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This supplement issue of the official ESICM/ESPNIC journal *Intensive Care Medicine* contains abstracts of scientific papers presented at the 20th Annual Congress of the European Society of Intensive Care Medicine.

The abstracts appear in order of presentation from Monday 8 October until Wednesday 10 October 2007.
The same abstract numbering is used in the Congress final programme.

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Wednesday 10 October 2007

ECCRN
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Abstracts submitted and selected under the label ECCRN. To be displayed during the three-day congress at the ECCRN corner close to the ESICM booth.

Abstracts pre-selected for the *Poster Awards*.

Oral Presentations
Treatment strategies in sepsis 0001-0005

0001

SEPSIS MORTALITY CAN BE REDUCED BY AN EDUCATIONAL PROGRAM BASED ON GUIDELINES

R. Ferrer*, Edusepsis investigators
Critical Care Center, Sabadell Hospital. Corporacio Sanitaria Parc Tauli., Sabadell, Spain

INTRODUCTION. The Surviving Sepsis Campaign (SSC) published the severe sepsis guidelines and proposed the "sepsis care bundles" as a method of clinical improvement (1). The aim of the study is to analyze the impact of a multicenter educational program (EP) based on SSC guidelines on treatment compliance and mortality.

METHODS. Seventy seven Spanish ICUs, representing 1251 critical care beds, with a homogeneous distribution around the country were included in a prospective study. We determined the rate of compliance of the resuscitation bundle (first 6-hour) and the management bundle (first 24-hour) during two months before the EP and four months after the EP. The EP targeted ICU, medical and surgical clinicians' application of SSC guidelines. All centers utilized the same teaching material.

RESULTS. We analyzed 2495 consecutive episodes of severe sepsis (20%) or septic shock (80%) admitted in the UCI (APACHE-II: 21 ± 7; Age: 62 ± 16 years; Male: 59%). The main sources of infection were: lung 38.5%, abdomen 30.2% and UTI 9.2%. Global hospital mortality was 41%. Non survivors were older (65.3 vs 60.0 years;p=0.000), had higher APACHE-II (24.7 vs 19.0;p=0.000), higher lactate (41.5 vs 29.9 mg/dL;p=0.000), and had worse compliance of the resuscitation bundle (6.7% vs 8.7%;p=0.045) and the management bundle (11.5% vs 15.3%;p=0.005). The after-EP population did not differ significantly in terms of age, APACHE-II score and lactate of the PRE-EP population. After the EP, the compliance of the bundles improved and survival improved: Table 1.

TABLE 1.

	PRE-EP	POST-EP	p
Resuscitation bundle compliance (%)	4.9	9.7	0.000
Management bundle compliance (%)	10.5	15.7	0.000
Mortality (%)	44.9	39.5	0.005

CONCLUSION. A multicenter EP was able to improve compliance of the sepsis guidelines and to improve survival. Waiting for new therapies for severe sepsis, further efforts should be made in order to improve compliance of the current recommendations.

REFERENCE(S). 1.- Dellinger RP,Carlet JM, Masur H, Gerlach H et al. Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. Intensive Care Med 2004;30(4):536-55.

0002

PREHOSPITAL USE OF STATINS AND SHORT- AND LONG-TERM OUTCOME OF INTENSIVE CARE - A DANISH COHORT STUDY

S. Christensen*[1], R. W. Thomsen[1], L. Pedersen[1], R. Jensen[2], K. M. Larsen[2], A. Larson[2], E. Tønnsen[2], H. T. Sørensen[1]
[1]Clinical Epidemiology, [2]Departments of Anaesthesiology and Intensive Care, Aarhus University Hospital, Aarhus, Denmark

INTRODUCTION. Statins may have beneficial immuno-modulating effects in critical ill patients. Whether preadmission statin use improves prognosis for ICU patients is not known.

METHODS. Cohort study of 7,020 critically ill ICU patients > 45 yrs of age with a first-time admission to one of three tertiary ICUs between 1999 and 2004. Preadmission statin users (n=747, 10.6%) were identified through population-based prescription databases. Information on use of ACE-inhibitors, low-dose aspirin or betablockers as well as main discharge diagnosis, department (medical/surgical), comorbidity, alcohol-related diseases, surgical procedures and use of mechanical ventilation and dialysis was obtained through prescription databases, discharge registries and the ICU database, respectively. We used Cox-regression analysis to compute mortality rate ratios (MRR) at 0-30 and 31-365 days after ICU admission in statin users vs. non-users controlling for potential confounding factors. We are still analysing the data and in this abstract we therefore present preliminary results.

RESULTS. Preliminary results suggest that statin use was associated with 30% reduced 30-day mortality [(22.1% vs. 25.7% corresponding to an adjusted MRR 0.69 (95% CI: 0.59-0.82)]. Similarly, prehospital statin use was associated with reduced 31-365 day mortality [(16.5% vs. 19.9% corresponding to an adjusted MRR 0.62 (95% CI: 0.49-0.77)]. We found reduced short- and long-term mortality among both medical and surgical ICU statin users and when analyses were restricted to patients with previous cardiovascular disease and diabetes.

CONCLUSION. Preliminary results from this large population-based cohort study showed that prehospital use of statins was associated with a substantially reduced short- and long-term mortality among ICU patients.

GRANT ACKNOWLEDGEMENT. This work was made possible through financial support from the Danish Medical Research Council grant 271-05-0511.

0003

IMMUNE EFFECTS OF HYDROCORTISONE IN SEPTIC SHOCK – RESULTS FROM THE CORTICUS BERLIN STUDY GROUP

O. Ahlers*[1], C. L. Sprung[2], J. Briegel[3], H. D. Volk[4], D. Annane[5], R. Moreno[6], M. Singer[7], R. Rueb[8], T. Engelhardt[9], H. Gerlach[10], D. Keh[11]
[1]Anesthesiology and Critical Care Medicine (ACCM), Charité Universitaetsmedizin, Berlin, Germany, [2]ACCM, Hadassah Hebrew University Medical Center, Jerusalem, Israel, [3]Anesthesiology, Ludwig-Maximilians-Universitaet, Munich, [4]Medical Immunology, Charité, Berlin, Germany, [5]ICU, Raymond Poincaré Hospital, Garches, France, [6]UCIP, H.St.António dos Capuchos, C. Hosp. de Lisboa Central EPE., Lisbon, Portugal, [7]Medicine and Wolfson Institute of Biomedical Research, University College, London, United Kingdom, [8]ACCM, Vivantes Klinikum Spandau, Berlin, [9]ACCM, Charité, Berlin, [10]ACCM, Vivantes Klinikum Neukoelln, Berlin, [11]ACCM on behalf of the CORTICUS Berlin Study Group, Charité, Berlin, Germany

INTRODUCTION. We investigated immune effects of hydrocortisone (HC) administration in septic shock with regard to adrenal function.

METHODS. Patients were enrolled in the randomized study of HC in septic shock (CORTICUS). A 250 µg ACTH-test was performed before administration of HC (50 mg q 6h for 5 days, tapered until day 11) or placebo (PL); cortisol was measured in a central laboratory. Responders (R) were defined by an incremental cortisol increase >9 µg/dl and non-responders (NR) </=9 µg/dl. Interleukin 6, nitrite/nitrate (nitric oxide), LPS-stimulated TNF release from monocytes, and quantitative HLADR receptor expression on monocytes was measured at baseline, day 3 (D3), and 6 (D6). Values on D3 and D6 were adjusted for baseline and analyzed with GLM for repeated measurements.

RESULTS. From Mar02 - Nov05, 84 patients were enrolled in 13 sites: 42 HC (26 R and 16 NR) and 42 PL (30 R and 12 NR). Mean BL values were: IL6: HC 350 pg/ml (95%CI: 62-676), PL 369 (58-668), R 321 (57-638), NR 436 (150-679), R vs. NR p<0.005; HLADR: HC 4504/cell (527-15707), PL 4331 (650-14331), R 4472 (658-15178), NR 4294 (527-13680); TNF: HC 269 pg/ml (6-1695), PL 131 (4-711), HC vs. PL p<0.05, R 187 (5-1137), NR 232 (6-1132), nitrite/nitrate: HC 103 µmol/L (10-435), PL 87 (9-398), R 91 (9-358), NR 103 (22-448). Mean changes from baseline were: IL6: HC -76% (D3) and -79% (D6), PL -49% and -65%, p<0.005; HLADR: HC -8% and +13%, PL +12% and +16%; TNF: HC +23% and +138%, PL +113% and +325%, p=0.052; nitrite/nitrate: HC -20% and -45%, PL +27% and +24%, p<0.05. Within the HC-group, changes from baseline were not significantly different between R and NR for all parameters. Within the PL-group, IL6 decrease was significantly higher in NR (p<0.05) whereas no differences could be observed for other parameters.

CONCLUSION. NR had significantly higher IL6 values at baseline than R. HC attenuated IL6 and nitric oxide production significantly. HC transiently depressed HLADR expression on day 3 and showed a trend toward a significant attenuation of LPS-induced TNF release from monocytes. The observed immune effects of HC were independent of adrenal function at baseline.

GRANT ACKNOWLEDGEMENT. Deutsche Forschungsgemeinschaft (KE870/1-1,2), European Union, European Society of Intensive Care Medicine, International Sepsis Forum.

0004

FLUID CHALLENGE SOLUTIONS AT THE ACUTE PHASE OF SEPSIS: A MULTICENTRIC STUDY OF THE CLINICAL PRACTICE

L. Zoric*[1], S. Jaber[2], L. Muller[1], Y. Falque[3], B. Jung[4], J. Lefrant[1]
[1]Division Anesthesie Reanimation Douleur Urgence, GHU Caremeau, Nimes, [2]DAR B, [3]DAR A, [4]Reanimation medicale, CHU Montpellier, Montpellier, France

INTRODUCTION. The recent Meta analysis show no impact of the choice of the fluid challenge solution (colloid or crystalloid) during severe septic states on survival (Cochrane Dat Review 2004). The two types of solutions seem to be equally used (Schortgen Intensive Care Med 2004). The French recommendations SFAR/SRLF 2005 recommend to prefer colloids since their cost is lower and the crystalloids have not proven their superiority. The endpoint of this study was to analyse the fluid challenge solutions used during the first 24 h of severe sepsis after the publication of these recommendations.

METHODS. A multicentric study realised during 2006 in 14 intensive care units of 9 hospitals (2 university hospitals) of the French region Languedoc Roussillon. The first retrospective phase lasted from Jan 1st until the June 1st and it was followed by a prospective phase from Jun 2nd until Dec 31 2006. Inclusion criteria: severe sepsis or septic choc < 24 hours defined according to the surviving sepsis campaign criteria. Exclusion criteria: moribund patients, patients with immunodepression, sepsis evaluating for more than 24 hours. Age, sex, body mass index (BMI), IGS II and SOFA scores, the kind and the volume of fluid during the first 6 and 24 hours were studied.

RESULTS. 445 out of the 538 eligible patients were included (230 men). The mean BMI was 26.9 +/-7.6. The median IGS II and SOFA sores were respectively 46 (interquartile = IQ:38-58)) and 7 (IQ :5-10). During the first 24 hours, 11 patients received no fluid challenge (2.5%), 318 (71%) received an association of crystalloids and colloids, 75 (17%) received only crystalloids and 41 (9%) only colloids. The median volumes infused during the first 24 hours were 3500 ml (IQ : 2000-5000), 2500 ml (IQ : 1500-4000) of crystalloids and 1000 ml (IQ : 600-1800) of colloids. The volume ratio between crystalloids and colloids was 40 %. During the first 6 hours, 264 (59%) of the patients received an association of crystalloids and colloids whereas from the 6th to the 24th hour this association was used in only 177 patients (40%) (p<0.001).

CONCLUSION. At the acute phase of severe sepsis states the quantity of infused fluids is low. More than 70% of patients receive a fluid challenge combining 40% of colloids and 60 of crystalloids. The use of colloids is more frequent during the first 6 hours. These results contrast with the current practice recommendations.

0005

SEPTIC SHOCK REANIMATION BASED ON VENTRICULAR-ARTERIAL COUPLING VS PULMONARY ARTERY CATHETER-DERIVED VARIABLES

E. Monares Zepeda*[1], J. E. Etulain[1], J. P. Membreno[1], V. Colin[1], C. G. Sanchez Castrillo[2], C. I. Olvera[1], M. Poblano[1], J. Aguirre[1], J. Martinez[1]
[1]Intensive Care Unit, [2]Institutional Research Committee, American British Cowdray Medical Center, Mexico City, Mexico

INTRODUCTION. Mortality from septic shock (SS) remains elevated. In selected patients (sinusal rhythm, controlled mechanical ventilation (MV) without respiratory effort and tidal volume (TV) >6ml/kgIBW and without right ventricular failure) an algorithm based in arterial tone and ventricular arterial coupling hemodynamic functional monitoring could be useful.

METHODS. In an 11 bed ICU, from january 2006 to january 2007 SS patients were selected and randomized in two groups: the 1rs one was reanimated following the pulmonary artery catheter (PAC) protocol suggested by Vincent and Pinsky (1), while the 2nd group was reanimated using the Vigileo system and Pinsky's protocol (2) based in preload response, arterial tone and ventricular arterial coupling. APACHE II and SOFA scores, mortality, lengths of stay, duration of MV and time of achievement of the goals were measured. Percentage, Mean, Standard deviation 25th-75th, Chi-Square, Fisher's Exact test were used for the statistical analysis.

RESULTS. 35 patients were included: 20 in the PAC group (SG) and 15 in the Vigileo group (VG), with 5 of them being excluded due to arrhytmia or TV<6ml/kg. For SG, age was 71(59-75), APACHE II 28(25-30), SOFA 12(12-14), mean arterial pressure (MAP) 64(60-65) mmHg, central venous pressure (CVP) 13.5 (11.2-15)mmHg, cardiac index (CI) 2.2 (1.8-2.4)L/min/m^2, stroke volume index (SVI)30.5 (30-34.7), SvO2 63 (61-64)%, O2 extraction ratio 40 (38-40). In VG: mean age was 68 (45-79), APACHE II 27 (25-28), SOFA 12 (10-14), MAP 60 (60-65) mmHg, CVP 10 (8-15) mmHg, CI 2.0 (2.0-2.1)L/min/m^2, SVI 31 (29.5-35.2), SvO_2 60% (57-60), O_2 extraction ratio 40 (38-40). Time between SS diagnosis and algorithm implement was: for SG 5 (4-6) and 8 (8-9.2) in VG (P<0.005). Goals were achieved in the SG in 8 (7.2-9) hours, and in 5 (4-6) hours in VG P=0.03. After 24 hours: APACHE II improved from 28 to 21 (P=0.02) and SOFA from 12 to 10 (P=0.03) in VG (SG remained without changes). Fluids required in the first 6 hours were: SG 400 (250-500) and VG 550 (250-950) ml/hr (P=0.056); after 24 hours SG 200 (100-200) and VG 250 (250-500) (P<0.005); norepinephrine and dobutamine requirements after 6 and 24 hours were similar. Mortality in the SG was 66%, while in VG was 33.3% (P=0.06).

CONCLUSION. The reanimation goals were achieved firstly in the group of Ventricular arterial coupling protocol with hemodynamic functional monitoring. Mortality showed no statistic difference due to the small number of patients.

REFERENCE(S). 1. Pinsky M, Vincent JL Let us use the pulmonary artery catheter correctly and only when we need it. Crit Care Med. 2005;33:1119-22
2. Pinsky MR Functional hemodynamic monitoring In: Vincent JL (ed) Yearbook of Emergency and Intensive Care Medicine Springer-Verlag, Heidelberg 2005, pp 381-95.

Oral Presentations
Global perfusion 0006-0010

0006

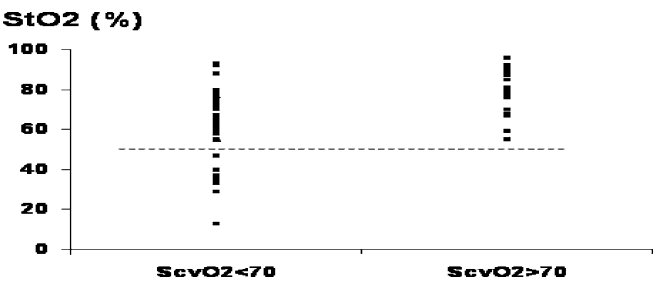
MUSCLE OXYGEN SATURATION CANNOT PREDICT CENTRAL VENOUS OXYGEN SATURATION IN PATIENTS WITH SEVERE SEPSIS

J. Creteur*, G. Ospina, T. Oliveira Silva, D. De Backer, J. Vincent
Intensive Care Department, Erasme University Hospital, Brussels, Belgium

INTRODUCTION. Central venous oxygen saturation (ScvO2) monitoring has been proposed to guide resuscitation in the early phase of severe sepsis. Nevertheless, this monitoring requires the insertion of a central venous catheter. On the other hand, muscle saturation (StO2) can be assessed rapidly and non-invasively by near-infrared spectroscopy (NIRS). We hypothesized that StO2 measurements can predict ScvO2 values in patients with severe sepsis.

METHODS. In 10 patients with severe sepsis, we obtained simultaneous measurements of ScvO2 and thenar eminence StO2 on admission, and at 2,4,6,24 and 48hrs. ScvO2 was measured from superior vena cava blood samples with a blood gas analyzer, and StO2 was measured by a tissue spectrometer (InSpectra Model 325, Hutchinson Technology Inc, Hutchinson, MN).

RESULTS. 60 paired measurements were obtained. ScvO2 was above 70% in 16 measurements. All StO2 values below 50% corresponded to a ScvO2 value below 70%. Nevertheless, for values of StO2 above 50%, StO2 measurement was not able to differentiate ScvO2 values below or above 70% (Figure).



CONCLUSION. Muscle oxygen saturation monitoring cannot replace central venous oxygen saturation monitoring in patients with severe sepsis.

0007

EFFECTS OF LOW CARDIAC OUTPUT AND HYPOXEMIA ON MITOCHONDRIAL FUNCTION AND OXYGEN CONSUMPTION

T. Regueira*[1], S. Brandt[2], L. E. Bruegger[3], F. Porta[1], E. Borotto[1], J. Gorrasi[1], P. M. Lepper[1], S. Djafarzadeh[1], J. Takala[1], S. M. Jakob[1]
[1]Intensive Care, [2]Anesthesiology, [3]Visceral and Transplant Surgery, University Hospital, Bern, Switzerland

INTRODUCTION. Tissue oxygenation and mitochondrial dysfunction may contribute to poor prognosis. We hypothesized that the mechanism of reduced tissue oxygen supply may be relevant to changes in organ and mitochondrial function. We therefore compared splanchnic hemodynamics and mitochondrial function in cardiac tamponade (CT) and hypoxic hypoxia (HH).

METHODS. Pigs were randomized to CT (8), HH (8) or controls (8). In CT, cardiac output was reduced in 6-hr steps to 50, 40 and 30 mlkg-1min-1. In HH, FiO2 was reduced in 6 hrs to reach a PaO2 of 50-60 mmHg and at 12 hrs to <50 mmHg. The lowest levels were mantain until 24 hrs. Systemic (thermodilution) and hepatosplanchnic blood flow (ultrasound), oxygen transport and lactate exchange were measured at 0, 3, 6, 12 and 24 hours. Muscle and hepatic mitochondrial oxygen consumption was measured polarographically.

RESULTS. Systemic DO2 decreased from 9.8 ± 1.8 to 5.5 ± 1.8 mlkg-1min-1 (41%) in CT, but was maintained in HH due to increased blood flow. In both, CT and HH, muscle PO2 decrease significantly (p<0.01). Systemic and regional VO2 did not change in any group, but systemic and regional O2-extraction increased in CT (p<0.01). Despite maintained oxygen consumption, hepatic lactate uptake decreased significantly in CT (p<0.005). Liver and muscle mitochondrial glutamate-dependent respiration decreased in both CT and HH, mostly due to a reduction in HH. Mortality and median survival times were similar in CT and HH (63% and 50%, 22.5 and 23.5 hours, respectively).

Variable	Group	Baseline	3 hours	6 hours	12 hours	End
Systemic O_2 extraction (fraction)	Controls	0,43 ± 0,1	0,44 ± 0,1	0,42 ± 0,1	0,42 ± 0,1	0,40 ± 0,1
	Hypoxia	0,49 ± 0,1	0,53 ± 0,1	0,57 ± 0,2	0,56 ± 0,04	0,53 ± 0,1
	Tamponade	0,48 ± 0,1	0,55 ± 0,1	0,58 ± 0,1	0,65 ± 0,08	0,78 ± 0,2 [ab]
Hepatic lactate uptake (µmol kg^{-1}min^{-1})	Controls	7,76 ± 3,5	9,12 ± 2,9	9,85 ± 3,8	10,2 ± 3,1	9,68 ± 3,3
	Hypoxia	9,3 ± 3,8	9,2 ± 4,1	7,5 ± 3,5	7,2 ± 4,2	9,1 ± 7
	Tamponade	9,1 ± 3	8,2 ± 2,6	7,2 ± 4,3	8,2 ± 4,8	-4,5 ± 9,6 [ab]
Muscle PO2 (mmHg)	Controls	44,6 ± 19,8	31,7 ± 9,7	31,3 ± 10,3	26,2 ± 12,4	23,2 ± 9,9
	Hypoxia	44,5 ± 15	18,9 ± 1,5	22,5 ± 9,1	15,3 ± 4,2	13,5 ± 3,8 [a]
	Tamponade	31,9 ± 18,8	21,8 ± 15,3	21,4 ± 11,1	13,4 ± 9,4	9,3 ± 6,3 [ab]
Liver Mitochondria: State 3 for Complex I (nanoatom min^{-1}mg^{-1})	Controls					73,5 ± 19
	Hypoxia					45,7 ± 18
	Tamponade					58,8 ± 17 [a]
Muscle Mitochondria: RCR for Complex I	Controls	10,9 ± 4,5		11,1 ± 5,9		12,5 ± 3,3
	Hypoxia	11,6 ± 3,7		11,4 ± 4,3		7,03 ± 2
	Tamponade	13,8 ± 4,5		13,8 ± 4,1		10,3 ± 3,5 [ab]

[a] p<0.05 (Friedman) for temporal evolution; [b] p<0.05 (Kruskal Wallis) compare end values of the groups.

CONCLUSION. Both HH with preserved DO2 and CT with markedly reduced DO2 resulted in low muscle PO2 and hepatic and muscle mitochondrial dysfunction despite preserved systemic and regional VO2. These results suggest that low tissue PO2 with either preserved or low blood flow may contribute to mitochondrial dysfunction.

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0008

EFFECTS OF HYPEROXIA ON TISSUE OXYGENATION DURING PROGRESSIVE HAEMORRHAGE

A. Dyson*, R. Stidwill, V. Taylor, M. Singer
Wolfson Institute for Biomedical Research, University College London, London, United Kingdom

INTRODUCTION. Although high flow, high concentration oxygen therapy is a routine component of resuscitation, its effect on tissue oxygenation (tPO_2) during severe blood loss is uncertain. Accordingly, we sought to determine the effects of hyperoxia on haemodynamics and tissue oxygen tension (an index of the local supply/demand balance) in various organ beds during mild and severe haemorrhage.

METHODS. Under isoflurane anaesthesia, male Wistar rats (approx 300g weight) underwent left common carotid and right jugular venous cannulation for blood sampling/BP monitoring and fluid administration, respectively. Ultrasonic flow probes (Transonic Systems, USA) measured blood flow in the descending aorta (ABF) and left renal artery (RBF). Tissue PO_2 was determined using Oxylite probes (Oxford Optronix, UK) placed in thigh muscle, between the right and left lobes of the liver, in the left renal cortex and within the bladder lumen. After a 30-min stabilisation period, normovolaemic, fluid resuscitated rats (20 ml/kg/h, n-saline) were subjected to 21% and 60% inspired oxygen (n=7). In separate experiments, the effects of hyperoxia vs room air were determined following removal of 20% (mild haemorrhage; n=8) and 50% (severe haemorrhage; n=4) of estimated blood volume. Statistics were performed using two-way ANOVA and post-hoc Tukey's test.

RESULTS. Data shown as mean (± SE), *p<0.05 between 0.21 and 0.60 FiO_2, $^{£}$p<0.05 between normovolaemia and mild haemorrhage, $^{\#}$p<0.05 between normovolaemia and severe haemorrhage. Baseline (B) in the 0.60 FiO_2 group denotes readings prior to hyperoxia i.e. at 0.21 FiO_2. $^{\$}$p<0.05 between baseline (normovolaemia, normoxia) and 0% (normovolaemia, hyperoxia FiO_2 0.60).

FiO_2 (Blood loss)	BP (mmHg)	ABF (ml/min)	RBF (ml/min)	Muscle tPO_2 (kPa)	Bladder tPO_2 (kPa)	Liver tPO_2 (kPa)	Kidney tPO_2 (kPa)
0.21 (0%)	92 (2)	41 (2)	7.2 (0.5)	4.8 (0.3)	7.5 (0.3)	2.9 (0.3)	1.8 (0.2)
0.21 (20%)	79 (5)$^{£}$	24 (2)$^{£}$	6.4 (0.9)	4.9 (0.4)	6.3 (0.4)$^{£}$	1.9 (0.3)$^{£}$	3.0 (0.7)
0.21 (50%)	49 (4)$^{\#}$	16 (1)$^{\#}$	2.6 (0.6)$^{\#}$	2.5 (0.8)$^{\#}$	2.4 (0.8)$^{\#}$	0.7 (0.3)$^{\#}$	2.3 (0.7)
0.60 (B)	97 (4)	40 (2)	5.8 (0.9)	5.8 (0.9)	8.3 (0.7)	3.3 (0.5)	2.2 (0.3)
0.60 (0%)	110 (7)	31 (3)	6.1 (0.9)	14.4 (1.4)$^{\$*}$	24.3 (1.2)$^{\$*}$	7.2 (1.3)$^{\$*}$	6.3 (0.5)$^{\$*}$
0.60 (20%)	83 (6)$^{£}$	23 (2)$^{£}$	5.2 (1.0)	6.4 (0.7)$^{£}$	15.6 (2.6)$^{£*}$	4.3 (0.7)*	4.2 (1.4)
0.60 (50%)	52 (4)$^{\#}$	9 (1)$^{\#*}$	2.1 (0.8)$^{\#}$	0.03 (0)$^{\#*}$	4.2 (1.0)$^{\#}$	0.7 (0.4)$^{\#}$	2.8 (0.7)$^{\#}$

CONCLUSION. During normovolaemia, hyperoxia significantly increased tissue PO_2 in all organ beds and trended towards a vasoconstrictor response. Hyperoxia raised tissue PO_2 during mild haemorrhage but had no impact during severe haemorrhage, neither at FiO_2 0.6 or at 1.0 (data not shown). These findings indicate the lack of utility of supplemental oxygen in improving tissue oxygenation during this severe low flow state. Despite the significant impairment of renal blood flow with severe haemorrhage, the absence of change in renal cortical PO_2 highlights the rapid adaptation of this organ in contrast to the others studied.

GRANT ACKNOWLEDGEMENT. This work is supported by the Medical Research Council (UK).

0009

ERYTHROPOIETIN DURING THORACIC AORTIC BALLOON-OCCLUSION-INDUCED ISCHEMIA-REPERFUSION INJURY

F. Simon*[1], G. Bassi[2], S. Öter[2], C. Nguyen Duong[2], E. Calzia[2], J. Kick[1], P. Radermacher[2], H. Schelzig[1]
[1]Abteilung Thorax- und Gefäßchirurgie, [2]Sektion Anästhesiologische Pathophysiologie und Verfahrensentwicklung, Universitätsklinikum, Ulm, Germany

INTRODUCTION. Thoracic aortic cross-clamping is a typical clinical example of ischemia/reperfusion injury (I/R) of the lower body part, the most vulnerable target being the kidney and the spinal cord. In unresucitated rodent models, high-dose erythropoietin (EPO) was shown to attenuate both cerebral and renal I/R injury. Therefore we investigated the effects of i.v. EPO in a clinically relevant porcine model of thoracic aortic occlusion-induced I/R injury.

METHODS. 14 anesthetized, ventilated and instrumented pigs randomly received either EPO (n=8; 300 IU/kg both over 30 minutes before as well as during the first 4 hours of reperfusion) or vehicle (n=6). Thereafter, animals underwent 45 minutes of aortic occlusion using inflatable balloons placed immediately downstream the A. subclavia and upstream the aortic bifurcation. During aortic occlusion, mean arterial pressure (MAP) was maintained between 80-120 % of the pre-occlusion levels using continuous i.v. esmolol, nitroglycerine and ATP. During the early reperfusion period continuous i.v. noradrenaline was titrated as required to maintain MAP > 80 % of the baseline level. Kidney blood flow and function were assessed by PAH- and creatinine-clearance, respectively, spinal cord function by motor evoked potentials and lower extremity reflexes. DNA damage in whole blood samples was evaluated with the alkaline version of the comet assay. Oxidative stress was determined by isoprostane blood levels as well as blood and renal tissue catalase and superoxid dismutase activities. After 8 hours of reperfusion post mortem kidney and spinal specimen were taken for histologic (hematoxylin eosin and Nissl staining, respectively) evaluation and apoptosis (TUNEL-assay). Data are median (range), intergroup differences were tested with an unpaired rank sum test.

RESULTS. EPO-treated pigs showed significantly (p=0.020) lower noradrenaline requirements to achieve hemodynamic targets during early reperfusion, and enhanced repair of I/R-related DNA damage. Furthermore, despite comparable renal blood flow, creatinine-clearance was also significantly higher (67 (45-126) vs. 49 (38-63) mL/min, p=0.029) in these animals. Spinal cord function did not differ between groups.

CONCLUSION. In our clinically relevant swine model, we confirmed the high-dose EPO-related protection of renal function reported in rodent models. The lacking beneficial of EPO on spinal cord function is mostly likely due to the relatively long period of spinal cord ischemia.

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0010

IS INTRATHORACIC BLOOD VOLUME INDEX AN IDEAL TARGET PARAMETER OF FLUID RESUSCITATION AFTER BURN INJURY?

C. Csontos*[1], V. Foldi[1], T. Fischer[2], L. Bogar[1]
[1]Anaesthesia and Intensive Care, [2]Ist Surgical Department, Medical University, Pécs, Hungary

INTRODUCTION. A number of target points have been used for fluid replacement in severely burned patients. The aim of our prospective randomised study was to compare the effect of two different types of fluid resuscitation regimes on the saturation of central venous haemoglobin (ScvO2) and multiple organ dysfunction score (MODS) in the first three days after injury. Moreover, the correlations between ScvO2 and preload parameters measured with transpulmonary dilution technique (PiCCO), and conventional parameters (central venous pressure: CVP, hourly urine output: HUO) were also studied.

METHODS. Twenty four patients were involved in the study. Inclusion criteria were the presence of burn injury affecting more than 15% of body surface area and in-hospital fluid resuscitation started within 3 hours after burn injury. Patients were randomised into two groups. In Group I (n=12) the fluid resuscitation was guided by the hourly urine output (target: 0.5 – 1.0 ml kg-1 h-1), in Group II (n=12) by the intrathoracic blood volume index (ITBVI, target: 800 - 850 ml m-2). Invasive transpulmonary haemodynamic measurements utilizing pulse contour analysis were performed with single dilution technique in both groups. For continuous ScvO2 measurement, a special fiberoptic probe was introduced in both groups. Haemodynamic parameters, ScvO2 and central venous pressure were measured in group I eight hourly, in group II two hourly. Daily MODS was calculated and HUO was averaged eight hourly.

RESULTS. Significant more fluid was administered in group II (5.8 ml kg-1 %-1, IQR 6.8–4.8) than in group I on day 1 (4.8 ml kg-1 %-1 IQR 5.0-4.5, p<0.05). Mean ScvO2 was significantly lower in Group I than in Group II (68.0 %, IQR 64-71 vs. 74 %, IQR 71-78; respectively; p<0.05) for the first 24 hours. MODS was significantly higher in Group I than in Group II calculated at 48 hours (5.0, IQR 4.25-5.75; 4.0, IQR 3-4.25, respectively; p<0.05) and 72 hours after injury (5.0, IQR 4.25 – 6.0; 3.0, IQR 3.25 – 3.75, respectively; p<0.05). The two main outcome parameters i.e. ScvO2 (measured on day 1) and MODS (calculated at 48 and 72 hours after injury) were in significant negative linear correlation (r=-0.684, p< 0.01, r=-0.677, p<0.01, respectively). ITBVI showed positive correlations with ScvO2 measured on day 1 (r=0.855, p<0.001) and CI (r=0.491, p<0.001). ScvO2 measured on day 1 did not show correlation neither with CVP nor with HUO. Extravascular lung water index was not significantly different between Group I and II on the first (6.0 ml kg-2, IQR 5.0 – 7.0, 6.0 ml kg-2, IQR 5.0 – 7.0, respectively; NS) or the second day after admission (7.0 ml kg-2, IQR 6.0 – 9.0; 6.0 ml kg-2, IQR 5.5 – 7.75, respectively; NS).

CONCLUSION. Our data suggests that ITBVI may be a better target parameter than HUO in the fluid resuscitation of severely burned patients in the first two days post injury.

Oral Presentations
Acute brain injury 0011-0015

0011

INFUSION STRATEGY IN PATIENTS WITH INTRACRANIAL HEMORRHAGE

S. S. Petrikov*[1], V. V. Krylov[2], A. A. Solodov[1]
[1]Neurosurgical ICU, [2]Neurosurgery, Sklifosovsky Emergency Medicine Institute, Moscow, Russian Federation

INTRODUCTION. The problem of infusion strategy choice in patients with the intracranial hemorrhage is not solved yet. We compared different strategies of infusion therapy in such patients.

METHODS. 12 patients with intracranial hemorrhage enrolled in the study (GCS 4 – 9). During 3 days after admission to the ICU six patients received infusion of 0.9% NaCl only (group "NaCl") and another six patients - combination of HES 130/0.4/9:1 (Voluven) with 0.9% NaCl in 1:1 ratio (group "Voluven"). Decision about infusion volume was based on the clinical signs. Every 4 hours after the beginning of the investigation blood gases and hemodynamic parameters (PICCO plus) (cardiac index (CI), global end diastolic volume index (GEDI), stroke volume variation (SVV), system vascular resistance index (SVRI), extravascular lung water index (EVLWI)) were investigated.

RESULTS. Initially parameters investigated didn't differ between groups. Day to day analyses showed marked benefits of using combination of Normal Saline with HES (Table 1). Infusion volume was the same in the both groups. "NaCl" group: 1 day - 4320±756 ml, 2 day - 4383±1227 ml, 3 day - 4900±876 ml. "Voluven" group: 1 day - 5266±909 ml, 2 day - 5150±1091 ml, 3 day - 5200±1645 ml.

TABLE 1.

Parameters investigated in "NaCl" and "Voluven" groups(M & SD)

	"NaCl" 1 day (n=10)	"NaCl" 2 day (n=26)	"NaCl" 3 day (n=23)	"Voluven" 1 day (n=16)	"Voluven" 2 day (n=21)	"Voluven" 3 day (n=22)
CI (l/min/m2)	4±0.8	4.3±1.3	5.2±1.3*,**	4.1±1.5	4.1±0.8	4.8±0.6*,**
GEDI (ml/m2)	641±174	710±147	819±280	665±154	706±149	751±127*
SVV (%)	14±5	12±5	12±4	14±8	10±5	8±3*,†
SVRI dyn*s*cm-5/m2	2227±277	2258±670	2014±590	2234±742	2050±567	1905±391
EVLWI (ml/kg)	7±2	7±2	10±5*,**	6±2	6±2	6±2†
PaO2/FiO2	409±44	396±80	342±90*,**	365±120	363±81	378±80

**- p<0.05 vs 1 day; **- p<0.05 vs 2 day; † - p<0.05 vs "NaCl";n – thermodylutions*

CONCLUSION. 1) Infusion of HES 130/0.4/9:1 and 0.9% NaCl combination in 1:1 ratio provided better volume status correction in comparison with management by normal saline only in patients with intracranial hemorrhage. 2) Infusion therapy by 0.9% NaCl increased EVLWI and decreased PaO2/FiO2 ratio.

0012

NEURONAL APOPTOSIS IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY: AN IN VITRO, IN VIVO AND POSTMORTEM STUDY.

M. Ballesteros*[1], M. López-Hoyos[2], J. Figols[3], M. Marín[2], P. Muñoz[4], M. Mayorga[3], E. Miñambres[1]
[1]Service of Intensive Care, [2]Service of Immunology, [3]Department of Pathology, Hospital Universitario Marqués de Valdecilla, [4]Epidemiologist. Atención Primaria, Servicio Cántabro de Salud, Santander, Spain

INTRODUCTION. To analyze the presence of apoptosis and the expression of apoptosis-related proteins in neurons obtained from brain samples of patients with traumatic brain injury (TBI), as well as in post-mortem samples as in brain tissue excised during emergency craniotomy for evacuation of cerebral contusions with mass effect. To investigate whether serum draining from the jugular bulb of patients with TBI induced apoptosis of neuronal PC12 cells in vitro and whether the apoptotic rate correlated with patients' outcome at 6 months.

METHODS. Prospective clinical investigation in a 21-bed intensive care unit (ICU) in a university hospital. Forty patients who had suffered from severe TBI were included. Brain tissue from the periischemic zone (PIZ) in patients with traumatic contusions (obtained during emergency craniotomy) and in post-mortem samples was analyzed. Immunohistochemical analyses of apoptosis-related proteins Fas, Bim, Bcl-2, Bcl-XL and Bax and terminal deoxynucleotide transferase-mediated nick end labeling (TUNEL) method to determine the presence of apoptotic cells were performed. Jugular bulb vein and systemic samples were obtained 48 hours after ICU admission. Neuronal (PC12) cells were incubated in the presence of 10% of heat-inactivated patient's sera and apoptotic rate was determined by flow cytometry using annexin V and 7-aminoactinomycin D.

RESULTS. TUNEL-positive cells were detected in all PIZ of traumatic contusions and in most of PIZ in post-mortem studies (none control, p = 0.026). In vivo samples showed higher expression of both antiapoptotic proteins Bcl-2 (p = 0.027) and Bcl-XL (p = 0.014) than post-mortem samples. In post-mortem studies, the expression of TUNEL-positive cells (p = 0.085) and proapoptotic proteins Fas (p = 0.034) and Bim (p = 0.038) were higher in PIZ than in zone far away from the contusion. In vitro studies showed that only early apoptotic rate was an independent factor associated with mortality at 6 months (odds ratio: 1.953, 95% CI 1.14-3.32; p = 0.014). In ROC curve a cut off point of 66.5% showed a sensitivity of 89.5% and specificity of 66.7% to predict patients' death at 6 months.

CONCLUSION. Our findings confirm the presence of apoptosis as a prominent form of cell death in the PIZ of human traumatic cerebral contusions and that apoptosis may worsen acute neurological damage after TBI. We also demonstrated that our in vitro model combined with clinical and radiological measurements might improve the value of prognostic models to predict TBI patients' outcome.

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0013

TEMPERATURE GRADIENT BETWEEN BRAIN TISSUE AND ARTERIAL BLOOD MIRRORS THE FLOW-METABOLISM RELATIONSHIP IN UNINJURED BRAIN

J. Soukup*[1], A. Rieger[2], I. Miko[3], N. Nemeth[3], M. Menzel[4]
[1]Anaesthesiology and Intensive Care, Martin-Luther-University Halle, Halle, [2]Neurosurgery, Klinikum Wolfsburg, Wolfsburg, Germany, [3]Operative Techniques and Surgical Research, University Debrecen, Debrecen, Hungary, [4]Anesthesiology and Intensive Care, Klinikum Wolfsburg, Wolfsburg, Germany

INTRODUCTION. The purpose of the present experimental study was to determine the feasibility and usefulness of brain temperature measurement (Tbr) and the calculated difference between brain temperature and arterial blood temperature (ΔTbr-a) in uninjured brain during variations of cerebral perfusion pressure (CPP) and concomitant changes of the regional cerebral blood flow (rCBF).

METHODS. Nine anaesthetized pigs were subjected to controlled CPP-decrease to assess the lower cerebral autoregulation threshold. A parenchymal ICP-sensor combined with a microthermistor for temperature measurement, a miniaturized Clark-type electrode measuring brain tissue oxygenation (ptiO2), a small flexible intraparenchymal thermodilution probe for measuring rCBF and cerebral microdialysis were inserted carefully in the frontal white matter.

RESULTS. Analyzing the ptiO2 during controlled CPP-decrease, we found significant breakpoints of ptiO2 at a CPP of 40 mmHg and 20 mmHg, related to an rCBF of 20mL/100g/min and about 10mL/100g/min. Similarly, the breakpoints of the temperature difference between arterial blood and brain tissue ΔTbr-a, meaning a characteristic increase of ΔTbr-a in the negative direction up to more than -0.30 $^{\circ}$C assuming a strong flow dependency.

CONCLUSION. The temperature difference between brain tissue and arterial blood ΔTbr-a mainly reflects the cerebral blood flow - brain tissue oxygenation -metabolism relationship as far as the estimation of the individual lower cerebral autoregulation threshold.

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0014

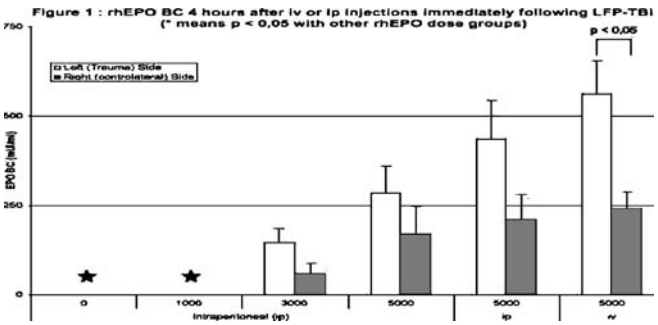
IV OR IP RHEPO DOES NOT REACH ANTI-INFLAMMATORY BRAIN CONCENTRATIONS 4 HOURS AFTER LATERAL FLUID PERCUSSION INJURY.

T. J. P. Lieutaud*[1], J. Rhodes[2], P. J. D. Andrews[2]
[1]Anesthesiology & Intensive Care Medicine, Hospices Civils De Lyon, Lyon, France, [2]Anesthesiology & Intensive Care Medicine, University of Edinburgh, Edinburgh, United Kingdom

INTRODUCTION. Erythropoietin (EPO) is promising in brain injury models. But bioavailability in brain is very poor (1). The aim of this study was to assess EPO Brain Concentrations (EPOBC) after ip or iv injections following brain trauma (TBI).

METHODS. Under isoflurane anesthesia, 29 SD rats subjected to fluid percussion TBI. Soon after, EPO was injected ip at 4 different doses or by the iv route. The right and left cortex were removed 4 h later and EPOBC were determined by ELISA kits.

RESULTS. EPO 5000 iu/kg, achieved BC 50 times less than those required to modulate inflammation in cell cultures (2). There was significant more rhEPO in the left than in the right side after IV injection (Figure 1).



CONCLUSION. EPOBC did not reach concentrations known to reduced inflammatory mediator concentrations in cell cultures. These data confirm the poor rhEPO bioavailability in the brain, even after LFP-TBI.

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0015

EFFECTS OF HYPERTONIC SOLUTIONS ON THE INTRACRANIAL PRESSURE AND CEREBRAL OXYGENATION IN PATIENTS WITH THE INTRACRANIAL HEMORRHAGE

S. S. Petrikov*[1], V. V. Krylov[2], A. A. Solodov[1]
[1]Neurosurgical ICU, [2]Neurosurgery, Sklifosovsky Emergency Medicine Institute, Moscow, Russian Federation

INTRODUCTION. Hypertonic solutions are widely used for intracranial hypertension correction. We evaluated and compared the effects of different hypertonic solutions on the intracranial pressure (ICP) and cerebral oxygenation in patients with the intracranial hemorrhage.

METHODS. Seven patients with intracranial hemorrhage and GCS 4-9 enrolled in the study. All patients had invasive ICP monitoring, jugular bulb oxymetry (SjO2) and central hemodynamycs monitoring (PICCO plus). ICP elevation higher than 20 mm Hg was an indication for treatment. In order to decrease ICP we used 15% mannitol -400 ml (n=6), 10% NaCl – 200 ml (n=6) and HyperHAES – 250 ml (n=8). ICP, cerebral perfusion pressure (CPP), SjO2 were recorded before infusion and 5, 30, 120 minutes after it.

RESULTS. Mannitol infusion decreased ICP from (M & SD) 32±10 mm Hg to 16±5 mm Hg ($p<0.05$). After 30 and 120 min ICP was 18±12 mm Hg ($p<0.05$) and 21±9 mm Hg. 10% NaCl infusion decreased ICP from 34±10 mm Hg to 14±4 mm Hg ($p<0.05$). After 30 and 120 min ICP was 15±7 mm Hg ($p<0.05$) and 29±8 mm Hg. HyperHAES decreased ICP from 29±8 mm Hg to18±5 mm Hg ($p<0.05$). After 30 and 120 min ICP was in normal ranges (13±7 mm Hg ($p<0.05$) and 18±8 mm Hg ($p<0.05$)). Mannitol infusion increased CPP from 80±13 mm Hg to 102±18 mm Hg (0.05). After 30 and 120 min CPP was 100±21 mm Hg (0.05) and 97±25 mm Hg. 10% NaCl increased CPP from 82±13 mm Hg to 113 ±30 mm Hg (0.05). After 30 and 120 min CPP was 106±31 mm Hg and 94±25 mm Hg. HyperHAES markedly increased CPP from 63±20 mm Hg to 89±17 mm Hg ($p<0.05$). After 30 and 120 min CPP was 91±19 mm Hg (0.05) and 86±20 mm Hg ($p<0.05$). Mannitol and hypertonic saline didn't influence SjO2 markedly (mannitol: before infusion - 74 ± 7%, 30 min – 80±4%, 120 min - 78±6%; 10% NaCl: before infusion - 76±10%, 30 min – 82 ±7%, 120 min - 75±3%). HyperHAES markedly increased cerebral oxygenation. SjO2 was 70±15% before infusion, 76±13% (0.05) after 30 min and 79±12% (0.05) after 120 min.

CONCLUSION. 1) Infusion of Mannitol, Hypertonic saline and HyperHAES is an effective method of ICP control. 2) HyperHAES has the most prolong effects on ICP, CPP and cerebral oxygenation in comparison with 15% Mannitol and 10% NaCl.

Oral Presentations
Paediatric cardiorespiratory 0016-0020

0016

MEASUREMENT OF TOTAL AND COMPARTMENTAL LUNG VOLUME CHANGES IN NEWBORNS BY OPTOELECTRONIC PLETHYSMOGRAPHY

R. L. Dellaca'*[1], M. L. Ventura[2], E. Zannin[1], V. Zimbaldi[2], A. Pedotti[1], P. Tagliabue[2]
[1]Biomedical Engineering Department, Politecnico di Milano University, Milano, [2]Department of Neonatology, Ospedale S. Gerardo, Monza, Italy

INTRODUCTION. The measurement of ventilatory pattern including end-expiratory lung volume (EELV) changes is of great importance in understanding respiratory mechanics, especially in pre-term infants. Optoelectronic plethysmography (OEP) is a method to determine lung volume changes through the measurement of the chest wall surface motion. It has been proved to be reliable in the estimation of total and compartmental (rib cage and abdomen) lung volume changes in adults in different postures and conditions (1,2). Moreover, it is not affected by drift and it can be used to track breath-by-breath changes of EELV (3). The aim of the present study was to develop protocols and algorithms to allow the application of OEP to newborns.

METHODS. We used retroreflective passive markers (6mm diameter) attached to the chest wall surface by double-adesive tape. Preliminary experiments allowed to define appropriate number and position of the markers in order to obtain reliable estimations of total and compartmental volume variations in supine position. We found that 24 markers provided a good description of the movements and distortion of the chest-wall surface. We studied 7 newborns of 3.23±0.80Kg mean±SD (min=2.4Kg max=4.3Kg) of body weight. Infants were studied during 1-2 minute periods of quiet breathing in supine position. Flow was measured at the inlet of a full-face mask by a mesh-type pneumotacograph connected to a differential pressure transducer. Chest wall volume changes were measured by OEP (ΔVOEP) and compared with lung volume changes obtained by integrating the flow signal (ΔVINT).

RESULTS. The average tidal volume (Vt) for all subjects was 27±9 ml (min=10ml, max=36ml). The mean difference between ΔVOEP and ΔVINT for all newborns was 4.55±1.59% of Vt (min=2.44%, max=7.14%) with a good linear correlation between the two (r2=0.97, m=1.06).

CONCLUSION. OEP provides accurate measurements of total and compartmental lung volume changes in newborns non-invasively and without requiring connections with the airway opening, providing a powerful tool to study respiratory mechanics and breathing pattern during both spontaneous breathing and invasive or non-invasive mechanical ventilation.

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0017

POST OPERATIVE VALUE OF CARDIAC TROPONIN I AFTER CONGENITAL HEART SURGERY AND CORRELATION WITH INTENSIVE CARE OUTCOMES.

S. Di Bernardo*[1], P. Stucki[2], M. Perez[2], L. Racine[2], N. Sekarski[1], J. Cotting[2]
[1]Department of Pediatrics, Cardiology Unit, [2]Department of Pediatrics, Pediatric Intensive Care Unit, University Center and University of Lausanne, Lausanne, Switzerland

INTRODUCTION. Cardiac Troponin-I (cTnI) is a well-recognized early postoperative marker for myocardial damage in adults and children after heart surgery. CTnI are routinely measured, but are difficult to interpret in a postoperative setting because of the variety of surgical insult on myocardium during surgery for congenital heart disease. We hypothesised that integrated values (area under the curve (AUC)) of postoperative cTnI is a better mode to predict outcome than post operative cTnI maximum value after surgery for congenital heart defects.

METHODS. Retrospective cohort study. 279 patients (mean age 4.6 years; range 0-17 years-old, 185 males) with congenital heart defect repair on cardiopulmonary by-pass were analysed. For these 279 patients, 2500 cTnI values were retrieved from our database. Maximal post operative cTnI value, post operative cTnI AUC value at 48h and total post operative cTnI AUC value were calculated and then correlated with duration of intubation, duration of ICU stay and mortality. Cut-off values were used to establish odds ratio for mortality risk.

RESULTS. The mean duration of mechanical ventilation was 5.1+/-7.2 days and mean duration of ICU stay was 11.0+/-13.3 days,11 patients (3.9%) died in post operative period. The mean value for max cTnI (16.7+/-21.8 vs 59.2+/-41.4 mcg/l, p<0.0001), 48h AUC cTnI (82.0+/-110.7 vs 268.8+/-497.7 mcg/l, p<0.0001) and total AUC cTnI (623.8+/-1216.7 vs 2564+/-2826.0, p<0.0001) were significantly lower in survivor group vs deceased patients. When using cut-off values of respectively 35 mcg/l for max cTnI, 175 mcg/l for 48h AUC cTnI and 950mcg/l for total AUC cTnI, we obtained respectively as odds ratio for mortality risk: 8.6 (95% CI 2.5-30, p=0.014) for max cTnI, 12.2 (95% CI 3.5-43, p=0.0003) for 48h AUC cTnI and 9.5 (95% CI 2.5-33, p= 0.0009) for total AUC cTnI. Analyses for duration of mechanical ventilation and duration of ICU stay by linear regression demonstrated a better correlation for AUC 48h cTnI (ventilation time r=0.82, p<0.0001 and ICU stay r=0.74, p<0.0001) than AUC total cTnI (ventilation time r=0.65, p<0.0001 and ICU stay r=0.60, p<0.0001) and max cTnI (ventilation time r=0.64, p<0.0001 and ICU stay r=0.60, p<0.0001).

CONCLUSION. Cardiac Troponin I is a specific and sensitive marker of myocardial injury after congenital heart surgery and it may predict early in-hospital outcomes. Integration of post operative value of cTnI by calculation of AUC improves prediction of early in-hospital outcomes compared to the maximal value of cTnI. It probably takes into account, not only the initial surgical procedure, but probably also incorporates the occurrence of hypoxic-ischemic phenomena in the post-operative period.

0018

NOVEL ULTRASOUND DILUTION TECHNOLOGY TO ROUTINELY MEASURE BLOOD VOLUMES IN PEDIATRICS AND NEONATES (IN VITRO VALIDATION)

N. V. Thuramalla*, V. K. Kislukhin, N. M. Krivitski
Engineering, Transonic Systems Inc., Ithaca, United States

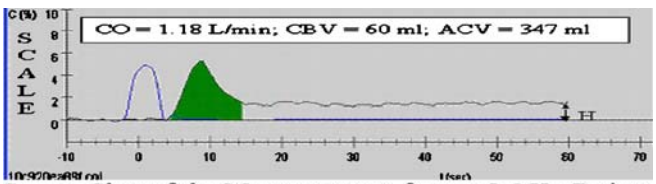
INTRODUCTION. None of the existing methods can be routinely used to measure blood volumes in neonates and pediatrics due to small vessel size and invasiveness. Purpose of this study is to present the theory and in-vitro validation of a new ultrasound dilution (UD) method using isotonic saline as an indicator for measurement of CBV (volume in heart and lungs); TEDV (sum of end-diastolic volumes of the atria and ventricles) and ACV (volume in which the indicator mixes in one minute).

METHODS. An extracorporeal AV loop was connected between the arterial and venous catheters in the in-vitro patient model for neonatal and pediatric settings. Reusable UD sensors were clamped on the loop. A pump was used to circulate the blood from the artery to the vein at 8-12 ml/min for 5-7 min. HCP101 system (Transonic Systems Inc, USA) measured the volumes, upon injecting 0.3–10 ml of isotonic saline into the venous limb of the AV loop.

RESULTS. CO, CBV, TEDV and ACV were determined both by dilution and volumetrically. Accuracy is estimated by the absolute percentage difference (delta% = Mean ± SD) between the two methods (Table 1). New saline concentration level (analogous as in patients, Fig 1) was used to calculate ACV.

TABLE 1.

Parameter	n	Neonate Range	Pediatric Range	Neonate (delta%)	Pediatric (delta%)
CO, ml/min	245	106-370	212-1200	4.4 ± 4.1	4.0 ± 3.0
CBV, ml	245	50-62	59-315	4.9 ± 3.7	4.6 ± 3.1
TEDV, ml	225	N/A	24-211	N/A	4.1 ± 3.1
ACV, ml	44	104-247	247-645	5.4 ± 4.4	3.3 ± 3.1



Screen Shot of the Measurements from a 5.6 Kg Patient

CONCLUSION. UD technology can accurately measure flows and volumes in the range of neonates and pediatrics. This works with existing arterial and venous catheters in ICU patients and hence can be routinely used to assess fluid status in the critically ill.

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0019

LONGITUDINAL ASSESSMENT OF CARDIAC FUNCTION IN SEVERELY BURNED CHILDREN

R. P. Mlcak*[1], O. E. Suman[2], M. G. Jeschke[2], D. N. Herndon[2]
[1]Respiratory Care, Shriners Hospital for Children, Galveston Burn Hospital, [2]Surgery, University of Texas Medical Branch, Galveston, United States

INTRODUCTION. The catecholamine-mediated hypermetabolic response to severe burn injury is associated with increased resting energy expenditure (REE) and catabolism, which is known to persist for up to 12 months post-burn (1). However, little is known of the long terms effects of this response on cardiac function. Therefore the purpose of this study was to assess cardiac function in severely burned children for up to 2 years post-burn.

METHODS. One Hundred Twenty Two severely burned children with a mean age of 8 ± 5 years were enrolled in a prospective, longitudinal study. Cardiac function was measured by Doppler echocardiography at discharge, 6, 9, 12, 18 and 24 months post-burn. Outcome variables included Cardiac Output, Cardiac Index, Heart Rate and Ejection Fraction. Patients were initially evaluated over time then stratified by gender. Cardiac function was compared to normograms for age-matched non-burn individuals (2). Statistical analysis was completed by using one way repeated measures ANOVA followed by Tukey's test for multiple comparisons. A p value of < 0.05 was considered statistically significant.

RESULTS. Mean total body surface area burned was 55 ± 17% and mean 3rd degree burn was 42 ± 23%. The actual Cardiac Output, Cardiac Index and Heart Rate was significantly lower at 6, 9,12, 18 and 24 months (p<0.05) compared to discharge. Similar to the actual cardiac function, the % of predicted Cardiac Output, and Heart Rate was significantly lower at 6, 9, 12, 18 and 24 months (p<0.005) compared to discharge. When stratified by gender Cardiac Output, Stroke Volume and Ejection Fraction were higher in males compared to females (p<0.05) only at discharge. At 24 months post-burn Cardiac Output and Heart Rate remained above 117% of predicted.

CONCLUSION. In severely burned children cardiac function is markedly increased for up to 24 months post-burn. This study suggests that therapeutic attempts to manipulate the hypermetabolic response to severe burn should continue for at least 2 years post injury.

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0020

IMPACT OF NOREPINEPHRINE AND BLOOD TRANSFUSION ON CEREBRAL OXYGENATION IN EXPERIMENTAL HAEMORRHAGIC SHOCK

P. Meybohm*[1], J. Renner[1], G. Hoffmann[2], M. Gruenewald[1], G. Schmitz[1], J. Scholz[1], B. Bein[1]
[1]Department of Anaesthesiology and Intensive Care Medicine, [2]Department of Cardiac and Vascular Surgery, University Hospital Schleswig-Holstein, Kiel, Germany

INTRODUCTION. Few data exist regarding resuscitation of hypovolaemic shock in infants and neonates (1). When inadaequate tissue perfusion is not recognized and treated rapidly, critical tissue hypoxia may develop, leading to multiorgan failure and global cerebral ischaemia followed by impaired brain function (2). Administration of the widely used norepinephrine (NE) has been advocated to control hypotension even in the acute phase of haemorrhage (3). However, the effects of NE on cerebral perfusion and oxygenation during haemorrhagic shock in the paediatric population are still unclear.

METHODS. Eight anaesthetised piglets were subjected to hypotension by blood withdrawal of 25 mL/kg. NE was titrated to achieve baseline mean arterial blood pressure (MAP), and cerebral oxygenation was determined by brain tissue partial pressure of oxygen ($P_{ti}o_2$; Licox®-System) and near-infrared spectroscopy-derived tissue oxygen index (TOI; NIRO 300). Then, NE was stopped, MAP was allowed to decrease again below 30 mm Hg, and shed blood was retransfused.

RESULTS. During haemorrhage, TOI dropped from 69 ± 3 to 59 ± 3 %, and $P_{ti}o_2$ from 29 ± 6 to 13 ± 1 mm Hg (mean ± SEM; p<0.001). Following NE, cerebral perfusion pressure (CPP) could be restored immediately, while TOI and $P_{ti}o_2$ did not increase significantly. In contrast, following retransfusion, TOI and $P_{ti}o_2$ increased to 68 ± 3 % and 27 ± 7 mm Hg reaching baseline values, respectively.

CONCLUSION. While NE increased MAP and CPP immediately, cerebral oxygenation as reflected by TOI and $P_{ti}o_2$ could not be improved by NE, but only by retransfusion. In this respect, normal MAP values following resuscitation with NE of haemorrhage-induced hypotension do not rule out compromised cerebral oxygenation, and therefore, should not be regarded as safe during pronounced fluid deficiency.

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Oral Presentations
Outside the walls 0021-0025

0021

THE IMPACT OF CRITICAL CARE OUTREACH SERVICES ON THE CHARACTERISTICS AND OUTCOMES OF ADMISSIONS TO INTENSIVE CARE UNITS: A MATCHED-COHORT ANALYSIS

D. A. Harrison*, H. Gao, C. A. Welch, K. M. Rowan
ICNARC, Intensive Care National Audit and Research Centre, London, United Kingdom

INTRODUCTION. Critical care outreach services (CCOS) were introduced in 2000, with limited evidence of effectiveness, as part of the modernisation of adult critical care in England. We assessed the impact on admissions to intensive care units (ICUs) of receiving CCOS visits before and/or after an ICU stay.

METHODS. Fifty-two CCOS collected prospective data for one year on every patient visit. These data were linked to the Case Mix Programme, the national comparative audit of critical care, to identify patients receiving CCOS visits before/after an ICU stay (cases). Each case was matched, where possible, to three controls: (1) a patient discharged from the same ICU in the year before CCOS were introduced in that hospital; (2) a patient discharged from an ICU in a hospital with no CCOS during the study period; and (3) a patient discharged from the same ICU during the study period that did not receive CCOS visits. Cases receiving CCOS visits pre-ICU were matched on: age (±10 years); severe comorbidity; reason for ICU admission; and source of admission/surgical status. Patients receiving CCOS visits post-ICU were additionally matched on: ICNARC physiology score (±10); length of ICU stay; and destination following ICU discharge. The primary outcome for CCOS visits pre-ICU was reduction in acute severity of illness measured by the mean ICNARC physiology score, and for CCOS visits post-ICU was mortality at acute hospital discharge.

RESULTS. Data were received on 71,660 CCOS visits to 23,234 patients. Of these, 2183 (9%) received CCOS visits pre-ICU and 5887 (25%) received CCOS visits post-ICU. Of cases receiving CCOS visits pre-ICU, 1022 (47%), 1946 (90%) and 1288 (59%), respectively, successfully matched to the three pools. The mean ICNARC physiology score was 1 point lower for cases than matched controls in match 1 (95% confidence interval 0.2 to 1.8), but there was no significant difference in match 2 or 3. The proportion of patients receiving cardiopulmonary resuscitation (CPR) within 24h prior to ICU admission was significantly lower for cases than matched controls in all three matches (risk ratio 0.51–0.78). Of cases receiving CCOS visits post-ICU, 1743 (30%), 4309 (73%) and 1792 (30%), respectively, successfully matched. Hospital mortality was lower for cases than matched controls in matches 1 and 2; significant in match 2 (risk ratio 0.87, 95% confidence interval 0.78 to 0.98). Length of stay in hospital post-ICU was also significantly shorter in matches 1 and 2. There was no difference in mortality or length of stay for match 3.

CONCLUSION. CCOS visits prior to admission to ICU are associated with reduction in CPR, and may be associated with lower acute severity of illness at admission. CCOS visits post-discharge from ICU are likely to be associated with lower mortality and shorter hospital stay, although these effects were not found in match 3, possibly due to an over-riding selection bias.

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0022

UNRAVELLING POST-ICU MORTALITY: PROGNOSTIC INDICATORS AND CAUSES OF DEATH

A. Braber*, A. R. H. Van Zanten
Intensive Care, Gelderse Vallei Hospital, Ede, Netherlands

INTRODUCTION. Post-ICU mortality ranges from 9-27%. In our post-ICU mortality group we evaluated patient characteristics, causes of death and potential factors to predict post-ICU mortality. Data were compared with both ICU-survivors and ICU-deaths.

METHODS. A two-year (2004-2005) retrospective cohort study in a mixed 12-bed ICU. We analysed data from 405 patients, 145 ICU-deaths, 93 post ICU-deaths and 167 survivors (representing a random sample from 680 survivors). Causes of death were determined by independent reviewers. Daly's model to predict the likelihood of mortality after ICU discharge was used on discharge[1].

RESULTS. Post-ICU mortality was 10.1%. Multivariate analysis identified 5 independent predictors of post-ICU mortality (table 1). Causes of death in post-ICU deads are comparable with ICU non-survivors except for sepsis, which is significantly more frequently seen among ICU non-survivors (table 2). Abdominal sepsis was most common in both groups. Of patients discharged from the ICU without treatment limitations 63% had a high risk to die according to Daly's model; of those 51% actually died.

TABLE 1.
Multivariate analysis: independent predictors of post-ICU mortality

Factor	Odds Ratio	95% CI	P-value
Age	1.04	1.01-1.07	0.005
APACHE II	1.13	1.07-1.20	<0.001
Total co-morbidity	1.86	1.20-2.89	0.006
Length of ICU stay	1.04	1.01-1.08	0.02
DNR first 24h	3.50	1.53-8.06	0.003

TABLE 2.
Causes of death in ICU and post-ICU non-survivors

	ICU (n/%)	Ward (n/%)	P-value
Sepsis	70 (48.3)	28 (30.1)	0.0055
Neurologic impairment	21 (14.5)	19 (20.4)	0.23
Heart failure	20 (13.8)	13 (14)	0.97
Malignancy	6 (4.1)	6 (6.5)	0.42
Pneumonia	6 (4.1)	11 (11.8)	0.025
Other	22 (15.3)	17 (17.2)	NA

CONCLUSION. Post ICU-non-survivors are older, have higher APACHE-II and co-morbidity scores, more DNR-codes on ICU admission, and show prolonged ICU stay compared to ICU non-survivors and hospital survivors. A high risk of post-ICU mortality according to Daly's model at ICU discharge, should make physicians cautious and probably discharge decisions should be reconsidered since 50% of these patients will die. We found a high number of patients (30%) that died on general wards due to severe sepsis. This may be preventable if the symptoms of sepsis are early recognised and proper treatment is started timely.

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0023

PREDICTORS OF READMISSION TO THE ICU: A PROSPECTIVE COHORT STUDY

A. D. Hill[1], C. M. Martin*[2], F. Priestap[2]
[1]Critical Care Secretariat, University Health Network, Toronto, [2]Critical Care Medicine, London Health Sciences Centre, London, Canada

INTRODUCTION. Readmission to the intensive care unit (ICU) is associated with significant mortality, morbidity and costs. The ability to identify patients that are at higher risk of readmission would allow for improved discharge decisions for patients who may benefit from longer ICU stay or more intense management on the general ward. We hypothesized that readmission to the ICU would be associated with both patient and system characteristics.

METHODS. Prospective cohort study involving 2763 consecutive admissions to the ICUs of five community hospitals. Data collected included patient demographics, APACHE II, primary ICU admission diagnosis, DNR status and ICU and hospital outcomes. System factors included ICU occupancy at time of discharge, nursing workload in the 24 hours prior to ICU discharge as measured by the Therapeutic Intervention Scoring System-28 (TISS-28), time of ICU discharge, and type of unit to which patients were discharged. We also collected data on the nurse to patient ratio on the ward to which patients were discharged as a proxy for nurse workload. Patients were classified as readmitted if they were readmitted to the ICU during the same hospitalization.

RESULTS. A total of 150 (5.7%) patients were readmitted to the ICU. Of these, 30.7% were readmitted within 48 hours of discharge from the ICU. Readmitted patients were significantly older, had higher admission APACHE II scores and were more likely to be admitted from the general wards compared to non-readmitted patients ($p < 0.01$). Compared to non-readmitted patients, a significantly higher number of readmitted patients were transfused within the 24 hours prior to ICU discharge (6.9% vs 12.8%, $p < 0.01$) and were discharged from the ICU at night (17.2% vs 24.0%, $p<0.05$). Patients discharged to a special care or step-down unit were more likely to be readmitted to the ICU than other patients ($p<0.01$). Nurse to patient ratio on the ward was significantly associated with readmission, with readmitted patients having a higher nurse to patient ratio on the day prior to ICU readmission ($p<0.01$). Neither TISS-28 score nor ICU occupancy at the time of discharge was significantly associated with readmission. Multivariate analyses revealed that APACHE II, nurse to patient ratio on the ward, the unit to which patients were discharged and hospital site remained significantly associated with readmission.

CONCLUSION. The data suggest that readmission to the ICU is more likely associated with initial severity of illness and factors on the ward to which the patient is discharged than ICU factors. Optimizing the management of these patients on the ward, such as through medical emergency teams, might reduce readmission and its adverse impact on patient outcomes.

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0024

CRITICAL CARE RESPONSE TEAMS IN ONTARIO: RESULTS OF THE 2005-2006 PILOT STUDY.

A. C. Steel*, P. Vaidyanathan, S. F. Reynolds
Critical Care Medicine, University of Toronto, Toronto, Canada

INTRODUCTION. As demand for state-of-the-art intensive care steadily rises general hospital wards will care for patients with increasing complexity and acuity. The introduction of critical care response teams (CCRT) has been advocated to reduce the risk of clinical deterioration and adverse events. We report on the impact of the CCRT in its first 12 months of operation at Toronto General Hospital (TGH), a 470-bed hospital, part of the University Health Network, Toronto.

METHODS. The multi-professional CCRT at TGH comprises an intensivist, senior critical care nurses, and a respiratory therapist. Criteria for referral to the team were established and disseminated, before introduction of the service in May 2005. Data were prospectively collected to evaluate each patient episode including management, resource utilization, and individual outcome. Hospital-wide outcome data are set in context by the number of in-patient episodes, and comparisons were made with preceding years.

RESULTS. 342 patient consultations were initiated over 12 months, predominantly from nursing staff (55.6%), and residents (31.3%). 42.7% of referrals were for abnormal respiratory parameters, 36.5% for cardiovascular, and 23.4% for non-specific concerns. CCRT interventions included oxygen therapy (43.3%), fluid administration (33.3%), and tracheostomy care (9.6%). 16 patients required immediate invasive ventilation. Following consultation, 246 (71.9%) patients remained on the ward, 22 (6.4%) were transferred to a higher dependency bed, and 74 (21.6%) were transferred to ICU. In the year following CCRT implementation cardio-respiratory arrest rate fell from 7.13 to 5.97 per 1000 admissions (χ^2 P=0.0002), and hospital mortality fell from 35.9 to 32.9 per 1000 admissions (χ^2 P=0.0005).

CONCLUSION. Over a twelve-month period the successful implementation of a full-time, intensivist-led CCRT was associated with a significant reduction in cardiac and respiratory arrest and hospital mortality.

0025

DISCHARGING PATIENTS FROM THE ICU AT NIGHT IS ASSOCIATED WITH INCREASED MORTALITY

B. Afessa*[1], R. M. John[1], M. T. Keegan[2], O. Gajic[1]
[1]Pulmonary and Critical Care, [2]Anesthesia, Mayo Clinic College of Medicine, Rochester, United States

INTRODUCTION. In many hospitals, there may be shortages of staffed ICU beds to accommodate all critically ill patients. The staffing shortage may be more pronounced at night and may lead to premature discharge of patients from the ICU. We undertook this study to determine the severity of illness and hospital mortality of patients discharged at night.

METHODS. This retrospective study involves analysis of data abstracted from the APACHE III database of patients admitted from January 2003 through December 2006. All patients who survived their initial ICU stay and authorized their medical records to be reviewed for research were included in the study. Only the first admission of each patient was included. Data collected include time of discharge from ICU; type of ICU (medical, mixed, surgical); APS, APACHE III score and predicted hospital death on the first and last ICU day; and hospital mortality. Night was defined as the time between 7 PM and 7 AM.

RESULTS. Of the 15,953 patients who survived their initial ICU stay, 999 (6.3%) were discharged at night. There were no statistically significant differences in the severity of illness between the night and day discharges at ICU admission. However, patients discharged at night were sicker than the day group on the last ICU day (Table). The hospital mortality rate was higher for night time discharges (Table). When adjusted for the first and last ICU day severity of illness, night time discharge was found to be an independent risk factor for hospital mortality. Subgroup analyses showed the mortality difference to be limited only to the medical ICU (Table).

TABLE 1.

Comparison of patients discharged form the ICU at night and day

Characteristics	Day discharge	Night discharge	P-value
Last ICU day			
APS, mean (SD)	31.9 (15.5)	34.7 (18.7)	< 0.001
APACHE II, mean (SD)	44.4 (19.0)	47.5 (21.7)	< 0.001
Mortality			
Total	627/14954 (4.2%)	68/999 (6.8%)	< 0.001
Medical ICU	348/5337 (6.5%)	44/405 (10.9%)	0.001
Mixed ICU	176/4049 (4.3%)	18/298 (6.0%)	0.222
Surgical ICU	103/5568 (1.8%)	6/296 (2.0%)	1.000

CONCLUSION. Discharging patients from the ICU at night is associated with increased hospital mortality. Attempts to minimize premature discharges from the ICU at night may improve patient outcome.

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Oral Presentations
Acute lung injury 0026-0030

0026

CAN VENTILATION WITH OXYGEN CAUSE STEROID RESISTANCE?

M. Kunze*[1], H. Dombrowsky[2], T. Meier[1], S. Uhlig[3]
[1]Department of Anaesthesiology, University clinic of Schleswig-Holstein, Campus Luebeck, Luebeck, [2]Division of Pulmonary Pharmacology, Research Center Borstel Leibnitz Center for Medicine and Biosciences, Borstel, [3]Institute of Pharmacology and Toxicology, RWTH Aachen, Aachen, Germany

INTRODUCTION. Enhanced expression of pro-inflammatory proteins is a central feature of many lung diseases including COPD and ARDS. Gene expression is favoured by histone acetylation and repressed by deacetylation. The anti-inflammatory effect of steroids depends in part of their ability to recruit HDAC 2 to the sites of pro-inflammatory gene transcription [1]. It was suggested that inhibition of this process by oxidative stress can explain the steroid resistance in COPD patients [2]. Another condition in which patients are exposed to higher than usual levels of oxidative stress is artificial ventilation with elevated FiO2 levels. The effect of FiO2 on histone acetylation is unknown. This translational study was designed to examine the short-term effect of inhaled oxygen on acetylation of histone 4 lysine 12 (H4K12) in overventilated isolated perfused mouse lungs. In addition we examined the contribution of histone acetylation to steroid mediated effects on gene transcription in human monocytes.

METHODS. Isolated perfused mouse lungs were ventilated over 180 min with 10 cmH20 (control) or 22.5 cm H2O (overventilation) peak inspiratory pressure and treated with 10 mM dexamthasone and/or oxygen (FiO2 =1). Freshly isolated human monocytes from healthy volunteers were stimulated with 1ng/ml IL-1β (stimulates also oxidative stress) and treated with steroids (10nM) and trichostatin A (100ng/ml, HDAC inhibitor). The acetylation of H4K12 and H4K8 as well as of IL-6-levels were determined.

RESULTS. Overventilation induced IL-6 release ($p<0.001$) but only had a small effect on histone acetylation. Dexamethasone (10mM) reduced the overventilation-induced release of IL-6 ($p<0.001$). This steroid effect was abolished by ventilation with O2 ($p<0.05$). In human monocytes, IL-1ß augmented histone acetylation of H4K12 ($p<0.05$) and increased IL-6 release ($p<0.01$). The IL-6-release was suppressed by 10nM dexamethasone ($p<0.01$) but was not altered by inhibition of histone deacetylase activity by trichostatin A.

CONCLUSION. Our findings suggest that the anti-inflammatory effects of dexamethasone in human monocytes are independent from histone acetylation. On the other hand the abrogation of steroid effect in overventilated mouse lungs by inhaled oxygen indicates that concurrent ventilation with high oxygen and high distending pressure may reduce anti-inflammatory potency of steroids.

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0027

ACUTE RESPIRATORY DISTRESS SYNDROME IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

P. A. D. Duarte*[1], E. Osaku[1], L. P. Wille[1], D. Itakura[1], S. M. Ogasawara[1], C. R. L. M. Costa[2], A. C. Casagrande[2], A. C. Jorge[1], A. A. Luiz[1], M. Campos[1], C. Mroginski[1], L. M. Ramos[3], F. L. Motter[3]
[1]General ICU, [2]Respiratory Therapy Group, [3]Internal Medicine, University Hospital - Universidade Estadual do Oeste do Paran, Cascavel, Brazil

INTRODUCTION. Patients with Chronic Obstructive Pulmonary Disease (COPD) have high incidence of respiratory infections, wich put them at risk to develop sepsis and Acute Respiratory Distress Syndrome (ARDS). On the other hand, advanced age and frequent co-morbidities, as well as the disability of the illness itself, suggest that in case of association of these entities prognosis will be worse. Besides this, increase of COPD incidence demands a higher attention to this association. OBJECTIVE: To study incidence, epidemiology and impact of COPD in ARDS patients admitted to a adult general ICU.

METHODS. This was a cohort study, with all patients admitted to the 9-bed adult general ICU in a University Hospital in a 23-month period. It was made descriptive statistics, as well as analysis of variance and t-test.

RESULTS. 798 patients were admitted in this period (60.8% male; mean age= 51.9; APACHE II= 18.2); 17.8% had COPD. There were 133 ARDS cases; of these patients, 16 (12.0%) had a diagnosis of CPOD.

TABLE 1.

	ARDS with COPD	ARDS without COPD	p
Male gender (%)	62.5	61.5	0.841
Age	67.2	46.8	<0.0001
APACHE II	23.9	22.8	0.608
Total invasive VM length(days)	9.4	12.4	0.438
UCI length (days)	11.3	14.4	0.428
Mortality (%)	68.7	70.9	0.911

CONCLUSION. CPOD represents an important clinical co-morbidity in critical patients. However, in this study, in ARDS patients, association with CPOD did not show increase in mortality, neither a higher invasive MV or ICU length.

0028

CORRELATION OF OXYGENATION AND AMOUNT OF NONAERATED LUNG TISSUE MEASURED BY CT – A MODIFIED DEFINITION OF NONAERATED TISSUE

A. W. Reske*[1], E. L. Costa[2], U. Gottschaldt[1], A. P. Reske[1], M. Seiwerts[3], D. Schreiter[4], J. B. Borges[2], M. B. Amato[2]
[1]Department of Anesthesiology and Intensive Care Medicine, University Hospital Leipzig, Leipzig, Germany, [2]Pulmonary Department, Hospital das Clinicas, University of Sao Paulo, Sao Paulo, Brazil, [3]Department of Diagnostic and Interventional Radiology, [4]Surgical Intensive Care Unit, University Hospital Leipzig, Leipzig, Germany

INTRODUCTION. The arterial partial pressure of oxygen (PaO_2) is frequently used to assess lung recruitment at the bedside. The correlation between PaO_2 and nonaerated lung tissue measured by CT (CT_{non}), however, has reportedly been weak, especially in patients with ALI or ARDS. Here we propose a modified definition of CT_{non} and evaluate its correlation with PaO_2.

METHODS. Traditionally, CT_{non} has been defined by the volume ($\%V_{non}$) of voxels within the -100 to 100 Hounsfield Units (HU) window relative to the total lung volume. In addition to this, we calculated the tissue mass ($\%M_{non}$) within this window relative to the total lung mass in mechanically ventilated patients. $\%V_{non}$ and $\%M_{non}$ within the -200 to -100, -300 to -200, -400 to -300, and -500 to -400 HU ranges were also calculated. A blood sample was taken immediately after CT. The PaO_2 values were transformed logarithmically ($\ln(PaO_2)$) to linearize the relationship between PaO_2 and CT_{non}. The correlation between $\ln(PaO_2)$ and CT_{non} was analyzed by multiple linear regression. To do so, $\%V_{non}$(-100 to 100 HU) or $\%M_{non}$ (-100 to 100 HU) was first entered into the model, followed by stepwise inclusion of variables representing the additional amounts of CT_{non} contained in the HU ranges specified above (numbers 1 to 5 in table 1 indicate the order of entrance).

RESULTS. We studied 60 patients (FiO_2=1.0, PEEP 10 cmH_2O (range 6-20), PaO_2 355 mmHg (range 63-598)). Contrary to previous studies, we found a strong correlation between $\ln(PaO_2)$ and CT_{non}. The strongest correlation with $\ln(PaO_2)$ could be shown for $\%M_{non}$(-200 to 100 HU), which was significantly stronger than the traditional $\%V_{non}$(-100 to 100 HU) or even $\%M_{non}$(-100 to 100 HU). Table 1 shows multivariate R^2 values for the correlation between $\ln(PaO_2)$ and CT_{non}. The p-values refer to the new information added to the model by each variable. *Model II* was significantly more informative than *model I* ($P<0.0001$).

TABLE 1.

model I ($\%V_{non}$)	overall R^2	p-value	*model II* ($\%M_{non}$)	overall R^2	p-value
***1*.-100to 100**	0.82	<0.0001	1.-100to 100	0.83	<0.0001
***2*.-200to-100**	0.84	0.01	2.-200to-100	0.89	<0.0001
***3*.-300to-200**	0.84	0.64	3.-300to-200	0.89	0.79
***4*.-400to-300**	0.84	0.2	4.-400to-300	0.89	0.88
***5*.-500to-400**	0.84	0.71	5.-500to-400	0.89	0.88

CONCLUSION. In patients, impaired oxygenation can be best explained by variations in the mass of CT_{non}, rather than volume. Also, a significant proportion of pulmonary shunt occurs in voxels within the -200 to -100 HU window, suggesting that a new definition of CT_{non} is desirable.

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0029

POSITIVE END EXPIRATORY PRESSURE REDUCES INCIDENCE OF VENTILATOR ASSOCIATED PNEUMONIA IN NON-HYPOXEMIC PATIENTS

E. Fernández-Mondejar*[1], F. F. Manzano[1], M. Colmenero[1], I. Catalan[2], A. Artigas[2], M. Poyatos[1], M. Rodríguez-Elvira[1]
[1]Intensive Care Unit, University Hospital Virgen de las Nieves, Granada, [2]Critical care Center, Sabadell Hospital, Parc Tauli, Barcelona, Spain

INTRODUCTION. To analyze the effect of positive end-expiratory pressure (PEEP) application on the outcome and respiratory complications rate in non-hypoxemic patients.

METHODS. A multicenter randomized controlled clinical trial was conducted in 131 mechanically ventilated patients with PaO2/FiO2 >250 and normal Chest X-ray. Patients were randomly allocated to receive mechanical ventilation with PEEP of 5-8 cmH2O (n=66), or No-PEEP (n=65).

RESULTS. The primary end-point variable was hospital mortality. Secondary outcomes included ventilator-associated pneumonia (VAP) microbiologically confirmed, acute respiratory distress syndrome (ARDS), barotrauma and atelectasis. The two groups were similar at the time of randomization with regard to demographic characteristics, ICU admission diagnoses, severity of illness and risk factors for development of VAP. Hospital mortality rate was similar among patients in No-PEEP group (25.4%) compared with PEEP group (29.7%) (p=0.58). VAP was detected in 16 patients (25.4%) in NO-PEEP group and in 6 patients (9.4%) in PEEP group (RR, 2.70; 95% CI= 1.13-6.47, p= 0.017). The incidence of ARDS (14% in No-PEEP group vs 5%, in PEEP group, p=0.07), barotrauma (8% vs 2%, p=0.06, respectively) and atelectasis (27% vs 19%, p=0.26, respectively) were similar in both groups.

CONCLUSION. The application of PEEP in non-hypoxemic patients does not have any influence in mortality, however PEEP application decreases the incidence of VAP.

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0030

A COMPARISON OF THREE ALVEOLAR RECRUITMENT MANEUVERS APPROACHES IN PATIENTS WITH ACUTE LUNG INJURY AND ACUTE RESPIRATORY DISTRESS SYNDROME

S. N. Nemer*[1], C. S. V. Barbas[2], T. C. Carias[3], J. B. Caldeira[4], P. C. P. Souza[3], C. N. Roderjan[5], R. Hatum[6], E. C. Neto[7]
[1]ICU, Hospital de Clínicas de Niterói, Niterói, [2]ICU, Hospital de Clínicas da Faculdade de Medicina da Universidade de São Paulo, São Paulo, [3]ICU, Hospital de Clínicas de Niterói, Nietrói, [4]ICU, Hospital de Clínicas de Nietrói, Niterói, [5]ICU, Hospital São lucas, Rio de Janeiro, [6]ICU, Hospital São Lucas, Rio De Janeiro, [7]ICU, Hospital São Lucas, Rio de Janeiro, Brazil

INTRODUCTION. High levels of positive end expiratory pressure are necessary to maintain the lungs open and assure homogeneous ventilation in acute respiratory distress syndrome.

METHODS. Twenty-four patients randomized in 3 similar groups were evaluated. Each group received one kind of ARM. Group 1: Progressive levels of positive end expiratory pressure (PEEP) with a fixed pressure control (PC). The PC was kept in 15 cmH2O and the PEEP levels were increased each 2 minutes: 25, 30, 35, 40 and 45 cmH2O. Group 2: Progressive levels of PC with a fixed PEEP level. The PEEP level was kept in 15 cmH2O and the PC levels were increased each 2 minutes: 20, 25, 30, 35 and 40 cmH2O. Group 3: Progressive levels of PC with a fixed PEEP level plus progressive levels of PEEP with a fixed PC level. Initially, the PEEP level was kept in 15 cmH2O and the PC levels were increased each 1 minute in 20, 25, 30, 35 and 40 cmH2O. Immediately after, the PC was kept in 15 cmH2O and the PEEP levels were increased each 1 minute in 25, 30, 35, 40, 45 cmH2O. The PaO2 / FiO2 ratio, Cst,rs and PaCO2 were evaluated before and after 1 hour of the ARM in each group alone and later compared among the three groups by Wilcoxon test. A p value < 0.05 was considered significant.

RESULTS. The PaO2 / FiO2 ratio improved significantly in the three groups after the ARM. There are no statistic difference in Cst,rs and PaCO2 after the ARM in the three groups. The initial PaO2 / FiO2 ratio was: group 1 (138.75), group 2 (143.75) and group 3 (131.12). When compared among the three groups, the PaO2 / FiO2 ratio in group 3 presented a significant improvement in comparison to the group 1 and 2: 257.87 x 195.25 (p < 0.05) and 257.87 x 194.75 (p = 0.02) respectively. According the PaO2 / FiO2 ratio, there are no difference between the group 1 and 2 (195.25 x 194.75; p = 0.878). We found no difference in mortality in the three groups evaluated.

CONCLUSION. ARM was effective in improving PaO2 / FiO2 ratio in the three groups. The three ARM were similar in improving the Cst,rs and PaCO2. In our study, ARM showed better results according to the PaO2 / FiO2 ratio when performed initially with progressive levels of PC and later with progressive levels of PEEP in comparison to the other two approaches.

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0031

PREVENTION OF ENTERAL FEEDING RELATED DIARRHEA BY PROBIOTICS: A RCT

W. P. Chaboyer*[1], T. Frohmader[2], I. Robertson[3], J. Gowardman[4]
[1]Research Centre for Clinical Practice Innovation, Griffith University, Bundall, [2]ICU, Launceston General Hospital, [3]School of Human Life Sciences, University of Tasmania, Launceston, [4]ICU, Royal Brisbane Hospital, Brisbane, Australia

INTRODUCTION. In critically ill patients, diarrhea may translate to physical pain, psychological distress and a failure to meet the extraordinary metabolic and nutritional demands of sickness or injury.

METHODS. A double blind randomized placebo-controlled trial conducted in one Australian ICU was used to evaluate the efficacy of probiotics to reduce diarrhea in tube fed critically ill patients. Ethical approval was granted by two independent ethics committees. After consenting, adults who were likely to require tube feeding for 3 days or more were randomised to receive a probiotic (VSL#3) or placebo, identical in appearance, twice daily, prepared daily by a pharmacist who was not involved in the study. Those with special dietary requirement, receiving TPN, with a history or diarrhea or were allergic to milk products were excluded. Doctors, nurses, patients and the research team were blinded to group allocation. Diarrhea was measured using the validated King's College Stool Chart. Poisson regression adjusted for albumin and weighted for duration of feeding and adjusted for repeated measures was used to estimate relative risk.

RESULTS. A total of 31 patients were recruited (15 treatment, 16 control) with no loss to follow up. There were no statistical differences between the treatment and control groups in terms of demographic and clinical characteristics, except that the control group had a significantly lower serum albumin (23.4 ± 4.6) than the treatment group(27.6 ± 6.1). Mean age of participants was 61.3 ± 17.3; 61% were male and 39% female. Mean APACHE II scores were 21.3 ± 9.1. Total study days were on average 6.7 ± 3.8. All participants were tube fed between 3 and 21 days duration. After controlling for albumin level, the treatment group demonstrated a statistically significant reduction of 56% in the frequency of liquid stool and a 37% reduction in the combined liquid and loose stool category compared to the control group (see Table).

TABLE 1.

Effect of Probiotic VSL #3 on Diarrhea

Stool Type	Treatment (n = 15) Rate (SD)	Control (n = 16) Rate (SD)	Treatment v Control RR (95% CI)
Liquid	4.1 ± 5.0	7.5 ± 5.3	0.44 (0.23 - 0.84)
Liquid & Loose	7.0 ± 9.5	10.84± 5.1	0.63 (0.41 - 0.98)

Rate (rate/100 pt days) RR (Relative Risk using poisson regression as per methods)

CONCLUSION. Probiotic VSL #3 was effective in reducing enteral feed associated diarrhea in ICU patients with comparable levels of disease severity. This single site study adds to the small but growing body of evidence that suggest probiotics do have a positive impact on diarrhea. Further, because no adverse events were identified, probiotic VSL#3 appears safe in terms of common adverse events. Preventing diarrhea will improve patients' experiences and have a positive impact on nurses' work.

0032

UNDERSTANDING THE WORK OF ICU NURSES; A TIME AND MOTION STUDY

W. P. Chaboyer*[1], M. Abbey[2], M. MItchell[1]
[1]Research Centre for Clinical Practice Innovation, Griffith University, Bundall, [2]Intensive Care Unit, Princess Alexandra Hospital, Brisbane, Australia

INTRODUCTION. Because Australian ICUs have strict guidelines for staffing, experienced ward nurses may be temporarily deployed to fulfil ICU needs but it is crucial to balance skill-mix to ensure patient safety. The aims of this study were to first describe the current activities undertaken by nurses working in the ICU and then to analyse these activities in terms of the cognitive skills they require.

METHODS. A time and motion study was used to identify the current activities of 10 bedside Registered Nurses (RNs) during the day shift in one Australian Cardiac ICU. These activities were sorted into 25 categories, grouped into 4 domains (direct care, indirect care, unit related activities and personal time) and then according to a cognitive schema that was developed to understand the cognitive underpinnings of work activities. Structured observation was used to record specific activities and the length of time each took during 10 day shifts. Data analysis involved examining the activities, classifying them in relation to the work categories and cognitive schema. The study was approved by two ethics committees and all RNs provided written consent.

RESULTS. The 10 RN participants had on average 18.5 ± 10.5 years of RN experience and 3.4 ± 1.7 years of ICU experience. The patients they cared for included six who had had cardiac surgery, and one each who had had abdominal surgery, respiratory failure, sepsis and unknown diagnosis (collapsed). Of these patients, 3 were unstable and the rest were considered stable. A total of 3,081 activities in the 76.5 hours of data collection were observed. Of these activities, 1,413 (46%) occurred simultaneously (i.e. more than 1 activity at a time). The 5 activities occupying the most time for the nurses are displayed in the table below. In terms of the activities themselves (and not the time they took) 60% of activities were direct care, 32% were indirect care (32%), 4.5% were personal time and 3.2% were unit related. While over 90% of activities were classified as routine and not intense, 96% required discretion, 41% involved multiple processes and 25% were complex.

Activity	Percentage of Time Spent on the Activity
Personal time	21.9%
Admission and assessment	12.3%
Procedures	11.0%
Coordination of care; rounds, team meetings	9.7%
Room and equipment set up or cleaning	9.2%

CONCLUSION. Given the fact that the vast majority of activities critical care nurses undertake require discretion, and almost half involve multiple processes, it is important that knowledgeable, skilled and experienced critical care nurses are available at the bedside, and not just as managers and team leaders. Some activities such as set up and cleaning of rooms and equipment should be undertaken by less skilled workers, allowing ICU nurses to focus on patient care.

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0033

PREVENTING CENTRAL VENOUS CATHETER RELATED INFECTIONS: CATHETER SITE SELECTION AND INSERTION TECHNIQUE SIGNIFICANTLY AFFECT THE CHANCES OF ADEQUATE CATHETER SITE CARE.

M. Pittiruti*[1], I. Migliorini[1], A. Emoli[1], L. Dolcetti[2], M. Pomponi[2], G. Scoppettuolo[2], A. LaGreca[1]
[1]Dept. of Surgery, [2]Dept. of Infectious Diseases, Catholic University Hospital, Rome, Italy

INTRODUCTION. According to the EPIC 2007 guidelines, catheter related infections can be minimised by appropriate insertion site care (adequate immobilisation of the catheter, appropriate skin antisepsis, choice of the right dressing, use of an appropriate site dressing regimen). On the other hand, the chances of performing an adequate site care are strongly affected by catheter site selection and insertion technique.

METHODS. In our University Hospital, we have performed a one-day investigation of the adequacy of catheter site care of non-tunnelled central venous catheters. On one single day, all short and medium term central venous access devices (short term CVCs, PICC, Hohn catheters, non-tunnelled dialysis catheters) in adult patients of any ward of our Hospital were carefully examined; catheter site was photographed, and a score given to the status of the dressing and to the conditions of the infusion line, according to an arbitrary scoring system developed by our CVC team (a Dressing Score – DS, 1 to 4; plus a Line Score – LS, 1 to 4). A total score was attributed to each catheter site, as the mean of scores given by 6 nurses experienced in catheter site care (from a minimum of DS 1 + LS 1, i.e. absolute need for immediate change of the dressing and of the infusion line, to a maximum of DS 4 + LS 4, i.e. optimal catheter site care).

RESULTS. During our single-day investigation, we examined 95 central venous accesses simultaneously in use in our Hospital, both in ICU (n=27: 22 CVCs inserted in the internal jugular vein or in the subclavian vein or in the femoral vein + 5 PICCs inserted in the basilic vein or in the brachial vein) and in non-intensive wards (n=68: 29 centrally inserted CVCs + 39 PICCs). The average total score (DS+LS) was 4.2 + 1.3 for CVCs and 6.5 + 1.2 for PICCs. CVCs inserted in the internal jugular vein via the high posterior approach by the landmark technique had a lower DS (1.9 + .9) if compared to CVCs inserted in the internal jugular vein via the low posterior approach by ultrasound technique (3.2 + .6), to CVCs inserted in the subclavian vein (3.4 + .9), or to PICCs (3.3 + .5) (p <.01 for all). In both centrally inserted CVCs and in PICCs, DS was significantly higher with transparent dressings (3.4 + .7) if compared to traditional gauze and tape dressings (1.8 + 1).

CONCLUSION. Site selection and insertion technique significantly affect the nursing of catheter site. Appropriate catheter site care is easier in PICCs, in CVCs inserted in the subclavian vein, and in CVCs inserted in the jugular vein via the low posterior approach by the ultrasound technique.

0034

EUROPEAN ICU NURSES' KNOWLEDGE OF EVIDENCE-BASED GUIDELINES FOR THE PREVENTION OF CENTRAL VENOUS CATHETER-RELATED INFECTIONS (CVC-RI)

S. Labeau*[1], S. Adam[2], J. Rello[3], D. Vandijck[4], J. Benbenishty[5], K. Vandewoude[4], S. Blot[4]
[1]Faculty of Healthcare, Ghent Univ College, Ghent, Belgium, [2]ICU, Univ College London Hosp Trust, London, United Kingdom, [3]ICU, Joan XXIII, Tarragona, Spain, [4]ICU, Ghent Univ Hosp, Ghent, Belgium, [5]ICU, Beth-Israel Hosp, Jeruzalem, Israel

INTRODUCTION. Evidence-based guidelines for the prevention of CVC-RI have been developed. However, non-compliance with these recommendations has been reported[1]. A lack of knowledge about CVC-RI prevention strategies may result in poor compliance. The present study aimed to determine ICU nurses' knowledge of evidence-based guidelines for CVC-RI prevention.

METHODS. The current study is part of the EVIDENCE project, a European study aiming to evaluate ICU nurses' knowledge of prevention of infection. A multiple-choice questionnaire, based on the CDC guidelines[2], was validated and used to evaluate nurses' knowledge of 10 nursing-related strategies for CVC-RI prevention[3]. Demographic data collected were gender, ICU experience (<1, 1-5, 6-10, >10 years), number of ICU beds and whether nurses hold an additional qualification in intensive care. Relationships between total scores and demographic data were assessed using linear regression analysis.

RESULTS. Between November 2006 and April 2007, 3361 nurses from 24 European countries participated in the study. The questionnaire's topics and the respective % of correct answers are shown in Table 1. The average score was 4.43 on 10 questions. Linear regression analysis identified only years of ICU experience (per class of increase) as independently associated with a better knowledge (p<0.001; Beta coeff. 0.13; 95% CI: 0.08-0.18).

Questionnaire's topics	% correct answers
Replacement of CVCs on indication only	56%
Replacement of CVCs over a guidewire on indication only	74%
Replacement of pressure transducers & tubing every 4 days	53%
Use of coated CVC in settings with high CVC-RI rates for patients with CVC>5days	31%
Change of dressings on indication only	43%
Use of both gauze & polyurethane dressings	26%
Use of chlorhexidine 2% for disinfection	14%
No use of AB ointments as they cause AB resistance	30%
Change of admin. sets within 24 hrs when administering lipid emulsions	90%
Change of admin. sets every 96 hrs when not administering lipids nor blood products	26%

CONCLUSION. Knowledge of CVC-RI prevention guidelines by European nurses is poor. A longer ICU professional seniority is associated with a better awareness, but curiously, the acquisition of a special ICU professional qualification did not influence knowledge. Screening of ICU nurse knowledge of prevention guidelines is useful to detect deficiencies in professional training. CVC-RI prevention guidelines should be included in the nurse education curriculum as well as in continuing refresher nursing education programs.

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0035

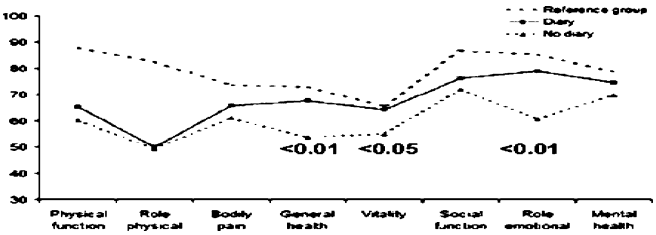
DO ICU-DIARIES INFLUENCE HEALTH RELATED QUALITY OF LIFE AFTER CRITICAL ILLNESS?

C. Bäckman*[1], L. Orwelius[2], F. Sjöberg[2], P. Nordlund[3], E. Simonsson[3], S. M. Walther[4]
[1]Dept of Anaesthesia and Intensive Care, Vrinnevi Hospital, Norrköping, [2]Dept of Anaesthesia and Intensive Care, University Hospital, Linköping, [3]Dept of Anaesthesia and Intensive Care, Ryhov Hospital, Jönköping, Sweden, [4]Surgical ICU, Ullevål University Hospital, Oslo, Norway

INTRODUCTION. Personal diaries written in the ICU may help patients recover after critical illness. We examined if diaries and a follow-up visit improved health-related quality of life (HRQoL) 12 months after discharge.

METHODS. Adult ICU patients with a stay greater than 24 hours were included. Diaries were initiated when a prolonged illness was anticipated. Anyone involved in the care of the patient were allowed to contribute. The diary was given to the patient at a follow up visit 2-8 weeks after discharge from the ICU. HRQoL was assessed with SF-36. Age, illness severity, hospital length of stay (LOS) and presence of a diary were entered into multivariate models with SF-36 physical (PCS) and mental component summaries (MCS) as dependent variables.

RESULTS. Patients with diaries were younger (52 vs. 62 yrs, P<0.001), sicker on admission (18 vs. 14 APACHE II points, P<0.01), stayed longer in the hospital (12 vs. 3 days, P<0.001) and had greater SF-36 scores at 12 months (Figure). MCS was significantly greater in the diary group (50 vs. 45 points, P<0.05). Presence of a diary was an independent positive predictor of MCS (P<0.05), while age and LOS were negative independent predictors of PCS (P<0.01).



CONCLUSION. ICU diaries may improve HRQoL at 12 months but this needs to be verified in a randomised controlled trial.

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