) (n = 43)^	6 [1–66]	22 [1–57]
Survivors (n = 21)*	23 [11]	355 [153]
Non survivors (n = 22)*	26 [12]	396 [140]

CONCLUSIONS. Our audit of antimicrobial management in a single centre ICU within a regional HPB centre showed poor compliance with current evidence advising against the use of prophylactic antibiotics in SAP. Our data showed a CRP peak in the third week when necrotic infection may take place [3], while WCC peaked in the first week although most blood cultures remain negative. The lower LOS and higher mortality rate seen in our data in the prophylaxis group reinforces current guidelines against this practice.

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GRANT ACKNOWLEDGMENT. Royal Blackburn Hospital, ICU department.

1011
VANCOMYCIN PHARMACOKINETICS IN CRITICALLY ILL PATIENTS RECEIVED CRRT

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INTRODUCTION. Sometimes the antibiotics can also be eliminated when patients receive Continuous renal replacement therapy (CRRT). It makes the uncertain medicine clearance rate variation, thus make the medicine can't attain the blood density of the valid treatment.

OBJECTIVES. To identify the variables affecting vancomycin pharmacokinetics in ICU patients who receive CRRT, and to evaluate the potential efficacy of dosage schedules by PK/PD analysis, providing an excellent tool for choice of the best available therapy.

METHODS. Internalized ICU patients who accepted Vancomycin therapy, measured their serum creatinine (Scr) and endogenous creatinine clearance rate (CL_{CR}). All subjects were grouped into CRRT group and Non-CRRT group. Blood samples of ca. 5 mL were gathered prior to vancomycin administration (t = 0) and at 0, 0.5, 1, 2, 3, 4, 6, 8 h and before the fourth dose, after dosing. Patients' plasma samples were analyzed by FPIA method using Abbott AxSYM Vancomycin_II system. Pharmacokinetic parameters were calculated by DAS2.0 processing. A PK-PD modeling guiding evaluation was taken which contents PK parameters, PD parameters, and patients' information. In order to eliminate other factors to produce the impact of CRRT, the machine are from Baxter, filter is HF1200, blood flow velocity 150-180 ml/min ultrafiltration rate of 1,000–1,500 ml/h on the experimental results.

RESULTS. A total of 16 patients were included in the study. Vancomycin pharmacokinetic parameters in ICU patients meet the multi-compartment model, calculated in the two compartments model, the mean pharmacokinetics parameters of all patients are following: $t_{1/2\alpha} = 0.77$ h, $V_d = 0.28$ L/kg, $t_{1/2\beta} = 30.96$ h, CL = 0.052 L/min. CRRT group: $t_{1/2\alpha} = 0.31$ h, $V_d = 0.26$ L/kg, $t_{1/2\beta} = 17.58$ h, CL = 0.060 L/min. Compared with the population pharmacokinetic study, the distribution reduces to (0.11–0.64 vs. 0.5–1.0 h, $P < 0.01$), volume of distribution has been reduced. Non-CRRT group: $t_{1/2} = 1.23$ h, $V_d = 0.28$ L/kg, $t_{1/2\beta} = 44.34$ h, CL = 0.043 L/min. Non-CRRT group creatinine clearance, low levels of vancomycin clearance to reduce, $t_{1/2\beta}$ significantly prolonged compared CRRT group. Non-CRRT group, bivariate correlation analysis, we obtain the CL_{CR} with drug clearance rate CL presents the correlation coefficient $r = 0.8$ ($P < 0.05$), the SOFA score and CL correlation coefficient $r = 0.76$ ($P < 0.05$), albumin Alb and Vd correlation coefficient $r = 0.902$ ($P < 0.01$).

CONCLUSIONS. To compare with the patients without CRRT, the distribution volume of vancomycin in CRRT patients were apparently decreased, drug distribution, and elimination half-life was significantly slower than the non-CRRT group. Vancomycin pharmacokinetic parameters with the SOFA score showing a good correlation.

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1012
AUDIT AND ANTIMICROBIOGRAM OF ISOLATES OF CENTRAL VENOUS CATHETER BLOOD STREAM INFECTIONS IN A NINE BED CRITICAL CARE UNIT

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BACKGROUND and OBJECTIVES. Central venous catheter-related blood stream infections (CRBSI's) are associated with 10–20 % of hospital acquired infections reported in the UK [1], and are associated with increased length of ICU stay and mortality [2]. Migration of skin contaminants is the leading cause, and it has been shown that aseptic catheter insertion techniques are essential for reducing infection [3].

The aim of this audit was to determine the antimicrobial spectra of our isolates and their sensitivities, proportion that received antibiotics within a 48 h window of diagnosis and compare ITU length of stay between cases and controls.

METHODS. The Matching Michigan definition was used to identify all patients between January 2010 and September 2011 who met the criteria for CRBSI. 12 patients were identified, and 12 control patients were matched to the cases on the basis of age, sex and APACHE score. A retrospective review method was used to look at patient information obtained from the Critical Care electronic record, notes and microbiology.

RESULTS. Mean age of both groups was 60 and APACHE scores were 22 and 21 respectively (cases and controls.) Median line days were 15 and 6 and mean number of lines were 3 and 1, respectively, in cases and controls. Organism spectrum for confirmed cases of CRBSI is shown in Fig. 1.

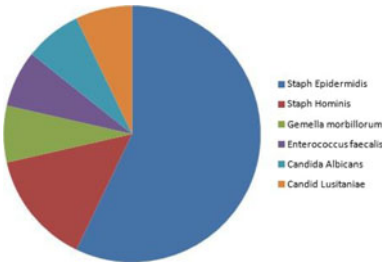

Fig.1 Organism spectrum in CRBSI cases

All bacterial isolates were sensitive to Vancomycin and Teicoplanin. All isolates were resistant to Benzyl Penicillin and demonstrated 88.9 % resistance to Flucloxacillin.
66 % of cases had sensitive antibiotics administered within 48 h of diagnosis.
Median ITU length of stay in cases and controls was 42.5 and 18.5 days, respectively. $P < 0.001$ (Mann–Whitney U).

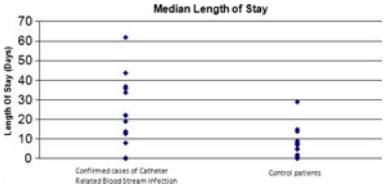

Fig. 2 Median length of ITU stay

CONCLUSIONS. Predominant organisms isolated from confirmed CRBSI's were Staph Epidermidis and Staph Hominis (common skin commensals), reinforcing the need for aseptic line insertion, maintenance and good hand hygiene practice. 66 % of confirmed cases had sensitive antibiotics administered within 48 h of diagnosis, demonstrating that there is scope for earlier initiation of appropriate antibiotic therapy. Median line days and mean number of lines was higher in cases, suggesting that this increases the risk of developing CRBSI. Root-cause analysis demonstrated that six cases could have benefited from earlier line removal, with lines remaining in situ a median of 4.5 days longer than necessary. Patients who acquired a CRBSI had a significantly longer duration of ICU stay than patients who did not. There was no difference in mortality between the two groups.
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1013
SYSTEMIC INFLAMMATORY RESPONSE IN CRITICALLY ILL PATIENTS

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OBJECTIVES. To asses the systemic inflammatory response (SIR) to infection in critically ill patients, according acquisition (community, nosocomial or ICU), focus (respiratory, urinary, blood, abdominal and others) and aetiology: (Gram negative bacilli (GNB), Gram positive (GP), fungi (H), viruses (V) or unknown (D).
METHODS. Prospective, voluntary, multi-center, incidence study. Infections were diagnosed according to ECDC criteria (1). The SIR was classified according to the Consensus Conference of 2003 (2). Data collection was entered through a web. We included patients registered from 01/01/2005 to 15–11 to 2011.
RESULTS. A total of 68,361 infections were diagnosed, of which 20,952 (31 %) were community acquired (C), 14,380 (21 %) nosocomial extra-ICU (NI), 32,252 (47 %) ICU acquired (ICU-NI) and 777 (1 %) came from another hospital (OH). The focus was respiratory in 25,803 (40 %) cases, Blood 8,731 (14 %), urinary 8,552 (14 %), abdominal 5,393 (9 %) and other 14,315 (23 %). 67,286 microorganisms were isolated, of which 35,616 were BGN, 22,302 GP, 6,397 fungi, 546 viruses and 2,425 unknown. The SIR (NoR, Sepsis, Severe sepsis, Septis shock) expressed in percentage, is shown in the next table

Origin				
Community	16,1	28,4	22,4	32,6
NOsocom	4,1	30,1	22,0	36,2
ICU-NI	24,2	44,9	17,4	13,3
Other H	18,1	34,6	18,8	28,3
Focus				
Respiratoy	21,8	39 2	0,6	18,5
Blood	13,8	43,0	20,3	22,7
Urinary	25,9	35,6	14,9	23,5
Abdominal	25,4	21,7	25,2	47,5
Other inf	20,1	34,5	19,8	25,5
Etiology				
GNB	17,0	36,1	19,7	27,0
GP	16,1	38,1	22,0	4 25
Virus	18,8	30,0	30,7	20,3
Unknown	14,1	27,3	24,0	34,5

CONCLUSIONS. Almost half of all infections were ICU acquired, followed by the communitary. The respiratory focus and GNB infections were the most frequent. Approximately 50 % of infections had a severe SIR (severe sepsis or septic shock) except those acquired in the ICU, with only 30 %. The impact was higher on abdominal focus and unknown etiology.
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1014
THE IMPACT OF A WARD BASED PERIPHERALLY INSERTED CENTRAL CATHETER (PICC) LINE SERVICE

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INTRODUCTION. A ward based service has been running at Good Hope Hospital for those patients requiring peripherally inserted central catheters (PICCs) for over 4 years. Previously such patients were booked into Emergency theatres for the procedure which caused delays in treatment. This led to the development of a ward based service provided by M. Kyi. The PICC lines were inserted in accordance with EPIC Guidelines and using well designed CVC packs. The service means that patients can have PICCs inserted and monitored on wards with no delay. Patient data is added to a database allowing the Critical care outreach team to monitor patients every 72 h as well as allowing a consultant microbiologist to review patients for possible line sepsis.
OBJECTIVES. An observational audit was conducted to assess the uses, outcomes and potential savings associated with this service.
METHODS. 123 PICC were inserted in Good Hope Hospital using the ward based service during 2011; indications, complications (including line sepsis) and areas for potential cost saving were examined.
RESULTS. The number of PICC inserted showed an increase of 115 % between 2010 (57 PICC) and 2011 (123 PICC). The main indication was for long term antibiotics, 53 patients (43 %), with 25 patients (47 %) of these requiring it for bacterial endocarditis. PICC line duration ranged from 1 to 107 days. 10 patients (8 %) were discharged with PICC lines still in situ for antibiotic therapy in the community making an acute bed available for use. Out of the 123 inserted 13 patients (11 %) experienced complications; 6 (5 %) were malpositioned, 5 (4 %) failed, 1 line (0.8 %) became blocked and 1 (0.8 %) had to be removed due to a clot forming in the vein. No cases of line sepsis were reported.
CONCLUSIONS. There is an increasing demand for this essential PICC line service, particularly for those patients requiring long term antibiotics. There is no increase in complications associated with PICC inserted on the ward and the service allows for a reduction in delays in treatment. There is however room for development of the service to further improve patient care.
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1015
AGE AND ETIOLOGY OF INFECTIONS IN CRITICALLY ILL PATIENTS

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OBJECTIVES. To asses the etiology of infection in critically ill patients and whether there are differences according to age
METHODS. Prospective, voluntary, multi-center, incidence study. Infections were diagnosed according to ECDC criteria (1). Patients were classified into four categories according to their age, <40, 40–59, 60–79 and ≥80 years. The identification of microorganisms was carried out in the microbiology services of each hospital. Data collection was entered through a web. We included patients registered from 01/01/2005 to 15-11 to 2011.
RESULTS. We studied a total of 136,052 patients and identified a total of 68,175 microorganisms (MO) responsible for infection. In 14,410 (21.13 %) cases, MO were community-acquired, 15,615 (22.9 %) were nosocomial (no ICU), 37,353 (54.78 %) were ICU-acquired and 797 (1.16 %) from another hospital. N (%); All, <40; 40–59; 60–79; ≥80; Patients 136.052 (100); 15.686 (11, 5); 36.488(26, 8); 67.647 (49, 7); 16.228 (11, 92) MO 68.175 (100); 7,665 (11, 2); 18,355 (26, 9); 36,285 (53, 2); 5,868 (8, 6); *E coli* 10.298 (15, 1); 5.995 (8, 7); 2.372 (12, 9); 5.810 (16, 0); 1310 (22, 3) *P. aeruginosa* 7.288 (10, 6); 824 (10, 7); 1.949 (10, 6); 3.946 (10, 8); 569 (9, 6) *S. aureus* 803 (10, 4) 7.900 (11, 7); 1.788 (9, 7); 2.826 (7, 7); 381 (6, 4) *R. meticilina* (%) (29); (18, 8); (26, 9); (33, 6); (38, 5) *C albicans* 3.512 (5, 1); 327 (4, 2); 867 (4, 7); 2.009 (5, 5); 309 (5, 2) *E. faecalis* 3.276 (4, 8); 234 (3, 9); 879 (4, 7); 1.856 (5, 1); 307 (5, 2) *Klebsiella pn* 3.251 (4, 7) 353 (4, 6) 819 (4, 4) 1.795 (4, 9) 285 (4, 8) *S epidermidis* 3.217 (4, 7) 354 (4, 6) 875 (4, 7) 1.767 (4, 8) 221 (3, 7) *A. baumannii* 2.728 (4); 456 (5, 9); 853 (4, 6); 1.320 (3, 6); 99 (1, 6) *S. pneumoniae* 2.506 (3, 6); 387 (5); 903 (4, 9); 1.060 (2, 9); 156 (2, 6) *Enterobacter* 2.024 (2, 9); 221 (2, 8); 502 (2, 7); 1.092 (3); 209 (3, 5)
CONCLUSIONS. We note a parallel in the proportion of patients and MO except the elderly, with an increase in the group between 60 and 79 years and decline in those >80 years. There are variations in the etiology, highlighting *E. coli* (increase), *S. aureus* (decline in n but increased methicillin resistance. *S. pneumoniae* and *A. baumannii* also decrease with age.
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1016
SUCCESSEFUL STRATEGY TO REDUCE VENTILATOR-ASSOCIATED PNEUMONIA—HOSPITAL MBOIMIRIM—SAO PAULO

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INTRODUCTION. VAP rates in Brazil are higher than those related in Europe and USA.

OBJECTIVES. The study objective was to examine the effect of the Institute for Healthcare Improvement's ventilator bundle plus oral decontamination with chlorhexidine (ODC) in the incidence of VAP in an intensive care unit.
METHODS. The study was conducted in a 20-bed, medical-surgical ICU. Criteria for nosocomial pneumonia are those from the CDC. Strategy was to implement the IHI's ventilator bundle plus ODC. The goals were the ICU team adhesion of 88 % achieved in 9th month after bundle implementation and 98 % after 1 year of follow up. These measures included five strategies to prevent ventilator-associated pneumonia: 30°–45° elevation of the head of the bed, adequate sedation level (Ramsay 2 or 3), DVT/PE prevention, peptic ulcer prophylaxis and oral decontamination with chlorhexidine 0.12 %. From January 2009 on, the ICU nursing staff and ICT performed a daily checklist in order to observe the five issues accomplishment. If any item was found to be inadequate it was promptly corrected.
RESULTS. In February (2009) and December (2011), adhesion to the whole bundle was 12 and 86 %, respectively ($p < 0.001$). VAP density was proportionally lower to bundle adhesion in the same period, 20 per 1,000 ventilation/day and 4.5, respectively.
CONCLUSIONS. Initial VAP rates were extremely high even for Brazilian benchmarks. Although we could not implement expensive technologies like continuous aspiration of subglottic secretions, ICU team and ICT efforts were crucial for satisfactory results, as well the administrative board support, which turned this issue an institutional priority. Our goals are to reduce even more, implementing ''ventilator bundle-getting to zero'' program, maintaining a continuum effort to sustain these results.
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1017
INFLUENCE OF INFECTION CONTROL IMPROVEMENT ACTIVITIES ON MORTALITY RATE IN ICU

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INTRODUCTION. The ICU is often epicenter of emerging NI problems in the hospital. Patients admitted to ICU are 5–10 times high risk of acquiring of NI due to both intrinsic and extrinsic risk factors. According some data, nozocomial infections are main reason of mortality in intensive care units (ICU).
METHODS. We created the project and the goal was defined as a reduction of mortality rate in KCUH ICU via improvement of infection control process. The project was run for 6 months. The problems which we tried to solve were the complex and recurring. So we used systematic team problem solving methodology and four step quality improvement approach to achieve our goal. 1. We analyze the statistical data got from ICU regarding the correlation between mortality rate and nozocomial infections. We create the problem statement—to improve the infection control activities in ICU and therefore to improve the survival. We identify the possibilities of changing: to reorganize the infection control system already established in ICU, to create the evidence-based protocols for all procedures and manipulations, to put the nurse as a infection control supervisor and define the responsibilities for this person, to organize the training course regarding the infection control for nurses and physicians, to provide supplies and materials for infection control process, to optimize the antibiotic therapy process in ICU. 2. We analyzed the data got from ICU, we identified why system did not work appropriately. 3. We developed hypothesis of changes: improve the level of knowledge in this field, provide all necessary supplies, train the nurse as an infection control supervisor and define responsibilities for her, review the all protocols regarding the infection control, improve antibiotic management in ICU. 4. We identified the list measures about the process being changed and the designed the data collection process. We tested each hypothesis in practice and changes which gave improvement were implemented in practice.
RESULTS. After the testing and implementing all planed hypothesis of change, the average LOS in ICU and the rate of nozocomial infections was reduced. The same time percentage of death in ICU was dropped from 17 to 9 % and standardized mortality rate was declined from 0.9 to 0.5. The average LOS was declined from 12 to 8 days.
CONCLUSION. Standardization of clinical and management processes according the evidence-based principles improve the quality of services in ICU. This process dramatically reduces the morbidity and mortality in ICU. Maintenance above mentioned improvement needs more detail analysis of process based root cause analysis principles.

Neuro-intensive care: 1018–1031

1018
PROSPECTIVE IDENTIFICATION OF HIGH-RISK NEUROLOGIC PATIENTS OUTSIDE THE CRITICAL CARE UNIT. THE BRESCIA EXPERIENCE OF AN INTENSIVIST-LED CRITICAL CARE OUTREACH TEAM

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INTRODUCTION. Critical Care Outreach (CCO) teams are critical care nurse-led, rapid response systems providing prospective identification and treatment of high-risk patients outside the critical care unit (CCU) [1].
OBJECTIVES. To evaluate the efficacy of an intensivist-led CCO team within a large Neuroscience Department at the University of Brescia, Spedali Civili.
METHODS. CCO was activated in July 1, 2011 to follow daily (Monday to Friday) the high-risk neurologic patients admitted to the 26 beds of the intermediate-care units of the Divisions of Neurology, Neurosurgery and Stroke and Cerebrovascular Diseases. A senior intensivist evaluated all patients to identify clinically relevant events, and treated them in the unit or ordered CCU admission, if required. Diagnostic and therapeutic strategies and end-of-life decisions were discussed and shared with the attending physicians.
RESULTS. During the first 6 months of CCO activity, 703 patients were evaluated, of whom 137 (19.5 %) had 242 clinically relevant events identified. The most common events were acute respiratory deterioration (29 patients), untreated or inappropriately treated sepsis (22) and incorrect drug administration (39). In 40 patients a decision to limit treatment and to not resuscitate in case of cardiac arrest was established. Sixteen of the 137 patients (11.7 %) were admitted to the CCU. Criteria for admission were respiratory (6 patients), circulatory failure (3) and neurologic (2) compromised airway patency (2), and acute neuromuscular respiratory failure (3).
CONCLUSIONS. This preliminary analysis indicates that a prospective, intensivist-led CCO activity can identify clinically relevant events at an early stage before serious adverse events occur. A more prolonged observation period is necessary to evaluate the impact of such activity on patients' mortality.
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1019
USE OF HIGH RESOLUTION DIFFUSION TENSOR IMAGING IN ACUTE TRAUMATIC BRAIN INJURY: FEASIBILITY AND INITIAL CLINICAL RESULTS

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INTRODUCTION. Diffusion tensor MR imaging (DTI) provides better characterisation of microstructural anatomy in traumatic brain injury (TBI), and allows imaging to be used as a biomarker in early drug development. However, there is a growing appreciation of substantial microstructural heterogeneity in TBI lesions which may not fully quantified by conventional DTI.
OBJECTIVES. We undertook imaging of contusions in TBI patients using conventional DTI, developed and implemented a high resolution (HR) sequence, examined the feasibility of its application using a high sensitivity coil with high filling factor (HFF), and documented microanatomy, evolution of pathology, and tissue fate in TBI.
METHODS. Conventional DTI (two b values, 63 directions, isotropic 2 mm resolution (8 mm^3 spatial resolution), was compared with a range of HR variants, with spatial resolution 1–3.4 mm^3. To optimize signal-to-noise (SNR) with reasonable sequence length ($\leq$15 min), we compared a 32 channel HFF coil against a conventional 12 channel coil (15 cm vs. 18 cm diameter). Finally, we compared our optimal HR coil/sequence combination against conventional acquisition. Initial contusion characterization was undertaken in 35 datasets using conventional acquisition, the novel sequence was optimized in 6 volunteers, the HFF coil was trialed in one patient, and 7 high resolution datasets obtained in the acute TBI.
RESULTS. Early contusions (<7 days post-TBI) showed two regions on conventional DTI images; a core of restricted diffusion surrounded by an area of high diffusion. A thinner rim of low ADC, thought to be the traumatic penumbra, surrounded the area of high diffusion in patients scanned within 72 h of injury, but not later. The HR sequence showed greater detail of both normal anatomy and contusion pathology, and significantly improved image quality with the HFF coil. However, injury associated swelling and protruding intracranial monitoring devices meant that the HFF coil could not be used in >80 % of patients with acute TBI. Implementation of the HR sequence on the standard 12 channel coil resulted in optimal SNR contrast with 12 directions and a resolution of 2.7 mm^3. Comparison with conventional DTI in acute TBI showed that the HR sequence provided more detailed characterization of contusion pathology, with greater detection and/or conspicuity of the perilesional penumbra, and detection of axonal injury in the brainstem.
CONCLUSIONS. While the use of HFF coils is limited by patient logistics, the application of HR DTI sequences is feasible with standard radiofrequency coils in the context of acute TBI, and provides more detailed microstructural pathology at the expense of reduced angular resolution. Such improved characterization of lesions and tissue compartments may provide important prognostic information, and more robust and/or sensitive biomarkers for translational drug development.
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1020
EVALUATION OF VENTRICULOSTOMY MANAGEMENT PROTOCOL IN NEURORITICAL CARE UNIT (NCCU)

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Published data show that use of ventriculostomy increased in the last decade. There are no consensus recommendations for external ventricular drainage (EVD) management in ICU patients, in spite of significant morbidity [1]. The aim of the study is to evaluate an EVD (external ventricular drain) protocol in a NCCU in a major teaching hospital. We analyzed demographic, clinical and laboratorial data for EVD complications, namely infection-related. Retrospective study included a cohort of patients admitted in the NCCU in 2011 that needed an EVD. Patient records and laboratory findings were daily analyzed and at unit discharge none had EVD. Clinical, microbiological and laboratorial data was registered. Infection was defined as a positive CSF culture. Data was analyzed using IBM SPSS

Statistics 19. 30 patients were enrolled, with average age 58 years and 63.3 % female Severity scores: SAPS2-45.5 (expected mortality 40.6 %); SAPS3-61.7 (42.6 % expected mortality). The average length of stay (LOS) was 18 days. Main diagnosis [1, 2] were intracerebral hemorrhage (ICH), spontaneous subarachnoid hemorrhage (SAH) and traumatic brain injury (TBI). EVD placed for intracranial pressure monitoring or treatment of acute hydrocephalus. The average duration of ventriculostomy was 11.1 days, representing 284 CSF samples (average 9.5 per patient). The infection rate was 16.7 % with 4 species isolated (3 gram-negative). The risk factors [2] for EVD infection defined were: mechanical ventilation, systemic infection, intraventricular hemorrhage, SAH, ICH, open TBI, neurosurgical procedure, intrathecal drugs and CSF leakage. We found a week correlation between CNS infection and number of samples (0,294) and with LOS. No statistically significant relation between CNS infection and EVD duration and CSF sampling using Mann–Whitney test. The patients with infection had an average of 3.8 associated risk factors (ARF) compared with non-infected patients (3.2 ARF). Overall mortality rate was 43.3 and 15 % of these had EVD-related infection. We didn't find a higher infection rate when catheters-day was used as the denominator in the analysis. In our study, the rate of device-associated meningitis was 15/1,000 number of drainage days, but the mortality differences (40 % in CNS infections vs. 12 % in non-infection group) couldn't be assigned to the infection itself (3 %). Surveillance data on infections represent an important tool for recognizing the magnitude of the problem and can serve as a basis for intervention and therapeutic management.

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1021
THE NEURO-PROTECTIVE EFFECT OF CITICHOLINE (CDP CHOLINE) IN PATIENTS WITH TRAUMATIC BRAIN INJURY

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INTRODUCTION. Traumatic brain injury (TBI) is the leading cause of death and disability. Central nervous system trauma accounts for almost half of all trauma deaths examined post-mortem in population-based analyses or following trauma center admission. It is more common in males and young age (<40 years). Head injuries could be due to road traffic accidents (RTA), falling from height, sport injuries, and violence [1].

OBJECTIVES. Assess the neuroprotective effect of citicoline in patients admitted to Alexandria university hospital with the diagnosis of severe traumatic brain injury.

METHODS. The study was carried out on 40 adult patients of both sexes. Informed consent and approval of local ethical committee were obtained. Patients were classified into two groups, group I received citicoline 1 g intravenously daily for 14 days and group II, received only the conventional treatment. Complete clinical and neurological examinations were done. Initial CT brain was done on admission, follow up CT brain was done after 48 h, and at the end of the study (14 days). GCS was done on admission and everyday for 14 days. Glasgow outcome score was done at the end of the study.

RESULTS. The age of studied patients ranged from 16 to 60 years with a mean of 27.90 ± 12.47 years in group I, and a mean of 30.0 ± 13.59 years in group II. There were two females in each group (10 %) and (90 %) of patients were males. It was obviously observed that the highest percentage of TBI in the two studied groups was among young adult males. In group I GCS ranged from 3.0 to 8.0 on admission with a mean of 5.95 ± 1.57, and ranged from 3 to 15 at the end of the study with significant increase in the mean value to 10.47 ± 4.51 p (0.002).In group II GCS ranged from 3.0 to 8.0 on admission with a mean 6.05 ± 1.64. and ranged from 10.0 to 15.0 at the end of the study a with significant increase in the mean value to a mean 12.0 ± 2.0 p (0.043).We tried to find the relationship between outcome and CT brain initially, it was found that patients presented with the initial CT finding brain edema showed the best outcome in group I with Glasgow outcome scale 'recovery' with a statistical significance (p 0.007),while intracerebral hematoma showed the worst outcome in group II with Glasgow outcome 'Death' with a statistical significance (p 0.022).

CONCLUSIONS. Citicoline trends towards improvement in morbidity and mortality in severe trauma patients.

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1022
USE OF TRANSCRANIAL DOPPLER IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY

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INTRODUCTION. Severe traumatic brain injuries are associated with a high rate of mortality and disability. Transcranial Doppler sonography (TCD) permits non-invasive measurement of cerebral blood flow.

OBJECTIVES. The purpose of this study is to determine the usefulness of TCD in patients with severe traumatic brain injury (TBI).

METHODS. TCD was performed in 138 patients with severe TBI defined as a Glasgow Coma Scale of 8 or less on admission. All patients were on mechanical ventilation. TCD was performed on hospital days 1, 2, 3 and 7. Hypoperfusion was defined as having two out of three of the following: mean velocity of the middle cerebral artery less than 35 cm/s, diastolic velocity of the middle cerebral artery less than 20 cm/s and a pulsatility index of greater than 1.4. Vasospasm was defined by the following: mean velocity of the middle cerebral artery greater than 120 cm/s and a Landegaarde index greater than 3. The Landegaarde index is the ratio of the blood flow in the middle cerebral artery to the flow in the internal carotid artery.

RESULTS. Sixty patients (43 %) had normal measurements. Twenty-four were discharged home, 27 were discharged to a long term facility and 9 died. Five of these patients were vegetative or comatose and their families requested withdraw of care. Two died from brain death and two died from complications of their associated injuries. Thirty-seven patients (27 %) had hypoperfusion. Thirty-six died from brain death and one died from withdraw of care. Forty-one patients (30 %) had vasospasm. Six of these patients were discharged home, 21 to a long term care facility and 14 died, 9 from brain death, 3 from withdraw of care and 2 from complications of their associated injuries. The vasospasm was detected on hospital day 1 in 4 patients, on day 2 in 14 patients, on day 3 in 10 patients and day 7 in 13 patients. Nimodipine was administered to 17 patients. Thirteen of these patients survived and 4 died from brain death. In one patient, the nimodipine caused hemodynamic instability and had to be discontinued. In 24 patients with vasospasm, nimodipine was not given and 5 of these patients died from brain death. Twenty one of 43 patients (49 %) with subarachnoid hemorrhage on computed tomography developed vasospasm.

CONCLUSIONS. Patients with normal measurements can be expected to survive. Patients with hypoperfusion have a poor prognosis. In patients with vasospasm, the use of nimodipine should be considered however further studies are needed to determine safety and efficacy. TCD may be useful in determining prognosis. Further studies are needed to determine if TCD can improve outcome in patients with severe TBI.

1023
CEREBROSPINAL FLUID LEVELS OF HIGH MOBILITY GROUP BOX 1 IN PATIENTS WITH VENTRICULOSTOMY-RELATED INFECTION

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INTRODUCTION. Cerebrospinal fluid (CSF) infection is a feared complications in neurological patients with external ventricular drainage (EVD) catheters. Reported rates of ventriculitis and meningitis ranges from 0 to 45 %, depending on the patients population, the strategies adopted to prevent infection, and timely diagnosis and treatment. Diagnosis of ventriculitis and meningitis is based on positive CSF cultures. Other criteria include clinical signs of meningitis combined with altered CSF composition. High mobility group box 1 (HMGB1) is a nuclear protein that is secreted by activated macrophages and monocytes as a delayed mediator of septic shock [1, 2]. CSF concentration of HMGB1 is elevated in children with community acquired meningitis [3].

OBJECTIVES. To investigate CSF and plasma concentration of HMGB-1 in adult patients with EVD catheters.

METHODS. Patients were evaluated daily for development of clinical signs of ventriculitis or meningitis. CSF and plasma were collected at day 1, 3, 5 after EVD catheter insertion and every other 5 days; HMGB1 concentrations were determined with an ELISA assay. Based on clinical signs, CSF cultures and CSF glucose and protein alterations, patients were classified as having 1. ventriculitis/meningitis, 2. high probability infection, or 3. low probability infection according to Lozier classification. Patients without central nervous system diseases subjected to spinal anesthesia were used as control.

RESULTS. 34 patients and 4 controls were enrolled. Plasma and CSF concentration of HMGB-1 are presented in Table 1. CSF and plasma HMGB1 were significantly higher in patients with ventriculitis/meningitis compared to the other groups (CSF: ANOVA test, $F = 17.99$; $p < 0.001$; plasma: ANOVA test, $F = 8.01$; $p < 0.001$); however, there was some overlapping between groups.

DISCUSSION. CSF concentration of HMGB1 is higher in adult patients with EVD-related ventriculitis/meningitis than in those without, but its diagnostic role remains unsettled.

Table 1

	Mean (SD) ng/mL	Min–max ng/mL
Ventriculitis/meningitis		
HMGB-1 CSF	94.78 (64.07)	0.6–160
HMGB-1 serum	73.42 (77.42)	3–160
High probability		
HMGB-1 CSF	18.95 (31.06)	0–98.9
HMGB-1 serum	18.55 (13.99)	5.51–38.7
Low probability		
HMGB-1 CSF	13.00 (17.90)	0–93.67
HMGB-1 serum	17.71 (15.33)	0.165–66.35
Controls		
HMGB-1 CSF	0.0 (0.0)	0.0 (0.0)
HMGB-1 serum	12.11 (10.96)	5.51–28.50

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1024
RISK FACTORS FOR INFECTION OF THE EXTERNAL VENTRICULAR DRAINAGE

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OBJECTIVES. Establish the risk factors for infection associated with the use of external ventricular drainage.

METHODS. Retrospective analysis of patients who were admitted in a polyvalent intensive care unit (ICU) in February 2007 to November 2011, and were carriers of an external ventricular drain (EVD). We define infection according to the criteria of Lozier et al. [1]. In

January 2008 in our unit, we begin a protocol for the manipulation of de EVD. We filled a form with demographic information, previous illness, risk factors at admission and actual pathology. We analysed de risk factors for the development of infection. Analysis with SPSS, Ji-Square and logistic regression. We consider statistical significance with $p < 0.05$.
RESULTS. We included 103 patients with a total of 155 EVD with a mean of 1.5 catheters per patient. 20 (19.4 %) of patients developed proved or possible infection associated with EVD. There were no demographic differences, clinics or related to the reason for admission among patients with or without infection. The risk of infection has been associated in the bivariate analysis with the number of days of ICU stay ($p < 0.01$), presence of at least a replacement of catheter ($p < 0.01$), more days of mechanical ventilation ($p < 0.01$) and days of EDV. By logistic regression, we have indentified the duration of catheter EDV as an independent risk factor for infection, with a safety period, free of infection, the first 9 days of catheter. No significant differences were found in the presence of infection in relation with EDV among the patients which the catheter has been placed in the ICU. The presence of infection has not been associated with increased mortality.
CONCLUSIONS. Has been identified as an independent risk factor for infection, the duration of EDV device with an infection-free period, corresponding to the ninth day of EDV.
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1025
THE ROLE OF PLASMA D DIMER AS A PROGNOSTIC MARKER IN TRAUMATIC BRAIN INJURY

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INTRODUCTION. Traumatic brain injury (TBI) is a leading cause of death and disability around the globe. It is the leading cause of death among people less than 24 years of age. Serum S-100B, which is a calcium binding protein, is an attractive marker of primary and secondary brain insults. Coagulopathy is common in TBI with unique features; as the injured brain release tissue factor which triggers coagulopathy and hyperfibrinolysis marked by high levels of plasma D-dimmer There has been a clear relationship found between high levels of plasma D-dimmer and poor outcome among patients suffered from traumatic brain injuries.
OBJECTIVES. The aim of the study was to investigate the value of D-dimmer as a prognostic marker of severe traumatic brain injury (TBI) and compare it with serum S-100B.
RESULTS. The study was conducted at Alexandria University Hospitals on 50 adult patients with isolated non surgical traumatic brain injury. The study protocol was approved by the ethical review committee and informed consents were obtained. Patients were classified into favorable and unfavorable groups according to Glasgow outcome score (GOS) which was measured on day 14 or on either discharge or death of the patient. Blood samples for S-100B and D-dimmer were taken on admission, day 3 and day 14. D-dimmer mean values were $5{,}652.32 \pm 7{,}916.04$, $4{,}529.0 \pm 5{,}353.54$, and $1150.0 \pm$ - μ/L on admission, day 3 and day 14, respectively in the unfavorable group (those who had GOS of 1, 2, 3); which were significantly higher than the favorable group (those who had GOS of 4, 5);where the mean values of D-dimmer were $1{,}980.0 \pm 2{,}276.51$, $1{,}073.45 \pm 810.86$ and 455.45 ± 347.99 μ/L on admission, day 3, and day 14, respectively. D-dimmer was found to have a cut off value of 1,540 μ/L; which had a sensitivity and specificity of 78.57 and 72.73 %, respectively and a positive predictive value (PPV) of 78.57 % and a negative predictive value (NPV) of 72.73 % with accuracy of 76.0 %. S-100B mean values were 125.43 ± 30.94, 142.40 ± 6.19, and 96.0 pg/ml on admission day, day 3 and day 14, respectively in the unfavorable group, while in the favorable group the mean values were 81.0 ± 25.0, 69.95 ± 20.33 and 55.36 ± 15.59 pg/ml on admission, day 3 and day 14, respectively. ROC curve analysis of the mean values of S-100B was done whereby we found that at a cut off value was 115 pg/ml which can predict poor prognosis in TBI patients with a sensitivity of 60.71 % and a specificity of 95.45 % and PPV of 94.44 % and NPV of 65.63 % with accuracy of 76.0 %.
CONCLUSIONS. D-dimmer could be used for prediction of poor patient outcome as well as S-100B. Also, we found that D-dimmer has positive correlation with S-100B.

1026
REPEATED EVENT-RELATED POTENTIALS TECHNIQUE IN ACUTE BRAIN INJURED PATIENTS: DIFFERENT NEUROPHYSIOLOGIC EVOLUTIONS OF DISORDERS OF CONSCIOUSNESS

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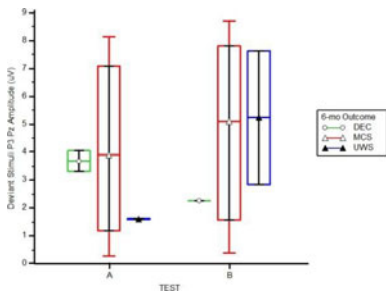
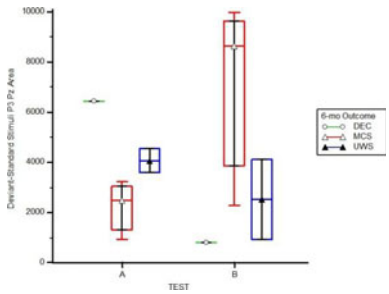
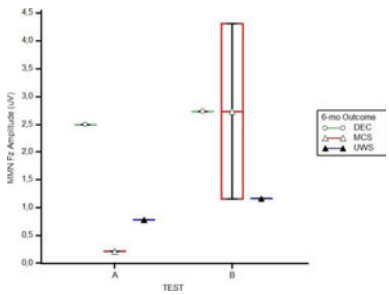
INTRODUCTION. Event-Related Potentials (ERPs) technique has been widely used in the assessment of comatose patients following brain injury since the admission on intensive care unit (ICU). To this regard, mismatch negativity (MMN) and other long-latency components such as N100 and P300 have been advocated as useful tools in the evaluation of unresponsive patients and in the neurological outcome prognostication. As far as we know it has never been investigated the qualitative alterations along time of these ERPs components as possible prediction of recovery of consciousness.
OBJECTIVES. This study aims to investigate the modifications of different ERPs components along the first month of ICU stay of brain injured patients in order to identify a neurophysiologic response improvement able to predict a short or long term recovery of consciousness.
METHODS. We enrolled seven severely brain injured patients admitted to ICU (1 encephalitis, 3 subarachnoid haemorrhage, 3 traumatic brain injury) with no previous history of neurological disorders or head trauma. As soon as patients were considered free of sedative drugs effects during the first week of ICU stay they had: short-latency auditory evoked potentials to evaluate auditory pathways, 15-min resting EEG to exclude seizures or suppressed activity, ERPs recording during an auditory oddball paradigm (standard tone 750 Hz, deviant tone 1,000 Hz, 130 dB, ratio 15 %, ec time 2 s, bandpass 1-50 Hz, rec in Fz, Cz and Pz, 30 sweeps averaged). ERPs and EEG recording was repeated 30 days after injury to all patients. Amplitude and latency of identified components (N1, P3, MMN) were measured. Moreover, the differential area obtained at P3 latency between standard stimuli wave and deviant one was calculated (EBNeuro, Florence-Italy). Medians were calculated and Wilcoxon test performed between first ERPs (test A) and 30-days ERPs (test B). Patients' outcome at 6 months was evaluated by mean of the Coma Recovery Scale-Revised assessment as Minimally Conscious State (MCS), Persistent Vegetative State/Unresponsive Wakefulness Syndrome (UWS) and deceased (DEC).
RESULTS. Differences were found in all ERPs components considered. Particularly P3 response to deviant stimuli seems to increase its amplitude over time in UWS but not in MCS ($p < 0.05$). However, analyzing the differential area between deviant and standard stimuli (P3) it is evident the highest increase of its value in MCS ($p < 0.001$). There is a similar increase of MMN in this population ($p < 0.01$) with respect to UWS and DEC patients.



Graph 1



Graph 2



Graph 3

CONCLUSIONS. The development of the ability to discriminate different tones (P3 area and MMN) even if automated and not voluntary, appears already 1-month after injury in those patients who will recover consciousness and show clinical signs later on. ERPs analysis is therefore an interesting tool when performed early and repeatedly in those patients, but its correct interpretation is necessary to avoid misprognosis.

1027
IS FEVER STILL A BURDEN IN NEUROINTENSIVE CARE UNIT (NICU)?

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INTRODUCTION. Fever, defined as a core temperature ≥38.3 °C, is frequent and it has been widely associated with neurological impairment in patients suffering from any neurological injury and requiring intracranial pressure (ICP) monitoring [1–3]. Therefore, in NICU a strict temperature control is required to protect brain from the well know secondary injury.
OBJECTIVES. We aimed to disclose the fever burden in our NICU.
METHODS. This is a retrospective study of a cohort of patients affected by brain injury (TBI), subarachnoid haemorrhage (SAH), ischemic stroke (S), intra cerebral haemorrhage (ICH) and brain tumours (T). Inclusion criteria were: age ≥18 years, ICP monitoring, length of stay in NICU ≥48 h, continuous temperature monitoring thought a bladder catheter. Physiological data were acquired minute by minute by a Patient Data Management System (Innovian Draeger®). Temperature was managed with a protocol previously described by our group [4] and physical cooling. For any patient we calculated: total minutes monitored, the highest and lowest temperature, the percentage of time ≥38.2 °C (high temperature—HT).
RESULTS. Sixty patients were included in the study (34M), mean age 56.8 years, 19 SAH, 16 TBI, 5 S, 11 ICH, 9T. For each patient the mean of points analysed was 9,393 (mode 7,847), i.e. 6.5 days of monitoring. Cases of HT were reported in any group. 45 % never had HT. 28 (53 %) patients had HT, even if for few minutes; only 33 % (n = 18) had HT for more than 1 % of total time of monitoring. The maximum of time with HT was 8 % in a

patient. The mean of minutes of HT was negligible (1.47 %). The maximum temperature reached was 40 °C in one patient with ICH, the mode of highest temperature reached in all patients was 38.1 °C.
CONCLUSIONS. In this study we sought to perform only a picture of fever burden in our NICU. Therefore, we did not match our data with presence or absence of infection. In some case series of acute neurological patients (TBI, SAH and S), fever occurs in 60–90 % [1–3]. Some authors reported a mean of 4.7 febrile episodes per febrile patient and an average peak temperature of 39.2 ± 0.6 °C [4]. Recently, in a population of TBI patients, 73 % experienced HT [5]. Therefore, we conclude that in this cohort the fever control is almost well achieved and we dare to consider HT not to be the worst burden affecting our patients.
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1028
HYPOPHOSPHATEMIA IN SEVERE BRAIN INJURY

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INTRODUCTION. Phosphate is the most abundant intracellular anion and plays a crucial role in the regulation of vital functions. The clinical complications caused by hypophosphatemia are attributed to reduction of cellular energy stores and include: muscle weakness, frequently associated to respiratory muscles, cardiac dysfunction, including cardiac hypocontractility and ventricular tachycardia, dysfunction of the central nervous system, changes in hematological and immune systems. All these changes may aggravate the clinical state of seriously sick patients, eventually leading to death. Reduction of serum phosphate may occur due to a decreased intestinal absorption, to an increased urinary excretion or, more commonly, to an internal redistribution [1, 2].
OBJECTIVES. The objective of the present study was to identify the incidence of hypophosphatemia in patients with severe brain injury.
METHODS. The study included 91 adults with acute brain lesion either severe head injury (n = 34) or acute subarachnoid hemorrhage (n = 55) admitted to the Neurointensive Care Unit of Hospital de São João, Porto, Portugal. For the purpose of this study we considered serum phosphate determination at 48 h after admission. Electrolyte replacement was performed according to the basal needs, added by correction of eventual losses. The normal range of phosphate for our hospital laboratory is 2.7–4.5 mg/dL. We considered values below 2.7 mg/dL as moderate hypophosphatemia and values below 2 mg/dL as severe hypophosphatemia.
RESULTS. Phosphate levels at 48 h of admission were at mean 2.67 mg/dL (range ≤1–5.4 mg/dL). Moderate hypophosphatemia was present in 51.6 % of patients of which 17.6 % were severe hypophosphatemia.
CONCLUSIONS. We conclude that hypophosphatemia is a common finding in the early phase of acute brain lesion and that more than half of patients presented an important fall in the serum phosphate. The development of hypophosphatemia in severe head injury had been previously reported, but the causes and the clinical implications were superficially approached. There are several factors in these patients that could be associated with hypophosphatemia: polyuria induced by cerebral injury and by diuretics administration, nasogastric suction, hyperventilation, volume expansion, systemic inflammatory response syndrome [1] and drugs such as anti-acids, catecholamines and Na bicarbonate. Intensivists should be aware of this potential problem and if necessary, adequate supplementation of phosphate should be initiated promptly.
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1029
ADMINISTRATION OF FLUIDS TO TRAUMATIC HEAD INJURY PATIENTS IN A NEURO-INTENSIVE CARE UNIT. ARE WE GIVING THEM TOO MUCH?

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INTRODUCTION. Parenteral fluid therapy in patients with brain injury may aggravate brain swelling, intracranial pressure and neurological dysfunction, resulting in increased neurological morbidity. Intravenous fluids are indicated for either resuscitation, where the targeted end points are hemodynamic parameters or for maintenance of euvolemic state, balancing urinary and insensible losses.
METHODS. 50 patients admitted to the Neurointensive care unit with traumatic head injury were followed up on a daily basis from their chart in terms of the fluid prescribed, the actual total fluids administered over a 24 h period and the total output in 24 h during their stay in the intensive care unit. The total input included the daily maintenance fluid (crystalloid, NG feeds, colloid, blood products and osmotherapy if any) and the output (urine, drains and aspirates). Standard protocol was followed for ICP control with standard monitoring. Data collected was analyzed using paired t test and a $p < 0.05$ was considered statistically significant.
RESULTS. The results showed a statistically significant increase in the volume of fluids administered on an average over a 24-h period in comparison with that prescribed. The mean prescribed (total IV prescribed fluids + NG feeds) volume was 1,534 ml and actual volume administered was 3,692 ml. Hence, 2.4 times more fluid is infused than the volume actually prescribed. This difference is statistically significant as indicated by paired t test. ($P < 0.0001$) Out of the total average input of 3,692 ml, NG infusion accounted for 950 ml (25 %), the crystalloid and colloid together accounted for about 57 % of the total fluids (2,106 ml out of total input of 3,682 ml) with average of 1,654 ml of crystalloids and 452 ml of colloids. Blood products 258 ml (7 %) and osmotherapy 444 ml 1(2 %) as needed contributed the rest 19 %. Totally 23 out of 50 patients received osmotherapy. Overall there was a positive fluid balance. The average total output was 3,172 ml against the average input of 3,692 ml, leaving a positive average fluid balance of about 515 ml. There was a statistically significant difference between total input and total output t ($P < 0.0001$)
CONCLUSIONS. This audit demonstrates the increased administration of intravenous fluids over and above the prescribed value to maintain the cerebral perfusion pressure. This practice may be due to the physiologic parameters that are very strictly adhered to TBI patients. This degree of fluid overload could be detrimental in worsening the outcome in TBI and also in patients with a compromised cardio-respiratory system.
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1030
DECOMPRESSIVE CRANIECTOMY FOR TRAUMA BRAIN INJURY. FUNCTIONAL OUTCOME SIX MONTHS AFTER HOSPITAL DISCHARGE

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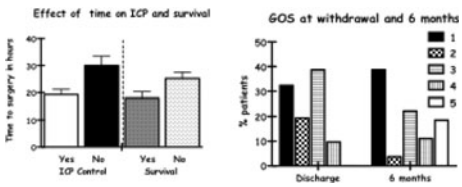
OBJECTIVES. Decompressive craniotomy (DC) is proposed as second-tier measure for intractable intracranial hypertension but long-term prognosis after DC because trauma brain injury (TBI) has not been definitely established.
METHODS. Evaluate functional outcome of TBI that are treated by DC because refractory intracranial pressure (ICP) and possible factors related to outcome. Registry of DC performed in 31 TBI patients admitted to our centre. We registered anthropometric data, brain tomography (CT) and ICP, time and type of DC, use of barbiturates and outcome (GOS) at discharge and 6 months.
RESULTS. 31 patients, 33.9 ± 15.4 years, 77.4 % males. TBI origin was motor vehicle accident in 35.5 %, fall in 48.4 % and direct trauma in 16.1 %. Median ICU stay 26 days (17.5–37.75) and mortality 32.3 %. Glasgow scale at admission was 7 (5–8). CT lesion was type II in 61.3 %, type III in 16.1 %, type IV in 3.2 % and in 9.4 % a surgically treatable lesion. DC performed was frontal-bilateral in 32.3 % and frontal-temporal-parietal in the rest. ICP before DC was 33.8 ± 8.8 mmHg and after the procedure lowered below 20 in 90.3 % (ICP 15.3 ± 6.9 mmHg). Shorter delay for surgery was related to response and survival. The GOS status registered at discharge improved at 6 months (4 patients were lost for follow up).



Left delay for surgery, right GOS at 6 months

Patients treated with barbiturates showed a lower mortality (15 vs. 63.6 %, $p < 0.05$).
CONCLUSIONS. Decompressive craniotomy provides a good control of ICP. Mortality in these patients is high and functional results initially poor but improving in the following months after discharge. Use of barbiturates as a rescue measure after DC can be of potential interest in this scenario.

1031
INTRACRANIAL PRESSURE AND BIS MONITORING CHANGES IN RELATION TO SODIUM DECREASE IN SEVERE TRAUMATIC BRAIN INJURY

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INTRODUCTION. Pentobarbital coma (PBC) may control intracranial pressure (ICP) after traumatic brain injury (TBI) when all other conventional measures, such as mannitol/hypertonic saline, have failed. Previous retrospective research suggests reduced mortality in PBC patients with sodium levels <160 mmol/L, osmolarity <330 mOsm/L and higher cerebral perfusion pressure (CPP) [1]. Furthermore, reduction of serum sodium levels by more than 12 mmol/L/day is associated with rebound cerebral edema.
PBC is guided by the electroencephalogram (EEG) aiming for burst suppression. Recently, a good relationship between BIS (Bispectral index) and EEG was described [2]. BIS provide a composite number representing cortical activity and is normalized to a scale of 0 (isoelectric signal) to 100 (full arousal).
OBJECTIVE. Are ICP and BIS changes associated with decreasing sodium levels in PBC.
METHODS. As part of a prospective observational pilot study performed at a university hospital intensive care unit, we included 3 patients with PBC after severe TBI. Continuous measurement of the ICP, mean arterial pressure and CPP was performed as part of standard monitoring. The BIS-VISTA monitor expressed BIS.
RESULTS. All three patients developed elevated sodium levels (>160 mmol/L) after pentobarbital and mannitol infusion, due to a relative water deficit. They all showed an increase of ICP at the same time the sodium levels decreased and the sedation was slightly reduced. Several hours later, we noticed a marked increase of BIS values (up to 50–70) in patient 1 and 2.

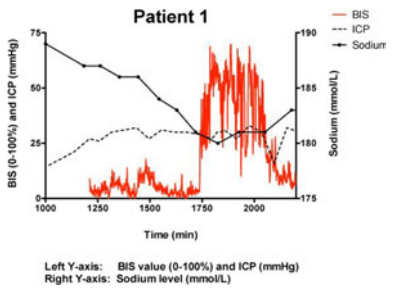

Figure 1

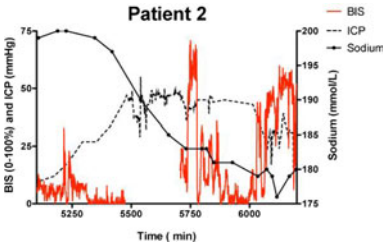

Figure 2

Although they received high dose pentobarbital and adjuvant sedatives at that moment. Both patients died. A third patient, although the sodium levels decreased 13 mmol/L/day, did not show a BIS increase and obeyed orders 2 weeks after termination of PBC. Elevated BIS values can be explained by reduced levels of sedation, although we did not see any response to pain stimuli. Another explanation could be epilepsy [3]. Unfortunately we weren't able to exclude epilepsy by EEG. A third speculation could be that increased level of BIS activity is related to the cellular loss of membrane polarization due to hypoxemia [4]. This phenomenon could be true for TBI where high ICP will lead to reduced cerebral flow and consequently a hypoxic cerebrum. An absent a. cerebri posterior and cerebellar blood flow was observed on CTA-brain in patient 1.

CONCLUSIONS. Contrary to our expectations, increase in BIS was found in two out of three patients with PBC several hours after decreasing sodium levels and increasing ICP levels, which may indicate terminal cerebral hypoxemia, rather than return of normal electro cortical activity. Further research is necessary.

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Quality & safety in the ICU: 1032–1044

1032

ANALYSIS OF THE UTILIZATION OF THE NURSING ACTIVITIES SCORE IN TWO SPANISH CRITICAL CARE UNITS

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INTRODUCTION. Different organizations have highlighted the importance of adequate nurse staffing as a measure to increase patient safety and reduce health care associated adverse events. Assessment of nursing workload is essential in order to stablish staffing needs. The nursing activities score (NAS) evaluates 23 rutinary activities performed by nursing staff in critical care.

OBJECTIVES. The aim of the present study is to analyze the differences in NAS scoring in two Spanish critical care units.

METHODS. Prospective study performed in two polyvalent Spanish intensive care units (ICU) (with 10 and 12 beds, respectively) during the months of October and November 2011. Data regarding nursing workload was colleted daily in both units for all the patients admitted in the ICU during the study period.

RESULTS. Data from 103 patients was collected, obtaining 941 NAS measures during the study period. Statistically significant differences were found in the collection of the following items: Monitoring and titration, hygiene procedures, mobilization and positioning, administrative and managerial tasks and left atrium monitoring ($p < 0.001$).

CONCLUSIONS. Using standardized instruments to measure nursing workload is important in order to be able to compare between different critical care units. The NAS scale, despite of having a small application manual, has several items with an important subjective assessment component. It is important to stablish unified assessment criteria to be able to make comparisons between different critical care units.

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1033

IMPLEMENTATION OF SURVIVING SEPSIS CAMPAIGN IN A GROUP OF PRIVATE HOSPITALS IN BRAZIL: EFFECTS ON OUTCOMES, COST-EFFECTIVENESS AND TEMPORAL TRENDS IN A PROPENSITY ANALYSIS

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INTRODUCTION. Implementation of Surviving Sepsis Campaign (SSC) has been associated with better outcomes in several settings around the world. However, there is a lack of this information in South-America. Furthermore, cost-effectiveness and temporal compliance to the SSC have been poorly studied until now.

OBJECTIVES. To analyze the implementation of the SSC in a group of 11 private hospitals in Brazil. Specifically, we intend to verify the clinical outcomes associated with compliance to the 6-h SSC's bundle and the cost-effectiveness of this campaign.

METHODS. We performed a multicentric prospective study during 15 months after the campaign implementation. The SSC was customized to each hospital in a repeated assessment. We grouped the temporal analysis in trimesters and used propensity score method with the sIPTW (stabilized Inverse-Probability of Treatment Weight) adjustment to evaluated in-hospital mortality in a clustered logistic regression. The cost-effectiveness was evaluated in a hospital perspective and the boundary was obtained by a bootstrapping procedure.

RESULTS. During the 5 trimesters, we enrolled 1,462 patients. The incidence of age, APACHE II score and septic shock criteria decreased through the time ($p < 0.01$ for trend). The full compliance to the 6-h bundle range from 14 to 59 % across the study ($p < 0.001$ for trend), reaching 90 % to antibiotic within 1 h after sepsis identification and 96 % to lactate measure. The in-hospital mortality range from 50 to 22 % following the campaign and ICU length-of-stay from 7 [3–17] to 5 [3–8] days ($p < 0.001$ for trend). After the propensity score method, the full compliance to the 6-h bundle was a protective factor to in-hospital mortality (0.567, 95 %CI 0.359–0.894, $p = 0.020$). Interestingly, we found a pleiotropic effect through the temporal time, being the 5th trimester (0.341, 95 %CI 0.125–0.928, $p = 0.044$) a protector factor together with the compliance. The cost-effectiveness data was available for 916 patients and the mean overall cost per patient was 29,244 euros. We could observe 31 lives saved to 1,316 euros expenses. Finally, the incremental cost per life saved of the SSC protocol was 43 euros. After the bootstrapping procedure, this could range from 94 euros to a decreased cost of 286 euros per life saved.

CONCLUSIONS. In this large cohort with a robust adjustment, we observed that the 6 h bundle from SSC was able to reduce the in-hospital mortality in a multicentric study in Brazil. Furthermore, the SSC protocol is a cost-effective option for treating severe sepsis, outperforming other well accepted practices in critical care and emergency medicine. We also could conceive new thoughts, as a pleiotropic time effect of the campaign.

1034

STANDARDIZED DRUG LABELLING IN INTENSIVE CARE: RESULTS OF AN INTERNATIONAL SURVEY AMONG ESICM MEMBERS

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INTRODUCTION. Medication errors in intensive care units (ICUs) occurring during drug preparation and administration are more common than generally thought [1]. A recent study identified 74.5 medication errors per 100 ICU days [2], and Franklin et al. suggest that this error rate may even be an underestimate [3]. Therefore, it is no surprise that standardized drug labelling enjoys strong support from many health professionals as it is considered to increase patient safety [4, 5]. The rates of adherence to standardized drug syringe labelling (DSL) in European and non-European ICUs, and the standards applied are not known.

OBJECTIVES. The aim of this survey among ESICM members was to assess if and what standardized drug syringe labelling is used, if the standards for drug syringe labelling are similar internationally and if intensivists expect that standardized DSL should be delivered by the pharmaceutical industry.

METHODS. A structured, web-based, anonymized survey on standardized DSL, performed among ESICM members (March–May 2011; Clinicaltrials.gov NCT01232088). Descriptive data analysis was performed and the Fisher's Exact Test was applied where applicable.

RESULTS. Four hundred and eighty two submissions were analysed (20 % non-European). Thirty-five percent of the respondents reported that standardized drug labelling was used hospital-wide, and 39 % reported that standardized DSL was used in their ICU (Europe: Northern 53 %, Western 52 %, Eastern 17 %, Southern 22 %). The ISO (International Organisation of Standardization) 26,825 norm in its original form was used by 30 %, an adapted version by 19 %, and local versions by 45 %; 6 % used labels that were included in the drug's packaging. Eighty percent wished that the pharmaceutical industry supplied ISO 26825 norm labelling together with the drugs.

CONCLUSIONS. Standardized DSL is not widely applied in European and non-European ICUs and mostly does not adhere strictly to the ISO norm. The frequency and quality of DSL differs to a great extent between European regions. This leaves much room for improvement.

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GRANT ACKNOWLEDGMENT: We are grateful that this survey has been endorsed by the European Society of Intensive Care Medicine (ESICM).

1035

PRELIMINARY ASSESSMENT OF THE FEASIBILITY AND FULFILLMENT OF PROCESSES OF CARE IN AN ICU TO EVALUATE QUALITY IN ACCORDANCE WITH THE DECLARATION OF VIENNA

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INTRODUCTION. The improvement of quality of care is a highly desirable goal. It is now well established that fulfilment with standards of care represents a valuable tool for the improvement of patient safety and outcome in intensive care units (ICU).

OBJECTIVES. In accordance with the spirit of the Declaration of Vienna, the authors endeavoured to assess ICU performance through the measurement of key processes of care. The rates of observance defined the ICU global standard, considered an essential working knowledge to design a strategy to implement quality programs.

METHODS. In an 11-bed medico-surgical ICU, the authors did an observational prospective study, blinded to all the other professionals, during a 44-day period. We measured the compliance to predefined and internationally accepted processes of care indicators. We collected data for general patient care [semirecumbent position, immobilization, deep venous thrombosis (DVT) and stress ulcer prophylaxis (SUP), fulfilment of nutritional goals by early enteral nutrition (EN), observance with the principles of lung protective ventilation and its registration, daily sedation interruption, timely (first 12 h) hemodynamic characterization of shock states, rates of ventilator-associated pneumonia (VAP) and antibiotic

adequacy (time from diagnosis to administration, rate of de-escalation in the first 96 h and rate of anti-MRSA drug prescription)] and global ICU performance indexes (self-extubation, endotracheal reintubation, catheter-related bloodstream infection).
RESULTS. 55 patients were admitted to the ICU. We found a very good rate of compliance in many processes (100 % for DVT prophylaxis, 89,4 % for SUP, 100 % for early EN—median time admission-to-nutrition of 4 h, 80 % for hemodynamic characterization of shock by echocardiography or hemodynamic monitoring), a good rate of compliance in antibiotic de-escalation (77,8 %) and lung protective ventilation—registered tidal volumes below 6 ml/kg in 72,7 % (3 patients had no registry of tidal volumes). Poor performance was documented in improper immobilization practices (18 %) and semirecumbent positioning (44.6 %); we also found a 41 % prescription rate of anti-MRSA antibiotics with only 2 cases (15 %) in which a MRSA infection was confirmed. General ICU performance indexes were: no catheter-related infection, self-extubation rate of 2.74 and VAP rate of 27.4 (both per 1,000 days of ventilation) and reintubation rate of 2.2 %.
CONCLUSION. According to internationally recommended programs for quality assessment, our study found a general good accomplishment with standard levels of performance. However, we identify areas caring for improvement, namely the quality of registries and some issues related to general patient care. The authors conclude for the feasibility of quality of process self-monitorization and would like to reinforce the need for a more generalized assessment to evaluate the principles of the Declaration of Vienna.

1036
CLINICAL AUDIT ON CENTRAL VENOUS CATHETER (CVC) PLACEMENT

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INTRODUCTION. Sub optimal positioning of a CVC is often associated with cardiac and vascular complications. Recent study has identified that left sided CVCs are more likely to cause vascular perforations [1]. Bodenham et al. suggests placing the left sided CVC catheter tip below the level of carina to reduce the risk of vascular perforation [2]. Gravenstein et al. has showed that multilumen stiff cathethers along with presence of acute angle of CVC catheter >40° with the longitudinal axis of superior vena cava will increase the risk of perforation [3].
OBJECTIVES. We did a retrospective audit to evaluate performance of our practice against the current recommendations in terms of CVC tip positioning. We accepted position of CVC tip as optimal if the tip lies within 40 mm above the carina or 10 mm below the carina. Placing a CVC tip too high (>40 mm) will increase the risk of infection, extravasation and accidental dislodgement. Placing a CVC tip more than 10 mm below the carina may increase the risk of pericardial tamponade. For the left sided CVCs we accepted an angle of <40° to vertical axis as optimal as it is shown to reduce the risk of vascular perforation.
METHODS. After approval, we collected retrospective data from of 245 central line insertions from 01/01/2011 to 30/04/2011. We collected data from patient's notes and chest X-rays which included date of insertion, site of insertion, any immediate complications, position of CVC tip in relation to carina, angle of left sided CVC in the first 1 cm to the vertical axis and data on any repeat x rays after repositioning in case of sub optimal tip position.
RESULTS. Main results are in tables below. Gross malpositions happened in 4 out of 245 CVCs out of which 3 CVCs were repositioned. There was no evidence of any major complications on the chest X-rays. Less than 1 % of CVCs were inserted through subclavian route which is probably due to the ease of insertion and less catastrophic complications with the jugular route under ultrasound guidance. 31.8 % of all CVCs and 57.5 % of left sided CVCs were suboptimally positioned.

No. of CVCs according to insertion site

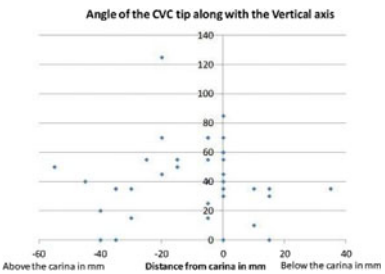
	Internal jugular	Subclavian	Total
Right	204 (83.3 %)	1 (0.4 %)	205 (83.7 %)
Left	039 (15.9 %)	1 (0.4 %)	040 (16.3 %)
Total	243 (99.2 %)	2 (0.8 %)	245 (100 %)

CVC Tips positioned 40 mm above-10 mm below carina

	Internal jugular	Subclavian	Total
Right	69/204 (33.8 %)	1/1 (100 %)	70/205 (34.1 %)
Left	08/039 (20.5 %)	0/1 (0 %)	08/040 (20.0 %)
Total	77/243 (31.6 %)	1/2 (50 %)	78/245 (31.8 %)

L CVC tips distance from the Carina versus angle

Angle of the CVC tip to vertical axis in degrees	Tip with in 40 mm above to 10 mm below Carina	Tip more than 40 mm above Carina	Tip more than 10 mm below Carina	Total
0–40	17	0	4	21
>40	15	2	2	19
Total	32	2	2	40



L CVC angle of CVC Tip versus vertical axis

CONCLUSIONS. Right sided CVCs are more likely to be placed in optimal position when compared with left sided CVCs. Only 66 %(4/6) of left sided CVCs placed 10 mm below the carina were in optimal position. This means even if all the left sided CVCs are placed 10 mm below the carina aiming to achieve <40° angulation, we would have been able to achieve optimal position only in 7 more left sided lines but we would have placed 17 more CVCs 10 mm below the carina increasing their risk of pericardial tamponade. We recommend that all CVCs to be placed according to current guidelines at or above the level of carina. We suggest against routinely placing all left sided CVCs below the level carina.
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1037
ROUTINE COAGULATION SCREENING IN THE INTENSIVE CARE UNIT: AN AUDIT OF CURRENT PRACTICE

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INTRODUCTION. Daily blood testing is a common part of intensive care unit (ICU) practice [1]. Routine testing is associated with significant financial costs, blood volumes, and other risks such as contamination of vascular access ports [2]. Informing clinicians of the cost of tests and introducing guidelines have been shown to reduce the number of tests performed [2, 3].
OBJECTIVES. To assess the frequency of coagulation screen testing in the ICU, costs associated and how many of these routine tests are clinically indicated. This data will then be used to calculate potential cost savings for the ICU.
METHODS. A retrospective audit of patients admitted to a 20 bed tertiary referral ICU, February 2012. Data collected included ICU length of stay, all coagulation screen results during ICU stay, and the use of anticoagulant therapy. Prothrombin time (PT) and Activated Partial Thromboplastin Time (APTT) were converted to International Normalised Ratio (INR) and APTT ratio, respectively using standard formulae. An INR of >1.4 or APTT ratio >1.4 were deemed to be clinically significant. The cost of a single coagulation screen in the study centre was £1.94 (2.35 Euros).
RESULTS. Ninety-eight patients were admitted during the audit period, for a total of 360 ICU patient days. Table 1 summarises the main results. Figure 1 shows the number of coagulation screens performed versus ICU length of stay.

Table 1. Summary of results

Median ICU length of stay (days) (IQR)	1.9 (0.9–5.0)
Median number of coagulation screens (IQR)	3 (2.0–5.8)
Total number of coagulation screens performed	472
INR >1.4	95
APTT ratio >1.4	76
APTT > 1.4 and INR < 1.4 (with patient not receiving Heparin)	6 (1.3 %, 95 % CI 0.5–2.8 %)
Total cost of coagulation screens	£915.68 (1109.20 Euros)
Estimated annual cost of coagulation screens	£10,988.16 (13,310.42 Euros)

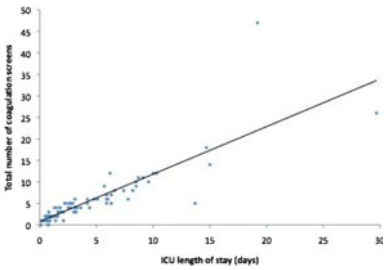

Fig. 1 Number of coagulation screens performed

The total blood volume required for the 472 tests was 1,274 ml, giving an estimated annual volume of 15,293 ml.
If coagulation screening was not performed as a routine daily test, but instead was performed using the algorithm suggested in Fig. 2, only 318/472 tests were clinically indicated (67 %, 95 % CI 63–72 %). If the algorithm had been used 6 abnormal tests (INR > 1.4) would have been missed (1.3 %, 95 % CI 0.5–2.8 %).

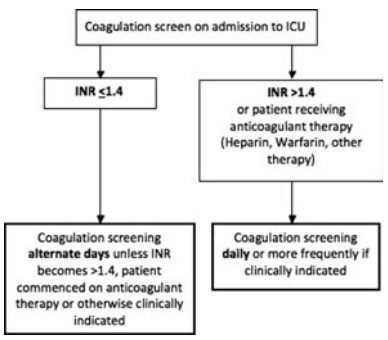

Fig. 2 Algorithm for coagulation screen testing

The potential cost saving using the algorithm was £298.76 (361.90 Euros), equating to an annual saving of £3585.12 (4342.81 Euros) (Fig. 3). The blood volume saved would have been 416 ml, saving an annual volume of 4,990 ml.

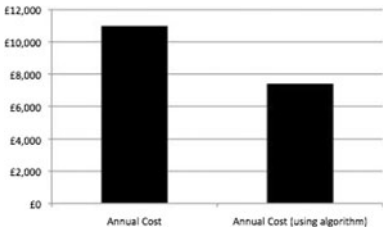

Fig. 3 Annual reduction in costs using algorithm

CONCLUSIONS. The introduction of a simple algorithm for coagulation screen testing could reduce costs in this ICU by £3585.12 (4342.81 Euros) per year. The results of this audit suggest reducing the frequency of coagulation screening would have no detrimental impact on patient care but bring significant cost savings.

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1038
ARE WE GIVING A FAST HUG ONCE A DAY?

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INTRODUCTION. Over the last years some authors reassessed the idea of giving a FAST HUG to ICU patients once a day, by adding new variables to the original model. All suggest to continuously improve quality of patient care in ICU. On our ICU we defined a policy of evaluation of performance on care giving based on FAST HUG mnemonics that can easily be remembered allowing to evaluate standards of care in ICU. Are we giving a FAST HUG once a day?

OBJECTIVES. To identify accomplishment of FAST HUG variables within our ICU.

METHODS. We performed a prospective observational study including all patients admitted on our mixed-case ICU between 1st and 31st March 2012. Patients with ICU length of stay less than 24 h and organ donors were excluded. A Web-based tool was created to collect data regarding demographics and FAST HUG variables. Data was collected on week days (excluding weekends and holidays) and accomplishment of FAST HUG was evaluated daily at 4 pm. SPSS was used for data analysis.

RESULTS. From a total of 30 patients (total of 110 evaluations), mean [sd] APACHE II score of 16.5 [5, 6], SAPS II score of 39.8 [10, 2] and SAPS III score of 61.5 [10, 9], 91,8 % (101) had enteral feeding (47.9 % with 20-30 kcal/kg/dia), 82.7 % (91) had analgesics (66.3 % opioids), 74.5 % (82) were sedated (36 % classified as Ramsay 5 and 6 and 49 % as Ramsay 1 to 3, 48 % (24) had sedation vacation), 96.4 (106) were under heparin therapy, 92.7 % (102) had head elevation (more than 30°). 99.1 % (109) had stress ulcer prevention and all had glycemic control: about 6.7 samples/patient/day, 2 % of hypoglycemia, 54 % under 140 mg/dL.

CONCLUSIONS. On our sample 81.8 % (90) had a complete "FAST HUG". Regarding sedation vacation, the measurement of sedation and analgesia on this study may have a rather important operator bias. We may have to improve early enteral feeding and glycemic control, reviewing current protocols. The knowledge of our performance take us further on defining best policies and standards of care to our ICU patients.

1039
DAILY DATA RECORDING IN A NATIONAL COMPARATIVE CLINICAL DATABASE TARGETING CONTINUOUS QUALITY IMPROVEMENT OF THE UNIVERSITY HOSPITAL SINGLE INTENSIVE CARE UNIT PERFORMANCE

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INTRODUCTION. University hospital single medical intensive care unit (ICU) was enrolled in the Croatian national comparative clinical database (CROICUnet) aiming date collecting for improvements in the organization and practice of the unit, development of a self program for ICU research, managing and practicing, and improving the quality of care. The standardized mortality rate (16.3 %) was lower than might be expected when measured against the outcomes of international best practice. The aim of the present report was to assess the impact of twenty independent variables on the likelihood of the ICU outcome.

METHODS. Study patients were recruited from the medical ICU at the Sisters of Mercy University Hospital, Zagreb, Croatia, between 2005 and 2008. Demographic, clinical and laboratory date were collected by the three researches on day-by day-basis, and recorded on line in National database CROICUnet. The study included overall 1,896 consecutive patients. The standard of care was measured by length of stay (LOS) and the results of care. Final outcome was ICU outcome.

RESULTS. Binary logistic regression was performed to assess the impact of a number of factors on the likelihood of ICU death outcome. The model contained twenty independent variables (age; gender; ICU admission time; ICU LOS; APACHE II, SOFA and GC scores; patient history of cardiomyopathy, coronary artery disease, cerebrovascular disease, peripheral vascular disease, COPD, diabetes mellitus, cirrosis, chronic renal failure, and/or malignancy; and acute presence of atrial fibrilation, hypertension, sepsis, and/or shock). The full model containing all predictors was statistically significant, X2 (21, N = 1,894) = 783.74, P < 0.001, indicating that the model was able to distinguish between influence of predictor variables on selected outcome (ICU death). The model as a whole explained between 33.9 % (Cox and Snell R square) and 55.8 % (Nagelkerke R squared) of the variance in symptomatology status, and correctly classified 90.1 % of cases. Predictors and their influence on ICU outcome are shown in Fig. 1 (Forrest plot). Significant contributions are marked in red. Highest odds ratio was noted for patients who were in shock (6.7 times more likely to die, controlled for all other factors in the model).

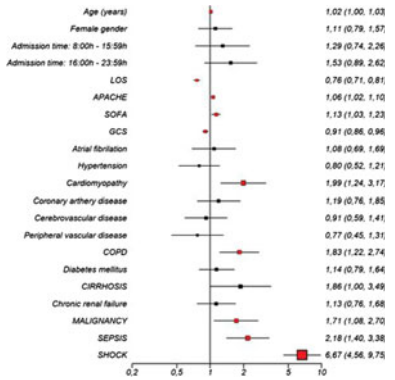

Fig. 1 Binary logistic regression model

CONCLUSIONS. Daily data recording in a national comparative clinical database resulted with not only continuous quality improvement of the patient care, and ICU organization and managing, but with the development of the research programs which led to implementation of the new ICU and hospital pathways in the admission and managing critically ill patients.

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1040
IMPACT OF THE USE OF COMPUTERIZED RECORD KEEPING ON PATIENT CARE MANAGEMENT

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INTRODUCTION. In recent years, health organizations in general, doctors, and nurses in particular are adopting computerized record systems in clinical work in hospitals. However, despite the potential of this technology, the advantages of its use in daily practice and its possible contribution to the improvement of clinical practice there have been difficulties with its integration and implementation including user dissatisfaction.

OBJECTIVES. The purpose of this study was to examine the effect of computerized record keeping on the clinical performance of doctors and nurses employed in a general intensive care unit (ICU), and review how its implementation influences the patterns of day-to-day work. In addition, we aimed to identify the areas in which the system's contribution is maximal and those areas that require changes, and to increase user satisfaction.

METHODS. A cross-sectional, descriptive study was conducted with a convenience sample of 41 doctors and nurses employed in a general ICU in a 450-bed hospital in Northern Israel. Participants were asked to complete a self-report questionnaire built by the research team, based on research literature and evidence from the field. It examined doctors' and nurses' perceptions of the extent to which the computerized records contributed to their clinical practice and its impact on day-to-day work.

RESULTS. The findings focus on the effects of computerized record keeping on various aspects of care management. Results of the survey testify to the positive contribution such record keeping has on quality and management of clinical information. 73–75 % of participants stated that the system makes systematic, detailed and up to date information available. It allows for accumulative information about patients to be viewed easily. However, 46–56 % of participants say that the efficiency of the writing of doctors' orders is not improved and that clinical care is not aided. Additionally 55–70 % of participants feel that the system does not reduce errors in the writing of medical orders, does not help significantly in diagnosis and care planning and does not improve patient care. Despite the fact that 75.6 % of participants agree that the computerized system contains far more information than hand written records, two thirds of participants were dissatisfied with the system.

CONCLUSIONS. Computerized record keeping is an integral part of the clinical practice of ICU doctors and nurses and is one of the central resources in management of patient care. The results of the study show that despite the clear advantages of this system staff do not feel that it improves clinical decision making and doubt if it improves patient care.

The areas that appear to need improvement and cause most dissatisfaction are drug management and the writing of medical orders.

1041
ADULT DEPENDENCY AND ILLNESS SEVERITY SURVEY (ADISSEY) IN A LARGE UK DISTRICT GENERAL HOSPITAL

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INTRODUCTION. In the context of secondary care, the management of the right patient, in the right place at the right time in their illness will inevitably have an impact on their outcome. For example, a Critical Care environment, with specialist interventions, monitoring and nurse staffing is optimum for patients assessed as having level 2 dependencies [1]. Despite a consensus in policy and the literature [2] that level two patients should have free access to Critical Care, implementation has been inconsistent. We feel this is because

the extent of the unmet need and the case mix of hospital inpatients is not clearly understood and may not be used effectively to plan Critical Care capacity.
OBJECTIVES. This study aims to assess the dependency of adult patients in a large UK District General Hospital. We applied the Association of United Kingdom University Hospitals (AUKUH) [1] dependency level tool, and their Modified Early Warning Score [3]. We focused on the location of patients assessed as level 2 because there is acceptance that these patients should be managed in a Critical Care environment.
METHOD. Data was collected face to face from each patient from nineteen wards at the Royal Cornwall Hospital UK (catchment population of 480,000) between October 2011 and February 2012. Patient dependency levels were defined using the AUKUH dependency tool (Table 1) [1]. The dependency level criteria was applied to each inpatient upon the end of bed inspection. We excluded obstetric, paediatric and emergency department patients.

AUKUH level 2 dependency criteria

Level 2 patients who are unstable and at risk of deteriorating and should not be cared for on general wards. (Should be managed in designated beds, resourced with the required expertise and staffing levels.)	Deteriorating/compromised single organ system, post op mgt following major surgery, post op optimisation/extended post op care. Step down from level 3. Uncorrected major physiological abnormalities.	Patients requiring NIV/ respiratory support. Routine post op ventilation. First 24 h following tracheostomy insertion. Requires a range of therapeutic interventions: >60 % oxygen, continuous ECG and invasive pressure monitoring, Vasoactive drugs. Haemodynamic instability. Pain management. IV analgesia. Airway protection and neuro monitoring

RESULTS.

Table 2 Table showing level 2 patients and their location in the hospital

	Intensive care unit	Medical high dependency	Medical admissions unit	Surgical receiving unit	Medical wards	Surgical wards	Total inpatients
02/11/11	0	4	0	0	3	0	n = 336
02/12/11	0	3	1	0	6	0	n = 357
05/12/11	3	3	0	1	5	4	n = 380
20/01/12	3	0	2	0	5	0	n = 383
02/02/12	3	1	1	0	0	0	n = 398

CONCLUSIONS. In the context of current UK health reform, we believe this methodology is useful in service planning, identifying patients who can safely be managed in a community setting liberating staff to manage patients of a higher dependency in critical care. We have identified 39 level 2 patients outside critical care on 5 surveys and are conducting a case note review on these patients.
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1042
LESSONS LEARNED FROM CRITICAL INCIDENT REPORTING: TIME FOR A CENTRALISED CRITICAL INCIDENT REPORTING SYSTEM?

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INTRODUCTION. Critical incident reporting originates from World War II, formalised by the UK Ministry of Health in 1955 [1]. Despite this history and with almost one million incidents occurring annually in the UK [1], there is no single universal system for reporting critical incidents within the National Health Service (NHS). The practice of critical care medicine is complex and technical, and the margins for error are small. Critical incidents in this setting have the potential to cause serious patient harm.
OBJECTIVES. To analyse critical incident reporting within the Critical Care Unit at Chester hospital.
METHODS. Critical incidents are reported online via 'DatixWeb' and analysed by the Critical Care Delivery Group. National Patient Safety Agency (NPSA) 'never events' or incidents potentially causing significant harm are escalated to the Clinical Governance team, where root cause analysis and a 'table top' exercise is performed. Recommendations are reported to the Clinical Lead, who is responsible for implementing appropriate change in clinical practice.
RESULTS. Between 1st April 2009 and 29th February 2012, 995 critical incidents were recorded within our unit (reporting rate of one incident per three patients).

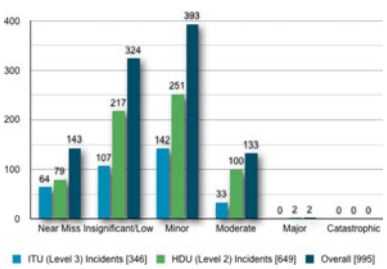

Figure 1 Incidents according to potential harm

All events were reviewed, analysed and actioned by risk management, parent speciality and critical care teams.
CONCLUSIONS. These 995 critical incidents represent a sample of incidents occurring. Reasons for under-reporting may include problems with the reporting system itself, fear of consequences and perceptions on how incidents are used to improve patient care. Over this review period we noted decreasing trends in potentially major harm incidents due to actions implemented after locally or nationally reported key cases, for example airway and nasogastric tube placement problems. Our and NPSA data suggest that airway incidents occur infrequently but are associated with potentially significant patient harm [2]. We recommend a central standardised reporting system for critical incidents and that: • potential harm scoring should be performed independently post-report of event;
• the categories of incidents should be standardised to NPSA style of reporting;
• it should be possible to file incidents under more than one NPSA category type;
• following analysis, feedback should be returned to individual units;
• practice should modify with emerging trends.
A centralised reporting system allows easier and more reliable data analysis and accumulation of infrequent but potentially major or catastrophic injuries. We believe such a system could significantly reduce the number of critical incidents occurring and therefore improve patient outcomes.
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1043
QUALITY INDICATORS COMPLIANCE SURVEY IN INDIAN ICU

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INTRODUCTION. Quality indicators act as a benchmark of a unit's performance, and provide measures to initiate programmes to improve the quality of patient care by optimize safety, better patient outcomes, and greater efficiency. The implementation of these indicators may be appropriately prioritized according to local resource availability.
OBJECTIVES. To study whether optimum quality standards are implemented in Indian ICUs according to local resource availability and to locate areas of non-compliance.
METHODS. A survey initiated at 18th Annual Congress of the Indian Society of Critical Care medicine & International Congress 2012, Pune (India) through a 22 point Questionnaire regarding professional status, hospital and ICU details, quality indicators compliance in Critical care units, such as patient safety, outcome parameters and infection control. Analysis of the first 200 responders is being presented here.
RESULTS. 73 % of responders were from age group of 20–40 years. 42 % of ICUs are mixed, admitting patients from all specialties. 40 % of ICUs are managed by trained intensivist round the clock. In 60 % of ICUs admission criteria are followed for ICU admission. In nearly 70 % ICUs, beds are fully occupied for most part of the year. Only 20 % of discharged patient get readmitted with 48 h of discharge. Nurse-patient ratio in ventilated patient is 1:1 to 1:2 in 85 % ICUs, and in non-ventilated patient is 1:2 to 1:3 in 88 % ICUs. Around 75–80 % ICUs follows Hand Hygiene protocols. 80–85 % ICUs are regularly auditing incidence of VAP, CRBSI, CAUTI, MRSA cases. Regular review of unit morbidity and mortality done in 68 % ICUs. End-of-life care pathway is followed in 51 % of ICUs. Standardized mortality ratio (SMR) monitoring is done in 46 % ICUs. 66 % of ICUs is following isolation policy for infected patient. Early Enteral Nutrition is initiated in 95 % of ICU patient. Daily goals sheet and structured handover are practiced in 75–80 % of ICUs. 40 % of ICUs allowed discharge from 8 p.m. to 8 a.m. 84–88 % of ICUs are regularly reporting needle stick injuries, patient injury or fall and Decubitus Pressure ulcer. Medication error and adverse events' reporting is done in only 42 % of ICU.
CONCLUSION. Quality indicators act as the yard stick to measure the level of care offered in a unit over a period of time. Selection of indicators and monitoring the same therefore should be considered as the most vital and challenging task to bring continuous improvement in the performance level of the unit.
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1044
ANALYZING THE SAFETY CLIMATE IN THE ICU: A TOOL FOR PATIENT AFETY

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INTRODUCTION. The intensive care unit is one of the sectors where the patient is more at risk within the hospital. The quest for patient safety in hospital must prioritize many of the processes that occur in the ICU. The assessment of safety climate from the team is a tool increasingly used in improving hospital safety.
OBJECTIVES. Through the application of a questionnaire previously described to measure the safety climate in nursing team. Our ICU is at this time being evaluated for certification for quality in health by the ONA (National Accreditation Organizaton). We will analyze the three main pillars of safety climate from the nursing work.
METHODS. The nursing staff of a 12 beds ICU, received an anonymous questionnaire with 30 questions. For each question had a five-point scale where 1—strongly disagree and 5—strongly agree. The three main dimensions of nursing work were studied: patient orientation, professional development and teamwork. The strength of the security environment was calculated from the correlation of measures within the group, with the null hypothesis of complete absence of agreement.
RESULTS. Five nurses and 13 nursing technicians were survey respondents (72 % of the team). 58.50 % are female, mean age 32.61 years, with a mean profession of 6.75 years (SD 4.65). The security climate in the unit was 4.09 (SD 0.39). The strength of the security environment was 0.77. With respect to the three main areas of nursing work were found: patient education—3.88 (SD 0.47); professional development—4.21 (SD 0.41); teamwork—3.77 (SD 0.86).
CONCLUSIONS. Any security policy must replace the individual blame and reinforce the responsibility of each member on the results, from the knowledge of the importance of their role. Nursing is a fundamental part of this process. Training, encouragement of personal development, better working conditions and an open and collaborative environment are essential for the patient safety in intensive care.

Technology in the ICU: 1045–1058

1045

EFFECTS OF HYPEROXIA, HYPOXAEMIA AND HAEMORRHAGE ON BLADDER TISSUE OXYGEN TENSION IN PIGS

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INTRODUCTION. Tissue oxygen tension (tPO_2) measured in various organ beds in both patients and animal models is an early indicator of organ hypoperfusion. Monitoring bladder tPO_2 via a Foley catheter is feasible in man.

OBJECTIVES. Prior to clinical testing, we aimed to further validate bladder tPO_2 monitoring in a large animal model following changes in inspired O_2 and haemorrhage.

METHODS. Anesthetized, mechanically ventilated instrumented female pigs (n = 6) were subjected to changes in inspired oxygen [FiO_2, 0.1–1.0] at 20 min intervals. After a stabilization period, sequential hemorrhage (10 % estimated circulatory blood volume removal) was performed at 40 min intervals until 40 % blood volume had been removed. Animals were then resuscitated (RES) with 2 l hetastarch and shed blood. At study end (END), animals were bled to a MAP of 25 mmHg. At each step, animals breathed 21 % O_2 for the first 20 min, and 100 % O_2 ('oxygen challenge test') for the last 20 min. Global haemodynamics, arterial and pulmonary blood gases and bladder tPO_2 were measured.

RESULTS. Bladder tPO_2 fell with increasing degrees of (A) hypoxaemia and (B) haemorrhage and were restored after resuscitation. These changes preceded those seen in arterial base excess (not shown) and lactate. The rise in bladder tPO_2 with hyperoxia was blunted by progressive haemorrhage while PaO_2 increased regardless of circulating blood volume status.

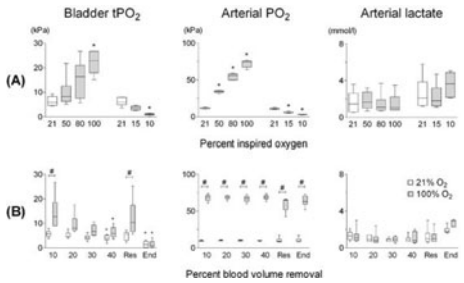

Fig. 1

Data shown as median, IQR, range. (A) *p < 0.05 vs. 21 % O_2. (B) *p < 0.05 vs. 10 % haemorrhage, #p < 0.05 comparing 21 % and 100 % O_2. Statistics performed using a one- or two-way ANOVA followed by Dunn's Multiple Comparison Test or Dunnett's test in A and B, respectively.

CONCLUSIONS. Bladder tPO_2 provides a sensitive indicator of organ hypoperfusion in a large animal model, and offers a potentially useful tool for clinical monitoring.

GRANT ACKNOWLEDGMENT. UCL-business funded the study. Oxford Optronix (Oxford, UK) provided tPO_2 probes and monitors.

1046

AGREEMENT BETWEEN HB AND SO_2 MEASUREMENTS IN DIFFERENT VASCULAR COMPARTMENTS USING A HUMAN HEMOGASOMETER AND A CALIBRATED DEVICE FOR PIGS: CALIBRATION FOR ANIMAL SPECIES NECESSARY?

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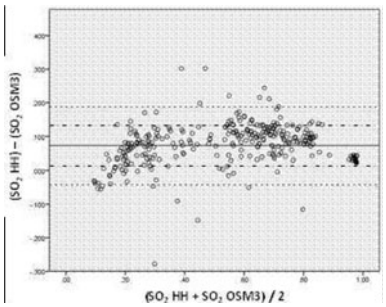
INTRODUCTION. Oxygen transport is of high relevance in diseases of critically ill patients. A significant part of research in this field has been performed in animals. Because of structural and functional differences of hemoglobin between different species, specifically calibrated devices should be used when hemoglobin and oxygen saturation are analyzed [1].

OBJECTIVES. To compare the performance of a human hemogasometer and a pig pre-calibrated device in the setting of Hb and SO_2 measurements, with simultaneous blood samples collected in different vascular compartments.

METHODS. 13 healthy anesthetized and mechanically ventilated pigs, 41 ± 2 kg, were treated with increasing doses of Angiotensin II (n = 5), Enalapril (n = 6) or placebo (n = 2). A total of 360 simultaneous blood samples, from 6 different vascular sites (carotid and pulmonary arteries, coronary sinus, portal, hepatic, and renal veins) were taken at various time points during the experiment. The samples were concomitantly analyzed in a human hemogasometer (HH) (GEM Premier 3000 analyzer–Bohemia, NY, USA) and in a pig pre-calibrated co-oximeter (OSM3 analyzer—Radiometer, Copenhagen, Denmark) and compared. Coefficients of variation (CV) between two concomitant measurements were calculated as the difference divided by the mean, and CV between hemoglobin values measured at different vascular sites as standard deviation divided by the mean.

RESULTS. Correlation between hemoglobin ($r_s = 0.903$, $p < 0.0001$) and oxygen saturation values ($r_s = 0.979$, $p < .0001$) measured by the two devices was high. The oxygen saturation Bland–Altman plot suggest in general the non-calibrated device overestimate the calibrate device measurements, and they present different limits of agreement along the range of means (worst performance for the lowest saturation values)—coronary sinus (mean SO_2: OSM3 20.3 ± 6.1, HH 25.2 ± 8.1): 0.19 ± 0.29, hepatic vein (mean SO_2: OSM3 26.6 ± 10, HH 33 ± 13.6): 0.18 ± 0.23, pulmonary artery (mean SO_2: OSM3 52.7 ± 6, HH 62.6 ± 8.4): 0.17 ± 0.11, portal vein (mean SO_2: OSM3 65.6 ± 6.5, HH 75.1 ± 5.7): 0.14 ± 0.06, renal vein (mean SO_2: OSM3 70.7 ± 8.9, HH 80.4 ± 8.4): 0.13 ± 0.07, carotid artery (mean SO_2: OSM3 95.7 ± 0.6, HH 98.9 ± 0.4): 0.03 ± 0.01. CVs for hemoglobin measurements at different vascular sites varied between 0.01 and 0.03.



Bland–Altman SO2: human x pig-calibrated device

CONCLUSIONS. High coefficients of variation between oxygen saturation measurements obtained by calibrated versus non-calibrated devices warrant measurement with calibrated devices, especially when oxygen saturation is low. In contrast, CVs for haemoglobin measurements are small and within the range of pre-analytical and/or device-related, technical variation.

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1047

REGIONAL ANTICOAGULATION WITH CITRATE DURING MARS TREATMENT: PREELIMINARY RESULTS

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INTRODUCTION. Liver failure is a serious medical problem in ICU patients. The mortality in acute liver failure without liver transplant reaches 85 % and with liver transplant up to 35 %. There are different methods of supporting liver function in ICU: MARS, Prometheus, SPAD and perfusion through live lines of hepatocytes. We have been using MARS treatment since 2006. We performed 192 sessions in total. The usual method of anticoagulation in MARS treatment was heparin infusion. 10 sessions ended prematurely due to thrombosis in the system and three patients had serious bleeding problems that caused early termination of MARS treatment. The risk of heparin infusion in liver failure patients led us to implementation of regional anticoagulation with citrate.

OBJECTIVES. Our objective was to assess the safety of regional anticoagulation with citrate in liver failure patients without encephalopathy or with mild form of encephalopathy.

METHODS. We performed six MARS/PRISMA sessions in three patients with liver failure: two patients with acute on chronic liver failure and one patient with subacute liver failure. Each session lasted 10 ± 1 h. We used prismocitrate 10/2 (GAMBRO) for regional anticoagulation. We analysed post-filter Ca^{2+} every 4 h (range 0.2–0.4 mmol/l) and Ca^{total}/Ca^{2+} every 2 h. Calcium chloride was substituted into separate iv line. We decided to terminate the session if $Ca^{total}/Ca^{2+} \geq 2.5$.

RESULTS. See table below.

Results of the study

	Patient 1 (pre)	Patient 1 (post)	Patient 2 (pre)	Patient 2 (post)	Patient 3 (pre)	Patient 3 (post)
Encephalopathy	I	I	I	I	II	I
Bilirubin (mg/dl)	22.39	15.8	24.46	17.23	6.85	2.47
Factor V (%)	47	38	140	–	35	55
Bloot amonia (μmol/l)	50	–	28	–	90	68
Albumin (g/dl)	2.6	2.5	3.4	3.2	2.1	2.1
PLT ($x10^{9/l}$)	44	51	290	261	105	70
INR	2.2	2.36	0.84	0.82	1.43	1.68
Doppler TC MCA—PS (cm/s)	80	85	125	120	–	–
Ca^{total}/Ca^{+2} during MARS	1.8 (±0.2)		2 (±0.2)		1.6 (±0.3)	

CONCLUSIONS. 1. Regional anticoagulation with citrate might be safe option for patients with mild liver failure. 2. We didn't observe any side effects of citrate infusion. 3. Further studies are needed for more severe cases of liver failure where there is high risk of citrate accumulation.

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GRANT ACKNOWLEDGMENT. Team of ICU.

1048

THE ACCURACY AND PRECISION OF A DISPOSABLE NON-INVASIVE CORE THERMOMETER IN PATIENTS UNDER GENERAL OR SPINAL ANESTHESIA

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INTRODUCTION. Perioperative hypothermia is still a common complication of perioperative anesthetic management. Therefore, thermal management including accurate core

temperature measurements remains important. Especially in patients undergoing regional anesthesia, patients having a laryngeal mask airway or postoperative patients, core temperature measurements are difficult to obtain. Thus current studies have already investigated non-invasive temperature monitoring systems in patients under general anesthesia [1].
OBJECTIVES. We evaluated the accuracy of a new, non-invasive, forehead double-sensor core thermometer compared to a distal esophageal as well as bladder thermometer in patients undergoing general *or* regional anesthesia.
METHODS. We assessed core temperature in 36 patients undergoing general anesthesia and 20 patients undergoing regional anesthesia. The temperature obtained using the double-sensor monitor was compared with the distal esophageal temperature in the general anesthesia population and the bladder thermometer in regional anesthesia patients. We assessed the accuracy of the double-sensor monitor using Bland–Altman analysis and Lin's concordance correlation coefficient.
RESULTS. In the general anesthesia patient population, 1,047 measurement pairs were obtained at 5-min intervals. 90 % of all double-sensor values were within ±0.5 °C of esophageal temperature. The mean bias between the methods was 0.08 °C for the lateral position; the limits of agreement were −0.52 to 0.68 °C. Sensitivity and specificity for detection of fever was 0.97 and detection of hypothermia was 0.7. Lin's concordance correlation coefficient was 0.89. In patients undergoing regional anesthesia, 1,241 measurements pairs were obtained at 5-min intervals. 89 % of all double-sensor values were within ±0.5 °C of esophageal temperature. The mean bias between the methods was −0.13 °C; the limits of agreement were −0.40 to 0.65 °C. Lin's concordance correlation coefficient was 0.77.
CONCLUSIONS. In a perioperative patient population undergoing general or regional anesthesia, the new non-invasive disposable double-sensor thermometer is sufficiently accurate to replace a distal esophageal and bladder thermometer in routine clinical practice.
REFERENCES. 1. Kimberger et al. Br J Anaesth. 2009;103(2):226–31.
GRANT ACKNOWLEDGMENT. This project was supported by Draegerwerk AG & Co. KGaA (Luebeck, Germany); and the Joseph Drown Foundation (Los Angeles, CA, USA).

1049
CAN PULSE WAVE TRANSIT TIME VARIATION PREDICT A FLUID RESPONSIVENESS MORE PRECISELY COMPARED WITH PULSE PRESSURE VARIATION?

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INTRODUCTION. Fluid therapy during surgery is challenging because both hypovolemia and fluid overload may cause circulatory failure. Therefore, prediction of fluid therapy is a major issue in optimizing hemodynamic status. However, there has been no ideal hemodynamic parameter. For predicting cardiac output (CO) changes, pulse pressure variation (PPV) has been a useful less-invasive parameter. Pulse wave transit time (PWTT), measured as the interval from the ECG R wave to the pulse plethysmograph upstroke, is recently introduced to non-invasively assess cardiovascular response including CO. We hypothesized that PWTT variation (PWTTV) might be a useful parameter to predict CO change.
OBJECTIVES. The present study examined the ability of PPV and PWTTV for estimated CO change.
METHODS. After approval of the institutional animal ethics, six adult pigs weighting 40 kg were anesthetized with an i.m. injection of midazolam and ketamine. Anesthesia was maintained thiamylal and vecronium bromide. Tracheostomy and mechanical ventilation was undertaken with the following baseline ventilator settings: 12 ml/kg in tidal volume and 5 cmH_2O in positive end-expiratory pressure (PEEP). An electrocardiography, femoral arterial pressure and plethythmograph on tail were monitored by polygraph-system (RMT-1000, Nihon Kohden, Tokyo, Japan). A 5 Fr pulmonary artery catheter was inserted by pressure curve visualization. CO was measured by thermodilution method (774HF75, Edwards Lifescience LLC, Irvine, CA, USA). Data were collected in three different phase: baseline, hypovolemia, after transfusion. Hypovolemia was induced by the withdrawal of 20 ml/kg blood of body weight for 20 min. After haemorrhage, transfusion was conducted step by step in 5 ml/kg of body weight. PPV and PWTTV were calculated every 32 beats. Receiver operating characteristics curve was used to compare the predictive ability for >10 % changes in CO.
RESULTS. Area under the curve were 0.769 in PPV and 0.764 in PWTTV, respectively. Cut off point were 19 % (78 %; sensitivity, 67 %; specificity) in PPV and 9 % (78 %, 75 %) in PWTTV, respectively.
CONCLUSIONS. PWTTV might be a useful parameter to estimate the >10 % changes in CO induced by transfusion in accordance with PPV.
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1050
IMPACT OF ARTERIAL LOAD ON RELIABILITY OF PULSE CONTOUR-DERIVED CARDIAC OUTPUT MEASUREMENTS

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OBJECTIVE. To evaluate the impact of arterial load on reliability of eight non-proprietary algorithms of pulse contour analysis for estimating cardiac output (PCCO) during arterial tone changes (introduction or modification in dose of vasoactive medication or during volume administration), as well as to determine the optimal arterial tone parameter to detect a clinically significant discrepancy between PCCO and the reference cardiac output.
METHODS. Thirty-three mechanically ventilated patients monitored with esophageal Doppler (CardioQ Combi, Deltex Medical) and invasive blood pressure (radial or femoral). Initial calibration of PCCO algorithms was made on the value of esophageal Doppler cardiac output (EDCO). We assessed different aspects of arterial tone: arterial compliance (C = stroke volume/pulse pressure), effective arterial elastance (Ea = 0.9 × systolic blood pressure/stroke volume), mean arterial pressure (MAP) and total systemic vascular resistance (TSVR = MAP/EDCO × 80).
RESULTS. A total of 12,156 paired measurements were performed (368 ± 192 per patient). 37 changes on vasopressor dosage in 28 patients and 27 fluid challenges in 23 patients were performed. The range of percentage change on MAP was −18.3 to 37.2 % during fluid administration and −30.9 to 61.6 % after vasopressor change. Overall, all pulse contour algorithms were affected by changes in arterial vasomotor tone, however, the impact of Ea and C changes on PCCO was superior to TSVR and MAP. Only the Liljestrand–Zander algorithm provided a clinical acceptable accuracy over a wide range of arterial tone change (bias 0.11 L/min, limits of agreement: −1.61 to 1.82, percentage of error: 28.3 %). However, the ability to detect directional and proportional changes in EDCO (assessed by polar concordance plots), was poor for all PCCO algorithms. A change of 7–10 % of Ea of C was associated with a discrepancy of ≥10 % between PCCO and EDCO in most of PCCO algorithms. The predictive performance of Ea and C changes was superior to TSVR and MAP changes in all cases.

	Source	Algorithm
CO_{X1}	**Windkessel** (Erlanger and Hooker 1904)	$k * (SBP - DBP) * HR$
CO_{X2}	**Windkessel with RC decay** (Bourgeois, Gilbert et al. 1974)	$k * (MAP / 60) * \ln(SBP/DBP) * HR$
CO_{X3}	**Liljestrand-Zander** (Liljestrand and Zander 1928)	$k * (SBP - DBP) / (SBP * DBP) * HR$
CO_{X4}	**Pressure root-mean-square** (Jones and Tuner 2002)	$k * \sqrt{\int_{sys}(ABP(t) - MAP)^2 dt} * HR$
CO_{X5}	**Herd** (Herd, Leisier et al. 1966)	$k * (MAP - DBP) * HR$
CO_{X6}	**Systolic area** (Jones, Righer et al. 1959; Verduure, Beaune et al. 1975)	$k * \int_{sys} ABP(dt) * HR$
CO_{X7}	**Systolic area with correction** (Warner 1954)	$k * \left(1 + \frac{Tsys}{Tdia}\right) * \int_{sys} ABP(dt) * HR$
CO_{X8}	**Corrected impedance** (Weseling, de Wit et al. 1983)	$k * (163 + HR - 0.48 * MAP) * \int_{sys} ABP\,(dt) * HR$

ABP: arterial blood pressure; DBP: diastolic blood pressure; HR: heart rate; MAP: mean arterial pressure; SBP: systolic blood pressur; T_{dia}: duration of diastole; T_{sys}: duration of systole.

PCCO algorithms

CONCLUSIONS. Changes in arterial tone profoundly affected the reliability of cardiac output measurements obtained from studied algorithms. Only the Zander–Liljestrand algorithm provided a clinically acceptable accuracy on estimation of cardiac output. However, the ability to track changes during arterial tone modification was poor in all studied algorithms. Monitoring the effective arterial elastance may provide a guide to detect significant discrepancies and to determine when to perform a new calibration.

1051
STUDY ON THE FEASIBILITY OF QUANTITATIVE MITOCHONDRIAL OXYGENATION MEASUREMENTS IN THE RENAL CORTEX

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INTRODUCTION. Previous studies in our lab have led us to the hypothesis that acute kidney injury (AKI) is characterized by both microvascular dysfunction, as indicated by very heterogeneous distribution of microvascular oxygen in the renal cortex, and mitochondrial failure as indicated by disturbed renal oxygen handling and severe generation of reactive oxygen species.
OBJECTIVES. To test these hypotheses, we are developing and validating a setup for quantitative imaging of microvascular and mitochondrial oxygen tensions in the kidney in vivo to allow quantitatively correlating microvascular and mitochondrial oxygen tensions during shock and therapy. This is based on measuring the oxygen-dependent delayed fluorescence of aminolevulinic acid (ALA) enhanced protoporphyrin IX (PpIX) endogenously present in mitochondria. We have applied this technique in vivo to the liver and to the heart [Nature Methods 3:939-45, 2006; Biophys J 95:3977-90, 2008; J Mol Cell Cardiol 46:943-51, 2009], but not yet to the kidney. Here we present a study on the feasibility of quantitative mitochondrial oxygenation measurements in the renal cortex.
METHODS. In feasibility experiments for this project we have made fluorescence microscopy and cryomicrotome images to investigate whether ALA administration would result in sufficient mitochondrial PpIX accumulation in the kidney.
RESULTS. Figure 1 presents the PpIX fluorescence, MitoTracker Green fluorescence, and phase contrast images of human kidney (HK-2) cells incubated with ALA for 4 h and co-stained with MitoTracker Green for 30 min. Similar heterogeneous cellular distribution of PpIX fluorescence and MitoTracker Green signals were observed in tubular kidney cells, confirming the mitochondrial localization of the ALA-enhanced PpIX signal. Cryomicrotome images of PpIX fluorescence in an ALA-treated and a control kidney are presented in Figure 2. The ALA-treated kidney clearly shows fluorescence in the medulla and cortex, while there is almost no fluorescence in the pelvis. Images from the control kidneys show no fluorescence at all, confirming that the fluorescence observed in the ALA-treated kidney represents PpIX fluorescence.

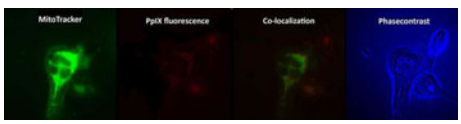

Fig. 1

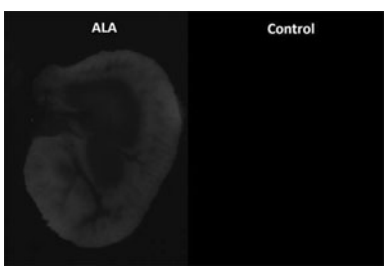

Fig. 2

CONCLUSIONS. These preliminary results demonstrate sufficient PpIX expression in renal cortical cells for mitochondrial oxygenation measurements in the kidney in vivo. We anticipate that using such innovative methodology, we will provide novel insights regarding

the role of mitochondrial dysfunction in critically ill patients and renal disease and potentially identify therapeutic opportunities for the prevention and/or treatment of AKI in the intensive care unit.

1052
INTEROBSERVER RELIABILITY OF THE TRANSTHORACIC ECHOCARDIOGRAPHY IN INTENSIVE CARE UNIT

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INTRODUCTION. Transthoracic echocardiography (TTE) is a non invasive exam widely used in intensive care units (ICU) for many diagnostic and monitoring purposes. Indications for performing TTE examinations are large (shock, respiratory distress) but its diagnostic performances in ICU patients (pts) are unknown. The aim of the study was to assess inter-observer reliability of TTE in the ICU setting.
METHODS. This prospective study conducted in a surgical ICU included pts who had an TTE decided by the clinician in charge of the case. Each examination was performed twice by two observers (senior graduated in echocardiography) blinded to the results of the second procedure. Datas collected during TTE were: left ventricular ejection fraction (LVEF); velocity time integral (ITV) subaortic; E, A and Ea wave velocities at the mitral annulus; maximum diameter minimum of the inferior vena cava (IVC) and measurement of systolic excursion of the tricuspid annular plane (TAPSE). Results are expressed in median and range or proportions. Statistical analysis consisted in calculation of the intra-class correlation coefficient with confidence interval of 95 %.
RESULTS. Twenty two patients admitted for shock or acute respiratory distress were analyzed. Their median age was 56 years [48–70], SAPS II 54 [30–70], 18 % of them had chronic respiratory failure, 18 % were obese, 59 % were mechanically ventilated. The results of intraclass correlation coefficient (ICC) were: LVEF [0.741 (0.469–0.885)], E/Ea ratio [0.715 (0.434–0.870)] and ITV subaortic [0.713 (0.431–0.869)]. For the minimum and maximum diameter of IVC, the E/A ratio and TAPSE, the ICC was between 0.38 and 0.69.
CONCLUSIONS. TTE is routinely performed in ICU, inter-observer reliability was never specifically assessed. It appears to be highly variable according to the parameters analyzed. These preliminary results suggest that TTE is reliable for assessing of LVEF, cardiac output and E/Ea ratio. However, the inter-observer reproducibility of TTE is low in measuring diameters of the IVC and TAPSE, which may be a limit of the value of TTE as monitoring technique.

1053
RELIABILITY OF PULSE CONTOUR METHOD-BASED HEMODYNAMIC MEASUREMENTS ASSESSED BY DIFFERENT OPERATORS

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INTRODUCTION. Pulse Contour Methods (PCMs) provide stroke volume (SV) and cardiac output (CO) from the analysis of the arterial waveform. Artifacts affecting arterial wave morphology may reduce the reliability of PCMs in estimating such haemodynamic variables. The new operator who is facing a PCM for the first time should need a training period to gain ability in recognizing artifacts and avoiding mistakes in CO assessment.
OBJECTIVES. The aim of this study is to evaluate the potential bias rising when comparing CO values obtained by transthoracic echocardiography (TTE-CO) and Most-Care (MC-CO) system recorded by trained (T) and not-trained operators (NT).
METHODS. 23 consecutive patients (10 male, mean age 60 ± 15) admitted to general ICU for heterogeneous pathologies were enrolled. Inclusion criteria were: the presence of a radial artery catheter for invasive blood pressure monitoring, need for a transthoracic echocardiography evaluation, age >18 years old. Exclusion criteria were: cardiac arrhythmias, aortic valve pathologies, ascending aortic pathologies, pregnancy, arteriovenous fistulas, and significant artery obstruction. For each patient, during haemodynamic stability (i.e., mean arterial pressure changes <10 %), CO was obtained with Most-Care (Vytech Health, Padua, Italy) by T (i.e., who has been using Most-Care for at least 6 months) and NT operator (who had only read the user manual of MostCare). TTE-CO was performed with MyLab^{TM} 70 Xvision (Esaote, Italy) by the same operator during CO measurements obtained by T and NT (T-CO, NT-CO). TTE-CO was calculated as the product of heart rate by SV averaged over five consecutive measurements obtained during both NT-CO and T-CO Most-Care estimations. Bland–Altman analysis was used.
RESULTS. 46 paired CO values were obtained. TTE-CO values ranged from 3.0 to 8.9 l/min, T-CO ranged from 3.2 to 9.0 l/min, and NT-CO from 4.5 to 16.0 l/min. The mean bias between T-CO and TTE-CO was 0.04 l/min (limits of agreement, LoA −0.5 to 0.6 l/min, percentage error, PE = 11 %), and between NT-CO and TTE-CO −2.8 l/min (LoA −9.8 to 4.5 l/min, PE > 30 %). The fast flush test, to improve the quality of the arterial pressure waveform, was performed in 100 % of cases by T and in 48 % of cases by NT. Resonance over-shoot eliminator (R.O.S.E., Becton–Dickinson, Becton Drive, NJ) was used in 32 % of cases by T and in 9 % of cases by NT.
CONCLUSIONS. The comparison between T-CO and NT-CO showed that bias and percentage of errors were very relevant for NT. A period of training is needed for the new user to assess correctly CO values with such PCM. This would avoid misinterpretation of arterial pressure waveform-derived variables and could help the clinical staff to get reliable hemodynamic data for daily clinical practice.
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1054
EARLY EXPERIENCE WITH INTEGRATION OF A NOVEL CONTINUOUS GLUCOSE MANAGEMENT SYSTEM IN HOSPITAL CRITICAL CARE

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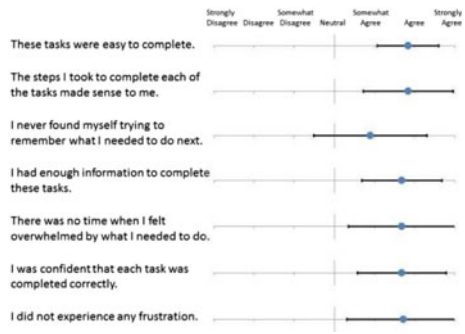
After years of successful use in outpatients with diabetes, there has been a rising interest in applying continuous glucose monitoring (CGM) in the critical care setting. Clinical adoption of CGM devices in the ICU will ultimately depend on clinical efficacy, safety and accuracy. However, additional factors such as usability and ease of integration into routine clinical workflow are also important aspects of CGM performance evaluation.
OBJECTIVES. Two studies are being conducted with the following objectives:
1. To examine clinical operator experience with a CGM device
2. To study the implementation of a CGM device into an ICU environment.
METHODS. Study 1: 19 ICU nurses (RNs) participated in a simulated usability study. Nurses received an initial training on the system and specific tasks that they would be required to complete when using the device. The RNs were then evaluated on their knowledge of the system, task completion, as well as their overall experience with the device. Each participant was a practicing professional RN for at least 3 years with at least 1 year of practice in the ICU. 10 RNs were from Thomas Jefferson University (TJU) Hospital in Philadelphia, PA. 9 RNs were from Saint Luke's Mid-America Heart Institute (MAHI) in Kansas City, MO. Study 2: The first four subjects of a prospective, non-randomized trial have been admitted to the CCU or CTICU at MAHI. Through a combination of surveys and performance analysis, we will evaluate ease of training and use, response to alarms, and overall experience during routine patient care.
RESULTS. Study 1: The task success rate was 87 % for all 19 study participants. TJU RNs had an 88 % successful completion rate and MAHI RNs had an 87 % successful completion rate. Thus, there was no performance difference between settings. Participants' experience as it relates to performing ongoing patient care tasks is included. Study 2: The prospective, non-randomized trial at MAHI is anticipated to be completed by August 2012. A total of 30 RNs have been trained through classroom setting and hands-on experience. Feedback from nursing staff after the enrollment of the first four study subjects has exceeded expectations related to the ease of use and implementation into the clinical workflow.



Survey data from Study 1

CONCLUSIONS. Study 1: The overwhelming majority of ICU nurses completed the simulated usability study successfully, and found the CGM device to be intuitive and user-friendly. Study 2: A total of 30 RNs have been trained through classroom setting and hands-on experience as part of the prospective, non-randomized trial at MAHI. Early feedback from nursing staff has been positive on this system's ease of use and clinical integration. Overall, early experience with this novel, minimally-invasive CGM technology suggests that it can be successfully implemented into the ICU environment. On-going studies are evaluating other aspects of its performance, including accuracy, clinical efficacy and safety.
GRANT ACKNOWLEDGMENT. Medtronic

1055
THROMBOELASTOGRAPHY ON THE INTENSIVE CARE UNIT: AN OBSERVATIONAL STUDY OF INITIAL USE, BENEFITS AND IMPACT ON DIAGNOSIS AND TREATMENT

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INTRODUCTION. Originally invented in 1948, Thromboelastography (TEG) is used to identify coagulopathy by assessing the viscoelastic property of clot formation in whole blood under low shear conditions to produce a diagrammatic trace of the different stages of clot formation [1]. Screening for abnormalities in coagulation and application of haemostatic interventions based on classical coagulation tests—Prothrombin Time (PT) and Activated Partial Thromboplastin Time (aPTT)—is of limited use in perioperative and acutely ill patients [2]. In these patients TEG offers effective method of measuring coagulopathy in addition to significant advantages over laboratory tests in terms of near-patient capability, real-time result delivery and the production of a functional clotting analysis as opposed to numerical assays.
OBJECTIVES. We present an observational study of the use of TEG following its introduction into routine use on a 17 bedded, mixed medical and surgical, university teaching hospital ICU.
METHOD. A prospective audit of TEG studies conducted over a 3-month period following its introduction. A data-capture sheet was produced to ascertain the reason for; and the results of the TEG and any treatment decisions made based on the TEG. The TEG findings were compared to classical laboratory-based investigations taken for those patients.
RESULTS. 19 of 28 (70 %) of the studies conducted identified coagulopathy of varying severity. 16 of 28 (57 %) of the patients received haemostatic blood products based on the TEG. 6 of 28 (21 %) of patients were referred to a Haematologist for advice in managing their coagulopathy. When compared to a conventional panel of clotting tests, PT, aPTT, platelet count and fibrinogen level, TEG demonstrated 'sensitivity' and 'specificity'. Initial TEG results were available within 15 min of specimen acquisition compared to ∼90 min for the coagulopathy panel.
CONCLUSION. This study demonstrates that the introduction of TEG into routine practice in a medical/surgical ICU provides a practical, rapid and reliable technique to diagnose and assess the response to therapy of a wide range of coagulopathic ICU patients. Further work is being conducted to refine our use of this tool, which has diagnostic, therapeutic and prognostic benefits [3].
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1056
COMPARISON OF TWO DIFFERENT ADSORPTIVE THERAPIES FOR THE TREATMENT OF ENDOTOXEMIA

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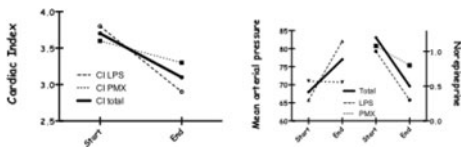
INTRODUCTION. Bacterial endotoxins initiate a physiological response that can finally derive in septic shock, so the blockade of these molecules can be useful to abort this response. Adsorption has been proposed as a mean for its elimination and new adsorbents aimed specifically to the clearance of endotoxins has been recently developed.

OBJECTIVES. To compare the hemodynamic response after two different extracorporeal adsorptive systems in severe sepsis of abdominal origin.

METHODS. Series of cases. 14 patients admitted to the ICU after successful abdominal surgery for infection control that presented signs of severe sepsis after the surgery. These patients were treated by one of two different systems: 7 with polimixyn-B (Toraymixin®) (PMX group) and 7 with LPS-adsorber® (LPS group). Two sessions separated 24 h were performed for the PMX patients but only one session for the LPS group (initiated in both groups during the first 24 h after surgery). Differences in response between groups were compared by X-square test and non-parametrical test.

RESULTS. Severity level was similar in both groups, with APACHE II 23.4 ± 3,2 for PMX vs. 25 ± 8.7 for LPS; SOFA 10.7 ± 2.6 for PMX vs. 12 ± 1.1 for LPS and lactate 4.5 ± 4.4 for PMX vs. 3.4 ± 2.1 for LPS (p ns). Mean arterial pressure, cardiac index and norepinephrine dosage ($p < 0.05$) improved with the therapies but we did not detect differences between groups. We did not detect any complication related to these procedures. Mortality was 57.1 % for the PMX group and 42.9 % for LPS (p ns).



Comparison of results

CONCLUSIONS. Early application of an adsorptive therapy aimed for clearance of endotoxins improves hemodynamic parameters in severe sepsis of abdominal origin. Both systems were safe for the patients and provided similar beneficial effect but with lower number of sessions for the LPS-adsorber.

1057
COMPARISON OF A UNIT-USE BLOOD GAS ANALYZER (BGA) WITH A STANDARD LAB BGA DEVICE AS TWO OPTIONS FOR POINT-OF-CARE TECHNIQUE (POCT) DURING ROUTINE PRACTICE ON A SURGICAL ICU: DATA QUALITY, DEVIATIONS, FEASIBILITY, AND IMPACT FACTORS

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INTRODUCTION. Recent developments of small, portable unit-use POCT analyzers for blood gas analysis (BGA) as well as other lab parameters have made considerable progress. However, clinicians are still reluctant to apply these techniques as a standard due to presumed inaccuracy of data.

OBJECTIVES. We tested the portable epoc™ (Alere Company) unit-use BGA device in parallel with a standard cassette lab analyzer (ABL-800 Flex™, Radiometer Company), aiming at testing feasibility, comparing paired data for deviations, and possible influence of individual patients and users.

METHODS. Prospective cohort study over 4 weeks after an initial 4 week training phase, performed by two highly experienced ICU nurses. Paired samples were taken from eight long-term ventilated patients. Primary lab parameters were in both devices: pH, pO_2, pCO_2, Na^+, K^+, glucose (glu), lactate (lac). Hematocrit (hct) was measured by the epoc device, but calculated by the ABL; vice versa, epoc calculated hemoglobin (hgb), whereas ABL measured hgb. Both devices calculated SO_2, base excess (BE), and HCO_3^-. In addition, a third sample was compared by the central clinical chemistry lab for Na^+, K^+, and hgb. Statistics: paired t-test, unpaired t-test (users), Passing-Bablok regression, Mountain Plot, Bland–Altman Plot, ANOVA.

RESULTS. A total of 56 paired samples were analyzed; six tests had to be repeated due to technical error signals (3 x epoc, 3 x ABL). Excellent accordance was found for K^+, lac, and glu. The pH data were systemically higher in the epoc compared with the ABL (mean deviation: +0.03; similarly, Na^+ values by the epoc were always higher (mean deviation: +5.6 mmol/L). Interestingly, comparing central lab data, epoc values were 2 mmol/L higher, whereas the ABL values were 4 mmol/L lower than the central lab data. pO_2 and SO_2 were slightly lower in the epoc, mainly by one user at the beginning of the test period. pCO_2 was 1.8 mmHg lower in the epoc system compared with the ABL. For one patient, who was on CVVH, calculated hgb values of the epoc was considerably higher than the measured hgb values of the ABL. Overall, ANOVA revealed a low impact by the user, whereas the deviations were dependent from the individual patients.

CONCLUSIONS. Although some of the described deviations reached statistical significance, their clinical relevance is very limited. The overall accordance of data were good or excellent; the problems with the Na^+ remain unclear, especially since the ABL data deviated from central data in a stronger manner. For the differences of hgb, patient-related factors such as hemofiltration seam to have major impact which should be clarified by the company. Overall, feasibility of the portable system was very good, and both systems can be used with equal value.

1058
USE OF NOVEL NONINVASIVE CARDIAC HEMODYNAMIC (NICHE™) MONITORING SYSTEM IN MECHANICALLY VENTILATED PATIENTS: PRELIMINARY REPORT

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INTRODUCTION. Cardiac Doppler derived parameters are routinely used for assessment of systolic and diastolic left ventricular function and left ventricular filling. However, standard cardiac echocardiography is not suitable for continuous monitoring. The NICHE™ monitoring system is a new device that continuously acquires and displays blood-flow and tissue-Doppler measurements. Using ultrasound transducers attached to the chest, the monitor automatically measures physiologic parameters in a 'hands free' manner. A previous study on healthy subjects and cardiac patients has demonstrated high correlation of NICHE™ derived measurements with those obtained by transthoracic echocardiography [1].

OBJECTIVES. The goal of the present study is to evaluate the ability of NICHE™ system to monitor transmitral blood flow and tissue Doppler parameters during the induction of anesthesia and preparation for cardiac surgery.

METHODS. Ten patients undergoing elective cardiac surgery were included in this study. Transthoracic echocardiographic examination was performed prior to induction of anesthesia. NICHE™ monitoring was performed through induction of anesthesia. Before the patients' final prepping NICHE™ transducers were removed and a transesophageal echocardiographic examination was performed. Study measures included: transmitral early wave peak velocity (E) [associated with trans-mitral pressure gradients], early-wave peak velocity of mitral annular motion (E') [associated with diastolic left ventricular function], E/E' ratio [associated with left ventricular filling], transmitral velocity–time integral (VTI), [correlated with stroke volume] and mitral annulus motion (MAM) [a known Doppler-derived index of left ventricular contractility]. In addition, the following events were recorded: induction of anesthesia; commencement of mechanical ventilation; changes in patient position.

RESULTS. The ability of NICHE™ system to record blood and tissue Doppler simultaneously in a 'hands free' manner was demonstrated in all cases. Measurements of Doppler signals were maintained from the time patient was awake until patient prep (15–25 min session). All measurements were found to be sensitive to rapid changes due to the documented interventions.

CONCLUSIONS. The present study demonstrates for the first time the ability of the novel non-invasive NICHE™ technology to monitor transmitral blood flow and tissue Doppler indices in anesthetized, mechanically ventilated patients. This new method may provide real-time monitoring capabilities of changes of left ventricular filling, systolic and diastolic function, and cardiac output. It has potential for use in fluid management as well as global cardiac function monitoring in critically ill patients.

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ICU infections: Biomarkers & antimicrobial treatment 2: 1059–1072

1059
USE OF COLISTIN TO TREAT MULTIDRUG RESISTANT (MDR) GRAM NEGATIVE PATHOGENS: A SINGLE CENTER EXPERIENCE

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INTRODUCTION. Multidrug resistant pathogens such as Acinetobacter Baumannii and Pseudomonas aeruginosa have emerged as the most troublesome pathogens for health care institutions globally [1, 2]. The clinical significance, especially over the last 15 years, has been propelled by their remarkable ability to acquire resistance threatening the current antibiotic era. This has led to the necessary revival of colistimethate which is associated with significant complications.

OBJECTIVES. To assess the safety and efficacy of colistimethate for the treatment of infection caused by MDR gram negative pathogens in the ICU setting.

METHODS. A retrospective review of charts of all patients admitted to Medical/surgical ICU between August 2010 and 2011 was performed.

RESULTS. A total of 749 patients were admitted to ICU during this period. Sixty seven (0.8 %) patients acquired MdR gram negative pathogens during their stay in the ICU. Ninety percent of the patients had MdR Acinetobacter Baumanni and 8 % had MdR Pseudomonas. Majority of the patients (88 %) who acquired MdR pathogens were medical patients and the remaining 12 % were surgical. Among these, 73 % of the patients had evidence of infection and 13 % were colonization. See Fig. 1 for site of isolation of these pathogens. In 43 % of patients, colistin was administered intravenously, 18 % received inhaled colistin and 39 % received both inhaled and intravenous colistin. Seventy nine percent of the patients receiving IV colistin had good clinical response and microbiological eradication, where as 57 % of patients receiving IV and inhaled colistin had good clinical and microbiological response. All patients with colonization had good microbiological eradication. Forty three percent of the patients who were colonized received colistin by both IV and inhaled route, 37 % received inhaled colistin and 18 % had IV colistin. Thirty five percent (24 patients) of patients with a normal baseline creatinine developed renal impairment as assessed by rise in creatinine by over 50 % from baseline, of these 37 % (9 patients) required dialysis. There was no correlation between the dose of colistin and development of renal impairment.

Fig. 1

CONCLUSIONS. Intravenous colistin is effective in treating MdR pathogens with good clinical and microbiological response. There was no benefit in adding nebulised colistin to

IV colistin to treat infections. However, inhaled colistin was as effective as IV and combination of IV and inhaled in eradicating MdR pathogens in colonised patients. The incidence of renal impairment with colistin is high.
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1060
PERIOPERATIVE MANAGEMENT AND EARLY OUTCOME AFTER SURGERY FOR ACTIVE INFECTIVE ENDOCARDITIS

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INTRODUCTION. Today, the early outcomes of patients treated surgically for active infective endocarditis is getting better because of advances in surgical and intensive care management. But in some critical conditions such as sepsis or presence of annular abscess, the in-hospital mortality still remains high.
OBJECTIVES. The study aim was to examine perioperative and postoperative factors affecting early outcomes in surgically treated infective endocarditis in a tertiary care hospital.
METHODS. Retrospective descriptive study. Between January 2001 and January 2012, 36 patients underwent surgery for active infective endocarditis and admitted to our ICU..
RESULTS. A total of 36 patients of whom 27 were males and 9 females. The mean age was 57 ± 18 years. Native valve endocarditis (NVE) was present in 25 patients (69 %), and prosthetic valve (PVE) in 11(31 %). Involved valves were mitral valve in 18 patients, aortic valve in 15, tricuspid in 1, double valve in 3 patients. Blood culture was positive in 24 (67 %). Staphylococcus species were the most common infecting microorganisms detected in 13 patients (36 %). Preoperative critical manifestations: respiratory failure with mechanical ventilation in 4 patients (11 %), congestive heart failure in 10 (28 %), shock in 4 (11 %), renal failure with renal replacement therapy in 2(6 %), acute or previous cerebrovascular involvement in 9 (25 %). Cardiac operations; Aortic valve replacement (including aortic root replacement) was performed in 15 cases (42 %), mitral valve surgery in 18(50 %), double valve surgery in 3 (8 %). An emergent operation was performed in 8 patients(22 %). Annular abscess was present in 9 patients (25 %).The in-hospital mortality was 6 % (n = 2). 71 years patient with NVE died of progression of cerebral bleeding and 75 years patient with PVE died of MOF. Preoperative acute cerebral involvement was identified as possible predictor for in-hospital mortality. PVE, annular abscess, other organ failure did not affect the in-hospital mortality.
CONCLUSION. In the surgery for active infective endocarditis, surgical eradication of cardiac infectious lesion should always be associated with the intensive treatment of systemic organ involvement. Patient with acute cerebral involvement are at increased risk for early outcome.

1061
COPEPTIN UTILITY IN ICU COMMUNITY-ACQUIRED PNEUMONIA (CAP) PATIENTS

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INTRODUCTION. Appropriate early prognostic assessment is crucial for severe CAP patients management, admitted to the ICU.
OBJECTIVES. We aimed to investigate copeptin (CP) levels in ICU CAP patients and their relationship with in-hospital outcomes (in-hospital mortality (IHM), length of in-hospital stay (LOS), duration of ICU stay), disease specific complications, need for invasive mechanical ventilation (IMV) and vasopressor support (VS).
METHODS. 20 ICU patients with proven SCAP CURB-65 class 3, 4 were enrolled to the study. Serum CP values were measured within the first 24 h after the hospitalization.
RESULTS. Increasing CAP severity was associated with increased CP values(r = 0,53;p = 0,02). CP levels on admission appeared to be higher in CURB-65 4th class patients vs the 3rd class patients—74.8 [55.06; 90] vs. 47.6 [24.5;59.8] pg/ml, respectively (p = 0,03). CP values on ICU admission correlated with need for VS (r = 0.54; p = 0.02, respectively) and showed higher concentrations in patients requiring VS compared with those with stable haemodynamics [74.8 vs. 47.6 pg/ml, p = 0,03], respectively. CP correlated with duration of ICU stay(r = 0.43; p < 0.005).
CONCLUSIONS. CP could add prognostic information in SCAP patients.
GRANT ACKNOWLEDGMENT. We disclose any relationship with manufacturers or providers of any commercial products or services relevant to this research.

1062
CLINICAL OUTCOMES OF TIGECYCLINE MONOTHERAPY AND COMBINATION THERAPY IN HAP/VAP WITH CARBAPENEM-RESISTANT ACINETOBACTER BAUMANNII

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INTRODUCTION. In recent years, carbapenem-resistant Acinetobacter baumannii (CRAB) infection have been an emerging problem. CRAB nosocomial pneumonia have been in limited therapeutic options.
OBJECTIVES. This study was to evaluate the outcomes of tigecycline monotherapy and combination therapy in HAP or VAP with CRAB.
METHODS. From January 2009 to December 2010, we retrospectively reviewed the clinical data of patients with CRAB hospital acquired pneumonia/ventilator associated pneumonia (HAP/VAP). The confirmation of quantitative or semi-quantitative culture was required for the inclusion criteria. We decided to compare the clinical outcomes of initial antibiotics treatment regimens that maintained from start to finish.
RESULTS. Twenty-eight patients were enrolled finally. Nine was treated with tigecycline alone, eight with tigecycline with a proper antibiotics for superinfection, six with tigecycline with a combination regimen for CRAB, and five with tigecycline with colistin. All patients were kept initial antibiotics regimen to the end at least for 3 days. The baseline characteristics between seventeen patients in monotherapy and eleven in combination therapy was not significantly different. There was no significant difference in mortality, length of hospital stays, and duration of antibiotics treatment. However, clinical outcome and microbiologic outcome tended to be higher in combination therapy. Combined antibiotics were rifampin, sulperazone, and aztreonam.
CONCLUSIONS. Hospital acquired pneumonia and ventilator associated pneumonia of Carbapenem-resistant Acinetobacter baumannii have left physicians limited therapeutic options. We used tigecycline alone or tigecycline with other antibiotics combined. Retrospective analysis showed more higher tendency of clinical outcome and microbiologic outcome in combination therapy. However, this study was not a randomized controlled study, and small number of patients. There seems to be a necessity for further prospective studies.
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1063
HAND-WASHING OBSERVATION IN AN ICU WITH CONTROLLED MRSA CROSS-COLONIZATION

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INTRODUCTION. Hand-washing is considered as a major success in controlling the cross-colonization of Methicillin Resistant *Staphylococcus aureus* (MRSA) [1–3]. Since 2000 [4], we have obtained this control through a progressive process by using povidone iodine for hand-washing in ICU. Our local protocol demands hand-washing when coming out of a patient's room, and defines gradual risk situations. It also imposes a common supervision(s) of hygiene rules within the ICU team.
OBJECTIVES. The objective of this study was to observe hand-washing practice in a situation of controlling cross-colonization of MRSA before changing to the hydroalcoholic solution (HAS).
METHODS. Meaux ICU has 12 beds in a 1,000 beds general hospital. The staff is composed of 10 physicians (including 4 residents) and 47 paramedics (including 27 nurses). The survey was performed between February and March 2011. MRSA cross-color.
RESULTS. We observed 139 hand-washing situations of which 128 (92 %) were performed; only 26 % (cases) of which lasted ≥30 s as usually recommended. There was no significant differences, about hand-washing compliance, between physicians (87 %) and nurses (92 %). According to the patients' colonization status, compliance to hand-washing when coming out of patients' rooms was 100 % in case of MRSA colonization, 94 % in case of suspected colonization, and 86 % in case of patients not classified as colonized.

MRSA cross-colonization

	Imported colonization	Acquired colonization	Imported infection	Acquired infection
Between 2007 and 2010	4.32 %	0.56 %	1.33 %	0.25 %
In 2011	5.24 %	0.00 %	0.43 %	0.00 %

CONCLUSIONS. Our study suggests that respecting the rule of hand-washing by the ICU team (physicians and paramedics) is more important than fully respecting the duration of hand-washing. Common supervision(s) of hygiene rules within the ICU team, which is mandatory with colonized patients, might be an important key to success. The choice of antiseptic solution (i.e. povidone iodine) may have a limited impact on cross-colonization control.
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1064
INFLUENCE OF INFECTION DURING POST-OPERATIVE PERIOD AFTER HEART TRANSPLANTATION IN ONE-YEAR MORBIDITY AND MORTALITY

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INTRODUCTION. Infection is a major cause of morbidity and mortality after heart transplantation (HT).

OBJECTIVES. To determine the relevance of infection during post-operative period after HT in morbidity and mortality within the first year.
METHODS. Historical cohort study that includes all HT patients in a single institution from January, 1991 to December, 2009 followed until June, 2010. Centers of Diseases Control and prevention criteria were used to define nosocomial infection. The events of interest were rejection, unscheduled hospital admission and death during first year after HT. Chi-squared were used to determine bivariate associations.
RESULTS. From a total of 594 HT performed, 509 (85.7 %) patients survived post-operative period after HT. 21 (4.1 %) of this patients died within first year after HT. 75 patients (12.6 %) suffered at least one episode of infection during post-operative period of HT. Post-operative infections were associated with cellular rejection during post-operative period [odds ratio 1.98, 95 % interval of confidence 1.01–0.64) and incidence of unexpected hospitalization (7.1 % vs. 8.1, p 0.7) from any cause were not found.
CONCLUSIONS. Patients who had infections during the inmediate hospitalization after HT compared with those uninfected have almost the double incidence of acute cellular rejection during this period, with no differences in survival or re-hospitalizations during the first year.

1065
ELEVATED PROCALCITONIN PREDICTS GRAM-NEGATIVE SEPSIS IN ONCOLOGICAL CRITICAL PATIENTS

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INTRODUCTION. An early diagnosis of bacteraemia is crucial to facilitate adequate treatment of severe infections [1] particularly in cancer patients with some degree of immune compromise. Procalcitonin (PCT) levels have been shown to distinguish between bacteraemia and non-infectious inflammatory states accurately and quickly in critically ill patients and current literature suggests that it may prove to be the most useful biomarker for infections [2]. Some studies show that a high PCT level in patients with suspected infection may be indicative of Gram-negative infection.
OBJECTIVES. The objective of the study was to estimate the value of PCT as a discriminate marker of Gram-positive and Gram-negative infection in cancer patients with suspected bacteraemia.
METHODS. Retrospective study during 2010 and 2011 in an oncology intensive care unit. Selection criteria: Patients with proven bacteraemia with only an isolated microorganism, as first documented infection, and serial determinations of serum PCT. Exclusion criteria: more than one microorganism isolated; bacteraemia was not de first infection. It was recorded the type of bacteria, gram classification, maximum PCT and C reactive protein (CRP) and maximum or minimum white blood cells count.
Statistic analysis with T-test, Levene test and Chi-Square test and $p < 0.05$ was considered statistically significant.
RESULTS. 37 patients were selected, 32.4 % Gram-negative bacteraemia ($n = 12$) and 67.6 % Gram-positive bacteraemia ($n = 25$). Verified homogeneity of the sample regarding age, gender, SAPS II and APACHE II score. Serum PCT was significantly higher in the gram-negative bacteraemia group (58.7 ng/mL vs .18.9 ng/mL, $p = 0.002$) as well as serum CRP (261 mg/L vs. 197 mg/L, $p = 0.05$). There was no statistical significant difference between groups in white blood cells count (Gram-negative $20.9 \times 10^3/mm^3$ vs. Gram-positive $18.6 \times 10^3/mm^3$, $p = 0.68$).
CONCLUSIONS. Some studies already indicated that the PCT would be a more specific marker than CRP and white blood cells count to Gram-negative bacteraemia [3]. However, there is little information with regard to critically ill cancer patients in which an early and specific marker make a difference at the start of appropriate antibiotic therapy.
Our study concluded that a high PCT level in patients in oncological critical patients with suspected infection may be indicative of Gram-negative infection before obtaining the culture results. Although non-specific CRP can be complementary to PCT to increase the degree of suspicion of Gram-negative bacteraemia, unlike the white blood cells count.
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1066
IMPACT OF ANTIBIOTIC APPROPRIATENESS IN OUTCOME AND EARLY C-REACTIVE PROTEIN EVOLUTION IN ICU PATIENTS WITH BACTERAEMIA

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INTRODUCTION. Infection in intensive care units (ICU) is a significant complication and is associated with increased morbidity and mortality. The antibiotic appropriateness is likely to be one of the interventions with most impact on prognosis. Timing of antibiotic administration is also of prognostic importance in patients with severe infection. Therefore, it is important to identify factors that may give early clues as to the appropriateness of empiric antibiotic therapy so that an "early rescue" strategy can be implemented. Patterns of C-reactive protein (CRP) evolution have been shown to be of use in predicting early response to antibiotics in many different settings.
OBJECTIVES. Evaluate the effect of antibiotic appropriateness in mortality, as well as in early C-reactive protein (CRP) evolution pattern, in patients with bacteraemia admitted to our intensive care department.
METHODS. A retrospective review of 58 adult ICU patients with a first episode of bloodstream infection (BSI) was performed. Bacteraemia was defined according to Centres for Disease Control and Prevention criteria. Antibiotic appropriateness was determined according to microbiological susceptibility. The primary outcomes were ICU and hospital mortality. Secondary outcomes were infection resolution and the pattern of early CRP response to antibiotics, defined as the rate of CRP variation in the first 4 days under antibiotic effect.
RESULTS. When comparing patients with appropriate/inappropriate antibiotic therapy, no significant differences were found in the mean age, gender, co-morbidities, severity and place of acquisition of infection. In both groups most of the bacteraemias were nosocomial. Patients with appropriate antibiotics had a lower ICU mortality (27.5 % vs. 61.5 % $p = 0,04$), hospital mortality (42.5 % vs. 76.9 % $p = 0,05$) and more frequent resolution of infection (80.6 % vs. 38.5 % $p = 0,01$).They also had a significantly greater decrease in CRP values in the first 4 days after antibiotic beginning, when comparing with the inappropriate group. In the first 24 h under the antibiotic effect, those with appropriate therapy had a median smaller increase (2.4 %) in the CRP comparing with those with inappropriate therapy (39.9 %; $p = 0.03$). At 48 h of antibiotic effect, they had a 10.0 % median decrease in CRP, while it continued to rise in those with inappropriate therapy (26.7 %; $p < 0.001$). At the fourth day of antimicrobial therapy, the CRP median value decreased almost to half in the appropriate group (48.1 %) and only 8.5 % in the inappropriate group ($p = 0.002$).
CONCLUSIONS. BSI in ICU patients is frequently associated with poor outcomes with inappropriate antibiotic therapy being significantly related to increased mortality and ongoing infection. Differences in CRP variation between groups become evident early in the course of antimicrobial therapy and may be helpful when deciding on the need to re-evaluate the treatment strategy.

1067
THE IMMUNE STATUS OF PATIENTS WITH PROLONGED STAYING IN THE INTENSIVE CARE UNIT

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INTRODUCTION. The practical meaning of diagnosis of systemic inflammatory response syndrome in the intensive care unit is to separate groups of patients, at-risk of the development of sepsis, which requires a rethinking of tactics of treatment and diagnostic.
Patients in serious condition, who stay in the ICU for a long time, are at risk of sepsis.
OBJECTIVES. The important parameters in the diagnosis of systemic inflammatory response syndrome, except for the main criteria is the definition of patient's immunogram.
METHODS. We investigated the immune status of 13 patients who stayed in the intensive care unit in critical condition for more than 72 h. The study group included six men and seven women. Diagnosis were the following: severe head injury in four patients, brain tumors in five patients, rupture of cerebral aneurysms in three patients, thrombosis of the basilar artery in 1 patient. Systemic inflammatory response syndrome was observed in all patients.
RESULTS. In patient's immunogram we found significant changes of immune status: • the quantity of leukocytes expressing the receptor of apoptosis (CD-95) increased—10 patients.
• reduction of immunoglobulin A and G-8 patients
• decreasing of the functional activity of leukocytes, in 8 patients
• the quantity of the dying cells (T-helper cells and CD-95) increased- in 2 patients
• reduction of natural killer cells - in 4 patients
• violation of T-helper/T-suppressor ratio in 2 patients.
2 of 13 patients, included in our study transferred severe sepsis. Procalcitonin test demonstrated more than 10 by semi-quantitate method. In these patients, we have observed the most significant immunological changes—three times reduction of the immunoglobulins, changes in relations T-helper/T-suppressor.
CONCLUSIONS. Clinical immunological analysis show that the development of systemic inflammatory syndrome in patients with severe neurological deceases, who stayed in the intensive care unit for a long time, is associated with a violation of the immune status at 100 % of the cases, which confirms the need for further study surveys of the immune status of patients for in-time immunotherapy.

1068
VENTILATOR ASSOCIATED PNEUMONIA CAUSED BY MULTIDRUG RESISTANT ACINETOBACTER BAUMANNII: COLISTIN MONOTHERAPY VERSUS COMBINATION THERAPY WITH COLISTIN AND HIGH DOSES AMPICILLINE-SULBACTAME

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INTRODUCTION. Acinetobacter baumannii has become a serious nosocomial pathogen, mainly affecting patients with impaired host defences in the ICU. Its broad antimicrobial resistance patterns leave few therapeutic options. Often, only colistin shows in general good in vitro activity against these multidrug resistant strains. However, sulbactam combinations are bactericidal against A. baumannii in in vivo models.
OBJECTIVES. We studied the efficacy of colistin monotherapy versus combination therapy with high dose of ampicillin-sulbactam (A/S) in patients with Ventilator Associated Pneumonia (VAP) caused by A. baumannii.
METHODS. Twenty patients with VAP, according to the criteria of CDC, caused by multiresistant Acinetobacter baumannii (quantitative cultures of a BAL specimen) were included in the study. Seven of them (group A) received colistin intravenously, as monotherapy (3×10^6 IU three times daily, adjusted for creatinine clearance), and thirteen were treated with 27 gr A/S and colistin (9 g sulbactam, group B). 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 BAL cultures.
RESULTS. Follow up BAL revealed microbiologic success in three patients from group A (42.85 %), in 11 patients from group B (84.6 %) ($p = 0.125$). A statistical significant difference ($p = 0.04$) was observed between group A and group B, regarding clinical success. This was observed in one patient from group A (14.28 %), and in nine patients from group B (69.2 %). There was no significant difference in 14 days and 30 days mortality between the two groups. Adverse reactions occurred in one patient from group A (reversible nephrotoxicity, 14.28 %), and two patients from group B (nephrotoxicity and allergic reaction, 15.4 %).
CONCLUSIONS. Colistin monotherapy and combination therapy with colistin and high doses of A/S seem equally safe and effective in eradication of multidrug resistant A. baumannii in BAL cultures of patients with VAP. However, combination treatment tends to be more effective than colistin monotherapy in the clinical treatment of these patients. More data are needed, in order to clarify the role of these regiments in the treatment of A. baumannii infections.

1069
ACINETOBACTER AND THE CRITICALLY-ILL PATIENT: RISK FACTORS AND PATIENT OUTCOME- CASE SERIES ANALYSIS IN A SAUDI INTENSIVE CARE UNIT

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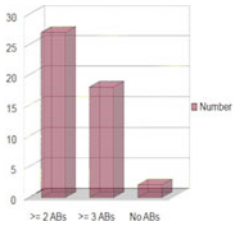
INTRODUCTION. Described in 1911 as *Micrococcus calco*-aceticus before being known as *acinetobacter* in the 1950, this G negative micro-organism has since become more problematic in recent years due to the emergence of multi-resistant (MDR) strains.
OBJECTIVES. To analyze the characteristics of acinetobacter strains affecting patients on typical Saudi ICU and to identify risk factors that may help to early suspect and treat these infections.

METHODS. Prospective data collection of confirmed cases following a minimum stay of 5 days on the ICU.
RESULTS. The incidence of *acinetobacter B.* cases at our institution reached 0.6 % of all inpatients. 29 cases were reviewed on the ICU, representing 9 % of ICU admissions.
The average age was 53.7 years (13–96). The average ICU incubation period was 13.3 days (5–25). 93 % of patients (n = 27) received wide spectrum antibiotics (*WSA)* within the 5 days before a first positive sample was confirmed, 67 % being on three or more wide-spectrum antibiotics. For Multi-Drug Resistant (MDR) strains [62 % of cases (n = 18)], 89 % (n = 16) received at least two *WSA,* and at least 3 in 61 % (n = 11).

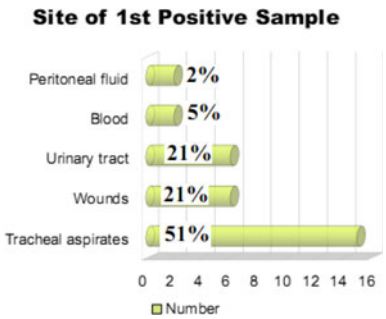
Table/ Figure "a"

	Number
>= 2 ABs	27
>= 3 ABs	18
No ABs	2



Antibiotics usage

Admissions were related to poly-trauma- equal with septic conditions in 28 % (n = 8), GI conditions in 10 % (n = 2). Respiratory conditions in 14 % (n = 4).
Sites of positive cultures included: respiratory in 51 % (15), wounds in 21 % (n = 6), urinary tract in 21 % (n = 6), blood in 5 % or less (n = 2) and peritoneal fluid in 2 % (n = 1).



Site of first positive sample

Patients required mechanical ventilation for 24 days in average (1–97 days). The length of stay (LOS) on ICU exceeded 7 days in 82 % of patients.
The mortality reached 34 % (n = 10), with MDR strain found in 50 %. In 70 % of mortality cases (n = 7), the delay before a first negative sample being obtained exceeded 10 days.
CONCLUSIONS. *Acinetobacter* infections seem to be much more severe and would contribute to a higher mortality rate among ICU patients regardless of the MDR status. The delay until first negative culture being obtained would have an impact on this mortality rate. The *acinetobacter* infections would also be an independent factor affecting the LOS and the duration of mechanical ventilation. This may be due to the very high incidence of *acinetobacter* related respiratory infections.
Prophylactic measures are of course paramount. But a closer look at our sample suggests that some risk factors may help to early suspect *acinetobacter* infections on ICU. Thus, poly-trauma, respiratory-related admissions, above 50 year-old male, the use of 2 or more wide-spectrum antibiotics within the 5 days preceding the acinetobacter infections, mechanical ventilation or a LOS exceeding 10 days seem to be significant elements to allow high degree of suspicion for these infections.
We suggest that, in these circumstances, Colistin (depending on local antibiogram) should be initiated if other wide-spectrum antibiotics- already in place- remain ineffective while awaiting positive cultures.

1070
PROGRAM CONTROL FOR VENOUS CATHETER RELATED INFECTIONS IN A BRAZILIAN ICU: THE PURSUIT OF EXCELLENCE IN THE REAL WORLD

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INTRODUCTION. Intravascular catheter-related infections are very critical in ICU environment, with elevated morbi-mortality and great impact on costs. In our unit, according to a quality political, it was established standards on prevention, diagnosis and treatment of nosocomial infections, with a periodic review of ours rates.
OBJECTIVES. We will describe 2 year of follow up results after a task force model chosen when we noticed a new increase of the catheter related infections incidence: outcome management.
METHODS. Prospective study, two-phases model, in a general ICU of 23 beds from January 2007 to December of 2010. First phase: multi-professional work group was created (4 Physicians, 6 nurses and 2 respiratory therapists) who performed a meeting with the "brainstorming" technique. All the infections date were reviewed. The main group identified risk factors related to the problem using a cause-effect diagram. Then, it was established corrective measures, deadlines and ways for execution. The second phase was the implementation of the measures chosen: the classical bundles and the routine replacement of catheters 10 days after insertion. Two years later we suspended the withdrawal of the catheter after 10 days, maintaining all other measures.
RESULTS. In 2007, 61 patients were followed with 118 catheters in the sites: 61.9 % in the subclavian vein (n = 73), 19.5 % in the internal jugular (n = 23) and 18.6 % in the femoral (n = 22). The median time the catheter was 8.4 days (SD ± 5.16). In 2009 were followed up 149 patients and 205 catheters. The puncture sites: 68.8 % in the subclavian (n = 141), 18.0 % in the jugular (n = 37) and 13.2 % in the femoral (n = 27) with a median stay of 6.8 days (SD ± 5.17). Infection rates were: 13.08–7.43 per 1,000 days/catheter in 2007 and 15.3 per 1,000 days/catheter in 2009.
CONCLUSIONS. Recent studies have suggested zero rates in BSI. Our experience showed favorable results with the initial program adopted, but not sustained in the following 2 years, indicating lack of compliance for the measures. A new campaign was started from the analysis of these results. Ongoing efforts to improve safety in intensive care must include preventive and corrective measures, inexpensive and easy to apply, with commitment of all staff through education and vigilance.

1071
MICROBIOLOGICAL PROFILE AND ANTIMICROBIAL SUSCEPTIBILITY OF ISOLATES IN CULTURES IN THE INTENSIVE CARE UNIT AT A UNIVERSITY HOSPITAL IN BRAZIL

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INTRODUCTION. Infections are the most prevalent complications in intensive care unit (ICU) patients and account for 20–30 % of all hospital cases associated with infection. Mortality rates can reach up to 60 %, accounting for about 40 % of the cost of a general ICU. Currently, increasing antimicrobial resistance among gram-positive and gram-negative pathogens have been seen in hospital and community infections, so it is necessary to know the hospital bacterial flora, including the intensive care units (ICUs).
OBJECTIVE. Evaluate the microbiological profile in the ICU at a university hospital in Ribeirão Preto, São Paulo, Brazil.
METHODS. Two hundred and thirty-six ICU patients were enrolled in the study between May and December, 2009. Blood, urine and bronchoalveolar lavage (BAL) cultures and bacterial susceptibility were evaluated.
RESULTS. Ninety-seven (41.1 %) patients had one or more positive cultures, including any of studied specimens. Of these, approximately 52 % (n = 50) were male, mean age (±SD) 56.6 ± 17.4 years. The calculation of APACHE II severity score showed a mean (±SD) of 25.2 ± 7.5. The mean (±SD) duration of ICU stay was 13.4 ± 11.5 days. Approximately 41 % (n = 40) progressed to death. Among the gram-positive bacteria isolated, the most common were: blood culture, *Staphylococcus epidermidis* (44 %) and *Staphylococcus aureus* (20 %); urine culture, *Enterococcus faecium*, *Staphylococcus lentus* and *Staphylococcus epidermidis* and; BAL culture, *Staphylococcus aureus* (83 %). Among the gram-negative germs, *Acinetobacter baumannii* (33 %), *Pseudomonas aeruginosa* (29 %) and *Klebsiella pneumoniae* (16 %) were the most common found in blood culture; *Klebsiella pneumoniae* (42 %) and *Acinetobacter baumannii* (27 %) in urine cultures and; in the BAL culture, *Acinetobacter baumannii* (39 %) and *Pseudomonas aeruginosa* (31 %) were the most frequent. Important to note that most of them were multi-resistant to antimicrobial commonly used in clinical practice (The *Acinetobacter baumannii* isolates showed sensibility only to polymyxin and tigecycline in 75.7 %, and *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* isolates were sensitive only to polymyxin in 47.6 and 29.2 %, respectively).
CONCLUSION. Multi-resistant germs have been seen frequently in the ICU and may be implicated in adverse clinical outcomes, emerging a worry perspective.
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1072
ANALYSIS OF MORTALITY IN URINARY SEPSIS

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INTRODUCTION. Urinary infections are one of the commonest causes of nosocomial infection and gram-negative bacteremia. Changes in patients' characteristics such as age and immunodeppresion have led to increased rates of multiresistant-bacterial infection. Given the low incidence of urologic sepsis, only few studies have been focused on the characteristics and mortality of these patients.
OBJECTIVES. Analysing mortality-related factors in urinary sepsis patients.
METHODS. Retrospective descriptive study of urologic sepsis patients in the ICU from 2008 to 2010. Clinical, epidemiological and outcome variables were analysed. Quantitative variables are expressed as either mean and standard deviation or as median and interquartile range for asymmetric variables. Qualitative variables are expressed as percentages and absolute values. Mann–Whitney's U test and Fisher's exact test were applied (alpha error was 5 % in both cases), as well as binary logistic regression for multivariate analysis.
RESULTS. A total number of 44 patients (aged 59.39 ± 17.71; 63.8 % females). APACHE II upon admission was 18 ± 6. Out of these patients, 27.3 % showed no underlying disorder and 18.2 % (no = 8) showed chronic renal failure; 25 % were immunodepressed patients; 31 % underwent urinary instrumentation in the previous 15 days, yet only three of them had undergone permanent urine catheterization. Observed mortality was 25 %, while sepsis-related mortality was 22.7 %.
The patients who died were, on average, older that those who survived (67.9 + 10.2 vs. 56.8 + 18.7; p = 0.02). Besides, the former also reported greater delay in turning to the hospital after symptom onset (13.4 + 6.6 vs. 6.2 + 4.7 days; p = 0.0001). Immunodepressed patients presented higher mortality rate: OR 8.7 (IC 95 % 1.7–42.3), as well as those who underwent inappropriate initial antibiotic treatment: OR 10.8 (IC 95 % 2.1–54.7).No relation was observed between germen typology or resistance to beta-lactam antibiotics and mortality. After adjustment of mortality due to APACHE II upon admission, delay in the onset of appropriate antibiotic treatment was an independent predictor of mortality in our patients: OR 1.2 IC 95 % (1.02–1.42).
CONCLUSIONS. Urinary sepsis mortality is associated to late onset and/or inappropriate antibiotic use, as well as to immunodepression and advanced age.
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Control Hosp Epidemiol. 2007;28(12). 3. Van Nieuwkoop et al. Procalcitonin reflects bacteremia and bacterial load in urosepsis syndrome: a prospective observational study. Critical Care. 2010;14:R206.

Acute kidney injury: Pathophysiology: 1073–1085

1073

BALANCED 6 % HES 130/0.4 IMPAIRED KIDNEY FUNCTION IN HEALTHY RODENTS

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INTRODUCTION. Volume replacement is a cornerstone in the therapy of critical ill patients. Both, volume depletion and hypoperfusion contribute to organ failure, which in turn increases mortality. There is still an ongoing discussion which infusion solutions should be preferred—crystalloids or colloids. Previous studies revealed impaired kidney function in CLP induced rodent sepsis [1] and decreased cell viability of human proximal tubules cells in vitro without inflammation when hydroxyethyl starch 130/0.4 (HES) was applied [2]. Therefore, the present study was designed to compare possible effects of HES on renal function with or without sepsis in a rodent model.

OBJECTIVES. The influence of 50 ml/kg BW Volulyte® on renal function in rodents with or without sepsis.

METHODS. After animal committee approval 15 male Sprague–Dawley rats were randomized as follows: control (C; n = 6), control + volulyte® (VOL; n = 5) and CASP (Colon ascendens Stent Peritonitis) + Volulyte® (CASP; n = 4). Rats were anesthetized and the carotid and jugular vein were cannulated for continuous measurement of blood and central venous pressure over 24 h. Sepsis was induced by a novel CASP method, whereas C and VOL were left untreated. All animals had access to water ad libitum. After 18 h 50 ml/kg Volulyte® were adminstered i.v. over 6 h, and after 24 h animals were re-anaesthetized, tracheotomised, controlled ventilated and cardiac output (CO) was measured by thermodilution method. To evaluate kidney function creatinine, urea and inulin clearance were analysed. Variance analysis (ANOVA post hoc Duncan test $p < 0.05$ mean ± SEM) was used for statistical analysis.

RESULTS. MAP, heart rate and CO revealed no significant differences between the groups. Lactate was significantly increased in CASP (6.1 ± 4.2) compared to C (1.6 ± 0.1) and VOL (1.8 ± 0.2 mmol/l). Urea and creatinine were significantly increased in CASP group compared to VOL and C (Fig. 1A, B). Inulin clearance was significantly reduced in CASP animals compared to C and decreased in VOL but did not reach significant levels (Fig. 1C), whereas urine output was significantly reduced in animals receiving 50 ml/kg Volulyte® with or without sepsis (Fig. 1D). Compared to C (293 ± 2) serum osmolality was significantly increased in CASP (311 ± 7), but not in VOL (292 ± 3 mosmol/kg).

CONCLUSION. Our preliminary data showed a possible harmful impact of 6 % HES 130/0.4 on kidney function in rodents without inflammation, and sepsis triggered the severe side effects. The pathomechanism of colloid induced acute kidney injury remains unclear, and further research is needed to analyse the molecular mechanism.

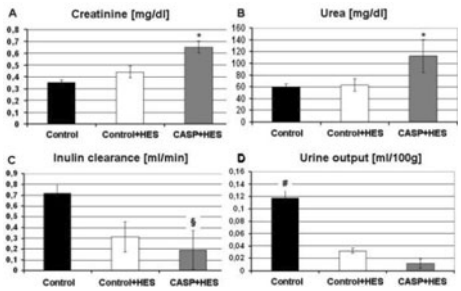

Fig. 1 Baar

Fig. 1 Rats were treated with 50 ml/kg Volulyte® 18 hours after first surgery; kidney function parameters were measured after 24 hours: A) Serum creatine level B) Serum urea level C) Inulin-Clearance D) Urine output per 100g BW collected via urinary catheter during 20 minutes (mean±SEM, p<0.05; * vs. Control and Control+Volulyte®, vs, Control, #vs, Control+Volulyte® and CASP+Volulyte®).

REFERENCES. 1 .Neuhaus W and Schick MA et al. Anesth Analg. 2012;114(2):371–4. 2. Schick MA et al. Intensive Care Med. 2010;36(3):541–8.

1074

THE IMPACT OF HYDROXETHYLSTARCH 130/0.4 ON HUMAN PROXIMAL TUBULAR CELLS IN VITRO

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INTRODUCTION. Volume therapy plays a pivotal role in emergency medicine and in daily perioperative clinical care. The indications of colloid solutions and their side-effects, especially regarding acute kidney injury (AKI), are continuously discussed. Previous studies showed harmful derangements of synthetic colloids (Hydroxyethylstarch 130/0.4 (HES), Gelatin) to renal proximal tubulus cells in vitro and in vivo, whereas the crystalloid (Sterofundin®Iso) was even protective in vitro [1, 2]. However, the pathomechanism of colloid induced AKI is not known yet.

OBJECTIVES. The specific impact of HES 130/0.4 on cell viability of human proximal tubules cells (HK-2) in a time-, dose-, molecular size-, and balanced/non-balanced depended manner in vitro.

METHODS. HK-2 cells were cultured under standard conditions as described previously [1]. Cell viability was measured 7 days after seeding using the EZ4U-Test (dye XTT-Assay). Voluven® and Volulyte® solutions were diluted in HK-2 medium (27.5 %) to 0.1 % to 4 % HES concentration, and residual volumes were filled up with NaCl 0.9 %. To isolate HES molecules, Voluven® was dried using a centrifugal evaporator (Speed-Vac®) and afterwards HES was diluted in pure HK-2 medium to a 0.1–4 % concentration. To investigate the impact of the different molecular size of HES on HK-2, HES was filtered into different molecular sizes using Amicon® UltraCentrifugal Filter Units. All solutions were adjusted to pH = 7.4. EZ4U-tests were performed at 0, 2, 4 and 21 h. In additional experiments the diverse fractionated HES were dried and weighed. Statistic was performed by 2-sided student's t-test; level of significance at $p < 0.001$; values expressed as mean ± SD.

RESULTS. Volulyte®, Voluven® as well as HES diluted in cell media decreased significantly cell viability of HK-2 cells in a dose depended manner (Fig. 1A). There were no significant differences between balanced or nonbalanced HES. HES decreased significantly in a concentration-depended manner HK-2 viability, even after 0 h incubation (e.g. 50.3 ± 10.6 % viability by 1.5 % HES, Fig. 1B). The HES fraction of 150–100 kDa decreased viability significantly to 49.5 ± 8.6 %, where as <30 kDa to 93.5 ± 7 % (Fig. 1C). The impaired viability of HK-2 in the fraction 150–50 kDa correlated with the total weight of the fraction volume (Fig. 1D).

CONCLUSIONS. HES decreased the viability of renal human proximal cells immediately after the first contact, and this effect dependens not on the solution media. Furthermore our data suggests that the harmful impact of HES on HK-2 is independent of the molecular size, but regulated by the applied mass of HES. Further research is necessary to uncover the responsible molecular mechanisms.

REFERENCES. 1. Neuhaus W, Schick MA et al. Anesth Analg. 2012;114(2):371–4.2. 2. Schick MA et al. Intensive Care Med. 2010;36(3):541–8.

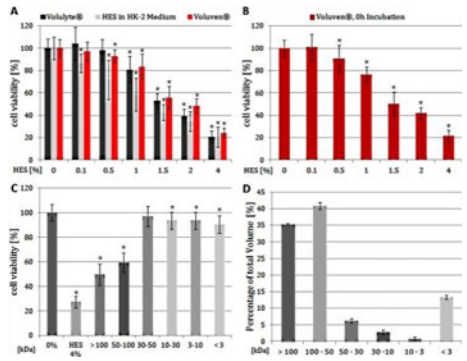

Fig1

Figure 1: A) Relative reduction od cell viability of HK-2 cells by increasing hydroxyethyl strach (HES)130/0.4 solved in different solutions after 21h incubation B) Dose dependent decreased cell viability after 0h incubation with HES C) Relative reduction of cell viability with 4% fractioned Voluven® after 21h incubation D) Relative weigth of dried molecular fraction of 6% HES 130/0.4; Data are presented as mean±SD (n=32-48), *p<0.001.

1075

CONTINUED VENTILATION DURING OPEN HEART SURGERY REDUCES SYSTEMIC SECRETION OF SOLUBLE ST2 AND INHIBITS POLYMORPHONUCLEAR CELL ACTIVATION

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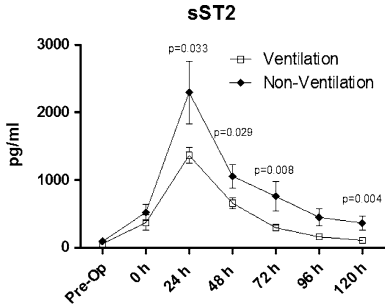
INTRODUCTION. Cardiopulmonary bypass, utilized in on-pump coronary artery bypass graft procedure (CABG) is known to affect cytokine release leading to a generalized endogenous immune suppression. Recent reports suggest that maintaining ventilation during cardiopulmonary bypass (CPB) might reduce lung injury and affect outcome of patients after cardiac surgery.

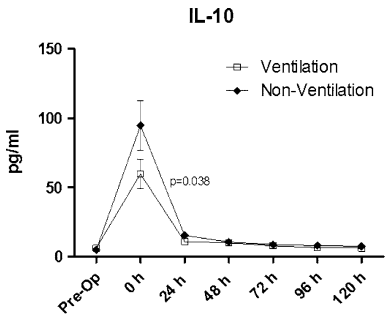
OBJECTIVES. We investigated whether continued ventilation on cardiopulmonary bypass induces attenuation of immune response.

METHODS. 30 patients undergoing conventional CABG operation were randomized into a ventilated on CPB (VG) and non-ventilated (NVG) group. Ventilation of the patients was performed with a tidal volume of 7 ml/kg, with 10–12/min respiratory rate, and a PEEP of 5 H2O cm. In the VG, mechanical ventilation was done with the half of the initial tidal volume (i.e. 250–300 ml) during the aortic cross-clamp. Respiratory rate and PEEP remained at the same level. In the NVG lungs were collapsed after completion of CPB until after weaning from the extracorporeal circulation. Venous blood was drawn preoperative, postoperative and 24, 48, 72, 96 and 120 h after initiation of CABG operation. sST2, IL-4, IL-6, IL-10, IL-13, Endotoxin, MCP-1, MIP-1 beta, IgM and IgG were measured by ELISA. An unpaired t-test or Mann–Whitney-U-test was used for statistical analysis.

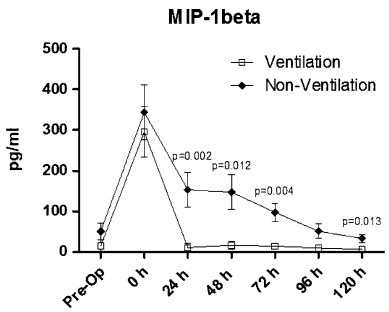
RESULTS. Serum levels of sST2 increased within 24 h after NVG-CABG procedure. sST2 levels were significantly lower in VG group (1,366.4 ± 111.9 vs. 2,296.3 ± 463.6 pg/ml; $p = 0.033$) at 24 h. Endotoxin levels correlated with sST2 levels (24 h post CABG, $R = 0.743$, $p < 0.0001$). Moreover, IL-10 levels were significantly lower in the VG as compared to NVG (10.5 ± 1.0 vs. 15.3 ± 1.7 pg/ml; 24 h post CABG; $p = 0.038$). The mean MIP-1beta levels (pg/ml) measured 24, 48, 72 h after CABG were significantly lower in VG: 10.9 ± 10.0 vs. 153.2 ± 153.2, $p = 0.005$, 16.7 ± 9.5 vs. 147.9 ± 42.7 $p = 0.019$ and 14.2 ± 6.2 vs. 97.8 ± 22.5, $p = 0.005$ compared to VG. NVG patients showed significantly higher MCP-1 concentration after CPB compared to VG (72, 96, 120 h, $p < 0.05$). Moreover, L-6 levels were significantly reduced in VG as compared to control group (83.1 ± 13.5 vs. 110.2 ± 10.3 pg/ml, 24 h, $p = 0.033$). IL-13, IL-4, IgM and IgG showed no difference between the two groups.



sST2



IL-10



MIP-1beta

CONCLUSIONS. Continued lung ventilation during CABG results in a significant reduction of sST2, IL-6 and IL-10 concentration 24 h after surgery. Concentrations of chemotactic proteins MCP-1 and MIP-1beta are significant lower in VG patient, suggesting that continued ventilation during bypass reduce inflammatory immune reaction and lung injury.

1076

A POPULATION PHARMACOKINETIC-PHARMACODYNAMIC MODEL OF CARDIOVASCULAR EFFECTS OF MAGNESIUM IN PATIENTS WITH SEVERE PREECLAMPSIA

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INTRODUCTION: Preeclampsia/Eclampsia (PE)is a multiorganic disease characterized by hypertension and proteinuria after 20 weeks of gestation. PE complicates 10 % of pregnancies and represent the first cause of maternal-fetal mortality in developing countries [1]. Magnesium is used for prevention and treatment of PE. However, there is scant information about its PK/PD in this critically ill obstetric population [2].

OBJECTIVES. To develop a PK-PD population model of the effect of magnesium (Mg) on hemodynamics in patients with severe preeclampsia.

METHODS. We studied 47 consecutive patients with severe preeclampsia who were administered a continuous infusion of Mg. Blood samples for determination of Mg and at the same time physiological variables were obtained. Mg concentrations and physiological variables were linked by a PK-PD model, using a non linear mixed effects model implemented in the software program Monolix 3.2.

RESULTS. A one compartment model adequately described the pharmacokinetics of Mg. The population parameters estimated were 4.5 L/h for clearance (CL) and 65 L for volume of distribution (VD). The coefficients of variability for CL and VD were 39 and 47 %, respectively. An E_{max} model was used to model the effect on vascular resistance (VR), cardiac output and mean arterial pressure. A significant relationship was obtained for VR with an E_{max} of 27 % decrease (CV 36 %), an EC_{50} of 4.79 mg/L (CV 43 %) and k_{eo} of 0.71 h^{-1}(CV 58 %).

CONCLUSIONS. The relationship between Mg and vascular resistance was captured in a population PK-PD model. This model may allow design infusion regimens for control vascular resistance and blood pressure in critically ill obstetric patients with PE.

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1077

CONTINUED LUNG VENTILATION DURING OPEN HEART SURGERY ATTENUATES SYSTEMIC HEAT-SHOCK PROTEIN 70 RELEASE

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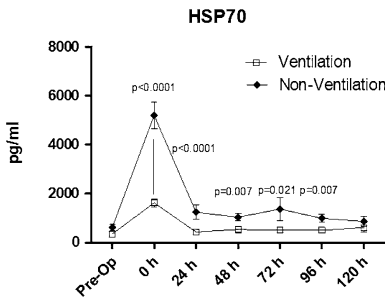
INTRODUCTION. Cardiopulmonary bypass, utilized in on-pump coronary artery bypass graft procedures (CABG) induces generalized immune suppression and release of heat shock proteins (HSP), CK18 M30. HSP are cell stress markers which are released into the circulation after conventional CABG.

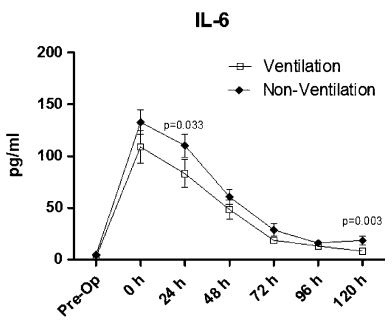
OBJECTIVES. We hypothesized that continued ventilation on cardiopulmonary bypass (CPB) induces attenuation of immune response and reduces HSP serum concentration.

METHODS. 30 patients undergoing conventional CABG operation were randomized into a ventilated on CPB (VG) and non-ventilated (NVG) group. Ventilation of the patients was performed with a tidal volume of 7 ml/kg, with 10–12/min respiratory rate, and a PEEP of 5 H_2O cm. In the VG, mechanical ventilation was done with the half of the initial tidal volume (i.e. 250–300 ml) during the aortic cross-clamp. Respiratory rate and PEEP remained at the same level. In the NVG lungs were collapsed after completion of CPB until after weaning from the extracorporeal circulation. Venous blood was drawn preoperative, postoperative and 24, 48, 72, 96 and 120 h after initiation of CABG operation. HSP27, HSP60, HSP70, ICAM-1, IL-6 and CK18 M30 were measured by ELISA. An unpaired t-test or Mann–Whitney-U-test was used for statistical analysis.

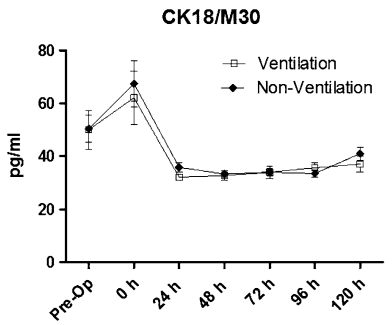
RESULTS. Serum levels of HSP70 were significantly lower in VG compared to NVG 24 h after CABG procedure (1,629.2 ± 157.1 vs. 5,203.5 ± 549.6 pg/ml, $p < 0.001$). Serum IL-6 increment after CABG operation does not correlate with HSP27, 70, ICAM-1 and cc-CK18 levels indicating that HSP release and the described pro-inflammatory response after CABG were two independent events. HSP27, HSP60, ICAM-1 and CK18 M30 concentrations showed now differences between the two groups.



HSP70



IL-6



CK18M30

CONCLUSIONS. Significantly less HSP70 was detectable in patients receiving uninterrupted lung ventilation on CPB, possibly indicating a difference in inflammatory responses, cellular stress or damage between the ventilated and non-ventilated group. These date suggest that inter-operative ventilation has a protective effect on HSP70 secretion in CABG patients.

1078
ACUTE KIDNEY INJURY (AKI) AFTER LIVER TRANSPLANTATION (LTX): A SINGLE CENTER EXPERIENCE

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INTRODUCTION. AKI after LTx is reported to be frequent (20–80 %) impacting on the postoperative course and on the medium and long term outcome. Intraoperative management has indeed a role in maintaining renal function and in reducing postoperative complications.

AIMS AND METHODS. We retrospectively evaluated 90 consecutive pts who underwent LTx at our Institution (Jan 2008–Jul 2009) to define, according to AKIN definitions, the incidence of postoperative AKI. Indications for LTx were viral cirrhosis (72 %), alcohol abuse (20 %) and miscellanea (8 %): carcinoma was present in 53 % of the cases. The analysis included Intraoperative hemodynamics, blood loss (BL), transfusion requirements (TR), fluid management, pressors use, renal function (creatinine, glomerular filtration rate, urine output, UO).

RESULTS. Median age was 52 y, median MELD 16. One year mortality rate was 6 %. Piggy back technique with inferior vena cava (IVC) preservation was always used. Baseline Creatinine was 0.94 ± 0.92 mg/dL, GFR 114 ± 46,5 ml/min. Intraoperative BL were 2,335 ± 3,370 mL (median 1,500 ml), TR were 6 ± 7 PRC (median 4 U) and 17 ± 10 FFP U (median 14 U). Total crystalloid infusion was 3,000 ± 1,300 ml (median 3,000 ml). Intraoperative UO was 2,835 ± 1,200 mL: furosemide continuous infusion was used at 0.002 mg/kg/h throughout surgery, which lasted 487 ± 112 min. According to AKIN definitions, on POD 1 AKI was recorded in 26 pts (29.5 %): stage 1 was present in 16 pts, (61 %); stage 2 in 7 pts (29 %); stage 3 in 3 pts (10 %). In pts who developed postoperative AKI, UO was significantly reduced ($p = 0.004$) after reperfusion of the graft in spite of similar fluid management, while Cardiac Index was higher ($p = 0.01$). AKI pts showed a significantly higher Creatinine on POD 1, 3 and at ICU discharge ((1.32 ± 0.45, 1.61 ± 0.53, 1.21 ± 0.56, respectively, $p = 0.00291$ vs. non AKI pts). Same significant changes were recorded for GFR. At Hospital discharge the differences were non significant.

CONCLUSIONS. In our series, incidence of AKI (29 %) was among the lowest reported in the most recent literature: important, large part of the AKI pts being in stage 1; a very small proportion of pts needed CRRT; good functional recovery of renal function was present at Hospital discharge. Invasive hemodynamic control, volume optimization, renal perfusion pressure defence, judicious use of diuretics might have impacted on our results on perioperative renal function. We did not use a strict "low CVP" philosophy (median CVP throughout surgery was 7 mmHg instead of the CVP value <5 mmHg now frequently championed in the literature). In spite of the median transfusion quantity of 4 PRC and of 14 FFP (figures today associated with increased postoperative complication and worse outcome), the entire management should have had a positive impact on the 1 year survival rate (94 %).

1079
NEUTROPHIL GELATINASE ASSOCIATED LIPOCALCIN (NGAL) IS A RELIABLE BIOMARKER OF DIALYSIS-DEPENDENT ACUTE KIDNEY INJURY AFTER INFRARENAL AORTIC SURGERY

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INTRODUCTION. Abdominal aortic surgery (AAS) is a high risk procedure with a relatively high incidence of postoperative acute kidney injury (AKI). NGAL may be useful in the early diagnosis of postopeative AKI. However, NGAL is also known as a marker of inflammatory activation [1]. The ischaemia–reperfusion injury and subsequent inflammatory response to aortic cross clamping may per se induce a rise in NGAL despite intact renal function. Therefore, NGAL may not be a reliable marker of AKI after AAS. The aim of this study is to describe the changes in NGAL after AAS in patients with and without postoperative dialysis-dependent AKI.

METHODS. 20 patients undergoing infrarenal AAS using aortic cross clamping were included after informed consent. U-NGAL was measured in spot urine samples and blood, respectively, before surgery (T0), after 24 h (T24), 48 h (T48), and 72 h postoperatively (T72).

RESULTS. NGAL, ng/ml Patients without dialysis: T0: 10 (6–22), T24: 17 (6–31), T48: 25 (18–73), T72: 50 (28–117). Patients with dialysis: T0: 18 (16–168), T24: 203 (47–603), T48: 2,473 (1017–4036), T72: 5,323 (3,606–7,039). No significant rise in U-NGAL was seen in patients without AKI at any time point. 3 patients developed dialysis-dependent AKI. Two of these patients required acute dialysis from day 1 and 3, respectively, and one died of multi organ failure on day 3. In all three patients U-NGAL increased significantly ($p < 0.05$ for T24-T48). U-NGAL also increased significantly more than in patients without AKI ($p < 0.03$ at T24, T48 and T72).

CONCLUSIONS. U-NGAL-levels did not increase above threshold value (250 ng/ml; BioPorto Diagnostics, Gentofte, Denmark) solely as a response to the surgical trauma including aortic clamping. In patients who developed dialysis-dependency U-NGAL increased significantly and may thus be a useful biomarker for severe acute kidney injury following abdominal aortic surgery.

REFERENCES. 1: Kim T et al. J Surg Res 2011.

1080
ACUTE KIDNEY INJURY FOLLOWING EMERGENCY SURGERY IN A UNIVERSITY TEACHING HOSPITAL

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INTRODUCTION. Acute Kidney Injury (AKI) is common amongst hospitalised patients and leads to increased morbidity and mortality. In the United Kingdom the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) examined process of care in hospitalised patients with AKI who subsequently died [1] and this was satisfactory in only 50 %. The majority of individuals in this study were elderly patients admitted as an emergency with evidence of kidney disease at hospital admission. Few patients were identified from surgical specialities and post-operative AKI was observed in only 9.3 %. This might be because surgical deaths did not include AKI in their coding, post-operative AKI was successfully treated or this data represented the true incidence.

OBJECTIVES. To undertake an audit of AKI following emergency surgery focussing on the incidence, recognition and appropriate management using the NCEPOD audit tool.

METHODS. All patients' 18 years of age undergoing emergency surgery and remaining in hospital ≥24 h were included. Patients were initially identified from the results of electrolytes and serum creatinine, followed by a review of their medical records. Data was collected over a 4-week period from 16th January 2012 and patients were followed up for up to 72 h after surgery for the development of AKI.

RESULTS. A total of 259 patients (129 males, 130 females) had emergency surgery over the audit period. The average age of patients with AKI was 68 compared to 83 in the NCEPOD report. Four patients died within 24 h of surgery and were not evaluated. Fourteen patients (5.5 %) patients developed AKI within 72 h of emergency surgery. Full medical records could be assessed in 12 patients. AKI was recognised in all cases and the complications managed appropriately, however other aspects of care could be improved. The results are displayed in the table.

CONCLUSIONS. The incidence of AKI following emergency surgery was only 5.5 %. Patients developing AKI were appropriately recognised and their complications managed but the assessment of risk factors, performance of investigations and other aspects of management could be improved.

Table

Average age	54 years (64 years AKI)
Specialty distribution	T&O = 107, general surgery = 65, neurosurgery = 23, transplant = 13, cardiothoracic = 11, others = 40
AKI within 24, 72 h	9/255 (3.5 %),14/255 (5.5 %)
AKI stage	I = 6,II = 7, III = 1
Acute on chronic kidney injury	6/14 (42.8 %)
Adequate recognition of AKI, clinical risk assessment	12/12, 4/12 (33.3 %)
Adequate investigations,management	1/12 (8.3 %), 6/12 (50 %)
Number of patients receiving RRT	4/12 (1 HD, 3 CVVHF) (33 %)
Complications of AKI	8/12 (66.6 %)
Adequate recognition, management of complications	8/8 (100 %),7/8 (87.5 %)

REFERENCE. 1. NCEPOD report 2009, Acute kidney injury: adding insult to injury. www.ncepod.org.uk

1081
RENAL FAILURE AND MORTALITY IN POSTOPERATIVE CARDIAC SURGERY. WHAT FACTORS INFLUENCE? ANALYSIS ARIAM REGISTRY OF CARDIAC SURGERY

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INTRODUCTION. Acute renal failure requiring renal replacement therapy (RRT) is one of the most serious complications in the postoperative period of cardiac surgery and is related to high mortality.

OBJECTIVES. Our objective was to study the preoperative and intraoperative factors associated with the development of this complication.

METHODS. Observational, prospective, multicenter study of patients undergoing cardiac surgery included in ARIAM registry of 11 hospitals in Andalusia between 2008 and 2011. These patients were not on dialysis prior to surgery, and underwent myocardial revascularization surgery, valve replacement or both. We analyzed epidemiological, preoperative and surgical variables. Data were expresssed as mean ± standard deviation (SD) for continuous variables or median and interquartile range in asymmetric variables. Qualitative variables were expressed as absolute number and percentage. We used Students' *t* test for comparisons of two means, Chi squared test was used to compare proportions. Logistic regression was used for multivariate analysis. We considered an alpha error of 5 % maximum.

RESULTS. We included 4,510 patients, 59.1 % men, mean age was 64.13 ± 12.02 years and EuroSCORE 5.58 + 2.94. Requiring dialysis in the postoperative period 96 patients (2.1 %). Mortality at discharge was 80 % in the group of patients requiring RRT, and 9.7 % in non-dialytic group ($p = 0.0001$. OR 36.9 95 % 21.8 to 62.7). In multivariate analysis, acute renal failure requiring RRT after surgery was related to presence of preoperative atrial fibrillation (OR 2. IC 95 %, 1.18 to 3.4), peripheral vascular disease (OR 3.5 95 % 1.44 -8.5), previous cardiac surgery (OR 2.1, 95 % CI, 1.22 to 3.82), intraoperative need for intra aortic baloon pump (OR 6.6. 95 % CI, 1.95 to 22.5), emergency surgery (OR 2.55. 95 % CI, 1.4 to 4.6), combined surgery (OR 3.1. 95 % CI, 1.15 to 8.39), bypass time (OR 1.007. 95 %, 1.003 to 1.01), Grade NYHA III-IV OR 1.77 95 % (from 1.06 to 2.97) and impairment of glomerular filtration rate with Cr > 2.3 for the first postoperative hours (OR 4.8. 95 % CI, 1.48 to 15.6).

CONCLUSIONS. Acute renal failure requiring RRT in postoperative cardiac surgery is associated with high mortality. Therefore, we must identify those patients at high risk and modifiable risk factors should be optimized before surgery.

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1082
INCIDENCE AND OUTCOMES OF RED BLOOD CELL TRANSFUSION IN SURGICAL INTENSIVE CARE UNIT AT SIRIRAJ HOSPITAL

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INTRODUCTION. Anemia is not uncommon problem encountering surgical critically ill patients. The information regarding the incidence of blood transfusion and transfusion

trigger in this population remains controversial and has not been previously reported in Siriraj Hospital.
OBJECTIVES. To describe the incidence of blood transfusion and transfusion trigger in adult surgical critically ill patients and to determine the factors associated with an increased incidence of transfusion.
METHODS. Data of 288 patients from the prospective cohort study in adult patients admitted to general surgical intensive care unit (SICU) and required mechanical ventilator support of greater than 24 h was retrospectively reviewed. Patient characteristic, transfusion and clinical outcome data were collected.
RESULTS. The incidence of transfusion was 83.0 %. The mean hemoglobin level before red blood cell transfusion was 8.74 ± 1.18 g/dL. Patients received the first transfusion on average 1.41 ± 2.85 day after SICU admission and received average 4.61 ± 4.41 units of blood transfusion during their SICU stay. Patients in transfusion group had significantly higher rate of pneumonia and acute kidney injury which required hemodialysis (26.8 vs. 8.2 %; p 0.005 and 13.4 vs. 0.0 %; p 0.007, respectively). SICU stay, hospital length of stay and ventilator days were also significantly longer in transfusion group (9 vs. 5 days, 31 vs. 18 days and 7 vs. 3 days; all $p < 0.001$, respectively). Hospital and SICU mortality were significantly higher in patients received transfusion (34.8 vs. 12.2 %; p 0.032 and 21.8 vs. 6.1 %; p 0.011, respectively). In multiple logistic regression analysis; lower body weight, higher Sequential Organ Failure Assessment (SOFA) score and lower hemoglobin level on admission were associated with red blood cell transfusion (adjusted OR 0.97, 1.19 and 0.60, respectively).
CONCLUSIONS. In surgical critically ill patients, the incidence of blood transfusion is high and the blood transfusion trigger remains within high threshold. Whether it is associated with increased adverse events or is only a marker of severity, large randomized controlled studies are warranted to confirm potential benefit of blood transfusions in surgical critically ill patients.
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1083
CD4+/CD8+ RATIO AS A USEFUL INDICATOR FOR POSTOPERATIVE SEVERE SEPSIS IN CRITICALLY ILL PATIENTS UNDERGOING ELECTIVE ABDOMINAL OPERATIONS

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OBJECTIVES. To determine whether CD4+/CD8+ ratio is a useful indicator for postoperative severe sepsis in critically ill patients undergoing elective abdominal operations or not.
METHODS. This was a single-centre, prospective, observational study, conducted in Surgical Intensive Care Unit (SICU) of an academic tertiary care hospital in China.129 critically ill patients undergoing elective abdominal operations were enrolled into this study.
RESULTS. The morbidity and mortality of postoperative secondary severe sepsis were 10.85 % (14/129) and 64.29 % (9/14), respectively. The area under ROC of CD4 +/CD8 + ratio and IL-6 were 0.782 (0.646–0.918), 0.741 (0.574–0.908), respectively. The optimal cutoff value of CD4 +/CD8 + ratio and IL-6 were 2.36 (sensitivity: 80 %; specificity: 77.9 %; Yuden index: 0.58) and 309.75 pg/ml (sensitivity: 60 %; specificity: 83.1 %; Yuden index: 0.43), respectively. Parallel test (sensitivity: 92 %; specificity: 65.7 %; Yuden index: 0.58) was superior to serial test (sensitivity: 48 %; specificity: 96.3 %; Yuden index: 0.44).
CONCLUSIONS. CD4+/CD8+ ratio is a useful indicator for postoperative severe sepsis in critically ill patients undergoing elective abdominal operations compared with IL-6. The optimal cutoff value of CD4+/CD8+ ratio was 2.36 (sensitivity: 80 %; specificity: 77.9 %; Yuden index: 0.58). The efficacy of parallel test (sensitivity: 92 %; specificity: 65.7 %; Yuden index: 0.58) was better than that of serial test (sensitivity: 48 %; specificity: 96.3 %; Yuden index: 0.44). Clinical trial: ChiCTR-ONC-11001452
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1084
NEUTROPHIL GELATINASE-ASSOCIATED LIPOCALIN (NGAL) AS AN EARLY BIOMARKER FOR ACUTE KIDNEY INJURY AFTER ENDOVASCULAR STENT GRAFT REPAIR OF AORTIC ANEURYSM

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INTRODUCTION. NGAL has been characterized as an early biomarker for acute kidney injury (AKI). Although stent graft repair of aortic aneurysm may cause AKI for operation or contrast agent, NGAL has not adequately been examined in this population.
OBJECTIVES. We studied whether NGAL can be an early biomarker for AKI after stent graft repair of aortic aneurysm
METHODS. Urine and serum NGAL were measured at 2 h, 1 day, 2 day, 4–5 day and stable period after operation in addition to pre-operation in 42 patients scheduled for stent graft repair of aortic aneurysm.
RESULTS. 6 patients (14 %) developed AKI with AKIN criteria. Although serum NGAL reached maximum value 21 ± 43 (h) after serum creatinine did maximum value, urine NGAL corrected by urine creatinine value reached 31 ± 38 (h) before serum creatinine did maximum value in AKI patients. Urine NGAL corrected by urine creatinine showed good predictive values for AKI (97 % specificity, 83 % sensitivity at a 65.1 mg/gCr cutoff) and the area under the receiver operator characteristic curve (AUC) of urine NGAL 2 h after operation was 0.9.
CONCLUSIONS. Urine NGAL has the possibility to be an early and useful biomarker for AKI after stent graft repair of aortic aneurysm.

1085
BLOCKADE OF LEUKOTRIENE B4/BLT1 PATHWAY PREVENTS ISCHEMIA REPERFUSION INJURY OF KIDNEY

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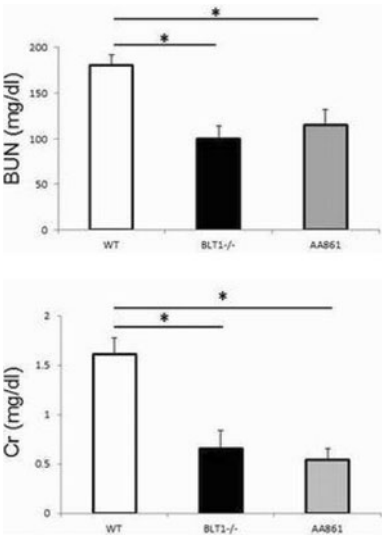
INTRODUCTION. Leukotriene B_4 (LTB_4), a 5-lipoxygenase (5-LOX) metabolite of arachidonic acid has been well-documented to be a potent chemotactic factor for granulocytes. LTB_4 exerts its biological activities through two distinct LTB receptors: BLT1 and BLT2. We have demonstrated that LTB4/BLT1 signaling enhanced hepatic microcirculatory dysfunction during endotoxemia. The glomerular endothelium forms an important part of the filtration barrier in the kidney, and is damaged by ischemia–reperfusion.
OBJECTIVES. We hypothesized cardiac arrest damages the glomerular barrier through the LTB4/BLT1 pathway.
METHODS. All animal experiment procedures were performed in accordance with the guidelines for animal experimentation of Kitasato University School of Medicine. We made three groups, wild type male mice (WT, n = 14), BLT1 knockout mice (BLT1−/−, n = 16) and AA861 treatment (AA861, n = 9). AA-861 is a specific inhibitor of 5-LOX, and AA-861 (100 mg/kg in 0.5 mL saline, i.p.) was injected in 30 min before Cardiac Arrest. The doses used were enough to inhibit 5-LOX activity. The mice were subjected to Cardiac arrest (CA) induced by intravenous (IV) KCL. After 8 min of CA, we reopened their ventilation with 100 % oxygen, and the chest compressions were started at a rate of 300 bpm. Moreover, the resuscitation was initiated with IV epinephrine (8–16 μg in 0.5–1.0 ml 0.9 % saline). During surgery, the rectal temperature was maintained at 37.0 ± 0.5 °C. At the 24 h after CA, we measured their Blood Urea Nitrogen (BUN) and serum creatinine (Cr). Statistical analysis was performed by using one-way t-test, and statistical significance was set at $p < 0.05$.
RESULTS. There were no significant differences in time to resuscitate, rectal temperature, and epinephrine dose between WT, BLT1−/− and AA861 treatment groups. The level of BUN was significantly lower in the BLT1−/− compared with WT (99.5 ± 14.6 mg/dl vs. 180.6 ± 11.2 mg/dl). Moreover, AA861 significantly reduced the level of BUN relative to WT (114.9 ± 16.6 mg/dl vs. 180.6 ± 11.2 mg/dl). Also, there were significant differences between WT and BLT−/− (1.62 ± 0.17 mg/dl vs. 0.69 ± 0.17 mg/dl), WT and AA861 (1.62 ± 0.17 mg/dl vs. 0.54 ± 0.11 mg/dl) in the creatinine.



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CONCLUSION. Present study showed the blockade of LTB4/BLT1 pathway prevented the ischemia–reperfusion injury in the kidney. The results might be suggested that LTB4/BLT1 signaling is an attractive therapeutic target with available specific agonists.

Re-evaluation of sepsis therapies: 1086–1099

1086
RANDOMIZED CONTROLLED TRIAL OF NOVEL RECOMBINANT HUMAN SOLUBLE THROMBOMODULIN (RTM) FOR SEPSIS WITH DISSEMINATED INTRAVASCULAR COAGULATION PATIENTS IN JAPAN

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INTRODUCTION. For patients of sepsis with DIC, Surviving Sepsis Campaign Guideline 2008 recommends the use of recombinant human activating protein C (rhAPC). However, rhAPC has not licenced as sepsis with DIC yet in Japan. Like rhAPC, it is expected that

recombinant human soluble thrombomodulin (rTM) plays a role for not only reversing hyper-coagulative status but also inhibiting inflammatory response through activating protein C. According to retrospective research, rTM improves 28-day mortality of sepsis with DIC patients. However, there is no prospective study yet. We started a randomized controlled trial of rTM for sepsis with DIC patients. We introduce the preliminary report.
OBJECTIVES. To assess whether rTM improves mortality of sepsis with DIC patients in 28 days.
METHODS. We enrolled and analyzed 49 patients who were admitted for treating sepsis with DIC from October 2008 to March 2012. They were randomized into rTM-treated group or placebo group (22 to 27). Primary outcome was survival rate in 28 days. As surrogate outcomes, we compared physiological scores; APACHE II, SOFA, JAAM DIC, and SIRS score, indicators of coagulation and inflammation among both groups during administration of rTM. Statistical analysis was performed by Chi-square test and Wilcoxon rank-sum test.
RESULTS. 28-day mortality were not different in both groups (rTM group 27.3 %, control group 37.0 %; $p = 0.20$). SOFA score of rTM group significantly reduced on day 8. JAAM DIC Score significantly improved on day 4 in rTM group, and day9 in control group. It showed significant difference between groups on day 3. CRP of rTM group significantly reduced on day 2. Platelet count of rTM group significantly recovered on day 8.
CONCLUSIONS. More samples are necessary to ascertain whether rTM is effective for sepsis with DIC. Earlier improvement of platelet and CRP in rTM group may be attributed to effect of anti-coagulation and anti-inflammation of rTM.
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1087
REQUIEM FOR XIGRIS®: ITS USE IN SEPSIS-ASSOCIATED ARDS REQUIRING ECMO SUPPORT

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INTRODUCTION. In October 25th 2011, the European Medicines Agency issued a press release on the worldwide withdrawal of Xigris® from the market by Eli Lilly due to lack of beneficial effect on 28-day mortality in the PROWESS-SHOCK study (expected to be published in 2012). In this context, here we show our experience in sepsis-associated Acute Respiratory Distress Syndrome (ARDS) combined with veno-venous Extracorporeal Membrane Oxygenation (ECMO).
METHODS. This is an observational study (April 2009–Sept 2011) designed in an intensive care unit (ICU) of an Emergency Department, ECMO referral Center (Careggi Teaching Hospital). Veno-venous ECMO (Centrigufal Pump Rotaflow and Quadrox-D Oxygenator, Maquet®, Rastatt, GE) positioning was achieved percutaneously trough Seldinger technique and ECMO high-flow technique (up to 6 l per min) was initially established according to patient's requirement. Xigris® administration was started within 24 h after onset of severe sepsis with an APACHE II score of 25 or more and dosage regimen was performed at 24 μg/kg of body weight per hour as a continuous infusion over a period of 96 h. Heparin infusion was set at a maximum of 15 UI/kg/day. Coagulation status was controlled by activated partial thromboplastin time (aPTT) every four hours. Infusion of Xigris® was stopped in case of moderate to severe bleeding events and severe thrombocytopenia.
RESULTS. A total of nine patients (7 males and 2 females) were treated with Xigris® and veno-venous ECMO. All following data are expressed as median and 25th and 75th percentile are enclosed in parenthesis. Median age was 53 (49–55) years with a SAPSII at admission to ICU equal to 48 (43–50). APACHEII score at the beginning of Xigris® infusion was 28 (25.5–32.5) with a number of organ failures equal to 4 (3–5). Four patients died during ICU-stay, five survived. Moderate bleeding events during combined treatment defined as need for transfusion of 1 to 3 packed red blood cells (RBC) for 2 days were observed in seven patients. The need for four packed RBC were observed in two patients. No fatal or critical bleeding events were observed such as in the control ECMO group with no Xigris® administration.
CONCLUSIONS. In our case series, limited in sample size, the use of ECMO and Xigris® resulted feasible and safe. Xigris® might be used, if still available, in course of sepsis, as anticoagulant during ECMO support. Unfortunately, this therapeutic option cannot be further investigated and used due to the Producer decision. Our opinion is that the lack of "evidences of efficacy" is not always synonym of "evidences of inefficacy". Moreover, in this particular case, the evidence is represented by the 28-day mortality, which is absolutely questionable as outcome parameter.

1088
SERUM SOLUBLE ICAM-1 IS A RELIABLE BIOMARKER OF INFECTION IN PATIENTS WITH SYSTEMIC INFLAMMATORY RESPONSE SYNDROME

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INTRODUCTION. Vascular endothelium activation is a key pathogenic step in systemic inflammatory response syndrome (SIRS) that can be triggered by both microbial and sterile proinflammatory stimuli. Thus, activated endothelial cells shed the soluble adhesion molecules implicated in leukocyte recirculation. The relevance of the latter molecules as clinical biomarkers to discriminate between infectious and non-infectious SIRS, and the individual patient prognosis, has not been established.
OBJECTIVES. To determinate the relevance of soluble adhesion molecules as clinical biomarkers to discriminate infection in SIRS. The kinetics within the first 28 days of sepsis was also investigated.
METHODS. We prospectively measured by sandwich ELISA, serum levels of sE-Selectin, sVCAM-1, sICAM-1 and sICAM-2 at ICU admission, at 48 h and at days 7, 14 and 28 in patients with sepsis and at 48 h and at day 7 in patients with non-infectious SIRS patients. Thirty-six healthy volunteers matched for age and sex served as controls.
RESULTS. Fifty-two patients with sepsis and forty with non-infectious SIRS were included. At ICU admission, sE-Selectin, sVCAM-1 and sICAM-1 in patients with sepsis were significantly higher than those found in patients with non-infectious SIRS. The table shows the comparison of circulating soluble E-Selectin, VCAM-1, ICAM-1 and ICAM-2 levels between infectious SIRS and non-infectious SIRS patients and healthy controls. ROC analysis revealed that the AUC for infection identification was best for ICAM-1 (0.900 ± 0.041; 95 % CI 0.819–0.981; $p < 0.0001$). Moreover, in all patients with SIRS, sE-Selectin concentration was higher at ICU admission in survivors (106.4 ± 24.1 ng/ml) than in nonsurvivors (78.4 ± 30.3 ng/ml; $p < 0.001$). In patients with sepsis, increased circulating levels of sVCAM-1, sICAM-1 and sICAM-2 was found along 28 days.

Table

		At ICU admission	At ICU admission	Day 3	Day 3	Day 7	Day 7	Day 14	Day 28
	CONTROLS	SIRS	SEPSIS	SIRS	SEPSIS	SIRS	SEPSIS	SEPSIS	SEPSIS
sE-Selectin	46 ± 5	60 ± 35 β	96 ± 24 α, γ	74 ± 21 β	80 ± 26 γ	50 ± 37	60 ± 26	53 ± 22	42 ± 22
sVCAM-1	931 ± 80	1069 ± 324	1606 ± 1047 α, γ	770 ± 145	1853 ± 1318 α, γ	1221 ± 418	1733 ± 843 α, γ	1865 ± 863 γ	1733 ± 688 γ
sICAM-1	475 ± 29	736 ± 611	1114 ± 300 α, γ	508 ± 242	1074 ± 293 α, γ	562 ± 202	1043 ± 374 α, γ	1115 ± 351 γ	1067 ± 252 γ
sICAM-2	144 ± 8	248 ± 101 β	212 ± 53 γ	186 ± 63	224 ± 55 γ	172 ± 44	288 ± 68 α, γ	410 ± 155 γ	404 ± 190 γ

Data are shown in ng/ml and as mean ± S.D. mean. α: $p < 0.05$ for comparison of means between infectious SIRS patients and non- infectious SIRS patients. β: $p < 0.05$ for comparison of means between non- infectious SIRS patients and healthy controls and γ: $p < 0.05$ for comparison of means between infectious SIRS patients (sepsis) and healthy controls

CONCLUSIONS. Patients with SIRS secondary to infectious or non-infectious etiology show distinctive patterns of disturbance in serum soluble adhesion molecules. Serum sICAM-1 is the best biomarker of infection in SIRS. In addition, sE-Selectin levels may be used as predictor of fatal outcome in patients with SIRS.
GRANT ACKNOWLEDGMENT. This study was supported by grant S-BIO-0189/2006 from Comunidad de Madrid Spain, Fondo de Investigación Sanitaria FIS 98/1431, PI-08-1890 and SAF2011-29405 from Ministerio de Ciencia e Innovación.

1089
RECOGNITION AND MANAGEMENT OF SEVERE SEPSIS: A RETROSPECTIVE AUDIT

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INTRODUCTION. Severe sepsis accounts for an estimated 36 800 deaths annually in the UK [1]. The Sepsis Six is a simple, non-ICU care bundle developed by the Survive Sepsis team. In a 2010 prospective study at this hospital [2], Sepsis Six compliance was 39 %. This was associated with a reduction in mortality from 44.1 to 20 % and an increased likelihood of achieving the Surviving Sepsis Campaign (SSC) resuscitation bundle. At the time of that study, 'sepsis nurses' had been employed to actively seek and review patients with sepsis, as well as increase awareness and education.
OBJECTIVES. To determine if there has been a decline in the recognition and management of sepsis in acute medical admissions since the loss of the sepsis nurse role.
METHODS. This retrospective audit included patients admitted to the Acute Medical Unit (AMU) on seven consecutive days in November 2011. All patients with a coded diagnosis at discharge from AMU that was suspicious of sepsis were selected ($n = 112$). Emergency department and AMU records were reviewed. Clinical and pathological parameters were used to retrospectively classify patients into actual diagnoses of SIRS, sepsis or severe sepsis in line with SSC guidance. Notes were assessed for documentation of 'SIRS', 'sepsis' or 'severe sepsis', the use of pre-printed care pathways and the implementation and timing of Sepsis Six interventions.
RESULTS. Of 112 patients with coded diagnoses suspicious of sepsis, 41 had a retrospective diagnosis of sepsis or severe sepsis, of which only 34 % had 'sepsis' documented in the notes. Half of these patients ($n = 21$) had signs of severe sepsis, but there was no documented evidence of recognition of this in any of these patients' notes. Pre-printed care pathways were used for 29 % of septic patients. Within the first 24 h, only 10 % of patients with severe sepsis received the Sepsis Six. 76 % of patients with sepsis were treated with IV antibiotics; the average time between time first seen and administration of these was 3 h 34 min. Oxygen administration and urine output monitoring were the criteria least frequently achieved.
CONCLUSIONS. The recognition and management of sepsis has declined due to multiple factors, including the loss of the sepsis nurse role and reduction in visibility of the campaign within the trust. Funding has now been secured to reinstate the sepsis nurse post across the trust. It is also recommended that there should be mandatory training on sepsis for junior doctors, as well as increased publicity and accessibility of the Sepsis Six care pathway. This will be re-audited after the implementation of the above measures.
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1090
THE ROLE OF RECOMBINANT HUMAN SOLUBLE THROMBOMODULIN (RHS-TM) IN SEPTIC DIC (DISSEMINATED INTRAVASCULAR COAGULATION)

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INTRODUCTION. Since 2008, rhs-TM (Recomodulin®, Asahi Kasei Pharma Co., Tokyo) administration has been used as the therapy for adults with disseminated intravascular coagulation (DIC) in Japan [1]. Thrombomodulin (TM) is also known to have direct anti-inflammatory activities to inhibit activated kinases and NFκB responses in endothelium. In the previous study, we have reported rhs-TM may have an efficacy as an anti-inflammatory response in septic patients.
OBJECTIVES. To clarify the role of rhs-TM in septic DIC patients.
METHODS. Twenty five severe septic patients (17 men, 8 women; age range 34–85 years) with rhs-TM therapy for DIC in our ICU were investigated. Rhs-TM therapy consists of 380 U/kg intravenously every 24 h for 6 days. Between before the start of rhs-TM therapy and on the day after finished the therapy, WBC, CRP, Platelet, PT, APTT, antithrombin III (AT III), thrombin-antithrombin III complex (TAT), tissue plasminogen activator plasminogen activator inhibitor-1 (tPAPAI-1) complexes, Protein C (PC), Thrombomodulin (TM) and DIC score were evaluated. The measurement of AT III was using by chromogenics assay. TAT was measured by enzyme immunoassay and tPAPAI-I and PC were used

with latex photometric immunoassay. TM was measured by enzyme-linked immunosorbent assay. Values are expressed as median. Data were analyzed by Mann–Whitney U test. A $p < 0.05$ was considered as statistically significant.
RESULTS. There were 15 survivors and 10 non-survivors. No side effects of rhs-TM occurred.

Values before and after rhs-TM therapy

	Before	After	p		Before	After	p
WBC(/mm$^{3)}$	12,765	12,420	0.37	PT (s)	15.4	13.6	0.01
CRP (mg/dL)	20.4	8.3	<0.0001	APTT (s)	44.2	37.4	0.02
Platelet (/μL)	105,000	125,500	0.20	PC (%)	47.5	43	0.79
AT III (%)	54	79.5	0.05	TM (ng/mL)	7.4	17.5	0.0003
TAT (ng/mL)	7.1	5.2	0.15	DIC score	4	2	0.04
tPAPAI-1 (ng/mL)	53	27	0.10				

CRP values were statistically significantly decreased after rhs-TM therapy. PT, APTT and DIC score were also significantly improved. AT III and TM values were increased, while PC did not change. TAT and tPAPAI-1 were decreased but did not reach to statistical significances.
CONCLUSIONS. Rhs-TM therapy could have a key role of protein C pathway for anti-coagulation in DIC. However, it still remains a possibility to have an efficacy for anti-inflammation in septic DIC.
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1091
IMPLEMENTATION OF A SEPTIC SHOCK CODE TRACK BY A MULTIDISCIPLINARY TEAM

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INTRODUCTION. Sepsis is a complex syndrome that is difficult to define, diagnose and treat.It's a rapid killer, so the quick diagnosis and management is critical to successful treatment. Key to overcome is the cross-functional cooperation of the healthcare professionals involved.
OBJECTIVE. To assess the degree of compliance with the resuscitation bundles, defined by the Surviving Sepsis Campaign (SSC) that must be accomplished within the first 6 h of presentation for patients with severe sepsis or septic shock (SS), after implantation of a clinical track designed by a multidisciplinary team.
METHODS. Observational study (July 2011–March 2012) of 121 patients included in the SS Code track designed by doctors and nurses of the Emergency Department (ED),intensive care unit (ICU),infectious diseases and epidemiology. The code is applicable from the time of patient arrival to the ED or during his stay there. Inclusion criteria: 1. Suspected infection; 2. Temperature <36 °C or >38 °C, and/or heart rate >90, and/or respiratory rate >20, and/or GCS <15; 3. Systolic blood pressure <90 mmHg or mean arterial pressure <70 mmHg or decreased blood pressure >40 mmHg in hypertensive patients or lactate >4 mmol/L. The exclusion criterion is severe comorbidity. The track consists of two activation phases: 1. early detection and resuscitation, carried out in the ED; 2Evaluation by an intensivist in case of persistent hypotension despite initial resuscitation. A treatment protocol for the first 6 h, based on clinical guidelines proposed by the SSC, was developed. A program to optimize the use of antimicrobials was spread among the physicians. The track was implemented after 2 weeks of training. Conferences on this issue are done periodically to keep the level of knowledge and awareness among the professionals involved in the care of these patients. Clinical variables, performed bundles within the first 6 h of SS identification, admission to ICU and hospital mortality were collected.
RESULTS. 121 patients were activated as SS Code. 42 (35 %) had some exclusion criteria, and 11 (9 %) spontaneously recovered blood pressure. 62 (51 %) patients followed the clinical track. Of these, 84 (69 %) were men, with a mean age of 67.4 ± 21.5 years. 97 % of patients underwent early volume resuscitation, in 97 % lactate was measured during the first 6 h, in 94 % blood cultures were performed prior to antibiotic administration and in 89 % the antibiotic was administered in first 3 h after the first registered hypotension. In 96 % of patients in whom hypotension was refractory to volume administration and/or lactate was greater than 4 mmol/L vasoactive drugs were administered independently of the hospital service in which they were located (ED or ICU). 55 % of patients were admitted to ICU. Hospital mortality was 2 %.
CONCLUSIONS. The accomplishment of the first 6 h goals of the SSC for the treatment of SS is high at our institution. The multidisciplinary management of these patients through the development and implementation of a clinical track leads in great final clinical results.

1092
THE MIS-FIRED MAGIC BULLET? RECOMBINANT ACTIVATED PROTEIN C (RHAPC) USE IN PATIENTS WITH DECOMPENSATED LIVER DISEASE OR GRAFT DYSFUNCTION FOLLOWING LIVER TRANSPLANTATION

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INTRODUCTION. The PROWESS trial reported a 6.1 % absolute reduction in 28-day mortality with the use of APC in severe sepsis or septic shock. Almost as a direct result, it was approved by the FDA. Patients with liver disease were excluded from the original trial. RhAPC was recently withdrawn from the market [i], [ii], subsequent to the findings of the SHOCK-PROWESS trial and Cochrane review [iii]. The role of rhAPC in liver disease therefore went largely un-assessed. Prior to the withdrawal, we used rhAPC on the liver intensive care unit (LICU) for patients in septic shock, whilst suffering from chronic liver disease, graft dysfunction following liver transplant, or severe hepatic dysfunction in the context of hepato-biliary surgery.
OBJECTIVES. To report on rhAPC use in this population.
METHODS. Retrospective review of 21 LICU admissions for septic shock who received rhAPC (years: 2003–2010).
RESULTS. 21 patients with septic shock and MOF were treated with rhAPC. Of these, 14 patients had a history of liver transplantation. The interval between APC use and transplantation was between 3 days and 11 years; 8 were treated within 30 days of transplantation. 6 patients suffered from cirrhosis and/or portal hypertension; 1 patient had had liver resection for liver metastasis. Overall, 11 patients survived to hospital discharge (52 %); 13 (62 %) had shock reversal 7 days after starting therapy. 2 patients (9.5 %) had severe bleeding complications possibly contributing to their death.
The mean SOFA score on commencing treatment was 15; 16 patients scored 4 for CVS function. Mean bilirubin level was 118 umol/L; mean platelet count was 119,000. 4 patients' platelet count was less than 35,000 (range 10–422,000). 13 patients required renal replacement.
CONCLUSIONS. The selected use of rhAPC in this group of patients—originally excluded from the PROWESS trial - showed a respectable survival rate to discharge. 2/3 of patients achieved shock reversal. Despite a high incidence of coagulopathy, bleeding complications were relatively rare. Following market removal, the debate regarding the use of rhAPC and the appropriate patient selection is perhaps even more controversial. The published evidence indicates no benefit from rhAPC; anecdotal clinical experience may suggest otherwise. We propose that perhaps rhAPC use in those excluded from the original trials should be re-assessed, not dismissed. Unfortunately though, proof of efficacy in subgroup populations with septic shock may never be found.
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1093
EFFECTS OF COMBINATION THERAPY OF RECOMBINANT HUMAN SOLUBLE THROMBOMODULIN AND ANTITHROMBIN ON DISSEMINATED INTRAVASCULAR COAGULATION WITH SEVERE SEPSIS

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INTRODUCTION. Thrombomodulin (TM) is an endothelial anticoagulant cofactor. Specifically, recombinant human soluble thrombomodulin (rhs-TM) has a potent anticoagulant effect on septic disseminated intravascular coagulation (DIC) by binding thrombin and activating protein C.1) In patients with renal failure, the infusion dose of rhs-TM should be reduced. Moreover, antithrombin (AT) has potent beneficial effects on septic DIC patients.
OBJECTIVES. The aim of this study was to investigate the effects of the combination therapy of rhs-TM and AT on severe septic DIC patients.
METHODS. DIC was diagnosed using the Japanese Association of Acute Medicine (JAAM) DIC criteria. 2. The subjects were 12 patients with septic DIC (DIC score ≥6 and AT level ≤70 %). They were treated with rhs-TM (380 units/kg/day) and AT (30 units/kg/day) for 3–6 days in the intensive care unit. In 9 patients treated with continuous hemodiafiltration (CHDF) for acute renal failure, the dose of rhs-TM was reduced to 130 U/kg/day. We also examined the JAAM DIC scores, sequential organ failure assessment (SOFA) scores, platelet counts, AT level, fibrinogen degradation product (FDP) level, prothrombin time-international normalized ratio (PT-INR), and procalcitonin level before and after treatment. Furthermore, we evaluated the prognosis of the patients 28 days after ICU admission and any complications during this study. All values were expressed as mean ± SD and analyzed using the paired t-test and Wilcoxon t-test. A p-value of less than 0.05 was considered to indicate a statistically significant difference.
RESULTS. We found the following: 1. 8 patients survived 28 days after ICU admission; 2. the SOFA score, JAAM DIC score, and PT-INR, FDP and plocalcitonin levels significantly decreased after the combination treatment; 3. the platelet counts increased, although not statistically significantly; 4. the AT levels increased significantly after the treatment; 5. no treatment complications (e.g., bleeding) were observed during the study.
CONCLUSION. The combination therapy of rts-TM and AT exerted a potent and improving effect on severe septic DIC even at a reduced infusion dose of 130 units/kg of rhs-TM in patients treated with CHDF.
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1094
EVALUATION OF THE INITIAL ATTENTION OF SEVERE SEPSIS AND SEPTIC SHOCK IN DAILY CLINICAL PRACTICE

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INTRODUCTION. Diagnostic and therapeutic guidelines, organized as sepsis bundles, has shown to improve mortality, but timely and consistent implementation of these can be challenging
OBJECTIVES. To assess the initial management of patients with severe sepsis or septic shock, and analyze its impact on morbidity and mortality.
METHODS. Prospective study of patients admitted in ICU with severe sepsis and septic shock from April to November 2011. Epidemiological data, comorbidity, severity scores, etiology of sepsis, implementation of Surviving Sepsis Campaign (SSC) recommended bundles, elapsed time until recognition of sepsis and before the administration of the first dose of an adequate antibiotic were collected.
Chi-square analysis was used to compare categorical data and continuous data were compared using simple logistic regresion analysis. Independent prognostic factors of mortality were studied by means of multivariable logistic regression analysis.
RESULTS. 74 patients were studied. 62 % were male. The average age was 61 ± 16 years. 46 % had comorbidity, with a Charlson Index of 2 (1–4). Severity scores: APACHE II 22 (18–28), SOFA 8 (6–12), number of organ failures 3 (2–4), and lactate levels 3.2 mmol/l (1.6–4.9). 66 % of patients were septic shock, and the most frequent infectious focus were respiratory (46 %) and abdominal (27 %). 53 % of patients required mechanical ventilation with a mean duration of 14 days (4–22). The mean time elapsed until sepsis recognition was

30 min (0–3 h 20′) and the mean time before the first administration of an adequate antibiotic was 2 h (50′–4 h 15′). The number of SSC recommended bundles correctly applied was 4 (3–5) in the first 6 h and 2 (1–3) in the following 24 h. The microbiological cultures were positive in 56.8 % of patients and the antibiotic therapy was adequate in 89.2 % of them. Mean stay was 7 days (4–23) in ICU and 22 days (12–43) in hospital. Mortality rate was 25.7 % in ICU and 29.7 % in hospital. Univariable analysis showed that factors related to mortality were: APACHE II (OR 1.16; 95 % CI 1.06–1.26), SOFA (OR 1.37; 95 % CI 1.15–1.62), number of organ failures (OR 1.68; 95 % CI 1.11–2.54); lactate levels (OR 1.29; 95 % CI 1.03–1.61), severity of sepsis (septic shock) (RR 3.55; 95 % CI 1.01–13.66) and the elapsed time until the start of an adequate antibiotic therapy (OR 1.05; 95 % CI 1.02–1.12). The multivariable logistic regression analysis including the previous variables showed that APACHE II (OR 1.24; 95 % CI 1.06- 1.43) and the elapsed time until the start of an adequate antibiotic therapy (OR 1.08; 95 % CI 1.01–1.15) had relation to mortality.
CONCLUSIONS. Currently, there is still an irregular implementation of SSC recommended bundles in the management of patients with severe sepsis and septic shock. With the limitations of a small sample size, the delay in the administration of the first dose of an adequate antibiotic was associated with an increase of mortality.

1095
OXYGEN THERAPY FOR SEPSIS PATIENTS IN THE EMERGENCY DEPARTMENT; A LITTLE LESS?

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INTRODUCTION. Liberal oxygen therapy has been an unquestioned cornerstone in the treatment of critically ill patients. Recently the awareness of possible hyperoxia toxicity has emerged. In sepsis patients acute hyperoxia has not been investigated yet.
OBJECTIVES. We investigated the PaO_2 in sepsis patients treated at the Emergency Department with a reduced inspired oxygen fraction ((FiO_2 0.4 instead of 0.6–0.8).
METHODS. Patients with ≥2 SIRS-criteria and suspicion of infection received 10 l O_2/min via a Venti Mask 40 %. After 5 min, routine arterial blood gas analysis was performed. If after 5 min PaO_2 was <9.5 kPa, 15 l O_2/min via a non rebreathing mask was started. Vital signs, medical history, sepsis classification, in-hospital and 28 day mortality were recorded. Hyperoxia was defined as PaO_2 > 13.5 kPa (N 9.5–13.5 kPa).
RESULTS. Of 83 patients, 77 had a PaO_2 > 9.5 kPa with 10 l O_2/min, of whom 51 had hyperoxia (PaO_2 > 13.5 kPa) Only six patients showed hypoxia with 10 l O_2/min. Patients needing 15 l O_2/min via a non rebreathing mask more often had severe sepsis or septic shock and a positive history for pulmonary diseases. Of the hyperoxic patients 8 % died in-hospital vs. 6 % with normoxia (NS).
CONCLUSIONS. This study shows that with a substantial protocolized reduction in inspired oxygen the majority of patients with two or more sepsis criteria still appears to have hyperoxia. The small portion with hypoxia can be identified quickly and inspired oxygen can be increased immediately. Risk factors for the need for 15 l O_2/min with a NRM seem to be high age, severe sepsis or septic shock, pulmonary condition in medical history and low initial saturation or EMV score.
Avoiding possible hypoxia, the majority of patients is exposed to potentially dangerous hyperoxia. Titration of oxygen therapy in the ED should be evaluated.
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1096
CORRECTION OF THE HEMOCOAGULATION DISORDERS AND REDUCING THE LEVEL OF THE SEPTIC COMPLICATIONS BY USING EPIDURAL ANESTHESIA AT PATIENTS WITH ACUTE NECROTIZING PANCREATITIS

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INTRODUCTION: Most researchers have noted that the incidence of acute necrotizing pancreatitis (ANP) came in third place in the structure of acute abdominal surgery. The septic complications is the most frequent early complication of ANP. The researchers noted that the degree of the hemocoagulation disorders in tissue of pancreas and surrounding tissues is directly correlated with the volume of necrosis and the severity of the condition. Perspective, in our opinion, is the ability to influence on the severity of the disease and its outcomes with epidural anesthesia as a method of correction the hemocoagulation disorders.
OBJECTIVES AND METHODS. The study was conducted in 44 patients with the ANP, which were divided into two groups according to type of analgesia: epidural administration of the local anesthetics or opioids. Patients from 1st group (23) had epidural analgesia by ropivacaine 6–14 mg/h during 7–10 days and from 2nd (21)—opioid analgesia by trimeperidine 20 mg three times a day during the same period. We monitored level of septic and thrombo-hemorrhagic complications by clinical and instrumental data, during month after treatment starting.
The hemostatic system was evaluated using indicators of hemoviscoelastography (Analyzer "Mednord-01M").
RESULTS. It was found that all patients with ANP initially have hypercoagulation and fibrinolysis inhibition. Level of hemostatic disorders correlate with the level of septic complications, treatment in ICU, mortality. In 1st group we noted a deep vein thrombosis (DVT), 2 pneumonia, 7—pseudopancreatic cysts and abscesses, 2 deaths and time of stay in the ICU to 15.4 days. In the 2nd group: 3 cases of deep vein thrombosis, 4—pneumonia, 10—pseudopancreatic cysts and abscesses, 2 episodes of gastro-intestinal bleeding, 5 deaths and time of stay in the ICU to 27.8 days.
CONCLUSIONS. The using of epidural anesthesia in patients with ANP reduced the number of septic complications on 36.6 % and reduce the mortality rate from 23.8 % (2nd gr.) to 8.7 % (1st gr.). We think that violations of blood coagulation and microcirculation are the basis for ischemia, necrosis in tissues and septic complications. Epidural analgesia is effective method to decreasing level of septic and thrombo-hemorrhagic complications and mortality in ANP patients.

1097
PROGNOSTIC FACTORS OF SEPSIS WITH DISSEMINATED INTRAVASCULAR COAGULATION (DIC) PATIENTS UNDER ADMINISTRATION OF ANTITHROMBIN III IN JAPAN

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INTRODUCTION. In patients with severe sepsis, Antithrombin (AT) activity <54 % at baseline has been shown one of predictive factors in 28-day mortality [1], while admission AT concentrations is not independently associated with hospital mortality rate [2].
OBJECTIVES. We wanted to determine prognostic factors under administration of AT for patients with septic DIC, and to evaluate whether AT activity in diagnosis of DIC may be linked to mortality.
METHODS. Data was collected from adult septic DIC patients who admitted in our department during the period May 2008 to December 2011, using our database and retrospective analysis of individual patient records. We applied the Surviving sepsis campaign to the septic DIC patients. AT was replaced in the patients whose value for less than 70 % (unused heparin). We compared physiological score (APACHE II, SOFA), acute phase DIC score, and indicators of coagulation and inflammatory at DIC diagnosis, in 28-day survivor and non-survivor group, low and high value AT group. Statistical analysis was performed by Chi-square test, Mann–Whitney U test, multivariable logistic regression analysis.
RESULTS. 83 septic patients with DIC were included, age 74 (median, 29-97) years, men 53 and women 30, APACHE II 22 (median, 8-41), SOFA 9 (median, 2-20). Survival rate in 28 days was 69.9 %. There was no significant differences in AT activity among both groups, but APACHE II, SOFA score and age was statistically higher in non-survivor group ($P < 0.05$). The patients with low AT activity showed significantly high score in APACHE II, SOFA($P < 0.05$).
CONCLUSIONS. The prognostic factors in patients with septic DIC under AT administration, is SOFA score and age at DIC diagnosis, not AT activity. AT activity indicate organ dysfunction.
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1098
GLYCAEMIC CONTROL IN CRITICALLY ILL. A TERTIARY DUBLIN HOSPITAL EXPERIENCE

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INTRODUCTION. Hyperglycaemia and insulin resistance are common in critically ill patients, even if they have not previously had diabetes [1]. Following the publication of the NICE-SUGAR Study [2], the protocol managing the serum glucose levels in critically ill patients in St Vincent's (SVUH) intensive care unit was modified.
OBJECTIVES. We aimed to audit the incidence of hyperglycaemia and hypoglycaemia following the introduction of the modified protocol and risk factors associated with their occurrence.
METHODS & RESULTS. 63 out of potential 121 patients admitted to SVUH ICU were included in the study. The average age of the recruits was 60.7 ± 18.1 years with a mean APACHE II score of 28.3 ± 8.1. 48 patients (76.1 %) had one or more episode of hyperglycaemia during their ICU stay; 16 of those (33.3 %) were hyperglycaemic for a mean of 4 h/day throughout their ICU stay. The incidence of hypoglycaemia—defined as serum glucose level less than 4 mmol/dL was way low at 3 %.
CONCLUSIONS. On conclusion, the modified glucose control protocol was associated with high incidence and prolonged periods of hyperglycaemia in critically ill patients. Whether this finding is due to human factor i.e. failure to follow the protocol guidelines strictly or the laxity of the guidelines themselves or both needs further studying.
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1099
EARLY WARNING SCORES IN SEPSIS: UTILITY OF A SINGLE EARLY WARNING SCORE IN THE EMERGENCY DEPARTMENT?

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INTRODUCTION. Sepsis continues to be a major cause of morbidity and mortality in developed countries. An important element in improving the care of patients with sepsis is early identification and intervention [1]. Physiological deterioration often precedes clinical deterioration as patients develop critical illness. Recognition of this has led to the development of Early Warning Score (EWS) systems to identify physiological deterioration earlier [2]. Recently there has been interest about the use of EWS in the Emergency Department (ED) [3].
OBJECTIVES. In this study, we aimed to evaluate an EWS in a national cohort of patients with sepsis presenting to ED, to determine whether a single EWS in the ED was a useful predictor of outcome, either death within 30 days or ICU admission within 48 h.
METHODS. Data was collected over a 3 month period as part of a national audit in 25 ED in Scotland. All adult patients who were admitted for at least 48 h or died within 48 h were screened for sepsis criteria. These patients then had an EWS calculated basedon their initial physiological observations in the ED using the National Health Service EWS (NEWS).
RESULTS. 2,489 patients were identified as displaying signs of sepsis in the ED, complete data was available for 2003 patients. Age adjusted odds ratios were estimated for each NEWS category. Each rise in NEWS category was associated with an increased risk of mortality when compared to the lowest category (0–4). This was also the case for the combined outcome (ICU and/or mortality). Patients with a NEWS of 5–6 were not

associated with an increased risk of ICU admission when compared to those with a NEWS of 0-4, but patients with an NEWS of 7–8 or 9–20 were.
CONCLUSIONS. Our study shows that a single NEWS is able to predict patients with sepsis in ED at risk of adverse outcome. Patients with a NEWS of five or more have a significantly higher risk of death or ICU admission. For patients with an NEWS >9 this risk is five times that of patients with an NEWS of four or less. The use of this scoring system could facilitate patient pathways to ensure triage to a high acuity area of the ED and early senior clinician involvement to improve outcome.
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Scoring & prognosis in ICU patients: 1100–1113

1100

THE ASSOCIATION BETWEEN ELEVATED CREATINE PHOSPHOKINASE AND ACUTE KIDNEY INJURY IN CRITICALLY ILL PATIENTS: A COHORT STUDY

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INTRODUCTION. The level of creatine phosphokinase (CPK) that is associated with the risk of acute kidney injury is not known. To date, acute kidney injury has not been studied related to elevated CPK in the ICU.
OBJECTIVES. We aimed to study the hypothesis that an increase in CPK at critical care initiation would be associated with acute kidney injury 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 14,907 patients, age ≥18 years, who received critical care between 1997 and 2007. The exposure of interest was the highest CPK measured between 7 days prior to critical care initiation and the 3 days after critical care initiation. CPK was categorized a priori as <1,000, 1,000–5,000, 5,000–10,000 and >10,000 IU/L. The primary end point was acute kidney injury defined as RIFLE criteria class Injury or Failure. Pre-admission serum Creatinine in all patients was determined from 365 to 7 days prior to hospital admission. Peak serum Creatinine was determined between 7 days prior to the highest CPK and three days after the time of the highest CPK. Secondary outcomes included mortality at 30 days post-critical care initiation. Unadjusted associations between CPK and outcomes were estimated by logistic regression analysis. Adjusted odds ratios were estimated by multivariable logistic regression models with inclusion of covariate terms including age, gender, race (white, non-white), Deyo-Charlson index, sepsis, type (surgical vs. medical), white blood cell count, hematocrit, baseline creatinine, gentamycin, hypotension, ACEI/ARB, contrast, and NSAIDS.
RESULTS. CPK was a strong predictor of acute kidney injury with a significant risk gradient across CPK groups following multivariable adjustment: CPK 1,000–2,500 IU/L Odds Ratio (OR) 1.45 (95 % CI, 1.23–1.70; $P < 0.0001$); CPK 2,500–5,000 IU/L OR 2.24 (95 % CI, 1.74–2.89; $P < 0.0001$); CPK 5,000–10,000 IU/L OR 3.59 (95 % CI, 2.52–5.12; $P < 0.0001$); CPK >10,000 IU/L OR 7.21 (95 % CI, 4.67–11.14; $P < 0.0001$); all relative to patients with CPK <1,000 IU/L. Estimating the receiver operating characteristic curve AUC shows that CPK has moderate discriminative power for RIFLE injury/failure (AUC = 0.76; SE = 0.006; 95 % CI 0.75–0.77; $P < 0.0001$). Further, analyzing maximum CPK as a continuous variable we find that for every increase in CPK of 1,000 IU/L, the odds of RIFLE injury/failure increases by 10 % (OR 1.10; 95 %CI 1.07–1.12; $p < 0.0001$, fully adjusted). CPK was also a predictor of 30-day mortality across CPK groups following multivariable adjustment: CPK 2,500-5,000 IU/L OR 1.60 (95 % CI, 1.21–1.12; $P = 0.001$); CPK 5,000–10,000 IU/L OR 2.17 (95 % CI, 1.48–3.19; $P < 0.0001$); CPK > 10,000 IU/L OR 2.95 (95 % CI, 1.87–4.66; $P < 0.0001$); all relative to patients with CPK < 1,000 IU/L.
CONCLUSIONS. CPK is strongly associated with the risk of acute kidney injury and death in the critically ill.

1101

HOW WELL DO PHYSICIANS ESTIMATE MORTALITY AT DISCHARGE FROM ICU?

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INTRODUCTION. Despite the ubiquity and utility of the various scoring systems available to predict outcome in critical illness, their use as prognostic tools remains limited. Studies have shown clinician's prediction of outcome at admission and on a daily basis are more powerful than a single APACHE II score at admission [1, 2] and that accuracy and completeness of prognostic information is an independent determinant of family satisfaction [3].
OBJECTIVES. The aim of this study was to determine whether the physician's prediction of patient outcome at ICU discharge correlated with the 30 day mortality in all patients discharged from a seven bedded ICU (400 admissions a year) in a UK DGH.
METHODS. A retrospective study was conducted of all patients discharged in a one year period using data from the national ICU audit database (Ward Watcher). Information was collected on age, gender, admitting specialty, APACHE II, physician prediction of outcome and survival at discharge. 30 day mortality was determined from the "Clinical Portal", a national clinical information database.
RESULTS.

Survival to unit discharge	
Admitted	399
Survived to unit discharge	321/399 (80.1 %)
Died in unit	78/399 (19.9 %)

30 day mortality post discharge		
Predicated outcome post discharge	Frequency	30 day mortality
"Survivors"	239/321 (74.5 %)	4/239 (1.7 %)
"Uncertain"	61/321 (19.0 %)	11/61 (18.0 %)
"Non survivors"	14/321 (4.4 %)	14/14 (100 %)
Lost to follow up	7/321 (2.2 %)	

The prediction of "survivor" and "non-survivor" had statistical significance with 30 day mortality—PPV 98.3 %, NPV 100 % ($p < 0.0001$), excluding patients with an "uncertain" outcome. There was no statistical difference in APACHE II between the predicted "survivors" who did and did not survive 30 days ($p = 0.42$). There was no statistical difference between re-admission policy ($p = 0.49$) or APACHE II score ($p = 0.74$) in those with an "uncertain" outcome who survived 30 days and those who did not. The trend was towards 30 day survival (82.0 %). There was a significant relationship between 30 day mortality and APACHE II ($p < 0.0001$) in all patients. All deaths occurred prior to hospital discharge.
CONCLUSIONS. The physician's opinion with regards to whether a patient would be a "survivor" or a "non survivor" at discharge was a statistically significant predictor of 30 day mortality within this ICU.
The limitations of this study included its retrospective nature, the reliance on data collection and that the primary outcome was mortality and not quality of life. Further studies are needed to evaluate quality of life predictions, as this would alter clinical decision making to a greater extent than mortality predictions.
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1102

SAPS3 SCORE MULTICENTRE MORTALITY EVALUATION STUDY IN SPAIN

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TARGET. To analyze hospital mortality with SAPS3 prognosis system by a multicentre study in four Spanish ICUs.
INSTRUMENTS AND METHODS. A study including all the consecutively patients admitted to the ICUs in several Spanish hospitals, i.e.: Carlos Haya Hospital (over October–November 2011), Motril Hospital (from June 2006 to October 2007), Cabra (March 2012) and Virgen de las Nieves in Granada (for a few months in 2009) was carried out. Necessary data for the realization of this SAPS3 score have been collected, and the ICU and hospital mortality of the period have been studied. Data are expressed by mean ± standard deviation for quantitative variables and proportions for qualitative data. Hosmer–Lemeshow test was used to evaluate calibration and area under ROC curve was used to assess discrimination.
RESULTS. The study included 1,611 patients, age was 62.29 ± 15.87 years old. The ICU mortality was 12 % and hospital mortality 16.26 %. SAPS3 score was 45 ± 13.76. Following this equation, the mortality probability of our geographical area was 16.48 % and by the general equation, was 15.88 %. Hospital mortality was 16.26 %, as mentioned above. Calibration (predicted vs observed mortality) was analyzed with Hosmer–Lemeshow test. To this end, patients were divided into five groups: the first one comprised the patients with a mortality probability under 0.2, another group, between 0.2 and 0.4, and the rest were 0.4–0.6, 0.8–1. Hosmer–Lemeshow test value for the Spanish equation was $H = 16.14$, ($p < 0.05$) and for the general equation $H = 9.99$, ($p < 0.05$). Hospital mortality discrimination was evaluated with the area under the ROC curve and was 0.85 (0.82-0.88).
CONCLUSIONS. Our study shows that in several Spanish ICUs, SAPS3 score presents a good discrimination and, with regards to the calibration, we observe a very similar mortality to predicted by SAPS3 prognosis system, both for the equation in our geographical area and for the general one; in spite of the fact that differences in both cases are statistically significant.

1103

COMPARISON OF RANSON AND BISAP PROGNOSTIC INDICES FOR PREDICTING ORGAN FAILURE, COMPLICATIONS AND MORTALITY IN SEVERE ACUTE PANCREATITIS

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INTRODUCTION. The incidence of acute pancreatitis has increased in recent years, standing still with significant morbidity and mortality. In Portugal, it is estimated that 5,655 new cases/year occur. An early detection of patients with Severe Acute Pancreatitis (SAP) at high risk of mortality is essential for treatment and prognosis. Over the years have been developed many prognostic indicators or clinical markers/serum or multifactorial scores, however, neither proved to be an ideal prognostic indicator. A new prognostic index, Bedside Index for Severity in Acute Pancreatitis (BISAP) was proposed as an accurate score in identifying patients at high risk of mortality.
OBJECTIVES. The aim of this study is to compare the BISAP and Ranson scores in the prediction of organ failure, pancreatic infection and mortality in the PAG.
METHODS. Patients admitted with SAP in a Gastroenterology Intensive Care Unit were evaluated retrospectively in the period between 2004 and 2010. The BISAP (serum urea nitrogen >25 mg/dl, impared mental status, systemic inflammatory response syndrome, age

>60 years and pleural effusions) was calculated in the first 24 h of admission and Ranson in the first 48 h. The comparison of these indices in predicting morbidity and mortality in the SAP was carried out by AUC (area under the receiver-operating characteristic curves).
RESULTS. There were 143 patients with SAP (mean age 63 years, 84 men) of whom 31 died. The average length of stay was 14.7 days. The most frequent etiology was the lithiasic (54.5 %). It was documented organ failure in 125 patients (87.4 %), and 51.2 % had multi-organ failure. It was found that more than half of the patients (61.7 %) had local complications during the course of the disease, being the most common complication necrosis (75 cases). Pancreatic infection occurred in 15.4 % of the population (most frequent agents: Escherichia coli and Enterococcus faecium). AUC's for BISAP and Ranson in the prediction of organ failure was 0.74 [confidence interval (CI) 0.61 to 0.87 and 0.62 (CI 0.5 to 0.75)], the pancreatic infection was 0.67 (CI 0.54–0.78) and 0.68 (CI 0.55–0.83) and mortality was 0.74 (CI 0.64–0.83) and 0.63 (CI from 0.52–0.74), respectively.
CONCLUSIONS. The BISAP is a simple, fast to calculate, has low cost, easily reproducible and has high predictive efficacy. In fact, the main advantage of this score is its simplicity, its criteria are easy to obtain and are usually requested during the first 24 h of hospital admission. When compared with the Ranson Index, it showed superior efficacy in predicting organ failure and mortality in patients with SAP.
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1104
AUGMENTED CREATININE RENAL CLEARANCE IN CRITICALLY ILL PATIENTS: IS THERE A PLACE FOR A NEW PROGNOSTIC MARKER?

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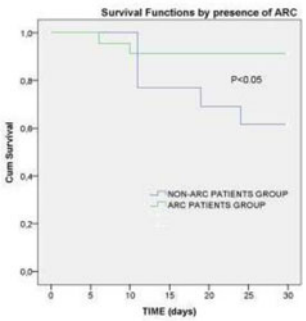
INTRODUCTION. Augmented creatinine renal clearance (ARC) is frequent in critically ill patients, however the prevalence and impact of it on clinical outcomes are not yet established.
OBJECTIVES. To assess the prognostic value of the presence of ARC in critically ill patients.
METHODS. Prospective, observational, monocentric study in an Intensive Care Unit at a University Hospital of a cohort of 36 consecutive patients admitted to the ICU. Daily evaluation of 8 h-creatinine renal clearance ($CrCL_8$) collected from ICU admission to discharge or until renal dysfunction becomes evident, corresponding to 418 $CrCL_8$ evaluations. ARC was defined as the median $CrCL_8$, during the period of admission, above 120 or 105 mL/m, 1.73 m^2, respectively for man and women. Patients with abnormal creatinine serum levels or brain lesion were excluded. Chi-square test, risk estimate, Kaplan–Meier survival functions were performed for 30-day mortality.
RESULTS. The average age of the patients was 55.2 ± 16 years old and the male gender was predominant (72.2 %). The median APACHE II score was 14.9 ± 6 and the SOFA was 5 (3–7). The median of $CrCL_8$ was 144.5 (123.6–164.9) ml/m/1.73 m^2. The group with ARC (23 patients) was characterized by a significantly lower 30-day mortality rate: 8.7 % (2/23) versus 38.5 % (5/13) in the patients without ARC ($p < 0.05$). The Odds Ratio was 6.56 (1.05–40.9; $p < 0.05$) and the relative risk was 0.40 (0.12–1.3) for the ARC group. The survival plot from time of ICU admission for each group is illustrated in Fig. 1 ($p < 0.05$).
CONCLUSIONS. This pilot study showed that the presence of ARC seems to have a prognostic value regarding the 30-day mortality in a sub-group of critically ill patients without brain disease or trauma.



Kaplan–meier survival plot

1105
PROSPECTIVE ANALYSIS OF CRITICAL CARE REFERRAL PATTERNS PRIOR TO THE INTRODUCTION OF A NATIONAL EARLY WARNING SCORE (EWS)

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INTRODUCTION. Early warning scores (EWS) aim to trigger a skilled, experienced response for at risk patients [1]. The efficacy of the response system is controversial [2].
OBJECTIVES. To analyse all referrals to and subsequent actions by the critical care team (CCT) prior to the introduction of an EWS system in our hospital.
METHODS. All referrals to the CCT in a 500-bed hospital over a one-month period were prospectively analysed. Data collected included: grade of referring doctor, EWS, duration of review, interventions performed on review and patient outcome.
RESULTS. 76 referrals were logged during the study period. 46/76 (61 %) referrals were made for in-patients, representing 35 calls per 1,000 hospital admissions for the same period. 30/76 (39 %) referrals came from the Emergency Department. A total of 55.1 h were spent outside of the CC area responding to these calls. 19/46 (41 %) referrals from the ward were made at registrar level and above. In contrast, 21/30 (70 %) of referrals from the ED were made at registrar level and above. Consultant referral increased the probability of admission to CC (26/39). CC admission rates from the ward (23/46 (50 %) and ED (16/30 (53 %)) were similar. Of the EWS data available for ward patients, 27/42 (64 %) scored <7 (the threshold for activating an emergency response). 9/27 (33 %) of these patients were admitted to CC. A total of 9.75 h were spent outside of CC providing care for ward patients who responded to simple interventions on the ward and did not require admission to CC. 17/23 (74 %) of admissions from the ward survived to CC discharge compared to 8/16 (50 %) from the ED. However, in-hospital mortality was similar: 48 and 50 %, respectively.
CONCLUSIONS. This study identifies a higher than expected CCT referral pattern (35/1000 vs. 25/1000 hospital admissions [2]), bypass of senior medical team input and delayed institution of relatively low intensity measures (e.g. supplemental oxygen, volume challenge) pending CCT review. Further, the EWS threshold for referral is not always a sensitive enough indicator of a critical care need.
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1106
DEVELOPMENT OF A POINT OF CARE MODEL TO PREDICT INTENSIVE CARE UNIT (ICU) ADMISSION

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INTRODUCTION. Tissue Oxygen Saturation (StO_2) is a non-invasive bedside measure of tissue oxygen exchange at the microcirculatory level. Recent evidence demonstrates that StO2 has good predictive test characteristics in various settings such as trauma and sepsis. Thus, we investigated the value of StO2 as an adjunct to Rapid Response Team (RRT) assessment. RRTs assess sick inpatients to determine the need for ICU admission. This determination is subjective and based on clinical gestalt after considering key parameters such as systolic blood pressure (SBP), heart rate (HR) and pulse oxygen saturation (SpO_2).
OBJECTIVES. To determine if vital signs (SBP, HR, SpO_2) could predict ICU admission objectively and determine if StO_2 adds any predictive power.
METHODS. All inpatients referred for RRT assessment at a tertiary Canadian hospital were consecutively sampled for 3 months. The RRT physician was blinded to StO_2 values. Following clinical assessment, the RRT physician would make the ultimate decision to admit patients to the ICU. Multivariable logistic regression and Receiver Operator Characteristic (ROC) analysis were performed using prospectively collected data.
RESULTS. One hundred seventy-five patients, equally distributed between medical and surgical services, were assessed by the RRT. Mean age was 68.6 ± 15.5 years and 51.4 % (n = 90) were males. There were 54 (30.8 %) ICU admissions. A model including HR, SBP, SpO_2 and adjusting for age and resuscitation status significantly predicted ICU admission ($p = 0.008$). ROC analysis showed good discrimination (AUC = 0.71, $p < 0.001$). Addition of StO_2 into the model did not increase predictive power.
CONCLUSIONS. An objective model containing few variables that are readily available during bedside assessment significantly predicts ICU admission. Although StO2 does not appear to add further predictive power to the model, failure to detect an effect may have been due to several reasons including inconsistent data capture. More importantly, this small pilot study was not powered to detect an effect of StO_2. A larger prospective cohort study is needed to determine if an objective model containing non-invasive measures including StO_2 can accurately predict ICU admission as well as need for ICU interventions. Such a model could potentially enhance RRT triage and potentially increase efficiency of the ICU admission process.
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1107
THE COMPARISON OF GCS, PSS, SAPS III SCORING SYSTEMS OF ORGANOPHOSPHATE POISONED PATIENTS, TREATED IN AN INTERNAL CARE UNIT

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INTRODUCTION. Organophosphate poisoning (OPP) occurs as aresult of accidental exposure, suicidal attempt in developing countries and needs to be treated in internal care unit (ICU).
OBJECTIVES. The aim of this study to compare the efficacy of Glasgow Coma Scale (GCS), Poisoning Severity Score (PSS), Simplified Acute Physiology Score III (SAPS III) scoring systems in predicting morbidity and mortality in an ICU.
METHODS. After the approvement of Mersin University Medical Faculty Research Committee, 91 patients' datas, who were treated in Mersin University Medical Faculty Hospital, Anesthesiology and Reanimation ICU Service between January 1999 and December 2010 were analysed retrospectively. GCS, PSS, SAPS III scores were calculated according to the worst physiologic values in first hour of admission to the ICU. Patients were divided into two group as survivors and nonsurvivors. Predicted mortality and Standardized Mortality Rates for each scoring systems were calculated separately. The ability of differentiating survivors and nonsurvivors for GCS, PSS, SAPS III scoring systems were determined by Receiver Operating Curve (ROC) analyse. Sensitivities and specifities were determined and compared by area under ROC.
RESULTS. The actual mortality in OPP was 11.0 %. Predicted mortality by PSS was significantly different from actual mortality [SMR and 95 % CI for GCS: 0.795 (0.40–1.42), PSS: 0.29 (0.14–0.53), SAPS III: 0.58 (0.29–1.05)]. The area under the ROC curve for PSS is largest, but there is no statistically significant difference when compared with SAPS III and GCS (PSS 0.762 ± 0.918, GCS 0.613 ± 0.806 and SAPS III 0.74 ± 0.905).
CONCLUSIONS. We found that in these prognostic tests GCS is the most sensitive one, and it has the most close estimation. The advantage of the GCS is that it does not need any laboratory findings, it can be measured every time of the day whenever we see the patient. It is found that PSS is the best discriminative one which differs survivors from nonsurvivors. PSS is the most specific test in predicting mortality. The advantage of PSS is that it can be calculated easily in admission period. We showed that cholinesterase levels don't have a role in distinguishing survivors from nonsurvivors. In calculating SAPS III: patient's historical morbidities, current complex laboratory findings are needed. It is not useful, has higher costs, and cannot be measured in every hospital. SAPS III is an inessential test for predicting.
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1108
AGGRAVATING FACTORS FOR ACUTE KIDNEY INJURY IN THE INTENSIVE CARE UNIT

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INTRODUCTION. AKI is a common problem in critically ill patients, with a reported incidence between 3 and 25 % [1]. The AKIN system is a method[2] that allegately provides earlier diagnosis, higher sensibility for Stage 1 patients and a more continuos and dynamic evaluation over previous systems [3, 4]. We conducted a prospective study to identify factors associated with worsening of renal function in patients with AKIN 1.

OBJECTIVES. To recognize the aggravating factors of AKI in patients at AKIN Stage 1. Secondary outcomes were to determine the incidence of AKI in our unit and to define risk factors linked with receiving RRT during the hospital stay.

METHODS. Patient admitted from December 1, 2010 to June 30, 2011 with diagnosis of AKIN stage 1 were included. We continued the follow up for at least 48 h. Patients were classified as those who worsened in renal function (either advanced to stage 2, 3 or RRT) and as those who did not. Both groups were compared using Multivariate logistic regression analysis.

RESULTS. 163 patients were admitted to the ICU, of which 48 met the criteria for AKIN 1 (29.44 %). 23 deteriorated in renal function (14.1 %) and 6 were treated with IHD (3.6 %). Patients who worsened had higher admission SOFA score in Neurologic (OR 2.53, $p = 0.03$) and Hepatic (OR 3.97, $p = 0.04$) systems. We perceived a tendency for higher serum Osmolality in patients who deteriorated, although not Statistically Significant (299 vs. 285.5 mOsm/l; $p = 0.052$). Older age was recognized as protective factor for RRT (OR. 0.88, $p = 0.04$).

CONCLUSIONS. After adjusting for age, SAPS-3 score and admission category (surgical or medical), higher admission SOFA score in Neurologic and Hepatic systems were associated with a decline in renal function. The incidence of AKI in our ICU was 29.44 %, similar to other previously reported [3,4,5]. Older age emerged as a protective factor against RRT as it has been seen interiorly [6, 7]

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1109
THE BUNCRE INDEX AS A PREDICTOR TOOL FOR PROLONGED INTENSIVE CARE UNIT'S LENGTH OF STAY IN POSTOPERATIVE CARDIAC SURGERY PATIENTS

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INTRODUCTION. Acute kidney injury is known as a cause of prolonged length of stay (LOS) in Intensive Care Unit (ICU). The ability to early predict prolonged ICU LOS is critical to the department's adequate management. In this context, finding low cost methods that could early predict patients at risk for prolonged LOS after cardiac surgery would be of great value.

OBJECTIVES. To create an index based on serum creatinine and blood urea nitrogen (BUN) that relates with prolonged ICU LOS, in patients at immediate cardiac surgery postoperative period.

MATERIALS AND METHODS. Using December 2009 to March 2011 serum creatinine and BUN database, we conducted a retrospective study that included all patients undergoing valve replacement surgery and coronary artery bypass grafting surgery or both. Patients who died during hospitalization in ICU or those who last more than 180 min after ICU arrival to collect blood for serum creatinine or serum BUN measurement were excluded from the analysis (Fig. 1). The serum creatinine was measured using CREA Flex® reagent cartridge, Cat. No. DF33A and serum BUN was measured using BUN Flex® reagent cartridge, Cat. No. DF21. After obtaining the initial values of those two markers of renal failure, we multiplied one by another, resulting in an index that we called BUNCre Index (BCI).

The index was categorized as normal (<14) and abnormal (≥14). All analysis were performed using BioEstat *v.5* software. We considered ≥4 days as prolonged ICU LOS.

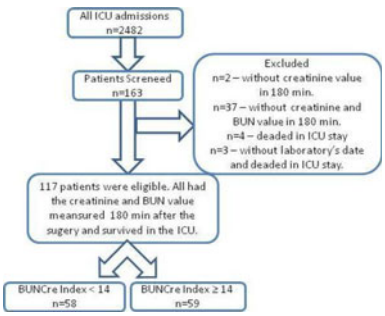

Fig. 1 Patient selection flow chart

RESULTS. A total of 163 patients were enrolled; 46 were excluded according criteria described above. 117 patients were included in statistical analysis; 58 (49.5 %) had normal index value and 59 (50.4 %) had abnormal values. The LOS varied from 2 to 37 days. The median and mean values were 4 (3–5) and 5.0 ± 4.2 days in the normal index group and 4 (3–7) and 5.9 ± 5.8 days in the abnormal one, respectively. Baseline clinical features for both groups were similar, except for high blood pressure (p 0.02) and valve replacement plus coronary artery bypass graft surgery (p 0.002) (Table 1).

Table 1 Baseline clinical features*

Variables	BUNCre index		p value	Variables	BUNCre index		p value
	<14 (n = 58)	≥14 (n = 59)			<14 (n = 58)	≥14 (n = 59)	
Age, years	57 ± 13.7	59.8 ± 12.1	p 0.29	Smoker (%)	25.8	16.9	p 0.34
Male gender (%)	67.2	71.1	p 0.79	NYHA IV heart failure	0	1.6	p 1
Renal failure in renal replacement therapy (%)	0	6.7	p 0.11	Valve Replacement (%)	32.7	33.8	p 0.94
Chronic obstrutive pulmonary disease (%)	6.8	1.6	p 0.35	Coronary artery bypass graft surgery (%)	55.1	62.7	p 0.52
Arteriopathy (%)	3.4	3.3	p 0.62	Valve replacement + coronary artery bypass graft surgery (%)	8.6	3.3	p 0.002
High blood pressure (%)	68.9	42.3	p 0.02	Mechanical ventilation, hours	8.5 (6.1–14,8)	9.5 (7.5–20.9)	p 0.09
Diabetes (%)	34.4	44	p 0.38	Hospital stays, days	9 (7–13)	10 (8–15.7)	p 0.09
*Data are expressed as mean ± SD, median (25 to 75 % IQR) or %				Hospital + ICU mortality (%)	3.4	1.6	p 0.98

In the multivariable logistic regression model, NYHA IV heart failure ($p < 0.0001$) and smoker ($p < 0.04$) seems to be statistically significant independent predictor factor for prolonged ICU. The rate of prolonged ICU LOS was higher in patients in the abnormal index group than in the normal one (OR 2.30 95 % IC 1.07–4.94 $p = 0.04$). BCI's specificity and sensibility were 48.2 % and 71.1 %, respectively. When compared to serum creatinine alone, the BCI showed higher area under curve (AUC) (Fig. 2).

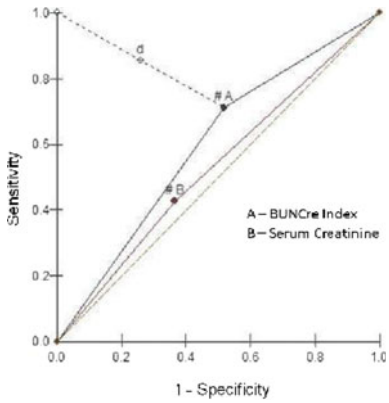

Fig. 2 ROC curve

CONCLUSIONS. BCI seems to be a good and low cost predictor tool for prolonged ICU LOS on immediate post operative cardiac surgery patients. When compared to serum creatinine alone, BCI showed to be even more sensible and specific. Moreover, these markers are already routinely used in the clinical practice, which make this an easy and low cost method. However, more studies with great number of patients are needed.

1110
RISK STRATIFICATION OF PATIENTS ATTENDING TO THE EMERGENCY HOSPITAL DEPARTMENT BY AN EPISODE OF SYNCOPE. INITIAL EXPERIENCE OF A SYNCOPE UNIT

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INTRODUCTION AND AIMS. Syncope is a frequent reason for hospital emergency care, associated with a fatal prognosis according to their origin. Our objective was to analyze the clinical profile of patients evaluated by a Syncope Unit (US) since its inauguration.

Materials and methods. Prospective analysis of all patients consecutively referred to the US, from June 2009 to October 2011. We studied clinical and epidemiological variables, established diagnosis and indicated treatment.

RESULTS. We included 303 patients, 47.5 % women, mean age 56.7 ± 20.6 years (14–91 years). 46.3 % had hypertension, 17.2 % diabetes mellitus, 9.7 % a history of ischemic heart disease, 4 % prior coronary revascularization procedure and a low comorbidity associated (Comorbidity Charlson Index 0.81 ± 1.63). There was prodrome in 69 % of cases, with recurrent syncope in 33.7 %. The baseline ECG was normal in 70.2 %. Among ECG abnormalities, the prevailing existence of AV block (31.3 %), followed by bundle branch block (25 %) and signs of left ventricular enlargement (20.8 %). Holter EKG was performed in 56.8 % of the cases, being normal in 90.7 %. 97.7 % of the patients had no structural heart disease by echocardiography. Cardiac treadmill test was performed in 13 patients (normal result) and tilt test in 50, with positive results in 59.6 % (type I response in two-thirds). Implantable loop recorders were required in 3 patients, one of them established the diagnosed. It was established the diagnosis of neurally-mediated reflex syncope in 67.8 % of cases, 8.2 % neurological or psychogenic syncope, 6.6 % orthostatic, 7.7 % cardiogenic syncope and 9.8 % is still unknown. 10 patients received a pacemaker. Cardiogenic syncope was associated with an increased prevalence of age ≥40 years (100 vs. 0 %, $p = 0.01$), male gender (71.4 vs. 28.6 %, $p = 0.05$) and baseline abnormal ECG (85.7 vs. 14.3 %, $p = 0.0001$). After adjustment, male sex and the presence of an abnormal ECG predicted an increased risk of cardiac origin of syncope (OR 4.22, 95 % CI, 0.86 to 10.74 and OR 3.12, 95 %, 2, 78 to 6.69, respectively).

CONCLUSIONS. Patients evaluated by a Syncope Unit have a heterogeneous clinical profile. The neurally-mediated reflex syncope is the most frequent diagnosis. Cardiogenic syncope is associated with male gender, age over 40 years and baseline ECG pathology.

1111

INTRODUCING THE NEW CARDIAC POST-OPERATIVE MORBIDITY SCORE (C-POMS) INTO CLINICAL PRACTICE: A PILOT STUDY COMPARING POST-OPERATIVE TOTAL MORBIDITY BURDEN IN PATIENTS UNDERGOING SURGICAL AORTIC VALVE REPLACEMENT (AVR) AND TRANS-CATHETER AORTIC VALVE IMPLANTS (TAVI)

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INTRODUCTION. Postoperative morbidity is a potentially useful indicator of outcome, changes of quality in care and variation in performance [1]. C-POMS [1] is a new validated, 13 domain tool for describing and quantifying morbidity in cardiac surgical patients on postoperative days 3 (D3), 5 (D5), 8 (D8), and 15 (D15). C-POMS can be used as a summary score (0–13), denoting total morbidity burden on each day.
OBJECTIVES. We sought to assess the feasibility of using the C-POMS tool in patients undergoing open aortic valve replacement (AVR) surgery or transcatheter aortic valve implantation (TAVI).
METHODS. 32 patients undergoing AVR and 19 patients undergoing TAVI were prospectively assessed. Feasibility was assessed in terms of time taken per assessment, number of patients assessed per day and usefulness of information obtained.
RESULTS. Table 1 shows the percentage of patients with each morbidity type on D3, D5, D8 and D15. Bold figures indicate the three commonest morbidity types for that day. Over a 76 day period, the mean time taken to collect data per patient was 4.6 min for a mean of 1.6 (range 0–6) patients per day. The mean additive EuroSCORE [2] was 5.25 for the AVR group and 8.9 for the TAVI group. Pulmonary, renal and assisted ambulation were the most commonly occurring morbidities in both groups. Additionally, renal morbidities occur frequently in TAVI patients who stay >5 days.

	D3		D5		D8		D15	
Morbidity type	AVR (n=32)	TAVI (n=18)	AVR (n=30)	TAVI (n=10)	AVR (n=12)	TAVI (n=7)	AVR (n=8)	TAVI (n=1)
Pulmonary	**93.8**	**61.1**	**56.7**	**80**	**66.7**	**71.4**	**75**	100
Infectious	31.3	27.8	43.3	30	50.0	**71.4**	50	0
Renal	**90.6**	**66.7**	36.7	**80**	41.7	**71.4**	37.5	100
Gastrointestinal	9.4	22.2	23.3	40	16.7	42.9	37.5	100
Cardiovascular	53.1	50.0	**46.7**	40	**66.7**	42.9	25	0
Neurological	9.4	16.7	13.3	30	16.7	42.9	25	100
Haematological	40.6	33.3	40.0	20	50.0	14.3	37.5	0
Wound	37.5	5.6	20.0	0	16.7	0.0	0	0
Pain	18.8	16.7	20.0	0	16.7	0.0	12.5	0
Endocrine	12.5	11.1	6.7	10	16.7	28.6	0	100
Electrolyte	21.9	16.7	30.0	10	25.0	14.3	37.5	100
Review	15.6	22.2	36.7	30	33.3	28.6	**62.5**	100
Ambulation	**84.4**	**61.1**	**56.7**	**80**	**66.7**	57.1	**75**	100
Mean C-POMS score	*5.2*	*4.1*	*4.3*	*5*	*4.8*	*4.9*	*4.8*	*8*

Table 1

CONCLUSIONS. C-POMS is an easy-to-use and feasible tool that is useful to describe and quantify morbidity. Potential benefits include identifying preventative therapeutic targets to prevent these morbidities. Data collection is ongoing to generate a larger sample size.
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1112

PREDICTING OUTCOME OF PATIENTS WITH SEVERE ACUTE PANCREATITIS

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OBJECTIVES. To compare the efficacy of various scoring systems, tomographic parameters and a biochemical marker (C-reactive protein), in predicting outcome of patients with severe acute pancreatitis (SAP) admitted to intensive care unit (ICU).
METHODS. Longitudinal single centre descriptive study. We included all patients admitted to ICU from april 2006 to april 2010 diagnosed of acute pancreatitis, and any of the following: Ranson's score ≥3 or APACHEII score ≥8 within the first 48 h, any organ failure, local complications (necrosis, abscess…).
Disease severity scores and mortality predictors, including, APACHEII, APACHE O and POP score, were calculated using the collected data in the first 24 h of ICU admission, Ranson's score and C-reactive protein level were calculate over 48 h of admission; CT severity index (rapid-bolus CT) was performed 48–72 h after ICU admission.
Statistical study was made with SPSS version 15.0. $\aleph^2$ and fisher exact test were used to compare categorical variables. Statistical significance was considered when p value less than 0.05. Sensitivity, specificity and receiver operator characteristic curves (ROC) were estimated with STATA version 9.0.
RESULTS. Thirty-seven patients diagnosed of SAP were admitted at the intensive care unit. 70.27 % patients were men. Mean age 63.24 years (SD 13.15). Mean APACHE II 16.02 (SD 7.04); mean APACHEO 16.26 (SD 6.96); median POP (non parametric distribution) 15 mean 17.35; median Ranson's score 4 and mean 3.91; median CT severity index was 7, mean 6.92; mean C-reactive protein 33.2 mg/dl (SD11.66). ICU- mortality and 1 year-mortality were 32.43 % CI and 43.24 %, respectively. After application of association test (Pearson chi2) only Ranson's score ≥3 was an independent predictor for 1 year-mortality ($p = 0.036$). Using ROC curves and comparison of area under curves (AUROC) we founded scoring systems, C-reactive protein and CT severity index were not good mortality predictors (Table 1). APACHE II >8, APACHE O >6, POP >14 and Ranson score ≥3, had high sensitivity (>95 %) and negative predictive value evaluating (>85 %) ICU and 1 year mortality. 48 h C-reactive protein level and CT index were low sensitivity (>60 %) and specificity (<30 %) mortality predictors (at ICU and 1 year mortality).
CONCLUSIONS. SAP is a high mortality disease, in our series ICU prognostic scores (APACHEII and APACHE O) or SAP specific scores (POP) are not good mortality predictors but can be used to identify less risk patients within 24 h of presentation. Ranson's score ≥3 was an independent predictor of 1 year mortality.
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1113

SAPS3 SCORE MULTICENTRE MORTALITY EVALUATION STUDY IN CORONARY PATIENTS IN SPAIN

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INTRODUCTION. To analyze hospital mortality with SAPS3 prognosis system by a multicentre study in patients suffered ischemic cardiopathy in Spanish ICUs.
METHODS. A study including all the consecutively patients admitted to the ICUs in several Spanish hospitals, i.e.: Carlos Haya Hospital (over October–November 2011), Motril Hospital (from June 2006 to October 2007), Cabra (March 2012) and Virgen de las Nieves in Granada (for a few months in 2009) was carried out. Necessary data for the realization of this SAPS3 score have been collected, and the ICU and hospital mortality of the period have been studied. Data are expressed by mean ± standard deviation for quantitative variables and proportions for qualitative data. Hosmer–Lemeshow test was used to evaluate calibration and area under ROC curve was used to assess discrimination.
RESULTS. The study included 401 patients, age was 66.13 ± 13.70 years old. The ICU mortality was 5 % and hospital mortality 8.73 %. SAPS3 punctuation was 44.17 ± 9.48. Following this equation, the mortality probability of our geographical area was 12.92 % and by the general equation, was 13.69 %. Hospital mortality was 8.73 %, as mentioned above. Calibration (predicted vs observed mortality) was analyzed with Hosmer–Lemeshow test. To this end, patients were divided into five groups: the first one comprised the patients with a mortality probability under 0.2, another group, between 0.2 and 0.4, and the rest were 0.4–0.6, 0.8–1. Hosmer–Lemeshow test value for the Spanish equation was $H = 16.01$, ($p < 0.05$) and for the general equation $H = 17.52$, ($p < 0.05$).Hospital mortality discrimination was evaluated with the area under the ROC curve and was 0.85 (0.78–0.93).
CONCLUSIONS. Our study shows in coronary patients admitted in several Spanish ICUs, that SAPS3 prognosis system presents a good discrimination in that kind of patients but the mortality was lower than predicted by SAPS 3 system. Although we think that it would be necessary to study a high number of patients and hospitals, our study reflects a bad system calibration in coronary patients.

Training ICU teams: 1114–1127

1114

PRE-ICU UNDERSTANDING OF RENAL PHYSIOLOGY AND MANAGEMENT OF ACUTE RENAL FAILURE ARE SUBOPTIMAL

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INTRODUCTION. Intensive Care Unit nurses and doctors are increasingly involved in managing pre-ICU patients who decompensate. *ICU sans frontier* is an established concept globally. While practices such as Rapid Response Team (RRT) and Medical Emergency Team (MET) are effective solutions in hospital organisation, they may contribute to deskilling of pre-ICU clinicians. Proficient pre-ICU management of renal insufficiency is crucial in preventing acute renal failure.
STUDY OBJECTIVES. We invited 150 doctors attending a clinical course in Acute Care Medicine (ACM Course—focussed on pre-ICU care of the acutely ill) (www.easternhealth.org.au/media/events/acm/aspx) to complete a single page 28-question survey.
METHODS. The survey questions explored basics of renal physiology, principles of monitoring renal function, fundamentals of acute renal failure, common investigations in elucidating the cause of acute renal failure, fluid therapy in managing acute renal failure, some aspects of monitoring response to therapy and contrast induced nephropathy.
RESULTS. 99 doctors involved in active pre-ICU medicine in various hospitals in Australia out of 150 registrants to the ACM Course completed the survey on a voluntary basis. All were at least 3 years after basic medical qualification and 33 % had completed the specialist examinations in either internal medicine, emergency medicine or anaesthesia.

Acute renal fsurvey

Number	Question ideation	Correct answer %	Wrong answer %
1	Importance of baseline creatinine in azotemic patient	72	28
2	MAP should always be 90 mmHg in ARF	70	30
3	Some patients require MAP of only 60 mmHg in ARF	47	53
4	CVP = 12 implies adequate volume status	33	67
5	Frusemide infusion is better than bolus in ARF	40	60
6	Prednisone is useful in minimising contrast nephropathy	70	30
7	N-Acetylcysteine is key to prevent contrast nephropathy	47	53
8	Volume repletion is the key to prevent contrast nephropathy	87	13

CONCLUSION. Pre-ICU clinician understanding of renal physiology is sub-optimal. Basics of fluid/electrolyte physiology and clinical features of acute renal failure are not properly understood. The principles of supportive and specific therapy of acute renal failure are also not commensurate with the professional level expected from the survey participants. Overall, pre-ICU clinicians have a generally poor concept of fundamentals of physiology and practice of acute renal failure. Critical care medicine professionals should focus on medical education in acute care medicine to optimise pre-ICU care of the acutely ill.

1115
SURVEY OF NURSES. RECOGNITION OF CAPNOGRAPH TRACES

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INTRODUCTION. Maintenance of a patent airway is a primary responsibility of anesthesiologists. Interruption of gas exchange, for even a few minutes can result in catastrophic outcomes such as brain damage or death. Closed claims analysis has found that the vast majority (85 %) of airway related events involve brain damage or death, and as many as one third of death attributable solely to anesthesia have been related to inability to maintain a patent airway. intensivists rely on nurses in maintenance of a patent airway. NAP4 emphasizes on training of all clinical staff working in ICU in interpretation of life threatening capnography. NAP4 recommends in teaching all critical care staff in correctly identifying airway obstruction, displacement of endotracheal tubes and tracheotomies and recognition of abnormal traces during CPR.

OBJECTIVES. To survey the critical care nurses in our ICU for their ability to recognize the different life threatening capnography traces to help the educators in fulfilling an important gap in knowledge. To assess the improvement in knowledge and the ability to recognize the important life threatening capnography traces following didactic teaching.

METHODS. ICU nurses of all grades were given printed Capnograph traces (Bronchospasm, Disconnection, CPR, Esophageal intubation, Cardiac arrest) and were asked to write down what the traces meant. The numbers of traces correctly identified were noted. This formed the basis for assessing the knowledge base and percentage was calculated, as there was no gold standard available.

In Part II of the survey following PowerPoint presentations and interactive teaching of capnography we showed them common scenarios of capnography changes. Following the teaching we gave them the printed sheets of capnography traces, this time the order of traces were changed to prevent them from memorizing, and were asked to name the traces. The number of traces correctly identified was noted.

RESULTS. 24 nurses took part in the survey. Total numbers of traces (number of nurses X 6) were 144. 9 (6.25 %) traces were correctly identified (9/144). Following teaching, 31 Nurses in ICU were shown the Capnograph traces (Obstruction, bronchospasm, disconnection, dislodgement of tracheostomy and ET, Cardiac arrest, CPR and Esophageal intubation). Total number of traces shown 279. Number of traces correctly identified was 279.All 31 Nurses identified all 9 capnography traces correctly. There was an improvement of 93.75 %

CONCLUSIONS. Capnography provides important diagnostic information in many respiratory conditions, airway patency and ventilation. Our survey showed recognition of life threatening capnography traces is easy to teach and learn. It has high impact on the day today management of critically ill ventilator dependent patients on our ICUs.

REFERENCE. NAP4 Major complications of airway Management in the United Kingdom.

1116
RECENTLY GRADUATED DOCTORS' SELF-REPORTED PREPAREDNESS IN THE MANAGEMENT OF ACUTELY ILL PATIENTS. A 5 YEAR REVIEW OF LONDON DEANERY'S FOUNDATION PROGRAMME SIMULATION TRAINING: A CLINICAL CHALLENGE FOR MEDICAL EDUCATION?

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INTRODUCTION. In the UK, the first 2 years of postgraduate (PG) medical training is organised into a structured Foundation Years Programme (FY), during which doctors care for patients and develop essential clinical skills. Diagnosis and management of the acutely ill patient is a key skill in the curricula [1]. In 2005 the London Deanery established a simulation programme for all FY doctors in London, to provide learning opportunities in the management of acutely ill patients.

OBJECTIVES. To gain insights into FY doctors perceived ability to manage acutely ill patients.

METHODS. Using pre & post Acute Care Simulation course questionnaire responses (2005–2010), a content analysis was performed on annonymised free-text responses (FTRs) using a word-based technique. 15–36 categories were determined per question, the frequency of each was recorded as a percentage. Nine questions specifically asked for FTRs about acute care.

RESULTS. Data from 4,542 FY doctors was collated, 59.7 % were female. Only 49.5 % of FY1s and 66.8 % of FY2s felt "prepared" for clinical practice. To the question "what specific skills or information would you have liked to have had before starting your FY1/2 year?" the commonest answers were 'management of acute illness' (21.9 %), 'algorithms/guidelines' (21.1 %) and 'practical procedures' (14 %); worryingly 72.5 % of FY1s and 82.5 % of FY2s responded 'yes' to "have you been involved in an emergency that you found difficult to manage?" 'what skills would have helped/did help manage the emergency situation' the most common responses were 'experience/exposure' (16.6 %) and 'ALS/ATLS' courses (12 %). "Name 3 things you have learnt from today's course." 'Communication' (12.3 %) followed by 'management of acute illness' (11.4) and 'calling for help' (9.5 %). These were specific learning objectives for the course. 'Is there anything that has not been taught as effectively elsewhere?' 'Management of acute illness' was the most common (21.2 %), then 'practice' (7.5 %) and 'communication' (7.3 %).97.3 % agreed that the Acute Care course 'matched their learning needs', 98 % agreed that they were 'satisfied with the educational programme' and 98.5 % found it 'relevant' (Likert scale responses).

CONCLUSIONS. This review reveals a significant perceived lack of preparedness by newly graduated doctors in their ability to manage acutely ill patients. It offers useful insights into the nature of these deficiencies. The London Deanery's programme was specifically commissioned to target these deficiencies. This training has been positively received and is effective in raising awareness of acute care skills. Our results suggest undergraduate and postgraduate medical education should focus on developing effective training for acute care skills to address the perceived gap between education and clinical practice [1].

REFERENCE. 1. "An Acute Problem?" National Confidential Enquiries into Patient Outcome and Death 2005.

1117
THE BENEFITS OF A SIMPLIFIED METHOD FOR CPR TRAINING OF MEDICAL PROFESSIONALS: A RANDOMIZED CONTROLLED STUDY

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INTRODUCTION. Basic life support training program for medical professions may be better delivered by a simplified and short training course.

OBJECTIVES. A Basic Life Support (BLS) training program was developed and tested using a two-member team comprised of medical and nursing students. This program incorporated the use of "real-time" defibrillator feedback during simulated cardiac arrest (CA) scenarios and performance debriefing using offline review of CPR performance from the defibrillator to demonstrate an improvement in cardiopulmonary resuscitation (CPR) performance.

METHODS. This study randomized 298 subjects into 3 groups in a single blind fashion. Training: All groups received a 2-h training session with verbal feedback review of CPR performance followed by a 5 min simulated CA test scenario. Group 1 (control group) trained with a defibrillator that provided no feedback. Group 2 and 3 (intervention groups) were trained with a defibrillator.equipped with visual and audible real-time feedback and received performance debriefing using offline review of CPR performance. Testing: Group 1 and 3 were tested immediately following training and again at 3 months (retention testing) using a non-feedback defibrillator. Group 2 had immediate and retention testing using a feedback defibrillator. Quality of CPR performance was measured as the average rate of compressions, average depth of compressions and the percentage of time in which compressions were performed (compression fraction, CF) over a 5-min time period. Study participants' self-assessment of performance was assessed by a 2-page questionnaire.

RESULTS. Groups 2 performed significantly deeper chest compressions (1.72 ± 0.23) as compared with Groups 1 (1.39 ± 0.30) and 3 (1.66 ± 0.26) $p = 0.001$. At retention testing, Group 2 showed significantly deeper compressions (1.85 ± 0.29) as compared with Groups 1 (1.54 ± 0.39) and 3 (1.66 ± 0.33) $p = 0.001$. After training and testing, 63 % reported a very comfortable rating with their own BLS skills.

CONCLUSIONS. A simplified 2 h training method using real-time CPR audiovisual feedback combined with offline review of CPR performance improved CPR quality metrics as well as the retention of these skills. All participants reported a much higher level of comfort with CA after taking the CPR training. These results suggest that training modalities utilizing real-time audiovisual feedback combined with offline review of CPR performance are effective tools in improving CPR skills and comfort level.

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1118
PRE-ICU UNDERSTANDING OF SEPSIS AND MANAGEMENT OF SEPSIS AND SEPTIC SHOCK ARE SUBOPTIMAL

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INTRODUCTION. Optimal pre-ICU management of sepsis and septic shock are crucial to the prevention of multi-organ failure and, despite modern critical care and ongoing scientific and technological expertise, septic shock has a high mortality worldwide. Effective pre-ICU therapy contributes to reduction in mortality of serious sepsis and septic shock.

STUDY OBJECTIVES. We determined the pre-ICU clinician understanding of fundamentals of sepsis and principles and practice of management of serious sepsis and septic shock in a cohort of pre-ICU clinicians attending a clinical course in acute care medicine (ACM Course—focussed on the pre-ICU care of the acutely ill) (www.easternhealth.org.au/media/events/acm/aspx).

METHODS. 76 doctors attending the ACM Course completed a 28-question single page survey on a voluntary basis. The course registrants hailed from all over Australia and New Zealand and were all at least 3 years out of medical school. 33 % of the cohort had qualified for the specialist examinations either in internal medicine, emergency medicine or anaesthesiology. The survey questions explored fundamentals of sepsis, basics of the circulatory consequences of serious sepsis and septic shock, principles of managing serious sepsis and some basics about managing septic shock.

RESULTS. The response of the 76 respondents is shown in the following table.

Sepsis survey

Number	Question ideation	Correct answer %	Wrong answer %
1	Septic shock, even treated, has 20 % mortality	78	22
2	Early antibiotic therapy is the surest strategy to reduce mortality	88	12
3	Gram negatives predominate in neutropenic sepsis	29	71
4	Coagulation pathway plays a critical role in sepsis	82	18
5	Septic shock leads to a vasodilated state	94	6
6	Optimal circulatory volume is the key to manage septic shock	82	18
7	Dopamine has no place in the management of septic shock	22	88
8	Noradrenaline is the agent of choice in septic shock	69	31
9	High dose Steroids improves outcome in Sepsis	51	49

CONCLUSION. Pre-ICU doctors' understanding of the principles of sepsis is not optimal. Fundamentals of circulatory consequences of sepsis and septic shock are not adequately understood. Medical registrars and consultant physicians have a generally poor concept of state-of-the-art management of septic shock and a surprisingly large number of pre-ICU doctors do not grasp the essentials of management of serious sepsis and septic shock.

1119
VENTILATOR-ASSOCIATED PNEUMONIA PREVENTION EDUCATION IN THE EMERGENCY DEPARTMENT

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INTRODUCTION. Nosocomial infections result in significant morbidity and mortality. Ventilator Associated Pneumonia (VAP) is a pneumonia not present at the time of intubation that develops after 48 or more hours of mechanical ventilation and is considered preventable. In the ICU setting, relatively straightforward patient care interventions have been shown to reduce the incidence of VAP.
In the ICU setting tools such as information packets, posters and competency testing provided to ICU nurses and respiratory therapists significantly decreased the number of patients who acquired VAP. To date, none of these studies have focused on VAP prevention education in the Emergency Department (ED).
OBJECTIVE. To determine whether a brief educational intervention could improve the knowledge of ED personnel in VAP prevention.
METHODS. After obtaining IRB exemption, we performed a pre-/post-study in our ED. Participants completed a 10-question test assessing knowledge of VAP, followed by a Powerpoint-based intervention, and a 10-question post-test. Pre- and post-test scores were compared using paired t-test. A and B versions of the test were used in a crossover fashion and their equivalence was demonstrated using unpaired t-test.
RESULTS. 65 subjects were enrolled. Mean difference between pretest and post-test was 25 ± 19 points ($p < 0.01$). There was no statistically significant difference between the A and B versions when administered as pre-test ($p = 0.61$) or post-test ($p = 0.37$).
CONCLUSIONS. We demonstrate knowledge transfer in ED personnel regarding VAP prevention after a brief educational intervention. This will be used as part of a larger study to reduce VAP in the ED.
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1120
INTERNATIONAL COLOUR CODED SYRINGE LABELS. A PROGRAMME OF EDUCATION AND ASSISTANCE TO IMPROVE PATIENT SAFETY AT LEEDS TEACHING HOSPITALS (LTHT)

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INTRODUCTION. Around 46 % of drug errors made by anaesthetists are thought to be due to syringe misidentification [1]. In 2003 the International Colour Coded System (ICCS) was introduced for labelling syringes to minimise these errors as part of a Department of Health safety initiative. Four acute care professional bodies recommend provision of these labels [2]. The Royal College of Anaesthetists proposes that 100 % of ICCS labels should be available for anaesthetic drugs provided in each clinical area and that 100 % of syringes are labelled with the correct ICCS label [3], to reduce the risk of error.
OBJECTIVES. • To audit the availability of ICCS labels for emergency anaesthesia outside theatres across LTHT.
Audit standards: 1. 100 % availability of specific drug labels (tailored for each location). 2. 100 % of the range of ICCS colours for the emergency drugs.
• To re-audit label availability after a programme of education and assistance.

METHODS. A list of areas where anaesthesia occurs outside the normal theatre environment at Leeds Teaching Hospitals Trust (LTHT) was compiled together with a list of fifteen drug labels commonly used in emergency anaesthesia. The label list was adapted to each area according to pharmacy stock lists. Label availability in each area was audited in May 2011 and following intervention, re-audited in January 2012.
RESULTS. Standard 1: Only 3/26 areas had 100 % of specific labels for the list of key emergency drugs. Standard 2: Only 12/26 areas had 100 % of the range of colours of ICCS labels for the key emergency drugs. Programme of education and assistance: 1. data was presented at the trust Critical Care Governance meeting. 2. the importance of ICCS labels and the patient risks were discussed with relevant staff. 3. assistance with the label ordering process was provided to all areas. From May 2011 to January 2012, the number of areas where 100 % of the specific emergency drug labels were available improved from 12/26 to 19/26. The number of areas where 100 % label colours were available increased from 12/26 to 25/26.
CONCLUSIONS. The lack of availability of ICCS syringe labels across LTHT was deemed to be a patient safety risk. A simple programme of education and assistance has raised the profile of this important international syringe labelling system and led to a significant improvement in label availability in all areas where anaesthesia occurs outside theatres. This translates to an important reduction in the perceived risk of syringe misidentification by anaesthetists across the trust.
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1121
PERCEIVED BENEFITS OF SIMULATION TRAINING FOR FOUNDATION DOCTORS IN MANAGING MEDICAL EMERGENCIES

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INTRODUCTION. Recognition and management of the acutely ill patient is a key learning outcome in the Foundation Curriculum; all foundation doctors should be competent in the early management of emergency patients [1]. Recent media has highlighted the perceived lack of confidence of newly qualified doctors in managing acutely ill patients and subsequent concerns over patient safety [2]. With the impact that the European Working Time Directive has had on working hours, high fidelity simulation offers practice in a safe environment [3].
OBJECTIVES. To explore how foundation doctors perceive training on simulated emergencies and the possible impact on competence and patient safety.
METHODS. 44 Foundation doctors participated in simulation scenarios over a two month period. Each session consisted of 4 acute scenarios involving a simulated manequin, followed by structured feedback by a facilitator. Participant surveys were collected and analysed.
RESULTS. The scenarios were universally rated extremely relevant and realistic. The most valuable learning outcomes were communication skills and crisis management. The themes emerging from free text comments were that participants learnt more structured approaches to assessing critically ill patients, learnt the importance of constant reassessment and also learnt when and how to call for help. 95 % of participants either agreed or strongly agreed that they were better able to manage the acutely ill patient as a result of the simulation session. 95 % also either agreed or strongly agreed that such sessions will lead to improved patient safety.
CONCLUSIONS. In conclusion, the simulation session is perceived to be realistic, relevant and beneficial in terms of equipping junior doctors with the confidence, technical and non-technical skills in dealing with critically ill patients. Nearly all participants felt that patient safety could be improved through such training.
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1122
DOES THE COLLABORATOR COMPETENCY MEAN THE SAME THING TO ALL PEOPLE? A DISCOURSE ANALYSIS OF INTERPROFESSIONAL COLLABORATION

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INTRODUCTION. Interprofessional Collaboration (IPC) has become a dominant theme in Critical Care delivery. Implementation of collaborative projects in the critical care environment dates back more than 30 years. Despite the long history, implementation in practice has been fraught with tension. Nevertheless, IPC has achieved prominence in medical education, as a key competency in North American and European competency-based frameworks such as CanMEDS, ACGME competencies and CoBaTRICE.
OBJECTIVES. To describe two dominant discourses of IPC that have impacted delivery of care and training.
METHODS. We used a Foucauldian discourse analysis methodology. Foucault posits that a discourse is a systematic way of describing and constructing the social world. Critical discourse analysis seeks to make explicit those constructions. The methodology is based on an analysis of an "archive" likely to contain those systematic descriptions and constructions. We limited our archive to peer-reviewed literature reflecting North American constructions of IPC between physicians and nurses. Papers were retrieved through an iterative search strategy using computerized databases from Medicine and Nursing. We excluded literature on Interprofessional Education because of the distinctiveness of this body of literature.
RESULTS. We describe two dominant discourses of IPC: The Utilitarian discourse and the Emancipatory discourse. The utilitarian discourse is centered around IPC as a means of improving health care outcomes. The emancipatory discourse is centered around IPC as empowering for non-medical health professionals. Each discourse constructs IPC differently. The discourses give rise to unique objects and practices. The relationship between the discourses is neither developmental nor a simple binary opposition. We describe different patterns of interaction between the two discourses, including conflict, co-existence and co-option.
CONCLUSIONS. The presence of two dominant discourses of IPC and their interactions may provide insight into the difficulties inherent in implementing IPC initiatives. Educational programs should consider whether and in what ways these discourses may underpin or complicate their curricular and assessment efforts.
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1123
CRITICAL INCIDENT REPORTING SYSTEMS AS FEEDERS FOR HIGH FIDELITY SIMULATION TRAINING

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INTRODUCTION. High Fidelity Medical Simulation (HFMS) systems are increasingly employed in critical care education. Proposed benefits of this technology include objective assessment of practitioner competence, assessment and development of team performance, human factor-related error prevention and rehearsal of critical interventions [1-4]. Scenarios utilized in HFMS are often designed by experienced clinicians and educationalists based on anecdote, Delphi methods, and education curricula. We propose that databases containing critical (adverse) incident records can provide an invaluable resource for creating HFMS scenarios that target recurrent errors, safety issues, incidents customized for the institution. This is may be particularly useful in the fields of anesthesia, critical care and acute specialties.
OBJECTIVES. Describe a practical method and our multi-centre experience in utilizing a computerized database as a feeder system for HFMS educational content.
METHODS. A database of 6,000 reported incidents over 5 years from multiple institutions was reviewed and content analyzed, screened for relevance and classified. Core themes were identified and tabulated. Themes/incidents were incorporated into learning objectives of simulation-center-based and in situ HFMS events.
RESULTS. Database analysis identified a number of recurrent themes that reflected variations in practice, case mix, periods of high patient acuity and resourcing. Further qualitative analysis suggested a number of areas highly suitable for HFMS-type educational

approach. A number of these were successfully integrated into HFMS training. Long term follow up will be undertaken to determine impact of the interventions on event recurrence and patient safety.
CONCLUSIONS. In view of the reported cost and resource implications of implementing HFMS; it's important that patient care and safety benefits are realized. We described a highly practical-low cost approach that will increase the possibility of this and tailor this tool to institutional needs.
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1124
DEVELOPMENT OF A NEW CRITICAL CARE AND APPLIED PHYSIOLOGY TEACHING PROGRAM SPECIFICALLY DESIGNED FOR THE SURGICAL TRAINEE

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INTRODUCTION. In the UK increasing numbers of surgeons are being exposed to 'critical care' style management of their patients. The number of critical care beds is remaining static, yet increasingly complex surgical procedures are being offered to an ageing, more demanding group of patients. NCEPOD's prospective 'Knowing the Risk' study revealed that 80 % of high risk patients undergoing surgery return to ward based care [1]. The surgical patients that are admitted to critical care continue to have complex needs (e.g. nutrition, fluid balance, pain management) post discharge. Surgical trainees have commented on their desire to increase the emphasis on critical care and applied physiology within their teaching programs [2].
OBJECTIVES. We set out to develop a teaching program in critical care and applied physiology that specifically addressed the needs of the surgical trainee and was of practical use rather than being solely exam focused.
METHODS. After discussions with surgical trainees, consultants and examiners, we reviewed the surgical curriculum in conjunction with the ESICM CoBaTrICE and the UK FFICM syllabi. Using these resources and our individual expertise, we constructed an innovative, systems-led teaching program. Our focus was on providing a novel organ-centric approach using a variety of methods suitable for adult learners. We hoped to build on each student's strengths and also identify and address any specific areas of weakness. We set out not only to increase the student's knowledge and understanding of the subject, but also to equip them with the necessary skills to continue their future learning.
RESULTS. Our teaching program incorporates face-to-face teaching (high fidelity simulation, small group sessions, practical workshops, interactive lectures), e-learning (presentations, articles, key paper review), a tutor-based student support system and both summative (short answer questions, MCQs, paper critiques) and formative (clinically driven literature reviews, OSCEs) assessments. In particular we used the simulation sessions to reinforce the learning objectives and allow the students to put their new knowledge into practice in a safe non-threatening environment. Our teaching program has now been incorporated by Salford University as part of an MSc in Surgical Practice. Feedback from our first cohort of surgical trainees has been extremely positive. The simulation and small group sessions were rated particularly highly.
CONCLUSIONS. We have developed a new teaching program in critical care and applied physiology that is based around an organ-centric approach. The students have provided informative feedback allowing us to continue to evolve and meet the needs and expectations of the surgical trainees.
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1125
DESIGNING A PERFORMANCE ASSESSMENT STRATEGY FOR A POST-GRADUATE PHARMACIST INTENSIVE CARE SPECIALIST ROTATION

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INTRODUCTION. Competence assessment is a routine and comprehensive contributor to formative and summative assessment for post-graduate pharmacists. Assessing performance ('does' in the terminology of Miller's triangle [1]) is difficult for this cohort as traditional modalities of performance assessment in the medical domain are unsuitable (patient outcomes—attributive inconsistencies, volume of care—does not reflect complexities of pharmaceutical care, standards of care—pharmacist case mix is too varied). Alternatives approaches to assessing post-graduate performance are required.
OBJECTIVES. Design a formative and summative performance assessment strategy for a post-graduate pharmacist intensive care specialist rotation.
METHODS. Assessment tools based on reflection (e.g. portfolio), observation (e.g. mini-CEX) and 360° feedback (e.g. SPRAT) were reviewed and then merged with a competence assessment programme.
RESULTS. A timetable and strategy of performance assessment was created which facilitates the post-graduate pharmacy learner in achieving competence and demonstrating performance of key competencies and of holistic professional performance.
CONCLUSIONS. Performance assessment ('does'), in addition to competence assessment ('shows how') may be included in pharmacy post-graduate assessment.
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1126
IMPROVING COMMUNICATION SKILLS FOR JUNIOR DOCTORS THROUGH SIMULATION: WHEN, WHOM AND HOW TO CALL FOR HELP

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INTRODUCTION. Amongst the learning outcomes stated in the foundation curriculum for junior doctors are non technical skills such as 'calls for help early', and 'provides clear guidance to medical and nursing colleagues' [1]. Lack of these non-technical skills during management of critically ill patients may affect patient safety and contribute to poorly perceived confidence amongst junior doctors [2]. High fidelity simulation offers the opportunity to enhance communication skills during crisis management in a safe environment [3].
OBJECTIVES. To evaluate the role of simulation on development of non-technical skills and behaviours of junior doctors during emergencies.
METHODS. 23 Foundation year 1(F1) and 21 Foundation Year 2 (F2) doctors participated in high fidelity simulation scenarios. Scenarios involved critically unwell simulated mannequins (anaphylaxis, life threatening asthma, sepsis, major haemorrhage). F1 and F2 doctors participated as first and second responders, respectively. A nurse was present, and other faculty played the role of senior registars and critical care. Each scenario was followed by a debrief and feedback by a facilitator. Pre and post session surveys were collected and analysed.
RESULTS. A common factor sited before the session by participants in affecting their ability to manage the acutely ill patient was knowing when and who to call for help. Both groups rated the session extremely relevant and realistic. When participants were asked to rate the value of the session in terms of various learning outcomes, communication was the most highly rated by F1s and second most highly rated by F2s. Multidisciplinary team working was also rated highly by both groups. F1s rated highly the value of the session in gaining insight into the roles of other team members, nurses and critical care. F2s gained more insight into the roles of critical care, but were less convinced of the value of the session in terms of gaining more insight into other team members. Knowing when and who to call for help were commonly emerging themes throughout the free text comments, as was learning of better ways to communicate, in particular using the SBAR (situation, background, assessment, recommendation) tool.
CONCLUSIONS. This study shows how our simulation training format helps develop the communication skills, particularly with regards to calling for help, that are perceived as highly important in managing critically ill patients.
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1127
COGNITION REGARDING DO-NOT-ATTEMPT-RESUSCITATE (DNAR) OF HEALTH CARE PROVIDER IN THE EMERGENCY DEPARTMENT OF KOREA: CHANGE OF PATIENT MANAGEMENT AFTER DNAR

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INTRODUCTION. The survival rate of critical patients has improved due to medical development whereas the survival period of patients has been extended through life-support equipment. However, arguments are being continuously raised regarding life support therapy performed on dying patients that cannot be recovered through treatment.
OBJECTIVES. To conduct the survey on the awareness regarding Do-not-Attempt-Resuscitate (DNAR) of health care providers working in the emergency department of Korea.
METHODS. This study conducted a survey related with DNAR on doctors and nurses working in the emergency department of 6 university hospitals from February to May 2011.
RESULTS. A total of 54 doctors and 148 nurses participated in the survey. 87 % of doctors and 71.6 % of nurses presented that patient management after DNAR were changed. There was no difference presented between doctors and nurses in answers for what should be maintained after DNAR. However, in answers for what is maintained in practice, significant differences were presented for the following items: 'vital sign check' (87 vs. 97.3 %, $p = 0.004$), 'input/output control' (75.9 vs. 91.2 %, $p = 0.004$), 'vasopressor' (33.3 vs. 57.4 %, $p = 0.002$) and 'antibiotics or blood products' (53.7 vs. 74.3 %, $p = 0.005$).
CONCLUSIONS. Both doctors and nurses thought that treatment policy and behavioural patterns were changed after DNAR. However, differences were presented between the two groups in some opinions. In order to overcome such differences, it is important for medical professionals to carry out more discussions in relation to DNAR and to develop guidelines appropriate for the Korean society.
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1128
USE OF ASSESSMENT TOOL BY CRITICAL CARE OUTREACH NURSE PRACTITIONERS IMPROVES ASSESSMENT AND DOCUMENTATION OF THE PHYSIOLOGICAL STATUS OF ACUTELY UNWELL PATIENTS

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INTRODUCTION. The Critical Care Outreach Team (CCOT) at a 680 bedded UK District General Hospital (DGH) bring a Critical Care perspective to patient care on the wards. Patients considered unwell based on an Early Warning System Score or due to concern raised by clinical staff are assessed by the CCOT. 1,875 patients were assessed in this way in 2011. Comprehensive assessment and documentation is imperative to the working of the

CCOT [1]. Patient assessments performed and documented using free text have the potential to vary significantly in terms of breadth and rigour. In order to ensure a thorough and uniform assessment amongst all members of the CCOT a Pro-Forma (using an ABCDE approach based on Advanced Life Support guidelines) was developed in conjunction with a multi-disciplinary team (MDT). This was to ensure it was suitable for both nursing and medical needs.
OBJECTIVES. To determine if the introduction of a standard Pro-Forma, developed by the MDT, results in a more comprehensive assessment of patients by the CCOT in a DGH.
METHODS. A retrospective study of patient assessments (n = 42) compared the documentation of key physiological parameters before and after the introduction of a Pro-Forma (1st week of October 2010 and October 2011, respectively). A total of 42 key parameters were identified and included: airway; respiratory rate, O_2 sats, chest auscultation; heart rate, blood pressure, fluid balance, intravenous access and fluids; GCS; abdominal examination; relevant bloods and plan. The free text (n = 22) and Pro-Forma (n = 20) assessments included those from different members of the CCOT.
RESULTS. In the free text sample a mean of 22.77 (SD 3.69) key parameters were recorded. Following the introduction of the Pro-Forma a mean of 35.95 (SD 2.19) parameters were documented. The difference between the two groups was statistically significant (13.18 parameters; 95 % CI: 11.26-15.09; $P < 0.0001$).
CONCLUSIONS. The CCOT Pro-Forma evaluated in this study is easy to use and provides a framework for members of staff to follow. It has been shown to significantly improve the assessment and documentation of the physiological status of unwell patients. The National Confidential Enquiry into Patient Outcome and Death[2] found that 13 % of patients subsequently admitted to intensive care had not had an adequate initial clinical examination. The introduction of the CCOT Assessment Pro-Forma will ensure all patients found to be deteriorating on the ward have a thorough assessment of their physiological status performed and documented clearly in the notes. This will aid prompt intervention in this patient group, and smooth transfer to critical care services if required.
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1129
VALIDATION OF THE CONFUSION ASSESSMENT METHOD FOR INTENSIVE CARE UNIT IN THE ITALIAN CONTEXT

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INTRODUCTION. Delirium is common in Intensive Care Unit (ICU), with an estimated prevalence rising up to 80 %. Often misdiagnosed, delirium can be easily assessed using the Confusion Assessment Method for Intensive Care Unit (CAM-ICU), a reliable scale previously validated.
OBJECTIVES. Aim of this study was to evaluate the reliability and validity of the CAM-ICU within Italian context; the secondary endpoint, was to determine the prevalence of delirium within our ICUs, and the association of delirium with prolonged ICU stay/prolonged mechanical ventilation (MV).
METHODS. Backward and forward translation of the tool was performed. Two independent observers' daily screened patients admitted at the three general ICUs of the University Hospital of Udine between January and February 2012, with a maximum delay of 4 h between the two observations. We excluded patients with known dementia, those who refused to give their consent, or awaiting to be discharged to another ward, or not able to understand adequately Italian language. Statistical analysis was performed using the software SPSS, version 17.0 (©SPSS Inc., Chicago, Illinois, USA). Scale validation was obtained through interrater reliability (Cohen's κ) and internal consistency (Cronbach's α). Relative risk association was searched between ICU length of stay (ICU-LOS) or MV duration, and the presence of delirium. Statistical significance was considered when $p < 0.05$.
RESULTS. 57 patients were screened for delirium. Patients were mostly male (63 %) and aged 67.9 ± 13.3 years (mean ± SD), and their median SOFA at the ICU admission was 7 (IQR 5–10). 20 patients (35 %) resulted positive after the screening for delirium (12 hypoactive, 7 mixed and 1 hyperactive form). Globally, 72 pairs of evaluations were obtained, of which 63 (87.5 %) were concordant. Global interrater reliability was 0.63, and rose over 0.75 when considering the pairs obtained within an interval lower than 60 min. Cronbach's α was 0.866. Median time needed for the tool administration was <2 min. Patients with a positive delirium screening had a significantly higher mean duration (in hours) of MV (241 ± 42 vs. 122 ± 27, $p = 0.01$) and of ICU-LOS (263 ± 29 vs. 165 ± 29, $p = 0.03$); delirium was also found to be a predisposing factor for MV longer than 5 days (RR 2.7; CI 95 % 1.32–5.71, $p = 0.008$) and for ICU-LOS longer than 7 days (RR 3.8; IC 95 % 1.61–9.13, $p = 0.0007$).
CONCLUSIONS. The CAM-ICU Italian version is reliable and easy to use. The agreement obtained can be defined "Substantial" and tool's consistency was also high. Delirium prevalence was similar to the one reported by other authors. Delirium was associated with poorest outcomes in ICU patients, leading to an increased of hospital costs.
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1130
NURSES ATTITUDES TOWARDS THE CONDUCT OF ICU RESEARCH: A MULTI-CENTRE SURVEY

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INTRODUCTION. Bedside nurses play an invaluable role in research in the intensive care unit (ICU); yet, little is known about their perspectives about research conduct or their role in the research process.
OBJECTIVE. To characterize ICU nurses' knowledge, experiences, and attitudes pertaining to clinical research.
METHODS. We distributed a paper-based survey to nurses in 1 pediatric and 7 adult academic ICUs affiliated with the Canadian Critical Care Trials Group. Rigorous procedures, including cognitive interviewing of experienced ICU nurses, were used in survey development. We evaluated face and content validity, discriminability, utility, clarity, and test–retest reliability prior to distribution. Survey items assessed research knowledge and experience, and personal, ICU, and hospital characteristics. Attitudes towards research were assessed on a 5-point Likert scale with responses grouped: disagree [1, 2], neither agree or disagree [3], and agree [4, 5]. Sites completed a form describing research activity and infrastructure.
RESULTS. Response rate was 56 % (n = 484/868). Respondents were female (79 %) with over 6 years of ICU experience (66 %). Most had a nursing degree (57 %); 44 % had completed an ICU certificate. While the majority had completed a statistics course (57 %), 79 % had minimal to no experience with protocol development, data analysis, or publication. While 63 % had cared for a patient requiring study procedures ≥6 times, 57 % never or infrequently (<6 times) completed study forms (57 %). Most (77 %) agreed that research leads to improved care and eligible patients should be approached for research (61 %). Most disagreed (78 %) that ICU patients were too sick to participate in research. Few (24 %) agreed that researchers consider practicalities of nursing care when designing studies and 42 % agreed that caring for study patients increases nursing workload. Most (74 %) agreed that physicians promote ICU research while only 39 % agreed that nurses promote research. Majority (68 %) reported a collaborative relationship between nurses and the ICU research team; however, only 34 % reported that their contribution to research was recognized. Study ICUs averaged 22 beds per unit. Sites were engaged in 12 studies (range 5–20) and employed 2.5 full-time research coordinators. All sites posted study information in areas visible to nurses and most (88 %) provided education about active research studies. Two sites reported participating in a nurse-led study in the past 12 months.
CONCLUSION. In these 8 academic centres in Canada, ICU nurses are actively involved in providing care to study participants yet minimally involved in protocol development, data analysis, and publication. Our findings suggest the need for inclusion of nurses in protocol development, greater recognition of nurses' contributions to research, and investigation of research-related nursing workload.
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1131
SPIRITUAL DISTRESS ASSESSMENT TOOL A VALID INSTRUMENT FOR ELDERLY PATIENTS IN THE INTENSIVE CARE UNIT

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INTRODUCTION. The Spiritual Distress Assessment Tool (SDAT) is a 5-item instrument developed to assess unmet spiritual needs in elderly patients and to determine the presence of spiritual distress.
OBJECTIVES. The objective of this study was to investigate the SDAT psychometric properties.
METHODS. This cross-sectional study was performed in Surgery Clinic of the Constanta County Emergency Hospital. Patients (N = 85), aged 65 years and over with Mini Mental State Exam score [greater than or equal to] 20, were consecutively enrolled over a 12-month period. Data on health, functional, cognitive, affective and spiritual status were collected upon admission. Interviews using the SDAT (score from 0 to 15, higher scores indicating higher distress) were conducted by a trained doctor. Factor analysis, measures of internal consistency (inter-item and item-to-total correlations, Cronbach alpha), and reliability (intra-rater and inter-rater) were performed. Criterion-related validity was assessed using the Functional Assessment of Chronic Illness Therapy-Spiritual well-being (FACIT-Sp) and the question "Are you at peace?" as criterion-standard. Concurrent and predictive validity were assessed using the Geriatric Depression Scale (GDS), occurrence of a family meeting, hospital length of stay (LOS) and destination at discharge.
RESULTS. SDAT scores ranged from 1 to 12 (mean 5.2 ± 2.7). Overall, 55.0 % (52/85) of the patients reported some spiritual distress on SDAT total score and 29.4 % (25/85) reported at least one severe unmet spiritual need. A two-factor solution explained 52 % of the variance. Inter-item correlations ranged from 0.11 to 0.38 (eight out of ten with $P < 0.05$). Item-to-total correlations ranged from 0.57 to 0.64 (all $P < 0.001$). Cronbach alpha was acceptable (0.60). Intra-rater and inter-rater reliabilities were high (Intraclass Correlation Coefficients ranging from 0.78 to 0.93. Compared with patients showing no severely unmet spiritual need, patients with at least one severe unmet spiritual need had higher odds of occurrence of a family meeting (95 %CI 1.3–15.8, $P = 0.02$) and were more often discharged to a nursing home (12.3 % vs. 3.1 %; $P = 0.027$).
CONCLUSIONS. SDAT has acceptable psychometrics properties and appears to be a valid and reliable instrument to assess spiritual distress in elderly hospitalized patients.

1132
SLEEP IN THE ICU: PATIENTS AND NURSES PERCEPTION

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INTRODUCTION. Sleep has always been considered as an essential factor for healing and should have an important place in recovery during critical illness; nevertheless, the singular ICU environment, where nursing procedures are performed all around the clock, impacts negatively in the sleeping pattern. Studies have shown poor sleep, with an altered circadian rhythm, a decrease or disappearance of deep sleep phases and a dramatic increase of micro-arousals.
OBJECTIVES. To assess the quality and quantity of sleep of ICU patients and disturbing factors from the perspective of patients and caregivers, and secondly, to evaluate the correlation between both assessments.
METHODS. This study was performed during August and September 2011 during 4 weeks in a section of 4 single rooms ICU. It consisted in: – A questionnaire identifying nursing activity between 23:30 and 5:30: number of interventions and degree, with an assessment of patients reactions
– An nurses's evaluation of the patient's attitude during daytime.
– Patients self-assessment questionnaires about quantity and quality of sleep, and disturbing factors.

RESULTS. 72 nights were observed, in which 33 nights corresponded to patients awake and aware (46 % of the nights). It concerned 17 patients, 11 of which were able to answer to our questionnaires. During 68 % of the nights, they experienced 3 or more awakenings, 26 % at least 1 or 2 awakenings, and only 6 % of nights without interruption. The main disturbances were: pain (33 %), anxiety (27 %), nursing procedures (23 %), noise (10 %) and discomfort feelings such as heat or thirst (8 %). For caregivers, sleep time was over estimated (2 h >compared to that reported by patients), and we noticed difficulties in identifying anxiety during daytime (only 10 % of cases were detected, compared to the feelings declared by patients); in contrast, during the night duty anxiety was detected in up to 70 % of the cases. The main disturbing factors estimated by nurses care were nursing procedures, noise and pain, in that order. Micro-arousals during night and daytime sleepiness was well identified.
CONCLUSIONS. It is represents a reliable picture of the night activity and its impact on sleep in our, revealing a systematic stimulation of patients throughout the night, with little difference between conscious or unconscious patients. It is a comprehensive collection of patients sleep experience in the ICU, where pain and anxiety appear as the main disturbing factors. Short- and medium-term consequences are still insufficiently evaluated, but it opens new perspectives for improving the quality of care in the unit, including: a thorough assessment of the impact of delirium, of sleep debt at the end of the ICU stay, and the possibility of setting up a nursing intervention in the evening, based on discussion to explain the events of the day, in order to reduce anxiety.
GRANT ACKNOWLEDGMENT. We did not benefit from any grant.

1133
PTSD AND MEMORY OF SYMPTOMS DURING ICU STAY

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INTRODUCTION. A large percent of ICU survivors suffer from Post traumatic symptoms (PTSD). There are many factors which contribute to the prevalence and incidence of PTSD.
OBJECTIVES. This is the first study to examine and describe specific symptom memory of ICU and the severity of PTSD in a Middle East population.
METHODS. Prospective cohort of 35 ICU survivors and their symptom memory before hospital discharge and 2 months post discharge from a large university hospital. The hospital serves a population of 1 million with a mixed ethnic and cultural background in Israel. Patients: Memories of ICU and were studied in 35 patients after ICU discharge. All were examined again at 8 weeks to assess memory stability and development of acute PTSD-related symptoms.
Measurements: ICU memory tool and PTSS-14 Standardized interviews and questionnaires were used to assess memory for ICU.
RESULTS. Admitting ICU diagnosis 55 % after trauma, 45 % post surgery, 65 % males, 2 months after hospital discharge, 50 % of all patients remember being in ICU, 60 % remember experiencing pain, 30 % remember vivid dreams, 45 % being confused, over 30 % remember being anxious, and depressed. There were differences in severity of PTSD symptoms between patients who were Muslims or Jews, those admitted following trauma or emergency surgery. Muslims more often remember suffering from social isolation more than Jewish patients.
CONCLUSIONS. We propose that the development of acute PTSD-related symptoms may be related more to ethnic background and traumatic admission to ICU. Realizing cultural differences may empower nurses to assist patients and their families in awareness of PTSD symptoms after hospital discharge.

1134
RELATIVES' EXPERIENCES OF CONFUSION AND AGITATION IN CRITICAL CARE PATIENTS

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INTRODUCTION. Delirium in the critical care setting is a common occurrence, with estimates of prevalence ranging from 20–80 % [1]. Previous work has shown that relatives who have witnessed episodes of delirium in patients can potentially develop signs and symptoms of depression and anxiety [2]. Nursing staff have the most contact with both the patient and the relatives on a day to day basis and the relationship between nurses and relatives has been the subject of much interest, especially in the environment of the Critical Care Unit (CrCU) [3].
OBJECTIVES. The aims of this study were as follows: 1. To determine whether nursing staff and relatives differed in their perception of delirium; 2. How any differences may affect the CrCU experience for the relative(s) in question 3. Whether it was possible for CrCU staff to improve the relatives' experience of the delirious episode.
METHODS. Following ethical approval by both Trust and regional ethics committees, semi-structured interviews were conducted with nursing staff and relatives over a 3 month period in a mixed surgical and medical CrCU. Audio recordings of each of the interviews, which lasted 10–30 min, were made so that transcripts could be generated and used for thematic analysis [4].
RESULTS. Eight nursing staff and eight relatives agreed to be interviewed. Significant differences were found in the emotional impact the delirious episodes had for the two groups, the perceived emotional impact for relatives versus the reported emotional impact and the perceived importance of nonverbal communication. Inconsistencies were also reported in the management of both the patient and the relative during the delirious episode, which lead to increased uncertainty and shock in relatives.
CONCLUSIONS. From the interviews and the differences observed after analysis, recommendations to improve future interactions between nursing staff and relatives are suggested and include: (a) increased communications training for nursing staff, specifically targeted at management of relatives and nonverbal communication, (b) implementing a standardised protocol on the management of relatives who witness episodes of delirium and (c) education for both nursing staff and relatives as to the importance and possible role of the family unit within the critical care setting.
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1135
WORKLOAD OF REGISTRATION OF VENTILATOR-ASSOCIATED PNEUMONIA IN THE ICU WITH AND WITHOUT THE USE OF A PATIENT DATA MANAGEMENT SYSTEM

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INTRODUCTION. Registration of nosocomial infections is an important parameter for quality of care in the ICU. However, careful registration is highly time-demanding and the need exists for less time consuming methods. The availability of a Patient Data Management System (PDMS) creates opportunities for (semi)- automated infection registration.
OBJECTIVES. To measure and compare the workload of registration of ventilator-associated pneumonia (VAP) with a manual registration system and with a (semi)- automated registration system.
METHODS. From 2001 to 2010 dedicated infection control ICU nurses prospectively collected data on VAP in a university centre Intensive Care Unit. Phase I (from 2001 to 2003): manual registration of relevant data by ICU nurse with specific case record forms and analysis of data after transfer of data to an Excel database. Phase II (from 2005 to 2007): partial online registration of relevant patient data in a Visual basics database by ICU nurse; Phase III (from 2007 to 2010): all relevant patient data extracted automatically from the PDMS of the ICU and transferred automatically to the Visual basics database. Data are checked on a routine basis by co-ordinating dedicated nurse and doctor.
RESULTS. We observed a stepwise reduction in workload per included patient: In Phase I, the mean total workload per included patient was 170 min (whereof 70 min to fill in the CRF). In Phase II, the total workload was 90 min, and in phase III 30 min ($p < 0.05$).
CONCLUSIONS. Registration workload is reduced nearly sixfold by the introduction of an automated infection registration system that extracts data automatically from the ICU's PDMS.

1136
PREFERRED CONTENT AND USEFULNESS OF A PHOTO-DIARY

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INTRODUCTION. Many patients have memory-gaps from the ICU stay and need to get information. A tool in the recovery could be a photo-diary which explains and clarifies thoughts and events from the ICU period. There are different standards for content in the photo-diary.
OBJECTIVES. The aim of this study was to identify preferred content and usefulness of the photo-diary.
METHODS. The study had a descriptive, explorative cohort design with a mixed method approach. The patients answered a questionnaire ($n = 115$) and participated in an interview ($n = 15$) 6 months after the ICU-stay. Data analysis was carried out in three stages; the questionnaire was analysed by descriptive statistics and categorized by content and the interviews were analysed by manifest content analysis.
RESULTS. The patients explained that complete information about daily activities and medical facts had to be included to understand and get a sense of coherence of what had happened. The content in the photo-diary had to be chronological to follow the process in which photos were an important part. The patients re-read the photo-diary during the recovery which helped them to fill in the memory gaps; i.e. they used it as a tool for communication.
CONCLUSIONS. We found that different standards for content and the use of photos have repercussions on usefulness of the diary. To fulfil the patients' wish for a tool to construct a coherent story from ICU, the development of standards and guidelines for ICU diaries are needed. This study could be the basis for such clinical guidelines.

1137
DETERMINATION OF RELATIVES NEEDS WHOSE PATIENTS HAVE BEEN TREATED IN ICU

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INTRODUCTION. Being treated in an intensive care unit (ICU) may cause negative impacts on the patients as well as their relatives. It is important to know the relatives needs to cope with this burden by providing optimal and holistic nursing care.
OBJECTIVE. The aim of the study was to determine the needs and expectations of ICU patients' relatives.
METHODS. This descriptive study was conducted in a general surgery ICU between 1 October 2011–29 and February 2012. The study sample was formed by the relatives of ICU patients who have been treated at least 24-h in ICU. One hundred and five adult (18 years and older) and volunteer relatives participated in the study. To determine the needs of relatives "ICU Family Needs Inventory-ICU-FNI" was used. The inventory had six subgroups and the scores of subgroups showed the level of needs. An increase of mean scores showed an increase in needs. 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. $P < 0.05$ was accepted as statistically significant.
RESULTS. Relatives of patients were 54.3 % male, 61.0 % high school graduates and mean age was 42.29 ± 12.16. The patients were 66.7 % treated 1–3 days in ICU, and 29.5 % of the relatives stayed as companion. The patients' relatives 87.6 % got information the condition and care and treatment given in ICU while 26.10 % got this information from the doctor and nurse. The ICU-FNI showed the most important needs as 84.8 % "being sure that the patient was given the best treatment", 81.0 % "providing clear explanations", and "feeling that there was a hope", respectively. According to the subgroup score means; the most important needs were information (the highest 32, mean: 29.04 ± 3.26), comfort (the highest 24, mean: 18.78 ± 3.43), and confidence (the highest 28, mean: 21.25 ± 2.46), respectively.
CONCLUSION. This study showed that the patients' relatives' most important needs were information and confidence. It was suggested that the nurses provide holistic care and services of education and consultation to fulfill patients' relatives' needs to cope with the problems they faced.

1138
THE IMPACT ON PATIENT CARE AND SAFETY OF COMPREHENSIVE EDUCATIONAL EFFORTS AT AN INTENSIVE CARE UNIT

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INTRODUCTION. At the Central Intensive Care Unit (CICU) at the Karolinska University Hospital (KUH), we have evaluated all medical emergencies where the team work and thereby patient care, could have been performed in a better and more efficient way. In order to evaluate our work and identify possibilities for improvements CICU has a system for reporting medical incidents. These report forms are graded into "clear medical risk, near-accident, negative incident". The aim with these reports is to have an efficient system that enables CICU to minimize clear medical risk and near-accidents. At the KUH there is a Centre for Advanced Medical Training (CAMST) with advanced equipment for simulator training in an environment similar to the one at CICU. The training is focused on complicated procedures, decision making, stress handling, communication and cooperation in a complex environment.

OBJECTIVES. The objective of this study was to train our entire staff in handling emergency situations to enable optimal care independent of participating staff members and type of emergency situation.

METHODS. The method was comprehensive training of the entire staff. The duration of the training was 1 day (8 h) and the instructors at CAMST had a 3 h theoretical introduction to the upcoming training scenarios (3 or 4). Thereafter the staffs was divided into training groups, each comprising 2 physicians, 3 nurses and 1 assistant nurse. Each training scenario for every group was filmed for immediate evaluation and discussion.

RESULTS. Today 197 out of 289 (68 %) have undergone training and by the end of May 2012 when this project is planned to terminate we estimate that 227 out of 289 (79 %) have been trained. The subjective impact of the training on the participants has been measured by a questionnaire. The result is a positive feedback regarding both the education per se and the possibility to reach the objectives of the training.

CONCLUSIONS. So far we have not evaluated the impact of the CAMST training on patient safety but to elucidate this problem we will follow up our medical incident reports to identify changes in prevalence of "clear medical risks" and "near-accidents". Is this an objective way to measure whether our action in emergency situations around the patient benefit this massive educational effort?

1139
COMPUTER APPLICATION IN INTENSIVE CARE UNIT

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INTRODUCTION. The Intensive Care Unit of Fundació Althaia in Manresa has initiated a new strategy to improve patients' safety by implementing the computer progam Gacela Care, not just in the ICU, but also in all hospitalitzation areas.

OBJECTIVES. To have a global view of the care process, guaranteeing its continuity starting in the ICU and ending in hospitalization. Increase security by avoiding mistakes, getting the information from any area of the hospital at any time, and with the possibility of accessing the data for subsequent evaluation.

METHODS. To implement the project nurses were trained for 12 and 5 h for nursing assistants. Also, we had support by an external nurse 24 h per day the first 17 days. After those days, we had monthly meetings. Concerning the logistics, the project implemented a data recovery system in case of contingency and a computer technical support. To set up a computer infrastructure a powerful WiFi and computers were installed in each box.

RESULTS. General data: 89 were the number of valued records in 2009 versus 61 in 2011. The registry format in 2009 was using paper, in 2011 with the computer support. Income valuation: The 14th valued income necessities (Virginia Henderson model) in 2009 were 68.5 % but in 2011 were 90 %. Falling risk was higher in 2009 (92.1 %) than 2011 (85 %). To detect the risk for impaired skin integrity was better collected in 2009 (92.1 %) than 2011 (85 %). Norton's average income was included in the application so the final number (13.1) meant medium risk. Barthel's preliminary income was 100 % in 2011 but 98.8 % in 2009. Barthel's average was just collected in the application (not with paper support), and got 89 points (low dependence). Social situation per cent was higher in 2011 (98.3 %) than 2009 (97.7 %). Getting to know the reference telephone got 100 % in both cases. Income pain was better known in 2009 (97.7 %) than 2011 (96.8 %).
Nurse diagnosis: In 2011 the application collected two of the most frequent diagnosis: risk for impaired skin integrity (73.7 %) and risk for constipation (42.6 %). Finally, the nurse diagnosis tracking was higher in 2011 (93.7 %) than 2009 (83.6 %).

CONCLUSIONS. After analyzing the results of the study we detect that the great variability of items for assessing falling risk patients hampers their evaluation. We must improve the computer registry tool to accurate this item. To analyze pain item we had to take measures in this regard, like starting on-line courses. Allows consulting information in front of the patient instantly, which prevents errors. Facilitates the planning, recording, improves the quality care, ensures the follow-up of the care plans and allows to recover the data from previous incomes. With different indicators, the system makes a good evaluation allowing to quantify nursing interventions and reducing the use of paper. We can conclude that with a computer support data are recorded more and better.

1140
THE KNOWLEDGE AND ATTITUDES OF NURSES ON PHLEBITIS IN A TRAINING AND RESEARCH HOSPITAL

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INTRODUCTION. The rate of phlebitis related to intravenous (IV) catheters is high and this raises the costs of treatment. Nursing care has an important role in preventing the development of phlebitis.

OBJECTIVE. The aim of the study was to determine the knowledge and attitudes of nurses working in a training and research hospital on phlebitis related to IV catheters.

METHODS. This cross-sectional and descriptive study was performed by volunteer nurses who were working in a training and research hospital. Permission has been taken from the local ethics committee and the nursing management service of the hospital before beginning the study. Data has been collected between 1 and 31 March 2012 by means of a questionnaire form by prepared by the researchers. This questionnaire was included two sections. The first section was included nurses demographics (age, education degree, units they worked, etc.), the second section was included the knowledge and attitude about phlebitis. Multiple choices questions about the knowledge on phlebitis (13 questions) and attitudes (11 questions) were derived from the literatures and current venous catheters infection prevention guidelines. The questionnaires were disturbed to 341 nurses and 299 (87.7 %) were returned. SPSS 15.0 was used to statistical analyses of the data. Statistical analyses was made by frequents, percentages, means and standard deviations, and Kruskal–Wallis analysis was uses for comparing the groups and $p < 0.05$ was accepted as statistically significant.

RESULTS. All the 299 nurses who participated in the study were female. The mean age was 31.32 ± 6.08 (range 21–52) years, 77.6 % baccalaureate, the mean professional experience 10.34 ± 6.86 years, 50.2 % were working in surgical, and 33.1 % medical units. Most of the nurses (77.9 %) were educated on phlebitis in advance and where as 75.6 % got this education in nursing. Some nurses 34.4 % evaluated that education totally in adequate, some other nurses 44.5 % evaluated it nearly adequate. According to the nurses (58.4 %) the rate of phlebitis occurrences in their unit was between 6 and 20 %. The mean of nurses' correct answers was 8.22 ± 1.53 (range 4–11) for total 13 knowledge questions. The differences between taking education on phlebitis and the total professional experiences groups was statistically significant ($p < 0.05$). The nurses 62.2 % were eager on taking education on phlebitis.

CONCLUSION. This study showed that most of the nurses were stated that they had an education on phlebitis their knowledge was inadequate. In addition according to the nurses observation on the development of phlebitis rate was high. It was concluded that informing the nurses about current guidelines on phlebitis and educate them periodically would be beneficial.


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Author index

The numbers are abstract numbers

B

C

D

H

L

M

N

O

P

Q

R

T

W

X

Y