Poster Corners
Acute Kidney Injury: Early diagnosis, epidemiology, outcome: 0852–0865

0852

THE PREDICTIVE PERFORMANCE OF PLASMA NEUTROPHIL GELATINASE-ASSOCIATED LIPOCALIN (NGAL) INCREASES WITH GRADE OF ACUTE KIDNEY INJURY

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INTRODUCTION. In adult cardiac surgery, the predictive value for AKI of neutrophil gelatinase-associated lipocalin (NGAL) appears to have wide variability. The choice of definition of acute kidney injury (AKI) might, at least in part, account for such variability.

OBJECTIVES. In this investigation, we assessed the impact of the definition of AKI on the performance of plasma NGAL as renal biomarker in adult patients after cardiac surgery.

METHODS. In a prospective study of 100 adult cardiac surgery patients, we assessed the value of postoperative plasma NGAL in predicting AKI according to the degree of severity used for its definition.

RESULTS. The predictive value of plasma NGAL varied according to the AKI definition used and was higher for more severe AKI (increase in creatinine >50%: mean AUC-ROC 0.79 ± 0.01) compared to less severe AKI (>25%: mean AUC-ROC 0.65 ± 0.02); $p = 0.001$. The discriminatory ability of NGAL for AKI also increased with increasing RIFLE classes (AUC-ROC R: 0.72, I: 0.79, F: 0.80) or AKIN stages (AUC-ROC 1: 0.75, 2: 0.78, 3: 0.81); $p = 0.015$. It was highest for the prediction of renal replacement therapy (AUC-ROC: 0.83).

CONCLUSIONS. In adult cardiac surgery patients, the predictive value of NGAL increases with grade of AKI. This observation needs to be taken into account when interpreting any future studies of this biomarker.

0853

NOVEL BIOMARKERS EARLY PREDICT THE SEVERITY OF ACUTE KIDNEY INJURY AFTER CARDIAC SURGERY IN ADULTS

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INTRODUCTION. To investigate the ability of neutrophil gelatinase-associated lipocalin (NGAL), cystatin C and their combination in predicting the duration and severity of acute kidney injury (AKI) after cardiac surgery in adults.

OBJECTIVES. In the present study, we assessed the association of NGAL and cystatin C and their combination with duration and severity of AKI in patients after adult cardiac surgery.

METHODS. Using data from a prospective observational study of 100 adult cardiac surgical patients, we correlated early postoperative concentrations of plasma NGAL and serum cystatin C with the duration (time during which AKI persisted according to the Acute Kidney Injury Network criteria) and severity of AKI (change in serum creatinine) and with length of stay in Intensive Care.

RESULTS. We found a mean AKI duration of 67.2 ± 41.0 h which was associated with prolonged hospitalization ($p < 0.001$). NGAL, cystatin C and their combination on arrival in Intensive Care correlated with subsequent AKI duration (all $p < 0.01$) and severity (all $p < 0.001$). The area under the receiver-operating-characteristic curve for AKI prediction was 0.77 (95%CI 0.63–0.91) for NGAL and 0.76 (0.61–0.91) for cystatin C on arrival in Intensive Care. Both markers also correlated with length of stay in Intensive Care ($p = 0.037$; $p = 0.001$). NGAL and cystatin C were independent predictors of AKI duration and severity and of length of stay in Intensive Care (all $p < 0.05$). The value of cystatin C on arrival in Intensive Care appeared to be due to a carry-over effect from preoperative values.

CONCLUSIONS. Immediately postoperatively, NGAL correlated with and was an independent predictor of duration and severity of AKI and duration of Intensive Care stay after adult cardiac surgery. The combination of NGAL and Cystatin C did not add predictive value.

0854

THE UTILITY OF URINAY CYSTATIN C (URCYC) AS EARLY PREDICTIVE BIOMARKER FOR ACUTE KIDNEY INJURY (AKI) IN CRITICALLY ILL PATIENTS ADMITTED TO THE ICU

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INTRODUCTION. AKI increases mortality. Potentially effective therapeutic interventions for AKI are currently delayed due to the paucity of early predictive biomarkers. In patients undergoing elective cardiac surgery urCyC was found to be an early predictive biomarker for AKI [1].

OBJECTIVES. We evaluated whether urCyC is an early predictive biomarker for AKI by RIFLE (2) in a heterogeneous ICU population.

METHODS. Multicenter prospective study in (cardio)surgical and medical patients admitted to the ICU for at least three days. After hemodynamic optimization urine samples were collected on days 0, 1 and every other day thereafter until discharge. Patients were scored daily for the presence of AKI using the seCreat and urine output criteria of the RIFLE system, whichever was more severe. We compared patients who developed AKI in the ICU with patients who never developed AKI. Patients with AKI at admission were not included in this analysis. We used non-parametric tests for data that were not normally distributed.

RESULTS. We analyzed 35 patients who developed AKI after a median of 2 days (range 1–7 days) and 60 patients who did not develop AKI. The differences in age and APACHE II were not statistically significant between groups. Table 1 shows the results of urCyC and seCreat on the two days prior to the first RIFLE event for patients who developed AKI, and on the first two days of ICU admission for patients who never developed AKI. In both groups approximately one third of the patients had urCyC levels below the detection limit of 0.05 mg/L. In these patients we replaced the urCyC level of < 0.05 mg/L by 0.025 mg/L in order to calculate median and IQR.

TABLE 1 URCYC AND SECREAT PRIOR TO AKI (MEDIAN AND IQR)

	AKI-day −2	AKI-day −1
urCyC (mg/L)		
AKI	0.13 (0.025–0.88)	0.14 (0.025–0.37)
Control	0.16 (0.025–1.50)	0.17 (0.025–0.84)
seKreat (μmol/L)		
AKI	91 (80–101)*	94 (84–115)*
Control	71 (61–89)	68 (57–82)

Increased levels of urCyC were seen in both AKI and non-AKI patients. The differences in urCyC were not statistically significant between groups in the 2 days prior to AKI. In contrast seCreat was significantly higher in the AKI group compared with the non-AKI group on the two days prior to AKI. urCyC did not rise earlier than seCreat in the AKI patients.

CONCLUSION. In the present study in a heterogeneous ICU population urCyC is not an early predictive biomarker for AKI, in contrast to earlier findings in patients undergoing elective cardiac surgery [1]. These conflicting results possibly result from differences in case mix and AKI definition between present and previous studies.

REFERENCES. 1. Koyner et al. (2008) Kidney Int 74:1059–1069
2. Bellomo et al. (2004) Crit Care 8:R204–R212

0855

DOES THE USE OF CYSTATIN C IMPROVE THE DIAGNOSIS OF AKI IN AN UNSELECTED POPULATION OF CRITICALLY ILL PATIENTS?

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It is admitted that the determination of cystatin C (Cyst-C) rather than serum creatinine (SCr) in populations at risk anticipates the diagnosis of acute kidney injury (AKI). The main objective of this study was to determine if this behaviour was maintained in a general population admitted to a polyvalent ICU. Secondary targets were to determine the incidence of AKI using the RIFLE criteria with Cyst-C and SCr.

During 7 months in 2008, after approval of the local Ethical Committee 107 patients who remained hospitalized more than 48 h in the ICU were prospectively studied. Those who died or were discharged before 48 h as well as those admitted for postoperative resuscitation were excluded from the study. At admission in the ICU and then for 7 days, Cyst-C and SCr were determined. In this period, AKI was diagnosed in patients having any of the R, I or F RIFLE criteria either with SCr (RIF-SCr) or Cyst-C (RIF-Cyst-C).

RIF-SCr identified 45 patients with AKI at ICU admission (42%). Five patients developed AKI later, but in only three cases Cyst-C levels increased before SCr (range 24–72 h). At admission, RIF-Cyst-C only identified 42 AKI (39%). There were discrepancies in 30 cases between the severity of AKI among the two RIFLE classifications. However, overall concordance as measured by the Kappa index was 0.55. Eleven per cent of patients needed replacement therapy. Mortality in AKI patients (25%) was similar to non-AKI patients (28%). Seven patients diagnosed as AKI with RIF-SCr criteria had SCr levels lower than 1.2 mg/days.

The use of RIFLE gives a high incidence of AKI in the ICU setting. There are no appreciable differences among the use of RIF-SCr and RIF-Cyst-C with respect to the functional classification of AKI. It seems that RIFLE use could overestimate the incidence of AKI by including cases without clinical relevance. Since in most cases AKI is present on ICU admission, the use of Cyst-C as a marker of early damage in this population is questionable.

0856

EARLY DETECTION OF ACUTE RENAL FAILURE AFTER CARDIAC SURGERY BY COMPARING ARF SCORE AND CISTATIN C

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INTRODUCTION. Acute renal failure (ARF) is a severe complication after cardiovascular surgery. It is not easy to detect ARF in the immediate postsurgical state because some biomarkers availability can delay diagnosis, ARF score is a clinic scale used to predict subclinical ARF after cardiac surgery in order to detect patients for a high risk, evaluating renal function with cistatine C can help to provide an opportune treatment.

METHODS. Study performed from March 2008 to July 2008. All patients undergone to cardiac surgery and received in the intensive care unit were included. They were older than 18 years. Septic patients, those with known renal failure and prior renal transplantation were excluded. For all patients determination of ARF score was made as well as plasmatic levels of cistatine C, creatinine, blood ureic nitrogen were measured at 24 and 72 h of admission to de ICU. APACHE II was also evaluated; we performed an analysis to incorporate ARF score and its association with cistatine C as predictors of acute renal failure and as a marker of prompt detection.

RESULTS. Twenty-seven patients were enrolled, mean age was 62 years old (24–75), coronary bypass artery grafting was performed in 40.7% of patients. Rate of ARF was 3.7–25.9% (mild to severe). Correlation between cistatine C and ARF score at 24 h had an association r of Pearson -0.7 and $p < 0.01$, at 72 h $r = 0.451$ and $p = 0.19$. We also found association among mechanical days and a high risk score with r Pearson of 0.75 and $p = 0.001$.

CONCLUSIONS. We obtained a relation between cistatine C levels and ARF score at 24 h after cardiac surgery, finding that lower levels of cistatine C correspond to higher values of ARF score; it concludes that cistatine C diminishes after 24 h of surgery as a predictor of renal failure.

0857

SERUM CYSTATIN C AS AN EARLY MARKER OF ACUTE KIDNEY INJURY IN CRITICALLY ILL PATIENTS. PRELIMINARY DATA

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INTRODUCTION. Timing is extremely important for the detection of early-stage renal impairment, especially for the therapeutic management of critical illness. In an acute condition, the absence of a reliable biomarker and the reliance on serum Creatinine markedly delays the diagnosis and, consequently, the institution of therapy. Serum Cystatin C (CysC) has recently been proposed as a better indicator of Acute Kidney Injury (AKI) than serum creatinine. Little is known about cystatin C changes in critical ill patients.

OBJECTIVE. We assessed CysC as an early biomarker of renal dysfunction in critically ill patients who developed acute kidney injury (AKI).

METHODS. We evaluated 36 critically ill patients (28 males, 19 trauma, 6, surgical 11 medical) of mean age 48.8 ± 6.2 years old and illness severity at time of admission of APACHE II 17.9 ± 6.4 and SOFA 8.3 ± 3.2. We recorded demographic data, cause of admission, and comorbidities. Serum CysC and creatinine were measured on admission and daily during the first 3 days. We also recorded length of ICU stay and outcome. Patients divided in two groups according to diagnostic criteria for Acute Kidney Injury (AKI) as an absolute increase in serum creatinine of more than or equal to 0.3 mg/dl (≥26.4 μmol/l), a percentage increase in serum creatinine of more than or equal to 50% (1.5-fold from baseline), or a reduction in urine output (documented oliguria of less than 0.5 ml/kg per hour for more than 6 h) in the first 48 h.

RESULTS. Nine patients (25%) developed AKI at admission, (group 1), while 27 did not (group 2). Differences between two groups are presented in Table 1:

TABLE 1 PATIENT'S CHARACTERISTICS

	Group 1	Group 2	* (p)
N (patients)	9	27	
Age (years)	52.6 ± 3.9	47.7 ± 3.9	ns
LOS (days)	30.67 ± 22	29.4 ± 9.3	ns
APACHE II	17.8 ± 2.2	17.9 ± 1.28	ns
SOFA	8.6 ± 0.99	8.3 ± 0.6	ns
CysC on admission (mg/l)	0.95 ± 0.19	0.66 ± 2.9	0.0267
Change from baseline (%)	62.9 ± 11.5	31.8 ± 6.8	0.039

* Values in X ± SEM, Student's t test

CysC on admission was significantly higher in group1 ($p < 0.05$).
Changes in CysC values during the 3 days of follow-up were also significantly higher in group 1 ($p < 0.05$)

CONCLUSIONS. Our preliminary results suggest that CysC could be a useful early marker for AKI detection, superior to serum creatinine. It could be an important tool to recognize early renal dysfunction; however, we are in need of more studies.

0858

SERUM CYSTATIN C LEVELS AS A MARKER OF GLOMERULAR FILTRATION IN CRITICALLY ILL PATIENTS

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OBJECTIVES. The aim of this study was to evaluate if there is a better correlation between serum Cystatin C levels and the glomerular filtration rate (GFR)—calculated with creatinine clearance and estimate by the MDRD and Cockcroft–Gault formulas—and the serum creatinine levels.

METHODS. A prospective and observational study was designed including all adults patients admitted in the Intensive Care Unit of the Gregorio Marañón Hospital during a period of 30 days. The serum Cystatin C levels, serum creatinine and creatinine clearance in 24 h urine were determinate at the admission day and every seven days until the unit discharge. We considered acute renal failure (ARF) a creatinine level 1.5 times the basal level, a 50% reduction of GFR or oliguria at least during 6 h. The Cockcroft–Gault (CG) and modification of diet in renal disease (MDRD) formulas were used to calculated creatinine clearance. The serum Cystatin C was determined using Hoek's formula.

RESULTS. In our study, 37.6% of all patients had ARF. There was a statistically significant correlation between the serum levels of Cystatin C and creatinine clearance measure ($r = -0.749$; $p = 0.000$), and this correlation was better than serum creatinine and creatinine clearance measure ($r = -0.639$; $p = 0.000$). Serum Cystatin C levels were related with a higher risk to develop renal failure (OR 39.7 IC 95%, 3.1–497.1; $p = 0.004$). Patients with elevated level of Cystatin C had a risk 38 times higher to develop ARF compared with those patients with normal levels (RR 38.2, IC 95% 4.5–318.6). When GFR is less than 60 ml/min, Cystatin C has a greater positive predictive value than creatinine. This also occurs when GFR is 80 ml/min (AuROC 0.89, IC 0.77–1.01, $p = 0.000$ for Cystatin C, and 0.782 IC 0.606–0.959 $p = 0.011$ for creatinine). Nevertheless, there is not statistically significant correlation between serum Cystatin C levels at the admission day with the risk to develop infectious complications (90.0% in patients with high Cystatin C and 63.2% in patients with normal levels) and non infectious complications (54.5% in patients with high Cystatin C levels and 31% in patients with normal levels). In the other hand, patients with high levels of Cystatin C had a greater rate of mortality in our intensive care unit (27 and 15%) and later during the hospital admission period (30.3 and 15%), but this difference were not statistically significant.

CONCLUSIONS. Serum Cystatin C is a good marker of renal function in critically ill patients. In our study Cystatin C was better than serum creatinine in the detection of ARF. Hoek's formula is a good test for glomerular filtrated rate, similar to other formulas already validated. We didn't find neither statistically significant correlation between Cystatin C levels and other complications nor Cystatin C levels and the mortality.

0859

WHICH GLOMERULAR FILTRATION RATE ESTIMATION MUST BE USED IN THE RIFLE SYSTEM: SERUM CREATININE OR CREATININE CLEARANCE?

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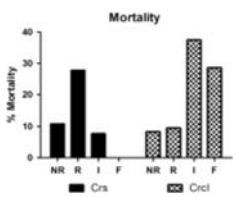
INTRODUCTION. The RIFLE staging system is based in equal changes for two estimates of glomerular filtration (GFR): serum creatinine (Crs) or creatinine clearance (Crcl) but there isn't lineal relationship between these parameters and their accuracy is not the same. Our aim was to demonstrate that these estimates give not equivalent results.

METHODS. Retrospective analysis of 180 cases from a prospective study on renal function in 307 ICU patients. We selected those in whom a Crcl determination was performed between 24 and 48 h after admission and used Crcl and Crs for the RIFLE staging against: (1) base Crs, and (2) an estimate of base Crcl using the Cockroft–Gault equation (demonstrated in different studies to be accurate in general population). We analyzed the agreement with the Kappa method and compared the relationship of RIFLE with mortality applying the same multiple lineal regression model for both estimates, including age, gender, SOFA and RIFLE level as variables.

RESULTS. Of the 180 patients, classification was equal in 121 (67.3%), with differences mainly in the "no risk" and "F" stages. From 138 cases "without risk" defined by Crs, 26 (18.7%) where classified in other levels by Crcl and of 10 cases in stage "R" detected by Crcl only four were detected by Crs. Kappa statistics was 0.24 (IC 0.19–0.35) ($p < 0.001$), meaning a poor agreement. Figure 1



Mortality and RIFLE

In the regression model based in Crs level "R" was related to mortality (compared to No risk) (OR 4.5, IC 1.05–19.3), but in the model with Crcl, levels "I" (OR 9, IC 2.1–28.6) and "F" (8.5, 0.9–85.3) showed relationship.

CONCLUSIONS. Crs has lower accuracy than Crcl to predict outcome, perhaps because the delay of Crs in detecting GFR decrease.

Considering that RIFLE is used to compare populations in clinical research, only one component should be contemplated in its definition and, until that, the parameter used should be stated in the methodology.

0860

URINE PRODUCTION ACCELERATION RATE AND PEAK URINE PRODUCTION RATE, NEW BED-SIDE, REAL-TIME PHYSIOLOGICAL ASSAYS OF RENAL FUNCTION

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INTRODUCTION. Plasma Creatinine and Creatinine Clearance Test (CCT) are currently the clinical golden standards for renal function assessment. These measurements provide static data that show kidney damage and are "retrospective" in nature. Thus, they avoid early detection of development of kidney injury and appropriate early response. Furosemide is a diuretic, acting by inhibiting the reabsorption of sodium at the ascending limb of Henle's loop in the nephron. It acts by blocking the $Na^+/K^+/Cl^-$ transporter. In a patient suffering from renal insufficiency, the kidney's remaining functioning nephrons, retain their responsiveness to diuretics. Quantification of this responsiveness can determine the active nephronal mass and thus serve as a measure of renal function.

OBJECTIVES.

1. To asses the ability of a defined diuretic challenge to dynamically evaluate renal function.
2. To evaluate new parameters: Urine Production Acceleration Rate and Peak Urine Production Rate as dynamic physiological assays of renal function.

METHODS. Patients included in the study were those admitted to the intensive care unit at Rambam Medical Center, Haifa, Israel, during the years 2007–2008. One hundred and sixty events of Intra Venous bolus injection of 20 mg Furosemide were prospectively recorded and analyzed. Urine production and Flow were monitored continuously (every 1 min recording) by the URINFO2000® device (Med-Dynamix, Israel), a novel electronic urinometer, connected to a Patient Data Management System (iMDsoft, Israel). Graphical analysis of urine production in response to Furosemide administration was done. Correlations between various parameters and renal function tests, based on Plasma Creatinine and CCT, were calculated.

RESULTS. Parameters evaluated were: Urine Production Acceleration Rate (UPAR) (calculated via the slope of the "up-rise" in cc/min^2) and the Peak Urine Production Rate (cc/min) (PUPR). A significant direct correlation was found between the "up-rise" slope (cc/min^2) and the Peak Urine Production Rate (cc/min) ($R^2 = 0.99$). Moreover, a correlation between the Urine Production Acceleration Rate and the GFR, calculated by the "Cockroft–Gault" equation was well demonstrated ($R^2 = 0.81$).

CONCLUSION. Quantification of the Urine Production Acceleration Rate (UPAR) and the Peak Urine Production Rate (PUPR) after a measured diuretic challenge can serve as a bedside, real-time and very early measure of urine production capacity and of impending renal failure. Thus, reflecting the activity of the functioning nephrons. These measurements can be used as new tools for renal function evaluation. They may serve as guides to early intervention for the prevention and treatment of renal failure.

REFERENCE. 1. Bellomo et al., the ADQI workgroup (2004) Acute renal failure-definition, outcome, measures, animal models, fluid therapy and information technology needs. Critical Care 8(4):R204–R212

0861

SIX-MONTH OUTCOME IN PATIENTS WITH ACUTE KIDNEY INJURY REQUIRING RENAL REPLACEMENT THERAPY IN INTENSIVE CARE UNIT. A MULTICENTER PROSPECTIVE OBSERVATIONAL STUDY

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OBJECTIVE. To assess the quality of life (QOL), mortality rate and renal function recovery 6 months after the onset of renal replacement therapy (RRT) for acute kidney injury (AKI) in 7 ICU.

PARTICIPANTS AND SETTING. A prospective observational study was conducted in 7 ICUs in France over 9 months. Inclusion criteria were: age $\geq$18 years, RRT delivered for AKI, written informed consent signed. AKI was defined from the RIFLE score. Recipients of kidney graft or patients under chronic RRT were not included.

MEASUREMENTS AND RESULTS. QOL was assessed using the Short Form Health Survey (SF-36) questionnaire and the index of activities in the daily living (ADL) (0: full assistance to 6: no assistance). SF-36 was compared to a reference age- and sex-matched French population. Twenty-eight days, 3 and 6 months after inclusion, patient status, place of living, persistence of RRT, ADL, SF-36 were assessed. In the study period, 205 patients were included. At 6 months, 77/204 were alive (mortality 62%). SF-36 and ADL significantly increased from day 28 to 6 months. In the survivors at 6 months, SF-36 items were significantly lower than in the reference population, with the physical items more affected than the mental items; 64% had full self-sustaining (ADL score = 6); 69% were living at their home and 12% were still under RRT; 94% would agree to undergo same management again.

CONCLUSIONS. ICU survivors from RRT for AKI have an impaired QOL at 6 months but sustained autonomy in the daily living.

0862

LONG-TERM OUTCOME OF SURVIVORS OF SEVERE ACUTE KIDNEY INJURY IS AFFECTED BY THE CAUSE OF ACUTE TUBULAR NECROSIS

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BACKGROUND. Acute kidney injury (AKI) secondary to acute tubular necrosis (ATN) is common in ICU patients, and causes significant morbidity and mortality. The underlying pathophysiology of ATN can be divided into pure ischemic, pure nephrotoxic, or mixed causes.

OBJECTIVE. To test the hypothesis whether the cause (pure vs. mixed) of renal insults resulting in AKI affects the long-term outcome of survivors of severe AKI.

METHODS. 226 survivors of severe AKI requiring renal replacement therapy (RRT) were divided according to the etiology of ATN in two groups (pure ischemic or nephrotoxic versus mixed) and prospectively followed up for 84 months after hospital discharge. None of these patients had pre-existing kidney disease. Vital status and renal function were documented at hospital discharge and thereafter annually.

RESULTS. Compared to the patient group with pure ATN (129 pts. 95% ischemic ATN, 5% nephrotoxic ATN) the 97 patients with mixed ATN were significantly older ($P < 0.001$), had more comorbid diseases ($P < 0.001$) and less complete renal recovery (77 vs. 38%, $P < 0.001$). Regression analysis revealed that etiology of ATN was a major independent risk factor for partial recovery of renal function. At 7 years, survival was significantly higher (60 vs. 22%) and the risk for chronic kidney disease was significantly lower (6 vs. 38%, $P < 0.001$) in the pure cause ATN patient group compared to patients in whom ATN was multifactorial. Five out of 21 survivors of mixed ATN needed maintenance haemodialysis, but none of the pure cause ATN group.

CONCLUSION. Patients with AKI due to ATN requiring RRT had significantly higher survival rates and less chronic kidney disease when pure ischemia or nephrotoxins were causative compared to those whose ATN was multifactorial (mixed ischemic and nephrotoxic) in origin. These data indicate that the various aetiologies of ATN represent different patient populations with different prognosis, which should be taken into consideration in future studies.

0863

INTRA ABDOMINAL PRESSURE ELEVATION AND ITS LINK WITH RENAL FAILURE IN MEDICAL INTENSIVE CARE PATIENTS

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INTRODUCTION. Elevation of intra abdominal pressure (IAP) is a recognized risk factor for visceral dysfunction apparition. The incidence of intra abdominal hypertension (IAH) is estimated between 18 and 81% depending on the studied population's characteristics. No data concerning exclusively medical patients are available. We report the preliminary results of IAP monitoring in an exclusively medical intensive care unit population.

OBJECTIVES. To assess the incidence of IAH in medical ICU patients, the link between IAP elevation and organ dysfunction.

METHODS. Measurement of IAP among medical, ventilated, and sedated patients with a predicted length of ventilation superior to 48 h at the time of admission.

First measurement within the first 24 h of ventilation and then once or twice daily during seven days or till the end of mechanical ventilation if inferior to 7 days. Calculation of abdominal perfusion pressure and filtration gradient.

RESULTS. 25% of the patients have at least one IAP measurement >12 mmHg during their ICU stay. IAP elevation mostly occurs after a fluid challenge (FC) in the previous 24 h. 70% of SOFA scores are higher at the time of IAP elevation compared to the time of admission.

Among the 127 collected values 5.5% are $\geq$12 mmHg. A single value of IAP is not predictive of renal function, however some episodes of renal function worsening are contemporary of increased IAP leading to decreased APP et FG even without impaired systemic mean arterial pressure.

TABLE 1 POPULATION

	All patients	IAH−	IAH+
Age	71.8 ± 14.8	73.1 ± 14.5	67.8 ± 16.7
SAPS II	61.2 ± 22	62.4 ± 17	57.4 ± 17
SOFA day1	8.1 ± 2.9	8.2 ± 3	7.6 ± 2.5
Mean IAP	3	3	3
Mean IAP day1	5	5	11
IAP min day 1	1	1	2
IAP max day1	12	11	12
IAP Elevation and Renal Function			

TABLE 2 IAP ELEVATION AND RENAL FUNCTION

IAP (mmHg)	17	12	15	12	18	12	12
Mean arterial Pressure (mmHg)	98	50	67	124	67	60	124
Abdominal perfusion pressure (mmHg)	81	38	52	112	49	48	112
Filtration gradient (mmHg)	64	26	37	100	31	36	100
ClCreat (ml/mn)	55	38	28	25	36	28	120
Fluid resuscitation (mL/kg)	29	22	5	0	37	74	10

CONCLUSION. Elevation of IAP is not uncommon among medical ICU patients. Net fluid balance contributes to IAP increase. The threshold value of IAP for ARF is low, particularly as compared with surgical patients, although the contribution of impaired systemic haemodynamics should also be considered. The usefulness of IAP as a guiding fluid ressuscitation therapy tool and as a minimally invasive renal blood flow monitoring one should be investigated.

0864

INCIDENCE OF ACUTE RENAL FAILURE (ARF) IN NON CORONARY CRITICAL PATIENTS

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OBJECTIVES. The aim of our study was to test the incidence, the rate of mortality and the impact of ARF to prolong the duration of ICU stay in non-coronary patients.

METHODS. During an 18-month period, from August 2007 to March 2009, 75 patients were admitted in our ICU and included retrospectively in our study. Mean age 66.04 years, mean LOS 16.26 days, mean APACHE II score 22.4. The patients compared into two groups: The group A included 33 patients (44%) who developed ARF and the group B included 42 patients (56%) who did not.

RESULTS. We detected no statistically significant difference among the two groups according the age (mean ± SD): 69.15 ± 14.67 and 63.59 ± 17.84, two-tailed $p = 0.15$. We detected statistically significant difference among the two groups according the APACHE II score (mean ± SD): 24.33 ± 8.95 and 20.23 ± 7.26, two-tailed $p = 0.032$, and also according the duration of ICU stay (days, mean ± SD): 21.57 ± 213.61 and 12.09 ± 13.0/8, two-tailed $p = 0.03$. We detected difference according the rate of mortality, 36.36 and 20% respectively, although not statistically significant: two-sided $p = 0.064$, odds ratio = 2.85, 95% confidence interval: 0.97–8.39. From the group A 23 patients had already developed ARF at the day of admission and the others developed ARF at the day (mean ± SD): 27.3 ± 9.37 in the place of MOF.

CONCLUSIONS. In our study the development of ARF was not associated with the age of the patients, but with the initial illness severity score, while the mortality rate for ARF is debated. Nevertheless, the development of ARF impairs the duration of ICU stay, assuming the use of renal protection protocols.

0865

ANALYSIS OF ACUTE RENAL FAILURE IN AN INTENSIVE CARE UNIT OF A SECONDARY LEVEL HOSPITAL

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OBJECTIVES. To assess the clinical characteristics of patients admitted to ICU with acute kidney injury using the RIFLE criteria (RIFLE = *r*isk, *i*njury, *f*ailure, *l*oss, *e*nd stage).

METHODS. Prospective and descriptive study of adult patients consecutively admitted to an intensive care unit from January 2008 to November 2008 who developed acute kidney injury were assessed using the RIFLE criteria at 24 h after admission. Demographics, clinical data and APACHE II and SOFA scores on admission and up to 24 h were recorded, as well as the use of concomitant supportive measures, extracorporeal depuration procedures, and mortality in the ICU and at 30 and 60 days. Quantitative variables are expressed as mean and standard deviation (SD) and qualitative variables as percentages. The SPSS computer program (version 15) was used for descriptive statistics.

RESULTS. Of the 928 patients admitted to the ICU during the 11-month study period, 67 developed acute kidney injury (71.6% males, mean age 63 [SD 14.4] years). The reason for ICU admission was a medical condition in 40 (59.7%) patients and the postoperative care of a surgical procedure in 18 (26.9%)(emergency surgery, $n = 17$; abdominal operation, $n = 14$). A total of 23.9% of patients had chronic renal failure. At 24 h, the mean APACHE II score was 26.25 (6.34) and the mean maximum SOFA score 11.62 (4.12). According to the RIFLE criteria, 14 patients were in the Risk category for acute renal failure, 18 in the Injury category, 34 in the Failure category. Fifty-eight (86.6%) patients reached the Failure category during the clinical course. Only 28.4% of patients were discharged without renal failure. Risk factors included hypovolemia in 88.1% of cases, sepsis in 61.2%, use of iodinated contrast media in 22.4%, need of surgery after ICU admission in 17.9%, use of nephrotoxic drugs in 9%, and rhabdomyolysis in 9%. In 86.6% of patients, more than one risk factor was present (mixed acute kidney failure). Acute kidney failure developed in outpatients in 47.8% of cases, in in-patients in 46.3%, and in ICU patients in 6%. Oliguric acute renal failure occurred in 36 patients. Vasopressor drugs were used in 50 (74.6%) patients, mechanical ventilation in 45 (67.2%), continuous renal replacement procedures (mostly continuous venovenous hemofiltration) in 45 (67.2), and diuretics in 64 (95.5%). The ICU mortality rate was 35.8%. The mortality rate was 30% at 30 days and 3% ay 60 days.

CONCLUSIONS. Patients admitted to the ICU with acute kidney injury had a high APACHE II score, required high supportive measures and showed a high mortality rate. The RIFLE criteria allowed the assessment of the level of involvement of acute renal injury.

Lung recruitment, PEEP and open lung approach: 0866–0879

0866

NURSES ALONG WITH PHYSICIANS PERFORM LUNG RECRUITMENT TO BETTER MEET PATIENTS' NEEDS AND SAFETY REGULATIONS IN ICU'S

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INTRODUCTION. In many countries ICU nurses are responsible for operating ventilators and offering respiratory therapy in the intensive care unit (ICU). Many ICU patients treated with mechanical ventilation need to be lung recruited several times a day due to loss of PEEP, when the tube is disconnected or endotracheal suction is performed. In Sweden, lung recruitment is primarily the physicians' responsibility. As physicians are not present in the ICU's to the same extent as ICU nurses this may result in lung recruitment not being performed as often as needed.

OBJECTIVES. To study the occurrence of and conditions for lung recruitment in adult patients treated with a ventilator in ICU's in Sweden.

METHODS. A nationwide survey was performed including all ICU's except neurological, cardiac, paediatric and neonatal. 60 ICUs participated in the study (82%). Data was analysed with descriptive statistics using SPSS version 14.0.

RESULTS. Lung recruitment was performed at 92% of the ICU's. It was more common that both physicians and nurses performed lung recruitment than physicians only. Lung recruitment was carried out more often in those units where both physicians and nurses performed lung recruitment (46 vs. 12%, $p = 0.03$). In these ICUs lung recruitment manoeuvres were performed after suctioning more often than in units where physicians only performed lung recruitment (68 vs. 32%, $p = 0.02$). Restrictions to nurses' lung recruitment were reported in most units where nurses were allowed to recruit. Restrictions included maximal level of PEEP and limitations of peak pressure even though limitations varied greatly between ICU's. Further, local guidelines on lung recruitment manoeuvres were more common in units where both physicians and nurses performed this treatment, suggesting better adherence to national requirements regarding patient safety (71 vs. 41%, $p = 0.02$).

CONCLUSIONS. The results suggest that recommendations of repeated and prompt lung recruitment are better met if ICU nurses with proper training, physicians' orders and guidelines along with physicians perform lung recruitment.

0867

ALVEOLAR RECRUITMENT MANEUVERS IN ADULT PATIENTS FOR EARLY EXTUBATION "FAST TRACK" IN HEART SURGERY

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INTRODUCTION. Alveolar maneuvers recruitment (AMR) in the immediate postoperative period decreases atelectasis and increases functional residual capacity, it also increases PaO_2 and a decrease shunts. Numerous studies have shown that early extubation or "Fast Track" is part of the treatment of heart surgery which results in less pulmonary complications, thus it decreases the staying time in the postoperative care unit reducing also hospital costs.

OBJECTIVE. To determine the usefulness of the recruitment maneuver in early postoperative period for an early extubation "Fast Track"

METHODS. A randomized, longitudinal, controlled and prospective study was designed. We included patients older than 60 years admitted to the postsurgical intensive care unit of the national medical center in the immediate postoperative heart surgery from October 2008 to February 2009. We determined demographic data (age, gender, Euroscore, comorbidities). On admission, the study group was conducted to maneuver recruitment (increasing tidal volume until 18 m/kg or peak inspiratory pressure of 40 cmH_2O in 10 respiratory cycles and PEEP between 5 and 15 cmH_2O) We compared PaO_2/FiO_2, time (hours) of mechanical ventilation, staying time in the ICU, complications and mortality. We performed Student's t by using SPSS software version 14.

RESULTS. Ninety patients were included and allocated into two groups, group A (control) and group B (study group). General variables: female gender $n = 45$ (50%), cardiovascular risk factors: one factor (20%), two factors (36.7%), three factors (43.3%), previous angina (26.7), previous myocardial infarction (50%), Type of surgery: Aortic (10%), mitral (6.7%), coronary artery bypass graft (CBAG) (36.7%), CBAG + one mechanical valve (36.7%), two valves (10%). Group variables: Age: 65 ± 5.7 (60–77 years) for group A and 64 ± 3.1 (60–69 years) for group B, Bypass pump time: 65 ± 5.7 (60–77 min) for group A and 64 ± 3.1 (60–69 min) for group B.) NS, Aortic clamp: 71.3 ± 12.1 (56–93 min) for Group A and 64.8 ± 23 (30–107 min) for group B, NS, Euroscore for group A was 4, and for group B was 5, PaO_2/FiO_2 preoperative: 273.8 ± 29.9 (200–317) for group A and 270.9 ± 45 (146–346) for group B, NS, PaO_2/FiO_2 postoperative: 150.1 ± 34 (210–90) for group A and 146 ± 28.8 (206–80) for group B, NS, PaO_2/FiO_2 after AMR 140.6 ± 32 (180–90) for group A and 239 ± 39 (324–190) for group B $p < \mathbf{0.01}$, mechanical ventilation time: 14.5 ± 3.6 (10–22 h) and 6.0 ± 0.2 (4–8 h) for group B, $p < \mathbf{0.01}$, Stay in the ICU 103.5 ± 15.6 (72–120 h) for group A and 74.9 ± 11.3 (50–96 h) for group B, $p < \mathbf{0.01}$. Pneumonia: 35% for group A and 18% for group B, $p < \mathbf{0.01}$. Pulmonary infections rate was 16% for group A and 6% for group B.

CONCLUSIONS. AMR improves PaO_2/FiO_2 exchange obtaining as a result less hours of mechanical ventilation, fewer pulmonary infectious complications and lower stay in the ICU.

0868

HIGH POSITIVE END-EXPIRATORY PRESSURE MAY ATTENUATE THE EFFECT OF A RECRUITMENT MANEUVER IN EARLY ARDS

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OBJECTIVE. To assess whether the level of positive end-expiratory pressure (PEEP) has any impact on the effect a recruitment maneuver (RM) on oxygenation in patients with early ARDS.

METHODS. Prospective clinical study in a multidisciplinary intensive care unit. Twenty-nine consecutive patients stratified into two groups according to their PEEP level: Group A, included patients who were ventilated with PEEPtot <10 cmH_2O ($n = 14$), while Group B, patients with PEEPtot ≥10 cmH_2O ($n = 15$) (PEEPtot: external plus intrinsic PEEP). Arterial blood gases were measured before (pre-), 3 min and 30 min after a RM, which consisted of two hyperinflations using CPAP of 45 cmH_2O for 20 s each and in meantime 1 min of baseline ventilation.

RESULTS. On day of study, oxygenation and respiratory mechanics were similar in the two groups (PaO_2/FiO_2: 142 ± 38 vs 131 ± 36 mmHg, $p = 0.432$, static compliance of respiratory system $C_{st,rs}$: 33.9 ± 13.6 vs 31.1 ± 9.7 ml/cmH_2O, $p = 0.533$, static alveolar plateau pressure P_{plat}: 26.7 ± 6.1 vs 29.9 ± 5, $p = 0.131$). Group's B patients had more severe lung insult, based on Lung Injury Score (LIS: 2.3 ± 0.5 vs 2.8 ± 0.5, $p = 0.011$). The effect of the sustained inflation on both groups is shown on Table 1. None of the patients suffered from barotrauma after the implementation of RM. No statistically significant decrease in mean arterial pressure was observed.

TABLE 1

	Pre-RM	PaO_2/FiO_2 mmHg 3 min after-RM	30 min after-RM	Pre-RM	Cst,rs ml/cmH_2O 3 min after-RM	30 min after-RM
Group A	142 ± 41	180 ± 59*	164 ± 55*	33.2 ± 12.5	35.1 ± 13.6*	33.7 ± 12.5
Group B	133 ± 36	150 ± 51*	141 ± 44	32.6 ± 10.8	34.9 ± 12.5*	32.6 ± 11.7

Values are mean ± SD

* Significant compared with pre-RM values

CONCLUSIONS. These preliminary results suggest that patients ventilated with lower PEEP benefited more from a RM. The effect of the RM on compliance was only temporal. Among our study population no major complications were observed.

0869

EFFECT OF PEEP ON LUNG STRAIN MEASUREMENT IN ARDS PATIENTS

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INTRODUCTION. Lung strain is indicated as a major determinant of ventilator induced lung injury. It has been defined as the ratio between end-inspiratory lung volume above functional residual capacity (ΔV) and functional residual capacity (FRC) ($STRAIN_{\Delta V} = \Delta V/FRC$). ΔV includes a static component due to PEEP ($STRAIN_{PEEP}$) and a dynamic component due to tidal volume ($STRAIN_{TV}$). To assess lung strain at different PEEP levels a single FRC measure, commonly at the lower PEEP level, it has been used, assuming that FRC is not influenced by PEEP. This may lead to overestimation of STRAIN at higher PEEP. We evaluated, in ARDS patients, the effect of neglecting PEEP induced FRC changes on $STRAIN_{\Delta V}$ and its components.

METHODS. Three levels of PEEP (5, 10, 15 cmH_2O), were randomly applied, for 1 h each, in 10 ARDS patients. At each PEEP we obtained the FRC by helium dilution method and the volume expired from PEEP to ZEEP.

RESULTS. FRC increased at increasing PEEP (507 ± 292, 607 ± 311, 681 ± 312 ml ($p < 0.05$) respectively at PEEP 5, 10, 15 cmH_2O). $STRAIN_{\Delta V}$ and $STRAIN_{PEEP}$ increased while $STRAIN_{TV}$ decreased at increasing PEEP (Fig. 1). Using the FRC at PEEP 5 for all PEEP levels lead to overestimation (24 ± 15% and 45 ± 36% respectively at PEEP 10 and 15) of $STRAIN_{\Delta V}$, $STRAIN_{PEEP}$ and $STRAIN_{TV}$ (Fig. 1). The overestimation is proportional to the difference between the measured FRC and the one used for the computation.

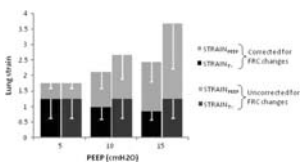

Fig. 1

CONCLUSIONS. FRC is affected by PEEP. Ignoring PEEP-induced FRC changes leads to relevant overestimation of both the components of lung strain.

0870

MECHANICAL RELATIONSHIP BETWEEN THORACIC AND ABDOMINAL COMPARTMENTS

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INTRODUCTION. In mechanically ventilated patients higher intra-abdominal pressure (IAP) change the respiratory system mechanics. However, different abdomino-thoracic pressure transmission has been reported.

OBJECTIVES. To study the mechanical relationship between intrathoracic and abdominal compartment in patients suspected of abdominal hypertension (IAH) with different abdominal compliance.

METHODS. 22 patients on controlled mechanical ventilation admitted in medico-surgical ICU with different diagnosis. Mechanical properties of abdomen and chest wall were studied by measurements of static and dynamic bladder (IAP), esophageal (Pes) and central venous pressure (CVP). At the bedside without additional devices for this study. End expiratory pressures were considered as static values and the difference between end-inspiratory and end-expiratory as dynamic values. Data are showed as mean ± SD and range.

RESULTS. Diagnosis were: 4 cardiac arrest, 2 thoracic trauma, 1 acute pancreatitis, 15 abdominal sepsis. IAPst [IAPst 10 ± 4 (3–21) mmHg], was related with static intrathoracic pressure (Pes,st, $r = 0.6$, CVP,st. $r = 0.7$). Pes,st 8 ± 4(3–20), Pes, dyn 5 ± 4(1–18) mmHg. CVPst 13 ± 5 (6–28), CVPdyn 3 ± 2 (1–9) mmHg.

Poor relationship was found between IAPst, and IAPdyn [IAPdyn 2 ± 1(1–7) mmHg], ($r = 0.3$). Whereas in patients ($n = 9$, 40%) with intra-abdominal hypertension IA$p = 14 \pm 2$ (12–21) mmHg, the relationship between these variables were significant ($r = 0.8$), compared with patients with lower IAP (7 ± 2 mmHg; $r = 0.4$). Compliance of the respiratory system (31 ± 9 ml/cmH_2O) was lower than lung compliance (56 ± 28 ml/cmH_2O) due to highest chest wall pressures. Chest wall compliance (119 ± 92 ml/cmH_2O) was related with static and dynamic abdominal pressure ($r = -0.5$, $r = -0.6$). Respiratory oscillations of CVP and Pes were related ($r = 0.6$).

CONCLUSIONS. The degree of respiratory system impairment caused by an increase in the intra-abdominal pressure is unpredictable in ventilated patients. In the clinical setting the estimation of chest wall compliance it is needed in order to manage the ventilator.

0871

CARDIOPULMONARY EFFECTS OF TITRATING POSITIVE END-EXPIRATORY PRESSURE TO MATCH ABDOMINAL PRESSURE ON AN EXPERIMENTAL MODEL OF INTRA-ABDOMINAL HYPERTENSION AND ACUTE LUNG INJURY

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INTRODUCTION. The effects of the transmission of increased intra-abdominal pressure to the lungs are relatively known, but there is uncertainty regarding the pulmonary effects of intra-abdominal hypertension (IAH) during acute lung injury (ALI), since there are few studies evaluating these conditions concomitantly. Another controversial issue on this topic is the setting of ventilatory parameters for patients with concomitant IAH and ALI. It has been suggested that application of external positive end-expiratory pressure (PEEP) matching abdominal pressure could improve ventilatory performance during ALI and IAH [1].

OBJECTIVES. Our purposes were to provide physiological data on the cardiopulmonary effects of IAH during ALI and to evaluate the cardiopulmonary effects of PEEP matching abdominal pressure in an experimental model of IAH and ALI.

METHODS. Eight anesthetized pigs (35–42 kg) were instrumented with pulmonary artery and arterial catheters and then submitted to IAH of 20 mmHg for 30 min through pneumoperitoneum with a CO_2 insufflator. ALI was induced by lung lavage with saline (3 ml/kg) and tween (2.5%). Pressure × volume curves of the respiratory system were performed by a quasi static low flow method during IAH, ALI and both conditions concomitantly. The lower inflection points (LIPs) of the inspiratory and expiratory limbs of the PV curves were also identified. PEEP was subsequently adjusted to 27 cmH_2O for 30 min.

RESULTS. IAH significantly decreased pulmonary and respiratory system static compliances and increased alveolar-arterial oxygen gradient. Concomitant IAH and ALI increased airway resistance and exacerbated the alterations in respiratory mechanics. IAH increased inspiratory and expiratory LIPs more pronouncedly than isolated ALI and the concomitance of both diseases did not induce a more significant increase in the value of LIPs, as compared to IAH alone. Thirty minutes of mechanical ventilation with PEEP identical to abdominal pressure moderately improved oxygenation and respiratory mechanics. Cardiac output was maintained during high PEEP through significantly increased heart rate. However, this short period of increased PEEP caused a statistically significant decline in stroke index, left ventricle stroke work index and right ventricle ejection fraction.

CONCLUSIONS. Concomitant IAH and ALI produce important impairments in the respiratory physiology. The adjustment of PEEP to match abdominal pressure may improve the respiratory performance, nevertheless with a secondary hemodynamic derangement.

REFERENCE. 1. Malbrain ML, Deeren D, Nieuwendijk R et al (2003) Partitioning of respiratory mechanics in intra-abdominal hypertension. Intensive Care Med 29:S85

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0872

LACK OF ASSOCIATION BETWEEN MORPHOLOGICAL AND FUNCTIONAL SURROGATES OF LUNG HYPERINFLATION

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INTRODUCTION AND OBJECTIVE. Lung hyperinflation associated with mechanical ventilation has traditionally been inferred from functional parameters such as dead space or compliance, but it may also be assessed by quantitative computed tomography (CT). Because information about the relationship of these surrogates of lung hyperinflation is scanty, we analyzed these parameters simultaneously in an animal model. We hypothesized that an increase in hyperinflation detected by CT should be paralleled by a decrease in compliance and an increase in alveolar dead space.

METHODS. Airway pressure, flow, and expiratory CO_2 were recorded continuously in 10 anesthetized, paralyzed and mechanically ventilated sheep with normal lungs. Expiratory CT scans of the entire lung were acquired and arterial blood gases measured at two different conditions. Before CTs and blood gas measurements, equilibration (10 min) was achieved during pressure controlled ventilation (PCV) with driving pressures of 15 cmH_2O and the respective PEEP. The first CT (CT-1) was acquired at positive end-expiratory pressure (PEEP) of 10 cmH_2O. After performing a recruitment maneuver (PCV with PEEP 40 and driving pressure of 20 cmH_2O for 2 min), a second CT (CT-2) was acquired at 20 cmH_2O PEEP. For each condition, the hyperinflated lung volume was quantified from the segmented CT images of the entire lung as the volume of regions with CT numbers < -900 HU, and the nonaerated volume was calculated as the volume of regions with CT numbers between -100 and 100 HU. Both volumes were expressed as percentage of the total lung volume. The dynamic compliance (tidal volume divided by pressure difference (peak inspiratory pressure minus PEEP)) and the alveolar dead space-to-alveolar tidal volume ratio (VD_{alv}/VT_{alv}) were computed. Data are given as median (extreme values) or mean ± SD. Paired *t* tests or Wilcoxon tests were used for comparison. Correlation was assessed by linear regression.

RESULTS. The hyperinflated volume increased significantly ($p = 0.02$) from CT-1 (0.5 (0.0–2.1)%) to CT-2 (1.3 (0.1–6.5)%). Although negligible at both conditions (1.4 ± 1.0% vs. 0.5 ± 0.2%), the nonaerated volume was significantly lower during CT-2 ($p = 0.02$). The increase in hyperinflation detected by CT was neither associated with a decrease in compliance nor with an increase in alveolar dead space. Instead, compliance was significantly higher during CT-2 than during CT-1 (50 ± 7 vs. 43 ± 7 ml/cmH_2O, $p = 0.04$), whereas VD_{alv}/VT_{alv} did not differ (0.36 ± 0.12 vs. 0.35 ± 0.10, $p = 0.67$). Changes in hyperinflation and compliance were not correlated ($p = 0.05$).

CONCLUSION. In the present study of normal lungs, lung hyperinflation detected by CT was not accompanied by the expected changes in compliance and dead space. The relationship of the appearance of lung regions with gas contents >90% (corresponding to CT numbers < -900 HU) and physiological indicators of lung hyperinflation must be further investigated.

0873

RELATIONSHIP BETWEEN CHANGES IN NT-PROBNP AND SOFA SCORE UNDER OPEN LUNG STRATEGY FOR PATIENTS WITH SUSPECTED ACUTE LUNG INJURY/ACUTE RESPIRATORY DISTRESS SYNDROME ON MEDICAL INTENSIVE CARE UNIT ADMISSION

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INTRODUCTION. Although decreased to a certain extent by protective ventilator strategy with lowering tidal volume and airway pressure, the mortality of acute lung injury/acute respiratory distress syndrome (ALI/ARDS) is still high. Recently, a few studies concluded that elevated NT-proBNP levels are associated with worse outcomes in patients with ARDS. But there still remains an area of uncertainty about how much change of NT-proBNP concentration is needed to reflect clinical improvement or deterioration of the disease.

OBJECTIVES. The aim of our study was to evaluate the relationship between changes in NT-proBNP and sequential organ failure assessment (SOFA) score of ALI/ARDS patients and to find out if there is a specific threshold by which NT-proBNP reflects clinical course of the disease.

METHODS. We enrolled the patients who fulfilled the American–European consensus conference (AECC) definitions for ALI/ARDS under standard ventilator setting (PEEP ≥ 10 cmH_2O, $FiO_2 \geq 0.5$) and finally classified as ALI/ARDS or acute respiratory failure (ARF) after 24 h. Under open lung strategy including recruitment maneuver, NT-proBNP was measured and SOFA score was recorded on ICU day 0, 1, 3, 7. We tested the relationship between the absolute vale of NT-proBNP and SOFA score on each day, between NT-proBNP ratio (NT-proBNP on day 1, 3, 7/NT-proBNP on day 0) and delta SOFA score (SOFA score on day 1, 3, 7—SOFA score on day 0) by partial correlation and multivariate linear regression model. To evaluate the relationship between NT-proBNP ratio and the clinical improvement, patients were divided into quintile by NT-proBNP ratio (~0.4 as group 1, 0.4–0.8 as group 2, 0.8–1.2 as group 3, 1.2–2.4 as group 4, 2.4~ as group 5) and delta SOFA score of each group was compared with one another by one-way ANOVA.

RESULTS. We enrolled 49 patients and 32 patients were finally classified as ARDS (65%), 12 patients as ALI (25%), and 5 patients as ARF (10%). Mean age was 64 years. Mean admission APACHE II score, SAPS II score, MODS score, SOFA score were 22, 48, 6, 8, respectively. The mean value of NT-proBNP was 8347.6. Among each severity scores, only admission SOFA score correlated with NT-proBNP on day 0 ($p = 0.027$) by multivariate analysis. NT-proBNP ratios on day 1, 3, 7 were all correlated with delta SOFA scores on day 1, 3, 7 by multivariate linear regression model ($p = 0.006$, $p = 0.001$, $p = 0.005$, respectively). As compared with group 5, only delta SOFA scores of group 1 or 2 were different.

CONCLUSIONS. NT-proBNP ratio correlates with delta SOFA score of ALI/ARDS/ARF patients on day 0, 1, 3, 7 and reduction in NT-proBNP concentration more than 20% are associated with clinical improvement when compared with increase in NT-proBNP concentration more than 140%.

REFERENCE. 1. Bajwa EK, Januzzi JL, Gong MN, Christiani DC (2008) Prognostic value of plasma NT-proBNP levels in the acute respiratory distress syndrome. Crit Care Med 36:000–000

0874

EFFECT OF THREE FORMS OF PEEP TITRATION AFTER RECRUITMENT MANEUVER IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME

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OBJECTIVE. To observe the effects of three forms of positive end expiratory pressure (PEEP) titration after recruitment maneuver in patients with acute respiratory distress syndrome (ARDS).

METHODS. Fourteen patients with ARDS were enrolled in the study. After lung was recruited by sustained inflation (SI), PEEP was randomly set according to the lower inflection point (LIP) of the inflation limb, which was determined by quasistatic pressure–volume (P–V) curves with the low flow technique ($PEEP_{LIP}$), maximal oxygenation and maximal static pulmonary compliance (Cst) after recruitment maneuvers (RM)($PEEP_{oxygen}$ and $PEEP_{Cst}$). Hemodynamics, lung mechanics, gas exchange and lung recruitment volume were examined at the same time.

RESULTS. (1) $PEEP_{oxygen}$ (14.6 ± 3.0 cmH_2O) was higher than that $PEEP_{Cst}$ (11.3 ± 2.6 cmH_2O) and $PEEP_{LIP}$ (13.0 ± 1.7 cmH_2O) ($p < 0.05$). (2) Oxygen index (PaO_2/FiO_2) was significantly improved post RM in all PEEP levels ($p < 0.05$). But there was no significant difference among the three PEEP levels ($PEEP_{oxygen}$, $PEEP_{Cst}$ and $PEEP_{LIP}$) ($p > 0.05$). (3) Compared with base state, Cst increased significantly in $PEEP_{Cst}$ (32.1 ± 14.6 vs. 40.7 ± 14.9 ml/cmH_2O), but there was no significant difference with $PEEP_{oxygen}$ and $PEEP_{LIP}$. Compared with base state, peak airway pressure was higher in $PEEP_{oxygen}$ and $PEEP_{LIP}$ ($p < 0.05$). Peak airway pressure and plat pressure were higher post RM with $PEEP_{oxygen}$ and $PEEP_{Cst}$ ($p < 0.05$). (4) Lung recruitment volume at pre-RM (135.9 ± 111.1) ml was significantly lower than that $PEEP_{oxygen}$ (401.6 ± 204.0 ml) ($p < 0.05$).

CONCLUSIONS. $PEEP_{oxygen}$ and $PEEP_{LIP}$ might increase peak airway pressure and plat pressure, but $PEEP_{Cst}$ may be good for ARDS patients post RM.

0875

EFFECTS OF OPEN LUNG APPROACH FOLLOWING ARDSNET VENTILATORY STRATEGY IN PATIENTS WITH EARLY ALI/ARDS

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INTRODUCTION. The beneficial effects of the institution of high levels of PEEP after recruitment maneuvers are controversial.

OBJECTIVES. Analyze the effects of the ARDS Network ventilatory strategy and open lung concept (OLC) applied after 24 h of ARDSNet protocol, in patients with acute lung injury/acute respiratory distress syndrome (ALI/ARDS).

METHODS. Fifteen patients fulfilling criteria for early ALI/ARDS were recruited. For definitive selection, blood gas collected after 30 min application of 5 cmH_2O PEEP and VT = 10 ml/kg had to demonstrate a $PaO_2/FiO_2 < 300$ mmHg. The first ten patients (group 1) were initially ventilated for 24 h according to the ARDSNet protocol. After this period, if the PaO_2/FiO_2 was ≤ 350, a recruitment maneuver was performed (sequential 5 cmH_2O increments in PEEP starting from 20 cmH_2O, until $PaO_2/FiO_2 > 350$) and an additional 24 h of ventilation according to the OLC (VT = 6 ml/kg and PEEP to achieve a $PaO_2/FiO_2 > 350$) was applied. The last five patients (group 2) were ventilated according ARDSNet for 48 h. In both groups whole lung computed tomography images (1.0 mm thickness with 10 mm gap) were acquired after 24 and 48 h of each strategy.

RESULTS. In group 1, the institution of OLC was necessary in 9 of the 10 studied patients. PEEP was significant higher during OLC (17 [17–19] vs 8 cmH_2O [8–11]; $p = 0.007$) and resulted in a significant improvement of oxygenation sustained for 24 h of follow-up, with no significant differences in plateau pressure, static compliance, minute ventilation, $PaCO_2$ and pH ($p > 0.1$). OLC resulted in a significant reduction of the fraction of non-aerated regions as compared to ARDSNet protocol (13% [10–23] vs 37% [33–42]; $p = 0.018$) without a significant increase in the percentage of hyperinsuflation (5% [1–13] vs 2% [0–7]; $p = 0.149$). No significant differences were observed in the infused doses of vasopressors, fluid balance and arterial blood pressure. In group 2, there was a significant rise in $PaCO_2$ during the first 24 h of ARDSNet (37 [34–39] vs 47 [40–55]; $p = 0.02$) without any difference in the lung compartments after 24 and 48 h of ARDSNet.

CONCLUSIONS. When applied after ARDSNet protocol, OLC improved oxygenation reducing the fraction of non-aerated regions without significant increment in hyperinflated areas with comparable levels of hemodynamics and fluid balance.

REFERENCE. 1. Grasso S et al. (2002) Anesthesiology 96:795–802

0876

PULMONARY VENTILATION/PERFUSION MATCHING DURING DIFFERENT STRATEGIES OF PEEP SETTING IN PORCINE LUNG INJURY

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RATIONALE. In patients with acute lung injury individual setting of positive end-expiratory pressure is necessary to avoid further lung damage induced by mechanical ventilation. Different PEEP-optimizing strategies are used. Whereas the ARDSnet protocol aims to avoid inspiratory overdistension, open lung strategies focus on reduction of expiratory alveolar collapse. Recently, the amount of cyclic opening and closing of ventilatory units can be estimated by homogeneity of regional ventilation delay index (SD_{RVD}) measured by electric impedance tomography (EIT) during a slow inflation manoeuvre. We hypothesized that different strategies to optimize PEEP affect pulmonary ventilation/perfusion matching.

METHODS. In 12 anesthetized and mechanically ventilated pigs lung injury was induced by central venous oleic acid injection and abdominal hypertension. PEEP and F_iO_2 were set guided by the ARDSnet protocol. Thereafter, maximal lung recruitment was performed followed by a decremental PEEP trial from 30 to zero cmH_2O in steps of two cmH_2O. Blood gas analyses were taken and EIT measurements were achieved at any PEEP level. Open-lung-PEEP (OL) was defined as PEEP level that avoids decrease in oxygenation. PEEP that minimizes SD_{RVD} calculated from EIT was selected as EIT-PEEP. Finally, ventilation/perfusion relationship (V/Q) was measured by single photon emission tomography (SPECT) during ventilation with ARDSnet-, OL- and EIT-PEEP, respectively. Repeated measures ANOVA and consecutive post hoc tests (Newman–Keuls) were made for statistical analysis.

RESULTS. PEEP, dead space ventilation and shunt perfusion are given as mean and (SD) in Table 1.

TABLE 1

	PEEP (cmH_2O)	Shunt (%CO)	Dead space (%MV)
ARDSnet	10.3 (3.0)$+	50.8 (9.3)$+	49.2 (20.8) $+
EIT	22.0 (2.7)#+	24.1 (24.7)#	26.2 (24.0)#
OL	24.8 (3.5)#$	21.3 (27.1)#	27.8 (22.9)#
ANOVA	*	*	*

* $p < 0.05$ repeated measures ANOVA; # $p < 0.05$ vs. ARDSnet, $ $p < 0.05$ vs. EIT, + $p < 0.05$ vs. OL (post hoc)

CONCLUSIONS. Compared to the ARDSnet protocol, EIT guided PEEP setting results in higher PEEP levels and reduces shunt perfusion and dead space ventilation. Open lung strategy further increased PEEP without additional improvement in V/Q matching.

0877

A HIGH PEEP STRATEGY DOES NOT DECREASE CYCLIC OPENING-CLOSING (O/C) BUT IT MAY INDUCE OVERDISTENSION

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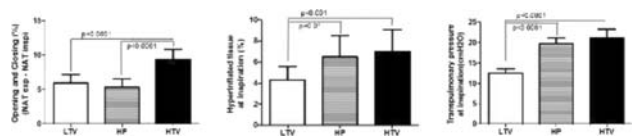
INTRODUCTION. In the last decade several clinical trials have studied the effects of low tidal volume (Vt) and higher PEEP levels in ARDS. Low Vt has been shown to decrease mortality compared to high Vt, and this effect has been explained by excessive overdistension related to high Vt. In contrast, higher PEEP levels have not been shown to impact survival, despite the theoretical benefits related to recruitment and O/C prevention.

OBJECTIVES. To evaluate the effects of PEEP and tidal volume on O/C and overdistension using cine-CT during uninterrupted mechanical ventilation.

METHODS. We studied ventilated ARDS patients, who underwent a protocol including 3 ventilatory modes: (1) Low Vt (LTV): Vt 6 ml/kg-respiratory rate(RR) 30/min-PEEP 9 cmH_2O, (2) High PEEP (HP): Vt 6 ml/kg-RR30/min-PEEP 15 cmH_2O, and (3) High Vt (HTV): Vt 12 ml/kg-RR 15/min-PEEP 9 cmH_2O. All patients were sedated and paralyzed, connected to a pneumotach including esophageal and proximal airway pressure monitoring. After having a thorax CTscan, a transverse region 2 cm over the diaphragm was chosen and cine-CTs of 8 s at this fix transverse region were performed at each ventilator mode (LightSpeed VCT, GE; image reconstruction at 0.25 s-32 images, 0.4 s/rotation, 16 × 1.25 mm slices, matrix 512 × 512). Images were analyzed manually with Maluna® (University of Gottingen, Germany). O/C was determined as the change in non aerated tissue (NAT, −100 to +100 HU) between inspiration and expiration, expressed as % of total volume. Overdistension was assessed by maximal transpulmonary pressure (end inspiratory airway pressure–esophageal pressure) and by maximal hyperinflated tissue (−900 to −1000 HU) which was expressed as the maximal % of total volume during inspiration. Differences between ventilator modes were analyzed by ANOVA for repeated measures, followed by Bonferroni post hoc test. A $p < 0.05$ was considered statistically significant.

RESULTS. Ten patients (57.7 ± 23 years old, 6 female), on their 1st to 6th day of ARDS ($PaFiO_2$ 155.5 ± 48.9, compliance 26.3 ± 8.3 ml/cmH_2O). HP decreased NAT from 29.4 ± 11.2% to 24.4 ± 8.8% ($p = 0.002$) but it did not decrease O/C. Furthermore, HP increased transpulmonary pressures and hyperinflated tissue in a magnitude comparable to HTV. HTV markedly increased O/C in all patients.



Cyclic opening–closing and overdistension

CONCLUSION. A strategy based on HP for all ARDS patients does not prevent O/C and it may induce overdistension. Tidal volume is the main determinant of O/C.

GRANT ACKNOWLEDGEMENT. Fondecyt 11060350.

0878

THE IMPACT OF POSITIVE-END-EXPIRATORY PRESSURE AT DIFFERENT INTRA-ABDOMINAL PRESSURES ON FUNCTIONAL RESIDUAL CAPACITY AND OXYGEN DELIVERY IN A PIG MODEL

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INTRODUCTION. High intra-abdominal pressure (IAP) is a common finding in critically ill patients and is associated with increased morbidity and mortality. The optimal level of positive end-expiratory pressure (PEEP) for oxygen delivery and functional residual capacity (FRC) in the setting of high IAP remains to be determined.

OBJECTIVES. In a prospective randomized animal study, we aimed to investigate the influence of PEEP on oxygen delivery and FRC in the setting of high IAP.

METHODS. 13 adult male pigs were studied. General anesthesia and mechanical ventilation was standardized. We produced different levels of IAP by inflating a latex balloon with air which was inserted through a midline laparotomy. The urinary bladder pressure was used to measure IAP and a pulmonary arterial catheter measured cardiac output. Hemoglobin and arterial oxygen saturation were obtained to calculate oxygen delivery and a multibreath nitrogen washout technique was used to calculate FRC. We also recorded femoral venous pressure. Measurements were carried out 5 min after a standardized lung recruitment maneuver. Each level of IAP (baseline, grade II and grade IV intra-abdominal hypertension) and PEEP (5, 8, 12 and 15 cmH_2O) was randomized.

RESULTS. Raising PEEP significantly increased FRC at baseline IAP and at 18 mmHg IAP, but not at IAP of 28 mmHg. Increasing PEEP significantly decreased oxygen delivery at baseline and at 28 mmHg IAP, while it was unchanged at 18 mmHg IAP. Femoral venous pressure correlated well with IAP.

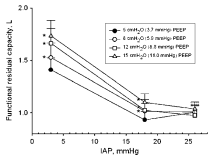
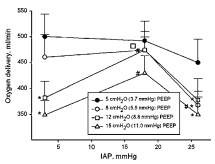


Fig. 1 FRC at different IAP settings and levels of PEEP. * $p < 0.05$ within an IAP setting vs. the corresponding value at 5 cmH_2O PEEP. # $p < 0.05$ within a PEEP setting vs. corresponding value at baseline IAP.**Fig. 2** Oxygen delivery at different IAP settings and levels of PEEP. * $p < 0.05$ within an IAP setting vs. the corresponding value at 5 cmH_2O PEEP. # $p < 0.05$ within a PEEP setting vs. corresponding value at baseline IAP.



CONCLUSION. FRC improved less by increasing PEEP as IAP rose. PEEP significantly decreased oxygen delivery in the setting of high IAP. Femoral venous pressure correlated well with IAP.

0879

THE INFLUENCE OF RECRUITMENT MANOEUVERS ON POST-OP. SPIROMETRIC INDICES

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INTRODUCTION. Mini-invasive surgical procedures have gained an increasing popularity due to a shorter hospital stay and more favourable outcomes. Several investigations have been performed to evaluate respiratory consequences of CO_2 abdominal insufflation.

OBJECTIVE. Aim of this study was to evaluate the effects of pneumoperitoneum on some spirometric indices, obtained before and after the surgical procedure, and the possible "protective" effects of intra-operative alveolar recruitment manoeuvres in addition to PEEP.

METHODS. Eighteen consecutive patients, undergoing elective laparoscopic cholecystectomy, were randomly assigned into 2 groups of 9 patients; the two groups were comparable for general data (age, sex, length of operation, ASA grading). Group A received a standard ventilation with TV 10 ml/kg IBW, ZEEP, FiO_2 45%. Group B received the same ventilatory pattern plus PEEP just after the induction of pneumoperitoneum and recruitment maneuvers made as both constant-flow and rapid occlusion technique, in order to maintain a constant plateau pressure of 40 cmH_2O for 10 s. The lower inflection point identified on the total respiratory system pressure–volume curve was used to set the exact PEEP level and it resulted as 9 ± 1 cmH_2O. All the patients enrolled underwent a complete spirometric analysis before (T0) and within 24–36 h after the end of the surgery (T1). Anaesthesia (sevorane, fentanyl, cisatracurium) and post-operative analgesia were standardized in both groups. Spirometric data, normalized for body size and expressed as mean ± SD, were analyzed by the Student's t test. $P < 0.05$ was considered significative.

RESULTS. VC: (Group A) T0 vs T1 $p < 0.0003$, (Group B) T0 vs T1 $p < 0.0005$; FEV1: (Group A) T0 vs T1 $p < 0.0005$, (Group B) T0 vs T1 $p < 0.0026$; TLC: (Group A) T0 vs T1 $p < 0.0597$, (Group B) T0 vs T1 $p < 0.0766$.

CONCLUSIONS. According to previous reports, general anaesthesia and pneumoperitoneum are detrimental on respiratory performance, as demonstrated by our spirometric indices measured in both groups. Our results show a more statistical significative detrimental indices mainly on FEV1 and VC in group A but it is not significative if we compare the two groups. Even if further data are needed to confirm our preliminary suggestions, it might result useful to apply such a ventilatory strategy to counteract the detrimental effects of anaesthesia combined with pneumoperitoneum at least on FVC and FEV_1.

REFERENCE. 1. Maracajà-Neto LF, Verçosa N, Roncalli AC, Giannella A, Bozza FA, Lessa MA (2009) Beneficial effects of high positive end-expiratory pressure in lung mechanics during laparoscopic surgery. Acta Anaesthesiol Scand 53(2):210–217
2. Ko SC, Zhang H, Haitsma JJ, Cheng K-C, Li CF, Slutsky A (2008) Effects of PEEP level following repeated recruitment maneuvers on ventilator-induced lung injury. Acta Anaesthesiol Scand 52:514–521

Haemodynamic monitoring: 0880–0893

0880

INTENSIVE CARE HEMODYNAMIC MONITORING: ASSESSING AGREEMENT BETWEEN MINIMALLY INVASIVE AND NONINVASIVE METHODS

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INTRODUCTION. Hemodynamic monitoring has become crucial in the evaluation of critically ill patients. Current strategies involve the use of invasive techniques. Impedance cardiography (ICG) is an emerging noninvasive method requiring validation in the intensive care unit (ICU) setting. We aimed to evaluate the agreement between ICG and pulse contour cardiac output analysis (PicCo®) in the determination of cardiac index (CI) and systemic vascular resistance index (SVRI) in ICU patients presenting with shock.

METHODS. Among 37 patients consecutively admitted to a polivalent ICU in shock, 15 were excluded due to recent cardiac surgery, major pulmonary embolism, moderate to severe aortic disease, tachyarrhythmia or aortic aneurism. Hemodynamic monitoring using ICG (BioZ ICG Monitor (Cardiodynamics, San Diego, California) and PicCo® were performed simultaneously to all eligible patients at admission and after 12 h. We used Bland–Altman analysis to assess the agreement between the two methods within 6 h of admission.

RESULTS. Data on hemodynamic parameters were available for 14 from the 22 included patients. The mean ± standard deviation age was 58.8 ± 15.8 years, 71.4% were men and 36.4% had depressed left ventricular systolic function by echocardiography. The median (interquartile range) CI acquired by PicCo® and ICG was 2.9 (1.8–3.7) and 2.4 (2.0–3,3) L/min/m^2, respectively. The mean difference between the two methods was 0.26 L/min/m^2. The limits of agreement were −2.37 and 2.89 L/min/m^2, widening with increasing CI values. After logarithmic transformation, the limits of agreement reflected a variation in CI from −49 to 230% between methods. For SVRI the median (interquartile range) was 1,545 (1,072–2,260) and 1,890 (1,182–2,270) dyn s cm^{-5} m^2, respectively determined by PicCo® and ICG. The mean difference between the two methods was −69.2 dyn s cm^{-5} m^2. ICG measured higher SVRI values in the majority of patients. The limits of agreement were −651 and 649 dyn s cm^{-5} m^2. After logarithmic transformation the ICG measurement may differ from the PicCo measurement by 39% below to 230% above.

CONCLUSION. Our results failed to confirm good agreement between ICG and PicCo® for the determination of CI and SVRI in ICU patients admitted with shock. The limits of agreement between the two methods were too wide to be clinically acceptable. The small sample size is a major limitation of our study.

0881

INTENSIVE CARE HEMODYNAMIC MONITORING: IS THERE A PLACE FOR NON INVASIVE METHODS?

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INTRODUCTION. Understanding the hemodynamic profile of patients admitted to the Intensive care unit (ICU) with shock can be clinically challenging. Invasive methods have been developed in order to evaluate and manage those patients. The role of impedance cardiography (ICG), a noninvasive method that provides accurate hemodynamic measurements, was not fully addressed in this clinical setting.

OBJECTIVE. To assess the role of ICG compared to pulse contour cardiac output analysis (PicCo®) in hemodynamic profiling of patients admitted to the ICU with shock.

METHODS. We prospectively enrolled 37 patients admitted to a polyvalent ICU with shock. Patients ($n = 15$) with recent cardiac surgery, major pulmonary embolism, moderate to severe aortic disease, tachyarrhythmia or aortic aneurism were excluded. Data on hemodynamic parameters simultaneously obtained by ICG (BioZ ICG Monitor, Cardiodynamics, San Diego, California) and PicCo® within 6 h of admission were available for 14 patients. For each method, patients were divided in 4 groups according to hemodynamic profile: group 1—cardiac output (CO) below and systemic vascular resistance (SVR) above the sample's median; group 2—CO and SVR above the median; group 3—CO and SVR below the median; group 4—CO above and SVR below the median. We calculated Cohen's kappa to assess the agreement between the two methods for hemodynamic profiling of patients.

RESULTS. The sample's mean (SD) age was 58.8 (±15.8) years. Seventy-one percent were men and 36.4% had systolic dysfunction by echocardiography. The distribution of patients in terms of different hemodynamic profiles assessed by PicCo® was: 6 (42.9%) patients in group 1, 6 (42.9%) patients in group 4, 1 (7.1%) patient in group 2 and 1 (7.1%) patient in group 3. For ICG, the number of patients in each group was the same. The agreement between the two methods in hemodynamic profiling of patients was moderately strong and statistically significant ($k = 0.66$, 95% CI 0.33–0.99, $p = 0.001$).

CONCLUSIONS. In our sample, we found a clinically acceptable agreement between PicCo® and ICG for the classification of patients in terms of different hemodynamic profiles. Our results support the use of ICG in hemodynamic monitoring of patients admitted to the ICU with shock.

0882

MOSTCARE AND VIGILEO TO ASSESS CARDIAC OUTPUT DURING INTRAOPERATIVE HYPERTHERMIC INTRATHORACIC CHEMOTHERAPY

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INTRODUCTION. Pulse Contour Methods (PCMs) have been recently developed and applied in different clinical conditions to assess cardiac output (CO) with the advantage of a less-invasivity. Our aim was to compare the trend of CO values obtained with MostCare-PRAM (Pressure Recording Analytical Method) and with Vigileo during hyperthermic intrathoracic chemotherapy (HIC).

METHODS. Eight patients (mean age 67 ± 8; 6 male, 2 female) undergoing thoracic surgery for malignant pleural mesothelioma were studied. CO monitoring was simultaneously performed by MostCare-PRAM and Vigileo, two different PCMs that allow beat to beat analysis of arterial pressure waveform by means of a radial line. Intrathoracic chemotherapy (pleural perfusion) was applied at the end of surgery with 3 litres of 0.9% saline solution warmed at 42.5°C, containing cisplatin (100–200 mg/m^2), and infused over a period of 60 min. During the study, hemodynamic parameters estimated by the two PCMs were blinded to the anaesthesiologist who based his intraoperative management on standard monitoring and variables. The comparison of CO values by the two techniques was carried out during all the duration of the surgical procedure and collected at six times: T1: Pre-induction; T2: skin-incision; T3: one lung ventilation; T4: 15 min before HIC; T5: During HIC, T6: end of surgery. Pearson's correlation and Bland–Altman analysis were applied.

RESULTS. Patients were hemodynamically stable throughout the study interval; a total of 48 MostCare-PRAM and Vigileo CO measurements were evaluated and compared. MostCare-PRAM CO values ranged from 3.4 to 6.2 l/min; Vigileo CO values ranged from 3.5 to 5.5 l/min. Mean MostCare-PRAM CO values vs mean Vigileo CO values were: 4.10 ± 0.54 l/min vs 4.28 ± 0.41 l/min; the overall correlation was $R = 0.76$ with a mean bias ± 2 SD of 0.03 ± 0.74. Table 1 shows mean MostCare-PRAM CO and Vigileo CO values, standard deviations (SD), mean bias, 95% limits of agreement, Pearson's coefficient (R) and percentage of error (PE%) at each time.

TABLE 1 COMPARISON OF MOSTCARE AND VIGILEO CO MEASUREMENTS

	CO PRAM (l/min)	CO Vigileo (l/min)	Biads ± 2 SD (l/min)	95% limits of agreement	R	PE (%)
T1	4.6 ± 0.55	4.2 ± 0.54	0.38 ± 1.0	−0.43 to 1.24	0.62	23
T2	4.3 ± 0.26	4.3 ± 0.53	−0.05 ± 0.56	−0.61 to 0.51	0.97	13
T3	4.1 ± 0.47	4.0 ± 0.45	0.08 ± 0.58	−0.5 to 0.66	0.80	14
T4	3.9 ± 0.31	4.0 ± 0.17	−0.02 ± 0.52	−0.54 to 0.5	0.71	13
T5	3.8 ± 0.20	4.0 ± 0.31	−0.25 ± 0.46	−0.71 to 0.21	0.69	11.8
T6	3.6 ± 0.20	3.8 ± 0.38	−0.17 ± 0.66	−0.83 to 0.49	0.68	17.8

CONCLUSION. Our findings showed an overlapping trend and a good agreement between MostCare and Vigileo CO at each time of the study. Both methods were able to provide a continuous hemodynamic monitoring of CO throughout the study. MostCare and Vigileo seem interchangeable devices in this type of surgery. This is the first study to assess the suitability and reliability of these techniques during HIC.

0883

CLINICAL SIGNIFICANCE OF SUPERIOR VENA CAVA TO PULMONARY ARTERY LACTATE GRADIENTS IN CARDIAC SURGERY PATIENTS

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INTRODUCTION. Blood lactate gradients (Δlac) from superior vena cava (SVC) to pulmonary artery (PA) is a common finding in critically ill patients. These gradients may be positive or negative, probably depending on the lactate concentration in coronary sinus blood. Negative (SVClac − Palac < 0) declares increased anaerobic myocardial metabolism.

PURPOSE. The study tests the hypothesis that negative Δlac is associated with an increased morbidity and mortality rate with prolonged hospital stay in patients undergone major cardiac surgery.

DESIGN AND SETTING. Prospective observational study conducted in a 14 bed cardiac ICU.

PATIENTS. Consecutive sample of 75 adult patients. Average age was 66 ± 15.5 years, Euroscore was 4.5 ± 2.5 (mean ± SD). Outcome measures were complication rate (including sepsis, renal insufficiency, respiratory insufficiency), duration of hospital stay and mortality.

MEASURES AND RESULTS. We aspirated blood samples from proximal and distal port of PAC at the time of admission in ICU and every 8 h until the removal of the PAC or until the normalization of the lactate levels. Patients were monitored for 24 ± 8 h and allocated in two groups: Δlac > 0 and Δlac < 0 respectively and the results analysed statistically. Patients in Δlac < 0 group had a lower complication rate ($p < 0.05$), a shorter hospitalization ($p < 0.05$) and lower mortality ($p < 0.05$).

CONCLUSION. There is strong evidence that Δlac < 0 is associated with a worse outcome in cardiac surgery patients.

0884

A COMPARISON BETWEEN PLETH VARIABILITY INDEX (PVI) AND ARTERIAL PULSE PRESSURE VARIATION (PPV) IN PATIENTS WITH SEPSIS

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INTRODUCTION. The pulse oximetry plethysmographic variation (Pleth Variability Index = PVI) has recently been proposed as a surrogate for arterial pulse pressure variation (PPV) to guide fluid therapy non-invasively in stable patients undergoing surgery.

OBJECTIVES. To compare PVI and PPV in patients with sepsis and to investigate the influence of the PVI site of measurement (finger, ear, forehead), peripheral perfusion, and the use of vasoactive drugs on the agreement between PVI and PPV.

METHODS. 249 PVI measurements (Radical 7, Masimo, Irvine, CA) performed using a finger probe (PVIfi), a ear probe (PVIea) and a forehead probe (PVIfo) were simultaneously recorded on a computer and compared to PPV in 28 patients with sepsis (all but four patients were receiving norepinephrine). The pulse oxymeter-derived marker of peripheral perfusion (perfusion index = PI) and SaO_2 were also recorded.

RESULTS. PPV ranged from 1 to 32% (mean 9 ± 5%) while PVIfi ranged from 2 to 41% (mean 13 ± 7%), PVIea from 2 to 44% (mean 12 ± 6%) and PVIfo from 2 to 46% (mean 12 ± 7%). PVIfi, PVIea, PVIfo were significantly ($p < 0.001$) but weakly correlated with PPV. Correlation coefficients (linear regression), bias, SD, and percentage errors between PPV and PVI, as well as PI and SaO_2 values are reported in the Table 1.

TABLE 1

	r^2	Bias ± SD	Error (%)	PI	SaO_2
Finder	0.27	−4.3 ± 5.9	128	1.6 ± 1.6	98 ± 3
Ear	0.45	−2.7 ± 4.9	107	0.4 ± 0.2	97 ± 7
Forehead	0.43	−2.5 ± 5.4	117	1.2 ± 1.0	97 ± 7

The difference between PPV and PVIfi (bias) was significantly ($p < 0.0001$) correlated with PI ($r = 0.38$) and the dosage of norepinephrine ($r = 0.30$). Comparable findings were observed at the other sites (ear and forehead).

CONCLUSIONS. We conclude that

1. PVI and PPV are not interchangeable in patients with sepsis, whatever the site of measurement.
2. The difference between PPV and PVI is significantly influenced by peripheral perfusion and the dosage of vasoactive drugs.

0885

DECREASED CENTRAL BLOOD VOLUME OF CIRRHOTIC ICU PATIENTS

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INTRODUCTION. Patients with advanced cirrhosis display a characteristic hemodynamic disturbance. According to the arterial vasodilation hypothesis, arterial vasodilation leads to sequestration of blood in the abdomen, reduced effective arterial blood volume and a compensatory increase in vasopressor tone jeopardizing renal blood flow. Cirrhotic cardiomyopathy may in addition limit increases in cardiac output necessary to compensate for the reduced peripheral resistance. Studies have questioned the possibility to raise cardiac output by plasma expansion in patients with advanced cirrhosis.

OBJECTIVE. To assess whether the hypothetical reduction in effective arterial blood volume is reflected by decreased measurements of global end-diastolic volume index (GEDVI) in cirrhotic patients and whether these patients are in a volume responsive state.

METHODS. Hemodynamic data obtained by transpulmonary thermodilution (PiCCO, Pulsion Medical Systems, Munich, Germany) of all invasively monitored cirrhotic patients treated in a gastroenterological ICU during one year (2007) were analyzed. Initial measurements were compared to measurements after 48 h. Results were compared to normal values published for the measuring device and to those of a random sample of non-cirrhotic medical non-cardiologic patients of the same ICU.

RESULTS. 25 cirrhotic patients (13 male, 12 female, mean age 55 (±10) years; Child Pugh score 12 ± 2, MELD score 28 ± 9) were monitored for 48 h or more and included in the study.

Global end-diastolic volume index (GEDVI; normal value 680–800 mL/m^2) of cirrhotic patients was lower than that of non-cirrhotic patients (604 ± 131 mL/m^2 vs 766 ± 136 mL/m^2; $p < 0.001$), systemic vascular resistance index (SVRI; normal values 1,200–2,000 dyn/cm^5/m^2) was also lower in cirrhotic patients (1,384 ± 575 dyn/cm^5/m^2 vs 1,719 ± 605 dyn/cm^5/m^2; $p = 0.005$), whereas cardiac index (CI; normal values 3.0–5.0 L/min/m^2) was increased (3.9 ± 1.2 L/min/m^2 vs 3.4 ± 1.4 L/min/m^2; $p = 0.021$).

In cirrhotic patients there were increases in GEDVI (to 689 ± 116 mL/m^2; $p < 0.001$) and CI (to 4.65 ± 1.15 L/min) during the first 48 h of ICU treatment. Relative changes of GEDVI and CI, however, were not correlated. SVRI was decreased (to 1195 ± 419 dyn/cm^5/m^2; $p = 0.021$) and the relative change was inversely correlated with the relative increase in CI ($r = 0.462$; $p = 0.02$). In non-cirrhotic patients, there was a close correlation between increases in GEDVI and CI ($r = 0.808$; $p < 0.001$).

CONCLUSION. Compared to published normal values and to non-cirrhotic ICU-patients, cirrhotic-ICU patients had a significantly reduced GEDVI at the beginning of invasive hemodynamic monitoring. After 48 h of intensive care treatment, GEDVI and CI were significantly increased. The lack of a correlation between these changes suggests that changes in afterload or in myocardial function may have contributed to the hemodynamic improvement.

0886

EVALUATE THE EFFECT OF UF VOLUME ON GLOBAL TISSUE OXYGEN WITH $SCVO_2$

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SUMMARY. Hemodynamic instability during haemodialysis (HD) is related to decrease in blood volume and cardiac output which result from the imbalance between ultrafiltration rate (UFR) and the plasma refilling rate. Compensatory mechanisms for hemodynamic stabilisation involve increase in heart rate, cardiac output and peripheral vascular resistance. Increased oxygen extraction in peripheral tissue (i.e. arterio-venous oxygen difference) is an additional compensatory mechanism. In patient at rest, mixed venous oxygen saturation ($ScvO_2$) reflects cardiac output and oxygen extraction (ERO_2; with $ScvO_2 = 1 - ERO_2$). The aim of the study was to evaluate the effect of UF volume on global tissue oxygen, as reflected by $ScvO_2$, compared to clinical and biological parameters

PATIENTS AND METHOD. After local ethical committee approval, 12 patients with central venous catheter and/or double lumen catheter HD in 34 consecutive sessions were studied. The amount of UF was prescribed at the discretion of the same physician, who determined the amount of fluid to be removed based on individual clinical parameters including fluid balance, previous haemodialysis sessions, estimated dry weight and chest X-ray. Non invasive cardiac index (CI) was evaluated via transthoracic bioelectrical impedance (Physioflow®). Central venous blood sample for $ScvO_2$ was drawn hourly. Pulse oxymetric oxygen saturation (SpO_2), heart rate, non invasive blood pressure and UF volume were recorded each hour. Arterial blood gas, haemoglobin (Hb) and Brain Natriuretic Peptide (BNP) were determined performed before (H0) and 15 min after completion the haemodialysis session (H4). Data are expressed as mean ± maximal and minimal values.

Data analyses were analyzed using SPSS for Windows Software. Analyses were carried out by Student's t test, Wilcoxon signed rank test and correlation tests (Pearson and Spearman) when appropriate. $p < 0.05$ was considered significant.

RESULTS. $ScvO_2$ decreased between H0 and H4 (75 vs. 66% $p < 0.0001$). The decrease in $ScvO_2$ was noticed from H0 and the whole HD period. Although significant, a non relevant correlation ($r = -0.381$) was found between $ScvO_2$ and UF volume or cardiac index ($r = 0.281$). The correlation ($r = -0.381$) between weight loss and $ScvO_2$ variation was not significant ($p = 0.09$) due to lack of power of the study sample.

CONCLUSION. UF volume affects tissue oxygenation as reflected by $ScvO_2$, and might decrease at a critical level of O_2 supply-dependency. $ScvO_2$, if available, seems an interesting tool to determine UF rate and volume.

0887

$S_{CV}O_2$ CHANGES FOLLOWING VOLUME EXPANSION CHARACTERIZE FLUID RESPONSIVENESS

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INTRODUCTION. Predicting the hemodynamic response to volume expansion (VE) is useful in hypotensive critically ill patients (ref). However, cardiac index (CI) measurements by thermodilution, Doppler or pulse contour methods are used as "gold standard" to categorize the hemodynamic response to fluid infusion.

OBJECTIVES. Central venous oxygen saturation variation ($\Delta ScvO_2$), which is measured via a central venous catheter, could be an alternative method to define responders (R) and non responders (NR) to VE in absence of CI measurements.

METHODS. We included prospectively 30 critically ill patients, equipped with radial arterial and pulmonary artery catheters. Patients with severe sepsis or septic shock were excluded. CI, mixed venous oxygen saturation (SvO_2) and $ScvO_2$ were measured both before and after VE in hypotensive patients. CI, SvO_2, and $ScvO_2$ changes (Δ) in % following VE were correlated using linear regression analysis. Thereafter, areas under the receiver operating characteristic (ROC) curves (AUC) to define R and NR were calculated for $ScvO_2$, SvO_2, MAP and CVP variations (Δ), varying the discriminating threshold of each parameter.

RESULTS. Before volume infusion mean CI value was 2.33 ± 0.5 L min^{-1} m^{-2} and increase to 2.54 ± 0.54 L min^{-1} m^{-2} following VE. SvO_2 changes correlated with CI changes ($r^2 = 0.24$, $p < 0.05$). $ScvO_2$ changes correlated with CI changes ($r^2 = 0.44$, $p < 0.05$). On 30 fluid challenges, patients were classified 14 times as responders and 16 times as non-responders respectively. ROC curve testing the ability of $\Delta ScvO_2$ to discriminate R and NR following VE had an AUC of 0.90 ± 0.05 (95%CI; 0.79–1.0, $p < 0.05$) for 30 fluid infusions (Fig. 1). The threshold $\Delta ScvO_2$ value of 8% allowed discrimination between R and NR patients with a sensitivity of 64% (95% CI; 44–80%) and a specificity of 100% (95% CI; 88–100%).

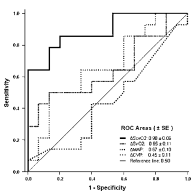

Fig. 1

CONCLUSIONS. In hypotensive critically ill patients in absence of cardiac index measurement, $\Delta ScvO_2$ following VE could be a useful alternative method to classify fluid responsiveness responders from non-responders.

REFERENCE. 1. Bendjelid K, Romand J-A (2003) Intensive Care Med

0888

IS $ScvO_2$ ASSOCIATED WITH OUTCOME IN CRITICALLY ILL PATIENTS?

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INTRODUCTION. Targeting low central venous oxygen saturation ($ScvO_2$) in the emergency department has been shown to reduce mortality [1], but recent studies in intensive care have found that low $ScvO_2$ is neither common nor a good predictor of poor outcome [2, 3].

OBJECTIVES. We looked at whether $ScvO_2$ taken on ICU admission was associated with patient outcome in our 17-bed mixed medical/surgical ICU.

METHODS. Unselected patients who had a central line placed on admission to the ICU or those who already had central venous access were included in the study. Admission $ScvO_2$, arterial-sample lactate concentration and base excess (BE) were recorded, along with basic clinical information and outcome data (ICU and hospital mortality). Subsequent treatment was determined by the clinician in charge.

RESULTS. Of 61 patients with a mean age 65 (Standard Deviation 16), 38 (62%) were male. 45 (74%) were surgical patients, and 28 (46%) were planned admissions after surgery. 25 (41%) met sepsis criteria. 18 (30%) died in hospital, 12 (20%) of them in the ICU.

For all patients median $ScvO_2$ was 74.2% (interquartile range 67.6, 81.2), median lactate was 1.3 mmol/L (0.9, 2.1) and median BE was −1.8 mmol/L (−4.2, 0.5).

ICU survival was associated with a less negative BE ($p = 0.005$) and being a surgical patient ($p = 0.005$). Hospital survival was associated with a less negative BE ($p < 0.014$). Neither $ScvO_2$ nor lactate concentration were associated with either outcome.

TABLE 1

* $p < 0.05$	ICU		Hospital	
	Survived ($n = 49$)	Died ($n = 12$)	Survived ($n = 43$)	Died ($n = 18$)
Mean age (SD)	65 (17)	65 (14)	64 (16)	66 (16)
Percentage male	65%	50%	67%	50%
Percentage surgical	82%	42%*	79%	61%
Median $ScvO_2$ (IQR)	74.5 (67.6, 81.0)	73.2 (67.1, 83.0)	74.3 (66.3, 81.0)	73.9 (68.7, 84.1)
Median lactate (IQR)	1.2 (0.9, 1.7)	2.0 (1.1, 3.6)	1.3 (0.8, 1.8)	1.4 (1.0, 2.4)
Median BE (IQR)	−1.1 (−3.4, 1.1)	−3.9 (−9.5, −2.6)*	−1.0 (−3.4, 1.6)	−3.0 (−8.1, −1.7)*

ROC curve analysis for ICU death as an outcome showed an area under the curve (AUC) for $ScvO_2$ of 0.52 (95% confidence interval 0.32–0.71), compared to AUCs of 0.76 (95% CI 0.60–0.93) for BE and 0.67 (95% CI 0.48–0.86) for lactate concentration

CONCLUSION. Our data would suggest that $ScvO_2$ measurement is of limited value as a predictor of either ICU or hospital mortality.

REFERENCES. 1. NEJM 2001; 345:1368–1377

2. Crit. Care 2008; 12:R33

3. Crit. Care 2007; 11:R2

0889

NON-INVASIVE PREDICTION OF VOLUME RESPONSIVENESS USING BIOREACTANCE IN HEMODYNAMICALLY UNSTABLE PATIENTS WITH SPONTANEOUSLY BREATHING ACTIVITY

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OBJECTIVE. In hemodynamically unstable patients with spontaneous breathing activity, volume responsiveness cannot be predicted by the respiratory variation in arterial pressure. Bioreactance (Reliant^{O}, Cheetah) is a non invasive technique which can measure stroke volume and be used for hemodynamic monitoring. Our objective was to test whether volume responsiveness can be predicted by the response of stroke volume measured by biorecatance to passive leg raising (PLR) in patients with spontaneous breathing activity.

DESIGN AND SETTING. Prospective study in the respiratory critical care of a university hospital.

PATIENTS. 10 patients with spontaneously breathing activity considered for volume expansion. An increase in stroke volume index (SVi) of 15% or more after volume expansion defined a responder patient.

MEASUREMENTS. We measured the response of the bioreactance stroke volume to passive leg raising and to saline infusion (500 ml over 15 min).

RESULTS. The proportional changes in (SVi) induced by PLR were correlated with the proportional changes in SVi induced by volume expansion ($r = 0.64$, $p < 0.05$). The proportional changes in cardiac index (CI) induced by PLR were also correlated with the proportional changes in CI induced by volume expansion ($r = 0.64$, $p < 0.05$). A passive leg raising induced increase in stroke volume of 9% or more predicted an increase in stroke volume of 15% or more after volume expansion with a sensitivity of 100% and a specificity of 75%.

CONCLUSIONS. In our hemodynamically unstable patients with spontaneous breathing activity the response of bioreactance (Reliant ^{O}, Cheetah) stroke volume to passive leg raising was a good predictor of volume responsiveness. In spontaneous breathing patients, fluid responsiveness can be assessed totally non invasively using a bioreactance device.

0890

MEASURING CARDIAC STROKE VOLUME USING ELECTRICAL IMPEDANCE TOMOGRAPHY IN AN ARDS PIG MODEL

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INTRODUCTION. As a direct indicator of the global cardiac pumping efficiency, the cardiac stroke volume (SV) has major diagnostic value in numerous conditions, including cardiovascular diseases or congestive heart failure. Electrical impedance tomography (EIT) has been reported to be capable of dynamically and noninvasively measuring changes of blood volume in the thorax. Most studies, however, have only dealt with healthy volunteers or animals and there has been limited data on EIT-derived SV measurements in respiratory failure.

OBJECTIVE. We designed a study to examine if EIT can also be used to noninvasively and continuously determine SV in severe cases of ARDS without further calibration methods and without holding the breath.

METHODS. In 8 anesthesized and mechanically ventilated pigs, lung injury was induced by central venous oleic acid injection and abdominal hypertension. PEEP and FiO_2 were set guided by the ARDSnet protocol (RR = 35 min^{-1}). After maximal recruitment of the lungs, two different PEEP levels for each pig were randomly set. One for an open lung (no decrease in PaO_2), one after detection of derecruitment. Reference cardiac output was measured by thermodilution and divided by the heart rate (HR) to obtain reference SV. Impedance changes related to perfusion were monitored by EIT and calculated as described in [1]. Ventricular ROI was extracted using principal component analysis (PCA). EIT stroke parameter was calculated as B × SQRT(A), see Fig. 1.

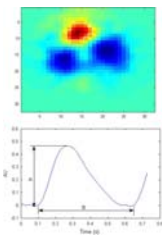

Fig. 1 ROI definition and impedance over time

RESULTS. Mean (Std.) of reference SV was 44.72 ml (8.68 ml). HR was 106 min^{-1} (16.3 min^{-1}). Cardiac output: 4.65 L/min (0.68 L/min). Linear correlation coefficient was $r^2 = 0.48$ ($p < 0.05$), see Fig. 2.

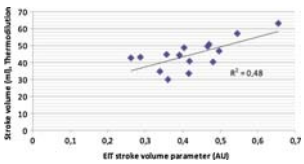

Fig. 2 Distribution of reference SV vs EIT SV

CONCLUSION. We found a good, but not a high correlation between non-calibrated EIT-derived SV parameter and reference SV. It seems necessary to use calibration methods as known, e.g., from pulse contour analysis.

0891

INVASIVE VS NON-INVASIVE ARTERIAL PRESSURE MONITORING: DO THEY MONITOR THE SAME THING?

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INTRODUCTION. Invasive arterial pressure monitoring is the method of choice for arterial pressure monitoring in most ICUs. The technique combines feasibility, continuous monitoring, the potential to derive some important hemodynamic parameters and constant access to arterial blood gases measurements.

OBJECTIVE. The purpose of this study was to evaluate whether the invasive and non-invasive blood pressure measurement correlate in critically ill patients in a general ICU. Furthermore, we tried to isolate parameters that influence the accuracy of invasive blood pressure monitoring.

METHODS. All consecutive patients admitted in our ICU for a 3 months time were included in the study. All patients underwent standard radial artery catheterization for invasive blood pressure monitoring and at the same time a cuff was placed in the arm for non-invasive monitoring. For each patient non-invasive measurements were performed three times a day and at the same time the invasive blood pressure was recorded for future comparisons. Once a day we were also measuring the frequency of the arterial circuit and the transducer and we compared the difference between the actual and the proposed frequency to the difference between the invasive and the non invasive monitoring.

RESULTS. Thirty six consecutive critically ill patients were included in the study. Mean age was 61.2 years, mean APACHE II score was 18 and mean ICU stay was 28.7 days. Median systolic, diastolic and mean arterial pressure for invasive and non-invasive monitoring is shown in Table 1. Median frequency of the circuit was 13.37 Hz whilst the proposed frequency from the manufacturer of the transducer is 15–20 Hz.

CONCLUSION. Invasive monitoring of arterial blood pressure is the method of choice for arterial pressure monitoring in the ICU setting. There is though a substantial difference between the invasive and the non-invasive technique. If there is an increased difference between the proposed frequency of the circuit and the actual one, the invasive measurement is inaccurate. There should be meticulous preparation of the circuits from the nursing staff to avoid such situations.

0892

PICCO-2-DERIVED PULSE CONTOUR CARDIAC INDEX VS. THERMODILUTION-DERIVED CARDIAC INDEX: A PROSPECTIVE STUDY WITH RECALIBRATION AFTER FIXED INTERVALS OF 1, 2, 4, 6 AND 8 H

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INTRODUCTION. Thermodilution using the PAC or PiCCO-based transpulmonary thermodilution (TD) are the gold standards for cardiac index (CI) determination. Additionally, continuous monitoring of CI based on pulse contour (PC) analysis is increasingly used. After calibration by TD, the PiCCO device is able to assess CI based on PC analysis. Despite an overall good short-term-correlation of CIpc and CItd in several studies, the manufacturer suggests recalibration by TD within ≤8 h. One retrospective study suggests decreasing accuracy after 1–2 h. By contrast, recent prospective data suggest acceptable long-term-accuracy (Critical Care 2009; 13S1: P217). However, these data were collected from routine measurements without fixed intervals between two TDs.

OBJECTIVES. Therefore, it was the aim of our study to prospectively investigate the accuracy of CIpc exactly 1, 2, 4, 6 and 8 h after the last calibration.

METHODS. In 15 consecutive patients 29 data-sets each including 6 TDs after intervals of 1, 2, 4, 6 and 8 h were recorded. In each TD measurement (triplicate TD) CIpc was recorded immediately before re-calibration by TD and compared to CItd. Statistics: Spearman correlation, Bland–Altman and multiple regression analysis.

RESULTS. 174 measurements with a mean time-lag between two TDs of 4.2 h were recorded. Patients characteristics: 9 male, 6 female, age 56.4 ± 13 years; APACHE-II 23.4 ± 6.2. The 174 pairs of CIpc and CItd showed a highly significant correlation ($p < 0.001$; $r = 0.898$). There was no significant difference between CIpc vs. CItd (4.37 ± 1.53 vs. 4.27 ± 1.48 l/min m^2). Analysis according to Bland–Altman demonstrated a mean bias of −0.101 ± 0.68 l/min m^2 (lower and upper levels of agreement −1.43 and 1.23 l/min m^2; percentage error of 31%). The percentage errors after 1, 2, 4, 6 and 8 h were 29, 27, 26, 36 and 36%, respectively.

In univariate analyses, the difference of CItd and CIpc was not correlated to the interval to the last TD ($p = 0.563$; $r = -0.044$), but it was correlated to CIpc immediately before recalibration ($r = -0.243$; $p < 0.001$) and the changes in SVRI derived from TD as well as PC compared to the previous SVRI ($p < 0.001$). Similarly, multiple regression analysis demonstrated that the difference of CItd and CIpc was not associated to the interval to the last TD ($p = 0.563$). By contrast, the bias (CItd–CIpc) was highly significantly associated with CIpc ($p < 0.001$) and changes in SVRI ($p < 0.001$). Sensitivity, specificity, positive and negative predictive value of CIpc were high regarding elevated (CItd > 5 L/min m^2; 91, 92, 85 and 96%) and decreased CItd (CItd < 2.5 L/min m^2; 63, 95, 67 and 95%).

CONCLUSION. CIpc and CItd are highly significantly correlated. Despite a non-significant trend to slightly increasing percentage errors after 6 and 8 h, the interval to the last calibration has, if at all, little impact on the accuracy of CIpc. By contrast, re-calibration should be considered in case of substantial changes of SVRI.

0893

COMPARISON OF THERMODILUTION USING A SHALDON CATHETER VS. CONVENTIONAL CENTRAL VENOUS CATHETER: A PROSPECTIVE STUDY USING THE PICCO$_2$-DEVICE IN PIGS

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INTRODUCTION. Thermodilution using the PAC and transpulmonary thermodilution (TD) using the PiCCO-device are the gold standards for Cardiac Index (CI) determination. In addition to CI, the PiCCO provides additional volumetric parameters derived from TD such as global enddiastolic volume index GEDVI and extravascular lung water index ELWI as well as pulse contour (PC) derived continuous CI (CIpc). According to the manufacturer's suggestion, TD usually is performed by injection of 15 ml of cold saline via a central venous catheter (cvc). Little is known about the impact of differing volumes of these catheters, thus retaining different volumes of the indicator bolus. In certain circumstances large volume catheters such as Shaldon catheters could be used for TD, however there are no data on correction for the higher volumes of these catheters as compared to a conventional cvc.

OBJECTIVES. Therefore, it was the aim of our study to prospectively compare the accuracy of TD via a Shaldon catheter using corrected TD volume (15 ml + (catheter volume of Shaldon − catheter volume of conventional cvc)).

METHODS. In 9 pigs (German landrace; female; 30–50 kg) a Shaldon catheter (Gambro GamCat 150, 175 or 250 mm; volume of the venous lumen 1.13, 1.35 and 1.65 ml, respectively) and a conventional cvc (Arrow multi-lumen; volume of the distal lumen 0.44 ml) were place in the left and right V. iug. int., respectively. Identical positions of the tips were verified by X-ray. A 20 cm, 5 Fr arterial PiCCO catheter was placed in the A. femoralis.

A total of 93 couples (7–12 per animal) of triplicate TD measurements using an indicator bolus of 15 ml via the cvc and 15 ml + (volume Shaldon − 0.44 ml) via the Shaldon catheter were recorded.

Statistical analysis: Wilcoxon test; Spearman correlation. Bland–Altman analysis. Calculation of the percentage error according to Critchley.

RESULTS. CItd, CIpc, stroke volume index SVI, SVRI, global ejection fraction (GEF), GEDVI, ELWI and pulmonary vascular permeability index PVPI measured by TD via the Shaldon correlated highly significantly ($p < 0.001$ for all comparisons) with the values derived from TD via cvc ($r = 0.962$, $r = 0.970$, $r = 0.976$, $r = 0.924$, $r = 0.879$, $r = 0.895$, $r = 0.962$ and $r = 0.832$, respectively) with percentage errors below the critical threshold of 30%: 7.8, 9.4, 9.0, 24.8, 18.2, 14.3, 15.2 and 25.9%, respectively. The measurements using cvc and Shaldon were not significantly different regarding CIpc, SVI and SVRI. Measurement via Shaldon significantly underestimated CItd (mean difference 0.22 ± 0.18 L/min m^2; $p < 0.001$), GEDVI (38 ± 42 ml m^{-2}; $p < 0.001$), ELWI (0.24 ± 0.75 ml/kg; $p = 0.003$). By contrast, TD via Shaldon overestimated GEF (−2.7 ± 3.3; $p < 0.001$) and PVPI (−0.12 ± 0.32; $p < 0.001$).

CONCLUSIONS. Using a corrected indicator bolus, TD via Shaldon catheters provides data with appropriate accuracy. Regarding low percentage errors and low bias, statistically significant differences in 5 of 8 parameters are of limited clinical relevance.

Poster Sessions
Paediatrics: 0894–0907

0894

ULTRASOUND GUIDED CATHETERIZATION OF THE BRACHIOCEPHALIC VEIN IN A PAEDIATRIC INTENSIVE CARE UNIT

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BACKGROUND. Central venous catheterization is often essential for the management of acutely ill children. Ultrasound (US) catheterization of the central veins is rapidly becoming the preferred technique in infants as in adults, since it appears to be associated with a very low rate of failure and of insertion-related complications. Though the internal jugular vein (IJV) is the vein most commonly cannulated by US, sometimes its catheterization is difficult because of the low calibre of the vein (particularly in neonates), its mobility in the tissues of the neck, and its tendency to collapse during breathing. US venipuncture of the brachiocephalic vein (BCV) may represent a safer and easier option than IJV. We report our experience with US percutaneous cannulation of the BCV in a cohort of acutely ill children.

METHODS. US cannulation of the BCV was performed in 26 paediatric patients admitted to our PICU. All patients required a short term central venous catheter, single or double lumen, for i.v. infusion and/or hemodynamic monitoring. Though calibre and length of the catheters were different, all were inserted by using a modified Seldinger technique (21G needle + 0.018″ non-J guidewire + 4 Fr micro-introducer and dilator). Smaller catheters (<4 Fr) were inserted directly inside the micro-introducer; catheters >4 Fr were inserted over their own 0.025″ guidewire, after introducing the 0.025″ guidewire through the 4 Fr micro-introducer. In all patients, a MicroMaxx Sonosite© with a 10–14 Mhz probe was utilized. The BCF was visualized longitudinally by scanning the upper anterior mediastinum, and needle was threaded 'in plane' towards the vein, under direct US guidance.

RESULTS. Patients' age ranged from 20 days to 10 years (weight 2–30 kg). The BCV was easily visualized by US in all patients. In most cases (24/26), the right BCV was chosen. In all patients, US was also useful to monitor the trajectory of the guidewire inside the BCV: in 4 neonates, the guidewire was visualized by US up to its entrance in the superior vena cava. The success rate was 100%, with no accidental arterial puncture and no pneumothorax or hemothorax or local hematoma. In most cases (20/26) the BCV was punctured at first attempt.

CONCLUSIONS. BCV cannulation guided by ultrasonography can be performed safely and easily in acutely ill pediatric patients. The US venipuncture of the BCV appears to be easier if compared to IJV, since the BCV

(a) has a diameter constantly larger,
(b) it is more stable,
(c) it does not collapse with breathing.

When puncturing the vein 'in plane' (i.e. threading the needle within the plane of the probe), the risk of failure or complications is minimized.

0895

CLINICAL SIGNIFICANCE AND OUTCOME OF HYPERGLYCEMIA IN THE PEDIATRIC TRAUMATIC INJURY POPULATION

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BACKGROUND. Recent studies on critically ill patients demonstrate the overwhelming benefits of tight glycemic control in the Intensive Care Unit (ICU). However, there is a paucity of data in the pediatric trauma population. Our objectives were to determine the significance of blood glucose levels on length of stay, clinical outcomes and mortality in traumatically injured pediatric patients.

METHODS. After approval from the Institutional Review Board (IRB), we retrospectively reviewed all injured pediatric patients (age 17 or less) with an Injury Severity Score (ISS) of 9 or greater admitted to the trauma service and the Pediatric Intensive Care Unit (PICU) between January 1, 2005 and December 31, 2006. Ninety four patients were identified. We excluded eight patients who did not have documented blood glucose levels at the time of admission. We evaluated data for ICU length of stay, ventilator dependent days, total hospital length of stay, infectious complications, Glascow Coma Scale, and outcome.

RESULTS. Patients who died had significantly higher admission serum glucose values than those who survived (201 vs. 153 mg/dl ($p < 0.048$)). Of the 4 pts who died, 3 had admission glucose greater than 200 mg/dl. The average admission glucose for patients discharged to home was 142.2 mg/dl. Patients discharged to rehab had an average glucose level of 193 mg/dl ($p < 0.00$). Eleven patients out of the included 86 (13%) developed an infection. The average admission glucose for this group was 186 vs. 150 mg/dl ($p < 0.020$) for the group of patients who did not acquire any infections. Out of the patients who survived, 22 patients (27%) had a serum admission glucose >180 mg/dl. This subgroup of patients had significantly longer ICU length of stays (9.0 vs. 4.0 days, $p < 0.017$), longer ventilator dependent days (6.3 vs. 1.4 days, $p < 0.008$) as well as longer total hospital length of stay (13.4 vs. 7.5 days, $p < 0.008$) when compared to patients with initial glucose <180 mg/dl. With regard to insulin therapy, there were no statistically significant differences in ICU length of stay and ventilator dependent days when comparing patients with admission glucose >180 mg/dl treated with insulin vs. those not receiving insulin. However, a decrease in the total length of stay was demonstrated in the insulin treated group (10.3 vs. 15 days in the non-insulin group)

CONCLUSION. This study demonstrates poor overall outcome with elevated admission serum blood glucose. Patients with elevated admission serum glucose levels (>180 mg/dl) were more likely to suffer from infections, had significantly prolonged ICU length of stay, ventilator dependent days and total hospital length of stay compared with patients with lower blood glucose. Furthermore, patients with admission glucose >200 mg/dl were more likely to die during their hospitalization. Tight glucose control and admission glucose is predictive of good outcomes in the pediatric trauma population.

0896

MICROBIOLOGY, ANTIBIOTICS UTILIZATION AND CLINICAL OUTCOMES OF VAP IN TERTIARY CARE PICU

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BACKGROUND. Ventilator associated pneumonia (VAP) is a leading cause of morbidity and mortality in PICU. Early and appropriate antibiotics prescribed are critical for survival of VAP patients. Knowledge of local resistance rate trends is invaluable when considering empirical antibiotics. Our study was to determine the prevalence, microbiological data, antibiotics therapy and clinical outcomes in Pediatric VAP.

MATERIAL AND METHODS. We retrospectively reviewed Infants and children admitted to the PICU who had diagnosis of VAP during 2004–2007. Clinical data, microbiology, treatment and outcomes were analysed.

RESULTS. There were 101 patients diagnosed with VAP by CDC criteria. 64 (63.4%) were male and 37 (36.6%) were female. Their average age was at 2.72 ± 4.51 years. They were on mechanical ventilator for 14.72 ± 16.28 days before VAP was diagnosed. The most common causative organisms were A Baumanii (32%), P aeruginosa (17%), K pneumonia (8%) and S aureus (5%). Co-infection(6%) was commonly found with A baumanii and P aeruginosa. There were 71% of MDR and 8% of PDR. A. baumanii was mostly sensitive to cefoperazone (36%) and aminoglycoside (21%). P aeruginosa was mostly sensitive to aminoglycoside (76%) and S aureus was mostly sensitive (83%) to glycopeptides group. Carbapenem (25%) was mostly prescribed as initial antibiotics followed with cefoperazone (17%). The duration of mechanical ventilation and PICU length of stay were at 28.54 ± 27.25, 31.1 ± 26.2 days, respectively. The mortality of VAP was at 42%. Previous antibiotics used was associated with VAP mortality (OR = 8.75, 95%CI = 1.07–71.23, $p = 0.016$)

CONCLUSIONS. VAP was associated with high mortality. MDR and PDR gram negative organisms were commonly found as causative agents. Appropriate empirical antibiotics coverage could be guided by local microbiological data (data represent Mean ± SD).

0897

PERFORMANCE OF SEVERITY SCORING SYSTEMS IN THE VENTILATED CHILDREN IN RUSSIA

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BACKGROUND. There are exist a lot of different scoring systems to estimate the illness severity of pediatric patients and to predicting morbidity and mortality. They have been infrequently compared, especially out of the countries where they have been designed.

OBJECTIVES. To compare mortality prediction models Pediatric Risk of Mortality score (PRISM), Pediatric Index of Mortality (PIM) in the ventilated children and Clinical Risk Index for Babies (CRIB) and Score for Neonatal Acute Physiology (SNAP-II)—in the newborn in ICU of a referral Regional Children's Hospital, Russia.

METHODS. Data were collected on 938 ventilated children, 777 of them were the newborn, 419 of which were premature, admitted in sequence to the multidiscipline intensive care unit of the referral regional 600-bed children's hospital from January 1, 2005 to December 31, 2007. In the newborn the mean birth weight was 2,196 (770–4,500) g; gestational age 32 (27–41) weeks; male 479 (61.6%), female 298 (38.4%); 1 min Apgar score less than 4 was in 119 (15.3%) and 5 min Apgar score less than 6 was in 196 (25.2%) babies. In children older than 1 month the mean age was 9.6 months (1.5–23 months). The total mortality rate was 10.8%.

Discrimination was quantified as the area under the curve (AUC) for the receiver operating characteristic curves (ROC). The calibration of the model with the best discrimination was assessed using the standardized mortality ratio.

RESULTS. Discrimination of all the scales was good: AUC for PRISM 0.811 ± 0.024; PIM 0.813 ± 0.032; CRIB 0.821 ± 0.03; SNAP-II −0.783 ± 0.03. CRIB and SNAP-II admission score both were correlated with sepsis in the newborn. The standardized mortality ratios for the CRIB and SNAP-II was 1.35 and 1.23 respectively. Using logistic regression method a model for mortality prediction in the newborn with the independent variables birth weight and CRIB (AUC = 0.869) was constructed.

CONCLUSION. Discrimination for these illness severity scores is good. Published models for severity of illness under predict hospital mortality in the ventilated children in Russia and need recalibration.

0898

THE ESTIMATE OF NEUTROPHIL RESPONSE IN CRITICALLY ILL NEWBORNS AFTER CARDIOSURGERY AS KEY FOR TARGET THERAPY

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INTRODUCTION. Neutrophil dysfunction may contribute to increased mortality during neonatal severe infectious complications or sepsis in postoperative period. Early recognitions of this process can improve the results of surgery.

OBJECTIVE. The aim of our study was to estimate the function of neutrophils in newborn with severe bacterial infections after cardiosurgery.

METHODS. Blood plasma samples from 25 ICU newborns with congenital heart disease (mean age 7 (4–21)) days, median weight 3.23 (1.98–4.24) kg) with systemic bacterial inflammation (procalcitonin level > 2 ng/ml) were taken on 3 day after cardiosurgery. Phagocytic activity were measured as the percentage of cells to ingestions latex particles ($d = 1.5$ m km) in vitro. Also measured the potential phagocytic cell to induced in vitro by zimozan and lipopolysaccharide of Klebsiella pneumoniae (SIGMA, Germany, concentration −0.1 mkg/ml). Procalcitonin level was measured by immunoluminometric method (PCT sensitive LIA, BRAHMS, Germany). The data were compared by Mann–Whitney U test, p value of <0.05 was considered statistically significant. The data are expressed as median and 25th–75th percentiles.

RESULTS. In both group of newborn with systemic bacterial infectious the level of procalcitonin were extremely high, repaired phagocytic activity after surgery were a good prognostic sign: the percentage of phagocytic activity and the count of cells with high ingestions activity were statistically significant higher from survived in comparison with lethal outcome patients (Table 1).

TABLE 1 CHARACTERISTICS OF NEUTROPHIL RESPONSE IN NEONATES

Parameters	Patients		p
	Survived ($N = 6$)	Lethal outcome ($N = 19$)	
Procalcitonin (ng/ml)	9.1 (8.68–12.54)	9.5 (4.43–22.8)	NS
Phagocytic activity (%)	27 (12–36)	9.5 (2–12)	0.02
Induced phagocytic activity (%)	29.5 (11–36)	9 (5–19)	NS
Cells counts with high phagocytic activity	7 (3–12)	2 (0–4)	0.03
Ratio of induction (phagocytic activity/ induced phagocytic activity)	1 (0.9–1.2)	1.8 (1.2–2)	NS

Meanwhile the neutrophils with extremely low phagocytic activity have shown the capacity to induce in vitro at 58% (11/19) patients with lethal outcome. Detected the correlation dependence ($r = 0.79$, $p = 0.000000$) between the ratios of induction with two type of inducing substances (zimosan vs lipopolysaccharide) in vitro experiment, that may be give evidence about TLR—independent pathways of neutrophil dysfunction.

CONCLUSION. Neutrophil dysfunction plays a key role in adverse prognosis in critically ill newborn with severe infection after cardiosurgery. However, neutrophils with decreased phagocytic function have showed the potential to enhance in vitro that may useful as target for therapy.

0899

LENGTH OF POST-OPERATIVE VENTILATOR SUPPORT AND OUTCOME OF THE ARTERIAL SWITCH OPERATION

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BACKGROUND. The arterial switch operation (ASO) is the gold-standard surgical procedure for transposition of the great arteries (TGA) in newborns and small infants. The goal of this current study is to describe the postoperative respiratory care of the patients that underwent ASO for TGA at our institute, and find the association between ventilator support duration and late outcomes.

METHOD. We retrospectively enrolled 28 patients (23 males and 5 females) with TGA, who underwent ASO in this institution January 2006 to December 2008. The outcome measurements were ventilator duration, re-intervention, and survival during hospitalization.

RESULTS. Mean age at ASO was 17.2 ± 32.3 days (median, 5 days; range 0–158 days) and mean body weight was 3.1 ± 0.6 kg (median, 3; 1.3–5 kg). Median ventilator duration was 17.5 days and survival was 73% in 2006, 8.6 days of ventilation and 100% survival in 2007, and 6.4 days of ventilation and 91% survival in 2008. Multivariate analysis showed patients with aortic coarctation had longer ventilation durations. A higher re-intervention rate was found in patients with ventilation support >14 days ($p < 0.05$).

CONCLUSIONS. Ventilation duration decreased and survival rate increased gradually from 2006 to 2008. Cardiorespiratory investigation or intervention was indicated in patients who required ventilation support more than 14 days postoperatively.

0900

IMPORTANCE OF SCORING SYSTEMS IN PROGNOSTIC MENINGOCOCCEMIA

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AIM. This study was designed to determine the distribution of demographic, clinical and laboratory parameters among our patients and the importance of Scoring Systems in Prognostic Meningococcemia according GMSPS (Glasgow Meningococcal Septicemia Prognostic Score).

METHODS. This was a retrospective descriptive study, performed on patients with definite diagnosis of meningococcal infection admitted to Pediatric Intensive Care "Mother Thereza" of Tirana between 2003 and 2008. Data were collected by filling checklists.

RESULTS. The cases were 32 patients [21 (65.7%) males and 11 (34.3%) females] from 0 to 14 years old. The most affected age was 1–4 years old [14 patients (43.8%)]. In the GMSPS system in the patients with 0–8 points, the mortality is 5%; 8–10 points the mortality is 50% and more than 10 points the mortality is 87.5%. Overall mortality rate was 31.2%.

CONCLUSION. Meningococci are still killers, they affect male more than females. Children 1–4 years old are at more risk than other age groups. Mortality in our study was higher than what is suggested (32.5%). We recommend using scoring systems for early separation of poor prognostic patients to provide them with more special care.

KEYWORDS. Meningococcemia, Scoring systems.

0901

ACUTE RESPIRATORY FAILURE FOLLOWING FOREIGN BODY ASPIRATION IN CHILDREN: REVIEW OF A SINGLE CENTER EXPERIENCE

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OBJECTIVE. Foreign body (FB) inhalation is a life threatening event in children leading in many cases to severe acute respiratory failure (ARF) requiring admission in the pediatric intensive care unit (PICU) and mechanical ventilation (MV). The aim of this study was to describe our experience with FB inhalation in children: clinical aspects, nature and location of FB, treatment and outcome.

METHODS. Retrospective review of the medical records of all children admitted to a tertiary PICU for ARF secondary to FB inhalation over a period of 8 years (2000–2008). Data recorded were: demographic characteristics, clinical and radiological aspects, bronchoscopy findings and outcome.

RESULTS. during the study period, 23 patients with ARF secondary to FB inhalation (0.6% of total admissions) were admitted, their age ranged from 7 months to 7 years with a mean of 28 months, 16 (69.5%) of whom were male. ARF was associated to a neurological distress in three cases (13%). A cardiorespiratory arrest was reported in two patients. Radiological abnormalities were seen in 82.6% of the cases. Bronchoscopy confirmed the diagnosis in all cases and allows the extraction of the FB with a delay of 15 ± 12.8 days after inhalation. Aspirations were primarily into the right lung (60.8%) and 82.6% of the foreign bodies were of vegetal origin. Seventeen patients (73.9%) required MV during a mean period of 4.8 ± 9.3 days. Complications were dominated by pneumonia in 12 cases (52.2%) and pulmonary air leak in five patients (21.7%). Pneumonia was associated with longer aspiration time ($p = 0.045$). One patient died. Death was caused by a prolonged cardiorespiratory arrest with an important cerebral damage. The mean length of stay in survival patients was 5.8 ± 10.3 days.

CONCLUSIONS. FB inhalation is an uncommon life threatening event (0.6% of total admissions) in pediatric patients that can manifest with ARF requiring MV. Diagnosis should be evoked rapidly and confirmed by bronchoscpopy allowing a prompt removal of the FB. A longer aspiration time seems to be correlated to pneumonia.

0902

PEDIATRIC TRAUMA CARE TO ROAD TRAFFIC VICTIMS IN THE MOSCOW REGION

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The Moscow region consists of two large administrative units—city Moscow and the Moscow area. These are two different regions, with different administration, management and the finance. Traditionally the public health services in Moscow area have the worst financing and are worse quality, than in the city of Moscow. On the other hand, traffic accidents victims in Moscow area have more serious traumatic injuries due to higher speeds on country roads and smaller availability of the qualified medical aid.

Children are evacuated from traffic accident places to local municipal hospitals by emergency medical service. Since 2004 patients with severe trauma are transported by a pediatric intensive care team of Centre for Disaster Medicine on the ambulance or the medical helicopter to the children's hospital of Moscow (it is approximately equal to level 1 pediatric trauma center).

Since May 1, 2004 till December 31, 2008 592 severely injured children have been transferred after stabilization to Moscow pediatric hospitals (totally 645 children have been consulted). 499 were evacuated by ambulance and 93 by helicopter. Survival and overall outcome was significantly better at pediatric hospitals. 1,117 children were injured on roads of the Moscow area and 58 of them lost their lives as a result of road traffic collisions in 2008 compare to 108 deaths on 1,439 pediatric road traffic trauma victims before the beginning of the program (2003), $p = 0.019$.

In order to improve decisions the pediatric ambulance was equipped by satellite antenna for telemedicine consultations in 2008.

Fig. 1 Pediatric ambulance with satellite antenna

Pediatric intensive care team can consult now with senior pediatric surgeons or emergency physician (intensivists) in children's hospital of the Moscow directly from local hospital or accident place. The satellite aerial is adjusted automatically. The information from medical equipment (monitor, blood gases analyzer, etc.) or video can be transferred with a speed 819 kbps. The ambulance can be used as the communication and telemedicine center at disasters with a great number of victims.

0903

CEREBRAL FUNCTION MONITORING IN TWENTY-FIRST CENTURY PAEDIATRIC INTENSIVE CARE—SURELY A NECESSITY?

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INTRODUCTION. A 6-week old baby presented with cyanosis, severe metabolic acidosis and hyponatraemia due to near drowning. She was paralysed for intubation and on-going ventilation, and cared for on our neonatal intensive care unit (NICU) pending transfer to a paediatric intensive care unit (PICU). Attachment of a cerebral function monitor showed status epilepticus. Prompt treatment with phenobarbital abolished the seizing, but she was transferred out to a regional PICU that did not offer cerebral function monitoring (CFM) or out-of-hours EEG assessment.

Cerebral function monitoring was introduced in 1969 for use in resuscitated adults following cardiac arrest, and has been increasingly used in neonatal intensive care in the last decade.

OBJECTIVE. Our aim was to survey all PICUs in the United Kingdom (UK) to determine availability and use of CFM and out-of-hours EEG monitoring.

METHODS. Telephone survey of all 33 PICUs in the UK conducted in March–April 2009.

RESULTS. All 33 (100%) UK PICUs provided data regarding available round-the-clock neuromonitoring (Table 1):

TABLE 1 AVAILABLE ROUND-THE-CLOCK NEUROMONITORING IN UK

Available neuromonitoring	Number of PICUs (%)
CFM only	6 (18)
Out-of-hours EEG only	4 (12)
Both CFM and out-of-hours EEG	7 (21)
No CFM or out-of-hours EEG	16 (49)

CONCLUSION. Despite the high prevalence of brain injured patients in PICU, almost half of PICUs in the UK do not presently have available CFM or access to out-of-hours EEG monitoring, and so are not able to routinely monitor brain function. Lack of neuromonitoring in paediatric intensive care may adversely affect outcomes.

REFERENCE. 1. Murdoch-Eaton D et al (2001) CFAM monitoring in paediatric intensive care. Dev Med Child Neurol 43:91–96

0904

MERRF SYNDROME AND REFRACTORY STATUS EPILEPTICUS

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INTRODUCTION. The characteristic symptom of MERRF syndrome (Myoclonus Epilepsy Associated with Ragged-Red Fibers—mitochondrial encephalomyopathy) are myoclonic seizures that are usually sudden, and can affect the limbs or the entire body. Status epilepticus can be severe and refractory even to Thiopental and propofol. What we can do in such severe cases?

CASE REPORT. We report three cases of Merrf syndrome, all from a family. First child, ten years old, had the first presentation with a refractory status epilepticus, not responding to benzodiazepines, phenytoine, thiopental and propofol. With the presentation of his brother 2 years after the girl, we made the diagnosis of Merrf syndrome, but we could not help him for the refractory status in wich he presented. In the same family is and another girl, wich has been too diagnosed for Merrf syndrome, and presents epilepsy. In refractory status in such cases, given the difficulty to treat SE, we think for a supplemental administration of continuous ketamine infusion with midazolam.

CONCLUSION. In refractory status epilepticus even to phenytoin, thiopental and propofol, after failure of GABA-ergic anesthetics, we suggest to incorporate ketamine into the therapeutic protocol for the strong anticonvulsant properties of ketamine due to increased NMDA receptor expression with ongoing seizure activity.

KEYWORDS. Mitochondrial epilepsy, Refractory status epilepticus, Ketamine.

0905

CASE REPORT OF A 6 MONTH OLD CHILD WITH SAGITTAL CRANIOSYNOSTOSIS UNDERGOING COMPLEX FRONTOORBITAL REMODELING USING OESOPHAGEAL ULTRASOUND DOPPLER MONITORING FOR INTRAOPERATIVE BLOOD AND FLUID MANAGEMENT

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Craniosynostosis is a congenital anomaly in which one ore more cranial sutures close prematurely. It occurs in approximately one of every 2,000–3,000 births, with males affected more frequently than females. The craniosynostosis may be simple, involving one suture, or it may be very complex. Though performed as extradural procedure, craniofacial reconstruction can lead to significant blood loss from scalp and cranium and challenge the pediatric anesthetist, especially because the correction of the cranium coincides in a period of physiologic anaemia. Central venous access to monitor cardiac filling pressure is used as 'gold standard'. Blood loss, fluid shifts can lead to major problems estimating fluid maintenance and can result in low haemodynamic performance although invasive monitoring is used. The use of the non-invasive monitoring by oesophageal Doppler can improve the haemodynamic management by detecting early hypovolaemia.

A 6 months old child presented to extensive remodeling without comorbidities. The induction of anaesthesia and the placement of an arterial and central venous line, intravenous lines and a gastric tube were routinely performed. After induction the patient was hemodynamically stable. The oesophageal Doppler probe could easily be fixed to the tracheal tube to assure monitoring throughout the whole procedure with only minimal access to the head under the drapes.

Initial volume administration (25 cc of colloid solution over 5 min) under Doppler monitoring improved the stroke volume index (SVI in ml/m^2) from 19.2 to 26.0 whereas the arterial blood pressure (ABP in mmHg) dropped from 64 to 54 and the central venous pressure (CVP in mmHg) from 10 to 7. A following decrease of SVI from 26.0 to 19.3 during hemorrage was not displayed by the CVP which increased from 7 to 10 but the ABP decreased to 46. Following volume administration and transfusion of red packed blood (RPB) units could improve SVI to 33.6. During the administration the CVP decreased to 7 and the ABP did not change. Therefore, continuous administration of norepinephrine was started with 0.1 μg/kg/min up to the end of the procedure to maintain a systolic pressure of 80 mmHg. Overall the child received 340 cc of crystalloid and 160 cc of colloid solution and 150 cc of RPB's. During the postoperative course the child was extubated directly after the operation and was hemodynamically stable without catecholamines and did not need any further organ support or blood transfusions.

The use of an oesophageal Doppler for the surgical correction of craniosynostosis is feasible nevertheless the difficult access to the head by fixing the probe to the endotracheal tube. Doppler monitoring was able to show deterioration of hemodynamics not seen by the ABP and the CVP. Early intervention due to this monitoring was able to improve hemodynamics.

REFERENCES. 1. Faerowski LW et al (1999) J Neurosurg Nesthesiol 11:167–173

2. Virtanen R et al (1999) Pediatrics 103:791–795

0906

TREATMENT OF A NEWBORN WITH INBORN UREA-CYCLE-DISORDER AND CEREBRAL EDEMA WITH VENOVENOUS HEMODIAFILTRATION AND THERAPEUTIC HYPOTHERMIA

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We report about a term newborn with urea-cycle disorder with severe cerebral edema in which the pharmacological treatment was combined with venovenous hemodiafiltration (VVHDF) and therapeutic hypothermia.

A 50 h old boy was admitted at a NICU in an external hospital because of convulsions and respiratory failure. Initial metabolic workup showed ammonia 2,320 μmol/l and the boy was transferred to our hospital. Initial examination showed a ventilated newborn with hepatomegalia and severe hypotension and ammonia concentrations of 2,391 μmol/l under treatment with Arginin-HCL and Na-Benzoat. Cranial ultrasound (CUS) showed a cerebral edema with systolic peaks and a pulsatility index (PI) of 3.0. After placing of a dual lumen catheter in the right jugularian vein VVHDF was started. In addition neuroprotection was performed by cooling the boy to a rectal temperature of 33°C for the first 24 h using CritiCool cooling therapy system. Then the boy was rewarmed stepwise to 36°C over the next 48 h. Ammonia concentration was decreased during the first 3 h to 830.4 μmol/l by VVHDF and CUS showed a significant improvement of the cerebral blood flow. VVHDF was stopped 3 h later at ammonia 224.3 μmol/l. There was no rebound of hyperammonemia and CUS showed regular findings. The metabolic investigation revealed an Argininosuccinate lyase deficiency. After Extubation at day 10, the boy was discharged at day 38. The 2 months follow up showed an adequate neurological development despite the classic signs of metabolic stroke in MRI.

CONCLUSION. Life-threatening cerebral edema in newborns with inborn urea-cycle defects can be treated effectively by the combination of VVHDF with therapeutic hypothermia.

REFERENCES. 1. Schaefer F (1999) NDT 14:910–918

2. Polderman K (2008) Lancet 371:1955–1969

0907

METHODS OF SURFACTANT MANAGEMENT IN CHILDREN WITH ALI/ARDS

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Recently, the important progression in therapeutic management of ALI/ARDS in infants and children has been established that has beneficial effect on decreasing the mortality. Except standardized guidelines the off-label therapeutic management accentuate. In recent clinical studies the important therapeutic effect of administration of exogenous surfactant was proved. Despite these results, there are still many questions and problems with optimal technique of surfactant administration, determining the ideal time for surfactant administration during the course of injury, and the development of optimal exogenous surfactant preparations that will be used to treat these patients.

Authors present and discuss the different methods of exogenous surfactant delivery techniques in infants and children with ALI/ARDS: aerosol nebulization, endotracheal instillation, bronchoscopic instillation, and bronchoscopic BAL.

We used exogenous surfactant in 13 patients (average age was 7.4 years) with ALI/ARDS during last 2 years. The exogenous surfactant doses vary from 20 to 100 mg/kg as BAL or endotracheal instillation. We manage two doses of exogenous surfactant in 24-h period. In 60% the selective bronchoscopic application was used. In all patients oxidative index improved after application. The effect of selective bronchoscopic application was faster. According to literature evidence and also according to own experiences authors suggest advantages of bronchoscopic selective instillation and bronchoscopic BAL as optimal delivery techniques for exogenous surfactant administration for treatment of infants and children with ALI/ARDS.

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Impact of technologies and health informatics: 0908–0921

0908

HAS INFORMATION TECHNOLOGY FINALLY BEEN ADOPTED IN INTENSIVE CARE UNITS?

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INTRODUCTION. Information technology (IT) has the potential of improving the quality, safety and efficiency of medicine. Intensive care medicine is one of the most data-rich specialism, making it especially favorable for extensive use of IT. Data regarding the implementation rates of IT in ICUs are scarce, and restricted to non-European countries.

OBJECTIVES. We wanted to evaluate (i) the use of "general hospital IT systems" such as laboratory systems, Pictures Archiving and Communication systems (PACSs), electronic medical record (EMR) and hospital EMR-linked Computerized Physician Order Entry (CPOE) in the ICUs and (ii) the adoption rate and its evolution over the last 3 years of a dedicated Intensive Care Information system (ICIS). Furthermore, we explored in detail the main obstacles for taking the decision to implement an ICIS, using a standardized questionnaire.

METHODS. A telephonic survey was conducted in October 2008, interviewing the head of the ICU department of each ICU situated in Flanders, Belgium.

RESULTS. A total of 63 ICUs (860 ICU beds) were surveyed, with a 100% response rate. Currently, every ICU consults laboratory results in an electronic way and PACS is used in 93.5% of them. Electronic ordering of laboratory and radiology investigations however, is only possible in 6.3 and 7.4% respectively. The use of CPOE for medication prescriptions is available in 41.3% of the ICUs, although only 27% also register the administered medication electronically, mostly by using the features of their ICIS. The availability of an EMR is more widespread, being 65%. The adoption rate of a dedicated ICIS nearly doubled over the last 3 years from 7.9 to 17.5%, but another 31.6% of the ICUs are planning an implementation within the next 3 years. All ICISs are commercially bought. Half of the tertiary non-academic hospitals and all university hospitals have implemented an ICIS, but only 7.7% of general hospitals have shifted to a paperless ICU. Main reasons for postponing an ICIS implementation are the substantial initial investment cost, linking problems with the Hospital Information System, concerns regarding the user-friendly interface, the need for dedicated personnel, and the unclear cost-benefit. The extraction of data for management of scientific purposes is used by only 4 out of the 12 ICIS hospitals.

CONCLUSIONS. Most ICUs in Flanders use hospital IT systems such as electronic laboratory results and PACS. However, electronic lab and radiology ordering is still the exception. The adoption rate of dedicated Intensive Care Information Systems doubled over the last 3 years but is still surprisingly low, especially in the general hospitals. To cross the implementation chasm, more investigation regarding the potential benefits of ICISs is urgently warranted. Furthermore, in order to overcome the high initial investment cost, the question of governmental financial incentives needs to be addressed as well.

0909

IMPROVING MEDICATION SAFETY IN THE INTENSIVE CARE UNIT BY IMPLEMENTING COMPUTERIZED DECISION SUPPORT SYSTEM—USING STATISTICAL PROCESS CONTROL

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INTRODUCTION. Computerized decision support systems (CDSS) are often said to reduce medication errors and Adverse Drug Events (ADEs). However, these systems themselves may be associated with new errors. This study describes four steps for improving quality of aminoglycosides prescription in intensive care unit (ICU).

METHODS. Gentamycin and Tobramycin prescriptions from the computerized physician order entry (CPOE) records of a tertiary adult ICU were compared to doses recommended by a locally developed guideline. The CPOE system displayed an initial fixed default value of dosage. We showed that using this default value is associated with new errors (Eslami et al., Drug Safety 2006). As a first step for improvement and in order to observe the changes in the physicians' prescription behaviour, we removed the fixed default dosage from the CPOE system.

To visualize and make inferences on the longitudinal development of outcome measures we resort to the powerful instrument of control charts from the field of statistical process control (SPC). SPC has rarely been reported in the analysis of quality of care in IC.

RESULTS AND STEP ONE. Prescription data 15 weeks before and 30 weeks after removing the fixed default value were analysed prospectively. Statistical Process Control charts showed that the proportion of prescriptions with the system default dose reduced and became out of control (that is, changed) after removing the default dose. However the error rate and ADEs among patients with renal insufficiency remained high and stable.

CONCLUSION AND FUTURE WORK. First, the prescribing behaviour prior to removing the default dosage can largely be explained by a high adherence to computerized suggestions, even when the "suggestions" are wrong. It seems that the physicians are overly trustful to the system's suggestions perhaps because of the widely reported advantages of CDSS. Second, we learned that physicians, when unsupported, deviate from the drug prescription guidelines and do not seem to consult the paper-based guideline. Therefore we conclude that there is a need for adequate CDSS.

Currently we are performing an evaluation study to evaluate three incrementally increasing levels of complexity in decision support (from patient non-specific to patient specific):

LEVEL1. ICU management makes physicians aware of the lack of guideline adherence based on our preliminary results.

LEVEL2. The computer provides relevant patient-related information (such as Creatinine Clearance and patient ideal weight) as well as the text of the guideline on the screen whenever physicians attempt to prescribe antibiotics, but the system does not provide any proactive advice.

LEVEL3. After a drug dose has been selected, the system calculates the correct dosage according to the guideline. In addition, each time a clinician logs in the system, the CDSS checks the patient's folder and based on therapeutic drug monitoring results, alerts the physician for any necessary change.

0910

QUALITY OF DATA ACQUISITION AND COSTS IN TRIAL DATA COLLECTION

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INTRODUCTION. Data collection is time consuming and expensive. In a prospective observational study, we compared the on-line electronically collected cardiac output values against data registered in the CRF during patient visits. We used continuous cardiac output by FloTrac-Vigileo system (FCO) and continuous cardiac output with pulmonary artery catheter (CCO). For Electronic Data Capture (EDC) we used a multi data logger (Edwards Lifesciences, Irvine, CA, USA). Simultaneously registered cardiac output data on CRF forms, marked as "CRF". Aim of this abstract is to compare quality of the data acquisition and costs.
METHODS. Data collected during standard post-operative care in 28 cardiac surgery patients. The Cardiac output data was collected at 1 h (T0), 2 h (T1), 4 h (T2), 8 h (T3), 12 h (T4), 24 h (T5), 36 h (T6), and 48 h (T7) after ICU admission. For data labeled "EDC", the values were taken as an average of 5 min at the time points described above (2.5 min before the time point and 2.5 min after the time point). 179 paired data points could be evaluated. EDC and CRF data was evaluated using a modified Bland–Altman technique (a random effects model to compute within subject variance [1]).
RESULTS. Measured with ICO mean cardiac output was 5.1 (0.98) [range 2.9–8.2] l/min.

Bias and precision between EDC data and CRF data for CCO was 0.15 (0.32) l/min, coefficient of variation 0.06, for FCO −0.05 (0.32) l/min, coefficient of variation 0.06, (Figs. 1, 2).

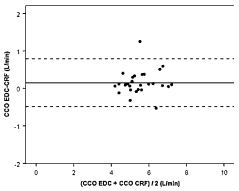

Fig. 1

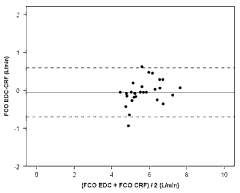

Fig. 2

During a half hour visit the study nurse can examine the used equipment and register CRF data; cost were calculated as 179 × 15 Euro = 2,685 Euro. If overtime and travelling costs over 97 time points was calculated, these costs increased to 5,110 Euro.
CONCLUSIONS. EDC data collection is interchangeable with cardiac output values in CRF registration. Both methods of data collection can be used and therefore cost aspects could be decisive in trial design and data collection.

0911

COMPARATIVE EVALUATION OF ACCURACY OF THREE POINT-OF-CARE GLUCOMETERS IN AN ADULT ICU

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INTRODUCTION. Obtaining accurate blood glucose levels at the bedside is mandatory to titrate intravenous insulin infusions in ICU patients. Glucose monitoring in this setting appears more complicated than in ambulatory monitoring in diabetic patients [1]. The use of glucose meters included in blood gas analyzers has been advocated [2]. We evaluated comparatively the performance of two new point-of-care devices and a blood gas analyzer.
METHODS. Simultaneously, arterial blood glucose was measured with a blood gas analyzer RapidLab 1265 (Siemens), the Accu-Chek Performa strip on the Accu-Chek Inform II (Roche), the Nova StatStrip (NovaBiomedical) and in the central laboratory using the hexokinase method. All the measures were duplicated and the average value of each method was computed. Bland–Altman, Passing–Bablok, Kanji and modified Kanji approaches were used.
RESULTS. A total 432 matched analysis were randomly performed in 343 adult patients. The mean SOFA score was 5.0 (minimum 0 and maximum 23). The range of reference method glucose was 20–585 mg/dL. No patient had paracetamol overdose. Biases are defined as point-of care minus reference glucose values. These biases were −0.5 mg/dL for the Accu-Chek Performa strip with the Accu-Chek Inform II, −1.0 mg/dL for the Nova StatStrip and −4.9 mg/dL for the RapidLab1265. The Passing–Bablok regression show that the confidence interval (CI) of the slope contains the 1.000 for the handheld glucose meters but not for the blood gas analyzer. Rates of discrepancies for the different levels (10, 15 and 20%) were not significantly different between the methods. See Table 1.

TABLE 1

	n	Mean bias (mg/dL)	Lower and upper 95% CI	Passing Bablok regression	95% CI for slope	*n* > 10% discrepancy	*n* > 15% discrepancy	*n* > 20% discrepancy
Accu-Chek Performa	432	−0.5	−18.8 to 17.7	$Y = 2.2778 + 0.9778 X$	0.9596–1.0000	50 (11.5%)	15 (3.5%)	8 (1.8%)
Nova StatStrip	432	−1	−20.3 to 18.2	$Y = -2.0742 + 1.0074 X$	0.9910–1.0261	47 (10.9%)	10 (2.3%)	5 (1.2%)
RapidLab 1265	432	−4.9	−24.5 to 14. 7	$Y = 4.0680 + 0.9390 X$	0.9251–0.9534	43 (10.0%)	18 (4.1%)	5 (1.2%)

CONCLUSIONS. The very low biases, the 95% confidence interval for the Passing–Bablok regression slopes and the low rate of of significant (>10%, >15% or >20%) suggest that these devices are as safe for glucose monitoring as with the use of a blood gas analyzer in an adult ICU.

REFERENCES. 1. Duncan K et al (2007) Diabetes Care 30:403–409

2. Kanji S et al (2005) Crit Care Med 33:2778–2785.

0912

EFFECTS OF TWO LEVELS OF COMPUTERIZED DECISION SUPPORT ON GLUCOSE REGULATION IN INTENSIVE CARE—USING STATISTICAL PROCESS CONTROL

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INTRODUCTION. Glucose control with insulin decreases morbidity and mortality of critically ill patients. The objective of this study was to evaluate the effect of two levels of computerized decision support on glucose control performance over time.

PATIENTS AND METHODS. A Prospective study was performed in a 30-beds mixed medical-surgical intensive care unit (ICU) of a university hospital. All adult critically ill patients who stayed in the intensive care unit (ICU) for >24 h between July 1, 2007 and February 28, 2009 were included. An active computerized decision support system in the first phase (date from January till August 2008) providing patient non-specific advice and in the second phase (date from September 2008 till February 2009.) providing patient-specific advice was developed, implemented and evaluated. Effectiveness/efficiency-related indicators (mean blood glucose levels (BGL), BGL within pre-defined targets and time to capture target), safety-related indicators (hypoglycemia and hyperglycemia events, and hyperglycemia index), and protocol-related indicators (BGL sampling interval) were measured. To visualize and make inferences on the longitudinal development of outcome measures we resort to the powerful instrument of control charts from the field of statistical process control (SPC). We advocate the use of SPC for monitoring the quality of glucose regulation through the two phases as it provides insight of outcome change over time.

RESULTS. Data of 3,208 patient admissions were evaluated, with 132,010 available BGL measurements. Of all measured indicators only the BGL sampling interval decreased and became out of control (indicating change) after introducing patient specific decision support. Mean BGL, time to capture target, hyperglycemia index, percentage of hyperglycemia events and "in range" measurements remained unchanged and stable after introducing both patient non-specific and patient specific decision support. The percentage of hypoglycemia events also did not change.

CONCLUSION. Adherence to protocol sampling rules slightly increased by using patient specific CDSS. But surprisingly and in contrast to other published studies, the use of a CDSS at both levels did not improve the quality of glucose control as measured by our indicators. Internal factors such as a low agreement with the guideline and external factors such as a recently published negative meta-analysis could be possible explanation for this unexpected result.

0913

REAL TIME MONITORING OF LEFT VENTRICULAR PERFORMANCE WITH AN EPICARDIAL ACCELEROMETER SENSOR

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INTRODUCTION. Left ventricular stroke work (LVSW) measured with a pulmonary artery catheter is considered the clinical gold standard method for assessment of global cardiac function. However, only intermittent measurements are achievable by the use of this technique. A miniaturized accelerometer sensor provides continuous real time information of myocardial movement and has shown excellent ability for continuous detection of myocardial ischemia. The aim of this study was to evaluate whether measures from an epicardial accelerometer sensor could represent LVSW.

METHODS. In 11 open-chest pigs an accelerometer ($11 \times 14 \times 5$ mm) was sutured on the left ventricle (LV) in the perfusion region of the left anterior descending coronary artery (LAD). Epicardial acceleration in the circumferential direction was measured. From this signal velocity was calculated by time-integration and peak systolic velocities were determined. Stroke volume (SV) was obtained by an aortic flow probe, and mean aortic pressure (MAoP) was measured by a fluid-filled catheter. LV end-diastolic pressure (LVEDP) was measured by micromanometer catheter (Millar). LVSW was calculated by the following equation: $\text{LVSW} = \text{SV} \times (\text{MAoP} - \text{LVEDP}) \times 0.0136$. Global LV function was changed by epinephrine, esmolol, colloid fluid loading and by temporary LAD occlusion. The correlation between LVSW and peak systolic velocity by accelerometer was calculated using the Spearman correlation coefficient.

RESULTS. LVSW decreased during esmolol infusion ($p < 0.01$) and LAD occlusion ($p = 0.020$), while LVSW increased during epinephrine infusion ($p = 0.024$). Fluid loading induced no significant changes in LVSW. Concurrent and significant changes in peak systolic velocity by the accelerometer were observed during all interventions ($p < 0.01$). Changes in circumferential peak systolic velocity by the accelerometer correlated strongly to changes in LVSW ($r = 0.81$, $p < 0.001$) (Fig. 1).

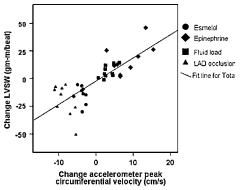

Fig. 1

CONCLUSION. Alterations in circumferential peak systolic velocities measured by an epicardial accelerometer were closely correlated to changes in LVSW during interventions affecting global cardiac function. Peak systolic velocity generated from an epicardial accelerometer sensor could therefore be used to quantify LV performance continuously and in real time. This technique may be a powerful tool for continuous monitoring of myocardial contraction during and after cardiac surgery.

0914

A SURVEY OF MANAGEMENT OF TEMPORARY EPICARDIAL CARDIAC PACING AFTER CARDIAC SURGERY

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INTRODUCTION. Patients undergoing cardiac surgery often have rhythm disturbances in the immediate post-operative period. Temporary epicardial pacing provides the back-up until sinus rhythm is restored. However if sensing and pacing thresholds are not correct, they can cause many iatrogenic problems including 'R-on-T phenomenon' inducing life-threatening ventricular tachyarrhythmias (VT).

OBJECTIVES. We sought to determine how often thresholds were within BPEG guidelines [1] and if the two readings correlated.

METHODS. We measured thresholds from 50 patients of coronary artery bypass graft or valve replacement. The pacing threshold was measured as soon as possible after surgery. The rate was set to 10 beats above the patient's intrinsic rate then output was slowly lowered till there was a loss of capture. It was raised again till there was consistent capture and this was the pacing threshold. The sensing threshold was measured soon after the patient developed an intrinsic heart rate. The rate was set to 10 beats below the patient's intrinsic rate and the voltage output was minimised. The voltage sensitivity was lowered till the pacing box could no longer sense the patient's rhythm, then it was raised again until it would consistently sense. This was the sensing threshold.

RESULTS. From the 50 patients studied, 30% had a sensing threshold of less than or equal to the BPEG guideline of 4 mV. 4% had sensing thresholds beneath the pacemaker default of 2 mV. 12% of patients had pacing thresholds above or equal to half the default setting of 10 mV. Sensing and pacing thresholds do not correlate; if one is adequate, the other may not be. During this 3 weeks audit, we encountered one patient who suffered from 'R-on-T' induced VT requiring CPR with a successful outcome. It became apparent that few doctors were aware of this problem, so a brief national survey of hospitals across Britain was conducted. It showed that of 17 responding hospitals, 3 did not measure pacing threshold; however 13 did not measure sensing threshold.

CONCLUSIONS. An unacceptably large proportion of the patients tested did not meet guideline threshold limits putting them at risk of iatrogenic complications. On a micro and macroscopic level, it is apparent that doctors are not aware of the risks associated with poor thresholds so this should be addressed.

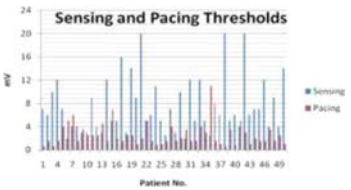

Fig. 1 Sensing and pacing thresholds

REFERENCE. 1. Moses HW, Mullin JC (2007) A practical guide to cardiac pacing, 6th edn, pp 160–163. Lipincott Williams & Wilkins, Baltimore

0915

INDUCED SYSTEMIC HYPOTHERMIA, USING THE COOLGARD SYSTEM (ALSIUS R), FOR COMBINED SURGICAL AND ENDOVASCULAR MANAGEMENT OF A GIANT CEREBRAL ANEURYSM

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Giant cerebral aneurysm surgery carries a high risk for intra-operative ischemic insults, especially if long periods of temporary artery clipping are necessary to achieve final aneurysm clipping. The most robust neuroprotection is provided by the application of moderate hypothermia (32° core temperature). However, all methods of surface cooling have shown major limitations, especially in the peri-operative setting. Therefore, we decided on the intra-operative use of the Coolgard System (AlsiusR) to induce systemic hypothermia during combined surgical and endovascular management of a giant aneurysm.

A 57-year-old female pt was scheduled for elective surgical clipping of a medial cerebral artery giant aneurysm (3.4 vs 9 cm diameter). After induction of anesthesia, left femoral vein was accessed inserting an ICY catheter (3-lumen coolgard catheter). Durign procedure, SSEP and EEG monitoring were applied to detect any cerebral ischemic event.

Coolgard was installed at 32° "end" temperature with "maximal cooling" setting. Body core temperature at start of hypothermic procedure was 34.6° for esophageal location, 35.6° for rectal, and 35.7° for bladder temperature (guide to coolgard catheter management). At 1 h 6 min after start of hypothermia induction, aimed core temperature of 32° was obtained. We did not observe any deleterious systemic effect during hypothermia induction. Mean arterial blood pressure did not change from baseline values, and remained stable (with minimal inotropic/vasopressor support). During surgical procedure (3 h 4 min), stable body core temperature (rectal-esophageal and bladder between a narrow range of 31.9°–32.1°) was maintained. In total, 4 periods of endovascular balloon occlusion were applied (34 min total duration), without any ischemic changes on SSEP/EEG monitoring. After surgical procedure, Coolgard was installed at 35° "end" temperature with maximal rewarming set at 0.65° per hour. After 3 h and 48 min, body core temperature reached 35°, coolgard system was stopped and external surface rewarming (Bair Hugger) was installed and pt was transferred to ICU. Body core temperature slowly increased to 36°–36.5° at which pt was extubated and awakened without any deficit (11.30 hours after ICU admission). We did not observe any significant postoperative systemic disturbances necessitating any intervention. Total duration of induced cooling procedure was 7 h 58 min, without any major systemic side effect.

This report describes intra- and post-operative management of induced systemic hypothermia using an endovascular cooling catheter. We were able to induce hypothermia (32°) over a very short time period (appr 1 h), while maintaining stable core temperature during procedure, without any risk of deeper hypothermia (lowest body core temperature: 31.7°). Most importantly, rewarming occurred at the desired slow rate, without any postoperative complication.

0916

DIFFERENCES IN LUNG SOUND ENERGY ACCORDING TO LUNG CONDITION

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INTRODUCTION. Differences in sound energy between affected and non-affected lungs in asymmetric lung disease were previously reported. In the present study, we compare total sound energy in patients diagnosed with different lung conditions.

OBJECTIVES. To assess differences in absolute sound energy according to lung condition in ICU patients.

METHODS. Lung sound measurements, recorded with VRI, were obtained from 72 ICU patients classified in four groups according to primary finding in chest radiograph (CXR): consolidation ($n = 35$), congestion ($n = 10$), pleural effusion ($n = 15$) and normal appearing CXR ($n = 12$). Means sound energy at peak inspiration collected from 34 sensors positioned on the back of the patient were compared between the groups. *p*-values (Wilcoxon Two Sample Test) are reported.

RESULTS. Significantly increased mean (±SD) sound energy was registered in patients with congestion and consolidation when compared to patients with normal appearing CXR or pleural effusion ($p < 0.003$).

CONCLUSION. Several lung conditions may generate increased absolute sound energy, possibly due to secretions or bronchial breathing.

Group	CXR Diagnosis	N	Min	Max	Median	Mean ± SD
1	Consolidation	35	0.07	120.5	11.0	28.9±34.9
2	Congestion	10	0.03	54.8	11.4	13.9±16.7
3	Pleural effusion	15	0.1	16.1	0.8	2.3±4.3
4	Normal	12	0.03	8.7	1.0	2.8±3.2

* Sound Energy in Arbitrary Units x 10^6

X-ray findings and sound energy measurements

0917

AUTOMATIC WEANING OF PEEP AND FIO_2 AFTER CARDIAC SURGERY

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BACKGROUND. Automation of PEEP and FiO_2 settings based on the SpO_2 signal has the potential to reduce the clinician workload in patients on mechanical ventilation. We developed an algorithm reproducing the medical reasoning to achieve this goal and conducted the clinical evaluation of this automated system (AS).

METHODS. The study was conducted in patients mechanically ventilated immediately after cardiac surgery. The algorithm was embedded in a computer connected to a pulse oxymeter and recommendations were provided every minute for PEEP and FiO_2 settings. Patients were randomized for PEEP and FiO_2 management based on AS recommendations (open-loop evaluation) or based on the usual protocol (written protocol relying on the SpO_2 value) during 2 h. Continuous SpO_2 values were recorded, as well as PEEP and FiO_2 settings, and haemodynamic values. Time to set the ventilator was recorded in the control group.

RESULTS. 28 patients were prospectively included. Mean initial PEEP and FiO_2 were 6 cmH_2O and 70% respectively. The mean time to wean the PEEP at 5 and FiO_2 to 40 was 33.5 min in the control group and 18.1 min in the AS group ($p = 0.01$) (Fig. 1). Mean PaO_2 at H1 was 147 ± 67 mmHg in the control group and 117 ± 38 mmHg in the AS group ($p = 0.16$).

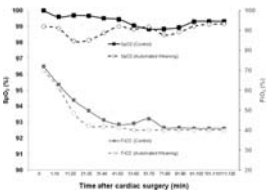

Fig. 1

CONCLUSION. An automated algorithm reproducing medical reasoning could safely wean PEEP and FiO_2 after cardiac surgery with the similar duration to wean these parameters in comparison with a protocol driven by clinicians.

0918

FUNKTION OF DIFFERENT ICU VENTILATORS UNDER PRESSURE SUPPORT (PSV) OR CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) VENTILATION UNDER HYPERBARIC CONDITIONS

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INTRODUCTION. ICU-ventilators are designed for use at normobaric conditions. Under certain circumstances patients need support mechanical ventilation during hyperbaric oxygen therapy.

OBJECTIVES. The aim of the investigation was, to analyse the function of three different ICU-ventilators EVITA-4, Oxylog 2000 (Drägerwerk AG, Germany) and Servo 900 C (Siemens-Elema, Sweden) under 5 (normobaric, 1.3, 1.6, 1.9 and 2.8 ATA) different atmospheric pressure conditions. We performed all measurements with the electromechanical lung simulator LS 1500 (Drägerwerk, Lübeck, Germany) which is is able so simulate spontaneous breathing.

METHODS. We performed the ventilator testing in a multiplace hyperbaric chamber. We tested the following ventilator modes: pressure support ventilation (PSV) with 10 cmH_2O, PEEP 5 cmH_2O (EVITA-4 and Servo 900 C only) and continuous positive airway pressure (CPAP) on a level of 10 cmH_2O (all ventilators).

During PSV and CPAP testing, at all ambient pressure levels, tidal volume (V_T) of the lung simulator was set in order to achieve 500 ml with a respiratory rate (f) = 20/min. Airway pressure (P_{aw}) was measured inside of the bellows of the simulator, the displayed Tidel/Minutevolumes were captured from the different display panels

RESULTS. The following Tables 1 and 2 shows the deviation from the default Tidel/Minutevolume [percent].

TABLE 1 CPAP-MODE

Ambient pressure (bar = atmosphere)	1 (bar) = normobaric conditions	1.3 (bar)	1.6 ATA	1.9 ATA	2.8 ATA
Oxylog 2000	0	24.0	38.7	49.3	80
Evita-4	0	0.8	3.4	6.7	14.2
Servo 900 C	0	32.06	65.15	101.2	211.44

TABLE 2 PSV-MODE

Ambient pressure	1 (bar)	1.3 (bar)	1.6 (bar)	1.9 (bar)	2.8 (bar)
Evita-4	0	34.18	45.97	79.17	279.03
Servo 900 C	0	9.5	13.2	16.7	26.8

CONCLUSIONS. This investigation of ICU-ventilators under hyperbaric conditions shows that the displayed Tidel/Minute volumes consistently raised with increasing ambient pressure. The displayed Tidel/Minite volumes by the ventilator generally overestimate the actual one, probably misleading the unexperienced user. The changes are quantitatively specific for each type of ventilator. P_{aw} pressure and monitoring was not affected by increasing ambient pressure.

REFERENCE. 1. Stahl W et al (2000) Intensive Care Med 26:442–448

0919

BENCH COMPARISON OF TRANSPORT AND NIV VENTILATORS: IMPACT OF LEAKS

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INTRODUCTION. Specific Non Invasive Ventilation (NIV) modes are now available on ventilators designed for transport and for emergency use. The presence of leaks interferes with several key aspects of NIV. This bench test aimed at comparing the performances of these ventilators to those obtained with ventilators specifically designed for NIV.

MATERIALS AND METHODS. Using an active simulated lung ASL5000, we compared 3 transport ventilators: Oxylog 3000 (Drager), Medumat (Weinmann) and Supportair (Airox), versus 3 NIV ventilators: Bipap (Respironics), Elisee 250 (Resmed) and Carina (Drager) set in PSV with a PS level of 15 cmH_2O and PEEP of 5 cmH_2O. NIV mode using optimal expiratory trigger (automatic or 40%) was compared to invasive mode. Three conditions were simulated: without leaks, with inspiratory leaks and continuous leaks. We evaluated pressurization capacity (pressure time product or PTP, measuring inspiratory area) and prolongation of insufflation during inspiratory leaks and we quantified auto-triggering during continuous leaks.

RESULTS. No auto-triggering were detected using NIV ventilators and one transport ventilator using the NIV mode, but it was very frequent for the other 2 ventilators during continuous leaks. Pressurization capacity at 0.5 s was significantly poorer with two transport ventilators during inspiratory leaks, and prolonged insufflation time occurred with the same 2 transport ventilators.

CONCLUSION. This bench test designed to test the impact of leaks, show that two transport ventilators are not efficient in presence of leaks despite a specific NIV mode. Others ventilators are better adapted to leaks.

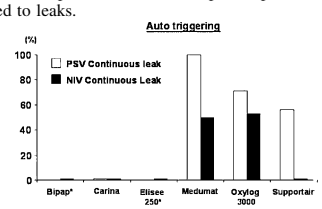

Fig. 1 vni

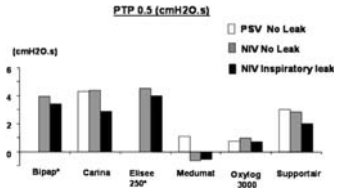

Fig. 2 vni

0920

CENTRAL VENOUS CATHETERIZATION MADE SAFER AND EASIER

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INTRODUCTION. The use of echography has been recommended to guide the insertion of central venous catheters (CVC) because "blind" punctures—relying on anatomical landmarks (LM)—may be associated with serious complications. However, limited access to echography and to appropriate training holds back so far the widespread use of such a technique.

OBJECTIVES. The aim of the present study was to assess the potential value of a novel pocket sized Doppler ultrasound (U/S) device dedicated to vascular access. The needle advances right in the middle of the U/S beam, allowing blood vessel cannulation under real-time U/S guidance (Fig. 1).

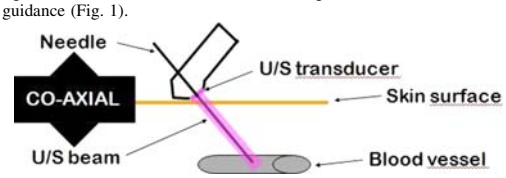

Fig. 1 COAXIAL needle and U/S pocket size system

METHODS. This was an observational and prospective study conducted in patients requiring a CVC in a surgical ICU. We recorded the number of needle passes for each CVC insertion, as well as potential complications (arterial puncture, hematoma, pneumothorax, hemothorax, abnormal position of the catheter). The transducer was applied on the skin at the usual puncturing site, and the strongest Doppler signal (characteristic acoustic signal) determined the puncture direction, indicating that the axis of the U/S beam hit the middle of the blood vessel. The needle was then introduced in the needle guide, was advanced co-axially to the U/S beam, and the procedure continued in the traditional way (Fig. 1).

RESULTS. 30 CVC insertions (10 jugular and 20 subclavian) have been attempted in 30 surgical ICU patients with a success rate of 100%. The rate of successful cannulation on the first needle pass was 84% and on the second pass 16% (mean number of needle passes per insertion = 1.2). No clinical complication related to vascular puncture was reported during the maneuver or after radiography control. Only one malpositioning of a sub-clavian catheter in the jugular vein was detected by radiography, but this was unrelated to the puncturing technique.

CONCLUSIONS. The high success rates, especially that on the first needle pass, compared favorably to those reported in several echo-guided studies. For vascular access, the advantages of this device over echographs could therefore be its ease of use (no training in echography), its pocket size, and a much lower price. The present preliminary results are very encouraging and deserve confirmation in a larger patient population, ideally in comparison with a control group (LM or echo-guided).

0921

CENTRAL LINE INSERTION-TECHNIQUES AND COMPLICATIONS

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INTRODUCTION. Central venous catheter insertion has complications including arterial puncture, pneumothorax, bleeding and air embolism. The risk of these complications is dependent upon multiple factors, including patient comorbidities, practitioner technique and skill. NICE guidelines recommend the use of ultrasound (US) in central line insertion aiming to reduce the number of complications encountered.

METHODS. 128 patients in a multicentre audit had central lines placed over a month period. Number of attempts made, seniority of practitioner, technique used and any complications were recorded. Time taken to prepare equipment, as well as time taken from first touch of skin with needle or US to catheter insertion and guidewire removal was also recorded. 67 lines were inserted using US, 60 without. One practitioner used both techniques.

RESULTS.

- Consultant line placement was achieved more quickly than junior attempts regardless of technique(3 min 27 s vs 6 min 45 s)
- Line insertion using the landmark technique was markedly quicker (2 min 46 s vs 6 min 4 s)
- Repeated attempts were needed more often in the US group
- Only significant complication (pneumothorax) occurred using US technique.

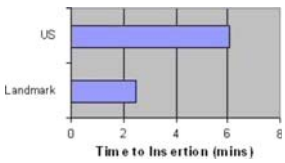

Fig. 1 Time to line insertion

DISCUSSION. A study assessing the implementation of NICE guidelines in a London tertiary referral centre found no significant difference between complications of consultants using either technique but reported improved safety in registrars using US as compared to landmark [1]. Keenan assessed 18 trials and suggested that US offered the most significant benefit to more junior team members [2]. Concerns have been raised as to the cost effectiveness of ultrasound use; initial outlay is projected to be £15 million with an additional cost of £10 per line inserted [2, 3].

CONCLUSIONS. Ultrasound technique is not without complications and has significant cost implications. Landmark technique may be quicker to achieve central access. Complications may relate more to skill and seniority of practitioner than technique used.

REFERENCES. 1. Wigmore TJ, Smythe JF (2007) Effect of the implementation of NICE guidelines for ultrasound guidance on the complication rates associated with central venous catheter placement in patients presenting for routine surgery in a tertiary referral centre. BJA 99(5):662–665

2. Keenan SP (2002) Use of ultrasound to place central lines. J Crit Care 17(2):126–137

3. Scott DHT (2003) Editorial II It's NICE to see in the dark. BJA 90(3):269–272

Sepsis therapies: 0922–0935

0922

ULINASTATIN PLUS THYMOSIN-A_1 IMPROVES IMMUNOLOGICAL FUNCTION AND PROLONGS SURVIVAL IN PATIENTS WITH SEPSIS

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OBJECTIVES. Sepsis is defined as the systemic inflammatory response to infection. Recently, immunotherapy was regarded as a new strategy for sepsis. In this study, the efficacy of immunotherapy with ulinastatin plus thymosin-α_1 was investigated in the septic patients.

METHODS. Seventy post-operative septic patients from Gastrointestinal surgery department were randomized into immunotherapy group ($n = 36$), and conventional therapy group ($n = 34$). Immunotherapy group received intravenous ulinastatin, 200,000 U, 3 times per day for 3 days, then 100,000 U, 3 times per day for 4 days, and subcutaneous thymosin-α_1, 1.6 mg, 2 times per day for 3 days, then once per day for 4 days. Other conventional therapies such as antibiotics and fluid resuscitation were given in both groups. Blood TNF-α, blood IL-10, blood lymphocyte subsets, blood monocytes HLA-DR CD_{14}^+ and 28 days survival rate were compared in the two groups.

RESULTS. The survival rate in the immunotherapy group was 63.9% (23/36), compared to the conventional therapy group was 41.2% (14/34), $P < 0.05$. In immunotherapy group, the blood TNF-α level (1.33 ± 0.50 ng/ml vs. 1.88 ± 0.53 ng/ml, $P < 0.05$) and in blood IL-10 level (217.52 ± 15.71 ng/ml vs. 101.53 ± 16.57 ng/ml, $P < 0.05$) were significant difference than that in the conventional therapy group. There were also significant difference in blood CD_4 $^+$T lymphocyte ($35 \pm 13\%$ vs.$21 \pm 7\%$, $P < 0.05$) and blood monocytes HLA-DR CD_{14}^+ ($50 \pm 5\%$ vs.$35 \pm 4\%$, $P < 0.05$) between the two groups.

CONCLUSIONS. Immunotherapy with ulinastatin plus thymosin-α_1 improves inflammatory response and immunological function and prolongs survival in the septic patients.

KEYWORDS. Sepsis, Ulinastatin, Thymosin-α_1, Immunotherapy.

0923

CONTINUOUS RENAL REPLACEMENT THERAPY AND INFLAMMATORY MEDIATORS

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OBJECTIVE. To evaluate the efficacy of continuous renal replacement therapy (CRRT) in the systemic inflammatory mediators removal in a group of patients with severe sepsis/septic shock and related renal failure.

MATERIAL AND METHODS. We conducted a prospective study, with the local ethic committee approval that enrolled 11 patients with severe sepsis/septic shock and submitted to CRRT. We measured the cytokines TNF, IL-1B, IL-6 and IL-10 levels using an immunoassay method. The cytokines measurement was done every morning and while the technique lasted. We analyzed the following variables: age, severity scores (SAPSII, SOFA), cytokines (TNF, IL-1B, IL-6 and IL-10) levels on prefilter, posfilter and ultrafiltrate. We correlated these data with filter duration, considering 24 h the maximum theoretical limit for effective cytokine removal.

RESULTS. From the eleven patients enrolled, we collected 420 valid samples to measure the cytokines levels. The mean age and SAPS II score were respectively 66 ± 10.7 years and 46 ± 27.1. The mean total SOFA score at admission and at day 3 were 11.2 ± 4 and 12.7 ± 4 respectively, with a ΔSOFA = + 1.3 points ($p > 0.05$). The mean ICU hospitalization time was 25.9 ± 33.5 days. We have done 876 h of continuous dialytic therapy; 33 AN69 membranes were used, during a mean time of 26.5 ± 25.6 h. The mean total levels found for cytokines are presented in Table 1 and the levels depending on the filter duration are in Table 2. The ICU mortality rate was 54.6%.

TABLE 1 TOTAL CYTOKINES LEVELS

$n = 420$	Pre-Filter	Post-Filter	Ultrafiltrate
TNF(pg/ml)	6.26 ± 12.5	6.48 ± 12.1	3.25 ± 1.14
IL-6(pg/ml)	$6{,}977.6 \pm 16{,}048$	$9{,}203.9 \pm 20115$	204 ± 351
IL-1B(pg/ml)	16.94 ± 84.96	16.36 ± 82.55	1.31 ± 3.8
IL-10(pg/ml)	109.1 ± 336	104.8 ± 330.8	11.8 ± 61.1

TABLE 2 MEDIATORS REMOVAL AND FILTER DURATION

AN69	Pre-TNF	Post-TNF	Pre-IL-6	Post-IL-6	Pre-IL-1B	Post-IL-1B	Pre-IL-10	Post-IL-10
<24 h	9.5 ± 5.2	9.66 ± 5	$9{,}722.8 \pm 852$	$6{,}955 \pm 545$	38.7 ± 35.8	37 ± 34.9	145 ± 126	145 ± 127
>24 h	3.7 ± 0.2	4.1 ± 3.5	$1{,}467 \pm 653$	$1{,}561 \pm 722$	2.3 ± 0.7	2.9 ± 0.8	13.5 ± 7.2	14.2 ± 6.1
p	ns		$p < 0.05$		ns		ns	

CONCLUSIONS. This study does not allow defining a specific pattern for the removal of inflammatory mediators related to CRRT. However we observed a statistical significant removal only for IL6 without relation with the values obtained in ultrafiltrate suggesting an adsorption effect and since the membrane be exchanged at each 24 h. More studies are necessary to define a standard of removal of the cytokines and his meaning in the CRRT immunomodulation treatment of septic patients.

REFERENCES. 1. Levy MM et al (2005) Crit Care Med 33:2194–2201

2. Shoji H (2003) Ther Apher Dial 7:108–114

3. Kellum J et al (2004) Crit Care Med 32:801–805

0924

ACUTE RENAL FAILURE IN SEPTIC SHOCK. SHOULD WE CONSIDER DIFFERENT CONTINUOUS RENAL REPLACEMENT THERAPIES ON EACH RIFLE SCORE STAGE?

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BACKGROUND. Acute renal failure (ARF) in septic shock (SS) is common and worsens prognosis. ARF can be classified in different stages with RIFLE score. Early stages of SS and ARF share pathophysiology pathways with citokines causing endothelial damage. Continuous renal replacement therapies (CRRT) could play an important role as convective techniques could eliminate citokines and achieve imunomodulation.

OBJECTIVE. Analyse clinical parameters in patients with SS and ARF that need CRRT. Analyse survival based on ARF stage and type of CRRT.

METHODS. Prospective observational study. We studied 148 patients with SS and ARF requiring CRRT admitted to our critical care unit (ICU) during a 2 year period. We analysed ARF stage based on RIFLE score, and type of initial CRRT applied (High Volume Hemofiltration-HVHF: ultrafiltrate dose (uf) $>$ 35 ml/kg/h; Continuous VenoVenous Hemofiltration-CVVH: uf $<$ 35 ml/kg/h; and Continuous VenoVenous HemoDiaFiltration-CVVHDF). $N = 148$ patients;68% men;mean age 60 $\pm$ 13 years; APACHEII 26 $\pm$ 9. On starting CRRT: 88% were on mechanical ventilation(MV), 53% presented disseminated intravascular coagulation (DIC), 51% liver failure, lactate 5.7 $\pm$ 5 mmol/L, urea 24 $\pm$ 12 mmol/L, creatinine 307 $\pm$ 155 µmol/L, and 54% presented metabolic acidosis. Based on RIFLE score, CRRT was started on Risk (12%) and Injury (18%) stage in 44 patients (Group I). The rest of our patients (104) began CRRT on Failure (70.3%) stage(Group II). Group/: 48% women, mean age 59.5 $\pm$ 13 years, APACHEII 24 $\pm$ 8. On starting CRRT: 93% were on MV, 48% DIC, 41% liver failure, lactate 5.1 $\pm$ 3.7 mmol/L, urea 18 $\pm$ 11 mmol/L, creatinine 178 $\pm$ 71 µmol/L, and 43% metabolic acidosis. Group II: 26% women, mean age 61 $\pm$ 13 years, APACHEII 27 $\pm$ 10. On starting CRRT: 86% were on MV, 55% DIC, 56% liver failure, lactate 6 $\pm$ 5.9 mmol/L, urea 26 $\pm$ 12 mmol/L, creatinine 361 $\pm$ 149 µmol/L, and 59% metabolic acidosis.

RESULTS. CRRT applied: 41%HVHF, 29%CVVH, and 30%CVVHDF. 39% were anticoagulated. Mean uf 31 $\pm$ 12 ml/kg/h. Depuration days 6 $\pm$ 6. Days from admission ICU to CRRT 3.1 $\pm$ 8.6. ICU length of stay 28 $\pm$ 35 days. 28 day mortality: 60%. Group I: depuration days 5, 1 $\pm$ 6, days from admission ICU to CRRT 2.2 $\pm$ 7, ICU length of stay 35 $\pm$ 55 days. CRRT applied: 57% HVHF, 32% CVVH, and 11% CVVHDF. 28 day mortality 47% (36% HVHF, 50% CVVH, 100% CVVHDF). Group II: depuration days 6.4 $\pm$ 9, days from admission ICU to CRRT 5.2 $\pm$ 11, ICU length of stay 24 $\pm$ 21 days. CRRT applied: 34% HVHF, 29% CVVH, 37% CVVHDF. 28 day mortality 65% (71% HVHF, 70% CVVH, 56% CVVHDF). No global statistical survival differences were found neither between the three different CRRT nor between the RIFLE initial score. We found statistically significant survival differences between different CRRT in each RIFLE score group. Group I: HVHF better survival than CVVH and CVVHDF. Group II: CVVHDF better survival than HVHF and CVVH.

CONCLUSIONS. Patients with SS and ARF who need CRRT present high mortality. Early start of CRRT (low RIFLE score) seems to improve survival. CRRT with HVHF seems the best technique in early stages (Risk-Injury). CRRT with CVVHDF seems the best technique in late stages (Failure).

0925

EFFECTS OF INTRAVENOUS IGM-ENRICHED IMMUNOGLOBULINS ON MUSCLE TISSUE MICROCIRCULATION IN SEPTIC SHOCK: A PRELIMINARY REPORT

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INTRODUCTION. In sepsis, multiple organ dysfunction is a consequence of cellular dysoxia caused mainly by microcirculation impairment. Intravenous polyclonal IgM-enriched immunoglobulins (IgGAM) have been recently re-evaluated as a valid therapeutic option in septic patients. The exact mechanism of action of IgGAM is still unclear, but the antitoxin and anti-inflammatory properties may influence the microcirculatory disturbances observed in sepsis. The aim of this study was to evaluate in patients with septic shock the effect of an early therapy with IgGAM on muscle tissue microcirculation by means of near infrared spectroscopy (NIRS).

MATERIALS AND METHODS. From April 2008 to January 2009, 11 patients with septic shock treated according to the Surviving Sepsis Campaign (SSC) guidelines and IgGAM (5 ml/kg for 3 days) have been studied. IgGAM therapy in all the patients started within 24 h from shock appearance. Before, 24 h after and at the end of igGAM infusion the we measured by NIRS technique (InSpectra^{TM}, Hutchinson Technology, USA) and arterial occlusion test: baseline tissue O_2 saturation (StO_2bas), StO_2 downslope during ischemia ($PStO_2$), the StO_2 upslope ($RStO_2$) and the StO_2 overshoot (StO_2max) after reperfusion, and muscle VO_2 ($nirVO_2$). The NIRS probe was applied on patients thenar muscle and the ischemia/reperfusion test was obtained by inflation/deflation of a pneumatic cuff to 240 mmHg for 60 s. Data obtained in igGAM patients have been compared to NIRS data observed in 10 historical patients (control group) treated according to the SSC guidelines but without IgGAM. In these patients, NIRS data have been collected (i) within 24 h after shock development and (ii) 24 h after first measurement. In all the 21 patients activated recombinant protein C was not used because of contraindications.

RESULTS. StO_2bas and $PStO_2$ remained constant during and after IgGAM therapy. $RStO_2$, StO_2max and $nirVO_2$ increased during IgGAM by about 15.8, 8.6 and 27.0% ($p > 0.05$). Similarly, at end of IgGAM therapy reperfusion data and $nirVO_2$ were still larger ($p > 0.05$) than data collected before IgGAM. In the control group we did not observed any NIRS data variation in the 2 time points of analysis.

CONCLUSIONS. The above preliminary data indicates that the early use of IgGAM in septic shock patients seems to affect muscular microcirculation with a rapid improvement in the parameters related to endothelial reactivity.

0926

VERY HIGH VOLUME HEMOFILTRATION IMPROVES HEMODYNAMICS AND RESPIRATORY VARIABLES AND PROBABLY INCREASE SURVIVING IN CRITICALLY ILL PATIENTS WITH SEPTIC SHOCK

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INTRODUCTION. Mortality rates in Septic Shock remain unacceptable high despite advances in our standing of the Syndrome. The Mortality associated with this disorder ranging from 30 to 50%. Humoral Factors are increasingly recognized to participate in the pathogenesis of Severe Sepsis and Septic Shock. Very High Volume Hemofiltration (VHVHF) can removes Levels of this Factors and improves Hemodynamics and Respiratory parameters and potentially improves Clinical Outcomes. Our procedure is routinely performed as continuous modality during 24 h. Befor we applied in all patients The Guidelines of Surviving Sepsis Campaign (SSC). Most of the patients presented Acute Renal Failure.

METHOD. We propose a Pulse of 80–100 Ml/Kgr/h that can be applied during 6–8 h/day and followed by Continuous venovenous hemofiltration of 55 Ml/Kgr/h during 16–18 h. We inserted a CAP in all the patients and measured Hemodynamics (CO, RVS, RVP, PECP, SvO_2), Respiratory variables (PaO_2/FiO_2) and Levels of Procalcitonin. In the future we are going to measure the levels of Cytokines (IL-1, Il-6, IL-10 and TNF-alfa). Our Prospective and Observational Study including 11 Patients hospitalized with Septic Shock; treated with PVHVHF between 2008 and 2009 in the Medical UCI of a teaching Hospital in Malaga. Demographic data, RIFLE Classification, APACHE II and SOFA Score, Organ Support needed, Hemodynamics and Respiratory variables, Levels of Procalcitonin and Prognosis were prospectively collected.

RESULT: We Treated 11 Critically ill Patients (NINE MEN, TWO WOMEN), mean age (57.6 years), APACHE II Score (28.36), SOFA Score (12.27) with Septic Shock using the Schedule described, commercial Bicarbonate Buffered replacement Fluid was used in Pre and Post-Dilution. We evaluated daily all the variables described above. The focus in the most of the patients were Pulmonic. The Observed 28-day mortality was 18 vs 56% predicted by APACHE II and 50% predicted by SAPS II. One of the patient developed intra-abdominal abscess (Aneurism Abdominal), requiring surgical debridement and died due to Septic Shock and multiorgan-failure, and the other died due to Empyema by Pneumococcus Pneumonia with severe sepsis and multiorgan-failure.

CONCLUSION. The Biological rationale includes issues related to Double Peak Citokynes Concentration Hypotesis. These reasons seems to be sufficient to explore a wider use of VHVHF techniques. Standard-dose HF, has failed to improve mortality in clinical trials. Increasing the dose is a viable option in altering the course of sepsis.

REFERENCES. 1. Ronco C et al (2000) Effects of different doses in continuous veno-venous Hf on outcomes of acute renal failure. Lancet 356

2. Honore et al (2000) Vhvhf on the hemodynamics course and outcome in patients with intractable circulatory failure resulting from septic shock. Crit Care Med 28(11)

0927

BENEFICIAL OUTCOME EFFECT OF ACTIVATED PROTEIN C IN PATIENTS WITH SEPTIC SHOCK: A CASE-MATCHING STUDY

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INTRODUCTION. It remains unclear whether administration of activated Protein C (APC) is beneficial in septic patients with circulatory failure (need of vasopressor) and at least one other organ failure.

We compared the outcome of septic shock patients who received APC in our institution from 2003 to 2008 to that of a series of patients who were case-matched in terms of characteristics and of severity but who did not receive APC while they fulfilled our criteria of treatment without presenting any contraindication.

PATIENTS AND METHODS. Sixty-five patients received APC. Before APC infusion, all of them had a circulatory failure with a mean dose of norepinephrine of 6.5 $\pm$ 4.5 mg/h and at least one other organ failure. All but one were mechanically ventilated (P/F: 168 $\pm$ 58). Blood lactate concentration was 4.9 $\pm$ 3.1 mmol/L before starting APC. To find 65 case-matched patients, a regional database (CUB-Rea) with patients from 33 medical intensive care units (ICU) was used. We searched in this database case-matched patients with similar characteristics in terms of age, gender, SAPS2, presence of circulatory failure, respiratory failure (need of mechanical ventilation), renal failure (need of renal replacement therapy). Were excluded patients admitted in ICUs where APC is used on a regular basis and those potentially presenting a contraindication to APC treatment: patent haemorrhage, bleeding risk or potential anticoagulant therapies. Among 1,748 eligible patients, 61 (from 21 ICUs) could be matched one-to-one with 61 patients from our ICU. The impact of APC on survival was evaluated by marginal models (logistic regression and Cox model).

RESULTS.

TABLE 1 RESULTS

	APC−	APC+
Age (years)	60 $\pm$ 13	60 $\pm$ 13
SAPS2	57 $\pm$ 15	57 $\pm$ 15
Circulatory failure	100%	100%
Respiratory failure	98%	98%
Renal failure	64%	68%
Number of organ failures $>$ 3	26%	74%
ICU mortality	54%	26% ($p = 0.003$)
ICU length of stay (days)	20 $\pm$ 18	24 $\pm$ 26 (ns)
Duration of MV (days)	12 $\pm$ 16	17 $\pm$ 21 ($p = 0.002$)

DISCUSSION. The use of APC was associated with a significant decrease in ICU mortality. This finding seems robust since it was confirmed in all the bootstrap samples (61 patients) that were generated from the 1,748 eligible patients. The main limitation of our study was the limited number of matching items ($n = 6$) to obtain a sufficient representative number of matched patients.

CONCLUSION. This study suggests that APC exerts a beneficial effect on survival of patients with septic shock.

0928

ACTIVATED PROTEIN C IN SEVERE ACUTE PANCREATITIS. A RANDOMIZED PILOT STUDY

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AIMS. Previous human studies have shown low activity of activated protein C (APC) in severe acute pancreatitis (SAP). This, together with the findings in animal models, suggests that activated protein C (APC) may theoretically protect against pancreatic injury and ameliorate the disease. We evaluated the safety of APC, and the effects of APC on multiple organ dysfunction measured by the SOFA (Sequential Organ Failure Assessment) and on organ-failure-free days in SAP.

METHODS. Prospective double-blind randomized clinical pilot study in one university hospital tertiary ICU with 8 beds. Patients: Inclusion criteria: 1. admitted to hospital < 96 h from pain, 2. a threefold increase in serum amylase over normal upper range or/and CT verification of SAP, 3. one or more organ dysfunction (OF) [1], 4. <48 h from the first OF. Of a total of 215 adult patients with SAP screened between June 2003 and August 2007, 57 were admitted >96 h from the onset of SAP. Of the 158 who would have fulfilled the study inclusion criteria, 126 had one or more exclusion criteria. Finally, 32 were randomized to the study after informed consent. Intervention: APC ($N = 16$) or placebo ($N = 16$) was administrated intravenously 96 h with a dose of 24 μg/kg/min [1].

MEASUREMENTS. Patient-related changes in laboratory values and SOFA between the start and day 5. Days free of organ failure and days alive outside hospital in 60 days were compared. Bleeding complications were registered. Changes in computed tomography (CT) severity score were analyzed between the start and day 7.

RESULTS. No serious bleedings were detected in either group. During the treatment (from 0 to day 5) the mean (±SD, range) SOFA score changed from 6.5 (±4.0, 2–14) to 8.2 (±5.0, 0–16) in the APC group and from 6.3 (±3.1, 3–11) to 6.1 (±4.4, 0–16) in the placebo group [difference in means (DIM) −2.3, 95% CI from −5.2 to 0.7]. No differences in ventilator free days, in renal replacement therapy free days, in vasopressor-free days, or in days alive outside hospital were detected. APC treatment was associated with significant increases in serum levels of bilirubin, and conjugated bilirubin [DIMs 30 (95% CI 5.5–35.5) and 25 (5.6–44.4)], respectively. The study revealed no difference in change of CT severity score of SAP between the groups. The 28-day mortality in APC-group was 3/16 compared to 0/16 in placebo-group [ARR −19%, 95% CIs 0–(−38%)]. The expired patients had pre-randomization SOFA scores of 10, 13, and 14. The deaths seem to be unrelated to bilirubin levels.

CONCLUSIONS. No serious bleedings were detected. No differences in the evolution of the SOFA score or in organ-failure-free days between the study groups were detected. On the contrary, the study revealed an increase in serum bilirubin levels in the APC group in SAP.

REFERENCE. 1. Bernard GR, Vincent JL, Laterre PF et al (2001) Efficacy and safety of recombinant human activated protein C for severe sepsis. N Engl J Med 344(10):699–709

0929

POLYMYXIN B HEMOPERFUSION (PMX-HP) AS RESCUE THERAPY IN SEVERE REFRACTORY SEPTIC SHOCK (RSS) WITH HEMODYNAMIC INSTABILITY

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INTRODUCTION. Endotoxin is the most potent microbial mediator in the pathogenesis of sepsis. The lack of clinical success with anti-endotoxin drug therapies has shifted interest to extracorporeal therapies to reduce circulating levels of endotoxin. Polymixin B hemoperfusion (PMX-HP) has been reported to effectively bind endotoxin in both in vitro an in vivo studies and to have a beneficial effect in the septic shock treatment [1].

OBJECTIVES.

1. To evaluate the effects of PMX-HP on hemodynamic and status in Pts with severe intractable RSS (baseline norepinephrine + epinephrine dose (NE + EPI): 1.36 ± 0.22 μg/kg/min).
2. To evaluate feasibility and tolerance and to compare observed vs expected hospital mortality.

DESIGN. *Prospective, interventional, nonrandomized study* in a general 8-bed ICU from Jan 2004 to Dec 2008.

PATIENTS. Forty-six Pts in RSS who fullfill all these criteria were included in the study: (1) hemodynamic instability (increasing dose of NE + EPI > 50% by the first 6 h from diagnosis) despite volume optimisation, (2) failed response to conventional therapy (according to Surviving Sepsis Campaign), (3) three or more organ failures, (4) known or suspected gram negative infection.

INTERVENTIONS. Two sessions of PMX-HP (2 h/each with 24-h interval).

METHODS. We measured changes in NE + EPI requirements and perfusion parameters every 24 h: at T0 (baseline and 1°PMX-HP session), T1 (at 24 h from 1°PMX-HPsession, at start of 2°PMX-HP session), at T2 and T3 respectively at 72 and 96 h from baseline. Pts were considered *responders*(R) if at T1 they stabilized MAP with a ≥ 50% decrease in NE + EPI requirements. Otherwise they were considered *nonresponders*(NR).

RESULTS. Twenty-one Pts showed a significant decrease in NE + EPI requirements at T1 (responders $p < 0.01$). Twenty-five Pts did not fulfill this criteria (nonresponders). Lactate levels and SOFA score decreased significantly only in responders from T0 to T2 and T3 ($p < 0.05$). Equally urinary output and PaO_2/FiO_2 increased significantly only in responder Pts at T2 and T3($p < 0.05$). There were no differences in baseline hemodynamic, metabolic and Simplified Acute Physiology Scores between R and NR Pts. Overall hospital mortality (36%) was significantly lower than predicted (64%): 52% (13/25) in NR vs. 14% (3/21) in R Pts ($p < 0.018$, CI = 0.036–0.657).

CONCLUSIONS. PMX-HP seems to induce a fast and significant "shock reversal" in 46% of intractable RSS. This response was associated with a better chance of survival since 76% of responders survived (higher than the predicted one, $p < 0.01$). No single variable at baseline proved useful in identifying Pts who could benefit from PMX-HP (responders and non responders were comparable). PMX-HP is a safe and easy to use device: sequential use PMX-HP and CRRT, no other therapeutic limitation (steroids, DrotAA). These data suggest that PMX-HP seems to be an effective support as rescue therapy in severe RSS with hemodynamic instability.

REFERENCES. 1. Cruz D et al (2007) Crit Care 11(2):R47

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0930

RECOMBINANT HUMAN ACTIVATED PROTEIN C IN SEPTIC SHOCK

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INTRODUCTION. Although the Recombinant Human Activated Protein C (rhAPC) is recommended for management of septic shock, its use in clinical practice remains controversial. The objective of this study is to compare a group of patients treated with rhAPC with a control group in our medical intensive care unit.

METHODS. Observational data were collected retrospectively from patients admitted in our medical intensive care unit with septic shock, between January 2005 to December 2008. We compared a group of patients treated with rhAPC versus a non treated group. All of them were managed following International Guidelines for severe sepsis and septic shock, including corticosteroids therapy. Baseline demographics, previous chronic diseases, severity scores, primary location of infection, vasopressors requirements, serum lactate level and hospital mortality were reported. We made an analysis of evolution of shock and organ dysfunction at the end of the infusion of rhAPC. Univariable analysis was made using Chi-square and Student's *t* test. Independent prognostic factors were studied by means of multivariable logistic regression analysis.

RESULTS. Sixty-nine patients were studied, 38 received rhAPC. There were no differences between both groups except a higher hepatic disease in no rhAPC group (41% vs. 8%, $p < 0.00$) (Table 1).

TABLE 1

	rhAPC patients	No rhAPC patients	*p* value
Male (%)	79%	71%	0.44
Age	54 ± 18	56 ± 16	0.55
Comorbidities (%)	45%	71%	0.03*
APACHE II	29 ± 6	29 ± 6	0.94
Organ dysfunction (%) (>2 org)	43%	64%	0.06
Lactate levels	5.1 ± 2.6	3.9 ± 2.1	0.06
Ventilated (%)	83%	90%	0.37
Pneumonia vs. others (%)	71%	55%	0.16
Hospital stay (days)	32 ± 26	28 ± 27	0.52

Neither the percentage of vasopressors dependent patients nor organ dysfunction number at the end of infusion rhAPC (96 h) decrease in treated group (68 vs. 58%, $p = 0.08$ and 26 vs 48%, $p = 0.06$ respectively). In the multivariable logistic regression analysis including age, comorbidities, severity scores, infection focus, serum lactate levels and rhAPC therapy, only severity scores were independent factors of vasopressors dependency (APACHE II OR 1.26, 95% CI 1.05–1.51, $p = 0.01$).

There were not statistical significant differences in mortality rate between both groups (47.4 vs 67.7%, $p = 0.08$). Independent prognostic factors related with death were: age (OR 1.02, 95% CI 1.00–1.06, $p = 0.05$) and organ dysfunction (OR 3.01, 95% CI 1.02–9.30, $p = 0.04$).

CONCLUSION. In our experience, despite of the limitations of a retrospective study with a small sample size, with the use of rhAPC we did not obtain neither an early improvement of shock nor a mortality decrease in patients with septic shock.

0931

FUNCTIONAL PROTEIN C IN SEVERE SEPTIC PATIENTS TREATED WITH DROTRECORGINA ALFA ACTIVATED

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OBJECTIVE. Functional Protein C (FpC) evaluated bedside can be used as a biomarker of sepsis severity and organ failure. We sought to determine whether FpC levels were influenced by the evolution and outcome in adult severe septic patients treated with Drotrecorgina alfa Activated (DaA).

METHODS. A prospective no randomized case-control study in accordance with our Institutional Ethical Committee enrolled 56 severe septic patients. Cases (26) were patients submitted to DaA treatment. Controls (30) were patients not submitted to DaA treatment. Severe protein C deficiency was defined as £40% of normal. A plasma sample for FpC testing was obtained on admission and daily for 5 consecutive days. The Student's test was used to compare the cases and control patients, the SAPSII, SOFA and FpC measures. Outcome was evaluated as mortality.

RESULTS. We found an FpC serious deficiency at admission in cases and control patients. Age, SAPS II and 28 days mortality has no statistical significance in both the groups. The FpC value after 24 h of DaA treatment go up with a significant reduction in the organ failure score. Although we haven't found a significant reduction in the mortality, the survival curve after the second day was similar for both groups and the deceased patients has an evident failure in ascent the FpC values even treated with DaA.

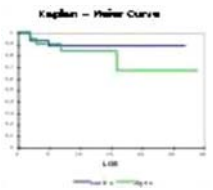

Fig. 1 DaA treatment and survival

CONCLUSIONS. Serious FpC deficiency persisting since the admission day appears to be associated with a worse prognostic and higher mortality in adults with sepsis. Although the limitation of the study, DaA treatment was more effective in ascent the FpC values, with a mortality almost despicable after the second day of treatment in the response patients.

0932

THE EFFECT OF FISH OIL ON MORTALITY AND LENGTH OF STAY IN INTENSIVE CARE UNITS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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OVERVIEW. n-3 fatty acids present in fish oils have been shown to obtund systemic inflammation, prevent intra vascular thrombosis and protect endothelium mediated tissue blood flow. This meta-analysis evaluates the effects of enteral and parenteral fish oil supplements on mortality and length of stay in intensive care units.

METHODS. A systematic review and meta-analysis of randomised controlled trials involving fish oil supplements. Studies combining fish oils with arginine were excluded.

RESULTS. Eight studies involving approximately 850 patients were eligible to be included in the mortality meta-analysis. Enteral supplements had significant mortality benefit with a Relative Risk Ratio (RRR) of 0.58 (95%CI; 0.43, 0.79). Parenteral supplements did not have a significant mortality benefit with a RRR of 0.88 (95% CI; 0.55, 1.43). Both enteral and parenteral supplements were associated with a significant reduction in length of stay in the ICUs of −2.75 (95%CI; −4.02, −1.47) days.

DISCUSSION. This meta-analysis demonstrates clear clinical benefits associated with feeds containing fish oils in the treatment of mixed groups of critically ill patients. Even though mortality reduction reaches statistical significance for the enteral route only, parenteral supplements too provide tangible benefits in the management of this patient group.

0933

RECOMBINANT HUMAN SOLUBLE THROMBOMODULIN (RHS-TM) MAY HAVE A ROLE OF ANTI-INFLAMMATION IN SEVERE SEPSIS

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INTRODUCTION. Since May 2008, rhs-TM (Recomodulin®, Asahi Kasei Pharma Co., Tokyo) administration has been approved to use for adults with disseminated intravascular coagulation (DIC) in Japan [1]. Thrombomodulin is one of components of the protein C anticoagulant pathway. And it is also known thrombomodulin has direct anti-inflammatory activities to inhibit activated kinases and NFκB responses in endothelium [2].

OBJECTIVES. Our hypothesis is rhs-TM may have an anti-inflammatory effect for sepsis.

METHODS. We investigated 6 severe septic patients (4 women, 2 men; age range 45–82 years) who were treated with rhs-TM for DIC in our ICU. In effect, rhs-TM therapy consists of 380 U/kg intravenously every 24 h for 6 days. Before the start of rhs-TM therapy and on the day after finished the therapy, WBC, CRP, IL-6, C3 (Complement 3), SOFA score, PT, APTT, Protein C (PC), Protein S (PS), thrombin-antithrombin III complex (TAT), DIC score were evaluated. IL-6 and PS were measured by enzyme-linked immunosorbent assay, C3 was by turbidimetric immunoassay, PC was by latex photometric immunoassay, and TAT was by enzyme immunoassay. Values are expressed as median. Data were analyzed by Wilcoxon signed-ranks test. A $p < 0.05$ was considered as statistically significant.

RESULTS. There were 4 survivors and 2 non-survivors. No side effects of rhs-TM occurred.

TABLE 1 INFLAMMATION AND COAGULATION FACTORS

	Before	After	*p*		Before	After	*p*
WBC (/mm^3)	15,040	14,445	0.12	PT (s)	17.3	14.9	0.69
CRP (mg/dL)	23.59	4.88	0.03	APTT (s)	44.8	42.4	0.89
IL-6 (pg/mL)	157.2	113.4	0.11	PC (%)	41	43	0.47
C3 (mg/dL)	79	78	0.35	PS (%)	48.4	51.5	0.11
SOFA score	9	2.5	0.06	TAT (ng/mL)	6.9	3.9	0.5
				DIC score	4	3	0.07

CRP values were statistically significantly decreased after rhs-TM therapy. WBC count and IL-6 levels also decreased after the therapy, but were not significant. SOFA score and DIC score were improved but did not reach to statistical significances. There were no differences in PT, APTT, PC and TAT.

CONCLUSIONS. The present study has a limitation of small number of patients. However, there is possibility rhs-TM may also have an efficacy for immflamation not only for DIC.

REFERENCES. 1. Saito H et al (2007) J Thromb Haemost 5:31–41

2. Conway EM et al (2002) J Exp Med 196:565–577

0934

CRITICAL ILLNESS-RELATED CORTICOSTEROID INSUFFICIENCY: WHICH INDEX IS THE BEST DIAGNOSTIC TOOL FOR THAI SEPTIC SHOCK PATIENTS?

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INTRODUCTION. The report incidence of Critical illness-related corticosteroid insufficiency (CIRCI) varies widely, depending on the patient population studied and diagnostic criteria used. Surviving Sepsis Campaign guidelines suggest that corticosteroid therapy should be considered for adult septic shock when hypotension responds poorly to adequate fluid resuscitation and vasopressors, regardless any results of diagnostic test. However, steroid treatment may be associated with an increase risk of infection.

OBJECTIVE. To identify the best diagnostic tool for predicting responsiveness to corticosteroid therapy in Thai septic shock patients with poorly responsive to fluid resuscitation and vasopressors.

METHODS. 29 patients with septic shock that poorly responsive to fluid therapy and vasopressor. A baseline serum total cortisol was measured in all patients and then 250 mcg corticotropin was injected to patients. Cortisol level was obtained 30 and 60 min after injection. All patients were administered hydrocortisone (100 mg IV then 200 mg IV in 24 h at least 5 days). Patients were considered steroid responsive if vasopressor agent could be discontinued within 48 h of the first dose of hydrocortisone.

RESULTS. Hospital death was 62%. Forty-five percent of patients were steroid responsive. Baseline serum cortisol was 27.6 ± 11.4 μg/dl in the steroid-responsive patients compared with 40 ± 16.9 μg/dl in the steroid-nonresponsive patients ($p = 0.03$). The area under the ROC curves for predicting steroid responsiveness was 0.72 for baseline cortisol level, which better than that derived from delta cortisol after ACTH stimulation test (Δ cortisol). Serum cortisol level of 35 μg/dl was the most accurate diagnostic threshold for determination of the hemodynamic response to hydrocortisone treatment ($p = 0.04$). Using baseline cortisol level of ≤35 μg/dl as the criteria of adrenal insufficiency, sensitivity was 85%, specificity was 62% and accuracy was 72%($p = 0.03$), while use of (Δ cortisol) showed sensitivity of 50%, specificity of 30% and accuracy of 41%($p = 0.41$).

CONCLUSIONS. Different population might need different diagnostics criteria of CIRCI. Baseline cortisol level ≤35 μg/dl is a useful diagnostic threshold for diagnosis of steroid responsiveness in CIRCI Thai patients with septic shock.

0935

DE-ESCALATION THERAPY STRATEGY IN PATIENTS ADMITTED TO THE ICU WITH SEVERE SEPSIS

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OBJECTIVE. Surviving sepsis campaign recommends reassessing antimicrobial regimen narrowing the spectrum of therapy, although this strategy has never been evaluated in septic patients and clinicians are frequently reluctant to reduce antimicrobial therapy in these high-risk patients. The aim of this study was to evaluate the impact on the outcome of de-escalation therapy in a cohort of patients admitted to the ICU with severe sepsis.

METHODS. Prospective observational study of patients admitted to the ICU with severe sepsis since December 2004 to December 2008. Appropriate cultures were obtained before initiating broad spectrum antimicrobial therapy and supportive measured were performed following Surviving Sepsis Campaign guidelines. Modification of the antimicrobial regimen after receiving culture results was left at the decision of physician in charge of the patient. The following variables were recorded: demographic characteristics, underlying diseases, severity of illness at admission (APACHE II and SOFA scores), adequacy of empirical antimicrobial therapy, SOFA score the day of culture results, worst SOFA score in the ICU, development of nosocomial infection, length of stay and mortality. Statistical analysis: chi-square or Fisher's exact test, Student's *t* or Mann–Whitney *U* test as appropriate.

RESULTS. Three hundred and fifty patients were enrolled. APACHE II at admission was 18.38 ± 7.68 and SOFA 8.61 ± 4.93. In-hospital mortality was significantly higher in patients with inadequate empirical therapy than in patients with adequate therapy (65.6 vs 32.6%; $p = 0.001$). Thirty patients died before culture results were available. Antimicrobial modification was: escalation 64 patients, de-escalation 116 patients and no change in 140 patients. In patients with microbiologically documented sepsis, mortality rate was similar in patients with de-escalation therapy and in those patients without modification (26.8 vs 27.4%; $p = 0.5$). Severity of illness at admission to the ICU, SOFA score the day of culture results and worst SOFA score were similar in these two groups. The rate of nosocomial infection was lower in patients with de-escalation therapy although this difference did not reach statistical significance (12.5 vs 20.2%; $p = 0.1$).

CONCLUSIONS. De-escalation is a feasible strategy in critically ill patients admitted to the ICU with sepsis.

Biomarkers: 0936–0949

0936

ELEVATED SERUM CHOLESTEROL: A NEW MARKER FOR ABDOMINAL SEPSIS?

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INTRODUCTION. Abdominal sepsis (AS) is leading in terms of diagnostic, prophylactics, treatment complexity, and mortality amongst the most spread surgical diseases associated with digestive system. While the multiple organ dysfunction/failure syndrome (MODS), including hepatic and polyglandular insufficiency became even more significant in prognosis and treatment outcome, role of messenger/regulatory and metabolic changes under AS is growing. Few publications predict an increased cholesterol (CL) as a marker of septic complications in elderly patients associated with abdominal surgery (S. Leardi et al. 2000) but this requires validation.

OBJECTIVES. The aim of the study is to reveal changes of systemic CL under AS and establish its diagnostic value in critically ill patients.

METHODS. CL concentration we assessed dynamically using KONE®-Ultra™ system in 364 AS patients (mean age 43.91 ± 2.87 years). Systemic inflammatory response syndrome (SIRS) was a major criterion for AS diagnosis (R. C. Bone 1996; Calandra et al. 2005). All patients were divided accordingly into SIRS-2 (2 SIRS symptoms) first group, SIRS-3 (3 SIRS symptoms) second, and SIRS-4 (4 SIRS symptoms, heavy sepsis) third group. 26 patients without abdominal pathology formed control group.

RESULTS. Changes of serum CL was time dependent. In the control group we established the reduction of the CL from the day of the surgery (5.38 ± 0.19 mmol/l) till the tenth day. In the groups of patients with AS the dynamic of the CL changes was presented as a waveform curve.

We established the elevation of the CL after the operation on the first day after surgery in all groups, with the next decrease till the third day in the first group (from 4.68 ± 0.19 to 4.23 ± 0.25 mmol/l), fifth day in the second group (from 6.27 ± 0.29 to 5.64 ± 0.18 mmol/l), and the seventh day in the third group (from 6.79 ± 0.27 to 5.27 ± 0.32 mmol/l). After that we noticed the elevation of the CL in first group to 5.08 ± 0.22 mmol/l, in second group to 6.19 ± 0.73 mmol/l on the seventh day, and to 5.41 ± 0.41 mmol/l in third group on the tenth day. Correlative analysis showed the following: Correlation coefficients −0.189, 0.355, 0.859 characterized interrelations between different research groups and control.

CONCLUSIONS. CL significance as AS severity marker in operated patients is determined by its role in cyclopenthan-perhydrophenantren associated metabolism of hormones and regulatory messengers characterizing regulatory disorders and hepatic dysfunction. Dynamically increased CL may be observed as an independent negative prognostic marker in ICU patients.

0937

MICROALBUMINURIA IS AN EARLY MARKER OF SIRS IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Increased capillary permeability is an early feature of Systemic Inflammatory Response Syndrome (SIRS). In various studies microalbuminuria has been correlated with rapid changes in vascular integrity. The evolution of an early, sensitive marker of inflammation might prove useful in clinical practice.

OBJECTIVES. To determine the incidence of microalbuminuria in ICU pts and to evaluate whether clinically significant microalbuminuria (defined as Urinary Albumin to Urinary Creatinine Ratio [ACR] > 100 mg/g) is an early marker of the capillary dysfunction that accompanies SIRS.

METHODS. We prospectively evaluated 35 patients (males 27—trauma 19, postsurgical 6, medical 10) admitted to the ICU. Samples were collected on admission and at 24 and 48 h thereafter. We calculated Acute Physiology and Chronic Health Evaluation (APACHE) II Score and Sequential Organ Failure Assessment (SOFA) score on the first ICU day, we recorded demographics, cause of admission, comorbidities, outcome, Length of ICU Stay (LOS) and the presence of SIRS. Urinary albumin, urinary creatinine, serum creatinine and CRP were measured on an automated biochemistry analyser (Architect, Abbott).

RESULTS. Twenty-three patients (69.56%) exhibited microalbuminuria on admission (ACR > 30 mg/g). Patients were divided in 2 groups: group 1 included 20 pts with admission ACR < 100 mg/g and group 2 included 15 pts with admission ACR ≥ 100 mg/g. Table 1 summarises our results. In both groups ACR levels were increasing during the 3 days of follow-up, with group 2 showing a more intense rise. No significant differences were recorded in comorbidities. 5 deaths occurred in group 2 vs 0 in group 1.

TABLE 1 PATIENTS' CHARACTERISTICS

	ACR < 100 mg/g (n = 20)	ACR ≥ 100 mg/g (n = 15)	Difference (p)
Age (years)	42.75 ± 20.10	58.45 ± 19.54	ns
LOS (days)	32.27 ± 17.84	44.83 ± 65.35	ns
APACHE II	16.08 ± 5.9	20.36 ± 5.95	ns
SOFA	7.17 ± 3.1	10.3 ± 2.85	0.007
SIRS (%)	45.54	90.90	0.02
CRP(mg/L)	9.05 ± 7.92	14.19 ± 5.95	0.029
ACR (mg/g)	31.71 ± 17.73	367.3 ± 261.70	0.0002

CONCLUSIONS. Microalbuminuria is common in ICU patients. Significant and persistent microalbuminuria is positively correlated with organ dysfunction. Monitoring of urinary albumin levels might serve as a sensitive marker of inflammation and disease deterioration.

REFERENCES. 1. Thorevska N, Sabahi R, Upadya A, Manthous C, Amoateng-Adjepong Y (2003) Microalbuminuria in critically ill medical patients: prevalence, predictors, and prognostic significance. Crit Care Med 31:1075–1081

2. Abid O, Sun Q, Sugimoto K, Mercan D, Vincent JL (2001) Predictive value of microalbuminuria in medical ICU Patients: results of a pilot study. Chest 120:1984–1988

0938

MULTICENTER EVALUATION OF PLASMA S100A8/A9 COMPLEX AS AN EARLY PROGNOSTIC MARKER IN SEPTIC SHOCK

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INTRODUCTION. A highly sensitive, specific and early prognostic marker for patients in septic shock would aid therapeutic decision-making and optimise patient selection for intervention studies.

OBJECTIVES. to investigate the utility of plasma levels of the damage-associated molecular pattern protein, S100A8/A9 complex, and the gene expression of S100A8 and A9 in circulating immune cells.

METHODS. patients with septic shock were enrolled within 24 h of onset of their second organ failure. Systemic inflammation was characterized by clinical scores, plasma levels of IL-10, IL-12p40 and MIF, and monocyte HLA-DR expression. Plasma S100A8/A9 complex levels in a training cohort then in a testing cohort and peripheral blood monocyte gene expression of S100A8 and A9 were measured on day 0 and day 1 after inclusion only in training cohort.

RESULTS. 49 septic shock patients (training cohort) were enrolled. Median [IQR] S100A8/A9 complex levels were significantly higher ($p < 0.0001$) in non-survivors (13.3 [5.4] μg/ml) compared to survivors (3.7 [0.9] μg/ml). Specificity and sensitivity for intensive care outcome were 100% on both day 0 and day 1 levels. The S100A8/A9 complex plasma level did not correlate with gene expression in circulating immune cells. The training threshold (8.1 μg/ml) for outcome prediction was tested in 62 consecutive septic shock patients with the same entry criteria (testing cohort) and validated the outcome prediction.

CONCLUSIONS. Plasma levels of S100A8/A9 complex fulfil the criteria for an early and accurate prognosticator of outcome in septic shock.

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0939

MULTICENTER EVALUATION OF MONOCYTE HLA-DR EXPRESSION AS A PREDICATOR FOR OUTCOME AND RISK OF SECONDARY INFECTIONS

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INTRODUCTION. Monocyte HLA-DR level (mHLA-DR) has been proposed for evaluation of innate immunity, especially in sepsis where low mHLA-DR could be associated with poor outcome and high risk of secondary infections, but never demonstrated in a large septic population.

OBJECTIVES. To evaluate mHLA-DR as a predicator for outcome and risk of secondary infections in severe sepsis ans septic shock.

METHODS. Prospective multicentric study (4 ICU units) in homogenous severe septic patients. Evaluation of mHLA-DR by flow cytometry, in AB/C and % positive cells. Clinical severity: SAPSII at D0, SOFA at D0, D1, D2, D7, D14, D21, D28; D7 and D28 mortality. Systemic inflammation: plasma IL-10, IL12p40 and MIF (ELISA). Diagnosis of secondary infection: Atlanta CDC criteria. Statistics: univariate analysis for relation between outcome and SAPSII, SOFA and mHLA-DR followed by multiple logistic regression and analysis with competitive risk for occurrence of secondary infection.

RESULTS. 221 patients included at 12 h ± 7 h after second organ failure, 91% in shock. Age 61 years old ± 17, 64% males, SAPSII 47 ± 14, SOFA D0 8 ± 3, 24% in surgical context. Mortality 25% at D7, 38% at D28. SAPSII ($p < 0.0001$) and SOFA ($p = 0.001$), IL-10 ($p = 0.001$) and MIF ($p = 0.015$) were associated with mortality but not mHLA-DR at D0-D2. Slow mHLA-DR recovery (mHLA-DR trend over first week) was associated with later mortality ($p = 0.03$) and secondary infections ($p = 0.005$).

CONCLUSION. Early fall in mHLA-DR was not associated with mortality. The slow recovery of mHLA-DR over the first week indicated a higher risk of later death or secondary infection. mHLA-DR monitoring may help for selection of patients for whom immunostimulation might be beneficial.

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0940

THE ROLE OF SERUM PROCALCITONIN (PROCT) AND THE SEQUENTIAL ORGAN FAILURE ASSESSMENT (SOFA) SCORE AS DIAGNOSTIC TESTS IN CRITICALLY ILL PATIENTS

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AIMS. Delay in diagnosis and treatment in critically ill patients often results in rapid progression to organ failure and eventually death. Minimizing delay in diagnosis is the primary reason that diagnostic tests are performed. The aim of this study was to investigate the accuracy of serum ProCT and SOFA score as reliable diagnostic tests for sepsis, severe sepsis or septic shock.

METHODS. Forty-five critically ill patients were included in this study: 15 patients with sepsis, severe sepsis and septic shock respectively. The Simplified Acute Physiology Score (SAPS) II was calculated 24 h after admission to ICU. The measurement of serum ProCT was performed when the diagnostic criteria for sepsis, severe sepsis or septic shock were present in the same day SOFA score was calculated. The serum ProCT was assayed by an enzyme-linked fluorescent immunoassay (ELFA) performed in automated VIDAS strument (VIDAS BRAHMS PCT Assay). Statistical analysis was performed using the Mann–Whitney test and the Receiver Operating Characteristic (ROC) curve analysis, also positive and negative likelihood ratios (LR) was calculated.

RESULTS. We did not observe correlation between serum ProCT and severity of illness scores (SAPS II and SOFA). Patients with septic shock had a SAPS II, SOFA score and serum ProCT significantly higher than those of patients with simple sepsis (Table 1). According to ROC analysis, ProCT > 0.79 ng/ml and SOFA score > 10 were the cut-off values that best discriminated sepsis from septic shock (AUC $\pm$ SE 0.86 $\pm$ 0.07 and AUC $\pm$ SE 0.92 $\pm$ 0.05 respectively). The values of positive and negative LR were reported in Table 2.

TABLE 1 VALUES WERE REPORTED AS MEDIAN AND 25TH AN

Variable	Sepsis ($n = 15$)	Severe sepsis ($n = 15$)	Septic shock ($n = 15$)
ProCT (ng/ml)	0.48 (0.25–2.33)	0.6 (0.36–5.8)	4.4 (2.63–9.85) (*)
SAPS II	46 (41–58)	47 (41–56)	61 (55–69) (*)
SOFA score	7 (4–10)	10 (8–11)	13 (11–17) (*)
Dead, *n* (%)	1 (6)	6 (40)	13 (86) (*)

TABLE 2

Cut-off	Sensitivity	Specificity	LR+	LR−
SOFA score >10	86.7	86.7	6.5	0.15
ProCT > 0.79 ng/ml	93.3	73.3	3.5	0.09

CONCLUSION. The findings from this study indicate that the ProCT test and the SOFA score could be used as indicators for a better differentiation of sepsis from septic shock, in conjunction with the clinical parameters. A clear limit of this study was the inclusion of a small number of patients.

0941

MICROALBUMINURIA IS ELEVATED IN CRITICALLY ILL PATIENTS WITH SEPSIS: VEGF-A MAY NOT BE THE CULPRIT!

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BACKGROUND. In critically ill patients admitted with Systemic Inflammatory Response Syndrome (SIRS), diffuse endothelial dysfunction leads to increased capillary permeability. In the glomerulus, it manifests as increased albumin excretion. Microalbuminuria is a common finding in various acute conditions like sepsis, trauma and surgery.

Animal and human studies have shown increased levels of plasma Vascular Endothelial Growth Factor-A (VEGF-A), a known potent vascular permeability inducing agent, in LPS induced endotoxemia, severe sepsis and septic shock.

The pathogenic mechanism of the glomerular leakage of albumin in acute inflammatory conditions remains to be clarified. We wished to investigate the causative role of VEGF-A, in this regard which might have therapeutic implications.

OBJECTIVE. To study the association of albumin excretion in the urine with concomitant serum levels of Vascular Endothelial Growth Factor-A in critically ill patients.

METHODS. Prospective non-interventional study in 43 bedded neurological, trauma and general Intensive Care Units (ICUs) of a tertiary care hospital. Of the consecutive patients admitted to the ICUs between Sept 2008 and Jan 2009, 597 patients were included, after excluding patients with ICU stay of less than 24 h, pregnancy, menstruation, anuria, hematuria and proteinuria due to renal and post-renal diseases. Of these, 30 consecutive patients with sepsis, severe sepsis and septic shock (sepsis group) and 30 randomly chosen patients without sepsis were recruited for the VEGF-A study. Spot urine samples for urinary albumin-creatinine ratio (ACR, mg/g) estimation (Immunoturbidimetry, Dade Dimension RxL, Siemens) and serum samples for VEGF-A estimation (ELISA Quantikine kit, R&D systems) were collected on ICU admission. Since ACR and VEGF-A data showed a skewed distribution, correlation was analyzed using Spearman's correlation coefficient.

RESULTS. 60 critically ill patients, with a median age (IQR) of 60 years (48–72), 39:21 male–female ratio, median APACHE II score (IQR) of 16 (7–23), and 3 median days of ICU stay, had a median ACR (IQR) of 125 mg/g (51.6–239.1) and a median VEGF-A (IQR) of 111 pg/ml (54.3–286.9) on ICU admission. The median ACR on admission in the sepsis group ($n = 30$) 161.8 mg/g was significantly higher the median ACR (78.3 mg/g) of the group without sepsis ($n = 30$) (p value $= 0.011$). On statistical analysis, no significant correlation was obtained between levels of urinary ACR and serum VEGF-A (p value $= 0.327$) in the entire grouo. Analysis for correlation between ACR and VEGF-A in the sepsis patients (p value $= 0.396$) and in the group without sepsis (p value $= 0.518$), yielded similar results.

CONCLUSIONS. Despite a strong physiologic rationale, our pilot study did not show an association between microalbuminuria and VEGF-A in critically ill patients. Larger studies are needed to come to a definitive conclusion.

0942

PROGNOSTIC VALUE OF SERUM PARAOXONASE 1 IN PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK

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INTRODUCTION. Our main objective was to determine the alterations and prognostic value of serum paraoxonase 1 (PON1) level in patients with severe sepsis or septic shock.

MATERIALS AND METHODS. Fifty-seven patients with severe sepsis or septic shock admitted to our medical intensive care unit were included into the study and followed for at least 30 days after recruitment or until death. At the end of the follow-up period, patients were classified as "survivors" or "nonsurvivors". Blood samples were drawn within the first day of severe sepsis or septic shock. APACHE II and SOFA scores were determined on the days of admission.

RESULTS. Serum lipoprotein levels, except HDL, were not statistically different in survivor and nonsurvivor groups. Serum HDL and PON1 levels were significantly higher in survivors ($p < 0.005$ for both). PON1 levels were directly correlated with HDL ($r = 0.74$, $p < 0.001$), and inversely correlated with TNF-α ($r = -0.77$, $p < 0.001$) and IL-6 ($r = -0.78$, $p < 0.001$). The power of admission day measurements of PON1 levels to predict the 30-day mortality in ROC curve analysis was good but not better than HDL, cytokines, and severity scores.

CONCLUSION. Our results revealed that serum PON1 activity was significantly higher in survivors. PON1 activity showed positive correlation with HDL, and inverse correlations with proinflammatory cytokines (TNF-α, IL-6). PON1 levels can be used to estimate the prognosis in patients with severe sepsis or septic shock.

0943

CIRCULATING INFLAMMATORY MEDIATORS IN PATIENTS AT HIGH RISK TO DEVELOP SEPSIS

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INTRODUCTION. Sepsis induces lethal effects primarily through uncontrolled activation of pro- and anti-inflammatory response, resulting in a deregulation of physiologic homeostasis, and ultimately leading to organ dysfunction, shock, and death. Rapid identification and initiation of treatment is of crucial importance for patients with sepsis. Although novel sepsis biomarkers have been proposed for clinical use, no single clinical or biological indicator has so far obtained unanimous acceptance. We recently showed that osteopontin (OPN) is strongly up-regulated during sepsis and induces secretion of interleukin 6.

OBJECTIVES. Aim of our study is to assess and compare the rate of variation of OPN with respect to well known sepsis-related inflammatory mediators, i.e. C reactive protein (CRP), procalcitonin (PCT), and soluble urokinase-type plasminogen activator receptor (SuPAR).

METHODS. OPN, CRP, PCT, and SuPAR levels were measured in 17 patients at high risk to develop sepsis, i.e. with a diagnosis at the intensive care unit (ICU) admission of intracranial hemorrhage, head injury, or polytrauma. Blood samples were daily collected for up to 15 days. Body fluid cultures were performed according to the standard-of-care. SIRS criteria, lactate, and organs dysfunction criteria were recorded daily. Data are presented as mean $\pm$ standard error.

RESULTS. Overall OPN levels significantly correlated with those of CRP ($p < 0.001$, $r = 0.294$), PCT ($p < 0.01$, $r = 0.225$), and SuPAR ($p < 0.0001$, $r = 0.359$). No correlation was found between OPN levels and white blood cells count and lactate levels. OPN, PCT, and SuPAR, but not CRP, resulted to be significantly ($p < 0.05$) higher in patients with positive blood culture, as opposed to those with negative culture (1876 $\pm$ 738.5 vs. 780.1 $\pm$ 167.9 ng/ml; 9.2 $\pm$ 5.4 vs. 0.4 $\pm$ 0.2 ng/ml; 8.8 $\pm$ 2.0 vs. 3.0 $\pm$ 0.3 ng/ml and 13.1 $\pm$ 1.9 vs. 17.9 $\pm$ 2.5 mg/dl, respectively). Furthermore, in patients who survived OPN on ICU admission was significant lower than in those who did not (336.4 $\pm$ 68 vs. 500.0 $\pm$ 78 ng/ml), regardless of the underlying diagnosis.

CONCLUSIONS. Dosing OPN levels may improve diagnostic accuracy in detecting bacterial versus nonbacterial causes of inflammation.

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0944

PREDICTIVE AND FOLLOW-UP VALUE OF INFLAMMATORY MARKERS AND CYTOKINES IN PATIENTS WITH SUSPECTED UROSEPSIS

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OBJECTIVE. To evaluate the predictive and follow-up value of procalcitonin (PCT), C reactive protein (CRP) and interleukin (IL) 6, 8 and 10 at the onset of the septic episode and throughout the initial follow-up of patients with urosepsis.

METHOD. The prospective study included 60 patients with suspected urosepsis. Blood samples were collected for PCT, CRP and IL 6, 8, 10 determinations for 14 consecutive days after sepsis onset. Biologic state and prognosis was evaluated using the Acute Physiology, Age and Chronic Health Evaluation (APACHE) II score and the adjusted (y) mortality index on days 1, 3, 5, 7 and 14. Patients were grouped in sepsis, severe sepsis and septic shock categories according to the American College of Chest Physicians/Society of Critical Care Medicine (ACCP/SCCM) guidelines. Outcome measurements were the development of organ dysfunctions and mortality. Predictive accuracy was evaluated by Receiver Operating Curve (ROC) statistics and marker correlations using the Pearson coefficient (R^2).

RESULTS. Overall mortality rate within the group was 23.3% and was highest for patients with septic shock (57.1%). Organ dysfunctions were present in 23 patients (38.3%) and lead to death in14 of them (60.1%). At mortality analysis, the predictive power of IL 10 (AUC 0.927 for a cut-off value of 232 pg/ml with 91% sensitivity and 93% specificity) was unexpectedly superior to that of PCT and APACHE II (Sn/Sp of 87/86% and 89/82% respectively) while CRP, IL 6 and 8 provided poorer results. Regarding the prediction of organ dysfunction development and severity, better results were provided by PCT (Sn/Sp of 90/95% for a 63 ng/ml cut-off value with AUC of 0.903) and IL 6 (Sn/Sp of 86/89% for a 378 ng/ml cut-off value with AUC of 0.886). PCT values showed the best correlation with the clinical evolution assessed by the APACHE II score ($R^2 = 0.955$) and was followed by IL 6 ($R^2 = 0.724$). No other significant correlations were found for the other markers.

CONCLUSIONS. Our results suggest that assessment of certain inflammatory markers and cytokines in patients with urosepsis might improve the risk prediction of both mortality (IL 10) and organ dysfunction development (PCT) as well as the clinical follow-up accuracy (PCT) together with the APACHE II score.

0945

CORRELATION OF APACHE II SCORE WITH ISCHEMIA MODIFIED ALBUMIN (IMA) LEVELS IN ELDERLY SEPTIC PATIENTS

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Immunomodulation through elevated production of intracellular mediators and myocardial ischemia resulted from inadequate microcirculatory blood flow are considered as the main causes of myocardial dysfunction in patients with sepsis. Ischemic Modified Albumin (IMA), is a new and highly sensitive marker of early myocardial ischemia. Oxidative process associated with ischemia reperfusion and tissue injury may lead to N-terminus modification of circulating albumin resulting in the formation of IMA.

AIM. Correlation of IMA levels with the severity of sepsis in elderly patients.

PATIENTS AND METHODS. Twenty nine patients (13 males, 16 females), aged 79 ± 11 years, hospitalized in the Internal Medicine department were diagnosed as having had sepsis of various origin (mainly urinary tract and low respiratory infections). E. coli and Klebsiella pn. were the most frequently isolated pathogens. Upon admission, APACHE II score was calculated and correlated with the serum IMA levels (COBAS INTEGRA 400, Roche Diagnostics) in all patients. Patients with acute myocardial infarction, liver failure and severe hypoalbuminemia were excluded from the study.

RESULTS. A significant positive correlation between IMA values and APACHE II score levels was detected (linear regression analysis, $r^2 = 0.161$, $p = 0.031$). IMA levels (IU/L) were significantly higher in patients ($n = 15$) with APACHE II score > 18 in comparison to patients ($n = 14$) with score < 18 (145 ± 17 vs 127 ± 25, $p = 0.024$, Student's t test). IMA levels were also found higher in patients who succumbed than in patients who survived (156 ± 20 vs 132 ± 21, $p = 0.033$, Student's t test).

CONCLUSION. In our study, Ischemia Modified Albumin seemed to be correlated with the severity of sepsis in elderly patients. Furthermore, a cut off prognostic value could be determined and used as a means for risk stratification of these patients.

0946

INCREASED LIPOCALIN-2 SERUM LEVELS IN ACUTE HEPATIC FAILURE

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INTRODUCTION. Lipocalin-2 (LCN2) is a 25 kDa secretory glycoprotein, which is predominantly expressed in adipose tissue and the liver. LCN2 is upregulated in cells under stress from infection, inflammation. A rise in serum levels of LCN2 has been reported under inflammatory and infective conditions. Artificial liver assist devices like the molecular adsorbent recirculating system (MARS) have been successfully used support organ function until recovery of the native liver, or to bridge the patient to liver transplantation. The pathophysiology of multi-organ dysfunction in acute hepatic failure is incompletely understood but increased systemic inflammatory response is believed to play a pivotal role.

OBJECTIVES. The relevance of LCN2 in the setting of acute liver failure (ALF) as well as acute-on-chronic-liver-failure (ACLF) is not known. Further we studied the effect of the MARS on this inflammation marker, since activation of an inflammatory cascade by the extracorporeal blood circuit of MARS could have deleterious effects in ALF and ACLF, and mitigate beneficial effects of the MARS treatment.

METHODS. Serum LCN2 levels were determined by a commercially available ELISA kit in eight ALF and eight ACLF patients undergoing MARS immediately before and after the first treatment cycle. Indications for MARS therapy were ammonia levels of 100 µmol/l or higher with hepatic encephalopathy grade 3, eligibility for liver transplantation. 14 patients with chronic hepatic failure (CHF) with Child-Pugh-Score C, who were clinically stable served as controls. Data are given as median with range.

RESULTS. Baseline LCN2 serum concentrations were significantly increased in ALF 103.9 (54.1–178.5) ng/ml and ACLF 142.2 (41.3–186.2) ng/ml patients as compared to CHF 63.9 (17.4–115.2) ng/ml ($p = 0.0086$ and $p = 0.0037$, resp.). Between the ALF and ACLF group there was no statistically significant difference. MARS had no obvious effect on the LCN2 serum concentrations. In both populations, ALF as well as the ACLF, serum concentration remained constant

CONCLUSIONS. Serum LCN2 levels maybe useful to discern acute from chronic hepatic failure or to monitor the course and the severity of the disease. MARS therapy apparently did not stimulate the production of these pro-inflammatory molecule in our patient collective after one treatment cycle, providing no evidence of an deleterious inflammatory response triggerd by MARS. Our results however warrant further larger clinical studies regarding the clearance of LCN2 in artificial liver assist devices and to assess their role in acute hepatic failure.

0947

PLASMA LEVELS OF PLASMINOGEN ACTIVATOR INHIBITOR-1 IN PATIENTS WITH TYPE 2 DIABETES AFTER LIPOPOLYSACCHARIDE INJECTION

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INTRODUCTION. Type 2 diabetes (T2D) is associated with an increased risk of thrombosis and disturbances in the antifibrinolytic system as evaluated by elevated plasma levels of plasminogen activator inhibitor (PAI)-1 [1]. Although T2D is characterised by aberrations in innate immunity and PAI-1 is markedly induced by proinflammatory stimuli, the effect of inflammation on the antifibrinolytic system has not previously been investigated in a standardised setup in these patients. We hypothesised that patients with T2D exhibit an exacerbated PAI-1 response after lipopolysaccharide (LPS) injection, a human experimental model of systemic inflammation.

METHODS. After ethical approval, a thorough physical examination and informed consent, 23 healthy men and 19 men with T2D were given an intravenous LPS injection (0.3 ng kg^{-1}). Measurements of PAI-1 in plasma were done hourly from baseline until 8 h after LPS. Two-sample t tests were used to compare diabetics with healthy subjects at baseline. Interactions between time and T2D were analysed by two-way ANOVA for longitudinal measurements.

RESULTS. At baseline, PAI-1 levels were higher in T2D than in controls (45.5 [95% CI 42.7–48.3] vs. 37.5 [34.8–40.1] ng L^{-1}, $P < 0.01$). Although LPS increased PAI-1 in both groups, the relative PAI-1 response was blunted in T2D ($P < 0.0001$) with an increase of only 40% (95% CI 18–62%) above baseline in patients compared to maximum levels at 108% (95% CI 71–144%) above baseline in healthy subjects.

CONCLUSION. We found higher baseline plasma levels of PAI-1, but an attenuated PAI-1 response after LPS injection, in patients with T2D.

REFERENCE. 1. Grant PJ (2007) Diabetes mellitus as a prothrombotic condition. J Intern Med 262:157–172

0948

NT-PROBNP IN SEPTIC PATIENTS: SHOULD BE THIS BIOMARKER A PROGNOSTIC TOOL?

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INTRODUCTION. The amino terminal pro-B-type natriuretic peptide (NT pro-BNP) has demonstrated high in septic patients, being postulated as a marker of septic cardiac dysfunction. Although several studies have demonstrated that brain natriuretic peptide (BNP) has prognostic value in septic patients, there is not evidence that NT pro-BNP provide prognostic information. Our aim is to analyze the behaviour of this biomarker in septic patients and its utility as a prognostic marker.

METHOD. Prospective study of septic patients admitted to Intensive Care Unit (ICU). Analyzed variables were demographic characteristics, severity scales (APACHE II and SOFA), adequacy of empiric antibiotic treatment, determination of NT-pro-BNP at admission and during the ICU stay, ICU mortality and hospital mortality. A univariate and multivariate analysis following a logistic regression model using SPSS 12.0 was conducted. For all test, $p < 0.05$ was considered significant.

RESULTS. We included 180 patients. Males 61.7%. Age mean 65.7 (SD 15.9). AP II mean 18.5 (SD 7.8). 24 h SOFA mean 7.36 (SD 4.1). Sepsis type: 58.3% medical, 41.7% surgical. Presentation: 5% sepsis, 22.7% severe sepsis, 72.3% septic shock. Focus: 45.6% abdominal, 26.7% pneumonia, 11.1% urinary, 4.4% soft tissue and 12.2% others. In 40% the responsible germs were Gram negative, Gram positive in 18.9%, polymicrobial in 10%, fungi in 2.8%, anaerobes in 1.1% and in 26.7% the responsible germ was not identified. Rate of inadequate empiric antibiotic treatment was 7.7%.

ICU mortality was 26.1%, hospital mortality was 33.3%.

The values of NT-proBNP at admission were higher in patients in septic shock ($p < 0.001$) and with acute renal failure (creatinine > 2.00 mg/dl) ($p < 0.001$) and in patients who died in the ICU and hospital ($p < 0.001$).

In multivariate analysis of patients with serial determinations of NT-proBNP ($n = 150$) statistically significant variables that are related as an independent marker of hospital and ICU mortality were the AP II and inadequate empirical antibiotic treatment. The increase of NT-proBNP during the stay in intensive care was independently associated with ICU mortality: OR 3.55 (CI 1.29–9.8; $p = 0.014$).

CONCLUSION. The values of NT-proBNP are higher at admission in patients with sepsis, although is not an independent prognostic factor of mortality in ICU or hospital. The increase in NT-proBNP values during the stay in ICU is a predictor of ICU mortality in septic patients.

0949

C-REACTIVE PROTEIN CONCENTRATIONS IN PATIENTS WITH FULMINANT HEPATIC FAILURE

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INTRODUCTION. Fulminant hepatic failure (FHF) refers to the rapid development of severe acute liver injury with impaired synthetic function, coagulopathy and encephalopathy in a person who previously had a normal liver or had a well-compensated liver. It is a rare complication of critical illness and carries a bad prognosis. Serum C-Reactive Protein (CRP) is a useful marker of infection and is produced exclusively by the liver. The aim of our study was to assess CRP concentrations in patients with FHF.

METHODS. From a database that included all patients admitted in an Intensive Care Unit (ICU) who were ≥18 years old and stayed for at least 48 h ($N = 260$), we identified the patients with FHF. Data collected included admission diagnosis, past medical history, vital signs, SIRS criteria, APACHE II, SAPS 2 and SOFA scores. CRP and WCC were measured at admission and then daily until discharge or death. Temperature was evaluated hourly and daily extreme values were recorded. Patients were evaluated daily for clinical evidence of infection. All the results are presented as median.

RESULTS. We included 8 patients (median age 46 years, 4 male, median APACHE II 26) with FHF and the following admission diagnosis: septic arthritis complicated with necrotizing fasciitis, acute abdomen with peritonitis (two patients), leptospirosis, pulmonary tuberculosis with acute respiratory failure, severe community acquired pneumonia, acetaminophen intoxication and mushroom intoxication. Five patients died in severe multiple organ failure (SOFA score 16). The presence of encephalopathy was not correctly evaluated as all patients were mechanically ventilated and sedated. Seven patients were already admitted with FHF, with the remaining one being diagnosed at the 26th day of ICU stay. All patients present severe coagulopathy (platelets 46,750/ml, fibrinogen 98 mg/dl, factor V 9.5%) and elevated bilirrubin (13 mg/dl). Four patients showed a marked elevation of hepatic enzymes. In all patients, despite the clinical deterioration, CRP levels markedly decreased to almost undetectable concentrations (5.67 mg/dl; range 0.6–6.1 mg/dl).

CONCLUSION. In patients with FHF, CRP is more a marker of severe liver dysfunction and should not be used as a marker of infection. In addition, in a patient admitted to an ICU with a very high suspicion of infection and a very low CRP concentration the presence of severe hepatic failure should be ruled out. Most patients admitted to the ICU are sedated, so assessment of encephalopathy to monitor FHF is usually not feasible.

SIRS, sepsis, and MODS: 0950–0963

0950

ADRENAL FUNCTION IN SEPTIC SHOCK: A SINGLE CENTRE COHORT OF 316 PATIENTS

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INTRODUCTION. We report a single-centre series of 316 patients with vasopressor dependent septic shock who underwent short synacthen test (SST) and received corticosteroids.

METHODS. Since 2001, patients admitted to the ICU of Bradford Teaching Hospitals with vasopressor dependent septic shock underwent SST. At the discretion of the intensivist, the patient also received corticosteroids until the vasopressor (norepinephrine) was withdrawn. SST used 250 μg synacthen, with levels of cortisol measured at baseline, 30 and 60 min. Data were collected retrospectively from patients who underwent SST, who had a clinical diagnosis of severe sepsis, and who, following fluid resuscitation, required norepinephrine to achieve an adequate blood pressure (systolic > 100 mmHg/mean > 70 mmHg).

RESULTS. 316 patients were identified. Table 1 gives patient data. Table 2 gives SST results. Table 3 gives mortality and outcome according to two definitions of adrenal insufficiency (baseline cortisol < 15 μg/dL and increment < 9 μg/dL). 249 patients (79%) received hydrocortisone (median dose 200 mg/day). The mortality for these patients was 68% compared with a predicted mortality of 55% (SMR 1.22, 95% CI 1.11–1.33). For non-steroid treated patients, the mortality was 54% (predicted 42%, SMR 1.27, 1.12–1.41).

TABLE 1 PATIENT CHARACTERISTICS

Age mean (range)	61 (18–91)
Male sex (%)	49
APACHE 2 mean (SD)	20.9 (6.7)
Source of sepsis (%) (nb multiple sources)	
Respiratory	59
Abdominal	25
Urinary	23
Other	1

TABLE 2 SST RESULTS (MG/DL)

Time	All	Survivors	Non-survivors	*p*
	mean(SD)	mean(SD)	mean(SD)	(*t* test)
	n = 316	*n* = 112	*n* = 204	
Baseline	20.5 (13.8)	17.6 (10.7)	21.9 (15.0)	0.005
Peak	27.8 (18.6)	26.1 (15.0)	29.5 (20.3)	0.058
Increment	7.7 (10.6)	8.1 (8.6)	7.5 (11.6)	0.31

TABLE 3 MORTALITY AND ADRENAL INSUFFICIENCY

All	*N* (%)	Mortality (%)	*P* (chi-square)
Baseline cortiso < 15 μg/l	127 (40.2)	59.0	}0.025
Baseline cortisol > 15 μg/l	189 (59.8)	68.2	}
Increment < 9 μg/l	228 (72)	66.2	}0.064
Increment > 9 μg/l	88 (28)	60.2	}

CONCLUSIONS. We present preliminary analyses of the largest single centre cohort study to date investigating adrenal function and outcomes in patients with vaspressor dependent septic shock.
SST results are broadly similar to those given in the retrospective corticus cohort study [1]. Overall mortality rates are higher than in that paper but only 53% of their patients were vasopressor dependent, and likely to be less sick.
Baseline cortisol levels were higher in non-survivors; there was no difference between survivor's and non-survivor's peak and increment cortisol levels.
Corticosteroid therapy did not appear to influence outcome.

REFERENCE. 1. Lipiner-Friedman D et al (2007) Adrenal function in sepsis; the retrospective corticus cohort study. Crit Care Med 35:1012–1018

0951

SYSTEMIC INFLAMMATORY RESPONSE AFTER ENDOLUMINAL STENTING OF THE ABDOMINAL AORTA AND CHANGES OF AT-III, VCAM, ICAM, PROTEIN C, PROTEIN S, FIBRINOGEN, D-DIMMERS, PLATELET COUNT, INR, IL-6, IL-10 AND H^+

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INTRODUCTION. A 'post-implantation syndrome' characterised by systemic inflammation is recognised after stenting of the abdominal aorta. The main features are leukocytosis and fever and elevated CRP. It was first described by Valazquez.
A large aneurysm will usually contain a large volume of thrombus and a possible cause of systemic inflammation post-graft implantation is cytokine release after manipulation of endovascular thrombus. We present our findings of an inflammatory response after endoluminal stenting of the abdominal aorta.

MATERIALS AND METHOD. This is a retrospective study about 18 patients, 96% were male undergoing endoluminal abdominal stents in our institution over one year period from 2006 to 2007. The indication for AAA was degenerative aneurysm of the abdominal aorta greater >6 cm. Three measurements were done preoperatively, on the operation day and postoperatively. Pre- intra- and postoperative data were collected from a retrospective review of the cases notes. Endovascular stenting was under general anaesthesia in an operative room in all cases and performed by a vascular surgeon and an interventional radiologist. After the administration of a single dose of 5000 IU of intravenous heparin, the common femoral artery was assessed and a custom made sized Y type graft was positioned to the abdominal aorta. All patients were admitted to our intensive care unit after the procedure. All patients had a post-procedure CT scan to assess the position of the stent and detect complications.

RESULTS. There was statistically significant difference in mean Protein C serum concentration, $p = 0.02$, mean fibrinogen serum concentration, $p = 0.01$, mean D-Dimmers serum concentration, $p = 0.01$, mean Platelet count concentration, $p = 0.02$, mean H^+ serum concentration, $p = 0.02$, mean ICAM serum concentration, $p = 0.02$, mean VCAM serum concentration, $p < 0.01$ and mean IL-6 serum concentration, $p = 0.01$.
There was no statistically significant difference in mean ATIII serum concentration, $p = 0.07$, mean Protein S serum concentration, $p = 0.26$, in mean INR time, $p = 0.1$ and mean IL-10 serum concentration, $p = 0.14$.

CONCLUSION. With the current sample, significant changes were found in serum concentration of VCAM, ICAM, Protein C, Fibrinogen, D-Dimmers, Platelet count, IL-6 and H^+ concentration pre, intra and postoperative. These factors seem to have an early change in patients undergoing endovascular surgery and need to be monitored to recognize a possible early beginning of P.I. syndrome. During endovascular surgery the inflammatory reaction seems to appear lower than in open surgery repair, but not long-lasting. In the future, the suggested phenomenon by many authors of a decreased general anti-inflammatory cytokine response during endovascular surgery needs to be further examined.

0952

MORTALITY AND FUNCTIONAL ASSESSMENT OF PATIENTS SUFFERING FROM MULTIORGANIC DYSFUNCTION SYNDROME

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AIMS. Long-term follow-up of patients suffering from multiorganic dysfunction syndrome (MODS) admitted to the intensive care unit (ICU), find factors associated with increased functional worsening and with mortality.

METHODS. This is a prospective cohort study including all the patients suffering from MODS admitted to a 24-bed medical ICU of a terciary hospital during 9 months. A subgroup of patients was assessed telephonically using Barthel and PAEEC scales.

RESULTS. 469 patients were admitted to the ICU and 191 (40%) of them suffered from MODS. In the group with MODS the mean age was 58.26 ± 16 years and 64% were males. The main causes of admission were sepsis (25%), neurologic (22%) and pulmonary (17%) disorders. The severity at the time of admission was: APACHE II 23.6 ± 7, SAPS II 54.2 ± 14; SOFA 9.9 ± 3.6. According to the Barthel Scale, 16 patients showed a moderate to severe degree of dependence before the hospital admission. At admission the number of failing organs in the group with MODS was: 1–2 in 67% of the patients, 3 in 20% and 4 or more in 7%. During hospitalization 76% of them had dysfunction of 2–3 organs and 17% of 4 or more organs. Hospital mortality was 48.9% (27.6, 53.8, 81 and 86% when 1–2, 3, 4 and 5 or more organs failed during the hospitalization).

Sixty-nine patients were discharged and telephonically contacted. 53 of these 69 patients survived at 18 months and 86.8% were independent or mildly dependent (Barthel 83.9 ± 25.9; PAEEC 9 ± 6.9). In the 191 patients with MODS, the total mortality at 18 months was 67.2% and severe dependence or 18-months mortality was 69.1%. In the subgroup of patients with sepsis the mortality at 18 months was 75%, similar to patients without sepsis. Factors associated to mortality or severe dependence were: APACHE II (24.9 ± 7.1 vs 21.8 ± 6.4, $p = 0.005$), SOFA max (13.3 ± 4.1 vs 11.2 ± 3.2, $p = 0.001$), highest SOFA scale score (12.7 ± 4.1 vs 10.6 ± 3.1, $p = 0.000$), highest number of failing organs (3.1 ± 1.1 vs 2.4 ± 0.7 $p = 0.000$), other complications during hospitalization (RR 4,4 IC95% 2.2–8.9), and moderate to severe degree of functional worsening at admission (mortality 100% $p =$ NS). In our group there was not any good predictor of long-term mortality: SOFA at admission (AUROC 0.60 IC 0.51–0.69), SOFA max (AUROC 0.65 IC 0.57–0.74), and highest SOFA scale score (AUROC 0.65 IC 0.56–0.74).

CONCLUSION. In this study, MODS had high mortality at 18 months. Functional worsening before admission and the number of failing organs at any time since admission were associated to mortality and a severe degree of dependence. In our group of patients, the SOFA and SOFA sequential had a poor prediction power of long-term mortality.

0953

THE ASSESSMENT OF SEVERITY OF PULMONARY EDEMA IN PATIENTS WITH SEPTIC SHOCK COMBINED WITH DIRECT AND INDIRECT ACUTE LUNG INJURY

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INTRODUCTION. Myocardial dysfunction, impaired microcirculation and increased vascular permeability accompanying severe sepsis contribute to lung edema, particularly in acute lung injury (ALI) and septic shock (SS). Therefore, these patients require thorough monitoring of gas exchange and pulmonary hemodynamics. However, data documenting the severity of lung edema and impairment of pulmonary vascular permeability in patients with different origins of ALI are still inconclusive. Thus, the aim of our study was to assess pulmonary hemodynamics and gas exchange in patients with SS combined with direct and indirect ALI.

METHODS. Thirty adult patients with SS and ALI were enrolled into a prospective study. The SOFA and Murray scores were used daily for evaluation of severity of multiple organ failure (MOF) and ALI, respectively. After the cannulation of femoral and pulmonary arteries, the PiCCO*plus* and VoLEF monitors (Pulsion Medical Systems, Germany) were used for assessment of systemic and pulmonary hemodynamics, including heart rate, blood pressure, central venous pressure, cardiac index, pulmonary arterial pressure, pulmonary arterial occlusion pressure, intrathoracic blood volume index, extravascular lung water index (EVLWI), pulmonary vascular permeability index (PVPI), right heart end-diastolic volume index and left heart end-diastolic volume index. The hemodynamics and gas exchange were registered every 4–8 h during 3 days. In addition, the survival rate was registered at Day 28. For assessment of data we used *t* test or Mann–Whitney test, depending on data distribution. Nominal data were compared using chi-square test. Data are presented as median [25th; 75th percentile] or percentage.

RESULTS. Indirect and direct origins of ALI were diagnosed in 14 and 16 patients, respectively. Patients with direct ALI had higher level of Murray score both at baseline (2.00 [1.25; 2.25] vs. 1.29 [1.00; 1.75] points, $p < 0.05$) and at 72 h (2.00 [1.37; 2.08] vs. 0.87 [0.62; 1.41] points, $p < 0.05$). There were no intergroup differences in severity of MOF and survival rate, gas exchange, systemic and pulmonary hemodynamics, and volumetric parameters. At baseline, EVLWI was higher in patients with direct ALI (9.0 [8.0; 10.7] vs. 6.5 [6.0; 8.8] ml/kg, $p < 0.01$). The baseline level of EVLWI > 7 ml/kg was also registered more frequently in patients with direct ALI (88 vs. 27%, $p < 0.01$). Patients with a decrease in EVLWI during the first 12 h had higher survival rate as compared to those with unchanged or increased EVLWI (75 vs. 8%, $p < 0.01$). PVPI tended to be lower in patients with indirect ALI (1.6 [1.4; 1.9] vs. 1.9 [1.5; 2.5], $p = 0.15$).

CONCLUSIONS. During severe sepsis complicated by ALI and SS, EVLWI is increased predominantly in direct ALI, indicating the development of pulmonary edema as a main mechanism of ALI. The changes in EVLWI have prognostic value and may be used for the goal-directed therapy of severe sepsis.

0954

EVALUATION OF THE INFLAMMATORY RESPONSE IN AN ANIMAL MODEL OF RESUSCITATED SEPTIC SHOCK

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INTRODUCTION. Inflammatory response after sepsis has been regarded as an important player in the development of multiple organ failure and in sepsis-related mortality. However, the dynamics of inflammatory response in experimental septic shock following resuscitation strategies similar to those used in human disease has been subject of few studies in the literature.

OBJECTIVES. This study aimed to evaluate inflammatory parameters in a model of septic shock treated with volemic resuscitation and antibiotics.

METHODS. Ten anesthetized pigs (35–45 kg) were instrumented with pulmonary artery and arterial catheters and submitted to peritonitis by injection of 0.75 ml/kg of fecal contents. After developing hypotension, the animals received fluids and antibiotics and were followed for 12 h. Hemodynamic and respiratory data were collected hourly after sepsis. Plasmatic concentrations of IL-6 and IL-10 were measured by ELISA. Oxidative burst was measured by non-fluorescent dichlorofluorescein oxidation on neutrophils constitutively and after *S. aureus* stimulus and CD14 expression was evaluated on neutrophils and monocytes by flow citometry. These parameters were measured before sepsis, before resuscitation and after 12 h of treatment.

RESULTS. The median time for occurrence of hypotension was 11 h (7–21). Sepsis induced a significant decrease in cardiac output and cardiac filling pressures, probably due to dehydration. Adequate treatment reversed these findings. Significant increases in IL-6 and IL-10 plasmatic concentrations were demonstrated after peritonitis. After treatment, there was a significant decrease in the plasmatic concentrations of IL-6. Plasmatic IL-10 concentrations remained stable. A non-significant decrease in constitutive and *S. aureus*-induced oxidative burst was evidenced after sepsis. After treatment, however, there was a significant increase in both oxidative burst measurements. Expression of CD14 on neutrophils was significantly reduced after sepsis, an effect that did not reverse after treatment.

CONCLUSIONS. The inflammatory response after sepsis is complex and variable. Sepsis treatment is associated with an increased neutrophil oxidative activity. On the other hand, the persistently reduced expression of the endotoxin receptor component CD14 and the increased IL10 concentrations early in the course of the disease may indicate a premature immune dysfunction.

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0955

OXIDATIVE STRESS INDEX (OSI) COULD MAKE THE DIFFERENCE FOR HEALING PROGNOSIS IN POSTSURGICAL SIRS, IN BURNS

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INTRODUCTION. Hemodynamic management for cardio-circulatory stabilization, in patients during and after burn and surgical injury, associated with normo- or hypovolemia, could be associated to progressively decreasing of Hb oxygen saturation (SaO_2Hb), at the level of microcirculation.

MATERIAL AND METHODS. We have realized a prospective study upon 60 patients from Plastic and Reparatory Surgery Department, who needed of 4 ± 3 interventions for tissular restauration (skin grafts). We observed the evolution of the local morpho-clinical aspects of granulative tissue development(in three periods of time) T1: after intervention at 72 h, (T2) at three weeks and to the outcome (T3), associated to the following values: lactate, C-reactive protein (CRP), procalcytonin (PCT), SaO_2Hb, oxidative stress index (OSI) and to clinical manifestations of SIRS. We have correlated these values to the SOFA and APACHE scores. The results, statistically assured evidentiated that there are very individualised modifications, imprevisible sometimes, but the CRP, PCT, OSI, reflected the endothelial dysfunction produced by insufficiency of tissular oxygenation

RESULTS. The seric level of antioxidant potential (TAOP), from the two groups: (a) good healing of surgical wounds and: (b) defectous one were appreciated, a: 502.3 (102.8), b: 551.7 (107.4) µmol Trolox echiv./L ($p < 0.05$). OSI was [3.43 (1.50): second group vs. 2.42 (1.30) first group ($p < 0.001$)].

CONCLUSIONS. Progressive increasing of tissular exposing to the oxitative stress creates different kinds of reactivity and adaptability of cells, belonging to different regions of body, depending of stagnant ischemia. An early evaluation of the appearance of stagfnant ischemia could be used as a very interesting index of wound healing evaluation.

REFERENCES. 1. Girardis M (2003) Muscle perfusion and oxygen consumption by near infrared spectroscopy in septic shock and nonseptic patients. Int care Med 29:1173–1176
2. Sair M (2001) Tissue oxygenation and perfusion in patients with systemic sepsis. Crit Care Med 29:1343–1349
3. Praagman M (2003) Muscle oxygenation consumption, determined by NIRS, in relation to external force and EMG. J Biomech 36:905–912
4. Lima A, Bakker J (2005) Noninvasive monitoring of peripheral perfusion. Int Care Med 31:1316–1326
5. Jubran A. (2004) Pulse oximetry. Int care Med 30:2017–1020
6. Hummler HD, Engelmman A (2006) Decreased accuracy of pulse oximetry measurements during low pwerfusion caused by sepsis. Is the perfusion index of any value? Int care Med. doi:10.1007.s00134–006–0254-y
7. Mannheimer PD, O'Neil MP (2004) The influence of larger subcutaneous blood vessels on pulse oximetry. J Clin Monit Comput 18:179–188.

0956

ACUTE ENTERAL DYSFUNCTION SYNDROME: RELATIONSHIP BETWEEN GUT MICROFLORA, ANTIENDOTOXIN CORE ANTIBODIES (ENDOCAB) AND NO LEVELS CREATE ANOTHER VICIOUS CIRCLE

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INTRODUCTION. Multiple organ deficiency/dysfunction syndrome (MODS) is the leading course of hospital associated mortality in Europe. We hypothesized that acute enteral dysfunction syndrome (EDS) may contribute into this malicious statistics by means of a vicious circle which includes disorders of gut microbiocenosis with associated EndoCAb and NO levels changes.

Objective. The aim of the study was to find whether changes of gut microflora, EndoCAb and nitric oxide levels are somehow related in pathogenesis of EDS and MODS.

METHODS. Study included 87 patients with clinically proven EDS due to acute obstruction = 57 (65.52%) and injury = 30 (34.48%). Male = 32, female = 55, mean age = 49.06 ± 8.34. Colonic microflora was determined with Abbot Laboratories® enterotest system, EndoCAb in Elisa with the use of EndoCAb® Assay by Hycult™ b.v. NO (nitrite/nitrate) total plasma concentration assessed by IEA.

RESULTS. Colonic flora change dramatically under EDS: significant decrease ($P < 0.05$) or elimination of autochthonic anaerobic microorganisms (*Bifidum*- and *Lactobacteria*), and hyperproliferation of conditionally pathogenic *Enterobacteriacea*: *E. coli*, including Hly^+, 9.31 ± 0.62 lg CFU/g against 7.39 ± 0.56 lg CFU/g in control; *Klebsiellae*, 5.17 ± 0.40 lg CFU/g against 3.48 ± 0.49 lg CFU/g in control; *Proteus*, 6.23 ± 0.35 lg CFU/g; and *Serratia*, 5.49 ± 0.74 lg CFU/g (not found in control). EndoCAb levels changes were not uniform. In patients with negative (complicated or lethal) clinical course of disease EndoCAb IgM (1.05 ± 0.02 MMU/ml) and IgG (2.51 ± 0.11 GMU/ml) were significantly lower than in control ($P < 0.01$). However, positive current of the syndrome, even accompanied by MODS, gives higher figures of IgM (2.98 ± 0.23 MMU/ml) and IgG (9.57 ± 0.84 GMU/ml). In most cases (83–95.4%) significant ($P < 0.05$) EndoCAb growth was observed only after fifth day of disease. In 4 (4.6%) cases only IgM increased, while IgG level remained low. NO levels rose reliably ($P < 0.05$) in all observed patients with EDS (42.96 ± 2.75 vs 34.61 ± 3.07 mmol/l in healthy subjects). Strong negative correlation ($r = -0.79$, $P < 0.05$) between EndoCAb and NO levels was found only in negative course cases.

CONCLUSIONS. Negative course of EDS leads to MODS formation. Under such circumstances, excessive growth of conditionally pathogenic *Enterobacteriacea* and endotoxin release is associated with insufficient production of antinuclear anti-endotoxin antibodies (EndoCAb). NO seems to aggravate EDS gravity by means of decreased motility and increased gut' permeability. This "intestinal leakage" plays role as pathophysiologic "vicious circle'.

0957

HIGHLY ELEVATED 11-DEOXYCORTISOL LEVELS IN SEPTIC PATIENTS: A NOVEL MECHANISM IN CRITICAL ILLNESS-RELATED CORTICOSTEROID INSUFFICIENCY?

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AIMS. The mechanisms underlying Critical Illness-Related Corticosteroid Insufficiency (CIRCI) in critically ill patients are poorly understood. Various mechanisms might be important in the pathogenesis of CIRCI, including suppression of ACTH production and impairment of enzymes of the steroidogenical pathway. Reduced activity of adrenal steroidogenic enzymes will result in lower cortisol levels and/or increased levels of cortisol upstream precursors. The aim of our study was to analyze cortisol precursors in septic patients with signs of CIRCI in order to indirectly unravel whether disturbed steroidogenic enzyme activity could account for a diminished response of the adrenocortical cells to ACTH in critically ill patients.

METHODS. A prospective study was performed in a tertiary medico-surgical intensive care unit from December 2004 to March 2007, including 30 critically ill patients with sepsis and a clinical suspicion of CIRCI. Patients who received etomidate within 48 h before ACTH testing were excluded. After measurement of baseline total cortisol and corticosteroid precursors (modified tandem mass spectrometry, Applied Biosystems Q trap 3200) all patients underwent a conventional 250 µg ACTH test. Post-stimulus total cortisol concentrations were determined at 30 and 60 min after the administration of synthetic ACTH.

RESULTS. Patients with a low response to the ACTH test (defined as < 250 mmol/L) had markedly higher 11-deoxycortisol levels compared to patients with a higher response to ACTH (≥250 mmol/L) (median 22.1 vs. 3.94 nmol/L, $p < 0.01$). The median cortisol/11-deoxycortisol ratios in nonresponders ($n = 12$) and responders ($n = 18$) were 28.9 and 107, respectively ($p < 0.01$). No difference was found between responders and non-responders in corticosterone, 17-hydroxyprogesterone, androstenedione, testosterone and DHEAS levels.

CONCLUSIONS. The mechanisms underlying CIRCI are complex and poorly understood. Our data on precursors of cortisol in patients with sepsis, revealing a low cortisol/11-deoxycortisol ratio in nonresponders to ACTH, indirectly indicate a decreased activity of 11β-hydroxylase resulting in a decreased conversion of 11-deoxycortisol to cortisol. This pathway may be involved in the pathophysiology in CIRCI and thus be a potential target for future therapy.

0958

CHARACTERISATION OF A FLUID RESUSCITATED MODEL OF FECAL PERITONITIS WITH CONTINUOUS BLOOD PRESSURE MONITORING IN A CONSCIOUS MOUSE

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INTRODUCTION. Sepsis is the leading cause of death in the critically ill [1]. Transgenic mice enable study of pathways of potential importance, however, mice models are often not clinically representative.

OBJECTIVES. To develop a reproducible fluid resuscitated model of fecal peritonitis in mice with continuous conscious blood pressure (BP) recording and intermittent echocardiography.

METHODS. Mice (age 22 weeks/wt 29 g) had tethered arterial and venous lines inserted under isoflurane anesthesia. The tether enabled mice to roam cages freely and obtain continuous BP traces. 24 h after surgery echocardiogram and intraperitoneal injection of rat slurry (septic) or n/saline (sham) was administered under anesthesia. Fluid resuscitation of 0.3 ml/h voluven/5% dextrose (50:50) was given to septics and 0.1 ml/h n/s/5% dextrose to shams. At 24 h echo was recorded, blood taken and mesenteric arteries dissected for myography. Data are expressed as mean (SEM). Statistical analysis—ANOVA, Chi square or *t* test.

RESULTS. Sham mice survived 72 h before cull and septics died at 18–28 h ($p < 0.0003$) and BP fell in septics from 113(4)–98(3) mmHg compared to 106(4)–102(3) mmHg in shams by 24 h ($p = 0.0012$)

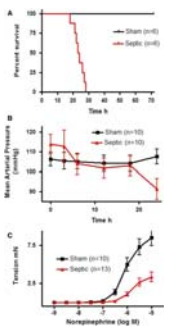

Fig. 1

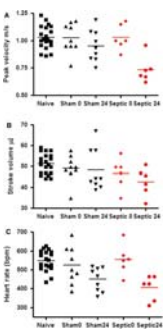

Fig. 2

(Fig. 1). Mesenteric arteries from septic mice were hyporeactive to norepinephrine cf shams ($p = 0.0001$; Fig. 1). Temperature fell in septic mice 36.7(.2)–32.5(1.6)°C. There was no change in renal function. Echocardiography showed a fall in peak velocity at 24 h in septics cf shams ($p < 0.05$) but no difference in stroke volume and heart rate fell in both (Fig. 2). Preliminary cytokine analysis showed an elevation in IL-6 in septics-median(IQR) 412(334–2,606) vs sham 140(6–234) $p = 0.036$.

CONCLUSION. We describe a clinically representative mouse model of fecal peritonitis with significant hypotension, myocardial dysfunction, vascular hyporeactivity and mortality.

REFERENCES. 1. Annane D et al (2003) Am J Respir Crit Care Med 168:165–172

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0959

INTERLEUKIN-6 PRODUCED IN ADIPOSE TISSUE IS STRONGLY LINKED TO DIASTOLIC BLOOD PRESSURE DURING SEVERE SEPSIS

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BACKGROUND AND AIMS. Inflammatory cytokines are recognized as mediators of major importance during sepsis. In recent years, adipose tissue appeared as a novel source of cytokines in different clinical situations, but the role of adipose tissue during sepsis remains, to the moment, completely undercover. The aim of this study was to investigate possible interactions between clinical variables and cytokines produced in adipose tissue of patients with severe sepsis.

MATERIALS AND METHODS. Nine patients with severe sepsis from a medical intensive care unit were investigated over 26 h. Informed consent was provided from the closest relative. A standard open-flow microperfusion catheter inserted in the subcutaneous adipose tissue (SAT) of the abdominal wall was used for continuous sampling of interstitial fluid effluent. Arterial blood samples were obtained simultaneously at two-hour intervals. Recorded clinical variables consisted of heart rate, blood pressure, body temperature, fluid balance, APACHE score II, blood gas analysis, blood count, blood glucose, albumin and high sensitive-C-reactive protein. Cytokines (TNF-alpha, IL-1beta, IL-6 and IL-8) present in SAT effluent samples and serum were measured using a bead-based multiplexed ELISA system. An explorative analysis was performed in order to identify significant ($p < 0.01$) correlations between clinical variables and measured cytokines.

RESULTS. Distinct time profiles were depicted for each cytokine in SAT effluent samples. Cytokine concentrations were higher in SAT than in serum for IL-1beta (10.0 [3.5; 13.9] vs. 0.7 [0.6; 1.4] pg/ml; median [25; 75 percentile]; $p < 0.05$), IL-6 (1.66 [1.17; 2.33] vs. 0.06 [0.05; 0.08] ng/ml; $p < 0.01$) and IL-8 (0.83 [0.51; 1.40] vs. 0.08 [0.02; 0.12] ng/ml; $p < 0.01$). Significant negative correlations were observed between SAT inflammatory cytokines and mean DBP (IL-1beta: Pearson −0.081, $p = 0.008$; IL-6: Pearson −0.084, $p = 0.005$; IL-8: Pearson −0.073, $p = 0.025$). Multiple regression analysis uncovered a strong interaction between DBP and IL-6 produced in SAT ($B = -0.01$; $p = 0.002$; $R^2 = 0.78$). No other significant correlation between clinical variables and cytokines was observed.

CONCLUSIONS. Cytokines measured in SAT effluent from septic patients using OFM technique are probably locally produced, as suggested by the serum-SAT gradients. As diastolic blood pressure is the main determinant of mean blood pressure, and therefore, of perfusion at the tissue level, the present data suggest that IL-6 secreted in the adipose tissue might be implicated in the regulation of tissue perfusion in patients with severe sepsis.

0960

LOW DOSE L-NMMA IMPROVES SURVIVAL IN A LONG-TERM RAT MODEL OF SEPTIC SHOCK

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INTRODUCTION. Though NO modulation is a likely therapeutic candidate for septic shock, the failure of the Phase III study of the non-specific NOS inhibitor L-NMMA (1) undermined this approach. However, this study revealed outcome benefit at doses <5 mg/kg/h but harm at higher doses (5–20 mg/kg/h). We thus wished to see whether the benefits of low-dose L-NMMA could be replicated in a long-term rat model of septic shock.

METHODS. Conscious instrumented male Wistar rats of approx 300 g body weight received 1.8 ml fecal slurry intraperitoneally. When blood pressure (BP) dropped 20% below baseline level (at approx 5–6 h), 1–3 × 10 ml/kg Voluven fluid challenges were given i.v. to restore pressure, followed by continuous infusion of a 1:1 mix of n-saline +5% glucose at a rate of 10 ml/kg/h. Treated animals also received 3 mg/kg/h L-NMMA added into the above resuscitation fluid. Animals were observed until 48 h or death. A Kaplan–Meier survival analysis was performed.

RESULTS. Five animals were excluded due to premature deaths <3 h ($n = 3$) and instrumentation mishaps ($n = 2$). Of the remainder, L-NMMA-treated septic animals ($n = 13$) showed a significant improvement in survival compared to untreated animals ($n = 12$) (Fig. 1). Median survival was 19 vs. 12 h ($p = 0.019$). Blood pressure was better maintained in the L-NMMA treated group.

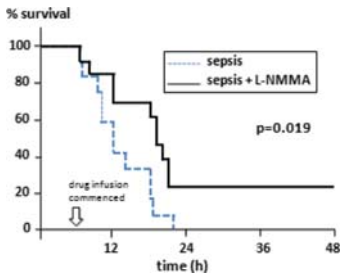

Fig. 1 L-NMMA survival

CONCLUSIONS. Low-dose L-NMMA improved haemodynamics and survival in this severe, long-term, fluid-resuscitated, conscious model of sepsis. NOS inhibition should be revisited as a treatment modality for sepsis at appropriate dosing.

REFERENCE. 1. Lopez A et al (2004) Crit Care Med 32:21

GRANT ACKNOWLEDGEMENT. The Wellcome Trust.

0961

THE EFFECT OF LEAD TIME AND CLINICAL CONTEXT ON THE HUMAN INNATE IMMUNE RESPONSE TO SEVERE SEPSIS

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INTRODUCTION. Severe sepsis and septic shock remain a major cause of mortality. Attempts to develop novel therapies in an effort to reduce this mortality have been remarkably unsuccessful. However, there appears to be an initial window of opportunity during which conventional resuscitation strategies and treatments such as antibiotics can provide a survival benefit [1, 2]. In this study we examined the immunological correlates for this clinical observation.

METHODS. We analysed immune receptor expression in monocytes taken from healthy volunteers and patients with shock at early (within 6 h) and late time points using flow cytometry. Patients with cardiogenic, haemorrhagic and septic shock were included. Importantly, only patients who subsequently were proven to be bacteraemic were included in the septic shock group. We further tested the proinflammatory responsiveness of these cells to stimulation with a panel of microbial toxins/heat-killed bacteria and toll-like receptor ligands by measuring tumour necrosis factor alpha by ELISA. We also compared the same innate immune profile of patients with established critical illness to those presenting de novo from the community.

RESULTS. We found that the clinical context (de novo community acquired-shock versus hospital-acquired shock) of samples and sample acquisition lead-time were crucial determinants of both receptor expression and cytokine release (Fig. 1). This was in contrast to diagnosis/shock type and severity which were not correlated with patient innate immune profile. This latter observation differs from that reported by other investigators [3, 4].

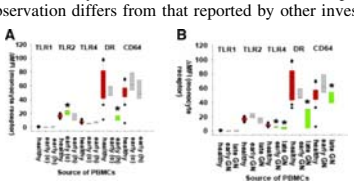

Fig. 1 Innate receptor expression. **a** monocytes from healthy volunteers are compared with cells from cells from patients with early community acquired (c) or hospital-acquired (h) Shock; **b** health controls are compared with monocytes taken at early and late time points from patients with Gram-negative shock

CONCLUSION. The innate immune profile of monocytes appears to be similar in all categories of shock and is not correlated with pathophysiological severity. However, the timing of sample collection and the clinical context of shock development does appear to be an important determinant of both monocyte receptor phenotype and *ex-vivo* proinflammatory responsiveness. Patients who develop shock (including severe sepsis) in hospital are immunologically distinct from those presenting from the community and should be treated as such both for the purposes of their supportive care and inclusion in clinical trials.

REFERENCES. 1. Rivers E (2001) N Eng J Med 345:1368–1377
2. Kumar A (2006) Crit Care Med 34:1589–1596
3. Pinsky MR (1993) Chest 103:565–575
4. Hershman MJ (1990) Br J Surg 77:204–207.

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0962

CHARACTERISATION OF THE CARDIOVASCULAR CHANGES AND ASSESSMENT OF LOCAL INFLAMMATORY RESPONSE (CARRAGEENAN-IN-PAW OEDEMA) IN A MOUSE MODEL OF LIVER INJURY SECONDARY TO BILE DUCT LIGATION

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INTRODUCTION. Sepsis in cirrhotic patients has a poor prognosis and putative causes include cardiovascular and immune dysfunction secondary to cirrhosis itself [1]. A mouse model would enable study of mediators using transgenics. We sought to characterise cardiovascular function and inflammatory response in a murine model of cirrhosis.

METHODS. C57black mice (12 weeks/26 g) were bile duct ligated (BDL) or sham procedure under isoflurane. Echocardiography under isoflurane was performed at intervals. At day 14—either blood pressure (BP) was measured, or 1% carrageenan injected into paw and resulting oedema compared to saline-injected paw, or mice culled for histology, blood and mesenteric arteries for myography. Data-mean(SEM), statistics-ANOVA.

RESULTS. Significant liver injury was present day 14 post BDL (survive to 21 days). Peak velocity, stroke volume and heart rate fell in cirrhotics $p < 0.001$ (Fig. 1). Weight (28%) and temperature fell $p < 0.001$ (Fig. 2). Although BP does not fall, mesenteric arteries were hyporeactive to norepinephrine $p < 0.001$ (Fig. 2). Bilirubin-390(56) and ALT-350(53) rose $p < 0.001$. The response to carrageenan measured by paw oedema was significantly reduced in cirrhotics $p < 0.001$ (Fig. 3). Preliminary cytokine analysis showed no change.

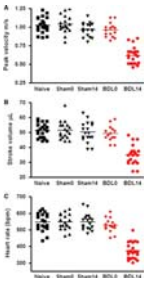

Fig.1

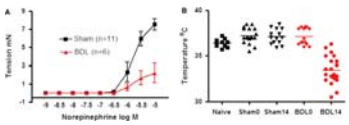

Fig.2

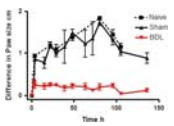

Fig.3

CONCLUSION. We demonstrate a mouse model of cardiovascular impairment and dampened inflammatory response secondary to cirrhosis.

REFERENCES. 1. Canabal JM (2008) Curr Opin Crit Care 14:189–197

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0963

ERYTHROPOIETIN DOES NOT PROTECT AGAINST ENDOTOXIN-INDUCED RENAL DYSFUNCTION

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BACKGROUND. Pro-inflammatory cytokines and lymphocyte apoptosis are important mechanisms in the development of immunosupression and organ dysfunction in severe sepsis and septic shock. Erythropoietin (EPO), well known for its role in promoting erythrocyte survival and differentiation, has recently been shown to exert tissue protective properties. Multiple protective capabilities of EPO, such as antiapoptotic and antioxidant effects, have been demonstrated. Interestingly, the anti-inflammatory effects of EPO in endotoxin-induced renal dysfunction are still not known. The aim of the present study was to evaluate the effect of EPO on endotoxin-induced renal impairment and to investigate whether EPO could reduce endotoxemia induced lymphocyte apoptosis.

METHODS. Twenty-eight pigs (31–35 kg) were anesthetized and mechanically ventilated. The pigs were randomized into one of three groups (1) LPS + EPO (5,000 IE/kg) $n = 10$, (2) LPS + placebo, $n = 10$ and (3) control group, $n = 8$. Escherichia coli endotoxin (LPS) was infused by a stepwise increasing dose to 20 μg/kg/h, continued for 2 h and then reduced to 2.5 μg/kg/h for the last 8 h. Renal function was assessed by glomerular filtration rate (GFR) estimated hourly. Blood samples were collected for the analysis of plasma cytokines (IL-1β, TNF-α, IL-6, IL-8 and IL-10). Peripheral blood mononuclear cells (PBMC) were isolated and analyzed by flowcytometry for changes in lymphocyte subsets and apoptosis.

RESULTS. LPS significantly reduced the renal function measured as GFR ($p = 0.003$). Treatment with EPO had no effect on the overall renal function and we found no significant differences between the LPS groups. The flowcytometry and cytokine analyses are ongoing.

CONCLUSION. EPO did not minimize the renal dysfunction induced by acute experimental LPS-endotoxemia. The possible immune modulating effects of LPS and EPO, including alterations in lymphocyte subsets and apoptosis, will be presented.

Infection in the neuro ICU/Trauma: 0964–0977

0964

INFECTIOUS COMPLICATIONS AND OUTCOMES IN ICU PATIENTS WITH CEREBRAL HEMORRHAGE AND BRAIN TRAUMA

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INTRODUCTION. The outcome of patients hospitalized in ICU due to cerebral hemorrhage or brain trauma may be adversely affected by serious infections that often complicate the course of these diseases.

OBJECTIVES. To document infectious complications and to study outcome and disability indices in patients admitted in ICU due to cerebral hemorrhage or brain trauma (CHBT).

METHODS. We prospectively studied CHBT patients hospitalised in the general ICU of University Hospital of Thessaly, between 2006 and 2008. Patients were followed up for a median period of 290 (120–690) days. The neurological status of patients was assessed by the Glasgow Coma Scale (GCS) and the Hunt and Hess Score; patients disability was evaluated by the Rapid Disability Rating Scale (RDRS). Diagnosis of nosocomial meningitis or infections was based on previously accepted CDC criteria.

RESULTS. Ninety-six patients (65 male) with median(IQR) age of 58(37–66) years and GCS of 8(5–10), hospitalized for 18(8–33) days, were studied. Six-month overall mortality was 31.2%. Twenty three patients (24%) presented bacteraemia, 44(45.8%) presented at least one septic episode during their hospitalization; the incidence of meningitis was 21.8%. Multiresistant bacteria (Acinetobacter baumanii, Klebsiella pn. and Enterococcus f.) were cultured in cerebrospinal fluid in 15 out of 31(48%) meningitis patients. Patients who presented meningitis or bacteriaimia with multiresistant bacteria ($p = 0.002$) had a significantly longer hospitalization ($p < 0.001$] and worse RDRS ($p < 0.03$). Twenty-five (26%) patients presented mild-moderate disability and 38(49%) severe-total disability at the final follow up. Total/severe disability was associated with advanced age ($p = 0.001$), low baseline GCS ($p = 0.001$), presence of blood/cerobrospinal fluid multiresistant bacteria ($p = 0.002$) and increased mortality ($p = 0.001$).

CONCLUSIONS. The course of neurosurgical patients in ICU may be complicated by multiresistant bacteria infections that may result in long term severe disability. These findings underline the necessity of developing effective strategies against multiresistant bacteria in ICU.

0965

NOSOCOMIAL INFECTIONS IN NEUROSURGICAL INTENSIVE CARE UNITS. FIRST RESULTS OF MULTY-CENTER STUDY

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INTRODUCTION. Nosocomial infections one of the basic problems in the neurological ICU.

OBJECTIVE. To study the aetiological structure, character and antibiotic resistance level of hospital infections (HI) agents in the neurological ICU in the major leading departments of neurosurgical Intensive Care Units in Russia.

MATERIALS AND METHODS. Prospective multy-center study in the period of march-april of 2007, based on the six largest neurosurgical ICU in Russia. During this period of time 50 patients with hospital infections were included in to the study. Strain identification and susceptibility level was evaluated with the help of standard bacteriological methods. Nosocomial infections (NI) diagnostic was conducted on the basis of general protocol for every ICU. For NI diagnostic the CDC criteria (1988) were used.

RESULTS AND DISCUSSION. Patients' conditions severity according to APACHE II was 13.0 points (5.5;18), consciouseness level according to Glasgow—10.5 (8.0;14), according to SOFA—3.0 (1;6). NI onset happened on the 9.3th (6;13.5) days. Among Hospital Infections the low respiratory tract infections were prevalent-66.6%. CNS infections were evaluated as 7%. VAP incidence was 13.2 per 1,000 device-days of mechanical ventilation. Urinary catheter—associated infections—4.9 per 1,000 device-days, central-line associated rate was 5.6 per 1,000 device-days. As NI agents the following ones dominated: *P. aeruginosa*-31.7%, *A. baumannii*-10.0%, *K. ðneumoniae*-8.3%, *E. coli*-8.3%,*MSSA*-10.0%, *MRSA*-8.3%. The highest level of activity towads *P. aeruginosa* was demonstrated by *imepenem/cilastatin* and *meropenem* 64.7 and 58.8% sensitive strains respectively. Strains of *A. baumannii* showed the maximum sensitivity towads *cephepime—76.7%, gentomycine—50%, ciprofloxacine—50%.*

CONCLUSIONS. Among NI the major leading place in the neurosurgical ICU is taken by low respiratory tract infections(LRTI). The main causative agents of NI are *P. aeruginosà*, *S. aureus* è *A. baumannii*. The highest level of resistance to antibiotics is achieved by non-enzymatic bacteria.

0966

EXTERNAL VENTRICULAR DRAINS (EVDS) INFECTIONS: THE DURATION OF DRAINAGE AS A PREDICTOR OF INFECTION AND ELECTIVE REVISION OF EVDS

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INTRODUCTION. The Brain Trauma Foundation guidelines for the management of traumatic head injury identifies EVD (external ventricular drainage) as the most accurate, reliable, and cost-effective intracranial pressure monitor.

They also represent the mainstay in the emergency treatment of hydrocephalus, On that basis: Drainage of CSF reduces intracranial volume and thus is one of the therapeutic tools available for the treatment of intracranial hypertension. The most common drawback of external ventricular drainage is that of CSF infection [16]. Mayhall and coworkers [20] found a strong relationship between the duration of insertion of EVD and the risk of drain-associated infection. They recommended elective revision of an EVD on Day 5 postinsertion to reduce this risk. Conversely, authors of other larger studies have shown that the duration of EVD insertion in a patient has no effect on the risk of infection [10, 34].

Furthermore, data from a randomized controlled trial [37] revealed no difference in the infection rate between one group of patients undergoing elective EVD revision every 5 days and another group with EVDs left unchanged unless clinically indicated. Despite this evidence, elective revision of EVDs with the aim of preventing CSF infection remains a common practice.

OBJECTIVES. To evaluate the role of the duration of insertion of EVDs as a predictor of infection together with the timing of infection relative to insertion. To discuss the practice of electively revising EVDs and wether we should adapt elective reviewing in our practice, recommending when a reinsertion revision should be performed.

METHODS. A prospective study of 102 patients with 138 EVDS in a tertiary intensive care unit in Abudhabi, UAE.

RESULTS. We found 11 cases of CSF (cerebrospinal fluid infection), approximately 46% of which were: pseudomonas auregenosa and gram positive bacteria.

We found the duration of drainage to be an independent predictor of infection. The longer the duration of insertion the higher the risk of infection.

An EVD infection was initially identified at a mean of 7.2 ± 2 days (by standard error of the mean).

CONCLUSION. Elective EVD revision would be expected to decrease the rate of infection in light of our results we recommend elective revision of EVD.

REFERENCES. 1. Alleyne CH Jr, Hassan M, Zabramski JM (2000) The efficacy and costof prophylactic and perioprocedural antibiotics in patients with external ventricular drains. Neurosurgery 47:1124–1129

2. Aucoin PJ, Kotilainen HR, Gantz NM, Davidson R, Kellogg P, Stone B (1986) Intracranial pressure monitors. Epidemiologic study of risk factors and infections. Am J Med 80:369–376

3. Bader MK, Littlejohns L, Palmer S (1995) Ventriculostomy and intracranial pressure monitoring: in search of a 0% infection rate. Heart Lung 24:166–172

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0967

RISK FACTORS IN THE ONSET PULMONARY INFECTION IN HEAD TRAUMA PATIENTS

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INTRODUCTION. Pulmonary complications are frequent occurrence in head trauma patients with pneumonia being the most important cause in morbimortality in these patients. Therefore is important the knowledge in variables that have influenced the development of pulmonary complication to improve the management of these patients. The aim of our study was to assess the risk factors of onset pulmonary infection in head trauma patients who were admitted in Critical Care Unit (CCU) in our centre, high technology hospital.

PATIENTS AND METHODS. A prospective observational study from June 2006 to July 2008 in head trauma patients who were admitted in our hospital.

The following variables were evaluated: age, gender, risk index, Glasgow Coma Scale (GCS), place where patients were intubated (before or after hospital admission), computer tomography (CT), polytrauma, hypotension, hypoxia, presence of intracranial hypertension, steroid and barbiturates use, aspiration before intubation, duration of mechanical ventilation, presence of pulmonary and infectious complication. Chi-square test, multiple and simple logistic regression analyses were used.

RESULTS. One hundred seventeen head trauma patients were admitted during study period. The mean age was 42.07 ± 20.37 years (range 16–88), 98 (83.7%) males and 19 (16.24%) females; the prognosis index risk were: APACHE II 20.15 ± 7.84; SAPS II 36.26 ± 15.86, APACHE III 65.1 ± 33.7, ISS 27.76 ± 12.58. The 93.2% of these patients were intubated, 62.39% in the accident place. About staying in CCU, infectious complication was the most frequent (66.67%), pulmonary infection was most common (58.12%); regarding these 29.9% had tracheobronchitis and 29.91% pneumonia (early onset: 14.53%, late onset: 16.24%). Pneumonia was associated with respiratory failure in 32.48% of these patients with PO_2/FiO_2 ratio < 200.

The presence of intracranial hypertension ($p = 0.02$), hypotension ($p = 0.04$) and days of mechanical ventilation ($p = 0.000$) were significantly associated with onset pulmonary infection. The tracheal intubation in accident place was not significant.

CONCLUSIONS. The pulmonary infection is a frequent complication in head trauma patients. About the variables that significantly have influenced in this complication, we have to early treat hypotension in an aggressive way, since microcirculatory disorders can make a great contribution to the development of this complication. We have to insist on applying recommendations to prevent pulmonary complication related mechanical ventilation.

REFERENCES. 1. Bronchard R, Albadalejo P, Bresar G et al (2004) Early onset pneumonia. Risk factors and consequences in head trauma patients. Anesthesiology 100:234–239
2. Schimer-Mikalsen K, Gisvold S, Skandsen T, Hynne H (2007) Severe head injury: control of physiological variables, organ failure and complications in the intensive care unit. Acta Anaesthesiol Scand 51:1194–1201

0968

TREATMENT OF RESISTANT FEVER WITH NEW METHODS OF LOCAL CEREBRAL COOLING

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Fever worsen neuronal damage in neurointensive care patients. Objectives of the study were (1) to develop new methods to be effective in lowering fever (temperature > 37.8°) resistant to conventional methods and (2) to be specific and more rapid in decreasing the elevated temperature of the brain. 6 patients with episodes of intractable fever were treated with specific neck pads of ArcticSun® Medivance. 88 temperature values of the brain, blood and bladder, respectively, were taken every 15 min over a period of 2 h, every 30 min until hour 4 and up to hour 8 hourly, after application of the cooling neck pads.

RESULTS.

- No side effects related to the cooling technique occurred.
- Brain temperature decreased from hour 0 with 38.2°C ± 0.3 to 37.5°C ± 0.4 hour 3.5.
- In all but one episode, the temperature of the brain remounted to values > 38°C after hour 5.
- In one episode the rise again was prevented by additional cool washing.
- During the entire study period the mean temperature measured in the brain (37.9°C ± 0.4) was significant higher compared to the blood (37.8°C ± 0.4) ($p = 0.01$ paired t test).

CONCLUSION. Selective cooling of the neck might be efficient in decreasing intractable for several hours, but not for a sustained period.

0969

LARGE VARIATION OF SERUM NEURON SPECIFIC ENOLASE LEVELS IN INTENSIVE CARE PATIENTS

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INTRODUCTION. Serum Neuron Specific Enolase (NSE) is used as a marker of cerebral damage in patients admitted for cerebral injury (cerebral infarction, intracerebral hemorrhage or traumatic brain injury) or post resuscitation [1]. Use of serum NSE in ICU patients to monitor for unknown cerebral damage is presently hampered since normal values of serum NSE levels in these patients are not available.

OBJECTIVE. To determine normal values for serum NSE levels in ICU patients.

METHODS. Single-centre, prospective observational cohort study in a mixed medical-surgical ICU. Inclusion criteria: age > 18 years, expected stay in ICU > 48 h. Exclusion criteria: primary central nervous disorders, cardiac arrest, cardiac bypass surgery, hemolysis, rhabdomyolysis/myopathy, some malignancies and severe hypoglycemia (<2.2 mmol/L) <96 h before sampling. NSE was measured by electrochemiluminescence immunoassays [2].

RESULTS. Serum of 67 patients (41 male; median APACHE II was 20 [IQ-range 25–75%: 5–45], median SAPS II 50 [13–86], median SOFA 7 [5–11]) was analyzed. The median level of serum NSE was 8.6 [6.4–11.3] (range 4.5–22.1) μg/L. In patients with sepsis, median NSE level was 8.1 [6.4–11.0] (range 4.9–22.1) μg/L. Patients with respiratory insufficiency had a median serum NSE of 7.8 [5.9–10.4] (range 4.5–16.4) μg/L. In 14/67 (21%) patients a serum NSE level >12.5 μg/L was measured.

CONCLUSION. Variation of serum NSE levels in ICU patients is large. Considering the substantial variation, serum NSE levels are presumably hard to use as tool to monitor brain injury of ICU patients. Further research to identify markers which can be used to identify cerebral damage seems necessary.

REFERENCES. 1. Snyder-Ramos SA, Böttiger BW. Molecular Markers of Brain Damage-clinical and ethical implications with particular focus on cardiac arrest. Restor Neurol Neurosci 2003 (21): 123–139

2. Rech TH, Regina Rios Vieira S, Nagel F, et al. Serum Neuron-Specific Enolase as Early Predictor of Outcome After in-Hospital Cardiac Arrest: a Cohort Study. Crit Care 2006 (10): R133.

0970

EFFECTS OF ACUTE ETHANOL INTOXICATION AND ALCOHOLISM ON FUNCTIONAL OUTCOME AFTER TRAUMATIC BRAIN INJURY

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INTRODUCTION. Individuals who sustain a traumatic brain injury (TBI) frequently present acute ethanol intoxication at the time of injury. and up to 75% also have chronic alcoholism. (1) Several studies provide support for a deleterious interaction between positive blood alcohol levels (BAL) and outcome from TBI. (2) Also, the influence of pre-injury alcohol abuse on poor outcome cannot be underestimated.

OBJECTIVES. Our purpose is to investigate the effects of day-of-injury intoxication and chronic alcoholism on early functional status in patients (pts) with TBI.

METHOD. We reviewed 589 pts from DRG database admitted at S. João Hospital with ICD9-CM codes of TBI with age between 18 and 65 years old during 2007–2008. 152 pts were selected considering the following inclusion criteria at admission: BAL measurement, Glasgow Coma Score (GCS) evaluation and head CT-scan. Acute alcohol intoxication was defined as BAL ≥ 0.5 g/l according to Portuguese law. Outcome analysis was based on the Glasgow Outcome Scale (GOS) at day of discharge. Statistical analysis was performed using chi-square tests, t test, two-way ANOVA, multivariate regression analyses using the forward stepwise model.

Table 1 Demographic data, alcohol injury, TBI severity and outcome variables

	$N = 152$			
	n	(%)	Missing	(%)
Sex			0	0
Male	128	84.2		
Female	24	15.8		
GCS	$n = 150$		2	1.3
3 to 8	42	28		
9 to 12	31	20.7		
13 to 15	77	51.3		
Cronic alcoholism	$n = 79$		73	48
Yes	60	75.9		
No	19	24.1		
BAL	$n = 135$		17	11.2
< 0.5 g/l	78	57.8		
≥ 0.5 g/dl	57	42.2		
CT-scan	$n = 152$		0	0
Extradural hematoma	7	4.6		
Subdural hematoma	16	10.5		
Contusion	24	15.8		
Diffuse edema	6	3.9		
Subaracnhoid hematoma	17	11.2		
Multiple lesions	74	48.7		
Normal	8	5.3		
GOS			10	6.6
5	77	50.7		
4	32	21.1		
3	15	9.9		
2	0	0		
1	18	11.8		
Numeric Measures	Mean ± SD			
Outcomes				
UCI stay (days)	3.90 ± 6.9			
Hospital stay	14.8 ± 14			

Note: categorical predictors appear as n and (percent). Numerical variables appear as mean ± SD

RESULTS.

BAL positive results were significantly higher in males ($p = 0.0018$). Preliminary correlational analysis indicated that BAL ≥ 0.5 g/l was associated with lower mortality ($p = 0.008$). Considering the acute alcohol intoxication status (AEI) and chronic alcoholism (CA) status, we divided the pts in four groups (i.e. AEI and CA; only AEI or CA and none). There was no difference between those groups as far as concerned the following variables: GCS, head CT scan, UCI stay, hospital stay, GOS and mortality. No correlation was found between chronic alcoholism and mortality. However, multivariate regression analyses demonstrated that the only predictor of mortality was GCS ($p = 0.000$).

CONCLUSIONS. We did not find a significant association between acute or chronic alcoholism and functional outcome at discharge as referred in previous studies. (2) Controlled, prospective research is needed to establish more consistently the effect of acute and chronic alcoholism in TBI outcome.

REFERENCES. 1. Arch Clin Neuropsychil 23:809–822 (2008)

2. Arch Phys Med Rehabil 89:48–55 (2008)

0971

CYTOKINES AS EARLY PREDICTORS OF OUTCOME IN SEVERE MULTIPLE TRAUMA

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OBJECTIVES. In the present study we investigated the early prognostic value of the serum levels of the main pro- and anti-inflammatory cytokines and soluble cytokine inhibitors for mortality and late complications as sepsis and MOF in trauma.

METHODS. 99 previously healthy immunocompetent patients with severe multiple trauma admitted to the E.R in less than 8 h from trauma were included during a period of 22 months. 64 healthy individuals served as controls. We determined a wide spectrum of pro- and anti-inflammatory cytokines simultaneously (TNF-a, IL-1b, IL-6, IL-10, sTNFR type-I and-II, IL-1ra and TGF-b) on admission, 12 h, and 24 h after trauma. All patients were followed up for sepsis, MOF and death until discharge from hospital. The variables were compared between groups with and without complications and death.

RESULTS. The age of patients (88 men and 11 women) was 41.98 ± 17.81 years, the ISS 23.21 ± 11.47 and the rate of mortality, MOF, ARDS and sepsis 20.20, 32.32, 10.10 and 41.41% respectively. On admission trauma patients had significantly higher levels of IL-6, IL-10, sTNFRII, IL-1ra and TGF-b than did controls. IL-6 (adm, 12 h, 24 h), IL-1ra (12 h, 24 h) and IL-10 (24 h) were more closely related to the severity of trauma as measured by the ISS score ($p < 0.001$). Elevated IL-6 (12 h), TGF-b (adm) and IL-6:IL-10 ratio were detected in patients who died, whereas sTNFR I (adm, 12 h) as well as IL-1β, IL-6, IL-10, IL-1ra, sTNFR I, sTNFRII levels (24 h) were significantly higher in patients who developed sepsis. Serum levels of TGF-1β and IL-1ra (adm) as well as IL-6, IL-1ra, sTNFR I, sTNFRII (12 h) and IL-1β, IL-6, sTNFR I, sTNFRII, IL-1ra levels (24 h) were significantly higher in patients who developed MOF. A significant decline in serum IL-10 and IL-1ra levels was observed in survivors, non-septic and without MOF patients (12 and 24 h). Results of the multivariate analysis by logistic regression are shown in Tables 1, 2, 3

TABLE 1 PREDICTORS OF SEPSIS

Predictor (pg/ml)	Regression coefficient	Odds ratio point estimate	95% Confidence interval
IL-6 at 24 h	0.007	1.007	0.999–1.016
IL-1ra at 24 h	−0.001	0.999	0.998–1.000
ISS	0.123	1.131	1.034–1.238
APACHE II	0.292	1.339	1.137–1.576

ROC curve for the model AUC (95% CI: 0.909 (0.840–0.978)

TABLE 2 PREDICTORS OF MOF

Predictor (pg/mL)	Regression coefficient	Odds ratio point estimate	95% Confidence interval
IL-6 at 24 h	0.007	1.007	0.999–1.016
IL-1ra at 24 h	−0.001	0.999	0.998–1.000
ISS	0.123	1.131	1.034–1.238

ROC curve for the model AUC (95% CI) 0.889 (0.820–0.958)

TABLE 3 PREDICTORS OF DEATH

Predictor	Regression coefficient	Odds ratio point estimate	95% Confidence interval
TGF-β1 (pg/mL)	−0.020	0.980	0.953–1.009
APACHE II score	0.190	1.209	1.041–1.403
Head injury	−18.888	0.000	0.000

ROC curve for the model AUC (95% CI) 0.879 (0.809–0.953)

CONCLUSIONS. Serum levels of TGF-β1, IL-6 and IL-1ra as well as the sustained overproduction of IL-10 and IL-1ra may predict death and late complications as sepsis and MOF as soon as into the first 24 h after severe trauma.

0972

HYPOMAGNESEMIA IN POLITRAUMA PATIENTS

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INTRODUCTION. The importance of magnesium in intensive care has been white of much attention in recent years. Some publications relate the hypomagnesemia with the increase in mortality of critical sick patients; others discuss the importance of its correction. Magnesium changes in the politrauma patient have been less referenced in literature, although some studies do mention its importance, especially in traumatic brain injury. Results and contradictory opinions exist in respect to admission magnesium levels in the universe of critical trauma patients.

OBJECTIVE. To find correlation between magnesium, at admission and during hospital stay, and main outcomes in trauma patients, admitted in to the trauma room of a 700 bedded teaching hospital (level 3 trauma centre), during a 5-year period.

MATERIALS AND METHODS. Retrospective analysis of our trauma database from 2002 to 2007. Evaluation of admission magnesium levels and daily magnesium in the first 8 days of hospital stay; correlation with the following parameters: mechanism of injury, need for intensive care, injury scores (ISS—Injury Severity Score, RTS—Revised Score Trauma). The evaluated measures of outcome were: LOS, ICU LOS and mortality. Cut-off for hypomagnesemia applied in the study was our institution's value of reference (0.6 mmol/L).

RESULTS. From a total of 1,311 trauma patients admitted in our trauma room from 2002 to 2007, 394 were excluded from the analysis for lack of magnesium related data. From the remaining 917, we found admission hypomagnesemia (Mg < 0.6 mmol/L) in 16.5% ($n = 151$). During the first 8 days of admission, normalization of the magnesium levels was verified in 113 patients admitted with hypomagnesemia (74.8%).

Patients with admission hypomagnesemia had significant longer hospital LOS (medium 14 days versus 12 days—$p = 0.075$), increased need for intensive care (83.4% versus 75.3%—$p = 0.031$) and increased ICU LOS (medium 7 days versus 5 days—$p = 0.003$) and ISS scores (average 27.4 versus 23.89—$p = 0.001$). We found an increased mortality, during the first 24 h, in 38 patients that remained hypomagnesemic (23.7% versus 5.3%).

CONCLUSIONS. In this population of severe politrauma patients, low magnesium at arrival to the trauma room was a marker of severity of the traumatic injury, but without significant influence on mortality.

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0973

POST-TRAUMATIC FAT EMBOLISM SYNDROME IN A MOROCCAN INTENSIVE CARE UNIT

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INTRODUCTION. The fat embolism syndrome (FES) is a rare clinical condition in which circulating fat emboli or fat macroglobules lead to multisystem dysfunction. Patients with long-bone fractures have a 1–20% chance of acquiring the syndrome. However, the true incidence of FES is rather unknown because mild cases may be unnoticed. Early and accurate diagnosis is crucial; it is mainly based on clinical criteria and may be masked by associated lesions especially in the multitrauma victim.

OBJECTIVE. The aim of this study is to describe the epidemiological, clinical and evolutionary findings in patients with post-traumatic FES.

MATERIALS AND METHODS. 23 patients had sustained trauma related FES and admitted in our unit between January 2006 and December 2008. They were reviewed retrospectively.

RESULTS. The median age of the patients was 34 years (range 17–59 years). All affected patients were exclusively male. 43.5% of our patients had an age $\leq$30ans. The average annual recruitment was 7.6 cases/year. FES was associated with long-bone isolated fracture in 52.1% (7 femur and 5 tibia fractures). 77% of patients presented closed fractures. All patients reached the hospital within 3 h from the injury. The clinical manifestations occurred a few hours to 5 days after the initial insult (the free interval's duration) with an average of 41 h 30 min. The clinical form was complete (presence of the classical triad consisting of respiratory distress, neurological abnormalities and a petechial rash) in 70% of cases, incomplete in 30%. Anemia and thrombocytopenia were found, respectively in 65.2%, 43.5% of cases. A decrease in hematocrit (<30%) was seen in 60%. No dyslipidemia was found. In most patients, chest radiographic findings were reported normal. Retinal changes at fundoscopy were revealed in two patients. Supportive pulmonary care with mechanical ventilation was indicated in 48% of cases, and 7 patients have required perioperative transfusions. Only 30.5% of cases benefited from early fixation of long bone fractures. The average time of osteosynthesis was 38.7 h (after trauma). Most patients responded well to supportive care, but serious infectious complications occurred and were dominated by nosocomial pneumonia in 30.5% of cases and catheter-related infections in 17.4% of cases. The mortality rate was 17.4% caused by severe acute respiratory distress syndrome. The average durations of stay in intensive care unit and hospital stay were 7.7 and 12.7 days respectively.

CONCLUSION. FES is one of the few pathologic entities that are diagnosed based on readily available clinical criteria. In our routine, careful clinical examination remains the "gold standard" for early diagnosing FES. The prevention, the improvement of trauma care process (with rapid and safe transfer system) and the correct management of bone trauma may decrease its occurrence of this life-threading disorder and the hospital stay of trauma patients.

0974

ADMISSIONS TO A SCOTTISH ICU SECONDARY TO ASSAULTS WITH SHARP WEAPONS

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It is becoming clear that serious violence and in particular knife violence are important public health matters. Knife violence has doubled over the past 20 years (1) with 47% of all murders now involving knives in Scotland (2). Unfortunately Scotland has the joint highest murder rate in Western Europe at 2.13 deaths per 100,000 (3). The majority of homicides are recorded in the West of Scotland with Glasgow having the highest murder rate in Western Europe at 5 deaths per 100,000 (3). This survey attempted to quantify the number of admissions and outcome for victims of stab injuries admitted to the Intensive Care Unit, Southern General Hospital Glasgow.

The information was obtained from a focused search of the ICU database (Ward Watcher) covering the period April 1995 to October 2008. A variety of search criteria were used to insure all patients admitted after assaults with sharp weapons were identified.

41 patients were admitted with injuries secondary to assaults with a sharp object over the specified time period. 37 (90%) of these patients survived and 4 (10%) died. Their mean age was 30 with the majority (88%) being 39 or less years of age. The mean length of stay was 2.1 days (range 1–11 days). The mean APACHE II score was 11 with most patients (83%) having an APACHE II score of 19 or less. Injuries involving the chest occurred in 14 instances; the abdomen in 25 instances; the neck in 8 instances; the limbs in 7 instances; the back in 2 instances and the head on one occasion. 30 (73%) patients received less than 10 units of Packed Red Cells (PRC). 11 (27%) patients received between > 10 units PRC. 16 (39%) patients required 1 to >20 units of Fresh Frozen Plasma. 5 (12%) patients required 1–4 units of pooled platelets to be transfused. 7 (17%) patients required 1–6 units of cryoprecipitate. There was no correlation between transfusion requirements and survival. Of the four patients who died, two died during resuscitation in the ICU with the other two dying on day 3 and day 10 of their admission to the ICU.

This retrospective survey demonstrates that although the total numbers of patients admitted after assaults with a sharp weapon are small representing roughly 3 patients a year. They represent a group of young patients with a high mortality rate (10%). Many require massive transfusions and active resuscitation. The injuries sustained can be lethal both immediately and later despite intensive care. Whatever the outcome these assaults have the potential to have a significant impact on the individuals, their families and the local community.

1. Leyland AH (2006) Homicides involving knives and other sharp objects in Scotland, 1981–2003. J Public Health 28(2):145–147
2. Statistics on crimes of homicide recorded by the police in 2007–2008. The Scottish Government
3. United Nations, Office on drugs and crime. Tenth United Nations survey of crime trends and operations of criminal justice systems, covering the period 2005–2006.

0975

PROGNOSIS FACTORS RELATED TO A BETTER OUTCOME IN MODERATE AND SEVERE TRAUMATIC BRAIN INJURY

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OBJECTIVE. To determine the prognosis factors related to a better outcome in patients with moderate and severe brain traumatic injury.

PATIENTS AND METHODS. Retrospective observational study made in a University Hospital Intensive Care Unit from January 2007 to March 2009. Patients older than 18 years old, with a moderate or severe head injury were included. Head injury severity was score based on initial Glasgow Coma Scale (GCS) and computerized tomography (CT) findings by the National Coma Data Bank (NCDB) scale. Epidemiology data and potential risk factors were collected. To evaluate the functional outcome a telephone interview was made, using the Glasgow Outcome Scale (GOS) and Modified Rankin Scale (mRS).

RESULTS. 83 patients were included, being 15 patients missed on the following process. 75% were men, median age 45.5 (SD 22.4) and initial Glasgow Coma Scale (GCS) 7 (SD 3.1). Based on CT finding patients present a NCDB score median of 3 (1.5). 30.9% had major trauma lesions associated and 16.2% required emergency surgery. For medical treatment 52.9% received neuromuscular blocking agents, 44.1% hyperosmolar therapy and 4.4% barbiturate; 39.7% were hyperventilated, and 7.4% required a decompressive craniectomy. 38.2% had blood transfusions. Injury location was frontal in 22.1%, temporal in 5.9%, occipital in 13.8%, diffuse in 26.2% and multiple contusions in 30.7%. Hyperthermia was present in 48.5% patients and hyperglycemias in 7.4%. Complications: 1—Infectious diseases: ventriculitis 17.6%, ventilator associated pneumonia 14.7% and urinary infection 13.2%. 2—Respiratory diseases: ARDS 8.8% and pulmonary oedema 1.5%. 3—Neurological: ischemia 1.5% and bleeding 1.5%. Discharge GCS was 14.0 (SD 3.1) and GOS 3.0 (SD 1.3). ICU length of stay (LOS) was 15.5 days (SD 11.7) and hospital LOS 24 days (SD 82.5). ICU mortality was 19.1%. Six months GOS was 4.0 (SD 1.7) and six months mRS 2.0 (SD 2.4). Analysing by unvaried analysis we found as prognosis factor related to six months GOS the followings factors: age ($p < 0.001$), gender (p: 0.002), APACHE II score ($p < 0.001$), NCDB score (p: 0.004), major trauma injuries (p: 0.042), seizures onset (p: 0.002), hyperosmolar therapy (p: 0.038), hyperthermia (p: 0.05) and hyperglycemias (p: 0.002). Multivariate analysis demonstrated that age (p: 0.008) and APACHE II score (p: 0.039) were independent risk factors.

CONCLUSIONS. The most significant prognosis factors related to outcome are age and APACHE II score in the first 24 h. CT findings classified by the NCDB scale have determined to be a good outcome predictor. Young people and male seem to have better outcome. Patients who presented hyperthermia or hyperglycemias during the ICU stay and those who need to be treated with hyperosmolar therapy are related with a worse outcome.

0976

"RISK-FRACTURE" OF POSTTRAUMATIC CEREBRAL VENOUS SINUS OCCLUSION IS ONE OF THE RISK FACTORS OF ACUTE BRAIN SWELLING

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INTRODUCTION. Posttraumatic acute brain swelling (ABS) is generally thought to result from a hypoxic, ischemic insult to the brain due to prolonged shock or apnea occurring immediately after the trauma. We previously reported that the incidence of posttraumatic cerebral venous sinus occlusion (CVSO) was over 20% in the patients with a skull fracture crossing a dural sinus or with a petrous bone fracture (risk-fracture of CVSO), and it is closely associated with ABS (J Trauma 66(4):1002–1007, 2009). The purpose of this study was to investigate the risk factor of ABS occurring immediately after the trauma.

METHODS. This study comprised 376 consecutive patients admitted to our Trauma Center from 2002 through 2009 with head trauma. Multivariate stepwise logistic regression (MSLR) analysis was used to identify independent risk factors for ABS. The dependant variable was ABS. ABS was defined as diffuse injury 3 or 4 according to the Traumatic Coma Data Bank classification on admission day. The explaining variables were age, gender, presence of risk-fracture of CVSO, blood pressure and blood gas data on admission (Shock was defined as blood pressure less than 90 mmHg, hypoxia was defined as PaO_2 less than 60 mmHg, and hypercapnia was defined as $PaCO_2$ more than 45 mmHg).

RESULTS. ABS was observed in 4.5% (17/376). Out of 119 patients with risk-fracture of CVSO, ABS occurred in 11.8% (14/119). ABS also was observed in 37.5% (9/24) in patient with shock. All patients of ABS were died. MSLR found as the most important prognostic indicators, risk-fracture of CVSO (OR: 13.3, $p < 0.01$), and shock (OR: 35.6, $p < 0.01$). There was no correlation between risk-fracture of CVSO and shock.

CONCLUSION. We reasoned in the previous study that the patients with a risk-fracture of CVSO could receive direct injury to cerebral venous sinus, which caused disturbance of venous outflow and increased the risk of ABS. These results indicated that risk-fracture of CVSO may be involved in occurrence of ABS by the mechanism different from the shock, such as venous outflow block. Further clinical studies are warranted to determine the effects of shock and obstruction of cerebral venous flow on ABS.

0977

VENOUS SINUS THROMBOSIS

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INTRODUCTION. The cerebral sinus venous thrombosis (CVT) is a rare subtype of stroke with a difficult diagnosis and an unknown incidence, in the past it was associated with an unfavourable outcome.

METHODS. The aim of the present study was to describe clinical characteristics and outcome of two patients with CVT admitted in ICU in the last 6 months.

RESULTS. Clinical case 1:A 25-year-old woman with a personal history of a recent epidural anesthesia for vaginal delivery was attended four days later in the emergency department by persistent headache. In the physical examination there was not nuchal rigidity nor neurological abnormalities. Initially hydration, analgesic drugs and lying down were the treatment for a suspected postdural puncture headache. Due to a lack of relieve with this treatment an urgent brain computerized tomography scan was performed, it showed a CVT.

Clinical case 2: A 27-year-old woman with oral contraceptives treatment history who consulted in the family medicine center several times with headache with a poor response to treatment. 24 h later was attended in the emergency department with headache and lower right extremity paresis. A brain computerized tomography scan showed CVT.

The patients were admitted in the ICU and were treated with systemic anticoagulation therapy, they started to improve and after 4 days (case 1) and 6 days (case 2) were discharged to the neurology ward.

CONCLUSION.

- The treatment with heparin in the acute phase of the CVT is safe and is likely to improve its outcome.
- Hypercoagulable states like postpartum and contraceptive treatment are frequently associated with the CVT.

Subarachnoid and intracranial haemorrhage: 0978–0991

0978

MAGNESIUM FOR PREVENTION OF DELAYED ISCHEMIC NEUROLOGICAL DEFICIT IN SUBARACHNOID HEMORRHAGE: A META-ANALYSIS

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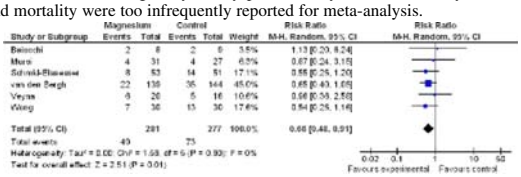
INTRODUCTION. Death or dependency occurs in up to 70% of patients with aneurysmal subarachnoid hemorrhage (aSAH) and is often due to clinical vasospasm (CV) causing delayed ischemic neurological deficit (DIND) in approximately one third of patients. Our objective was to systematically review randomized controlled trials (RCTs) examining magnesium (Mg) therapy for preventing CV/DIND in patients with aSAH.

METHODS. In duplicate, we searched Medline, Embase, CINAHL, and the Cochrane Central Registry of Controlled Trials from database inception to April 2009 using all terms for SAH (SAH or aneurysm or vasospasm) and magnesium. We included RCTs of Mg compared to any control group without Mg to prevent CV/DIND in adults after aSAH. Outcomes included CV/DIND (primary) and incidence of good neurological outcome, cerebral infarction evidenced by neuroimaging, rebleeding, hypotension, adverse events, and mortality, all at the latest time measured. We excluded RCTs of Mg to treat (vs. prevent) CV/DIND. Risk ratios (RR) with 95% confidence intervals (CI) were calculated using random effects models (RevMan 5). We used the Q test and I^2 to assess statistical heterogeneity.

RESULTS. Of 451 citations, 6 RCTs ($N = 558$) met inclusion criteria. All studies initiated Mg sulfate (MgSO4) intravenously on admission, with a bolus dose in 5/6 RCTs, and titrated with a continuous maintenance infusion to a prespecified level (double the normal serum Mg value in 4/6 RCTs). Interventions common to Mg and control groups included nimodipine (1 RCT), nimodipine/antiepileptic (3 RCTs), and nimodipine/phenytoin/prophylactic triple-H therapy (1 RCT). One additional RCT compared Mg to nimodipine directly. Meta-analyses showed that Mg reduced the incidence of CV/DIND (RR 0.66 [0.48–0.91]; $p = 0.01$; 6 RCTs) with a trend to increased incidence of good neurological outcome (RR 1.17 [0.95–1.44]; $p = 0.14$; 6 RCTs). There was no effect on cerebral infarction (0.93 [0.73–1.17] $p = 0.52$; 3 RCTs). There was no evidence of statistical heterogeneity in any pooled analysis. Unfortunately, data on adverse events and mortality were too infrequently reported for meta-analysis.



Incidence of CV/DIND

CONCLUSION. The available evidence suggests that Mg therapy reduces the incidence of CV/DIND and possibly improves neurological outcome when administered prophylactically to patients with aSAH. Forthcoming results from the MASH ($N = 1{,}100$) and IMASH ($N = 800$) trials may contribute to more definitive results.

0979

THE PROGNOSTIC RELEVANCE OF ACUTE PHASE REACTION IN PATIENTS WITH INTRACEREBRAL HEMORRHAGE

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INTRODUCTION. Cerebrovascular events can trigger a systemic inflammatory response through neuroinflammation. Limited data exists concerning the role of acute phase reaction (APR) in patients with intracerebral hemorrhage (ICH).

OBJECTIVES. We investigated the time course of interleukine-6 (IL-6), C-reactive protein (CRP) and fibrinogen serum levels, as markers of acute reaction, in ICH patients and their relation to the neurological outcome.

METHODS. Twenty eight patients with spontaneous ICH admitted to a general ICU of a tertiary hospital, were enrolled in this prospective study. Serum levels of the above markers were measured on days 1 and 3. Patients were divided in two groups according to their neurological outcome estimated with Glasgow outcome scale (GOS): Group A (GOS 1–3, worse outcome) 20 patients, Group B (GOS 4–5, better outcome) 8 patients. Data distribution was not normal according to Shapiro–Wilk test of normality. Mann–Whitney U test was used for differences in biomarkers between the two groups. Wilcoxon signed ranks test was used in order to confirm differences between first and third day measurement. Spearman's bivariate correlation test was used in order to correlate the three markers.

RESULTS. The only statistically significant difference between the two groups was the increase of IL-6 on day 3 in group A. A statistically significant elevation of fibrinogen was observed in Group A patients on day 3 compared to day 1. On the contrary CRP levels on day 3 increased in both groups of patients. Statistically significant correlation was observed on day 3 between fibrinogen, CRP and IL-6 only in group A patients. Mean, standard deviation and p values are shown in Table 1.

TABLE 1

	Group A			Group B		
	Day 1 Mean ± SD	Day 3 Mean ± SD	p	Day 1 Mean ± SD	Day 3 Mean ± SD	p
CRP	1.10 ± 2.36	14.05 ± 9.96	0.00	2.63 ± 3.50	14.75 ± 7.21	0.02
fibrinogen	2.50 ± 1.24	4.75 ± 1.39	0.02	2.00 ± 1.10	4.40 ± 1.14	0.06
IL-6	131.25 ± 151.48	181.63 ± 145	0.09	114.00 ± 61.31	81.38 ± 93.89	0.50

CONCLUSIONS. Our data indicate a stronger acute phase response in patients with poor neurological outcome after ICH. Elevation of IL-6 serum levels on day 3 seems to be a predictor for a worse outcome.

REFERENCES. 1. Dziedzic T (2008) Clinical significance of acute phase reaction in stroke patients. Front Biosci 13:2922–2927

2. Castellanos M et al (2005) Predictors of good outcome in medium to large spontaneous supratentorial intracerebral haemorrhages. J Neurol Neurosurg Psych 76:691–695

0980

MINIMAL INVASIVE SUPRA-ORBITAL SURGICAL APPROACH FOR CEREBRAL ANEURYSM CLIPPING SIGNIFICANTLY REDUCES LENGTH OF POSTOPERATIVE ICU STAY

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Supra-orbital incision offers a minimal invasive surgical approach for cerebral aneurysm clipping. Since 2004, we introduced this technique for all pts presenting for elective cerebral aneurysm surgery. In this paper, we want to present a retrospective analysis of this 5-years experience.

Over this 5-years period, 98 pts scheduled for elective cerebral aneurysm surgery underwent craniotomy by supra-orbital incision performed by the same neurosurgeon. In 65 pts, the aneurysm was located on the medial cerebral artery, in 11 pts it was located on the internal carotid artery, whereas in the other 22 pts the communicans anterior was involved. 9 pts presented with multiple aneurysms, in 2 pts multiple aneurysms were clipped in one surgical procedure. Retrospective control group included 98 consecutive pts, undergoing aneurysm clipping by conventional surgical approach, before 2004 and performed by the same neurosurgeon.

With minimal invasive approach, cerebral aneurysm was successfully clipped in 95/98 pts and post-operative course was uneventful. In 2 pts, it seemed impossible to clip the aneurysm due to anatomical characteristics. In 1 pt, intra-operative bleeding occurred during surgical manipulation of the aneurysm, with ensuing brain bulging and a large craniotomy had to be performed. In the control group, in 96 of 98 pts, cerebral aneurysm was successfully clipped without any neurologic deficit. We did observe a significantly shorter mean surgical procedure time compared to standard procedure times for cerebral aneurysm clipping before 2004 (m195 min vs m329 min). Related to this shortened mean surgical time, we observed a significantly shorter time to awakening (m135 min vs m285 min after ICU admission). 92 of 98 pts were discharged from ICU within 36 h of admission, and 32 pts were even discharged within the first 12 h of ICU admission. In the control group before 2004, mean ICU stay was 21.3 h with no pt leaving ICU within first 12 h of ICU admission. After 2004, mean hospital stay was reduced to 6.3 days, with 5 pts leaving the hospital within 3 days after surgical intervention.

In conclusion, our data confirm all advantages of minimal invasive neurosurgical approach for cerebral aneurysm clipping. The less invasive approach guarantees as well optimal surgical success (at least identical to conventional approach) as significantly shortened procedure time and ICU—hospital stay.

0981

SERUM IGF-I IN ACUTE SUBARACHNOID HAEMORRHAGE

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INTRODUCTION. IGF-I has an important role in neuronal growth and apoptosis in acute brain catastophes like SAH.

OBJECTIVES.

To characterize the behaviour of serum insulin like growth factor-I (IGF-I) and growth hormone (GH) in the acute phase and to three months after acute subarachnoid haemorrhage (SAH).

To evaluate if IGF-I has impact on the quality of life in patients with SAH.

METHODS. Patients > 18 years scheduled for elective aneurysm surgery ($n = 16$) and patients with SAH ($n = 30$) were included. Patients with pituitary insufficiency were excluded. First week daily IGF-I and GH concentration were measured and the measurements were repeated at three months. At three months a 15 dimension quality of life assessment was filled out. We defined low serum IGF-I concentration as <11 nmol/l and low quality of life as less than 0.8. We used a Bayesian network method for predicting factors affecting poor quality of life after SAH.

RESULTS. IGF-I levels were lower in patients with SAH than in control patients at days 1–5 ($p = 0.01$) (Fig. 1). No difference was found at three months. Serum GH concentrations were similar in both groups. There was no consistent correlation of SAPS II, SOFAmax or APACHE II scores with GH or IGF-I. There was no difference between IGF-I or GH in respect of aneurysm location, treatment modality, Hunt-Hess grades, Fisher grade, GCS, vasospasm or need for noradrenalin or hydrocephalus. The 15 days quality of life in patients with SAH was 0.81 ± 0.16 and in control patients 0.86 ± 0.09 ($p = 0.24$). The mean IGF-I concentrations from days 1–7 in patients with SAH was 11.1 ± 5.0 nmol/l. Patients with Glasgow Outcome Scale (GOS) < 4 had lower IGF-I levels than GOS 5 patients. If mean IGF-I concentration was < 6.22 nmol/it predicted poor quality of life with a probability of 97% in patients with SAH. IGF-I did not predict quality of life in the control group

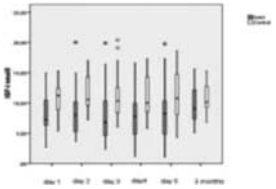

Fig. 1

CONCLUSIONS. This is the first study to evaluate the behaviour of IGF-I and its association with quality of life in the acute phase of SAH. Serum IGF-I levels are low during acute SAH, but they normalize at three months. Severity of SAH does not influence serum IGF-levels. Quality of life at three months was equal in patients with acute SAH and after elective operational aneurysmal surgery. However, low IGF-I concentration immediately after SAH may predict poor quality of life. More studies are needed to evaluate the role of IGF-I in acute brain catastrophes like SAH.

0982

COMPLICATIONS ASSOCIATED WITH SPONTANEOUS SUBARACHNOID HEMORRHAGE: CLINICAL IMPACT AND PROGNOSTIC VALUE

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INTRODUCTION. The aim of this study is to identify the characteristics of the patients with spontaneous subarachnoid hemorrhage (SAH) and analyze the complications, treatment, potencial risk factors and prognostic value associated with SAH.

METHODS. A retrospective observational study of all patients admitted to our hospital with SAH in the period between November 2006 and February 2009. We evaluate the functional outcome using the Glasgow Outcome Scale (GOS) at the discharge and 6 moths later. We compare categoric variables with chi-squared test, and quantitative variables with Student's t test. Multiple regression analysis (statistically significant $p < 0.05$).

RESULTS. 168 patients were included: age 57.5 years (SD 14.9), 62.5% women, APACHE II 12 (SD 6.7), Glasgow Coma Scale (GCS) 9.9 (SD 6.5). Punctuation in clinical grading scales was: Hunt-Hess(H-H) 2.8 (SD 1.5); Fisher(F) 3.0 (SD 1.0); World Federation Neurosurgeons Scale (WFNS) 2.8 (SD 1.5). Personal antecedents: arterial hypertension (32.1%), followed by alcohol/drugs use (31.2%) and previous SAH (6.8%). Presentation was headache (61.9%), followed by low consciousness (28.6%). We perform CT angiography 9.6% and arteriography 78.6% (delay was 1 day). We found no aneurysm in 24.6%. The embolization was complete 63.4% and incomplete 22.6%. The localization of the aneurysm was more frequent: 33.7% anterior communicating artery and 16.3% middle cerebral artery. Surgical treatment was performed 2.2%. Complications of SAH: vasospasm 31.5% (Nimodipine profilaxis was used in 86.9% and were managed with triple-H therapy 71.7%), ischemic stroke occurred 60.4%; 4.2% rebleeding; hydrocephalus 23.2% (external ventricular drainage was placed 94.9%; 35.4% developed ventriculitis). Mortality risk factors: Univariate analysis found as mortality risk factors: age ($p = 0.004$), worsening control CT ($p < 0.01$), rebleeding ($p < 0.01$), diabetes insipidus ($p = 0.03$), coma ($p = 0.02$), hydrocephalus ($p < 0.01$), intracranial hypertension ($p = 0.002$), H-H ($p < 0.01$), F ($p < 0.01$), WFNS ($p < 0.01$), initial GCS ($p < 0.01$), GOS at discharge to ICU ($p = 0.002$) and time to embolization ($p = 0.02$). Multivariate analysis we found as independent predictors of mortality: GCS at admission ($p = 0.025$) and at discharge to ICU ($p < 0.001$), worsening in control CT ($p = 0.013$), ischemic stroke ($p = 0.016$), intracranial hypertension ($p = 0.002$), age ($p = 0.046$) and length of stay (LOS) in ICU ($p = 0.042$). ICU LOS was 10.6 days (SD 9.9) and hospital LOS was 56.7 days (SD 26.3). Global ICU mortality was 29.2% (77.5% brain death).

CONCLUSIONS. The most frequent complications found were: ischemic stroke, vasospasm and hydrocefalus. In our study we found that clinical grading scales predict mortality in the univariate analysis. Independent mortality risk factors in HAS were: age, GCS at admission and discharge, control CT, delay to embolization and complications related to SAH are strong mortality predictors. In most patients, death is related with SAH complications.

0983

CHANGE OF FLUID AND VOLUME THERAPY FOLLOWING ADVANCED HEMODYNAMIC MONITORING IN PATIENTS WITH INTRACRANIAL HEMORRHAGE

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INTRODUCTION. Advanced hemodynamic monitoring role in the estimation of infusion strategy in the critically ill patients is still an unknown question. We compared the infusion volume and structure before and after systemic hemodynamic monitoring initialization in patients with intracranial hemorrhage.

METHODS. 46 patients with aneurismal subarachnoid hemorrhage and severe traumatic brain injury with GCS 4–9 enrolled in the study. Advanced monitoring of hemodynamic parameters by transpulmonal thermodilution was used in all patients. We calculated and compared infusion volume and structure in the 24-h periods before and after initialization of advanced hemodynamic monitoring.

RESULTS. At the time of first thermodilution hypovolemia (global end-diastolic volume index below 680 ml/m^2) was diagnosed in 32 patients (70%). Infusion volume increased after the beginning of advanced hemodynamic monitoring (before monitoring initialization—3,764 ± 1,815 ml, after monitoring initialization—4,215 ± 1,740 ml). Amount of infused crystalloid solutions and blood products remained unchanged (crystalloids: before monitoring initialization—2,084 ± 1,993 ml, after monitoring initialization—1,975 ± 1,705 ml; blood products: before monitoring initialization—575 ± 123 ml, after monitoring initialization—767 ± 105 ml). Volume of infused colloid solutions increased significantly (before monitoring initialization—1,105 ± 801 ml, after monitoring initialization—1,474 ± 899 ml ($p < 0.05$)).

CONCLUSION. Initialization of advanced hemodynamic monitoring in patients with intracranial hemorrhage allows accurate hypovolemia diagnosis and is associated with significant changes in the infusion strategy.

0984

CEREBROSPINAL FLUID CHANGES IN INFLAMMATORY AFFECTION AFTER SUBARACHNOIDAL HAEMORRHAGE

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INTRODUCTION. Subarachnoid haemorrhage (SAH) affects cerebrospinal fluid (CSF) changes during its course and reparation processes, including inflammatory changes.

METHODS. We carry out at least one examination of CSF in patients with SAH or with unruptured aneurysm, with a control of CSF pressure and a biochemical examination. In indicated cases we perform a more detailed CSF examination focused on inflammatory changes.

We evaluate the inflammatory reaction by an energy-balance examination, which describes the level of aerobic and anaerobic metabolism in the CNS compartment, based on the ratio of glucose and lactate levels in CSF and monitoring the cytology changes. The results were divided in three categories: without inflammation, with serous inflammatory response and with purulent inflammatory response.

RESULTS. 167 patients with SAH or unruptured aneurysms were treated in our department between January 2006 and December 2008 with the following Hunt-Hess classification: HH0 = 51, HH1 = 19, HH2 = 26, HH3 = 29, HH4 = 26, HH5 = 16. In 112 patients a surgery was performed (clip, wrap), 50 patients were treated with coiling, and in 5 patients we decided to conduct only a conservative treatment. In 43 indicated patients we performed altogether 119 detailed examinations of CSF, based on a single lumbar punction or external lumbar/ventricular drainage.

CSF samples showed no inflammatory response in 13 patients, serose inflammatory response was found in 11 patients and purulent response in 19 patients. This purulent response was more frequent in patients with higher degree of Hunt-Hess classification, however, it was recorded also in both clipped and coiled patients. Positive bacterial cultivation was found only in 9 patients.

DISCUSSION. Subarachnoid haemorrhage can produce an inflammatory response itself and the brain tissue damage caused by hemorrhage can elicit inflammation too. This response is intended for restoration of the initial condition and it is evidently a non-infectious etiology. In this reaction we can usually see moderate level of anaerobic metabolism in CSF compartment caused by activation of the immune system.

In SAH we can also see a non-infective purulent response caused by reperfusion of the ischemic areas of the brain due to cerebral vasospasms. The key role takes the C5a unit of the complement with its chemotactic effect on neutrophils and their production of free oxygen radicals. This response manifests itself with deep anaerobic metabolism in CSF compartment and predominantly neutrophils in cytologic picture. When the bacterial etiology is missing, we call this reaction a "pseudopurulent" response.

A significant risk factor for the participation of bacterial etiology is the presence of external lumbar or ventricular drainage.

CONCLUSION. By using these simple and widely available biochemical methods we can quickly and precisely detect the inflammatory changes in time with no systemic signs of an inflammatory response.

0985

UREA FOR TREATMENT OF ACUTE SIADH IN PATIENTS WITH SUBARACHNOID HEMORRHAGE

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BACKGROUND. Hypotonic hyponatremia is frequent in patients with subarachnoid hemorrhage (SAH) and is generally related to the syndrome of inappropriate antidiuretic hormone secretion (SIADH). Several treatments, including hypertonic solutions or arginine vasopressin receptor antagonists (VRA) may be considered but have potential adverse effects and VRA are expensive. The efficacy and safety of urea has been reported in patients with chronic SIADH, but not in patients with acute neurological disease and SIADH.

HYPOTHESIS. Urea is an effective and safe treatment to correct sodium (Na) levels in SAH patients with SIADH.

METHODS. We reviewed the medical data of all patients admitted in our department for non-traumatic SAH from January 2003 to February 2009 ($n = 368$). All patients with hyponatremia due to SIADH (Na < 135 mEq/L, osmolality < 270 mosm/L, urine Na > 20 mEq/L, urine osmolality > 200 mosm/L, absence of dehydration or edema, and of renal, adrenal and thyroid disease) received oral urea when hyponatremia was associated with clinical deterioration or remained below 130 mEq/L despite adequate fluid management and sodium administration. Urea was given orally or by nasogastric tube, at doses of 15 to 30 g q6 h. The primary efficacy indicator was the time to Na correction (>135 mEq/L). We also evaluated the total dose of urea received as well as the potential adverse events. Data are presented as median (range).

RESULTS. Thirty-nine patients (11%) received urea to reverse hyponatremia due to SIADH. Median age was 55 (29–80), 21 patients were female. Most aneurysms (23/39) were located in anterior vessels. Median admission Na was 139 mEq/L, with only one hyponatremic patient. Hyponatremia, with a median Na of 132 (126–134) mEq/L, was diagnosed after a median time of 4 days (1–13. Urea was started after a median time of 7 days (2–18) and given for a median of 5 days (1–23). Median daily dose was 60 g (15–150). Hyponatremia was corrected in all patients, with a median time to Na > 135 mEq/L of 3 days (1–18). The median Na increase over the first day of treatment was 3 mEq/L (1–12). Urea was well tolerated and no adverse effect was reported.

CONCLUSIONS. Oral urea is an effective and well tolerated treatment to increase serum Na in SAH patients with hyponatremia due to SIADH.

0986

CHARACTERISTICS OF THE SEVERE SPONTANEOUS SUBARACHNOID HAEMORRHAGE MANAGEMENT IN AN INTENSIVE CARE UNIT

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INTRODUCTION. Severe spontaneous subarachnoid haemorrhage (SAH) is a devastating illness often needing intensive care. Our objective is to analyze the clinical and radiological characteristics in patients with severe spontaneous SAH admitted to our ICU and the differences between endovascular or surgical treatment.

METHODS. Observational retrospective study of patients admitted to the ICU with a diagnosis of severe SAH during 2006–2007. Clinical and radiological data, complications, therapeutic approach and evolution were studied.

RESULTS. From 153 patients admitted consecutively with spontaneous SAH, 80 (52%) were admitted to the ICU. Severity: 33% Glasgow Coma Scale ≤ 8, 35% Hunt-Hess 4–5, 41% World Federation of Neurosurgical Societies (WFNS) 4–5 and 82% Fisher 3–4. There were 69 (86%) aneurismatic SAH. Diagnosis was made by arteriography (76%) or angio-computerized tomography (17%). Aneurism location: anterior 39%, cerebral medium 19%, posterior 22%, basilar 1% and carotid 5%. Clipping was the most used treatment (40%), coiling on 29% and both 4% (14% were not treated). Neurological complications: rebleeding 9%, hydrocephalus 46%, intracranial hypertension 24%, vasoespasm 43%, epilepsy 6% and CT ischaemia 22%. No neurological complications: mechanical ventilation was needed in 69%, tracheostomy in 17%. Vasoactive amines 34%, infection 34%, nosocomial pneumonia 20%, renal failure 7% and ionic disturbances 11%. Mortality: death at ICU discharge 18 (22%) and at hospital discharge 26 (32%). Mortality (ICU and in-hospital) was not associated with age, gender or Fisher classification. Worse GCS, Hunt-Hess and WFNS classifications presented statistically significant higher mortality. Hydrocephalus and vasospasm were not significantly associated with mortality. Rebleeding had higher mortality, but not significant. The need of mechanical ventilation, intracranial hypertension and renal failure were significantly associated with higher mortality. Coiling or clipping treatment were not associated with gender and pathological history. There were significantly more percentages of worse scores of GCS, Hunt-Hess, WFNS in patients with coiled than clipped aneurisms. Rebleeding and hydrocephalus were more frequent in coiled patients, but more intracranial hypertension and ischaemia in clipped patients, without statistically significant differences. No statistically significant differences were observed in no neurological complications in ICU.

CONCLUSIONS. Patients with SAH in our ICU were severe because most of them (82%) were Fisher 3–4. Characteristics associated with SAH mortality in ICU were: prognostic scores for SAH (GCS, Hunt-Hess, WNFS), intracranial hypertension, the need of mechanical ventilation and renal failure. There were more clipped aneurisms than coiled, and coiled aneurisms were more severe than the clipped ones.

0987

NON-INVASIVE MONITORING OF BRAIN OXYGENATION (FORE-SIGHT TECHNOLOGY) FOR COMPLEX CEREBRAL ANEURYSM SURGERY

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Complex cerebral aneurysm surgery carries a high risk for intra-operative ischemic insults, especially if multiple periods of temporary clipping seem necessary to allow final aneurysm clipping. The use of non-invasive neuromonitoring, applied during aneurysm surgery, could guide as well intra-operative neuroprotective strategy as postoperative neuro-critical care.

In 12 pts, scheduled for elective complex cerebral aneurysm surgery by supra-orbital incision, non-invasive cerebral oximetry was applied over the patient's forehead, enabling bilateral brain saturation monitoring intra-operatively and for the first 12 h after ICU admission. Fore-Sight monitor is a continuous wave, spatially resolved, near-infrared spectrometer that measures absolute cerebral tissue oxygen saturation ($SctO_2$ %) using 4 wavelengths. Validation studies proved a stable correlation between $SctO_2$ and jugular bulb saturation (SjO_2) with $SctO_2$ 10% higher than SjO_2. As SjO_2 has a normal safe limit of 45%, the absolute $SctO_2$ threshold is estimated at 55%.

In 3 of 12 pts, excessive intra-operative ambient light interfered with $SctO_2$ monitoring and no $SctO_2$ data could be obtained. In 7 of 9 remaining pts, multiple periods of temporary clipping were applied. In all pts, a small, nonsignificant decrease in ipsilateral $SctO_2$ was observed during temporary clipping, but in all periods, $SctO_2$ values remained above 55%. After release of the temporary clip, an immediate, shortlasting (3–5 min) and significant increase in ipsilateral $SctO_2$ was observed in 5 of 7 pts. After release of the temporary clip, ipsilateral $SctO_2$ immediately increased by a mean of 8.4% (range 7–11%) with return to baseline values after a mean of 4 min. This could point to a local and important hyperperfusion occurring after the release of the temporary clip. All pts remained sedated until stable postoperative conditions were obtained. During postoperative ICU course, all pts revealed slightly increased (bilateral) $SctO_2$ values without any values below 55%, even during awakening procedure. No pt revealed any neurologic deficit at awakening (mean 6.4 h after ICU admission).

This first report reveals the feasibility of intra- and post-operative non-invasive cerebral oxygenation monitoring, using absolute $SctO_2$ monitoring, during complex cerebral aneurysm surgery. Brain oxygenation monitoring during critical periods of temporary clipping may guide optimal postoperative neuro-critical care.

0988

MONITORING OF ABSOLUTE CEREBRAL OXYGEN SATURATION (FORE-SIGHT TECHNOLOGY) DURING CANIOTOMY FOR ACUTE INTRACEREBRAL BLEEDING

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Cerebral oximetry, based on NIRS, measures regional cerebral tissue oxygen saturation ($StcO_2$) non-invasively at the microvascular level. The FORE-SIGHT absolute cerebral oximeter, a recently introduced monitoring device, uses 4 precise wavelengths to determine absolute $StcO_2$. In the present study, we want to report on the changes in absolute $StcO_2$ occurring during craniotomy for acute intracerebral hematoma.

Thirteen pts suffering from acute intracerebral bleeding and scheduled for urgent craniotomy were included. All pts presented with reduced consciousness (GCS < 8) and with signs of increased intracranial pressure (referring to CT imaging). Pts received systemic stabilization (intubation, ventilation, hemodynamic monitoring and support) and were transferred as soon as possible from the emergency department into the operating theatre (OR) for urgent removal of the intracerebral bleeding. As soon as pt arrived in the OR, bilateral $StcO_2$ monitoring was started (sensors applied bilaterally over patient's forehead).

Pts arrived in the OR after a mean of 1.3 h after hospital admission. Five pts suffered from acute intracerebral bleeding, while 4 pts presented with acute subdural hematoma and 4 pts presented with acute epidural hematoma. In 2 of 13 pts, excessive ambient light interfered with $StcO_2$ monitoring and no $StcO_2$ data could be obtained. In the other 11 pts, $StcO_2$ values ipsilateral to the intracerebral bleeding, were significantly lower than contralateral $StcO_2$ values. In 2 pts, ipsilateral $StcO_2$ values below 55% were observed. One of these pts suffered from epidural hematoma, the other pt presented with a subdural hematoma. Bone removal resulted in a significant increase in ipsilateral $StcO_2$ in 2 pts. Opening of the dura resulted in a significant increase in ipsilateral $StcO_2$ in 7 pts, while in 2 pts (with intracerebral bleeding) a significant increase in ipislateral $StcO_2$ occurred after effective removal of the bleeding. In no pts, any significant change in contralateral $StcO_2$ values was observed during the whole procedure. In all pts, ipsilateral $StcO_2$ values increased further during procedure and ipsilateral $StcO_2$ values were higher than 80% in all pts at postoperative transfer to the ICU department.

Non-invasive monitoring of absolute cerebral oxygen saturation at the microvascular level might offer new opportunities for the management of pts suffering from acute intracerebral bleeding. Information obtained during urgent craniotomy might guide further neuro-critical care management.

0989

SIX MONTHS SURVIVAL AND OUTCOME PREDICTORS IN PATIENTS WITH SPONTANEOUS SUBARACHNOID HEMORRHAGE

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INTRODUCTION. Describe the prognostic factors associated to a better six months Glasgow Outcome Scale (GOS) in patients with spontaneous subarchnoid hemorrhage (SAH).

METHODS. A retrospective observational study of all patients with SAH, older than 16 years admitted to an intensive care unit (ICU) from November 2006 to February 2009, in a 36 beds polyvalent Intensive Care Unit (ICU). SAH was grading based on initial Glasgow Coma Scale (GCS), Hunt-Hess (H-H), Fisher (F) and World Federation Neurosurgeons Scale (WFNS). The evaluation of functional outcome was made with GOS at discharge and six months later. We compare categoric variables with chi-squared test, and quantitative variables with Student's t test. Multiple regression analysis (statistically significant $p < 0.05$).

RESULTS. 115 patients were included (5 patients were missed on the subsequent process). Characteristics of patients were: age 56.4 years (SD 14.1), 61.7% woman, APACHE II score 12.6 (SD 6.7), Glasgow Coma Scale (GCS) 11.8 (SD 4.3), clinical grading scales: H-H 2.7 (SD 1.4), F 2.9 (SD 1.1) and WFNS 2.7 (SD 1.5), discharge GSC 10.6 (SD 6.2), discharge GOS 3.3 (SD 1.5), worsening control-TAC 41.5%. Complications: rebleeding 4.3%, 31.3% vasospasm, ischemic stroke 22.6%, hydrocephalus 28.7%, ionic alterations 7.8%, coma 23.7%, intracranial hypertension 8.7%, invasive mechanical ventilation 50%, acute renal failure 8.8%. The ICU length of stay was 12.4 (SD 12.2). In our study the six months survival was 63.3%. The graduation 6 months outcome was: 1% vegetative state, 13% severe disability, 16% moderate disability and 70% good recovery. Univariate analysis identified prognosis factors related to 6 months GOS: age (0.02), initial GCS ($p < 0.01$), better/similar control-TAC ($p = 0.05$), discharge GOS ($p < 0.01$), clinical grading scales (H-H; F; WFNS) ($p < 0.001$), ischemic stroke ($p = 0.007$), hydrocephalous ($p = 0.04$), inappropriate secretion antidiuretic hormone (ISAH) ($p = 0.04$), coma ($p = 0.004$), seizures ($p = 0.017$), cardiac alterations ($p = 0.007$), mechanical ventilation ($p < 0.01$) and length of stay in ICU ($p = 0.026$). Multivariate analysis identified APACHE II ($p < 0.001$), initial GCS ($p = 0.032$), discharge GCS ($p = 0.001$), discharge GOS ($p < 0.001$), hydrocephalous ($p = 0.016$) and ischemic stroke ($p = 0.04$) as independent predictors of 6 months GOS. We found that GOS at discharge was lower than GOS-6 months (3.2 vs 4.1), with a statistically significant result ($p < 0.05$).

CONCLUSION. Our study showed that the most significant prognosis factors related to 6 months outcome are: APACHE II, initial GCS, discharge GOS and GCS. Complications related to SAH were associated with prognostic in the following 6 months. The patients with poor 6 months GOS had longer ICU length of stay. Six months outcome was significantly better than discharge ICU, and most of the patients present good recovery.

REFERENCE. 1. Management of aneurysmal subarachnoid hemorrhage. Crit Care Med 37:432–440 (2009)

0990

ONE YEAR FOLLOW UP AFTER INTRA CRANIAL SURGERY IN ELDERLY PATIENTS: A PROSPECTIVE, OBSERVATIONAL STUDY

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BACKGROUND. More and more elderly patients are proposed for neurosurgery. Only few data on elderly patients are available for long-term functional prognosis after intra cranial surgery.

MATERIAL AND METHODS. Inclusion: all patients >70 years old hospitalised for intra cranial surgery. Exclusion: chronic subdural haematoma. Health status was evaluated using 2 scales: Karnosky (KPS) and ADL scales (dependence if KPS $\leq 40\%$ or ADL ≤ 3). Data were expressed as median [Q1–Q3]. Continuous data were compared using Wilcoxon tests, discrete data using Fisher exact test. Primary endpoint: the probability of having an ADL ≥ 4 at 1 year assessed using maximum likelihood logistic regression. $p < 0.05$ for significance.

RESULTS. Between 2003 and 2006, 90 patients (54 females) were included in the survey. 46 (51.1%) patients had meningioma, 17 (18.9%) had high grade glioma, 11 (12.2%) had metastasis, others were adenoma, low grade glioma or neurinoma. Functional prognosis at 1 year was available for all patients. Age was 73.50 [71.25–76.00], ASA score 2 [2–3], KPS at admission 80% [70–90], ADL at admission 5.5 [4.5–6.0]. 2 deaths occurred during the first 28 days and 2 others during the first year of follow up. One year ADL slightly but significantly decreased (1 year ADL: 5.0 [3.5–5.5], $p = 0.002$), but KPS did not change (1 year KPS: 85% [62.5–90], $p = 0.49$). In multivariate analysis, none of the parameters recorded in the study (histology, localisation, scheduled/emergency, anaesthesia, ASA or KPS) predicted ADL to be above 4 at 1 year.

CONCLUSION. Intra cranial surgery in elderly patients is associated with a very low mortality. Despite a slight decrease in the ADL score, those patients remained autonomous 1 year after surgery.

0991

DIAGNOSIS AND MICROSURGERY OF ACUTE SYMPTOMATIC SPONTANEOUS SPINAL EPIDURAL HEMATOMA

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BACKGROUND. Acute Symptomatic spontaneous spinal epidural hematoma (SSEH) is an uncommon cause of cord compression that needs emergent treatment. Without effective management of the symptomatic SSEH, irreversible severe spinal injury would be possible.

OBJECTIVES. We aimed to investigate the diagnosis and surgical management of symptomatic SSEH.

METHODS. Five cases of acute symptomatic SSEH with favourable neurological recovery after emergent microsurgery were prospectively analysed.

RESULTS. The main clinical presentations were root pain and palsy. The main manifestations of MRI (Magnetic Resonance Imaging) were long-segment epidural lesions of high intensity on T1 and T2-weighted images without enhancement. With the microsurgery system, laminectomy via posterior approach and hematoma removal were undergone for all patients. Postoperative MRI confirmed the complete evacuation of hematoma, and all patients achieved full neurological recovery without complications.

CONCLUSIONS. MRI manifestation assisted with the main clinical symptoms may aid the preoperative diagnosis of acute SSEH, and the delay in obtaining Digital subtraction angiography before surgery is worthwhile, especially for those patients with progressive neurological deterioration. Microsurgery is an effective method for treating acute symptomatic SSEH.

Experimental neurology/Miscellaneous: 0992–1005

0992

HYPOXEMIC RESUSCITATION FROM HEMORRHAGIC SHOCK PREVENTS LUNG INJURY THROUGH DECREASED NEUTROPHIL ACCUMULATION, ROS PRODUCTION, AND ATTENUATION OF INTERLEUKIN-8 OVEREXPRESSION

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OBJECTIVES. The mechanism of acute lung injury prevention with shock resuscitation under hypoxemia was investigated.

METHODS. Rabbits were subjected to hemorrhagic shock; they were then resuscitated under normoxemic (NormoxRes) or hypoxemic conditions (HypoxRes). Broncho-alveolar lavage (BAL) was performed in the right lung and BAL fluid oxidative mediators and pro-inflammatory activity were estimated; the left lung was removed for measurement of wet to dry weight ratio, histopathology and estimation of cytokine gene expression.

RESULTS. Cell peroxides were considerably reduced in BAL cells of HypoxRes compared to NormoxRes animals; the same was true for BAL malonyldialdehyde, while BAL total antioxidant capacity was increased. NormoxRes group BAL was a greater stimulator of interleukin (IL)-8 and other pro-inflammatory cytokine release than those of the HypoxRes or sham groups. In the presence of SB203580 and Syk inhibitor and of monosodium urate (MSU), release of IL-8 was decreased suggesting involvement of specific tyrosine kinases. Lung oedema, nitrotyrosine and IL-8 levels, degree of lung infiltration by neutrophils, tissue myeloperoxidase (MPO) and IL-8 gene expression were reduced in lungs from HypoxRes compared to NormoxRes animals.

CONCLUSION. During resuscitation under hypoxic conditions, lung infiltration by neutrophils, generation of ROS and synthesis and secretion of IL-8 is markedly attenuated and lung damage diminished.

0993

IN VITRO AND IN VIVO VALIDATION OF STORED RED BLOOD CELL TRANSFUSION IN PIGS

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INTRODUCTION. The mechanisms associated with immunomodulation after red blood cell (RBC) transfusion are not completely understood, possibly due to methodological biases and presence of comorbidities such as sepsis and trauma in the clinical studies. Therefore, a controlled experimental model of blood cell transfusion in normal animals may be a more appropriate approach to minimize these issues and to study transfusion-induced adverse events.

OBJECTIVES. We designed this pilot study in order to validate in vitro and in vivo the survival of swine RBC stored for 13 days. We also performed a transfusion of stored red blood cells in one hypovolemic animal to test the feasibility of this procedure and to assess possible significant clinical reactions.

METHODS. Blood was collected from one swine and stored in 2 units of RBC. The following measurements (in vitro evaluation) were performed at baseline and after 13 days of storage: volume, hemoglobin and hematocrit, hemolysis index, potassium, sodium, glucose and pH. In vivo validation and hemolysis evaluation were performed by labeling the cells with $Na_2^{51}CrO_4$ and injecting 2.5 ml/kg of labeled cells in 1 autologous and 4 homologous animals. Blood was collected at different intervals (5 min, 10 min, 1, 3, 6, 9, 12 and 24 h) in order to acquire a feasibility curve of erythrocytes up to 24 h after transfusion. Three microliters of each blood sample collected were counted for 300 s in an Automatic Gamma Counter. The animal chosen to receive the allogeneic blood transfusion underwent a controlled hemorrhage of 1,000 mL with replacement of 3000 mL of normal saline and further transfusion of 233.4 mL of RBC stored for 13 days. Hemodynamic and respiratory parameters were measured before hemorrhage and every 2 h until 24 h after transfusion. A splenectomy was performed after death in all the animals to evaluate splenic sequestration of RBC.

RESULTS. In vitro validation of the samples is demonstrated in Table 1.

TABLE 1 IN VITRO VALIDATION OF SWINE ERYTHROCYTES

Unit	Period	Volume (mL)	Hematocrit (%)	Hemoglobin (g/dL)	Hemolysis index (%)	Potassium (mEq/L)	Sodium (mEq/L)	pH	Glucose (mg/dL)
Unit 1	Baseline	196.3	68.8	22.5	0.07	3.5	144	7.09	333
Unit 1	13 day storage	187.1	67.9	22.3	0.09	32.8	118	6.90	362
Unit 2	Baseline	163	67.9	22.3	0.02	3.2	145	6.96	362
Unit 2	13 day storage	144.7	67.2	22	0.1	31.3	120	6.90	370

These results are similar to human RBC stored for equivalent periods. The mean RBC recovery value after 24 h of injection of labeled RBC was 97.5% ± 19%, thus demonstrating a good viability of the samples. The evaluation of splenic hemolysis was negative. The transfusion of packed RBC was not associated with significant hemodynamic and respiratory dysfunctions during the evaluation period.

CONCLUSION. Erythrocytes from pigs stored under human standardized conditions up to 13 days may be used for experimental transfusion studies. This controlled animal model may be useful to study pathogenetic mechanisms related to adverse effects of red blood cell transfusion.

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0994

THE EFFECTS OF GABAPENTIN PRETREATMENT ON BRAIN INJURY INDUCED BY FOCAL CEREBRAL ISCHEMIA/REPERFUSION IN THE RAT

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BACKGROUND. Gabapentin has been reported to have protective effect against ischemic brain injury but the cellular mechanisms of action remain unknown. Heat shock proteins (Hsps) are important regulators of cellular survival and have neuroprotective effects against cerebral ischemia. The present study was undertaken to examine the protective effects of gabapentin pretreatment against cerebral ischemia and if the neuroprotective effects of gabapentin could have relation to the expression of Hsps.

METHODS. Forty male Sprague-Dawley rats (260–300 g) were randomly assigned one of four groups (control group, 0.1 mg/kg gabapentin group, 0.5 mg/kg gabapentin group, 5 mg/kg gabapentin group). In all animals, focal cerebral ischemia was induced by intraluminal middle cerebral artery occlusion for 1 h. The animals of gabapentin groups were pretreated with a single intravenous administration of gabapentin 20 min before ischemic insults. The infarct volume, brain edema and motor behavior deficits were analyzed 24 h after ischemic insult. The caspase-3 reactive cells and the cells showing Hsp70 activity were counted at the caudoputamen and fronto-parietal cortex.

RESULTS. The infarction ratio was significantly decreased in the 5 mg/kg gabapentin group ($P < 0.05$) and brain edema ratios were significantly reduced in the 0.1, 0.5, and 5 mg/kg gabapentin group 24 h after ischemia/reperfusion injury ($P < 0.05$). The number of caspase-3 reactive cells in the gabapentin groups was not significantly different than those values of the control group in the caudoputamen and fronto-parietal cortex, but the number of cells showing Hsp70 activity was higher in the 5 mg/kg gabapentin group than those values of the control group in the caudoputamen and fronto-parietal cortex ($P < 0.05$).

CONCLUSIONS. These results indicate that the gabapentin may have neuroprotective effect and reduce early neuronal injury caused by focal cerebral ischemia/reperfusion, and this could be mediated by expression of Hsp70. However gabapentin pretreatment may not prevent the caspase dependent apoptosis.

KEYWORDS. Caspase-3, Focal cerebral ischemia/reperfusion, Gabapentin, Heat shock protein 70, Rat.

0995

NEUROPROTECTIVE EFFECTS OF CHRONIC LITHIUM TREATMENT FOLLOWING HYPOXIC-ISCHEMIC BRAIN INJURY IN NEONATAL RATS: ^{1}H-MAGNETIC RESONANCE SPECTROSCOPY

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INTRODUCTION. Lithium is used to treat bipolar disorder. Recently, lithium has emerged as a neuroprotective property in preventing apoptosis-induced neuronal death against transient focal and global ischemic injury in the adult animal model. In the developing brain, it has been demonstrated that lithium has protective effects against neuroapoptosis induced by ethanol or anesthetics.

OBJECTIVES. This study designed to investigate the neuroprotective effects of lithium on hypoxic-ischemic brain injury in the neonatal rats. We analyzed the effect of lithium treatment using ^{1}H-magnetic resonance spectroscopy as a non-invasive tool.

METHODS. 7-day-old Sprague-Dawley rats underwent hypoxic-ischemic injury (HII) induced by the ligation of the common carotid artery followed by exposure to about 2.5 h of hypoxia (oxygen concentration was maintained about 7%). After the HII, rat pups were randomly assigned into two groups; control group ($n = 21$) and lithium group ($n = 32$). Two groups of rats were treated daily subcutaneous injection with lithium chloride (1 mmol/kg) or 0.9% normal saline for 2 weeks following the HII. N-acetylaspartate/Creatinine (NAA/Cr), Choline/Creatinine (Cho/Cr) and Lipid/Creatinine (Lip/Cr) ratios of proton magnetic resonance spectroscopy (^{1}H MRS) were evaluated as apoptotic markers on the day of HII, 7 and 14 days after HII. All rats were sacrificed 2 weeks after HII for morphologic scoring.

RESULTS. At 7 days after HII, the Lip/Cr ratios in the lithium group were significantly lower than in the control group ($p = 0.004$, $p = 0.021$, respectively) (Fig. 1). There were no significant differences in the Cho/Cr and NAA/Cr ratio between two groups. The mean morphologic score of the lithium group (3.5 ± 0.9) was significantly lower than the control group (3.0 ± 1.0) ($p = 0.026$).

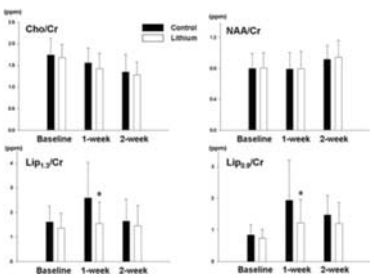

Fig. 1 1H MRS between two groups

CONCLUSIONS. Our in vivo study showed that chronic post-HII treatment with lithium had a neuroprotective effect in the immature developing brain.

0996

COMPARION OF TOLERANCE TO MORPHINE ANALGESIC AND RESPIRATORY EFFECTS: AN EXPERIMENTAL STUDY IN MICE

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INTRODUCTION. Morphine may be responsible for severe poisonings. Morphine toxicity was attributed, in chronically treated patients, to the development of a weaker tolerance for its respiratory effects in comparison to its analgesic effects.

OBJECTIVES. Our objective was to test this hypothesis.

METHODS. Experimental study in Swiss mice with intraperitoneal morphine administration and comparison of both analgesic (using hot plate, $N = 10$/group) and respiratory effects (using plethysmography under 4%-$FiCO_2$, $N = 8$/group); determination of a protocol inducing acute and chronic tolerance; calculation of the 50%-effective dose (ED_{50}); in vitro study of ^{3}H-DAMGO binding on 2 brain structures (periaqueductal grey region and brainstem); comparisons using ANOVA for repeated measurements followed by Bonferroni post-test.

RESULTS. Morphine analgesic effects were dose-dependent. Tolerance to morphine was reached with a repeated 2.5 mg/kg/day administration during 10 days, with a 13-time increase in ED_{50}. Kinetics of morphine-related respiratory effects were parallel to the analgesic effects with a significant increase in inspiratory time (TI) at 30 and 40 min after injection ($p < 0.01$), without any significant modification in the total volume. Mice pre-treatment with a huge dose of morphine (100 mg/kg, subcutaneously) one day before resulted in a significant reduction of 2.5 mg/kg morphine-related effects on the expiratory time (T_E) ($p < 0.05$). Using the same protocol, we observed in mice only a limited tolerance at day 10 in comparison to day 1 without a significant modification in the ED_{50} of the respiratory effects. Tolerance intensity to the analgesic effects was more important than tolerance to the respiratory effects at day 10. This difference was not accompanied by any significant modification in membrane expression of mu-opioid receptors based on differences in ^{3}H-DAMGO binding between the periaqueductal and brainstem regions.

CONCLUSIONS. Tolerance to morphine respiratory effects was more limited than to its analgesic effects at day 10 of repeated administration. Consequently, this model supports the hypothesis that attributes morphine toxicity to the development of a weaker tolerance to its respiratory effects. However, other mechanisms of toxicity should be considered to explain the variability of respiratory depression.

0997

ESTRADIOL DOES NOT IMPROVE RESUSCITATION SUCCESS AFTER HYPOVOLEMIC CARDIAC ARREST IN FEMALE PIGLETS

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INTRODUCTION. Resuscitation from hemorrhagic shock and subsequent cardiac arrest (CA) is a major clinical challenge in the care of trauma patients. Female gender is associated with better cardiac, hepatic and immune functions compared to males after hemorrhagic shock [1]. However, data about gender differences in hypovolemic normothermic cardiac arrest is lacking.

OBJECTIVES. The aim of this study was to evaluate possible beneficial effects of estradiol with vasopressin and amiodarone in hypovolemic CA and subsequent cardiopulmonary resuscitation.

METHODS. Five anesthetized female piglets (25.9 ± 1.6 kg) were bled (29 ± 4% of calculated total blood volume) via right femoral artery to a mean arterial blood pressure of 35 mmHg during 13.4 ± 0.2 min. At the end of bleeding 50 μg/kg 17β-estradiol was given intravenously to all piglets. Afterwards the piglets were subject to 4 min untreated ventricular fibrillation followed by 15 min open-chest cardiopulmonary resuscitation. At 5 min of CA 0.4 U/kg vasopressin and 0.5 mg/kg amiodarone were given intravenously and an infusion of hypertonic saline and dextran (HSD, 7.5% saline, 6% dextran 70) 3 ml/kg was given in 20 min. Internal defibrillation was attempted from 8 min of CA to achieve restoration of spontaneous circulation (ROSC). Hemodynamic variables, continuous cerebral cortical blood flow and blood gas parameters were measured during CPR and up to 180 min after ROSC. Blood samples for 8-iso-PGF2α, 15-keto-dihydro-PGF2α, protein S-100β and troponin I were taken.

RESULTS. ROSC was achieved in 3 out of 5 piglets. Only two of these piglets survived the whole experiment. Another piglet died 10 min after ROSC due to a new episode of ventricular fibrillation. It was difficult to achieve ROSC due to persistent ventricular fibrillation during CPR. The mean number of defibrillation attempts was 13 (range 5–30). The mean coronary perfusion pressure was 12–28 mmHg during CPR. Piglets that achieved ROSC needed a constant dobutamine infusion for hemodynamic stability. Concentrations of troponin I continuously increased after ROSC, reaching maximum levels in the end of the study. During the very early reperfusion phase (5–15 min after ROSC) cerebral cortical blood flow was 6–11% greater than baseline values. Thereafter, it decreased to baseline level during the remainder of the experiment.

CONCLUSIONS. Intravenous 17β-estradiol does not improve survival and hemodynamic parameters in female piglets after experimental hypovolemic cardiac arrest. Further studies are necessary in order to evaluate effects of vasopressin and other inotropic agents in hypovolemic animals' models.

REFERENCE.. 1. Diodato MD, Knoferl MW, Schwacha MG et al (2001) Cytokine 14:162–169

0998

THE NITRONE SPIN TRAP S-PBN EFFECTS ON CEREBRAL PERFUSION IN HYPOVOLEMIC CARDIAC ARREST MODEL IN MALE PIGLETS

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INTRODUCTION. Despite advances in resuscitation techniques and surgical management resuscitation from hemorrhagic shock and the subsequent cardiac arrest (CA) remains a clinical challenge in the care of trauma patients. Sodium 2-sulfophenyl-N-tert-butyl nitrone (S-PBN) is a spin-trap scavenger that significantly alleviates cerebral cellular damage after global ischemia [1].

OBJECTIVES. We hypothesized that S-PBN given during cardiopulmonary resuscitation (CPR) will diminish cerebral damage and improve cerebral perfusion response in hypovolemic cardiac arrest.

METHODS. Five anesthetized male piglets 24 kg were bled 30% of calculated total blood volume via femoral artery to a mean arterial blood pressure of 35 mmHg during 14 min. Afterwards the piglets were subject to 8 min untreated ventricular fibrillation followed by 15 min open-chest CPR. At 9 min of CA 0.4 U/kg vasopressin and 1.0 mg/kg amiodarone, and 60 mg/kg S-PBN were given intravenously. At the same time 3 ml/kg infusion of hypertonic saline and dextran (7.5% saline, 6% dextran 70) was started and given for 20 min. Internal defibrillation was attempted from 11 min of CA to achieve restoration of spontaneous circulation (ROSC). Hemodynamic variables, continuous cerebral cortical blood flow and blood gas parameters were measured during CPR and up to 180 min after ROSC. Blood samples for 8-iso-PGF2α, 15-keto-dihydro-PGF2α, protein S-100β and troponin I were taken.

RESULTS. ROSC was achieved in 5 out of 5 piglets. All these piglets survived the whole experiment. The mean number of defibrillation attempts was 5 (range 2–9). Dobutamine was started 8.3 min after ROSC. The total dose of dobutamine was 19 mg (range 10–26). Cerebral parameters are presented in Table 1 (data is presented as mean ± SD, $n = 5$).

TABLE 1 CEREBRAL PARAMETERS AT BASELINE AND AFTER ROSC

Time point (min)	Cerebral oxygen extraction ratio	Protein S-100β concentration (ng/ml)	Intracranial pressure (mmHg)	Cerebral perfusion pressure (mmHg)	Cortical cerebral blood flow, % from baseline
Baseline	0.319 ± 0.086	0.46 ± 0.09	7 ± 4	82 ± 14	100 ± 0
After hemorrhage	0.613 ± 0.118	0.46 ± 0.089	6 ± 4	29 ± 4	76 ± 20
Restoration of spontaneous circulation					
5	0.263 ± 0.224	–	10 ± 5	68 ± 7	99 ± 41
15	0.475 ± 0.089	–	5 ± 4	62 ± 15	91 ± 33
30	0.503 ± 0.099	0.62 ± 0.16	7 ± 3	58 ± 6	108 ± 20
60	0.502 ± 0.091	0.48 ± 0.08	10 ± 3	57 ± 10	95 ± 11
120	0.475 ± 0.148	0.36 ± 0.09	13 ± 2	60 ± 8	93 ± 10
180	0.484 ± 0.063	0.42 ± 0.04	13 ± 2	62 ± 8	94 ± 9

CONCLUSIONS. S-PBN alleviates cerebral damage and prevents cerebral hyperpefusion in male piglets after experimental hypovolemic cardiac arrest. Further studies are necessary in order to evaluate effects of other spin-traps in hypovolemic animals' models.

REFERENCE. 1. Yang Y, Li Q, Shuaib A (2000) Exp Neurol 163:39–45

0999

RENAL DOPPLER RESISTANCE INDEX: EARLY MARKER OF SPLANCHNIC HYPOPERFUSION AND BLEEDING IN MAJOR TRAUMA WITH A BORDERLINE HEMODYNAMIC STATUS

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INTRODUCTION. Renal Doppler is a non-invasive, suitable for routine use and reliable examination that can highlight a splanchnic renal hypoperfusion in the early stage of hypovolemic shock.

METHODS. In 30 adult patients with major trauma (ISS Score > 12), mean age of 55 years old (range 17–65), we analysed the Renal Doppler resistance index at admittance (within first hour from trauma) and we related Renal Doppler resistance index to arterial blood gas analysis (Hb, BE, lattati, CO_2, pO_2, ph) and outcome in the first 24 h (mortality, ICU admittance, eritrociatis transfusion).

RESULTS. Patients with higher Renal Doppler Resistance Index at admittance (0.80 vs 0.64), presented hypovolemic shock (Mean Arterial Pressure <60 mmHg for >30 min) within the next 24 h, needed more red blood cells transfusion (3 ± 3 Units vs 0 ± 1) and needed more ICU admittance (75 vs 5%). Renal Doppler Resistance Index was significantly related ($p < 0.05$) with Base Excess Deficit (8 ± 5 vs 3 ± 2) and pCO_2 (32 vs 38 mmHg). No relation was observed between Renal Doppler Resistance Index, pH, lattati and Hb.

CONCLUSIONS. Renal Doppler Resistance Index in major trauma patients without shock is an early marker of beginning hemodynamic lability.

1000

COLLABORATION OF EMERGENCY TEAM MEMBERS DURING ADVANCED LIFE SUPPORT

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AIMS. Cooperation of the members in emergency teams is very crucial to reduce the waste time and increase the chance of survival in critical care situations. The good teamwork may be achieved by continuous practicing of team members only. The structure of the Hungarian Emergency Medical Service (EMS) has changed in the last decade, new positions and staffs appeared in this altered system. Until recently there was no study available to assess the collaboration, and tasks of members in teams. Our goal is to analyze nurses' tasks and physician's attitude about advanced life support (ALS) skills of nurses according to daily routine.

METHODS. A representative cross sectional study design was applied with self-fill-in questionnaire about nurse's tasks and physician's attitude about nurse's duties in ALS process. The questionnaires was distributed between September and November 2007 in 24 (out of 31) emergency departments. In this survey 159 physicians' and 327 nurses' questionnaires were processed. Chi-square and Student's t test was used for comparison of variables. p-values less than 0.05 were considered statistically significant.

RESULTS. According to nursing answers their participations in different steps of ALS were low (17.7–68.2%). Several important steps of resuscitation as chest compression ($p = 0.029$) and defibrillation ($p < 0.001$) are significantly rarely were performed by nurses than the expectation of medical staff. But the achievement of mask-bag ventilation, intravenous access and drug administration did not show difference between medical and nursing staffs. Significantly larger part of male nurses were applied mask-bag ventilation ($p = 0.001$), and chest compression ($p < 0.001$), whereas the greater proportion of female nurses have been done intravenous ways ($p = 0.001$) and administered drugs ($p = 0.002$) in nursing practice during ALS. The tendencies of active participation of nurses in ALS process were increased with age of nurses.

CONCLUSIONS. The active participation of nurses during ALS was lower than required especially in cases of chest compression (49.8%) and defibrillation (17.7%) skills. If the assembling of emergency team is impaired the effectiveness of teamwork may be reduced critically. The low involvement of nurses in ALS and gender differences of duties highlight to determined the exact tasks of nurses and increased the collaboration of teamwork between the members of staff by more practicing.

REFERENCES. 1. Thomas EJ, Sexton JB, Helmreich RL (2003) Discrepant attitudes about teamwork among critical care nurses and physicians. Crit Care Med 31(3):956–959
2. Manser T (2009) Teamwork and patient safety in dynamic domains of healthcare: a review of the literature. Acta Anaesthesiol Scand 53(2):143–151

1001

IS THE ISS A PREDICTOR OF HEALTH STATUS IN THE SEVERE TRAUMATIC PATIENTS

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INTRODUCTION. Severity of traumatic patients is categorized by the ISS index and it is related with survival. Patients with an ISS $\geq$15 are considered to suffer a severe trauma. Although the follow-up in these patients is a difficult as consequence of different types of injury we want to know if health status and disability of the patients is related to anatomical lesions described with the ISS index.

OBJECTIVE. To determine if ISS could be a good predictor of long health and functional status.

METHODS. From a database of patients from January to December of 2005 patients with an ISS greater of 15 and alive were selected to perform a telephone interview. The interviewers were instructed to perform de SF-12 (Short form 12) to realize the general Health status and the HAQ-DI (Health Assistance Questionnaire-Disability Index) to realize the functional status of the patients. Results of SF-12 were divided in good health if the Physical Component Summary (PCS) and Mental Component Summary (MCS) were between 40 and 60. Results of HAQ-DI was divided in none disability, low disability, moderate disability and high disability for 0; 0.1–1; 1.1–2 and more than 2 respectively. Oneway ANOVA test was applied and $p < 0.05$ was considered significative.

RESULTS. A total of 23 patients accepted the interview and completed both questionnaires. Mean age was 44.9 $\pm$ 19.4 with median ISS of 24.0 range (16–45). All patients except two, with low disability, low PCS and good MCS returned to work.

TABLE 1

	n	ISS	p
HAQ-DI			
None disability	12	25.9 $\pm$ 7.9	
Low disability	8	23.6 $\pm$ 6.9	0.4
Moderate disability	3	20.0 $\pm$ 3.6	
High disability	0		
PCS			
Low health	9	22.1 $\pm$ 4.8	
Good health	14	25.8 $\pm$ 8.2	0.2
High health	0		
MCS			
Low health	3	26.0 $\pm$ 7.9	
Good health	18	24.6 $\pm$ 7.5	0.6
High health	2	19.5 $\pm$ 2.1	

CONCLUSIONS. ISS value is not a good predictor for long-term health and functional status. Return to work is not related to the presence of disability.

REFERENCES. 1. Gillen M et al (2004) J Occup Rehab 14(2):89–105
2. Schluter P et al (2006) Anz J Surg 76:886–893

1002

COMPARISON BETWEEN TWO DIAGNOSTIC TOOLS FOR ICU DELIRIUM

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INTRODUCTION. Delirium associated with ICU admission is a frequent pathology that has shown to increase mortality of critically ill patient and, in many cases, may go unnoticed to the clinician. Diagnostic tools used in other patients are not applicable to patients in intensive care. There have been proposed several specific diagnostic methods for ICU patients, such as the scale CAM-ICU (Confusion Assessment Method) and ICDSC.

MATERIAL AND METHODS. 350 assessments were performed simultaneously with both diagnostic methods in 91 patients admitted to a medical ICU. Each patient's possible risk factors for delirium were recorded, as well as scores on various severity scales, the depth of sedation according to the RASS and the score on Glasgow Coma Scale. In a multivariate, binary logistic regression analysis, the risk factors for deliriums have been studied. When the results in the two methods differed in the diagnosis, the various factors that could influence this disparity were investigated.

RESULTS. 46.2% of patients in the study were diagnosed of delirium with either (or both) method during their admission to the ICU. 38.5% were diagnosed by CAM-ICU, and 40.7% by ICDSC. Among the patients diagnosed of delirium by CAM-ICU, 84.7% were diagnosed of delirium by ICDSC scale valued simultaneously. Among those diagnosed using ICDSC, 74.8% were also diagnosed by CAM-ICU. The mean severity index of delirium among patients diagnosed using CAM-ICU was 2.68.

Factors associated with the development of delirium during ICU admission were the presence of neurological worsening (<0001), sensory deprivation ($p = 0003$) or sepsis ($p = 0001$) and treatment with benzodiazepines (<0001). Among the factors that were associated with the disparity between the two scales, only the diagnosis of delirium by CAM-ICU was associated with worse scores on Glasgow Coma Scale ($p = 0002$) and worse score on the SOFA scale($p = 0016$), while none of the factors studied were associated with the diagnosis only by ICDSC.

CONCLUSIONS. The presence of neurological disturbance, sensory deprivation or sepsis, and treatment with benzodiazepines were associated with the development of delirium in our series. The GCS score has a great influence on the diagnosis of delirium using the CAM-ICU system, since most patients with some degree of altered level of consciousness were diagnosed by that scale, but not with ICDSC. This may lead to overestimate the incidence of delirium using CAM-ICU in patients with neurologic deficits or sedation. Further studies are needed to define the ideal tool for the diagnosis of delirium in the ICU.

1003

MANAGING DELIRIUM IN INTENSIVE CARE

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INTRODUCTION. Delirium is a significant clinical entity that occurs in 11–80% [1] of the critically ill patients. It is an independent predictor of increased mortality at 6 months and prolongs the stay of ventilated patients in intensive care [2]. It may be associated with prolonged hospital stay and a high rate of cognitive impairment at discharge [3]. These factors contribute to amplified intensive care and hospital costs [4].

OBJECTIVES. To find out the existing practise of managing Delirium in Intensive care in UK.

METHODS. A nationwide telephonic survey was undertaken; data was collected by interviewing the doctors within 33 intensive care units in UK.

RESULTS.

- 67% of the Survey was answered by Registrars, 27% by Consultants and 6% by Senior House officer/foundation year doctors.
- Only 39% were aware of any guidelines/recommendation in the management of ICU delirium.
- 94% used subjective measures to assess and identify delirium in intensive care, while only 6% used objective findings.
- Based on UK Clinical Pharmacy Association guidance[5], only 61% got all the components right, with regard to clinical features of ICU delirium.
- 70% used Haloperidol as their first line management of ICU delirium, whereas 27% used benzodiazepine, and 3% used other agents.
- 58% used benzodiazepine as their second line management of the ICU Delirium, while 24% used haloperidol, and 18% used others.
- 100% practise some form of non pharmacological methods in managing delirium. 97% practiced sedation hold.
- 82% started pre existing psychiatric medications immediately (within 48 h)/as soon as they could in ITU patients, 13% delayed their use (after 48 h).
- 73% used sedation or agitation score in ITU.

CONCLUSIONS. Awareness among ITU medical staff is poor with regard to recommendations or guidance on management of delirium. Incorporation of recommended guidance based assessment and management of delirium in the ICU and awareness processes may improve long-term patient outcomes. It may also facilitate judicious utilisation of resources.

REFERENCES. 1. Ouimet S, Kavanagh BP, Gottfried SB, Skrobik Y (2007) Incidence, risk factors and consequences of ICU delirium. Intensive Care Med 33:66–73
2. Ely EW et al (2001) The impact of delirium in the intensive care unit on hospital length of stay. Intensive Care Med 27:1892–1900
3. Ely EW, Shintani A, Truman B, Speroff T, Gordon SM, Harrell FE Jr et al (2004) Delirium as a predictor of mortality in mechanically ventilated patients in the intensive care unit. JAMA 291:1753–1762
4. Milbrandt EB et al (2004) Costs associated with delirium in mechanically ventilated patients. Crit Care Med 32:955–962
5. UKCPA (2006) Detection, prevention and treatment of delirium in critically ill patients, version 2006

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1004

PROFILE AND OUTCOME OF TOXICOLOGY CASES ADMITTED TO ICU OF A TERTIARY CARE HOSPITAL IN URBAN INDIA

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INTRODUCTION. Poisoning is an important health issue. However, magnitude, circumstances of exposure, the types of poisoning and overall outcomes vary. The variables include degree of industrialization and urbanization, type of agricultural activities and available medical expertise.

OBJECTIVE. The study was conducted to determine the epidemiology of acute toxicology in patients admitted to ICU from July 2006 to March 2009.

METHODS. Data on patient demographics, psychological analysis, toxins involved, use of toxicology screen and toxidromic recognition were collected from the hospital records retrospectively.

RESULTS. Of the total 1,478 patients admitted to ICU, 138 (9.3%) were toxicology cases. Of these 70 (50.7%) were males and 68 (49.3%) females. The mean age was 34.5 years and ranged from 18 to 78. Mean APACHE II was 10.8 ± 5.5 (range 5–34). PDR calculated was 14.5 ± 11.9. Mean SOFA 3.9 ± 3.2 (range 1–16) Majority 66/138 (47.8%) admissions were from age group 21–30 years followed by 34/138 (24.6%) from 31 to 40 group. Most 89/138 (64.4%) were admitted in night. Time of presentation was within 2 h in 58/138 (42%) and 2–6 h in 49/138 (35.5%) patients. Thirty two (23%) consumed either two or more toxins or there was a history of alcohol co-ingestion. The most common agents were benzodiazepines 41/138 (29.7%), followed by alcohol 34/138 (24.63%), and opioids 10/138 (7.2%). The most common mode of poisoning was suicidal (78.26%), followed by accidental (14.5%). The route of exposure was mainly oral (97.8%). The highest incidence of poisoning was due to drugs (46.3%) followed by household agents (13%), agricultural pesticides (2.8%), industrial chemicals (4.3%), and plant products (2.8%). Many of them had history of psychological disorders majority (34.8%) being depression followed by anxiety (11.6%). Urine toxicology screen was used in 66/108 (61.1%) and was positive for 45/66 (68.2%). Most (28/45) tested positive for benzodiazepines followed by cannabinoids in six. Renal replacement therapy was used in 4 patients, two each for organ support and toxin removal. Inotropic support was given to 14 patients. 13 required ventilatory support. Organ failure, as assessed by sequential organ failure assessment score equal to or more than three, was present in 67 patients (48.5%), with liver in two, renal in 6, respiratory in 21, cardiovascular in 28 and central nervous system failure in 52 patients. ICU mortality was 3/138 (2.8%). All deaths were because of agricultural poisons.

CONCLUSION. The present data gives an insight into epidemiology of poisoning and represents a trend in urban India. The spectrum differs as we cater to urban middle and upper class. Substance abuse attributed to significant number of cases. There is an increasing variety and complexity of toxins.

REFERENCE. 1. Changing patterns of acute poisoning in adults: experience at alarge north-west Indian hospital. J Assoc Phys India 45:194–197 (1997)

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1005

A PROSPECTIVE OBSERVATIONAL STUDY EVALUATING THE CAUSE AND INTERVENTIONS FOR ABDOMINAL COMPARTMENT SYNDROME (ACS) IN HIGH RISK PATIENTS ADMITTED TO MICU

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INTRODUCTION. Sustained increase in intra-abdominal pressure (IAP) defined as intra-abdominal hypertension (IAH) can with ensuing onset of organ dysfunction lead to ACS. The etiology and management varies. Non surgical modalities like nasogastric decompression is useful in patients with gastric dilatation or ileus. Diuretics, flatus tube, colonoscopic decompression are often used. Percutaneous drainage and later surgical decompression if nonoperative measures fail to relieve ACS.

OBJECTIVES. To study the the cause and the interventions for ACS in MICU of a tertiary care corporate hospital.

METHODS. Prospective observational study from June 2006 to March 2009.

IAP was measured in high risk patients with Abviser by standardised techniques. Patients were admitted with Critical care department for diverse clinical problems. Out of 826 admissions 68 were found to have high risk for IAH.

RESULTS.

TABLE 1 DEMOGRAPHY

Groups	ACS	IAH	Control	*p* value
Age	51.5	53.1	54.1	0.08
Sex M/F	18/20	24/9	11/19	0.01
APACHEII	23.3	23.3	23.1	0.93
PDR	46.8	46.9	46.3	0.93
SOFA	9.6	8.8	9.4	0.88
Mortality (%)	9/28 (32.1)	9/33 (27.2)	7/30 (23.3)	

61/826 (7.38%) patients had IAH. IAP was normal in 7 patients. IAH distribution was grade I (9), grade II (13), grade III (11) and ACS (28). Sepsis was the commonest primary diagnosis in 11 patients followed by intestinal obstruction in 6. The primary diagnosis was SAP, post laparoscopy, ascites and polytrauma in two each. There were one patient in each group of intraperitoneal bleed, dengue and post TURP.

TABLE 2 CAUSE ON EVALUATION

Ascites	5
Fluid resuscitation	6
Retroperitoneal bleed	3
Intraperitoneal bleed	3
Bowel perforation	3
Impacted fecolith	3
Pneumoperitoneum	2
Pancreatic abscess	1
Bladder perforation	1
Fentanyl rigidity	1

The indications for intervention were unexplained respiratory deterioration (14), decrease in urinary output (6), critical bleeding (6), source control sepsis (2). There were 19 primary, 9 secondary and 2 recurrent cases.

TABLE 3 INTERVENTIONS

Colloids and diuretics	5
Manual evacuation of faeces	4
Colonoscopic decompression	3
Ascitic tap	5
Peritoneal dialysis catheter	2
Decompressive celiotomy	8
Continuous renal replacement therapy	1

CONCLUSIONS. Our study highlighted varied etiology of ACS in MICU. It also shows various cause dependent modalities that relieve ACS.

REFERENCE. 1. Ivatury R et al (eds) Textbook abdominal compartment syndrome. Landes Biosciences

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ICU careflow and processes: 1006–1018

1006

IS IT SAFE TO MOBILISE PATIENTS ON CONTINUOUS VASOACTIVE INFUSIONS?

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Survivors of prolonged critical care experience poor physical and functional outcomes. Early implemented rehabilitation may mitigate these. Continuous infusions of inotropes/vasopressors are considered often as contraindications to physical rehabilitation. There are no data to guide clinicians regarding appropriate intensities of physical activity in patients on vasoactive therapy.

OBJECTIVES. To audit the incidence of adverse events when mobilising patients receiving vasoactive agents.

METHODS. All physiotherapist-led mobilisations of patients receiving continuous infusions of vasoactive agents were prospectively examined over 8 weeks. Changes in haemodynamic parameters from baseline, adverse symptoms, and levels of physical activity achieved were recorded. Adverse events were defined as one or more of: 25% fall in blood pressure, 25% change in heart rate, signs and symptoms persisting more than 60 s, or early discontinuation of therapy.

RESULTS. 69 episodes of mobilisation occurred in 49 patients (pts). Their median (range) age was 69 (43–90) years. 36 patients were male. 43 (88%) pts had undergone cardiac surgery, 3 thoracic surgery and 3 cardiological procedures. During 61 mobilisations, patients were receiving only one agent: noradrenaline (32 pts), dopamine (17 pts), milrinone (8 pts), dobutamine (2 pts) or nitrates (2 pts). On 8 occasions patients were receiving 2 agents. 64 pts had continuous invasive arterial pressure recording and 2 pts were receiving haemodiafiltration. The maximum level of physical activity achieved was sitting over edge of bed (4), transferring to the chair (14), standing (13), marching on the spot (27), and walking (11). 8 adverse events were recorded. 4 of these represented prolonged dizziness without significant change in cardiovascular parameters (3 necessitating discontinuation of therapy). 4 represented a 25% reduction in blood pressure: 2 were associated with symptoms and 1 with tachycardia. 2 required early discontinuation of therapy. There were no significant differences in dose of vasoactive agent or number of agents being received in patients suffering adverse events (Table 1). 3 pts had been previously mobilised uneventfully on greater doses of vasopressor. All changes resolved when the patient returned to bed. All patients subsequently survived to hospital discharge.

TABLE 1

	No adverse event	Adverse event	*p* value
No. of patients receiving			
1 Agent	55	7	1.00
2 Agents	7	1	
Median (range) dose, mcg/kg/min			
Noradrenaline	0.05 (0.01–0.17)	0.05 (0.01–0.07)	0.730
Dopamine	3.3 (0.6–5.0)	2.7 (2.0–4.0)	0.422

CONCLUSION. 88% of patients were mobilised without event whilst receiving a continuous vasoactive infusions. 50% of events represented dizziness only. Dosage of vasoactive agent was unrelated to adverse events and alone should not be an absolute contraindication to physical rehabilitation.

1007

FACTORS AFFECTING MOBILISATION OF INTENSIVE CARE PATIENTS

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INTRODUCTION. Recently there has been increased interest in the early mobilisation of critically ill patients [1, 2, 3]. Proposed potential benefits include improvements in respiratory function, reduced muscle wasting and decreased intensive care unit and hospital length of stay [1, 4].

OBJECTIVES. The aims of this study were to describe the frequency of utilisation of early mobilisation techniques in critically ill patients and the reasons for inability to conduct the techniques.

METHODS. A 4-week prospective audit was undertaken in a mixed medical and surgical tertiary intensive care unit. Demographic data collected on all admissions included: age, gender and admission diagnosis. Outcome data included: the number of patients mobilised by a physiotherapist, the nature of mobilisation and the reasons for inability to mobilise the patient.

RESULTS. 106 patients were assessed over 324 patient days. 48% (155 patient days) were ventilated patient days. The patients were predominantly male (66%), mean age 60 ± 20 years with mean APACHE II score of 14.7 ± 7.8. During the patient assessment period, 76 patient days underwent active mobilisation (marching on the spot for >30 s or mobilising away from the bed space), of which 17% were ventilated and 83% were non-ventilated. 110 patient days underwent active transfer out of bed to a chair (15% ventilated patient days and 85% non-ventilated patient days) and 67 patient days underwent passive transfer out of bed to a chair (63% ventilated and 37% non-ventilated). Adverse events occurred in 2 of the 324 patient care days (0.6%). Reasons for inability to mobilise a patient during the ventilated patient days included: respiratory instability (28 patient days), haemodynamic instability (17 patient days), presence of a femoral dialysis catheter (15 patient days), neurological instability (14 patient days), and timing of procedures (11 patient days).

CONCLUSIONS. Critically ill patients can be safely mobilised during the majority of their intensive care unit stay, which can be further improved by some simple adjustments in care (siting of dialysis catheters and timing of procedures).

REFERENCES. 1. Morris et al (2008) Crit Care Med 36:2238–2243
2. Bailey et al (2007) Crit Care Med 35:139–145
3. Thomsen et al (2008) Crit Care Med 36:1119–1124
4. Stiller K (2007) Crit Care Clin 23:35–53

1008

INTRAHOSPITAL TRANSPORT OF CRITICALLY ILL PATIENTS—A PROSPECTIVE PILOT STUDY OF CRITICAL EVENTS

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INTRODUCTION AND OBJECTIVES. The critically ill patients on numerous occasions need to be transported from one section of the hospital to the other for diagnostic, therapeutic or operative procedures. During the intrahospital transport, a number of critical events have been reported with incidence ranging form 21 to 84%. These critical events mainly include variation in blood pressure, airway obstruction, hypoxaemia, cardiac dysrrhythmias and even frank cardiac or respiratory arrest. In addition, lack of appropriate monitors and advanced supportive care and absence of trained nurse(s) to transport a patient safely to areas within the hospital, add to the adverse untoward events during Intrahospital transport. However, the incidence of adverse outcomes from transport related complications is not well documented. So this study was designed to documents the critical events during the intrahospital transport of critically ill patients. An attempt is also made to recommend guidelines for safe transport of these patients.

METHODS. 55 critically ill patients requiring movement within the hospital were prospectively studied. Cardiovascular and respiratory parameters including oxygen saturation (SpO_2) and end tidal CO_2 ($ETCO_2$) were recorded using a battery powered monitor (Propaq 102 EL, Protocol Inc., USA) during the transport; ventilation wherever needed, was provided using a self inflation bag by a nurse, however a critical care nurse accompanied all the patients. A note was also made of complications related to equipment, personnel and route itself.

RESULTS. 85% of patients showed critical changes in pulse ($p < 0.001$), 83% developed haemodynamic instability ($p < 0.001$). 72% showed significant fall in SpO_2 ($p < 0.001$) and 93% of ventilator dependent patients showed changes in $ETCO_2$ ($p < 0.00$). Equipment related complications were encountered in 60% of the moves ($p < 0.001$) while 31% of the moves ($p < 0.05$) required a major intervention. Inexperienced Nurse resulted in life-threatening situations during two moves. Severity of the illness and total duration of transport contributed to frequency of complications. The linear relationship was observed on regression analysis between SpO_2 and time ($p < 0.05$).

CONCLUSIONS. We recommend a portable transport system with patient monitor, ventilator and resuscitative equipments (with sufficient power backup) along with trained Nurse and prior planning of the route for safe intrahospital transport of critically ill patients.

1009

COLLABORATION BETWEEN AN AMBULATORY PALLIATIVE CARE NETWORK AND EMERGENCY MEDICAL SERVICE. A PILOT STUDY

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INTRODUCTION. Ambulatory palliative care networks are increasing, improving the out-of-hospital management of end-of-life patients. The advanced palliative care plan, developed with the patient according to his living will, is a key point. Despite a poor short term prognosis, these patients often require the prehospital emergency system. Physician staffed Emergency Medical Service (EMS) teams have to deal both with prehospital emergency situations and with the care plan. The aim of this study was to evaluate the relevance of a formalized collaboration between a palliative care network and a physician staffed EMS.

METHODS. We conducted an observational retrospective pilot study over 12 months, including all patients from the Boucle Nord palliative care networks and who called the Service d'Aide Médicale Urgente (French EMS system, SAMU) for a life-threatening emergency. A formal procedure has been set up for these situations. In case of a life-threatening situation, the patient or his relatives call first the palliative network physician on duty who has full access to patient's file. The call to the EMS coordination centre (SAMU) is made by the palliative network physician and not directly by the patient himself. Both the palliative network physician and the SAMU physician share the decision whether an EMS team has to be sent out or not. Characteristics of patients, treatments, orientation and outcomes were recorded. Patients were allocated to one of the two groups: respect of the procedure or not. Data were compared between the 2 groups. Man criterion was the proportion of patients for whom the palliative care plan has been respected. Data were compared using a Fisher's exact test. A $p < 0.05$ was considered the threshold for significance.

RESULTS. 30 patients were included. The procedure was point by point followed for 20 patients and not followed for 10 patients. Main distresses were respiratory failure (13 patients), prolonged seizure (5 patients), unbearable pain (4 patients). Patient's characteristics are similar in both groups. A decision of transfer to the hospital was taken for 21 patients. In 5 cases, the EMS physician made a prescription for a left on-scene patient and management was continued by the palliative network. The palliative care plan was respected for 100% patient when the procedure was followed vs 50% when the procedure was not followed ($p = 0.002$).

CONCLUSION. Collaboration between an ambulatory palliative care network and a physician staffed EMS is promising and allows emergency responses for this particular population with a respect of the advanced care plan.

1010

HOW DO WE SET ALARMS IN THE ICU: DATA FROM THE FAIR ICU (FALSE ALARMS IDENTIFICATION AND REDUCTION IN THE ICU) STUDY

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INTRODUCTION. Created by multiple sources, alarms in the ICU generate noise, discomfort and stress for patients, and divert ICU staff attention. Less than 25% of alarms trigger a staff response (adjustment of sensor position, aspiration, treatment change…) and medical opinion is required in only 5.9% of cases [1]. Beside false alarms, some alarms could be generated by inappropriate settings. As there are no guidelines regarding alarms settings in the ICU, we conducted this study to assess variability in alarms settings on the monitor.

PATIENTS AND METHODS. We conducted a single-centre, prospective study during two 21-day periods to assess variability in alarms settings (07/08 and 09/08). After initial setting by nurses, alarms limits for various parameters (arterial blood pressure-ABP, EKG, arrhythmia, RR, SpO_2, $EtCO_2$) were reviewed and eventually modified by the physician (MD) in charge at the beginning of day shifts. Consistency between alarms settings by nurses and physician was recorded, as well as occurrences, type and reasons for modifications of alarms settings during the monitoring period. We also recorded demographic data, motif of ICU admission, ICU length of stay, type and duration of organ support, and SOFA scores.

RESULTS. 144 pts monitored for a total 484 monitoring days have been enrolled in the study. Nurses and MDs disagree on alarms settings in 26% of cases, and we identified major discrepancies in patterns of alarm setting irrespective of patients' condition. Nurses initiated 76% of modifications of alarms settings. They modified 3 ± 2.2 settings at start of day shift in 60% of cases whereas settings were altered in only 28% of cases (4 ± 1.8 changes) at start of night shift. 82% of alarms changes occurred outside of starting shifts. Figures 1 and 2 illustrate the reasons and the main changes in alarms settings.

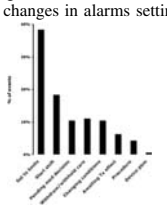

Fig. 1

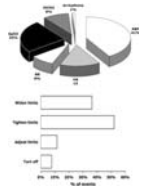

Fig. 2

CONCLUSIONS. Nurses and MDs commonly disagree on alarms settings, and patterns of alarms settings of ICU monitors are unclear. Nurses often modify alarms limits of ABP and SpO_2 during monitoring periods. Definition of patient-specific guidelines to set alarms limits is a pre-requisite to decrease the number of non-clinically relevant alarms and improve patient safety in the ICU.

REFERENCE. 1. Chambrin MC et al. (1999) Int Care Med 25:1360–1366

1011

ICU ALARMS—APPROACHES FOR A REDUCTION

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INTRODUCTION. Alarms are frequent on intensive care units (ICU), and their numbers even tend to rise with the introduction of new monitoring techniques. The noise peaks derived from the alarm systems often exceed 80 dB and are comparable to noise levels next to busy streets, thereby providing potential health hazards to patients and staff. Furthermore, low specificity of the alarms may lead to reduced alertness of staff which can result in missing responses to relevant alarms, eventually leading to a reduction of the clinical sensitivity of the alarm system. Previously, we established an experimental setting for generating a database of physiological data and clinical alarm annotations, and we here report the analysis of the completed database as well as possible solutions for a reduction of alarms.

METHODS. The study was performed as a prospective observational clinical study in a medical ICU of a university hospital. Physiologic data, monitor alarms and monitor settings from the cardiovascular surveillance network were recorded at one-second intervals. Bedside video recordings were performed with a day and night camera and clinically annotated offline with respect to alarm relevance and technical validity.

RESULTS. 5934 alarms were annotated during 982 h of observation, corresponding to 6 alarms per hour. About 40% of all alarms did not correctly describe the patient condition and were classified as technically false, 68% of those were caused by manipulation. Only 885 (15%) of all alarms were considered clinically relevant. Most of the generated alarms were related to arterial blood pressure (44%), followed by oxygen saturation (26%) and heart rate alarms (13%). Application of new alarm algorithms based on robust repeated median regression achieved an alarm reduction of 45% with acceptable sensitivity for arterial pressure, but not for heart rate.

CONCLUSIONS. This study showed that even with modern monitoring systems, most alarms are not clinically relevant. Based on our results, several approaches for alarm reduction could be applied. Statistical methods are suitable to reduce the number of threshold alarms, but the high rate of technically false alarms also call for technical improvements. Since many alarms were induced by staff, recognition of certain alarm patterns, i.e. flushing of central lines, or methods for the detection of staff at bedside could also contribute to a reduction of alarms in order to improve patient care.

1012

TEAMWORK FEATURES AMONG ACUTE CARE SETTING NURSES IN HUNGARY

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BACKGROUND. Acute care nursing requires more stronger and intense work relations among the staff. Our aim was to find out working characteristics between nurses' teams in critical care settings (intensive, coronary care, emergency room) and in other acute units (surgery, acute internal medicine).

METHODS. A cross-sectional study design was used to explore teamwork features in a Hungarian hospital in 2008. A pilot tested self fill-in questionnaire was distributed to 130 bedside acute nurses working in the given setting more then 2 years. The tool measured different characteristics and impacts of teamwork on direct patient care. The data analysis was done with chi-square, t test and ANOVA method using SPSS 14.0.

RESULTS. 104 nurses responded (80%). The average age was 37.8 years and 87% of them were female. Almost half of the nurses (44 persons) worked in critical care units and the rest in other acute words (60 persons). In critical care units working atmosphere is better (54 vs 43%, $p = 0.015$), the nursing duties are more standardized (using nursing protocols) (62 vs 40%, $p = 0.009$). Critical care nurses can influence other colleagues work and patient needs more (56 vs 38%, $p = 0.01$). In non-intensified acute care units team members feel more mutual support from and to their superiors ($p = 0.003$). The collegial support and autonomous work are present in both settings.

DISCUSSION. In acute care settings the nurses' team work has a great impact on patient outcome. Only in critical care units have a better regulated nursing process and a stronger coherence in teams although other acute care teams attend more patients.

1013

INTENSIVE CARE NURSES' INFORMATION RETRIEVAL

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INTRODUCTION. Intensive and critical care nursing is developing and evolving enormously all the time. This contributes to the skills of the intensive care nurse to update her/his knowledge and skill bases in intensive care nursing (cf. [1, 2]).

AIM. of this part study is to describe how intensive care nurses search evidence for practice.

METHODS. The data was gathered in Finland in year 2008 from one University Hospital. The convenience sample was 100 (=N) ICU nurses. This study is a part of the competence in intensive and critical care nursing measurement's background section. Nurses answered two questions. How independently they search evidence for practice and use nursing journals in searching evidence. Two open-ended questions were analysed statistically (SPSS 16.0) and by content analysis.

RESULTS. The response rate was 50% ($n = 53$ ICU nurses). Nurses search voluntarily information (92.5%). Nurses search information on (1) literature (books and journals), (2) Internet, (3) Internet health portal (Terveysportti-portal), (4) unit's clinical guidelines (5) educations (6) colleagues (nurses, doctors) and from ICU data systems. Nurses use mostly professional nursing journals (89%) and less common scientific nursing journals: international (23%) and national (19%) nursing journals.

CONCLUSION. Nurses search evidence for practice studiously. More effort should put on use of scientific nursing journals and use of research of intensive care. On the other hand nurses use and read professional literature (nursing books and journals) and Internet. Therefore research results should also be contributed to professional nursing journals and books in appropriate design and further, the articles should be easy to access and available to read through via Internet.

REFERENCES. 1. Adam S (2007) Nursing and allied health professionals in ESICM: 25 years of limited progress. In: 25 years of progress and innovation in intensive care medicine. Medizinish Wissenschaftliche Verlagsgesellschaft, Berlin, pp 359–367

2. World Health Organization (2003) WHO Europe Critical Care Nursing Curriculum. http://www.euro.who.int/document/e81552.pdf. Accessed 8 April 2003

1014

DIFFICULT AIRWAY TROLLEYS IN INTENSIVE CARE

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INTRODUCTION. Managing patients airways in ICU can prove challenging. Difficulty with or failure in airway management may result in significant morbidity and mortality. Rapid access to difficult airway equipment is essential for the provision of safe airway management. Although it is strongly recommended that a designated difficult airway trolley is present within all critical care units there are some critical care units that don't have immediate access to a difficult airway trolley and there are no guidelines in existence to standardise the availability of airway equipment within critical care1.

OBJECTIVES. To survey the availability of equipment within designated difficult airway trolleys on intensive care units and the training in the use of such equipment.

METHODS. Following an internal review of Difficult airway trolleys at Aintree University Teaching Hospital, a tertiary referral centre for ENT and Maxillofacial surgery, we devised a set of proposals for guidance regarding what constitutes the ideal Difficult Airway Trolley. Intensive care units in the UK were contacted to complete an electronic survey enquiring about the presence of a difficult airway trolley, the equipment contained in it and the training available to staff who are expected to use the equipment.

RESULTS. Only 74.4% of responses had a difficult airway trolley on their unit. The majority did not have a consultant in responsible for the airway trolley (62.3%). 97% of units surveyed checked the contents of the trolley either daily or after use and in most cases (85.9%) staff were aware of its location. Approximately three quarters of the units surveyed said that staff where not trained in the use of the equipment available for use.

72.9% of units had an attached list of contents and 58.6% had an attached algorithm for the management of a difficult airway.

As expected there was variability in the availability of equipment within the trolley but in some cases standard equipment such as facemasks, LMAs, guedel airways, etc. were deficient.

In the case of a failure to intubate, failure to ventilate scenario 83.1% of units had a type of kink resistant cannulae for use. However only 51.5% of units had means with which to provide high pressure oxygen to overcome the resistance of the device in order to provide adequate ventilation. 67% of units had capnogarphy. 52.6% of units had a fibreoptic laryngoscope and only 88.5% of units had 24 h anaesthetic cover.

CONCLUSION. Difficult airway trolleys should be present in all intensive care areas.

They are not. Equipment and training varies. We understand what constitutes the ideal contents of a difficult airway trolley is open to debate and we hope this will fuel discussion and lead to a consensus of opinion as to what should be or should not be included and ensure that all doctors receive formal training in the management of the difficult airway.

REFERENCE. 1. Goldhill D, Cook T, Waldmann C (2009) Editorial. Anaesthesia 64:351–357

1015

OUTREACH AND RESUSCITATION: ARE THERE BENEFITS TO COMBINING THE SERVICE?

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INTRODUCTION. Over the past decade, resuscitation training has evolved to include early recognition and treatment of acute illness to help prevent cardiac arrests. The introduction of Critical Care Outreach services to address this issue has also been advocated [1].

St Mary's Hospital, Paddington, commenced a new Critical Care Outreach and Resuscitation team in 2007. This service was formed by the amalgamation of the existing Resuscitation Training team with the newly developed Critical Care Outreach service. It was foreseen that the linking of the two teams would lead to a more 'joined up' service. The Practitioners working in the combined role have now been in post for over 1 year.

OBJECTIVES. A review was carried out to assess the impact of the implementation of the combined Outreach and Resuscitation service.

METHODS. Audit data was collected using the Medicus PDA system and MS Excel. A qualitative survey was also carried out using a free-text questionnaire.

RESULTS. It would appear that there is an overall benefit of having competent and experienced Practitioners both teaching and providing resuscitation and critical care in the ward environment. Both the Outreach and Resuscitation Practitioners and the ward staff felt that their clinical skills were maintained and the links between the Resuscitation department and the hospital were improved.

CONCLUSIONS. The Outreach and Resuscitation Practitioner role improves the credibility of the trainers and the links within the hospital.

This model of having a combined Outreach and Resuscitation service should be replicated in other hospitals.

REFERENCE. 1. "An Acute Problem?" NCEPOD (2005) National Confidential Enquiry into Patient Outcome and Death

1016

MULTIDISCIPLINARY TEAM INVOLVEMENT IN HIGH RISK CARDIAC SURGERY PATIENTS

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INTRODUCTION. High risk cardiac surgery patients require intensive care and a wide range of multidisciplinary team input. A 2007 Healthcare Commission report [1] recommended that the provision of care for patients in the cardiothoracic critical care unit must be reviewed to ensure that it provides continuity of care for patients and is in line with best practice in other cardiac units. We describe the multidisciplinary input of patients admitted to the Cardiothoracic Critical Care Unit (CTCC) of a large Teaching Hospital over a 6 month period and the severity of their condition on admission, examining the relationships between multidisciplinary team (MDT) input and trends in mortality.

METHODS. All patients with Log EuroSCORE > 10 admitted to the CTCC between May and October 2008 were included in this retrospective study. We captured data on log EuroSCORE, duration of ICU stay, number and type of MDT inputs and hospital mortality. 'Interventions' were defined as review or advice documented in case notes by a member of the multidisciplinary team. The MDT totalled 27 different specialties, ranging from Surgeons, Anaesthetists, Cardiologists, Microbiologists, Haematologists, Perfusionists, Physiotherapists, Dieticians, Pharmacists, and Specialist Nurses. Interventions were noted for each patient and were plotted against their Log EuroSCORE and Mortality.

RESULTS. In total 51 patients were included in this study. The average length of stay was 4.3 days. 11 patients died. The total number of interventions documented was 1550 with a range from 9 to 119. The average Log EuroSCORE was 25.4, the highest being 84.4 for an emergency redo aortic valve replacement. The average number of interventions for each patient was 30. The vast majority of these came from the surgeons, intensivists and cardiologists. The remaining MDT (other) interventions number 449 with a range of 7–14, the average 8.8. Very high risk patients (Log EuroSCORE > 40) had a greater number of other MDT interventions (avg. 9.7) but no difference was found in the total number of interventions between the groups (avg. 30). We also found this in the mortality group.

CONCLUSION. All high risk cardiac surgical patients had a minimum of 8 different MDT inputs from non-core team members. There was no statistical difference in the total number of interventions between very high risk patients (EuroSCORE > 40), the mortality group and the rest. A possible explanation for this could be because the length of stay was skewed in the very high risk and mortality groups; either very short or long, hence averaging out to the same number of total interventions between the groups. However the very high risk and mortality groups did have increased input from non-core MDT groups (mean of 9.7 vs. 8.8). This is in keeping with expectations that higher risk patients require more intensive MDT care.

REFERENCE. 1. Investigation into cardiothoracic services at the Oxford Radcliffe Hospitals NHS Trust—March 2007

1017

AN EDUCATION-BASED INTERVENTION REDUCES CATHETER-RELATED BLOODSTREAM INFECTION IN THE INTENSIVE CARE UNIT AND CHANGES PUNCTURE SITE PREFERENCE

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INTRODUCTION. Infection of a central venous catheter (CVC) occurs often in areas of critical care such as emergency department, intensive care unit and operating theatre. We investigated the role of the introduction site location in CVC sepsis, as well as puncture site in relation to catheter sepsis as defined by the Centre for Disease Control and Prevention, before and after an education-based intervention [1]. It has been shown that subclavian catheters show the least infection rates compared to femoral and jugular catheters.

HYPOTHESIS: Education-based interventions can decrease rate of catheter-related bloodstream infections and change the puncture site from femoral to subclavian.

METHODS. In 2007 and the second half of 2008 all central venous catheters in our hospital were investigated for colonisation. CVC puncture site was registered as femoral, jugular or subclavian. Also the location of introduction: emergency department, intensive care unit or operating theatre was registered. All positive blood cultures with the same micro-organism as on the CVC were registered, according to the definition of the Dutch Working group on Infection Prevention. After an introduced intervention we investigated in the second half of 2008 all CVCs for colonisation and the location of introduction.

The interventions were didactic sessions with the question: "How can we reduce the catheter-related bloodstream infection rate". The educational sessions comprised of hygiene instructions, assistance of the physician, daily care of the CVC, signalling of infection.

RESULTS. The proportion of CVCs inserted into the femoral vein decreased from 58% before the intervention to 40% after the intervention in the ICU. The catheter-related bloodstream infections rate before the intervention was 2.3 cases per 1,000 CVC-days and after the interventions 2.0 cases per 1,000 CVC-days on the ICU. The femoral route was the preferred puncture site for emergency department (45% in 2007 and 100% in 2008) and the jugular site was the preferred puncture site for the operating theatre (60% in 2007 and 90% in 2008).

TABLE 1 ALL CVC'S ON ICU AT VARIOUS SITES AND INFECTION

Site	Number CVC's introduced in 2007	Number CVC's introduced in second half of 2008	% CVC's on ICU in 2007	% CVC's on ICU in second half of 2008	% infected per CVC in 2007	% infected per CVC in second half of 2008
Femoral	234	70	58	40	1.0	1.2
Jugular	38	8	9	5	0	0
Subclavian	131	95	33	55	1.0	0
Total	403	173	100%	100%	Not available	Not available

CONCLUSION. An education-based intervention is a simple method to reduce catheter-associated bloodstream infection rate. The subclavian puncture site increased in the intensive care unit after the didactic training program.

REFERENCE. 1. Warren DK, Cosgrove SE, Diekema DJ et al (2006) A multicenter intervention to prevent catheter-associated bloodstream infections: an observational study with a planned intervention. Infect Control Hosp Epidemiol 27:662–669

1018

CLINICAL ADVANTAGES OF MULTIPLE LUMEN POWER INJECTABLE PICCS IN ICU: A PRELIMINARY REPORT

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INTRODUCTION. Peripherally inserted central catheters (PICCs) are increasingly used in ICU as an alternative option to standard central venous catheters (CVCs), particularly in patients with severe coagulation disorders or at high risk for infection, since their insertion is easy and safe, and their use is associated with a very low incidence of catheter related blood stream infections. Though, PICCs are still considered to be relatively contraindicated in ICU, for several reasons:

(a) the flow through a PICC is limited, due to the high resistance of the device (proportional to the length of the catheter and to its calibre),
(b) ICU patients typically need multiple lumen central venous lines,
(c) peripheral veins for PICC insertion may not be available in the ICU patient,
(d) there are concerns about the possible occurrence of PICC-related venous thrombosis, and
(e) measurement of central venous pressure is not considered reliable through PICCs.

We report the preliminary results of our clinical experience with 2-lumen and 3-lumen power injectable PICCs in ICU.

METHODS. 16 power injectable, open ended PICCs (7 Power PICC© Bard and 9 Pro-PICC© Medcomp, all made of highly resistant polyurethane, apt to tolerate very high pressures, >200 psi) were inserted in 15 patients in ICU. Ten PICCs were double lumen (5 Fr) and six were triple lumen (6 Fr). All PICCs were inserted by trained ICU nurses. US guided puncture of the basilica or brachial veins at midarm was performed in all cases: veins whose diameter was >4 mm were considered suitable for 5 Fr catheters, and veins >5 mm for 6 Fr. The tip of the catheter was positioned in the upper third of the right atrium by using the EKG method.

RESULTS. All 16 PICCs were successfully inserted. No insertion-related complication was detected. Most catheters stayed in place for more than 2 weeks: in six cases, the patient was transferred to another ward while the PICC was still in place. While in ICU, no PICC was removed because of complications. Complications were: one accidental dislocation + one thrombosis of the axillary vein, both occurring after the patient had been transferred to a non-intensive ward. There was no catheter-related blood stream infection. Most PICCs were easily used for high flow i.v. infusions (>1,000 ml/h, by infusional pump), as well as for measurement of the central venous pressure.

CONCLUSION. Double lumen and triple lumen power injectable PICCs can be successfully utilized in ICU patients requiring high volumes of fluids, and/or multiple i.v. lines and/or monitoring of the central venous pressure. Insertion failures can be minimized by inserting the catheter via ultrasound guidance. Catheter related thrombosis can be minimized by the choice of a vein with appropriate calibre and by careful positioning the tip by the EKG method.

End-of-life in the ICU: 1019–1029

1019

LIFE-SUSTAINING-TREATMENT LIMITATION IN ICU: A WELL ESTABLISHED AND IMPROVED PRACTICE WITH CRITICAL PATIENTS

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INTRODUCTION. Patients who do not recover despite intensive treatment or whose likelihood of survival with a good quality of life is very poor, recommendations about end-of-life care in ICU advise starting a deliberation process in order to decide whether or not to carry out Life-Sustaining-Treatment Limitation (LSTL). This procedure has been developed in our ICU with a new protocol that includes a standard order form.

OBJECTIVE. To analyze the LSTL procedure, which treatment was withheld or withdrawn, the differences between patients with LTSL and the remaining cases, and the clinical course of patients with LTSL.

METHODS. prospective observational study including all consecutive patients who were referred to our medical-surgical ICU in 2008. Data are expressed as median ± SD, compared with a percent confidence interval of 95%.

RESULTS. During the study period 679 patients were admitted to ICU, with a mortality rate of 11.48%. The decision to carry out LSTL was made in 65 patients (9.57% of patients admitted to ICU); the decision was documented by the specific form in 63 cases (97%) and the others with annotations on the medical record. During the study period 78 patients died, seven were brain stem dead and became organ donors; from the 71 remaining patients who died, LSTL was applied in 51 cases (73.91%). Ten LTSV patients were discharged from ICU: three of them died on the ward and seven were discharged alive from the Hospital. Compared to survivors, patients with LTSL were older (mean age 72 ± 13.38 vs. 62 ± 18.15 years, $p < 0.001$) and had higher severity scores: APACHE II (21 ± 7.44 vs. 13 ± 8.39, $p < 0.001$) and SAPSS II (51 ± 16.70 vs. 31 ± 17.85, $p < 0.001$). Patients who died despite full treatment were younger than LTSV-patients (mean age 65 ± 18.02 vs. 72 ± 13.38 years, $p < 0.05$) and more severe: APACHE II 29 ± 8.13 vs. 21 ± 7.44 ($p < 0.05$) and SAPSS II 63 ± 16.72 vs. 51 ± 16.70 ($p < 0.05$). There were not gender differences in cases of LTSV or with full treatment. Median length of stay in UCI before LTSV implementation was 6 days. LTSV was proposed by physicians in 37 cases, by patients' relatives in six cases and by doctors and families at the same time in the 21 remaining cases. All LTSV patients would not receive cardiopulmonary resuscitation. Decision to maintain but not to increase treatment was made in 25 cases. Treatment was withheld in 35 cases, most of all not to start dialysis (21 cases). In 37 patients treatments were withdrawn: mechanical ventilation in 24 cases (15 weaning and 9 terminal extubation), dialysis (21), vasoactive drugs (21), and nutrition (8).

CONCLUSION. In patients admitted to ICU, withholding or withdrawing life-sustaining-treatments precedes the process of dying in most cases, after a period of intensive therapy. Patients with LTSL are older and have higher severity scores than the others. Dialysis, mechanical ventilation and vasoactive drugs are the therapies which are withheld or withdrawn the most.

1020

PATIENTS PREFERENCES FOR DISCUSSION OF WITHOLDING OR WITHDRAWING LIFE SUSTAINING TREATMENT

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INTRODUCTION. Decisions to forgo life sustaining treatment are among the most challenging that physians and patients face. Decisions are made at patient explicit wishes or if not available suspected wishes. Previous studies mainly performed in the United States, have demonstrated much variation in life sustaining therapy decisions. Variation may be dependent on diagnosis but as well on the cultural background. There are no data about wishes concerning life sustaining treatment in Austria.

OBJECTIVE. Preferences of patients to discuss life sustaining treatment treated at an internal department of medicine in Austria.

METHODS. 164 patients were interviewed at the end of their stay at the department of internal medicine. 44 of them had discussed life sustaining treatments with relatives or friends before hospital stay.

RESULTS. 47% of patients ≤50 a, 59% of patients between 51 a and 70 a, and 43% of patients older than 70 a wanted to discuss and decide life sustaining treatment, when asked at the end of their hospital stay. 80% (<50 a), 89% (51–70 a) and 58% (≥71 a) with a positive decision wanted life sustaining treatments like CPR, admission to the ICU and artificial ventilation. None of the patients under 50 years, 8% of the patients between 51 and 70 a, and 2% ≤71a were bothered by the discussion. 44, 46 and 22% answered to be bothered if the discussion would have taken place at the time of admission to the hospital. 82% of the patients ≤70 years and 64% of the patients ≥71 a wanted to discuss life sustaining treatment in future hospital admissions.

CONCLUSION. More than 80% of patients wanted to discuss life sustaining treatment during there hospital stay, but many of them would prefer to discuss it not at the time of admission. More than half of them did not want to decide life sustaining treatments themselves, those of them who wanted to decide, mostly decided pro life sustaining treatment.

1021

EPIDEMIOLOGY AND FACTORS ASSOCIATED WITH END-OF-LIFE DECISIONS IN A SURGICAL INTENSIVE CARE UNIT

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INTRODUCTION. End-of-life decisions are increasingly common in ICU patients. Reports of factors associated with such decisions in surgical ICU patients are scarce.

OBJECTIVES. To investigate the incidence and possible factors associated with end-of-life decisions in our surgical intensive care unit (SICU).

METHODS. Analysis of prospectively collected data from all patients admitted to the SICU between September 2002 and July 2006.

RESULTS. During the study period, 14,720 patients were admitted to our SICU (61.8 male, mean age 62 years). The incidence of end-of-life decisions was 2.7% ($n = 398$); 1.1% decisions to withhold/withdraw life support and 1.6% ($n = 230$) only do-not-resuscitate (DNR) orders. Patients with end-of-life decisions had higher severity scores on the day of ICU admission, were mostly unplanned admissions, were older, and were more commonly referred from the emergency room or other hospitals compared to those who did not have end-of-life decisions. The incidence of end-of-life decisions increased significantly with the severity of sepsis. ICU and hospital mortality rates were 6.1 and 10.3%, respectively. An end-of-life decision was taken in 29% of the patients who died in the ICU. The ICU and hospital mortality rates in patients with an end-of-life decision were 65.1 and 82.2%, respectively. In multivariate analysis, older age, admission from another hospital, cirrhosis, sepsis syndromes, SAPS II and SOFA scores were independently associated with end-of-life decisions.

CONCLUSIONS. Twenty-nine percent of patients who die on the surgical ICU have an end-of-life decision. Severe sepsis/septic shock was associated with a 16-fold increased likelihood of having an end-of-life decision.

1022

CENTRAL NERVOUS SYSTEM FAILURE IS A MAJOR CAUSE OF WITHDRAWAL IN THE GENERAL ICU

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AIM. To withhold or withdraw life sustaining treatment are common decisions in the intensive care unit (ICU). The objective of this study is to assess the incidence of withdrawal of treatment and the reasons for withdrawal of life sustaining therapy.

METHODS. A retrospective observational, single centre study in a general ICU of a university hospital. All patients admitted to the ICU between November 1, 2006, and October 31, 2007 were included. Age, sex, length of stay, APACHE II score and diagnosis, and SOFA-score were collected for all subjects. Additional data on reasons to withdraw treatment were collected for patients who died in the ICU. Data were extracted from our patient data management system, electronic patient dossier, and handwritten medical charts.

RESULTS. Of the 1,353 patients admitted to the ICU, 218 patients (16.1%) died. Withdrawal of life sustaining treatment preceded death in 83.7% of the cases. Severe and irreversible central nervous system failure was the leading reason to withdraw life sustaining treatment, accounting for 49.4% of the patients in whom treatment was withdrawn. Secondly, in 38.5% of the cases, multiple organ failure was reason for withdrawal of therapy.

CONCLUSION. Most patients in our ICU die after the decision to forgo life sustaining treatment. Central nervous system failure is the leading cause of withdrawal of life sustaining treatment.

1023

A STUDY TO EVALUATE THE END-OF-LIFE CARE PROVIDED BY A CRITICAL CARE SERVICE

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AIMS. To explore the quality of the dying and death experience within a critical care service with the perception of relatives providing a surrogate assessment for the patient. To evaluate interventions instigated to facilitate the bereavement process for family members and to assess the standard of information giving and communication that operate within the service.

METHODS. A retrospective study, which surveyed relatives of patients who had died within a critical care service during a two-year period (2005 and 2006). A 31-item questionnaire was utilized to obtain both qualitative and quantitative data. The items were rated on a scale of 1–5, with higher scores indicating a better experience within the area.

RESULTS. During the study period a total of 287 patients died in the critical care area. Of this number, 232 patients were included in the study. A total of 137 completed questionnaires were returned giving a response rate of 59%. Of the respondents, 78% reported that they received good information; 65% believed they were involved in decision-making and 75% responded that they had received adequate spiritual care. For these items relatives were additionally asked to reply on behalf of the patient. Responses were overall positive; however 46% of participants felt they could not respond to these items on behalf of the patient. With regard to pain and symptom management 64% of respondents indicated that they believed the patient was comfortable and 84% reported that staff made all efforts to ensure that their loved one was pain free. Interventions to facilitate the bereavement process for relatives include the issuing of a condolence card to relatives and an annual Ecumenical Service. Although only 45% of respondents attended the service, qualitative data was overwhelmingly positive and relatives reported that this was a key factor in facilitating their bereavement process. Over 80% of relatives expressed the view that communication was adequate and expressed in an appropriate manner. An analysis was conducted using Spearman's Rank Correlation Coefficient to establish what items from the questionnaire are predictive of satisfaction on the part of the relative and the patient. Adequate information and staff support for the relative was strongly predictive of satisfaction as was pain and symptom management. An additional factor that correlated well with satisfaction was being allowed spend time after death with the patient. Aspects that did not appear to have important associations with satisfaction include adequate information and involvement in decision making.

CONCLUSIONS. Good communication, staff support, pain and symptom management were found to be indicative of a quality service. We further found that interventions already in place facilitated the bereavement process for relatives. Findings from this study will serve to optimize our service. Further research involving the perceptions of clinical staff using a similar tool could be valuable.

1024

CHANGES IN OXYGENATION OF TRANSPLANT DONORS AT TIME OF BRAIN STEM TESTING

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INTRODUCTION. Despite a 5% increase in all organ transplants in the UK (2007–2008 data), there has been a 10% decrease in the number of lung or heart/lung transplants being undertaken. This is on a background of an 8% increase in the number of patients on the list for a lung or heart/lung transplant. 20% of those on the list died, or were removed from the list while waiting for their transplant and 57% were still waiting.

Strict criteria exist for the selection of lungs suitable for transplantation. Studies have shown that targeted management of 'marginal donors' can improve oxygenation to meet transplantation standards in 18%.

OBJECTIVES. We examined whether the removal of PEEP and application of FiO_2 of 1.0 during apnoea testing decreased the PaO_2/FiO_2 ratios and increased the likelihood of patients failing to meet the oxygenation criteria.

METHODS. Medical notes of organ donors from the last 5 years of a mixed medical-surgical ICU were reviewed. Data from arterial blood gases and basic ventilatory settings were collected at time of admission, at different points of the brain stem testing period, and at the time of assessment for transplantation.

RESULTS. Results from the first 13 cases are presented here. The mean age of organ donors was 36 years. The cause of death was head injury in 31%, intracranial haemorrhage in 46% and hypoxic brain injury in 23%. The average length of ventilation was 53 h. From these 13 patients, 5 had lungs retrieved for transplantation. Prior to brain stem testing, 9/13 (69%) of patients fulfilled the criteria of PaO_2/FiO_2 ratio grater than 40. After brain stem testing, at assessment for suitability for transplantation, 3 of those patients (23%) suffered a decrease of PaO_2/FiO_2 ratio to below 40. In total, 7 (64%) patients had a decrease of PaO_2/FiO_2 ratio following brain-stem death testing.

CONCLUSIONS. The preliminary data suggest that some patients may sustain a decrease in PaO_2/FiO_2 ratio following apnoea testing to establish brain stem death. This reduction may breach predefined thresholds and label them as unsuitable for lung donation. Studies in anaesthetic populations have established that use of high inspired oxygen concentrations predisposes to atelectasis and increased shunt fraction. Prolonged ventilation with an FiO_2 of 1.0 followed by apnoeic oxygenation may produce similar effects in potential transplant donors. Maintenance of PEEP during, and recruitment manoeuvres after brain stem testing may help to negate possible detrimental effects of current apnoea testing practice

REFERENCES. 1. http://www.uktransplant.org.uk
2. Gabbay E, Williams TJ, Griffiths AP et al (1999) Maximising the utilisation of donor organs offered for lung transplantation Am J Resp Crit Care Med 160(1):265–271
3. Venkateswaran RV, Patchell VB, Wilson IC et al (2008) Early donor management increases the retrieval rate of lungs for transplantation. Ann Thorac Surg 85:278–286

1025

MORTALITY AND WAITING TIME LIST IN PEDIATRIC HEART TRANSPLANT IN STATUS 1A PATIENTS

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OBJECTIVE. This study is a review of the new program of pediatric heart transplant in Vall d'Hebron University Hospital in Barcelone.

BACKGROUND. We review the waiting time of the children listed for heart transplant, the mortality and complications. We focus our study in the different ages and status of the patients waiting an organ.

METHODS AND RESULTS. During the last three years 87 children has been inclosed in the list of heart transplant in Spain. The median age was 10.8 years, and the median weight was 22.8 kg and 24%) were female. The primary cardiac diagnosis that led to heart transplant listing was congenital heart disease in 49%, cardiomyopathy in 27%, and myocarditis in 22%. Overall, 63% were listed as status 1A, 25% as status 1B, and 12% as status 2. The ONT published a complete annual report about the number of pediatric heart transplant and the number of children in the waiting list. Almost 50% of the children gets out of the list in 5 month. The difference about age, weight and clinical status are very important with a significant increase of waiting time and mortality in the group of patients from 1 to 3 years, less than 10 kg and status 1A patients which rise to 65% mortality. Patients from 10 to 16 years in status 1 are less than 30 days in the waiting list with an acceptable mortality of 9.8%. The status 1A patients under ventricular assist device has the poorest outcome with 30% mortality in the waiting list and nearly to 80% after 90 days in waiting list.

CONCLUSIONS. In spite the improvements of getting appropriate organs for children, the waiting list and mortality for heart transplant remains still high. The distribution inside the list not only by clinical status but also weight and age is necessary looking better outcomes. The continuous promotion of organ donation in children in new inmigrant population is the key because the indications are growing year by year.

1026

IMPROVEMENT OF POTENTIAL DONOR PATIENT'S REGISTRATION FROM 2003 TO 2006: THE SETTING OF DONOR ACTION PROGRAMME IN A FRENCH TEACHING HOSPITAL

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INTRODUCTION. In response to a sharp decrease in the registration of organ donors in our institution, we started in our University Hospital in 2003 the international *Donor Action* program. This program, conceived to alleviate organ shortage comprises 2 parts: a MRR (Medical Record Review) and a HAS (Hospital Attitude Survey), which evaluates hospital staff opinion and knowledge regarding donation, and training acquired.

METHODS. Therefore we conducted a retrospective analysis of clinical charts (MRR) of all patients who died between 2003 and 2006 in the five different ICU's of our institution. We recorded: the number of potential donors, overt brain death, and also family consents, effective organ donation. Then, we collected 736 anonymous questionnaires (HAS) which had been proposed to all ICU staffs, in 2004. These data were analyzed using the Donor Action database.

RESULTS. The answering rate was 66% (doctors: 59%, paramedics: 67%). Professionals were much in favour of organ donation for themselves and their relatives, despite of a heterogeneous knowledge of organ donation. All highlighted a need for further training to diagnose and handle donors and relatives.

TABLE 1 RETROSPECTIVE ANALYSIS OF CLINICAL CHARTS

Year	Deaths	Potential donors (% of PD)	Brain death (% of PD)	Family approach of BD patients (%)	Donations (%)
2003	482	240 (50)	48 (20)	40 (83)	22 (46)
2004	440	203 (46)	51 (25)	44 (86)	35 (68)
2005	464	237 (51)	60 (25)	47 (78)	26 (43)
2006	433	208 (48)	53 (26)	48 (90)	31 (58)

CONCLUSIONS. *Donor Action* programme made the staff aware of potential donors and brain death patients, with an earlier and more exhaustive detection. However, more efforts should be made to meet and handle families in order to reduce families' refusals.

Donor Action programme is a highly efficient system to evaluate the donation process and assess staff behaviour. The sustained effect of this audit, as observed in our centre, through a 4-year follow-up showed a long lasting impact on donation rates, like in most of French centres which implemented this program.

1027

CONSEQUENCES OF A STRICT DEFINITION OF THE POTENTIAL HEART-BEATING ORGAN DONOR. A THREE-YEAR RETROSPECTIVE ANALYSIS IN A DUTCH UNIVERSITY HOSPITAL ICU

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INTRODUCTION. The leading causes of brain death are traumatic brain injury (TBI), (aneurysm) subarachnoid haemorrhage (SAH) and intracerebral haemorrhage (ICH), which compromise approximately 80–90% of the cases [1–3]. There is a steady decline in the actual number of brain death patients over the past decades as a result of progress in prevention and treatment of these conditions. There is no uniform definition of a potential organ donor that can be used to determine the potential of heart-beating organ donors. Therefore we defined a potential brain death organ donor as a patient with documented severe brain damage of a known origin, a GCS-score of 3 and more than 2 absent brain stem reflexes which includes: pupil, cornea, oculovestibular, oculocephalic and the cough reflex. We applied this definition in a retrospective analysis over the last three years of our ICU.

OBJECTIVES. To estimate the potential of heart-beating donors and determine reasons for non-procurement.

METHODS. Retrospective review of medical charts over 2006–2008, concerning patients with TBI, SAH, and ICH who died during the course of ICU treatment.

SETTING. A 32-bed tertiary general intensive care unit with neurosurgical services.

RESULTS. 555 patients with a diagnosis of TBI, SAH, or ICH were admitted of which 186 died. Of these patients 107 (57%) patients could be determined as potential heart-beating donor. Twenty one (19.6%) patients became a heart-beating donor. Five patients (4.6%) were converted to controlled donation after cardiac death. In 81 of the potential heart-beating organ donors, procurement could not be completed because of; family refusal before complete brain death determination (58%), malignancy (11%), or patient refusal in Donor Register (8.6%) being the most important reasons.

CONCLUSIONS. There is an unused potential heart-beating donors in which procurement could not be completed. Family-refusal is the most important reason for failure to procure organs. In respect to a study performed in 2006 in our hospital, an incline is observed of 26% [4]. With a strict definition of a potential organ donor (GCS-3, with 2 or more absent brain stem reflexes) more than 50% of the patients who died of SAH, ICH or TBI were eligible for organ donation.

REFERENCES. 1. Cohen O, De La Zerda DJ, Beygui R, Hekmat D, Laks H (2007) Donor brain death mechanisms and outcomes after heart transplantation. Transplant Proc 39:2964–2992
2. Opdam HI, Silvester W (2004) Identifying the potential organ donor: an audit of hospital deaths. Intensive Care Med 30:1390–1397
3. Wijdicks EF, Pfeifer EA (2008) Neuropathology of brain death in the modern transplant era. Neurology 70:1234–1237
4. Kompanje EJ, Bakker J, Slieker FJ, IJzermans JN, Maas AI (2006) Organ donations and the unused potential donations in traumatic brain injury, subarachnoid haemorrhage and intracerebral haemorrhage. Intensive Care Med 32:217–222

1028

NON-HEART BEATING DONORS PROGRAM IMPLANTATION IN A NON TRANSPLANT CENTER: A PRELIMINARY REPORT

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INTRODUCTION. During the last few years, non heart beating donation (NHBD) becomes a significant way to improve the shortage of organs available for transplantation. In February 2007, we began the screening and patient's care with potential for NHBD.

RESULTS. During a 24 months period, we have screened 15 patients. We performed 7 NHBD (mean age 31 ± 17 years; range 3–59 years). The diagnosis related to these procedures were severe neurologic damages after trauma ($n = 3$), anoxia ($n = 3$) or intra-cerebral hemorrhage ($n = 1$). The reasons for refusal from the transplant center were age ($n = 3$), medical history ($n = 4$) and sepsis ($n = 1$). Overall, 18 organs were offered and transplanted (kidney $n = 14$, liver $n = 4$). Moreover, tissues (heart valves, bones and hepatic cells) were also sent to the tissue bank.

DISCUSSION. For more than 15 years, our unit has developed an expertise on organ donation. With the evolving modifications in end of life considerations in ICU's, the implantation of a NHBD program appears to be a continuation of the local procurement coordination work. During the same period, the team took care of 322 potentials donors, and more specifically of 15 NHBD. This program was implanted progressively in the unit after consultation of the medical and nursing teams and of course the accordance of the Ethic Committee. A specific psychological support was not included in the program. However, upon request of the staff, psychologist was available. This program represents a hard work for the nursing team and was only possible with the presence of a local coordination (nurse) already in place in our institution since 1994. This point is probably the most important one in the successful introduction of such a program. It is important to point out that contacts with families were especially peaceful. For some patients, the potential of organ donation was indeed suggested by the close relationship when they had to face a hopeless prognosis. Moreover, the local coordinator remains in relationship with the family in the weeks following donation

CONCLUSIONS. NHBD program can be implanted successfully in a non transplant center, but the presence of local procurement coordination is probably mandatory. This program allowed an important increase of organ referred for transplantation. However, the burden of work and the psychological impact for the ICU team need to be carefully supported. In our experience, most of the time, the procedure was particularly well accepted by the donor's family and seems to bring some kind of moral support in the mourning process. Importantly, ethical as well as legal reflections are mandatory to explore the future of the NHBD. Indeed, juridical litigation and public disinformation could create a counter-productive opinion on organ donation in general. The specific role of the intensivist should also be carefully asses especially for the procedure surrounding withdrawal from mechanical ventilation.

1029

THE IMPACT OF EARLY POSTOPERATIVE COMPLICATIONS ON THE COURSE OF QUALITY OF LIFE IN THE FIRST YEAR AFTER CARDIAC SURGERY—A SURVEY IN AUSTRIAN PATIENTS

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INTRODUCTION. Surgery offers cure for many patients suffering from cardiac diseases, such as vessel diseases or valve dysfunctions. The success of intensive care management has improved and more complex diseases can be adequately treated. Co-morbidity and age of patients undergoing cardiac surgery have increased during the last years, often leading to a prolonged stay at the intensive care unit (ICU). Usually, the outcome following surgery is assessed with mortality or morbidity rates. Nevertheless, quality of life plays an important role in recovery after cardiac surgery. The aim of this study was to compare the quality of life in patients with an uncomplicated (<2 days) and prolonged (>14 days) postoperative ICU stay one-year after cardiac surgery at the Hietzing Hospital in Vienna, Austria.

PATIENTS AND METHODS. A standardized state of health questionnaire, the Short Form Health Survey (SF36), was used to evaluate the patient's subjective impression of their health state. We compared patients after a prolonged ICU stay (>14 days) with patients having experienced an uneventful postoperative course, and performed the SF36 questionnaire 3, 6, and 12 months after surgery. Reasons for cardiac surgery were aorto-coronary bypass surgery, valve replacement, combinations of both or complex surgical interventions. Furthermore, the duration and number of medication were investigated.

RESULTS. Patients with a short postoperative ICU stay had, in general, a good state of health and answered most of the questions with scores higher than the median. This response was consistent over the 3 consecutive surveys. In contrast, patients with a prolonged ICU stay had significant more limitations in daily short-term ($p = 0.03$, Mann–Whitney test), and long-term ($p = 0.03$) activities (according to SF36 questionnaire). They also had a significant worse subjective state of health ($p = 0.01$ compared with the control group). These limitations did not improve during the investigated period. No significant differences were observed in questions asking for pain, social contacts, and psychic problems, as well as the subjective estimation of the personal health state. Patients with a prolonged ICU stay still needed more medication one year after surgery.

CONCLUSION. This preliminary analysis demonstrates that patients with a shorter postoperative stay at the ICU seem to have a better postoperative subjective state of health (as assessed with the standardized SF36 questionnaire) than those with a prolonged stay. The effect was even evident one year after cardiac surgery.

Antimicrobial treatments: 1030–1043

1030

USING POPULATION PHARMACOKINETICS TO DOSE GENTAMICIN DURING EXTENDED-DAILY DIAFILTRATION IN CRITICALLY ILL PATIENTS WITH ACUTE KIDNEY INJURY

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INTRODUCTION. Extended-daily-diafiltration (EDD-f), also known as sustained-low-efficiency-dialysis (SLED), is an emerging form of renal replacement therapy (RRT) being increasingly used world-wide for critically ill patients with acute kidney injury (AKI). However, drug dosing remains a challenge to critical care physicians with little pharmacokinetic studies undertaken to date with this specific dialysis modality

OBJECTIVE. To describe the variability of gentamicin plasma concentrations in critically ill patients with AKI necessitating EDD-f using a population pharmacokinetic model and to subsequently perform dosing Monte Carlo simulations to determine which dose regimen achieves pharmacodynamic targets most consistently.

METHODS. This was a prospective pharmacokinetic study. Twenty-eight treatments in 14 critically ill adult patients with AKI requiring EDD-f and therapeutic gentamicin. Gentamicin dosing was undertaken at the discretion of the treating critical care physician. Serial plasma samples were collected. A population pharmacokinetic model was used to describe the pharmacokinetics of gentamicin and perform Monte-Carlo dosing simulations of 3, 5 and 7 mg/kg at various time points before commencement of EDD-f to evaluate the optimal dosing regimen for achieving pharmacodynamic targets.

RESULTS. This is the first known paper to describe gentamicin pharmacokinetics during EDD-f in patients with AKI. A two-compartment pharmacokinetic model described gentamicin clearance on and off EDD-f adequately. The plasma half-life of gentamicin during EDD-f was 9.9 h compared with 24.3 h without EDD-f. Monte-Carlo simulations suggest that that a 7 mg/kg initial dose either 30 min or 1 h before the commencement of EDD-f results in ca. 65% attainment of target $AUC_{0\text{-}24}$ (70–120 mg h/L) and ca. 98% of Cmax (<10 mg/L). None of the dosing regimens achieved satisfactory Cmin targets (<0.5 mg/L) at 24 h.

CONCLUSIONS. Dosing gentamicin 30-min to one-hour before EDD-f enables attainment of target peak concentrations for maximal therapeutic effect, whilst enhancing drug clearance to minimize toxicity. Re-dosing in many patients should occur using lower doses (5 mg/kg) for a course of ≤ 4 doses (where possible) with re-dosing also guided by therapeutic drug monitoring of 'trough' gentamicin concentrations.

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1031

ADMINISTRATION OF VANCOMYCIN USING A STANDARDIZED PROTOCOL: DO WE ACHIEVE THERAPEUTIC SERUM CONCENTRATION IN THE INITIAL PHASE IN CRITICALLY ILL PATIENTS?

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INTRODUCTION. One of the cornerstones of adequate antimicrobial therapy, is the achievement of therapeutic antibiotic serum concentration as early as possible. The aim of this study was to evaluate whether a standardised protocol for vancomycin treatment consisting of a loading dose followed by a continuous infusion results in adequate serum concentrations.

METHODS. This retrospective study includes all patients admitted in our 56 bed tertiary care ICU during the period September 2003 to December 2008 who were treated with vancomycin. Vancomycin administration is standardised: after a body weight adjusted intravenous loading dose, a continuous infusion of 2 g vancomycin q 24 h is started. The dose of the continuous infusion was adjusted on basis of a daily serum vancomycin serum concentration. Vancomycin dosing was considered inadequate if during a 3 day follow up period vancomycin serum levels were <20 mg/L. Data are reported as median and %, and groups were compared with univariate and multivariate logistic regression analysis

RESULTS. 325 patients were included; of these patients 90 patients (27.7%) had inadequate vancomycin concentrations (serum levels: day 1: 13.4 vs. 21.5 mg/L, $p = 0.001$; day 2: 13.6 vs. 22 mg/L, $p < 0.001$; day 3: 15.7 vs. 23.35 mg/L, $p < 0.001$; day 4: 17.1 vs. 24.4 mg/L; $p < 0.001$)). Patients with inadequate vancomycin dosing were younger (48.7 vs. 63.2 years, $p < 0.001$), had a greater body weight (79 vs. 73 kg, $p = 0.012$), and had a trend for lower APACHE II score (17 vs. 18, $p = 0.051$). There was no difference in gender or ICU type where patients were treated. Inadequate treated patients had better kidney function as indicated by a lower serum creatinine (0.59 vs. 0.81 mg/dL, $p < 0.001$), and a lower proportion was treated with renal replacement therapy (2.2 vs. 10.2%, $p = 0.018$). They had higher body temperature at start of therapy (38.2 vs. 37.5°C, $p < 0.001$). Less patients were treated with vasopressors (37.8 vs. 55.3%, $p = 0.005$), but there was no difference between both groups in volume balance at start, CRP levels, and proportion of patients requiring mechanical ventilation. There was no difference in ICU mortality. Multivariate analysis demonstrated that inadequate vancomycin dosing was associated with higher body weight (odds ratio [OR] 1.02 (/kg), $p = 0.018$), and younger age (OR 0.95, $p < 0.001$). There was an inverse relationship with vasopressor treatment (OR 0.51, $p = 0.023$).

CONCLUSION. Despite a standardised vancomycin administration protocol consisting of a loading dose followed by a continuous infusion, a quarter of the ICU patients did not reach therapeutic serum levels in the initial treatment phase. After correction for covariates, greater body weight and younger age were associated with inadequate therapy.

1032

ALVEOLAR EPITHELIAL LINING FLUID LEVELS OF CONTINUOUSLY INFUSED PIPERACILLIN-TAZOBACTAM EXCEED CORRESPONDING PLASMA LEVELS IN SEVERELY ILL PATIENTS

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INTRODUCTION. Piperacillin-tazobactam (pip-tazo) is a broad spectrum antibiotic, used for treatment of ventilator-associated pneumonia (VAP) and other serious infections. The effectiveness of such betalactam antibiotics is best predicted by the duration of free drug concentrations above the minimal inhibitory concentration ($t > MIC$) of infecting pathogens [1]. Continuous infusion (CI) of pip-tazo is an alternative mode of administration which may improve $t > MIC$ but there is little data on drug levels in plasma and corresponding levels at infections sites in critically ill patients.

OBJECTIVES. The aim of our study was to determine concentrations of pip-tazo in plasma and broncho-alveolar epithelial lining fluid (ELF) at steady state during CI, which may serve as surrogate parameters for therapeutic efficacy.

METHODS. After approval by the Ethics Committee, 16 mechanically ventilated critically ill patients were enrolled during treatment in 3 anaesthesiological and surgical ICUs. After a loading dose of 4 g/0.5 g of pip-tazo, 12 g/1.5 g were continuously infused every 24 h. At steady state (67.8 ± 39.5 h after loading dose), a total of 30 blood samples were drawn and bronchoalveolar lavage (BAL) was simultaneously performed in 8 cases (1 sample discarded for technical reasons). Samples were stored at −80°C until analysis by liquid chromatography coupled with mass-spectrometry (LC-MS). ELF-concentrations were calculated from BAL-samples using the relation of $urea_{plasma}$:$urea_{BAL}$ as dilution factor.

RESULTS. Plasma concentrations of pip and tazo ($n = 30$ in 16 pts) amounted to 15.38 ± 8.89 μg/ml, and 1.31 ± 0.95 μg/ml, respectively. ELF-levels ($n = 7$) were 56.63 ± 27.24 μg/ml, and 5.95 ± 3.74 μg/ml. ELF-levels were 368 + 236%, and 587 + 584% of corresponding plasma levels ($n = 7$) for pip and tazo, respectively. The ratio pip:tazo was similar in plasma (11.74:1) and in ELF (9.52:1).

CONCLUSIONS. CI yielded steady state pip plasma concentrations in excess of MICs of susceptible bacteria (≤8 μg/ml, according to EUCAST) in 76.6% of measurements, but ELF levels exceeded 8 μg/ml in all cases. These concentrations were higher than previously reported, which may be explained by the high severity of illness of our patients, as well as differences in sampling and analytical methods [2]. Our data provide further arguments for CI being the preferred mode of administration for pip-tazo in critically ill patients with suspected VAP.

REFERENCES. 1. Krueger WA et al (2005) Antimicrob Agents Chemother 36:1500–1506
2. Boselli E et al (2008) Crit Care Med 30:976–979

1033

THE IMPACT OF BODY WEIGHT ON OPTIMAL DOSING OF AMIKACININ IN PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK

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BACKGROUND. Altered pharmacokinetics (PK) in critically ill patients can result in insufficient amikacin (AMK) concentrations when standard doses are given. Distribution, metabolism, and clearance of many antimicrobials are altered by physiological changes associated with obesity. Some recommendations on dose adjustment for AMK have been proposed for patients with BMI <20 or >30, but no studies have evaluated the influence of patient body weight or body mass index (BMI) on the optimalization of AMK administration, especially in critically ill patients. The aim of this study was to evaluate the impact of body weight on serum AMK concentrations in patients with severe sepsis and septic shock.

METHODS. A loading dose of 25 mg/kg of amikacin (AMK), calculated on actual body weight (ABW), were given to 74 patients with severe sepsis and septic shock in combination of a broad-spectrum b-lactam. Serum concentrations were determined either by fluorescence polarization immunoassay method before and 1, 1.5, 4.5, 8 and 24 h after the injection. PK parameters were estimated by WinNonlin. The PK parameters of this population were used to generate a simulation of AMK peak concentrations for a 25 mg/kg dose calculated on the ideal body weight (IBW). We also calculated the AMK peak for patients with BMI < 20 and > 30, using published formulas (corrected body weight, CBW = 1.3 × ABW for BMI <20 and CBW = ABW + 0.4 (ABW-IBW) for BMI >30). Finally, we compared AMK peaks obtained by a loading dose calculated on ABW (pABW) and IBW (pIBW). Optimal drug concentration was considered if peak AMK concentration at least >64 mg/mL [1], corresponding to 8 times the clinical breakpoint for Enterobacteriacae and Pseudomonas aeruginosa (MIC = 8 mg/mL), determined by EUCAST.

RESULTS. Optimal AMK peak was obtained in 52 patients (70%). Adequate AMK peak were achieved in 6/11 (54%) of patients with BMI <20, 23/36 (64%) with BMI 20–25, 15/18 (83%) with BMI 25–30 and 8/9 (89%) with BMI >30. Simulation with doses calculated on IBW showed that only 37 (50%) would have reached a peak >64 mg/mL ($p < 0.01$). Using CBW, patients with BMI <20 had 7/11 (63%) optimal AMK peaks, whereas patients with BMI >30 6/9 (66%). Differences between pABW and pIBW were in a range of +10/−10% for BMI between 20.5 and 25.2, 15% for BMI between 19.4 and 26.5 and 20% for 18.4–28.0.

CONCLUSIONS. Optimal AMK peak could be influenced by BMI if doses are calculated on ABW. Doses higher than 25 mg/kg should probably be proposed in patients with BMI <25 to optimize amikacin PKs. Using CBW will not significantly improve adequate AMK regimen. If AMK regimen is calculated on IBW, a correction factor could already be considered for BMI >25, to reduce the risk of lower target concentrations when compared to dosage given on ABW.

REFERENCE. 1. Taccone FS (2007) Crit Care Med

1034

CEFUROXIME PLASMA CONCENTRATIONS IN PATIENTS UNDERGOING ELECTIVE CARDIAC SURGERY: CONTINUOUS VS. BOLUS APPLICATION

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INTRODUCTION. Surgical site infections remain a feared complication after cardiac surgery that results in significant morbidity and mortality, prolonged hospital stay and high healthcare costs [1]. Cephalosporins are the standard prophylactic antibiotics for cardiac surgery [2]. Administering an adequate dose of prophylactic antibiotics at the appropriate time has a paramount significance. Therefore, we compared two different regimens of antibiotic prophylaxis with cefuroxime in two groups of patients undergoing elective cardiac surgery.

METHODS. A total of twelve patients were investigated. Group A ($n = 6$) received 2 × 1.5 g cefuroxime as an i.v. bolus infusion before surgery and after 12 h. In group B ($n = 6$), after the initial i.v. bolus infusion of 1.5 g cefuroxime, continuous infusion of 1.5 g cefuroxime was started. Samples for analysis of cefuroxime plasma concentrations were collected during following 24 h. Student's t test was used for statistical analysis. Data are presented as means ± SD.

RESULTS. The plasma drug decay curves after cefuroxime bolus administration for group A and for group B are shown in Fig. 1.

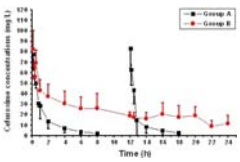

Fig. 1

In group A immediately after the bolus infusion, plasma cefuroxime concentrations rose rapidly within 10–20 min and achieved peak concentrations of 78 ± 15 mg/L (first peak) and 83 ± 9 mg/L (second peak) and thereafter decreased rapidly to 2.4 ± 1.9 mg/L (first trough) and 2.8 ± 2.7 mg/L (second trough) within 8 h. In group B a peak of 82 ± 18 mg/L was reached within 20 min after the bolus infusion. Thereafter, plasma concentrations decreased to 11.6 ± 7.8 at 24 h after the bolus infusion.

CONCLUSIONS. Plasma concentrations of cefuroxime increased and decreased rapidly. Total wash-out was observed 8 h after bolus infusion. In contrast, during continuous cefuroxime infusion therapeutic levels of the antibiotic were achieved throughout.

REFERENCES. 1. Barnett TE (2007) The not-so-hidden costs of surgical site infections. Aorn J 86(2):249–258

2. Geroulanos S, Marathias K, Kriaras J, Kadas B (2001) Cephalosporins in surgical prophylaxis. J Chemother (Florence, Italy) 13[Spec No 1(1)]:23–26

1035

AMINNOGLYCOSIDE THROUGH LEVELS DURING ONCE-DAILY DOSING IN SEVERE SEPSIS OR SEPTIC SHOCK MAY NOT BE NECESSARY FOR ALL PATIENTS

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INTRODUCTION. Aminoglycosides (AG) are concentration-dependent antibacterials and exhibit prolonged post-antibiotic effect. Once-daily regimens have been proposed to treat patients (pts) with severe sepsis and septic shock (SS). Their increased volume of distribution may induce a decrease of peak serum concentrations, delayed therapeutic responses or treatment failure. Therefore, an initial high weight-based dose, independent of creatinine clearance (Cl(Cr)), is necessary to achieve optimal killing rate; the subsequent doses being based on trough level (TL) and Cl(cr). Therapeutic AG monitoring may then be warranted to minimize nephrotoxicity particularly in seriously ill pts with renal impairment, even in case of 3–4 days therapy.

OBJECTIVES. To analyse the serum TL 24 h (TL 24) after the end of infusion in critically ill patients with SS, to study the incidence of potentially toxic values [Gentamicin (G) and Tobramycin (T) >2 μg/ml, Amikacin (AMK) >8 μg/ml according to renal impairment] and to define guidelines for TL24 assessment for intensive care unit (ICU) practice.

METHODS. Forty-one medical ICU pts [76 years old, (median); 57–83 (IQR: interquartile)] with SS were prospectively enrolled during a 5-month period; 24 had nosocomial sepsis, 2 needed renal replacement therapy at the time of AG treatment. All of them received combined empirical antimicrobial therapy. The CL(cr), estimated by the Cockcroft–Gault equation, at time of initial administration was 43.9 (26.9–78.1) ml/min; severe renal impairment [(Cl(cr) < 60 ml/min] was present in 68% of cases. Patients were divided into five groups according to their CL(cr): >90; 60–90; 30–60; 30–15; <15 ml/min. The SAPS II was 70, (47.5–79), the ICU length of stay: 21 days (8.5–31) and hospital mortality rate 44%.

RESULTS. Serum samples were systematically collected 24 h after AG injection. Initial and subsequent doses were at physician discretion. AMK, G, T were used as empirical therapy in respectively 13, 12 and 16 pts and for a limited time period (3.6 days/pt), and modified after culture availability.

TABLE 1 PHARMAKOKINETICS MAIN RESULTS

	Injection (n)	TL 24 (n)	Dose (mg/kg)	Cl(creat) (ml/min)	TL24 (mg/L)	Toxic TL24 (n)
AMK (IQR)	46	34	14.9 (14.2–15.2)	71 (41–87)	4.1 (1.8–7.1)	6 (18%)
G/T (IQR)	106	80	4.4 (3.4–4.9)	45.6 (27.7–82.4)	1.2 (0.7–2.2)	22 (28%)

For all AG initial and subsequent doses were not significantly different during treatment. A weak correlation was observed for G/T weight-based administration and TL24 values ($R^2 = 0.35$, $p < 0.01$), whereas no correlation could be demonstrated with AMK ($R^2 = 0.17$). G/T subgroup analysis showed that these pts with Cl(cr) < 60 ml/min had higher and/or toxic TL24 values ($p < 0.001$).

CONCLUSION. Initial high weight-based doses of AG, independent of creatinine clearance, appear to be safe during SS, and drug monitoring is warranted only in patients with SS and serious renal impairment.

1036

VENTILATOR ASSOCIATED PNEUMONIA CAUSED BY MULTIDRUG RESISTANT ACINETOBACTER BAUMANII: TIGECYCLINE OR COLISTIN?

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INTRODUCTION. Acinetobacter baumanii is an important cause of infections in patients in intensive care units. The emergence of these multidrug resistant (MDR) gram-negative bacteria necessitated the reappraisal of older antibiotic drug classes such as polymyxins (colistin) and tetracyclines. Tigecycline, the first clinically available semisynthetic glycylcycline approved for clinical use, has been shown to have potent activity against a wide variety of gram-positive and gram-negative pathogens, including MDR strains. We prospectively evaluated the efficacy of tigecyclin versus colistin in patients with Ventilator Associated Pneumonia (VAP) caused by A. baumanii.

PATIENTS AND METHODS. Thirty mechanically ventilated patients >72 h (mean age 70 ± 7) that developed VAP and had positive *A. baumannii* tracheal aspirates were enrolled in the study. The case was considered to be aetiologically confirmed if *A. baumannii* was isolated and quantitative culture of broncho-alveolar lavage ($>10^4$ cfu/mL) was achieved. The antimicrobial susceptibility of the isolates was determined using the disk-diffusion (Kirby-Bauer) method, the VITEK II system and the E-test method (AB Biodisk, Solna-Sweden). Interpretation of the susceptibility results was in accordance to the Clinical and Laboratory Standards Institute (CLSI). All isolates exhibited resistance to almost all antibiotics routinely tested, excluding colistin. Susceptibility to tigecyclin was intermediate. Ten of the patients received tigecyclin intravenously (Group A), as monotherapy (50 mg twice daily) while 20 of them received colistin intravenously, as monotherapy or in combination with cefepime (3×10^6 IU three times daily, adjusted for creatinine clearance) (Group B). Follow up cultures and clinical evaluation of all patients was performed 5 days after the initiation of therapy. Clinical success was defined by a lessening of the signs and symptoms of VAP, while microbiologic success was defined as eradication of the pathogen in BAL cultures.

RESULTS. Follow up BAL revealed microbiologic success in 8 patients of Group A (80%) and 10 patients of Group B (50%) ($p = 0.86$). Clinical success was observed in 7 patients of Group A (70%) and 9 patients of Group B (45%) ($p = 0.7$). There was no significant difference in 14 and 30 days mortality between the two groups. Adverse reactions occurred in 5 patients (25%) of Group B (reversible nephrotoxicity), which did not lead to discontinuation of treatment. Toxicity was not observed with tigecyclin use.

CONCLUSIONS. Colistin and tigecycline seem equally effective in eradication of multidrug resistant A. baumanii in BAL cultures of patients with VAP. More data are needed, in order to clarify the role of these regiments in the treatment of A. baumanii infections.

1037

VANCOMYCIN NEPHROTOXICITY IN ICU AND RISK FACTORS FOR ACUTE RENAL FAILURE

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INTRODUCTION. Nephrotoxicity is a known side effect of vancomycin, the most widely used antimicrobial for treatment of resistant Staphylococci, most often MRSA. Raise of BUN or creatinine, according to literature, occurs in 5–17% of treated patients. Acute renal failure (ARF) occurs less frequently (<5%), but is a serious side-effect, often requiring change of treatment, dialysis (in about half of patients) and prolongation of hospitalisation. Also, since acute renal failure occurring in sepsis is associated with worse prognosis, vancomycin neptrotoxicity can also influence survival. Patients admitted to intensive care units (ICUs) are usually at increased risk of renal failure because of critical illness (i.e. sepsis, severe trauma, severe pancreatitis, major surgery, burns, etc.); they also often already have impaired renal function at ICU admission. Such patients probably suffer additional risk of vancomycin neptrotoxicity.

OBJECTIVES. We have conducted an observational 2-year study in a medical ICU, trying to determine incidence of vancomycin induced acute renal failure (VI-ARF) in ICU population and to identify risk factors associated with occurrence of VI-ARF.

METHODS. All adult patients treated with vancomycin were eligible for inclusion. Excluded were patients with ARF before vancomycin treatment, patients with chronic renal failure and creatinine clearance <20 ml/min and patients on hemodyalisis. Deterioration of renal function (renal toxicity) was defined as raise in creatinine more than 10% of basal level; ARF was defined as twofold raise in serum creatinine. Age, sex, primary admission diagnosis, diabetes, APACHE II score, organ deficiencies other than ARF and use of concomitant nephrotoxic antimicrobials were evaluated as potential risk factors for VI-ARF.

RESULTS. A total of 625 patients were treated with vancomycin in the study period, from which 578 were included. Deterioration of renal function occurred in 249 (43%) patients. Acute renal failure occurred in 108 (18.6%) patients, from which 67 (62%) were treated with dialysis. Identified high risk factors (odds ration greater than 2.0) for occurrence of VI-ARF were: sepsis with organ failure (other than renal), hypotension requiring vaspressors, diabetes mellitus with microalbuminuria, chronic renal failure (creatinine clearance <60 ml/min/m^2), concomitant nephrotoxic treatment.

CONCLUSIONS. The incidence of vancomycin induced ARF is much higher in ICU than in general patient population reported in the studies. When treated patients with suspected or proven resistant staphylococcal infections and one of identified high risk factors for VI-ARF, other anti-staphylococcal drugs (such as linezolid) should be considered.

1038

ESTIMATIVES FOR GLOMERULAR FILTRATION RATE IN SEPTIC PATIENTS WITH OVERINCREASED 24 HOURS CREATININE CLEARANCE

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INTRODUCTION. Hyperdinamic stage occurring in early severe sepsis may be responsible for an increase in cardiac output that may lead to increased Glomerular Filtration Rate (GFR). The aim of this study was to compare between four equations for estimative of GFR (eGFR) in a population of Patients (P) with overincreased 24 h Creatinine Clearance (24CrCL): Cockroft–Gault (CG), Cockroft–Gault modified (CGm), 4-variable (MDRD4) and 6-variable (MDRD6) "Modification of Diet in Renal Disease" formula.

MATERIALS AND METHODS. This study was carried out in a multipurpose ICU, on 43 critical septic ventilated Patients (P) with 24CrCL > 130 ml/m/1.73 m^2 and serum creatinine <1.3 mg/dL. The evaluation is made in a single-day, once for patient. Septic Shock was present in 25% of P and male gender was predominant (81.4%). Average age, APACHE II and SAPS II were 44 years, 14.2 and 36.9, respectively.

RESULTS. The median of eGFR was 124.9/91.8/112.2/99.5 ml/m/1.73 m^2 respectively for CG, CGm, MDRD4 and MDRD6, lower than 24CrCL median (161.3 ml/m/1.73 m^2), $p < 0.05$. The identification rate of overincreased 24CrCL was 44, 2, 35 and 19%, respectively for the four formulas. Correlation between CG, CGm, MDRD4, MDRD6 and 24CrCL was 0.29/0.36/0.22/0.25, respectively, with significance only for CGm ($p < 0.05$). After selection of two equations—one with the best sensibility (CG) and the other with the best correlation (CGm)—we performed a Bland–Altman analysis for comparation with 24CrCL, witch showed a precision of 47 and a bias of 50 ml/m/1.73 m^2 for CG, and a precision of 42 and a bias of 83 ml/m/1.73 m^2 for CGm.

CONCLUSIONS. In this population of patients with overincreased 24 h Creatinine Clearance (>130 ml/m/1.73 m^2), none of the 4 formulas were useful for identification of this condition. For practice application, and adjustment of renally cleared drugs, Creatinine Clearance must be effectively measured, particularly when we suspect of this condition in early hyperdinamic stage of Sepsis.

1039

SENSITIVITY AND RESISTANCE: DOES EAST MEET WEST?

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The prevalent antibiotic practice and antimicrobial resistance patterns in India differ from western countries. But, empiric antibiotics for ICU infections in India are chosen based on western guidelines. We undertook a pilot study to explore microbial spectrum and resistance patterns and report our interim data.

1. To explore microbiology of culture specimens
2. To elaborate the resistance patterns

Observational study (Jan–Mar'09) of all positive cultures sent from a 24 bed mixed ICU. Relevant samples from all patients suspected to have infection were cultured and positive cultures analyzed. Patient demographics, culture positivity, microbial spectrum, resistance patterns, antibiotic use and outcome data collected.

25% (58/230) of patients admitted to ICU during study period had positive cultures. 101 bacterial strains grew in 82 samples. 57% were Gram negative bacilli, most common being *E. coli* (20%), followed by *P. aeruginosa* (15%) and *Klebsiella oxytoca* (11%). *Enterococcus* spp was the commonest gram positive isolate (15%), followed by *S. aureus* (8%). 8% of the isolates were *Candida*. 55% of E. coli isolates were ESBL producers. 63% *S. aureus* isolates were Methicillin resistant. 83% of *Acinetobacter baumanii* and 33% of *P. aeruginosa* were multi-drug resistant with sensitivity only to Polymyxin. Among culture positive patients, 39(68%) survived and 7(12%) died in the ICU. Outcome could not be tracked in 12 (20%).

TABLE 1 MICROBIOLOGICAL SPECTRUM

	Blood *n* (%)	Urine *n* (%)	Respiratory *n* (%)	Others *n* (%)	Total *n* (%)
S. aureus	2 (9)	–	–	6 (21)	8 (8)
Enterococcus spp	1 (4)	11 (38)	–	3 (11)	15 (15)
Coagulase-negative staphylococci	5 (22)	–	1 (5)	2 (7)	8 (8)
E. coli	7 (30)	8 (28)	–	5 (18)	20 (19)
P. aeruginosa	2 (9)	1 (3)	8 (38)	4 (14)	15 (15)
Acinetobacter spp	2 (9)	–	3 (14)	1 (4)	6 (6)
Candida spp	2 (9)	5 (18)	1 (5)	–	8 (8)
Others	2 (9)	4 (14)	8 (38)	7 (25)	21 (21)
Total	23 (100)	29 (100)	21 (100)	28 (100)	101 (100)

TABLE 2 ANTIBIOTIC RESISTANCE AMONG CULTURED ORGANISMS

	ESBL positivity (%)	Multi drug resistance (%)
E. coli	55	–
P. aeruginosa	13	33
Klebsiella oxytoca	45	–
Acinetobacter spp	–	83

Contrary to culture patterns in the west, predominant organism cultured in our ICU were gram negatives (*E. coli* and *Pseudomonas*). We noticed high incidence of ESBL producing gram negatives and multi-drug resistant *A. baumanii*. Incidence of MRSA was also significantly different from that found in other parts of world. These resistance patterns need to be taken into account when initiating empiric antibiotics and developing treatment recommendations for life-threatening ICU infections in India.

REFERENCES. 1. Epidemiology of sepsis and infection in ICU patients from an international multicenter cohort study. Intensive Care Med 28:108–121
2. Prevalence rates of infection in ICU of a tertiary teaching hospital. Rev Hosp Clin Fac Med S Paulo 58(5):254–259

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1040

CHANGES OF MULTIRESISTANT MARKERS IN THE ICU. 2005–2008 DATA

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OBJECTIVE. To describe changes of multiresistant markers (MRM) for ICU-acquired infections between the years 2005 and 2008.

METHODS. Prospective, cohort, and multicenter study. All patients admitted to the participating ICUs between 2005 and 2008 were studied. Patients were followed until discharge from the ICU or up to a maximum of 30 days. The following infections were recorded: mechanical ventilation-associated pneumonia, catheter-related urinary tract infection, and primary bacteremia. MRM were those defined by the CDC (1). Data were collected using an Access 97-based program developed for the study. Resistance rates are expressed as percentage of resistant isolates to antimicrobials selected in relation to the total number of isolates for each pathogen.

RESULTS. A total of 46,930 patients admitted to the participating ICU were included, 4,300 (9.2%) of which presented 6,245 infection episodes (13.3%). A total of 6,550 microorganisms were isolated, 3,606 (55%) of which were Gram-negative pathogens, 2,189 (33.4%) Gram-positive, 722 (11%) fungi, and 42 (0.6) other classes of microorganisms. Evolution of MRM are included in Tables 1 and 2

TABLE 1

	2005	2006	2007	2008
Methicillin-resistant Staphylococcus aureus	37.1	42.2	24.4	25.0
Vancomycin-resistant Staphylococcus aureus	0.6	0	0	0
Methicillin-resistant Staphylococcus epidermidis	85.2	83.6	80.9	84.1
Vancomycin-resistant Staphylococcus epidermidis	0	0	0.7	1.9
Vancomycin-resistant Enterococcus spp.	1	0	0	0

TABLE 2

	2005	2006	2007	2008
Ciprofloxacin-resistant Escherichia coli	32.1	34.4	34.4	32.4
Cefatoxime-resistant Escherichia coli	10.0	13.1	16.8	13.2
Imipenem-resistant Acinetobacter spp.	58.3	54.3	76.4	66.3
Amikacin-resistant Pseudomonas aeruginosa	11.4	13.0	12.9	17.7
Ceftazidime-resistant Pseudomonas aeruginosa	29.0	27.9	27.2	26.3
Ciproflofaxin-resistant Pseudomonas aeruginosa	30.2	33.1	35.2	38.0
Imipenem-resistant Pseudomonas aeruginosa	28.6	36.3	32.0	34.6
Piperacillin-tazobactam-resistant Pseudomonas aeruginosa	22.4	18.7	18.9	14.5

In the year 2008, two strains of *P. aeruginosa* and three strains of *A. baumannii* resistant to colistin were detected.

CONCLUSIONS. Decrease in the number of methicillin-resistant *Staphylococcus aureus* for the second consecutive year. Stabilization of resistance of *E. coli* to cephalosporins and ciprofloxacin. Persistence of a high rate of imipenem-resistant *Acinetobacter* spp. Increase in resistance to ciprofloxacin of *P. aeruginosa*. Absence of vancomycin-resistant Gram-positive cocci.

1041

ANTIBIOTIC ADMINISTRATION IN THE ICU—DISTRIBUTION AND ACCURACY

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INTRODUCTION. ICU patients are dying with infections caused by multi drug resistant bacteria not sensitive to any antibiotics. Bacterial antibiotic resistance is caused by antibiotic use and more judicious use might limit resistance. Antibiotics are started in the ICU for clinical indications, and not infrequently stopped when infection is not later verified. Limiting this "unnecessary" antibiotic use may decrease the selective pressure for resistant organisms.

OBJECTIVE. To describe antibiotic use in the ICU (between clinically indicated, culture driven and prophylactic), to define the proportion of antibiotic start decisions associated with verified infection, and to identify clinical indicators associated with correct antibiotic start decisions.

METHODS. Consecutive antibiotic start decisions were divided prospectively into 3 categories: (1) clinically indicated [subdivided into catastrophic deteriorations (e.g. septic shock) and suspected infections (e.g. ventilator associated pneumonia without evidence of multi-organ failure)], (2) culture driven decisions, e.g. narrowing of antibiotic spectrum based on culture results and (3) procedure related prophylaxis. Based on a retrospective examination of clinical course and culture data, the presence of infection was determined 1 week after each clinically indicated antibiotic start decision by an independent infectious diseases specialist not involved in patient care. Physiological data to determine SIRS criteria and SOFA scores were collected daily.

RESULTS. Data were collected on 45 antibiotic start decisions made during 202 days of patient care. These divided into 25/45 (56%) for clinical indications [9/45 (20%) for catastrophic deterioration and 16/45 (36%) for suspected infection], 9/45 (20%) for culture results and 11/45 (24%) for prophylaxis.

Infection was verified for 9/25 (36%) of the clinically indicated antibiotic start decisions, including 5/9 (56%) catastrophic deteriorations and 4/16 (25%) suspected infections. Catastrophic deteriorations included peritonitis (3 cases/2 verified), mediastinitis (2/1), pneumonia (1/1), meningitis (1/1) and 2 others. Suspected infections included pneumonia (6 cases/2 verified), other respiratory tract infections (4/0), soft tissue infections (2/1) and 4 others.

The SOFA score on antibiotic start days was higher than other days (8.2 ± 4.2 vs 6.5 ± 4.0, $p = 0.043$), principally due to the cardiovascular element (1.8 ± 1.9 vs 0.9 ± 1.6, $p = 0.006$). There were no significant differences in SOFA scores or SIRS criteria for antibiotic start days with vs without verified infection.

CONCLUSION. Infection was verified following only a minority of clinically indicated antibiotic start decisions. Better defining the presence of infection prior to beginning antibiotic therapy represents the potential to decrease unnecessary antibiotic administration. Additional information beyond physiological data (such as biomarkers) may be necessary to improve decision-making.

1042

A SURVEY OF ANTIBIOTIC USAGE IN A TERTIARY CARE INTENSIVE CARE UNIT IN INDIA

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INTRODUCTION. Indiscriminate use of antibiotics has been proposed to be one of the major reasons of increasing antibiotic resistance. The pattern of antibiotic usage in Indian ICU's has not been studied in a systematic manner.

METHODS. A prospective observational study conducted in 33 bedded medical surgical ICU at a tertiary level acute care hospital in Eastern India.

Inclusion criteria: All consecutive patients being admitted in the above mentioned units over a period of 2 years, i.e. Sep 2006 to Aug2008 were included. Antimicrobial usage was standardised by conversion to defined daily doses according to the National Nosocomial infections surveillance system (NNIS) report October 2004. Antimicrobial use density was calculated as DDD per 1000 patient ICU days.

RESULTS. 3,088 patients were admitted in the study period comprising 13,978 patient days. 2,556 (82.77%) patients received antibiotics. DDD/1,000 patient days was 203.33 for carbapenem while that for antipsuedomonal pennilcillin, fluroquinolones and third generation cepahalosporins was 245.75, 66.46 and 109.19 respectively. The comparative figures from NNIS data for medical/surgical adult ICU are 37.8, 75.5, 205.9 and 144.1 and those for INICC are 90.02, 47.19, 58.22 and 176.09 respectively. For linezolid, vancomycin and teicoplainin the DDD per 1000pt days was, 34.70, 11.79, 70.70 Comparative figures available only for vancomycin for NNIS are 85.8 and for INICC are 79.56.

CONCLUSION. Antibiotic usage is very high in Indian ICU's. As compared to the international data available (NNIS,) our use of Carbapenem is 5.5 times, anti psuedomonal penicillin >3 times, fluroquinolones one-third, cephalosporins three-fourth and vancomycin one-eigth. Thus we tend to overuse broad spectrum antibiotics, and underuse narrow spectrum antibiotics. Our use of antibiotics covering gram negative bacteria is much higher and that against MRSA is much lower.

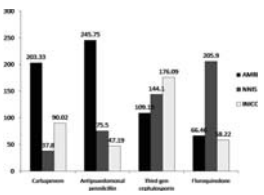

Fig. 1 Antibiotic usage

1043

SECULAR TRENDS FOR MARKERS OF QUALITY IN THE USE OF ANTIMICROBIALS IN CRITICALLY ILL PATIENTS

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OBJECTIVE. To describe the secular trends for the different markers of quality in the use of antimicrobials (ATM) in critically ill patients.

METHODS. Observational, prospective and multicenter study in which patients admitted to the ICU during the ENVIN study periods for the years 2005 and 2008 were included. The following markers of quality were defined:

1. ATM use ratio,
2. directed treatments rate,
3. inadequate empirical ATM rate,
4. overall ATM change rate,
5. ATM change rate by inappropriate treatment,
6. ATM change rate by adjustment or de-escalating strategy,
7. digestive tract decontamination (DTD) rate,
8. duration of prophylaxis with cefazolin, amoxicillin-clavulanate, and cefuroxime. Percentages for each category are presented.

RESULTS. Of a total of 46,930 patients included in the study, 27,885 (59.4%) of them received 62,724 ATM. Markers of quality of the use of ATM are shown in Table 1.

TABLE 1

No. days of ATM use/no. days of stay in the ICU x 100	114	101.5	112.4	116.5
No. of ATM used in directed treatment/no. of ATM used in all treatments x 100	24.3	24.1	23.1	23.6
No. of inadequate empiric ATM/no. empiric ATM x 100	NR	14.2	12.0	14.7
No. of changed ATM/no. ATM used for treatment x 100	23.4	24.7	24.2	27.0
No. of inappropriate ATM changed/no. total empiric ATM x 100	6.6	5.9	5.6	6.2
No. of ATM changed by adjustment or de-escalating strategy/no. total empiric ATM x 100	5.7	6.6	7.2	8.5
Days of use of ATM prophylactically (mean)				
Cefazolin	2.3	2.4	2.5	2.5
Amoxicilline-clavulanate	4.3	4.4	4.0	4.1
Cefuroxime	2.5	2.8	2.4	2.4

CONCLUSIONS. Increase in the use of ATM in 2008. Increase in the overall number of ATM that has been changed. Increase in the number of inappropriate treatments and changes due to de-escalating strategies. Persistence of prolonged prophylactic ATM therapies.

Infection control: 1044–1057

1044

A RANDOMIZED CONTROLLED CROSSOVER STUDY TO COMPARE FILTRATION FACTOR OF A NOVEL NON FIT TESTED HEPA FILTERING FACEMASK WITH A FIT-TESTED N95 MASK

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AIMS. To compare the filtration factor of a novel non fit tested HEPA filtering (Totobobo) facemask with a fit-tested N95 facemask

METHODS. Randomized unblinded crossover study involving 22 healthy volunteers who had previously passed a fit test with a 1860, 1860S or 1862 N95 filtering facemask. Prior to testing the N95 mask, the subject adjusted the mask and performed a user seal test. Prior to testing the Totobobo mask the investigator trimmed the mask according to the manufacturer's instructions and following training by the inventor. The investigator also visually checked the fit of both types of mask. Volunteers then underwent a standard quantitative mask fit testing protocol involving measurement of particles 0.02–1 μm diameter inside and outside the mask. Filtration factor was defined as the ratio of particles outside to particles inside the mask. If the ratio exceeded 100 the subject was considered to have passed the fit test. A PortaCount Plus (TSI Incorporated, St Paul, Minnesota) connected to a computer running FitPlus for Windows software (TSI Incorporated, St Paul, Minnesota) was used to count particles and calculate the filtration factor. Median filtration factors were compared using the Wilcoxon signed ranks test. The proportion of subjects passing the test was compared using the chi square test.

RESULTS. The median (interquartile range) filtration factor was significantly higher (193 (145–200)) for N95 masks compared to Totobobo masks (135 (83–184)) ($p < 0.05$). However there was no statistically significant difference between the proportion of subjects achieving a ratio of $\geq$100 between N95 (19/22) and Totobobo (16/22) masks.

CONCLUSIONS. The significantly lower performance of non fit tested Totobobo masks indicates that they are not an adequate replacement for fit tested N95 masks. Although there was no significant difference in the proportion of subjects passing the fit test with each mask, the study was not powered to show a difference in this outcome. However the absolute level of performance of this mask suggests that it is worthy of further investigation.

1045

PULSE-OXIMETRY IN INTENSIVE CARE: HAZARD WARNING OR POTENTIAL HAZARD?

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INTRODUCTION. In the UK, nosocomial infections affect 1 in 10 patients admitted to hospital, resulting in 5,000 deaths annually[1], and are an important cause of patient morbidity and mortality on ICU. Any personnel or equipment encountered by a patient during treatment is a potential vector for infection transmission.

This audit was conducted on the 16 bedded mixed general/neuroscience ICU at Salford Royal NHS Foundation Trust, between May and July 2008. It aimed to assess the adequacy of the current method of cleaning pulse oximeter probes, and to determine if alternative methods could improve the effectiveness of the cleaning process.

METHODS. Pulse oximeter probes on the ICU were examined to assess cleanliness and the effectiveness of current cleaning practices. Microbiology samples were taken from all probes and the specimens cultured. Initial results demonstrated ineffective cleaning techniques. Augmented cleaning techniques (where a toothbrush was used), and an alternative cleansing agent (Chloroprep) were then tested, to see if the use of such techniques reduced the potential for the probes to act as vectors for infection transmission.

RESULTS. Initial swabbing was carried out on all the pulse oximeters on the ICU. Mixed coagulase negative staphylococcus was isolated from > 80% of all probes after standard cleaning techniques were used, staphylococcus aureus from 3 probes and MRSA from isolated in one probe.

After cleaning using augmented cleaning techniques, only 12.5% of the probes cleaned showed no growth on culture: there was still significant growth of MCNS on most swabs. This is a similar incidence of growth to that found after cleaning using established techniques.

When ChlorPrep was used to clean the pulse oximeter probes, samples taken from 66% of the oximeter probes resulted in no bacterial growth; significant growth still occurred in swabs taken from 33% of pulse oximeters.

DISCUSSION. Established cleaning techniques are not providing adequate disinfection of the pulse oximeter probes. The augmented cleaning techniques using established cleaning agents (ChlorClean) did not improve the results. However, using a different cleaning agent (ChlorPrep) resulted in more effective cleaning. The clinical implications of the findings are relevant to patient care.

The design of pulse oximeter probes makes effective cleaning very difficult. Despite the use of enhanced cleaning techniques, we found that one third of all the pulse oximeter probes within the ICU were colonised with bacteria. The presence of colonisation after 'effective' cleaning clearly demonstrates the potential for probes to act as vectors of infection transmission.

REFERENCE. 1. Inweregbu K et al (2005) "Nosocomial infections", continuing education in anaesthesia. Critical Care Pain 5(1):14–17

1046

MORTALITY ATTRIBUTABLE TO PRIMARY AND CATHETER-RELATED NOSOCOMIAL BACTEREMIA. A CASE CONTROL STUDY

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OBJECTIVE. Evaluate the impact of primary (PB) and catheter-related bacteremia (CRB) on mortality in critically ill patients and study factors influencing outcome.

METHODS. Dealing with data base from the "Estudio Nacional de Vigilancia de Infección Nosocomial en UCI" (ENVIN-UCI) during the 1997–2007 period (120 Spanish ICU involved), a case control study (1:4) evaluating patients with their first episode of monomicrobial PCRB compared with patients without bacteremia has been carried out. The variables included in the matching process are: age (±10 years), gender, year of admission in ICU, type of the disease (coronary, medical, trauma or elective surgery), APACHE II score at admission (±5 points) or SAPS score (±10 points). Bacteria have been grouped according to gram stain and theoretical risk of death (high for Pseudomonas, Acinetobacter, MRSA and fungi, and low for the rest). A matched conditional logistic regression analysis was performed in order to determine the risk of mortality in the whole population.

RESULTS. 2,116 patients suffering at least one episode of PCRB. 1,879 were adequately matched and compared with 7,516 controls.

TABLE 1

Factor (cases/controls)	Mortality cases (%)	Mortality controls (%)	OR	CI 95%	*p*
PCRB (1,879/7,516)	28.1	18.7	1.14	1.05–1.25	0.002
PB only (862/3,472)	30.7	18.3	1.20	1.06–1.36	0.005
CRB only (1,011/4,044)	25.9	19.1	1.10	0.98–1.24	0.10
Gram-negative (499/1,996)	30.1	18.0	1.19	1.01–1.46	0.040
Gram-positives (1,280/5,120)	26.2	18.8	1.11	1.00–1.23	0.045
Fungi only (88/352)	46.6	19.1	3.01	1.85–4.89	<0.001
High-risk (638/2,552)	32.5	18.6	1.22	1.05–1.41	0.008
Low-risk (1,229/4,916)	25.9	18.8	1.11	0.99–1.23	0.057

CONCLUSIONS. In our study the PCRB attributable mortality was 9.4%. This impact on mortality has been higher in BP than CRB, and otherwise greater in episodes caused by gram-negative bacteria and fungi than those coming from gram-positive pathogens.

1047

THE ELIMINITION OF CENTRAL LINE RELEATED BLOOD STREAM INFECTION (CRBSI) ON THE INTENSIVE CARE UNIT

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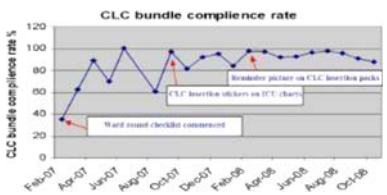
INTRODUCTION. The work was done in the Intensive Care Unit (24 beds) at the Royal Free Hospital in London. This is a major London teaching hospital. Primarily, doctors and nurses in the ITU were involved. The work spread to involve a culture change across all visitors to the ITU, both medical and non-medical.

OBJECTIVES. We set out to address the problem of central line related blood stream infection (CRBSI). It is one of the most frequent, lethal and costly complications of central venous catheterization. Together with the microbiology department we used an agreed definition for CRSBI, following root cause analysis. We measured the rate of CRBSI in the Intensive Care Unit. We assessed the cause as multifactorial. Using PDSA methodology we introduced a series of changes.

METHODS.

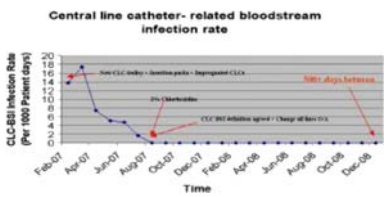
clc



A series of small step changes were introduced. These involved application of the central line care bundle, introduction of catheter packs and the use of 2% chlorhexidine. We also introduced strict policies for visiting teams and hand washing. All medical and nursing staff were involved with nomination of "champions" for each group.

RESULTS.

CRBSI



To date there have been no CRBSI's for more than 560 days. There have been no MRSA bacteraemia for more than a year. Constant attention to detail, dissemination of information and embedding a culture of ownership all proved challenging.

CONCLUSIONS. A target that initially seemed improbably achievable was in fact possible. This is a multifactorial problem that is not solved by a "quick fix". A combination of methodologies is the best way forward. Listening to all suggestions by any member of staff prove very useful and time saving.

It is imperative to involve all members of the team and to disseminate information, changes and results in a prominent and timely fashion. There must be a universal sense of ownership and responsibility for the problem. Ultimately it is necessary to change culture both within the individual unit and the wider organisation.

1048

WHAT IS THE IMPACT OF CATHETER-RELATED BLOODSTREAM INFECTIONS ON ICU STAY AND OUTCOME?

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OBJECTIVE. The purpose of our study is to assess the impact of bloodstream infections (CRBSIs) on morbidity and mortality during ICU stay.

METHODS. Prospective observational study in a multidisciplinary 8-bed ICU. During a 20-month period, 176 consecutive patients with a length of stay (LOS) ≥72 h were enrolled in the study. Data were collected using a specially designed software and included age, gender, APACHE II score on admission, days on mechanical ventilation, number of central venous catheters, LOS and ICU outcome. Patients were stratified into two groups: Group A included patients who did not develop CRBSI ($n = 152$) and Group B patients in whom CRBSI diagnosis was confirmed based on currently adopted criteria ($n = 24$). In Group B, isolated pathogens were also recorded. Data were analyzed using Student's t test, Mann–Whitney rank sum test and Chi-square.

RESULTS. Age (64.8 ± 17.6 vs 65 ± 12.5 years, $p = 0.963$) and APACHE II score on admission (18.9 ± 7.6 vs 19.7 ± 7.2, $p = 0.605$) were similar in both groups. During the study period, 35 episodes of CRBSI were diagnosed. Calculated CRBSI incidence was 8.32/1,000 catheter-days. Mean time from insertion of the catheter to the establishment of bacteremia was 9 days. Total number of central venous catheters inserted during ICU stay was significantly greater in Group B (3 ± 2 vs 7 ± 5, $p < 0.001$). CRBSIs accounted for 9.9% of the total number of bloodstream infections. Eight patients in Group B (33%) suffered from multiple CRBSI episodes. Microorganisms involved were Gram negative (27 pts), Gram positive (7 pts) and fungi (1pt). Duration of mechanical ventilation (14 ± 16 vs 42 ± 30 days, $p < 0.001$) and central venous catheterization (19 ± 19 vs 55 ± 40 days, $p < 0.001$) were statistically longer in Group B. Patients who developed CRBSI had a significantly longer LOS (18 ± 17 vs 47 ± 30 days, $p < 0.001$). ICU mortality did not significantly differ between the two groups (37.8% vs 26.1%, $p = 0.91$).

CONCLUSIONS. CRBSIs prolong the duration of mechanical ventilation and of central venous catheterization during ICU stay. Although CRBSIs contribute to significantly longer ICU LOS, no impact on ICU mortality has been documented in our study.

1049

FACTORS RELATED TO ICU STAY AMONG PATIENTS WITH PRIMARY AND CATHETER-RELATED BACTEREMIA ACQUIRED IN THE INTENSIVE CARE UNIT

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OBJECTIVE. Evaluate the impact of primary (PB) and catheter-related bacteremia (CRB) on ICU stay of critically ill patients, and study factors (type of bacteremia, etiology, onset and severity at admission) influencing this length of stay (LOS).

METHODS. From the data base "Estudio Nacional de Vigilancia de Infeccion Nosocomial en UCI" (ENVIN-UCI) during the 1997–2007 period (120 ICU units involved), a case control study (1:4) evaluating patients with their first episode of monomicrobial primary and catheter-related bacteremia (PCRB) compared with patients without bacteremia has been carried out. Controls were matched by ICU hospital stay at least as long as the cases' time acquisition of PCRB and age (±10 years), gender, year of admission in ICU, type of the disease (coronary, medical, trauma or elective surgery), APACHE II score at admission (±5 points) or SAPS score (±10 points). LOS has been calculated only in surviving pairs and is expressed as median and interquartile range (25–75%). A matched conditional logistic regression analysis was performed in order to determine the difference in LOS in the whole population.

RESULTS. 2,116 patients suffering at last one episode of PCRB. 1,074 patients were adequately matched and compared with 4,710 controls

TABLE 1 TABLAESTANCIA

Factor (cases/controls)	Cases (1,074)	Controls (4,710)	Difference* (median days)
PCRB (1,074/4,710)	22 (14–32)	9 (6–14)	13
PB only (519/2,278)	22 (14–32)	9 (6–13)	13
CRB only (555/2,432)	22 (14–33)	10 (7–15)	12
Gram-negative pathogen (280/1,206)	23 (14–33)	10 (6–14)	13
Gram-positive pathogen (740/3,279)	21 (14–32)	9 (6–14)	12
Fungi only (46/187)	28 (23–56)	10 (7–16)	18
Early onset (<7 days after admission) (715/3,054)	14 (8–23)	5 (4–6)	9
Late onset (≥7 days after admission) (359/1,656)	26 (18–36)	12 (9–16)	14
APACHE II ≥20 at admission (396/1,660)	26 (18–35)	10 (7–15)	16

* All differences: $p < 0.001$

CONCLUSIONS. Primary and catheter-related bacteremia are associated with prolongation of ICU stay about 13 days. The prolongation of ICU LOS is greater in patients with late onset bacteremia, more seriously ill at ICU admission and episodes caused by fungi.

1050

FACTORS INFLUENCING THE ETIOLOGY OF PRIMARY BLOODSTREAM AND CATHETER-RELATED BLOODSTREAM INFECTIONS

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INTRODUCTION. One of the most serious infection problem in ICU's patients is bloodstream infections (BSI), primary and catheter-related ones, which prolongs hospital stay, increases costs of hospitalization and may lead to death in selected patients.

OBJECTIVES. Study the etiology and factors that can modify primary BSI and catheter-related bloodstream infections (CR-BSI) in the spanish ICUs in the last 10 years.

METHODS. Prospective, observational and multicenter study from the database ENVIN-ICU (years 1997–2007). It is been documented n° episodes per patient, etiology, underlying disease and risk factors. The etiologies were grouped in Gram-positive cocci (GPC), Gram-negative bacilli (GNB) and fungi. The catheter site was not studied as a risk factor.

RESULTS. It is been documented 2,116 episodes in 1,985 patients. N° episodes: 1: 1,497 patients (83.86%), 2: 249 pat (13.95%), 3: 36 pat (2.02%), 4: 2 pat (0.11%) and 1 only patient (0.06%) had until 5 episodes.

Etiology: it is been isolated 67.5% GPC, 27.2% GNB and 5.3% fungi. first episode: 66.3% GPC, 28.6% GNB and 4.5% fungi; second episode: 53% GPC, 37.1% GNB and 9.1% fungi; third episode: 51.2% GPC, 43.9% GNB and 4.9% fungi.

Underlying disease: Medical 54.9%, Surgical 15.6%, Coronary 7.4%, Trauma 22.1%. Bloodstream infection etiology changed according to underlying disease (p 0.018): Medical: GPC 68.7%, GNB 26.1%, Fungi 5.2%; Surgical: GPC 67%, GNB 27.2%, Fungi 5.8%; Coronary: GPC 64.5%, GNB 34.2%, Fungi 1.3%; Trauma: GPC 68.2%, GNB 29.5, Fungi 2.4%.

TABLE BSI ETIOLOGY ACCORDING OTHER RISK FACTORS

	GPC (%)	GNB (%)	Fungi (%)	p
Immunodeficiencies	55.2	37.9	6.9	0.3
Extrarrenal depuration	59.2	31.1	9.7	0.11
PTN	63.5	28.8	7.7	0.05
Emergent surgery	32.3	25.9	40.2	0.15

TABLE BSI ETIOLOGY ACCORDING LENGTH OF STAY (LOS)

Etiology	Prior Bloodstrem infection Hospitalary LOS (days)	Prior Bloodstrem infection ICU LOS (days)	Post Bloodstrem infection ICU LOS (days)	p
GPC (mean/median)	17.76/13	12.87/10	14.08/11	0.00
GNB (mean/median)	20.34/15	14.84/12	12.36/9	0.00
Fungi(mean/median)	25.13/18	15.23/14	15.72/13	0.02

CONCLUSIONS. Although the most frequent BSI's etiology are due to GPC, until 1/4 of BSI are caused by GNB, whose share increases with the successive infection episodes and with the stay. It's been highlighted a greater isolation of GNB and a smaller isolation of fungi in coronary and trauma patients.

1051

INCIDENCE AND ASSOCIATED FACTORS OF REPEATED BACTEREMIAS IN THE ICU

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INTRODUCTION. The repeated bacteremia is a usually pathology in intensive care unit. This patients can present difference prognostics factors.

OBJECTIVES. To study the incidence and associated factors of repeated bacteremia (RB) in critical patients.

METHODS AND MATERIALS. Descriptive prospective study during 2007. Patients in the ICU that presented a bacteremia event were recruited. The cause of admission, severity, source and etiology of bacteremia, LOS and evolution, were documented. Statistics tests: χ^2, test Fisher, Student's t, Mann–Whitney U, and logistic regression analysis. Data expressed as mean (SD) and median (interquartilic range).

RESULTS. A total of 164 bacteremias in 123 patients, 75 men (61%), mean age 55.7 (14.4) years, APACHE II of 24 (6.1) was documented. The main admission pathology were respiratory 44 (36.4%), septic 28 (23.1%) and digestive 19 (15.7%).

Ninety-four patients (76.4%) presented a single bacteremia episode.

In both groups, CNS was the main cause (20.2 vs. 37.9%) and catheters were the main source (25.8 vs. 37.9%) observing a significant increase in mortality in RB due to catheters (12.5 vs. 54.5%; $p = 0.002$).

A previous history of cirrhosis (OR 2.83 IC95%: 1.05–7.65; $p = 0.040$) and the intra-ICU origin (OR 3.63 IC95% 1.48–8.94; $p = 0.005$) were presented as independent factors associated with RB.

CONCLUSIONS. We observed that factors such as source of intra-ICU bacteremia and previous history of cirrhosis pathology are associated to the presence of RB. In our series we did not observe significant differences in mortality between groups, but an increase in the LOS was evidenced.

EPIDEMIOLOGY

	Single bacteremia	BR	
N (%)	94 (76.4%)	29 (24.6%)	
Age (years)	56.2 (24.6)	54.2 (13.7)	NS
Men [n (%)]	58 (61.7%)	17 (58.6%)	NS
APACHE II	23.9 (6.2)	24.3 (5.6)	NS
LOS ICU (days)	16 (6–39)	59 (36.5–75.5)	$p < 0.001$
Days until 1st bact	5 (0–9.75)	11 (0–17)	$p = 0.01$
Treat. antibiotic. inadequate	35 (37.2%)	6 (20.7%)	NS
Mortality	36 (38.3%)	11 (37.9%)	NS

PROGNOSTIC FACTORS REPEATED BACTEREMIAS

	Single bacteremia (%)	BR (%)	
Admission diagn.			$p < 0.001$
Respiratory	38 (41.3)	6 (20.7)	
Sepsis	25 (27.2)	3 (10.3)	
Digestive	9 (9.8)	10 (35.4)	
Neurological	14 (15.2)	4 (13.8)	
Origin 1st bact			$p = 0.004$
Intra ICU	32 (35.2)	19 (65.5)	
Extra ICU	62 (64.8)	10 (35.5)	

PROGNOSTIC FACTORS REPEATED BACTEREMIAS (II)

	Single bacteremia (%)	BR (%)	
Source			NS
Catheter	24 (25.8)	11 (37.9)	
Abdominal	17 (18.3)	8 (27.6)	
Respiratory	22 (23.7)	2 (6.9)	
Systemic response			$p < 0.001$
Sepsis	44 (48.4)	26 (89.7)	
Septic Shock	47 (51.6)	3 (10.3)	

1052

LOW INCIDENCE OF RECOLONISATION WITH RESISTANT GRAM NEGATIVE BACTERIA AFTER CESSATION OF SDD

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BACKGROUND. Selective decontamination of the digestive tract (SDD) is a prophylactic antibiotic strategy, which aims to prevent secondary endogenous infections amongst critically ill patients by elimination of 15 Potential Pathogenic Microorganisms located in the digestive tract. However, it is unknown whether recolonisation with resistant aerobic gram negative bacteria (AGNB) occurs after cessation of SDD in the decontaminated intestine, which increases the incidence of antibiotic resistance on the ward.

PATIENTS AND METHODS. In a 20 bed mixed medical-surgical ICU in a teaching hospital a prospective observational cohort study was performed to the incidence of recolonisation of the digestive tract with resistant microorganisms (MO) after cessation of SDD. We analysed recolonisation of the throat and rectum and compared the resistance patterns before and after SDD treatment. Consecutive patients were included when they had been treated with SDD on the ICU for at least 72 h, age was older than 18 years and after written informed consent had been given. The SDD consisted of oral application and enteral administration of non-absorbable antibiotics (polymyxin E (P) 100 mg, tobramycin(T) 80 mg and amphotericin B 500 mg), 4 times daily during the entire ICU stay in combination with parenteral cefotaxim(C) for the first 3–4 days. Baseline throat and rectal swabs were taken on admission to the ICU. Colonisation pattern during SDD application was monitored twice weekly and recolonisation after cessation was monitored on the general ward through combined throat and rectal swabs taken twice weekly until discharge from the hospital. All AGNB recovered from throat or rectum cultures were screened for resistance to cefotaxime, cefpodoxime, polymyxin, ciprofloxacin and tobramycin. An attempt was made to find a matching control group on the general ward but the discrepancy in severity of illness and length of hospital stay was too large.

RESULTS. In 6 months 66 patients were included. Mean APACHE II score was 21. Median follow up after cessation of SDD was 4.5 weeks. Recolonisation with AGNB with a resistance pattern similar to the admission flora occurred in 38 out of the 66 patients (57.5%). Recolonisation with newly acquired AGNB resistant to either P, T, or C were found in 3 patients (4 samples) (4.5%). Two samples showed C resistant bacteria (*Aeromonas* and *Citrobacter*), one showed *Serratia* (intrinsic resistance for P), and one showed a P-resistant *Enterobacter*. In two patients Ciprofloxacin resistant AGNB were acquired during follow-up. No other resistant MO were found.

CONCLUSION. In this study, the incidence of recolonisation in the ward after cessation of SDD during treatment in the ICU with AGNB resistant to Polymyxin, Tobramycin or Cefotaxim was low (4.5%).

1053

REDUCING CATHETER-RELATED BLOODSTREAM INFECTIONS (CRBSI) IN THE ICU WITH AN EVIDENCE-BASED INTERVENTION

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AIM. to evaluate an evidence-based intervention aimed to reduce CRBSI and the central venous catheter (CVC) colonization rate.

METHODS. Design—Before–after study.

SETTING. A medical ICU with 7 beds. CRBSI was defined as CRBSIs for which other sources were excluded, and where a culture of the catheter tip demonstrated an organism identical to those found in the bloodstream [1]. CVC colonization was defined as a colony count of 15 CFU/ml or more by the technique of roll-plate of the distal segment of the CVC. CRBRI and CVC colonization rates were studied at two different periods: the before intervention period, between March 2006 and March 2007, and the after intervention period, between July 2007 and July 2008. The following interventions were already in use as a routine practice in the ICU: appropriate hand hygiene, use of full-barrier precautions during CVC insertion, subclavian vein placement as the preferred site. According to the guidelines and the work by Pronovost et al [1,2] the following interventions were implemented: (1) use of chlorhexidine for skin preparation, (2) use of sterile semipermeable dressings during CVC insertion (3) use of sterile semipermeable dressings during the all period of use of the CVC to protect hubs and connecters; (4) use of alcohol impregnated dressings in every manipulation of hubs and connecters; (5) removing unnecessary CVCs and (6) educational sessions for all ICU physicians and nurses. Data were obtained from a running database, only CVCs that were inserted in the ICU were considered. Collected data included age, gender, SAPS II, length of ICU stay (LOS), reason for ICU admission, local of CVC insertion, CVC days, type of microrganisms isolated in the CVC tip and in the blood culture. Appropriate descriptive statistics are presented. Comparisons between groups were performed using Chi-square test.

RESULTS. In the before period a total of 253 patients were admitted (60% male; mean age 61 years; mean SAPS II 45, mean LOS 7.5 days) and a total of 201 CVCs were recorded. There were 12 CRBSI—7.8 CRBSI per 1,000 catheter days. Colonization rate was 38%. In the after period, a total of 264 patients were admitted (59% male; mean age 61 years; mean SAPS II 46, mean LOS 7 days) and a total of 138 CVCs were recorded. There were 3 CRBSI—3 CRBSI per 1,000 catheter days. CVC colonization rate was 18%. A significantly statistical reduction was found in CRBSI and in the CVC colonization rate between both periods ($p < 0.001$).

CONCLUSION. An evidence-based intervention was able to reduce CRBSI and CVC colonization rate. A prospective study will be needed to confirm these findings.

REFERENCES. 1. O'Grady NP, Alexander M, Dellinger EP et al (2002) CDC Recommendations and reports. 51(RR10):1–26. Guidelines for the prevention of intravascular catheter-related infections

2. Pronovost P, Needham D, Berenholtz S et al (2006) An intervention to decrease catheter-related bloodstream infections in the ICU. N Engl J Med 355:2725

1054

BACTERIEMIA CHARACTERISTICS ACCORDING TO ACQUISITION (INTRA-EXTRA ICU)

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INTRODUCTION. Bacteremia in critical care patients presents different characteristics about intra or extra intensive care unit origin.

OBJECTIVE. To value the characteristics of bacteriemia in critical patients according to the origin, intra-ICU (IB), extra-ICU (EB) as well as to state the prognostic factors.

METHODS AND MATERIALS. Descriptive prospective study conducted at a third level hospital ICU during 2007. We documented the cause of admission, severity, source of the bacteriemia, situation at admission, LOS and evolution of all patients with validable positive blood cultures. Statistics Tests: χ^2, test Fisher, Student's t, Mann–Whitney U and logistic regression analysis. Data expressed as mean (SD) and median (interquartilic range). In order to estimate mortality, LOS and bacteriemias, only the patients with a single episode were included.

RESULTS. A total of 123 patients that presented 164 bacteriemias, 103 men (62.8%), mean age 55.9 (14) years and APACHE II of 24.2 (5.8), was documented. The main cause of admission was respiratory pathology 49(34.5%), followed by digestive 39 (24.1%) and neurological 22 (13.6%). There were 52.8% (84 episodes) of BI, 17. 7% (29 episodes) nosocomial extra-ICU, 16.5% (27 episodes) from the community and 1.6% (19 episodes) related to assistance. Catheters were the source in 81.6% of IB, whilst the abdominal (45%) and respiratory (15%) were responsible for EB ($p < 0.001$).

The LOS was 22.5 (8–54.5) days. IB was presented at 13 (8–25) days of ICU admission. Global mortality was 37.5%.

The main germs implicated in IB were 45.5%, *P. aeruginosa* 19%, *E. faecalis* 15.5% and *C. albicans* 3.6% vs. *E. coli* 17.3%, pneumococcus 14.7%, *P. aeruginosa* 10.7% and CNS 6.7% in the EB.

Both groups did not reveal significant differences in gender, age or APACHE II. However, we observed significant differences in the systemic response of the patient with diminishing of septic shock in the IB 23.7 vs. 69.4% ($p < 0.0001$), *LOS* 51 (26–67) vs. 14 (5–31.5) days ($p < 0.001$). The adequate empiric treatment in both groups did neither present significant differences (49 vs. 61%; $p = 0.157$), nor mortality (31.4 vs. 42%; $p = 0.286$).

The worst prognostic factors in IB were enolic previous history (OR 6.43 IC95%: 1.28–32.21; $p = 0.024$) and shock as a systemic response (OR 6.45 IC95%: 1.8–23.1; $p = 0.004$), while in EB were the cirrhosis (OR 9.28 IC95% 1.94–44.4; $p = 0.005$) and immunity alterations (OR 3.97 IC 95%: 1.02–15.42; $p = 0.046$).

CONCLUSIONS. We confirmed the difference both in etiology and source of IB and EB. The patient's history as well as the immunity response were associated with prognostic.

BACTERIEMIA SOURCE

Source	Related assistance	Communitarian	Nosocomial extra-ICU	Nosocomial intra-ICU
Catheter	1 (1.9)	1 (1.9)	7 (13.5)	40 (76.9)
Abdominal	2 (5.0)	6 (15.0)	14 (35.0)	18 (45.0)
Respiratory	7 (26.9)	11 (42.3)	4 (15.4)	4 (15.4)
Others	9 (20.0)	9 (20.0)	4 (8.9)	22 (48.9)

1055

EVALUATING THE IMPACT OF ANTIBIOTIC-COATED CATHETER USE IN REDUCING BACTEREMIA RATES IN THE ICU

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AIMS. Central venous catheter-associated bacteremia (CAB) can cause complications and result in high treatment costs. Studies suggest that the use of coated catheters is associated with lower CAB rates when compared to conventional catheters, and their use is warranted when preventive measures are not effective in reducing CAB rates. The aim of the study was to evaluate the impact of the use of minocycline- and rifampicin-coated catheters in lowering CAB rates in a medical/surgical ICU (Intensive Care Unit) in a private hospital.

METHODS. Central venous catheter-associated bacteremia (CAB) can cause complications and result in high treatment costs. Studies suggest that the use of coated catheters is associated with lower CAB rates when compared to conventional catheters. The aim of the study was to evaluate the impact of the use of minocycline- and rifampicin-coated catheters in lowering CAB rates in a medical/surgical ICU (Intensive Care Unit) in a private hospital.

RESULTS. See Table 1 and 2. Comparison between the two types of catheters.

TABLE 1 RESULTS

	Period 1	Period 2	p
Apache (75th percentile)	24	23	–
Median age (years)	73	66	–
Median CVC indwelling time (days)	8	8	–
Catheter utilization ratio	0.6	0.6	–
Studied catheters	169	207	–
Femoral	43	56	0.63
Jugular	68	68	0.06
Subclavian	58	83	0.87
Number of hemodialysis CVCs	38	38	0.16

TABLE 2 RESULTS

	Period 1	Period 2	p
Catheter-days	1,882	1,643	–
Bundle compliance rate	>90%	>90%	–
% of catheters with associated bacteremia	10.6	4.4	0.009
Incidence os CAB	9	5.5	0.19
Bacteremias	16	6	0.003
Fugemias	2	3	0.58

CONCLUSIONS. Although sample size was insufficient to demonstrate a significant difference in CAB incidence, the lower total number of bacteremias and lower percentage of catheters that presented this complication suggest that coated catheters result in reduced bacteremia risk.

1056

A PROSPECTIVE CLINICAL TRIAL ON PREVENTION OF CATHETER CONTAMINATION USING THE HUB PROTECTION CAP FOR NEEDLELESS INJECTION DEVICE

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AIMS. Catheter hub contamination has been recognized as a source of catheter-related blood stream infections (CR-BSI). We have investigated the efficacy of protection cap for a needleless injection device, Planecta SC® (PNSC), in preventing intraluminal catheter contamination, compared to a conventional three-way stopcock.

METHODS. Adult patients requiring an intravascular catheter placement for at least 48 h in intensive care unit were randomly assigned to receive either the infusion device with the protection cap and PNSC (Test group, $n = 31$, number of devices = 151), or with a conventional three-way stopcock (Comparator group, $n = 33$, number of devices = 179). To evaluate intraluminal contamination, we examined the bacteria isolated in the inline bacterial filters which were attached to downstream of the injection ports.

RESULTS. The incidence of bacterial contamination was significantly different between the groups (Test group 2/151 (1.3%) vs. Comparator group 11/179 (6.2%), $p = 0.04$). There was no correlation between the microbial contamination rate and in-situ time of filters or numbers of injections.

CONCLUSIONS. The use of the protection cap for needleless injection device decreased microbial transfer from the injection port to the intraluminal fluid pathway and lowered the risk of CR-BSI.

1057

MICROBIOLOGICAL PROFILE OF INFECTION AND RESISTANCE IN INVASIVE DEVICES IN THE INTENSIVE CARE UNIT. COLOMBIA YEAR 2007/2008

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INTRODUCTION. Proper antibiotic therapy is crucial for survival. With mortality of 35% and increased costs of up to 40,000 USD.

This paper describes the microbiological profile and resistance of germs associated with invasive devices in 35 Intensive Care Units in Colombia during the years 2007 and 2008 with 844 patients involved

OBJECTIVES. To analyse to microbiological profile and resistance of infectious agents in intensive care units in Colombia from 2007 to 2008

METHODS. Data were collected on device-associated nosocomial infection (DANI) in patients older than 16 years that remain for a period longer than 24 h in intensive care units in Colombia. We included patients with pneumonia associated with mechanical ventilation (VAP) central venous catheter-associated bacteremia (CVCB) and infections associated with urinary bladder catheter (UIAUC). The definitions of these infections are the same used by the GRUVECO group

RESULTS. The germs most commonly isolated were Klebsiella Pneumonia comprehensively in a 19.8%, 18.3% in Pseudomonas aeruginosa and *Escherichia coli* in 15.5% when analyzed all together.

When analysing germs by disease subgroup we found that the germ most commonly isolated for VAP was Pseudomonas aeruginosa in a 24.4%, for CVCB was *K. pneumonia* in a 16.57%, and for UIAUC was *E. coli* in a 37.2%.

When analyzing the profiles of resistance we found that in the 144 of the infections caused by *E. coli*, 40.94% were positive for extended spectrum beta-lactamase and in 182 infections caused by *K. pneumiae* 31.31% were positive for ESBL. No test was conducted for Amp C associated resistance in 67.07% of infections cause by *K. pneumonie* and 83.55% of infections due to *E. coli*.

It was found that the sensitivity of fourth-generation cephalosporins for *P. Aeruginosa* in VAP was 60.43 and 62.76% for carbapenems.

For *K. Pneumonia* in CVCB was 80.95 and 96.42% for carbapenems and for *E. coli* to a fourth-generation cephalosporins was 82 and 100% for carbapenems

CONCLUSION. Measures to increase the correct use of antibiotics in hospitals and reduce bacteria resistance profiles of nosocomial infections should implemented.

REFERENCES. 1. Epidemiología de las Infecciones Nosocomiales Asociadas a Dispositivos en 35 Unidades de Cuidados Intensivos de Colombia (2007–2008). Proyecto Gruveco

2. CDC National Nosocomial Infections Surveillance (NNIS) System (2002) Report data summary from January 1992 to June 2002. Am J Infect Control 32:1249–1272

3. Rosenthal VD, Maki DG, Salomao R, Moreno CA, Mehta Y, Higuera F, Cuellar LE, Arikan OA, Abouqal R, Leblebicioglu H (2006) International Nosocomial Infection Control Consortium. Device-associated nosocomial infections in 55 intensive care units of 8 developing countries. Ann Intern Med 145(8):582–591

4. Hughes JM (1988) Study on the efficacy of nosocomial infection control (SENIC Project): results and implications for the future. Chemotherapy 34:553–561

Perioperative stress, inflammation and organ dysfunction: 1058–1070

1058

ENOXIMONE REDUCES THE INFLAMMATORY RESPONSE TO CARDIOPULMONARY BYPASS: A PROSPECTIVE RANDOMIZED STUDY

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INTRODUCTION. Recent reports have showed an anti-inflammatory effect of phosphodiesterase III-inhibitors (PDEi) in patients undergoing cardiopulmonary bypass (CPB). We sought to evaluate the immunological and hemodynamic response to enoximone in patients undergoing Coronary Artery Bypass Grafting (CABG) [1, 2].

METHODS. *Design.* Analysis of a prospective and randomized collected database.

Setting. Intensive Care Unit (ICU) and operating room in an University Hospital.

Patients. A total of 40 patients (M/F 23/17) aged 30–80 (ASA II-III) submitted to elective and on-pump myocardial revascularization from September 2005 to March 2007.

Randomization. Pre-intervention, once obtained a preoperative informed consent, the patients were randomly assigned to Group 1 (Enoximone bolus 0.5 mg/kg after anaesthesia induction followed by continuous infusion 2.5 μg/kg/min during the first 48 h of ICU stay) or Group 2 (placebo, sodium chloride 0.9%). The study was approved by the local ethic committee.

Data collection: Preoperative and continuous assessment of Body Temperature (BT). Haemodynamic and immunological response (Cytokines blood levels, IL-2, IL-6, TNF-α, IL-10) before anesthetic induction (T0), after aortic-declamping (T1), at the end of surgery (T2) on ICU admission (T3) and 24 h (T4) postoperatively.

Statistics: Within-between groups analysis, one-way ANOVA and unpaired *t* test were used when appropriate.

RESULTS. The preoperative and operative variables were comparable between the two groups (p = NS for all measurements). BT was comparable between groups. Haemodynamic parameters were comparable between Groups except Indexed Systemic Vascular Resistances (ISVRs) that were lower in Group 1 ($p < 0.05$) and Cardiac Index (higher in Group 1 $p < 0.05$). TNFα, IL2 and IL6 blood levels were lower in Group 1 ($p < 0.0001$), IL10 blood levels were higher in Group 1 ($p < 0.0001$).

CONCLUSION. Enoximone modulates the inflammatory response and improve the haemodynamic response in this clinical context.

REFERENCES. 1. Boldt J et al (2002) Intensive care med 28:1462–1469

2. Vincent JL (2005) Yearbook in Intensive Care Medicine, pp 141–150

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1059

EFFECTS OF PERIOPERATIVE BETA BLOCKADE ON MONOCYTE FUNCTION AND POSTOPERATIVE INFECTION RATE

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INTRODUCTION. Beta-blockers (BB) are often prescribed and taken drugs in surgical patients. There are a lot of studies showing the effects of a perioperative beta-blockade on cardiovascular events [1]. The effects of BB on immune function are well documented [2]. New data suggesting an higher postoperative sepsis rate [3].

OBJECTIVES. Primary goal of the study was to evaluate the effects of BB upon monocyte function and postoperative infection rate.

METHODS. This study is a prospective observational study with post-ad-hoc design, approved by the local ethic committee. 123 patients undergoing elective abdominal surgery and classified ASA 3 and ASA 4 were consecutively included after written consent. Patients were divided into two groups regarding a home medication with or without BB.

Preoperative, postoperative and on the first postoperative day as well HLA-DR-expression as the ex-vivo-secretion in LPS-stimulated monocytes of TNF-alpha and IL-10 were measured. Infection rates were retrospectively detected fulfilling CDC-criteria. Statistical analysis was performed using Mann–Whitney *U* test and Pearson's Chi-Squared Test.

RESULTS. No significant difference could be detected regarding HLA-DR-expression of monocytes among the two groups. Likewise no significant difference regarding ex-vivo-secretion of TNF-alpha and IL-10 could be shown. 11 of 42 (20.8%) of the patients without BB-medication suffered from postoperative infection. 15 of 55 (21.4%) of the patients with preoperative BB-medication developed a postoperative infection (p = NS).

CONCLUSION. Perioperative monocyte function is not altered by a long-term beta-blockade. No Changes in postoperative infection rates were observed. The effects seen in randomized trials might be due to a near-term started medication.

REFERENCES. 1. Lindenauer PK (2005) N Engl J Med
2. Lang CH, J Trauma (2008)
3. POISE Study Group, Lancet

1060

HEMODYNAMICS DURING ISCHAEMIA-REPERFUSION PORCINE MODEL OF RUPTURED ABDOMINAL AORTIC ANEURYSM REPAIR

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INTRODUCTION. Abdominal aortic aneurysm (AAA) rupture is an emergency situation with high mortality. Most deaths occur from multiple organ failure which arises as a consequence of tissue hypoperfusion, activation of inflammatory response and excessive reactive oxygen species production.

OBJECTIVES. To develop a porcine model of ruptured AAA repair. This abstract presents hemodynamic data.

METHODS. Ten interventional and 5 sham-operated female pigs weighing 38 (37–39) kg were studied under general anaesthesia. During instrumentation, catheters for measurement of arterial pressure (MAP), cardiac output (CO) and mixed venous saturation (SvO_2) were introduced. Sampling catheters were placed into portal, renal and inferior caval vein. Transit time flow probes were used for renal artery and portal vein blood flow. Baseline values (T1) were obtained after at least 2 h of stabilization. During hemorrhagic shock (simulation of AAA rupture) pigs were bled to MAP 45 mmHg and abdominal cavity was filled with warmed saline to abdominal pressure of 25 mmHg. Data were collected after 4 h of shock (T2). During "surgery" phase, infrarenal aortic clamping was performed for 2 h and hemodynamics resuscitated with shed blood (T3). Post-surgery phase lasted 11 h (T4). Data are presented as median (IQR), appropriate non-parametrical tests was used.

RESULTS. Six interventional pigs completed the protocol; 4 pigs died at the end of hemorrhagic shock and are not included in results. Data on hemodynamics and metabolism from interventional group are presented in Table 1 (SO_2—oxygen saturation, # means $p < 0.05$ I vs. S, $ means $p < 0.05$ vs. baseline, double symbol means $p < 0.01$).

TABLE 1

	T1	T2	T3	T4
MAP (mmHg)	79 (72–99)	49 (47–54) ## $	99 (80–112)	90 (65–91)
Cardiac output (ml/kg/min)	91 (70–114) #	92 (74–108) ##	149 (136–217) $	123 (114–149)
Renal blood flow (ml/kg/min)	7.7 (7.3–7.9)	0.8 (0.5–1.4) ## $	6.0 (3.8–6.8)	3.6 (1.2–6.2) # $
Portal blood flow (ml/kg/min)	17 (10–28)	16 (15–21)	38 (27–46) $	22 (20–23)
Base excess (mmol/l)	3 (2–5)	−13 (−19 to −13) ## $$	−6 (−12 to −3) ## $$	−1 (−4 to 1) ##
Mixed venous SO_2 (%)	87 (82–95)	76 (72–92)	92 (92–93) ##	87 (85–88)
Renal SO_2 (%)	98 (96–98) #	73 (68–77) ## $$	92 (92–97)	92 (92–96)
Portal SO_2 (%)	90 (82–93)	76 (63–82) ##	97 (96–99) ## $$	94 (91–97)
Inf. caval SO_2 (%)	89 (87–96)	62 (59–76) ##$	76 (72–92) ##	94 (93–96)

CONCLUSIONS. This model of ruptured AAA repair induced substantive hemodynamic and metabolic changes resulting in high mortality. Less severe insult will be tested before the model will be used for intervention trials.

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1061

PERI-OPERATIVE FACTORS ASSOCIATED WITH SYSTEMIC INFLAMMATORY RESPONSE AFTER CARDIOPULMONARY BYPASS SURGERY

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INTRODUCTION. Cardiopulmonary bypass induced systemic release of proinflammatory cytokines and initiates a systemic inflammatory response. The peri-operative factors influence the level of cytokines and implicated the development of several post-operative complications, which is responsible for organ dysfunctions.

OBJECTIVES. To evaluate the correlation between Interleukin-8 (IL-8), Pediatric Logistic Organ Dysfunction (PELOD) scores and several factors that associated Systemic Inflammatory Response After Bypass (SIRAB) in children who undergo open-heart surgery with cardiopulmonary bypass.

METHODS. Clinical trial (quasi-experimental study), setting: pre and post-operative cardiac intensive care unit (CICU). Twenty-one children following open-heart surgery with cardiopulmonary bypass. Blood was drawn before and after surgery, samples were taken from mixed vein and coronary sinus. Plasma levels of IL-8 were analyzed at 3 different time points (before cardiopulmonary bypass, at reperfusion period and 3 h after aorta cross-clamp off) and measured by immunoassays. Internal factors that associated SIRAB were age, gender, body surface area and type of the congenital heart defect. The peri-operative factors were aortic cross clamp time, cardiopulmonary bypass time, hypothermic state and inotrope dose. Evaluated of the clinical outcomes included the duration of mechanical ventilation, length of stay in CICU and mortality. The cumulative influence of organ dysfunctions analyzed by using the PELOD scores.

RESULTS. Before operation and at reperfusion period, level of IL-8 raised but it did not correlated significantly. IL-8 concentrations at 3 h after aorta cross-clamp off were higher significantly than in the reperfusion period ($r > 0.49, p = 0.030$). Level of IL-8 correlated with the bypass time ($r > 0.53, p = 0.018$) as well as aortic cross clamp time ($r > 0.55, p = 0.014$). There was moderate associated between age and gender with PELOD scores ($r > 0.47$, $p = 0.041$). We found no correlation between IL-8 level and PELOD scores. There were significant correlation between age and mechanical ventilation time support ($r > 0.47, p = 0.030$), age and length of stay in CICU ($r > 0.44$, $p = 0.050$). Only one patient died in this study.

CONCLUSIONS. IL-8 level correlated with aortic cross-clamp time in children who undergone open heart surgery with cardiopulmonary bypass. No correlation was found between IL-8 and PELOD scores.

KEYWORDS. Cardiopulmonary bypass, Systemic inflammatory response after bypass, Interleukin-8, Pediatric logistic organ dysfunction scores.

1062

INFLAMMATORY RESPONSE TO THE ISCHAEMIA-REPERFUSION INJURY IN PORCINE MODEL OF RUPTURED ABDOMINAL AORTIC ANEURYSM REPAIR

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INTRODUCTION. Rupture of abdominal aortic aneurysm is a life-threatening event often resulting in multiple organ failure. The mechanisms involved are both hemorrhagic shock and ischemia-reperfusion injury. Understanding the underlying mechanisms may improve treatment options and patient outcome.

OBJECTIVES. To develop a porcine model of ruptured abdominal aortic aneurysm (AAA) repair. This abstract presents data on markers of inflammation.

METHODS. Ten interventional and 5 sham-operated female pigs weighting 38 (37–39) kg were studied under general anaesthesia (continuous i.v. infusion). Apart from basic biochemical analysis, TNFα, IL-10, IL-6 and TBARS were analysed. Baseline values (T1) were obtained after 2 h of stabilization following the instrumentation. Subsequently, hemorrhagic shock was simulated by bleeding the pigs to MAP 45 mmHg and abdominal cavity was infused with warmed saline to reach intra-abdominal pressure of 25 mmHg (model of AAA rupture). Data were collected after 4 h (T2) of shock. During "repair surgery" phase, infrarenal aortic clamping was performed and hemodynamics resuscitated with shed blood. Clamping lasted 2 h (T3). Final post-surgery phase lasted 11 h (T4). Data were processed with appropriate non-parametrical test and are presented as median (IQR). At the end of experiment, samples from kidneys, liver and heart were taken for oxidative-stress related DNA damage evaluation by "DNA-comets" assay.

RESULTS. Six interventional pigs completed the protocol; 4 pigs died at the end of hemorrhagic shock and are not included in results. The levels of TNFα, IL-6, IL-10 [ng/l] and TBARS [μmol/l] (all corrected to albumin concentration) are presented in Table 1: # means $p < 0.05$ H vs. sham, $ means $p < 0.05$ vs. baseline (sham group not shown).

TABLE 1

Parameter	T1	T2	T3	T4
TNFα	4.3 (3.2–4.9)	5.7 (5.6–7.1) # $	8.6 (4.0–9.5) # $	6.9 (5.9–14.3) # $
IL-6	0.5 (0.4–1.2)	7.0 (1.9–7.3)	4.0 (3.1–6.4) #	0.6 (0.5–0.8) #
IL-10	0.5 (0.4–0.8)	1.1 (0.5–3.2) $	1.3 (0.7–3.6) $	0.9 (0.4–2.0) $
TBARS	0.73 (0.71–0.75)	1.07 (0.97–1.31)$	1.20 (0.92–1.66)$	0.60 (0.41–1.01)

The DNA-comets showed significantly higher oxidative-stress related DNA damage in hemorrhage group in kidney cortex, kidney medulla and liver compared to sham-operated group.

CONCLUSIONS. This model induced well-marked changes in inflammatory parameters. The inflammatory response was not satisfactorily homogenous—most probably due to varying severity of intervention (haemorrhage target reached at different rate, etc.). Homogenous and less severe insult together with widening of the panel of examined inflammation markers will be applied in further experiments. The model will then be used for intervention testing.

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1063

GENDER DIFFERENCES IN PERIOPERATIVE MONOCYTE REACTION

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INTRODUCTION. Studies of septic patients show that significantly more male patients suffer from severe sepsis or septic shock than female patients [1, 2]. On the contrary, gender differences of the perioperative immune response have not yet been investigated.

OBJECTIVE. Aim of this study was to investigate monocyte response to an operation regarding gender differences.

METHODS. This study is a prospective observative study, approved by the local ethic committee. Consecutively, 218 patients classified ASA 3 and ASA 4 were included in the preoperative assessment clinic after written consent: 135 men and 83 women. Ex-vivo secretion of TNF alpha and IL-10 in LPS-stimulated monocytes were measured preoperatively, postoperatively and on day 1 after surgery. Postoperative infections were diagnosed according to CDC criteria. Statistical analysis: Mann–Whitney *U* test and Pearson's chi-squared test.

RESULTS. Ex vivo secretion in LPS-stimulated monocytes of TNF alpha was significantly increased in male patients at all three measurement points ($p < 0.05$), IL-10 was significantly increased on day 1 after surgery ($p < 0.05$). Postoperative infection rate was in tendency increased (19.4 vs. 12.2%) in male patients.

CONCLUSION. Women and men differed in perioperative monocyte function. Postoperative infection rates were in tendency different.

REFERENCES. 1. Schröder J (1998) Arch Surg 133(11):1200–1205

2. Wichmann WM (2000) Intensive Care Med 26(2):167–172

1064

LOW AND INTERMEDIATE RISK SURGERY INDUCES ACUTE DEPRESSION OF MONOCYTE HLA-DR EXPRESSION AND DYNAMIC TRAFFICKING OF MONOCYTE SUBSETS

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INTRODUCTION. Surgery is known to suppress immune function, and decreased Human Leukocyte Antigen-DR (HLA-DR) expression on blood monocytes has been proposed as a potential marker of postoperative infective complications. However, studies to date have focused on high risk surgery, and there have been few reports on this biomarker in low risk surgery. Blood monocytes consist of heterogeneous cell populations of different phenotype and maturity, which can be divided into 2 or 3 subsets based on their CD14 and CD16 expression. Since monocyte HLA-DR expression increases with maturation, the decreased HLA-DR levels following surgery may be just a reflection of surgical stress-induced monocyte trafficking, i.e. mobilisation of immature monocytes from the bone marrow, and/or disappearance of mature monocytes from the central circulation due to margination to the microvasculature or extravasation.

OBJECTIVE. We investigated early postoperative changes in monocyte HLA-DR expression in patients following low and intermediate risk surgery. We also evaluated the monocyte subset trafficking and correlated them with their HLA-DR expression.

METHODS. We recruited 42 elective surgical patients from four categories of procedure: laparoscopic bariatric, open lower GI, hip arthroplasty and knee arthroplasty using tourniquet, to represent varying degrees of tissue trauma and bacterial exposure. Peripheral venous samples were collected immediately prior to, at termination of, and 24 h following surgery. Samples were analyzed by flow cytometry to quantify cell surface HLA-DR expression and cell numbers for both $CD14^{high}$ and $CD14^{low}$/CD16 + monocytes.

RESULTS. The number of immature $CD14^{high}$ monocytes increased from baseline to 24 h (5.0 ± 2.2 vs. $7.6 \pm 3.9 \times 10^5$ cells/ml, $p < 0.01$), while the more mature $CD14^{low}$/CD16 + monocytes decreased (0.68 ± 0.36 vs. $0.44 \pm 0.36 \times 10^5$ cells/ml, $p < 0.01$). Within the $CD14^{high}$ population, the number of cells co-expressing CD16 (intermediate maturity) increased two-fold at 24 h ($p < 0.01$). HLA-DR expression decreased on both monocyte subsets in all surgical groups. This depression was evident by the end of the surgery, and became statistically significant at 24 h, with a greater decrease on $CD14^{high}$ than $CD14^{low}$/CD16 + monocytes (60 ± 30 vs. $40 \pm 30\%$, $p < 0.01$).

CONCLUSIONS. These results demonstrated that a substantial depression of monocyte HLA-DR expression occurs 24 h following low to intermediate risk surgery with minimal complications. Thus, the levels of HLA-DR expression on blood monocytes, when measured immediately following surgery, do not seem to be a clinically useful biomarker for postoperative complications. Our results also showed, for the first time, that surgery induces significant mobilization and margination/extravasation of individual monocyte subsets. However, the subsequent HLA-DR depression was consistent across all monocyte subsets and thus cannot be explained solely by differential monocyte trafficking.

1065

THE ANTI-OXIDATIVE ACTION OF DOBUTAMINE IS NOT INVOLVED IN ITS PROTECTION OF HUMAN LYMPHOCYTES AGAINST STAUROSPORIN-INDUCED APOPTOSIS

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INTRODUCTION. Previously we demonstrated that dobutamine protects human T-cells from apoptosis [1]. Because this effect of dobutamine may have clinical implications, our current research focuses on the molecular mechanism responsible for this cytoprotection. We already showed that this cytoprotective effect was *not* receptor-mediated and *in*dependent of MAPK pathways.

OBJECTIVES. Because dobutamine can protect cultured endothelial cells (HUVEC's) by acting as a ROS-scavenger [2], the goal of the current study was to investigate if anti-oxidative properties of the dobutamine molecule are responsible for its cytoprotective effect on human lymphocytes.

METHODS. Jurkat T-cells passages 1–12 were used. To measure generation of reactive oxygen species (ROS), cells were loaded with the fluorescent dye CM-H_2DCFDA (5 μM).

RESULTS. Experiments with a caspase-activity assay showed that pre-treatment with dobutamine decreased staurosporin-induced (2 μM for 2 h) apoptosis in Jurkat cells. In contrast, isoproterenol and epinephrine had no protective effect.

To test if dobutamine can act as a ROS-scavenger in these conditions, H_2DCFDA-loaded T-cells were exposed to staurosporin, with or without dobuatmine pre-treatment: the ROS-scavenging effect was very pronounced in the 0.1 mM group (decrease in fluorescence signal (arbitrary units) from $10{,}733 \pm 887$ to $5{,}345 \pm 342$ AU, $p < 0.01$), and increased further in the 0.5 mM group ($5{,}062 \pm 274$ AU).

Next we investigated if the protection was mediated by this anti-oxidative action:

The production of ROS due to staurosporin-treatment was measured: only after prolonged (6 h) staurosporin-treatment, the ROS-signal increased significantly.

Next, the anti-oxidative action of isoproterenol was investigated: with 0.1 mM, the ROS-fluorescence signal decreased from $10{,}826 \pm 2{,}069$ to $4{,}408 \pm 582$ AU, $p < 0.01$), and decreased further in the 0.5 mM group ($3{,}069 \pm 657$ AU). Epinephrine had a similar effect.

Finally, the protective action of *N*-Acetyl-Cysteïne (NAC) was investigated with a caspase-activity assay: although NAC did act as a ROS-scavenger, it did not reduce apoptosis in lymphocytes (caspase activity pre- and post-treatment (0.5 mM) was $38{,}427 \pm 7{,}531$ U and $39{,}182 \pm 5{,}695$ U).

CONCLUSIONS. Because (1) ROS levels do not increase significantly during staurosporin-induced apoptosis (2) isoprotrernol and epinephrine, which have no cytoprotective effect, have ROS-scavenging properties comparable to dobutamine (3) the universal ROS scavenger NAC does not protect lymphocytes in the current study-protocol, we conclude that although dobutamine is a ROS scavenger, this property of the dobutamine molecule can *not* be responsible for mediating protection of Jurkat cells against staurosporin-induced apoptosis.

REFERENCES. 1. Jans et al (2007) Critical Care 11(S2):31

2. Yard et al (2004) Am J Transpl 4:22–30

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1066

PERIOPERATIVE SYSTEMIC INFLAMMATORY PROFILE IN PATIENTS SUBMITTED TO SURGICAL TREATMENT OF GASTRIC AND COLORECTAL ADENOCARCINOMAS

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BACKGROUND. There is increasing evidence that the ongoing systemic inflammatory response is associated with advanced abdominal cancer. Thought to be due to infiltration of leukocytes, cytokines, and chemokines in the tumor microenvironment, such responses could predict outcomes, and studies have revealed that an inflammation-based prognostic score could be useful.

OBJECTIVE. This study aims to describe perioperative systemic levels of four cytokines, comparing patients with gastric and colorectal adenocarcinomas submitted to surgical treatment.

METHODS. We prospectively studied 59 patients, comparing 32 submitted to gastrectomy vs. 27 to colectomy. The two groups were comparable concerning preoperative status including comorbidities and neoadjuvant oncologic approach. All patients had peripheral blood harvest before, and also 3 and 6 days after surgical procedures. Using ELISA-sandwich technique, we measured circulating levels of a proinflammatory cytokine—macrophage migratin inhibitory factor (MIF), a chemokine—macrophage chemoatractant protein 1 (MCP-1), an anti-inflammatory cytokine—interleukin 10 (IL10), and a non-specific cytokine—interleukin 6 (IL6). Data were plotted and statistically treated by SPSS 11.0 for Windows, using non-parametric statistic.

RESULTS. Circulating levels of the reactants (pg/dL) were lower among gastrectomized patients compared with colectomized ones. MCP-1 started from 206 ± 74 vs. 715 ± 389 ($p = 0.027$), going to 198 ± 40 vs. 877 ± 479 ($p = 0.005$) at the third day. IL10 started from 24 ± 5 vs. 91 ± 55 ($p = 0.017$) going to 29 ± 9 vs. 173 ± 127 ($p = 0.024$) at the third day and to 11 ± 5 vs. 72 ± 29 ($p = 0.000$) at the fifth day. IL6 started from 10 ± 4 vs. 71 ± 28 ($p = 0.000$) going to 51 ± 12 vs. 198 ± 106 ($p = 0.006$) at the third day. The exception was MIF, whose preoperatively levels were significantly higher in the gastric adenocarcinoma population ($7{,}760 \pm 1{,}197$ vs. $2{,}761 \pm 532$, $p = 0.012$) and did not significantly differed postoperatively.

CONCLUSION. Gastric and colorectal adenocarcinomas have different inflammatory perioperative behavior concerning MCP1, IL-6 and IL10, whose circulating levels are significantly higher among colorectal population. These findings were not reproduced regarding MIF, possibly suggesting the involvement of alternative control mechanisms.

1067

INTRAOPERATIVE DECREASES OF SELENIUM, ZINC AND COPPER ARE ASSOCIATED WITH THE DEVELOPMENT OF SEVERE SYSTEMIC INFLAMMATORY RESPONSE SYNDROME IMMEDIATELY AFTER OPEN-HEART SURGERY

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INTRODUCTION. The trace elements selenium (Se), copper (Cu) and zinc (Sn) are essential for the maintenance of the oxidative balance and crucial for the regulation of immunological, endothelial and cardiac function [1].

Cardiac surgery using cardiopulmonary bypass (CPB) is known to trigger a systemic inflammatory response syndrome (SIRS). We hypothesized that trace element-depletion is critically involved in this response.

METHODS. In 60 consecutive patients (Age 65.12 ± 13.92; EuroScore: 5.35 ± 3.26) undergoing cardiac surgery with the use of CPB, whole blood concentrations of Se–Cu–Sn were measured after induction of anesthesia and 1 h after admission to the ICU (eos) using atomic absorption spectrometry. At the first postoperative day, patients where separated into 3 a priori-defined subgroups (according to the ACCP/SCCM-consensus): no SIRS, SIRS, and severe SIRS (=SIRS + organ failure). Results were statistically analysed using one-way, Kruskal–Wallis ANOVA and receiver operating characteristics analysis.

RESULTS. 50 patients exhibited a significant deficiency of Se–Cu–Sn already at beginning of surgery. In all patients, blood levels of Se–Cu–Sn were significantly reduced after eos when compared to preoperative values. During the first postoperative day, 6 patients presented with severe SIRS, 38 with SIRS and 6 without SIRS-criteria. In patients developing severe SIRS postoperatively, the intraoperative decrease of Se–Cu–Sn was most pronounced. Intraoperative losses of Se–Cu–Sn were predictive for the development of severe SIRS at day 1 after surgery (Fig. 1).

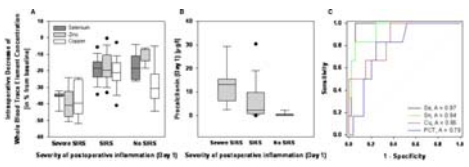

Fig. 1 Severity of postoperative inflammation

CONCLUSION. Cardiac surgery using CPB resulted in a profound depletion of whole blood-levels of antioxidant trace elements which was most distinctive in patients developing severe SIRS. Further investigations are warranted whether intraoperative trace element substitution might improve postoperative recovery.

REFERENCES. 1. Heyland DK et al (2005) Antioxidant nutrients: a systematic review of trace elements and vitamins in the critically ill patient. Intensive Care Med 31:327–337

1068

ACUTE RENAL FAILURE FOLLOWING CARDIAC SURGERY; IMPLICATIONS FOR INTENSIVE CARE

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INTRODUCTION. Acute renal failure requiring renal replacement therapy (RRT) is known to develop in 1–5% of patients undergoing cardiac surgery and is a strong predictor of peri-operative morbidity and mortality.

This retrospective study compares incidence of renal failure requiring renal replacement therapy and subsequent in-hospital mortality in subsets of patient groups defined by operation and pre-operative serum creatinine over three consecutive 4 year periods at a UK tertiary cardiac centre, the Bristol Royal Infirmary.

We define a group of patients with pre-operative creatinine of <200 μmol/l and subsequent requirement for (in-hospital) renal replacement therapy as 'unexpected' renal failure and analyse cardiac intensive care unit length of stay, age and sex distribution of this group.

METHOD. Data on all cardiac surgical patients treated at the Bristol Royal Infirmary is routinely stored in PATS (Patients Analysis and Tracking System, Dendrite Clinical Systems Ltd, UK). Data was ripped to Microsoft Excel (Microsoft Corporation, US) for analysis. We studied 6 groups: first-time valve replacements, re-do valve replacements, first-time CABG on-pump, first-time CABG off-pump, re-do CABG on-pump and re-do CABG off-pump. For the purposes of this study, we refer to a requirement for in-hospital post-operative renal replacement therapy (CVVHDF) in patients with a pre-operative serum creatinine of <200 μmol/l as 'unexpected' acute renal failure. Groups were studied over 3 periods: 1996–1999, 2000–2003 and 2004–2007.

OUTCOMES. New renal replacement therapy and in-hospital mortality. The unexpected renal failure group was analysed by age, sex and length of cardiac intensive care unit stay (LOS).

RESULTS. Incidence of unexpected ARF requiring renal replacement therapy was lowest in first-time CABG off-pump (0.55–0.98%) and highest in re-do valves (1.64–7.58%).

Mortality of unexpected ARF was extremely high (25–100%). Small numbers made analysis by operation difficult. No mortality trend was shown over the 3 time periods. Mortality is increased after age 80. There was no difference in incidence by sex but female mortality is increased.

Patients in the unexpected ARF group were much less likely than the overall patient group to have a cardiac intensive care stay of 0–5 days. Those that survived were most likely to be discharged between days 6 and 10. The overwhelming majority (97.8%) of patients in the overall group are likely to be discharged by day 11. This is not true for the unexpected ARF patients that survived (only 50% being discharged prior to day 11) or for the unexpected ARF patients that died (70.3% discharged prior to day 11). In addition 3.45% of patients that survived unexpected RRT and 6.6% of patients that didn't survive unexpected RRT were still on the cardiac intensive care ward beyond 40 days.

SUMMARY. We demonstrate that unexpected ARF presents a highly significant burden of cost and human suffering to cardiac intensive care services.

1069

PRE-OPERATIVE C-REACTIVE PROTEIN (CRP) AS A PROGNOSTIC INDICATOR OF ONE YEAR MORTALITY FOLLOWING CURATIVE PANCREATECTOMY

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INTRODUCTION. Biomarkers have shown to be complimentary prognostic tools in ICU patients. The objective of this study was to evaluate whether pre-operative C-reactive protein, white cell count (WCC), Creatinine, Fibrinogen and Albumin can serve as prognostic indicators of 1-year mortality in patients undergoing curative pancreatectomy for pancreatic carcinoma.

METHOD. This study is a retrospective observation carried out in an intensive care unit of a tertiary referral hospital in London. Data was collected from all patients admitted to the unit from 2005 to 2007 following either pylorus preserving partial pancreatectomy or Whipples procedure. According to one-year mortality patients were divided into survivors ($n = 53$) and non-survivors ($n = 21$). Mean age was 61.8 years (survivors) versus 65.6 years (non-survivors). Mean APACHE scores were 14.26 (survivors) versus 13.63 (non-survivors). Both pre-operative and immediate post-operative values of CRP, WCC, Creatinine, Fibrinogen and Albumin were recorded. We compared the means of these parameters between survivors and non-survivors with unpaired *t* test.

RESULTS. Pre-operative CRP in non-survivors (mean 30.25 mg/dl) was significantly higher than in survivors (mean 11.3 mg/dl) with a two-tailed p-value of 0.0342. No significant difference was seen with other parameters or any of the post-operative values.

Pre-operative *p*-values: WCC 0.369, CRP 0.0342, Albumin 0.344, Creatinine 0.465, Fibrinogen 0.186.

CONCLUSION. Pre-operative C-Reactive Protein has a significant association with 1-year mortality in pancreatectomy patients. C-reactive protein is an acute phase protein, reactive not only due to infection and inflammation but also linked to the presence and prognosis of cancer.

REFERENCE. 1. Erlinger TP, Platz EA, Rifai N, Helzlsouer KJ (2004) C-reactive protein and the risk of incident colorectal cancer. J Am Med Assoc 291:585–590. 2C-reactive protein levels correlate with mortality and organ failure in critically ill patients.

1070

USE OF L-LYSINI AESCINATIS AND DEXAMETHASONE FOR THE PREVENTION OF LARYNGEAL OEDEMA AFTER TOTAL THYREOIDECTOMY

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INTRODUCTION. The procedure of total thyroidectomy has a very high incidence of post-operative **laryngeal** oedema [1]. This facilitates an increase in the risk of acute respiratory insufficiency after the extubation of the trachea postoperatively [2]. To evaluate the effect of administering 0.1% 15 ml solutio L-lysini aescinatis intravenously for the prophylaxis against acute respiratory insufficiency resulting from the post-operative **laryngeal** oedema.

METHODS. After informed consent, 140 ASA II-III physical status patients, ages 35–62 years, undergoing total thyroidectomy, were randomly divided into two groups. A group ($n = 70$) received 0.1% 15 ml sol. L-lysini aescinatis intravenously, 30 min before the onset of anesthesia, while B group ($n = 70$) received 4 mg **dexamethasone** intravenously, 30 min before the onset of anesthesia. The anesthesia was induced with fentanyl, propofol, and vecuronium. The duration of anesthesia was 120 ± 15 min. SAP, DAP, HR, SpO_2, PaO_2, $PaCO_2$, sedation and pain degree were recorded before and after surgical procedure. Analysis of variance and t tests were used for statistical comparisons.

RESULTS. The two groups were similar in regard to demographical variables, ASA physical status, surgical procedure, anesthesia and duration of surgery. After extubation, 1 patient in group A developed symptoms of I degree acute respiratory insufficiency which resolved in 45 min. In group B, 7 patients developed the symptoms of I degree acute respiratory insufficiency which resolved in 110 ± 20 min and 2 patients developed the symptoms of III degree acute respiratory insufficiency demanding reintubation for lung ventilation ($P < 0.05$).

CONCLUSIONS. Use of 0.1% 15 ml sol. L-lysini aescinatis before total thyroidectomy effectively allows for decrease in the incidence of acute respiratory insufficiency as an outcome of post-operative **laryngeal** oedema.

REFERENCES. 1. Lacoste L et al (1993) Airway complications in thyroid surgery. Ann Otol Rhinol Laryngol 102:441–446

2. Rudra A, Chatterjee S (2006) Tracheal extubation in the difficult airway. Indian J Anaesth 50(6):430–434

Coagulation disorders and therapeutic techniques for the ICU: 1071–1084

1071

POST PARTUM ACQUIRED HEMOPHILIA A., DIAGNOSIS AND MANAGEMENT: CASE REPORT

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CLINICAL PRESENTATION. 28 Year old female, admitted with PV bleeding 2 weeks after termination of pregnancy. Underwent surgery for evacuation of retained products continued to bleed heavily post-operatively which necessitated transfusion with 6 units of packed cells and 4 bags of FFP. Coagulation tests showed significantly elevated APTT AT 3.1 while other coagulation parameters were normal. managed with further FFP and blood transfusion and referred for ITU input.

PAST MEDICAL HISTORY. 3 previous normal vaginal deliveries, last being 3 months prior to current admission. ITU team identified that APTT was deranged from a previous admission 4 weeks ago when she had presented with hematuria. Apart from this she had no significant past history of any bleeding diathesis or coagulation abnormalities.

INVESTIGATIONS. Coagulation tests showed significantly elevated APTT at 3.1 while other coagulation and haematological parameters were normal. The APTT was not corrected on mixing with O-ve serum. Factor 8 levels were 0.7% which increased to 7% after treatment with FFP. FACTOR 8 inhibitor assay was positive. Autoimmune screen was negative and complement levels normal.

MANAGEMENT. She was given 3 doses of recombinant factor 7 (novo 7) at a dose of 90 units/kg, which stopped the PV bleeding. Uterine tamponade was attained with a foley's catheter left inflated in-situ for 3 days. Adjuvant management with tranexamic acid, oral prednisolone 60 mg od and calcium. She had no further bleeding and foley's catheter was removed on third day. She was referred to a tertiary haematology centre for further management where she received Rituximab infusions, 3 doses at monthly intervals.

DISCUSSION. Acquired coagulation disorders in which autoantibodies against factor VIII are produced are termed acquired hemophilia A. The incidence rate of acquired hemophilia A in the UK is 1.48/million/year. Only 7% of these cases occur in the postpartum period. Acquired hemophilia is associated with significant morbidity and potential death. Cases may be associated with underlying immune or malignant disease, but at least 50% are idiopathic. In young women, the most common association is with the puerperium. There is variation in the natural history of factor VIII inhibitors in pregnancy with respect to onset, site, severity of hemorrhage and inhibitor titre. factor VIII inhibitors are most commonly found in primigravid patients. Acquired hemophilia is typically diagnosed in the postpartum period, but, rarely, it can be detected antenatally or during delivery. The median time to inhibitor onset is 2 months, but onset can occur from as soon as the antepartum period to 12 months after delivery. Common presentations are soft-tissue or vaginal bleeding, ecchymosis, postoperative bleeding and, rarely, hemarthrosis. This contrasts with congenital hemophilia, in which hemarthrosis is much more typical. Treatment of acute episodes with novoseven or aPCC.

1072

EFFECT OF FACTOR XIII ADMINISTRATION IN CRITICALLY ILL PATIENTS WITH ONGOING BLEEDING

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BACKGROUND AND GOAL OF THE STUDY. Thrombin activates the fibrin stabilizing FXIII to FXIIIa, which is responsible for the polymerisation of the fibrin clot and enables clot firmness along with platelets and fibrinogen as well as protection against fibrinolysis. Furthermore, FXIII decreases capillary leakage and improves regular wound healing. According to recommendations in the literature, FXIII activities of above 10% have been judged as sufficient in the past, while several clinical studies showed an increased blood loos and blood transfusion requirements in surgical patients with FXIII activities below 60%.

Until now, no clinical data are available, if administration of FXIII concentrate (FibrogamminHS®, CSL Behring, Vienna, Austria) is effective in reducing blood transfusion requirements in bleeding critical ill patients.

MATERIAL AND METHODS. The data presented were obtained retrospectively between January 2006 and March 2008 from 96 surgical critically ill patients with ongoing bleeding and transfusion requirements as a consequence of microvascular bleeding. All patients, who received FXIII concentrate (FibrogamminHS®, CSL Behring, Vienna, Austria) showed FXIII plasma levels below 60% and received a single shot application of about 20 IU/kg bodyweight. A Wilcoxon test for paired samples was applied to assess differences in blood product usage between baseline versus 24 h measurement and baseline versus 48 h measurements, respectively. A Mann–Whitney *U* test was used to compare the effect of FXIII concentrate alone or in combination with other blood products. According to the procedure of Bonferroni to correct for the two multiple comparisons (baseline vs. 24 h after administration of FXIII concentrate and baseline vs. 48 h after administration of FXIII concentrate) *p*-values <0.025 were assumed statistically significant.

RESULTS AND DISCUSSION. 24 h after administration of about 20 IU/kg FXIII concentrate (FibrogamminHS®), blood transfusion requirements as well as further need for blood products and clotting factor concentrates decreased statistically significant. The need for transfusion of red blood cell concentrates (RBC) decreased from a median transfusion rate of 4 RBC's (0–22) within 24 h before FXIII administration to 1 RBC (1–9) within 24 h after FXIII administration and 0 RBC (0–4) within 48 h after FXIII administration ($p < 0.001$). Furthermore, the transfusion of FFP and platelet concentrates as well as the administration of fibrinogen concentrate and PCC were reduced statistically significant.

CONCLUSION. In surgical critically ill patients with FXIII plasma levels below 60% and the tendency to microvascular bleeding, administration of FXIII concentrate (FibrogamminHS®) was effective to achieve normal haemostasis, to stop microvascular bleeding and to reduce transfusion requirements.

1073

PREDICTIVE VALUE OF SONOCLOT® AND ROUTINE COAGULATION TESTS FOR POSTOPERATIVE BLEEDING IN PATIENTS UNDERGOING CARDIAC SURGERY

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AIMS. Postoperative bleeding still is a major complication associated with a high mortality and morbidity in cardiac surgery and therefore coagulation monitoring is very crucial. Routine coagulation tests are widely used to monitor coagulation in cardiac surgery but they have several limitations. To overcome these new monitoring methods have been developed as the Sonoclot® system [1]. It assesses rapidly the viscoelastic properties of clot formation in whole blood. The aim of this study was to find out if preoperative conventional coagulation tests and perioperative Sonoclot® assays could predict postoperative bleeding in patients undergoing cardiac surgery.

METHODS. The study included patients undergoing cardiac surgery in our teaching hospital from july 2007 to december 2008. Exclusion criteria were a known coagulopathy or anticoagulating medication. Preoperative routine coagulation tests (platelet count, INR, activated partial Thromboplastin time (aPTT) and fibrinogen level) were obtained preoperatively and Sonoclot® assays (Activated Clotting Time (ACT), Clot Rate, Platelet Function; celite/Clay and glass bead as activators) were performed before the operation and after the administration of protamin. The amount of chest tube drainage was recorded hourly over the first 4 h postoperative. An abnormal bleeding was defined as more than 800 ml in these first 4 h. Statistical analyse was performed and ROC curves where obtained. Means are indicated ± SD.

RESULTS. 300 patients were included in this study [(female:male = 94:206 (31%:69%), mean age 65 ± 11 years, range 27–87 years); cardiopulmonary bypass 183 (61%), off-pump 117 (39%))]. 50 patients showed abnormal bleeding (16%). The area under the curve (AUC) for all the preoperative coagulation tests (routine tests and all the Sonoclot® assays) as well as for the postprotamin Sonoclot® tests with the celite/clay activator were between 0.51 and 0.55. These tests were unable to predict abnormal bleeding. On the contrary the postprotamin ACT, Clot Rate and Platelet Function performed with the glass bead activator were predictive of postoperative enhanced bleeding. AUC for the ACT was 0.76 (95% confidence interval (CI) 0.70–0.82), Clot rate 0.72 (95% CI 0.63–0.81) and Platelet Function AUC 0.79 (95 CI 0.72–0.87). Sensitivity for the ACT, the Clot Rate and the Platelet Function were respectively 81, 80 and 87%, specificity 70, 68 and 73%.

CONCLUSIONS. In opposition to the preoperative routine coagulation and initial Sonoclot® tests, the ACT, the Clot Rate and the Platelet Function determined using the glass bead activator after administration of protamin could predict an abnormal postoperative bleeding in patients undergoing cardiac surgery.

REFERENCE. 1. Despotis GJ, Gravelee G, Filos K, Levy J (1999) Anticoagulation monitoring during cardiac surgery: a review of current and emerging techniques. Anesth 91(4):1122–1151

1074

HAEMOVISCOELASTOGRAPHY AS A PERIOPERATIVE MEASURE OF ENOXAPARIN ANTICOAGULATION THERAPY

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INTRODUCTION. Patients undergoing open prostatectomy are at risk, for venous thromboembolic complications for up to 3 weeks postoperatively. We evaluated the efficacy and safety of postoperative regiment of enoxaparin. Currently, there is no convenient test to measure the degree of anticoagulation from LMWH.

OBJECTIVES. We carried out a single-centre, prospective, randomized, double-blind trial with the aim of assessing the efficacy of postoperative prophylactic treatment. This prospective study examines the relationship of haemoviscoelastography (HVG) MEDNORD (Ukraine Co analyzer), a viscoelastic test, measures clot formation and includes information on the cellular, as well as the plasmatic coagulation, system and serum anti-Xa concentration in patients treated with enoxaparin.

METHODS. 188 patients scheduled for open prostatectomy using epidural anesthesia were enrolled. Epidural catheters were removed the morning after surgery before the commencement of subcutaneous enoxaparin 20 mg once daily. Venous blood samples were obtained at: (1) the induction of anesthesia (baseline), (2) immediately before the third dose of enoxaparin operatively; (3) 4 h after the third dose postoperatively, and (4) immediately before the fifth close postoperatively. Whole blood samples were obtained for haemoviscoelastography (HVG), activated clotting time, and anti-Xa level analyses at each of the four time intervals.

RESULTS. At the four sample intervals, the *r* time (mean ± SEM) (5.91 ± 0.65; 7.5 ± 0.25; 9.5 ± 0.55 min) and the $\acute{e}$ time (5.8 ± 0.1; 8.2 ± 0.27; ± 9.14 ± 0.2 min) of the HVG were significantly correlated with the expected peak and trough levels of LMWH and serum anti-Xa levels ($p < 0.05$). After fifth dose immediately, HVG *r* times exceeded the normal range in 47 of 188 patients (25%). Prolongation of *r* time and $\acute{e}$ time on postoperative day 5 may indicate an exaggerated response to LMWH. Low frequency haemoviscoelastography is a test that could potentially correlate with the degree of anticoagulation produced by low molecular weight heparin enoxaparin.

CONCLUSION. Low frequency haemoviscoelastography MEDNORD (Ukraine Co analyzer), a viscoelastic test, measures clot formation and includes information on the cellular, as well as the plasmatic coagulation system is a test that could potentially correlate with the degree of anticoagulation produced by LMWH. The *r* time from the haemoviscogram correlates with serum anti-Xa concentration. HVG is a convenient test to measure the decree of anticoagulation from LMWH.

1075

EFFECT OF REGIONAL CITRATE ANTICOAGULATION ON HEMOSTATIC PROFILE IN CARDIAC SURGERY PATIENTS MONITORED WITH THROMBELASTOGRAPHY

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OBJECTIVE. Regional citrate anticoagulation is suitable for cardiac surgical patients with hemostatic defect requiring the continuous renal replacement therapy (CRRT) in the postoperative period. This mode of anticoagulation does not affect the coagulation system in terms of further alteration hemostatic profile monitored using thrombelastography. Thrombelastography (TEG) is a suitable method for comprehensive evaluation of hemostatic profile in cardiac surgical patients.

METHODS. The prospective study included 6 patients after cardiac surgery requiring continuous elimination (CRRT) for renal indications. The regional citrate anticoagulation protocol was administered with the definition of levels of calcium in the circuit 0.25–0.35 mmol/l and systemic levels of calcium within the physiological range. Sodium citrate 4% concentration, substitute calcium chloratum 10%, 10% magnesium sulfuricum were used. All patients were eliminated with the continuous venovenous hemodiafiltration using the substitution of bags according to the current state acid–base balance. Hemostatic profile during CRRT was monitored using thrombelastography (TEG ® Haemoscope 5000, kaolin activated). Thrombelastography was carried out before connecting the patient to CRRT (native) and after 3 h of the ongoing regional anticoagulation (sample of native blood).

RESULTS. The mean age of patients, 67 ± 17.1 years, 3 women, 4 men. Post-operative blood losses reaching 4260 ± 481.9 ml. The average duration of extracorporeal circulation was 927.4 min due to the connection of one patient on ECMO for 4 days. Total length of the elimination was 861 h, during this period, 17 hemofilters were used in this setting and the average life of the filter was 50.6 ± 16.5 h. The TEG parameters was significantly differred only in interval *R* (24.29 vs. 11.57, $p = 0.03$). Other parameters were recorded without significant changes (*K* 8.19 vs. 4.81, MA 44, 16 vs 55.8, LY30 0.21 vs. 0.41, CI −12.86 vs − 5.17).

CONCLUSIONS. Regional citrate anticoagulation is suitable for patients with high risk of bleeding. Minimally affects systemic coagulation and enables modification of blood coagulation disorders. The use of regional citrate anticoagulation provides a sufficient hemofilter life period in patients with impaired blood clotting Thrombelastography is the appropriate instrument for monitoring of hemostasis in the course of regional citrate anticoagulation.

1076

INFLUENCE OF TEMPERATURE ADJUSTMENT ON THROMBELASTOGRAPHY RESULTS—A PILOT STUDY

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INTRODUCTION. Hypothermia causes coagulopathy [1]. Thrombelastography (TEG) and standard coagulation tests are carried out at temperature of 37°C thus omitting the effects of hypothermia.

Shimokawa was comparing Sonocloth and TEG results in animal model and find out that conventional measurement at 37°C were not able to show coagulation disorder under hypothermia [2].

OBJECTIVES. To compare the results of TEG during therapeutic hypothermia when the blood was analysed at actual temperature (hypothermia) and 37°C (normothermia).

METHODS. Eleven patients after CPR because of cardiac causes were included into the study where therapeutic hypothermia (32–34°C) was indicated for 24 h. Patients were observed for 48 h, TEG measurements were done in 12 h intervals. Standard coagulation tests, blood count and dose of anticoagulants/antiaggregants were also monitored. Data are shown as median (IQR). Wilcox match pair test was used for the statistical analysis, $p < 0.05$ was considered significant.

RESULTS. Pooled TEG results when therapeutic hypothermia was reached ($n = 14$) are presented in tables for both kaolin (K) and kaolin–heparinase (KH) samples.

Kaolin Kaolin ($n = 14$)	Izothermia			Normothermia			p
	Median	25%	75%	Median	25%	75%	
R (min)	6.75	5.3	10.2	4.95	4.1	7.4	0.048
K (min)	2.55	2	3.2	1.9	1.5	2.7	0.103
Angle (°)	53.9	49.4	61	58.55	50.7	67.5	0.221
MA (mm)	61.8	60.5	65.4	58.6	56.9	64.3	0.020
Lys30 (%)	0	0	0	0.3	0	0.7	0.008
CI	−1.5	−5.6	0.9	0.2	−3.2	1.2	0.117

TABLE 2 KAOLIN–HEPARINASE

Kaolin–heparinase ($n = 14$)	Izothermia			Normothermia			p
	Median	25%	75%	Median	25%	75%	
R (min)	6.9	4.2	8.6	6.15	5.1	7.5	0.030
K (min)	2.2	2	2.8	1.65	1.4	2.6	0.038
Angle (°)	58.4	51.7	61.3	63.35	54.5	69.3	0.177
MA (mm)	59.6	56.2	61.4	57.65	52.7	61.2	0.124
Lys30 (%)	0.25	0	2.3	0.9	0.1	2.1	0.806
CI	−1.35	−4.4	1.5	−0.45	−2.9	1.1	0.068

In hypothermic TEG, coagulation index (CI) was classified as hypocoagulation in 1 case in K samples and in 3 cases of KH samples. In all these 4 samples CI index was normal at 37°C. Also NTP, aPTT and thrombocytes were normal.

CONCLUSIONS. Some relevant parameters of TEG measured during hypothermia were significantly different from the parameters measured at 37°C. Though clinical significance of these differences was often small in several cases hypocoagulation at TEG was missed when blood warmed up to 37°C.

REFERENCES. 1. Rohrer MJ, Natale AM (1992) Effect of hypothermia on coagulation cascade. Crit Care Med 20:1402–1405

2. Shimokawa M, Katsuyasu K, Kawaguchi M et al (2003) The influence of Induced hypothermia for Hemostatik function on temperature-adjusted measurements in rabbits. Anesth Analg 96:1209–1213

SUPPORT. IGA MZCR NS 10097–3.

1077

DETERMINATION OF THE ANTICOAGULANT EFFECT OF ENOXAPARIN IN VITRO WITH ROTATIONAL THROMBELASTOMETRY (ROTEM®) USING THE PROTHROMBINASE-INDUCED CLOTTING TIME REAGENT (PICT®)

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BACKGROUND. Drug monitoring of low molecular weight heparin (LMWH) is generally not recommended, but could be reasonable in critically ill patients, whose risk for bleeding or thrombosis shows a high interpatient variability. Prothrombinase induced clotting time-reagent (PiCT®) allows determination of factor Xa-inhibition in plasma.

OBJECTIVE. Aim of our study was to evaluate the feasibility of LMWH detection at the point-of-care employing the PiCT®-reagent in a whole blood assay of rotational thrombelastometry (ROTEM®).

METHODS. Citrated whole blood was incubated with enoxaparin at 16 different anti Xa-concentrations and subsequently tested with ROTEM®. The new PiCT® NATEM test modification was compared with a low tissue factor (LowTF) modification and the commercially available heparin-sensitive ROTEM® assays (CT delta calculated out of INTEM and HEPTEM). Main target value was the clotting time (CT), which gives information about the initial activation of clot formation and is prolonged by anticoagulants.

RESULTS. Baseline CT values were 168.60 s ± 6.11 s (PiCT® NATEM), 247.30 s ± 18.61 s (LowTF), and −6.20 s ± 7.91 s (CT delta). A linear dependency between anti Xa-concentration and CT was found for PiCT® NATEM ($p < 0.01$), for LowTF ($p < 0.01$), and for CT delta ($p < 0.01$). The correlation coefficients were 0.93 for PiCT® NATEM, 0.94 for LowTF, and 0.81 for CT delta.

CONCLUSION. This in vitro experiment demonstrates the feasibility of monitoring the anticoagulant effect of enoxaparin with PiCT® NATEM, a new ROTEM® test modification. This promising assay should be evaluated for monitoring anticoagulation in high risk patients.

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1078

IN VITRO EFFECTS OF DIPYRIDAMOLE ON PLATELET FUNCTION

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INTRODUCTION. Dipyridamole (DP) inhibits platelet aggregation by blocking platelets' adenosine diphosphate receptors [1]. Plasma concentrations between 0.5 and 1.9 μg/mL are considered to lie in the therapeutic range. DP is used together with aspirin in the secondary prevention of stroke and transient ischaemic attack. It has recently also been employed in patients with left ventricular assist devices to prevent thromboembolic events. A previous trial investigated by light transmission aggregometry the dose-dependent anti-aggregatory effect of DP ex vivo when given as the sole agent [2]. Testing platelet function in whole blood is closer to physiologic conditions, however. The novel Multiplate® analyzer (Dynabyte, Munich, Germany), which is based on whole blood impedance aggregometry has been successfully utilized to continuously assess platelet function in patients supported with artificial hearts who were anticoagulated with aspirin and phenprocoumon [3]. This assay was therefore selected to estimate the ADP inhibitory activity by DP.

METHODS. Hirudin-anticoagulated whole blood of seven volunteers was pretreated with DP to reach the following final plasma concentrations of 0, 0.4, 0.8, 1, 2, 4, 6, and 8 μg/mL, covering the therapeutic range. It was then incubated for 45 min at 37°C. After dilution (1:1 with 0.9% NaCl solution) and adding adenosin diphosphate that stimulates platelet activation by the ADP receptor, aggregation was continuously recorded for 5 min. Adhesion of activated platelets to the electrodes leads to an increase of impedance, which is detected for each sensor unit separately and transformed to aggregation units (AU) that are plotted against time (AU min). AU min is the Area under the impedance curve.

RESULTS. Figure 1 shows the dose-dependent DP-induced changes in electrical resistance depicted as units (U; One U corresponds to 10 AU min). * $P < 0.05$; 0 mg/mL vs. 2, 4, 6, and 8 mg/mL.

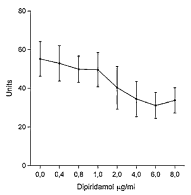

Fig. 1
Dipyridamol concentration

CONCLUSION. Our results show a DP concentration dependant reduction in ADP-stimulated platelet activation. The bedside Multiplate assay is thus a device that allows evaluation of DP's characteristic platelet inhibiting effect. This could be particularly useful in monitoring patients with ventricular assist devices who are anticoagulated with DP, aspirin and phenprocoumon.

REFERENCES. 1. Gresele P (1983) Thromb Haemost
2. Gregov D (1987) Br J Clin Pharmac
3. Steinlechner B (2009) Ann Thorac Surg

1079

INTRACAVITARY EKG GUIDANCE: AN ACCURATE AND INEXPENSIVE TECHNIQUE FOR REAL-TIME CORRECT POSITIONING OF THE TIP OF CENTRAL VENOUS ACCESS DEVICES IN ICU

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INTRODUCTION. Standard central venous catheters (CVC) and peripherally inserted central catheters (PICC) are commonly used in ICU. While ultrasound guidance has minimized needle-related complications (pneumothorax, arterial puncture), primary malpositions are still quite common, particularly after infraclavicular approaches to the axillary/subclavian vein and during positioning of PICCs at the elbow or at midarm. Since fluoroscopy is logistically difficult in ICU, most operators rely on post-procedural chest X-ray, after which the device may have to be repositioned. Intracavitary EKG guidance is a simple, effective and inexpensive alternative method for controlling of the tip position directly during the insertion.

METHODS. The electrical transducer—either the AlphaCard® (BBraun) or the Vygocard® (Vygon) device—is connected both with the catheter and with a cable going to lead II of a standard EKG monitor: the saline column within the catheter acts as intracavitary electrode. After ultrasound guided insertion of the catheter in the selected central or peripheral vein, either with the direct (CVC) or modified (PICC) Seldinger technique, the catheter is filled with saline and connected to the transducer. Then it is slowly advanced observing the morphological changes of the P wave, till the tip reaches the desired position: as the P wave gets to its maximal height, the catheter tip is close to the seno-atrial node, i.e. in the upper part of the right atrium; 1 cm above this point (when the P is at one-half of its maximal height), the tip is close to the atrio-caval junction.

RESULTS. 74 central venous access devices (47 CVC + 27 PICC) were positioned by the EKG method. All of them were successfully inserted. The "atrial P wave" was observed in all patients but one. In this case, the cardiac signal was disturbed by electrical artefacts. All patients underwent a post-operative chest X-ray: no primary malposition was observed and all catheter tips appeared to be at the desired location (either at the atrio-caval junction or in the upper part of the atrium). A retrospective comparison with a similar cohort of patients where no intra-procedural method had been adopted for tip positioning suggested that the EKG method allowed us to avoid at least 9 reposition procedures (which accounts for about €3,000). Also, replacing the post-procedural X-ray with the EKG method (even considering the cost of the transducer) would carry and additional saving of €5,000 every 100 insertions.

CONCLUSION. Intracavitary EKG guidance is an accurate, safe and inexpensive method for real-time positioning of the tip of PICCs and CVCs in ICU: its systematic adoption allows to avoid chest X-ray and reposition procedures, thus saving time and money. The only contraindication to the EKG method is the inability to detect the P wave (atrial fibrillation or other supra-ventricular arrhythmias, presence of an active pace-maker, or major electrical artefacts).

1080

EPIDURAL ANALGESIA IN INTENSIVE CARE: OUR EXPERIENCE

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INTRODUCTION. Few data has been published reporting the use of epidural analgesia in the setting of intensive care [1]. Limited evidence suggests its benefit [1]. There are nonetheless controversies regarding its use in the critically ill patient, due to infectious and bleeding risks, difficulty in neurological assessment and technical execution [1].

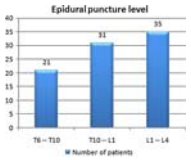
OBJECTIVES. To describe the use of epidural analgesia in a surgical intensive care unit (ICU).

METHODS. The clinical records of the 87 patients who received epidural analgesia during the years 2007 and 2008 were retrospectively reviewed.

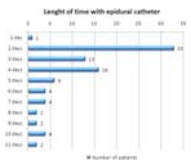
RESULTS. Fifteen percent of the patients admitted to the ICU received epidural analgesia. Mean SAPS II score was 31 with a standard deviation of 14. Relative contraindications were found in 8% of the patients; accountability was attributed to hemostasis disorders (corrected before epidural placement) and recent bacteriemia. Major contraindication precluded the technique.

Epidural placement was performed by anesthetists or intensivists with anesthetic background. Epidural puncture level was dictated by the dermatomes to be blocked (Graph 1). Perfusion of levobupivacaine 0.125% plus fentanil 1.25 μg/mL was used. The duration of epidural analgesia is shown in graph 2.

There were two cases of dural puncture and one case of paravertebral abcess.



Graph 1



Graph 2

CONCLUSION. We believe epidural analgesia can have an important role in the critically ill patient. It may improve pulmonary and bowel functions, reduce opioids requests and reduce time under mechanical ventilation. Further research is needed to prove epidural benefits in this setting.

REFERENCES. 1. Schulz-Stübner S (2006) The critically ill patient and regional anesthesia. Curr Opin Anaesthesiol 19(5):538–544

2. Tenenbein PK et al (2008) Thoracic epidural analgesia improves pulmonary function in patients undergoing cardiac surgery. Can J Anaesth 55(6):344–350.

1081

EFFECT OF EPIDURAL ANALGESIA ON OUTCOME IN PATIENTS WITH SEVERE ACUTE PANCREATITIS

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INTRODUCTION. The pain of acute pancreatitis, especially in most severe form, is excruciating, unrelenting and can lead to the shock and the death. Frequent, large doses of analgesics seem to alleviate the pain.

Epidural analgesia has emerged as a commonly applied method of improving pain management. Recent study supports the finding that epidural analgesia can significantly reduce intraabdominal hypertension and prevent pressure-related organ dysfunction.

AIM. The aim of the present study was to evaluate two analgesics regiment versus outcome in patients with severe acute pancreatitis.

METHODS. Data for 62 consecutive patients, who have been diagnosed as severe acute pancreatitis, were prospectively acquired and retrospectively reviewed at our institution. After 48 h of common management including aggressive fluid resuscitation, prophylactic antibiotic(imipenem-cilastatin) use and organ function protection, all patients were randomized in two groups, as: group I (IVA; $n = 29$), which received intravenous analgesic and Group II (EDA; $n = 33$) with thoracic epidural analgesia regiment. Respiratory, renal and cardiovascular functions were monitored upon the start of the resuscitation.

RESULTS. The baseline demographic and clinical characteristics of the two groups were similar. Patients administered epidural analgesia had significantly lower pain scores (successful pain relief observed in 38 patients, six in the group I; $p \leq 0.01$) and the incidence of respiratory complications (6 vs. 18, $p \leq 0.01$). Multiple organ failure was detected in 22 patients (eight in group II). At 38.2% IVA patients and 19.8% EDA patients have been necessary pharmacological support targeted at specific organ. A trend towards longer mechanical ventilation [9 (7–24) vs. 6 (1–15)] and intensive care unit hospitalization [21 (15–28) vs. 14 (9–18)] was observed among intravenous analgesia patients, who required more aggressive fluid resuscitation. Enteral nutrition support was preferred and was started earlier in second group (2 days after admission vs. 5 days in intravenous patients) which displayed better tolerance to this support(an average 3.2 complications in first and 1.8 in second group). Twelve intravenous patients and 21 with epidurally pain relief did not require decompressive laparotomy.

CONCLUSION. Thoracic epidural analgesia in severe acute pancreatitis is associated with hemodynamic stability, lower morbidity and intensive care unit hospitalization.

1082

IMPACT OF HEPARIN-INDUCED THROMBOCYTOPENIA IN VENTRICULAR ASSISTED PATIENTS

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INTRODUCTION. Cardiac surgery exposes patients to an approximate 1–2% risk of experiencing heparin-induced thrombocytopenia (HIT) which is a severe immune-mediated disease associated with thromboembolic events. The implantation of a ventricular assist device increases the risk of developing HIT by at least 5 times.

OBJECTIVES. To prove that the incidence of HIT is more important in patients admitted to cardiac ICU than in general population and that it is close to 10% in ventricular assisted patients. To draw the attention on the importance of this pathology in the cardiac ICU. To expose the complications associated with the anticoagulant treatment of these patients.

METHODS. A retrospective analysis of the data from our patients with ventricular assist devices between 2000 and 2008.

RESULTS. The data from 58 consecutive patients were analyzed. There was noticed a number of 5 patients (8.6%) with positive tests for heparin-induced thrombocytopenia.

CONCLUSIONS. The results of our study are correlated with those found in literature. Heparin-induced thrombocytopenia is a frequent complication in VAD patients. Early detection of HIT antibodies after VAD implantation and immediate implementation of an alternative anticoagulation regimen may be a strategy to improve outcome.

REFERENCES. 1. Selleng K, Warkentin TE, Greinacher A (2007) Crit Care Med 35(4):1165–1176

2. Koster A, Huebler S, Potapov E et al (2007) Impact of heparin-induced thrombocytopenia on outcome of patients with ventricular assist device support: single-institution experience in 358 consecutive patients. Ann Thorac Surg 83:72–76

3. Warkentin TE, Greinacher A (2003) Heparin-induced thrombocytopenia in cardiac surgery. Ann Thorac Surg 76:2121–2131

4. Bauer TL, Arepally G, Konkle BA, Mestichelli B, Shapiro SS, Cines DB et al (1997) Prevalence of heparin-associated antibodies without thrombosis in patients undergoing cardiopulmonary bypass surgery. Circulation 95:1242–1246

5. Pouplard C, May MA, Regina S, Marchand M, Fusciardi J, Gruel Y (2005) Changes in platelet count after cardiac surgery can effectively predict the development of pathogenic heparin-dependent antibodies. Br J Haematol 128:837–841

6. Warkentin TE, Sheppard JA, Horsewood P, Simpson PJ, Moore JC, Kelton JG (2000) Impact of the patient population on the risk for heparin-induced thrombocytopenia. Blood 96:1703–1708

7. Warkentin TE, Heddle NM (2003) Laboratory diagnosis of immune heparin-induced thrombocytopenia. Curr Hematol Rep 2:148–157

8. Warkentin TE, Greinacher A (2004) Heparin-induced thrombocytopenia: recognition, treatment, and prevention: the seventh ACCP conference on antithrombotic and thrombolytic therapy. Chest 126:311–337

9. Eichler P, Budde U, Haas S et al (1999) First workshop for detection of heparin-induced antibodies: validation of the heparin-induced platelet-activation test (HIPA) in comparison with a PF4/heparin ELISA. Thromb Haemost 81:625–629

1083

EFFECT OF PREEMPTIVE ALVEOLAR RECRUITMENT STRATEGY BEFORE PNEUMOPERITONEUM ON ARTERIAL OXYGENATION DURING LAPAROSCOPIC HYSTERECTOMY

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BACKGROUND. Alveolar recruitment and positive end-expiratory pressure (PEEP) is helpful for treatment of atelectasis-induced hypoxemia during general anesthesia. In laparoscopic hysterectomy, however, application of PEEP is limited because of high airway pressure induced by pneumoperitoneum and Trendelenburg position. So we applied the preemptive alveolar recruitment strategy (ARS) before gas insufflation and no PEEP during pneumoperitoneum. We investigated if it had preventive effect during surgery.

METHODS. After intubation, 50 patients were allocated randomly to two groups. In group C, ventilator was set with usual method with 35% oxygen. Group P received ARS of 10 manual breathings with peak inspiratory pressure of 40 cmH_2O followed by positive end-expiratory pressure of 15 cmH_2O until CO_2 insufflations started. Arterial oxygen pressure (PaO_2) was measured before and during ARS in supine position and every 15 min during pneumoperitoneum in the Trendelenburg position.

RESULTS. Baseline PaO_2 in group C was similar with that in group P (90 ± 15 vs 90 ± 10 mmHg). However, PaO_2 measured during peumoperitoneum in Trendelenburg position was higher in group P than in group C (166 ± 32 vs 145 ± 34 mmHg at 15 min, $p = 0.028$, 155 ± 30 vs 136 ± 32 mmHg at 30 min, $p = 0.035$). Alveolar-arterial oxygen gradient in group P increased less after gas insufflation (13 ± 9 to 60 ± 34 mmHg vs 10 ± 9 to 37 ± 31 mmHg, $p = 0.013$).

CONCLUSIONS. Preemptive ARS before gas insufflation may be useful in improving arterial oxygenation without additional increase in airway pressure in gynecologic laparoscopic surgery.

1084

TRANSPULMONARY THERMODILUTION MONITORING DURING ANS AFTER PNEUMONECTOMY

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BACKGROUND AND GOAL OF STUDY. Pneumonectomy is a major surgery with a high intraoperative adverse events with and postoperative mortality rate. The goal of study is to evaluate the practical utility of the PiCCO (Pulsion Medical Systems, Munich, Germany) for monitoring cardiac index (CI) and extravascular lung water index (ELWI) and its derived variables during pneumonectomy resection surgery and critical care postsurgery.

MATERIALS AND METHODS. The study protocol was approved by the hospital ethics committee. After induction of anesthesia and double-lumen intubation, a venous catheter was placed in the superior vena cava through the jugular right vein and a termistor-tipped catheter was placed in the descending aorta through the femoral artery, connected to the PiCCO monitor. Each measurement (3 thermodilution shots) was made 6 times, performed basal (before thoracotomy in supine position), posthoracotomy (decubitus lateral position), postneumonectomy, to the closed chest, at critical care unit admission and post 24 h. The cardiac output and ELWI and its derived variables was studied. Ventilation, fluids and analgesia intra and postoperative (epidural catheter) were managed according to our protocol.

RESULTS AND DISCUSSION. The population was composed of 12 men and 4 women,13 left and 3 rigth pneumonectomy for lung cancer. The catheter functioned in all cases and using the PiCCO system and is a reliable technique. Baseline values of CI and ELWI >3 L/min/m^2 and 3–7 ml/kg, respectively. Statistical analysis was performed (G-Stat 1.1 *GSK*), results are expressed as mean SD. During thoracotomy one patient developed low cardiac output and responded to conservative treatment (CI: 1.35). ELWI is reduced after pneumonectomy and remained relatively stable over the first 24 h.

Basal Toracotomy Pneumonectomy Thorax Closed Critical Care Post 24 h

CI 2.93 ± 0.78 2.91 ± 0.82 2.62 ± 0.68 2.83 ± 0.61 3.15 ± 0.52 3.28 ± 0.52

ELWI 6.25 ± 2.18 6.25 ± 1.67 5.37 ± 1.30 6.00 ± 2.56 5.62 ± 2.50 6.50 ± 2.23

CONCLUSION(S). ELWI decreased little after pneumonectomy and is underestimated. The PiCCO system during pneumonectomy is an excellent monitoring to detect adverse events.

REFERENCES. (optional) 1. Belda FJ, Aguilar G, Perel A (2007) Transpulmonary thermodilution for advanced cardiorespiratory monitoring. In: Vincent JL (ed) Yearbook of Intensive Care 2007. Springer, Berlin, pp 501–510

2. Roch et al (2005) Accuracy and limits of transpulmonary dilution methods in estimating extravascular lung water after pneumonectomy. Chest 128:927–933

Cardiovascular failure in the ICU: Causes and markers: 1085–1098

1085

INCIDENCE OF COCAINE USE IN PATIENTS UNDER 45 YEARS PRESENTING TO AN EMERGENCY DEPARTMENT WITH ADVERSE CARDIOVASCULAR EVENTS

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OBJECTIVE. To study the incidence of cocaine use in patients under 45 years presenting to an emergency department with adverse cardiovascular events

METHODS. Prospective, observational cohort study during four months (February–May 2006). All patients under 45 years presenting with a cardiovascular complain such as chest pain or palpitations were included. Data collected were demographic data, ECG registry, presence of acute myocardial infarction (AMI) and hospital course.

To detect cocaine use, measurement was made in urine samples by AXYM test. For statistical analysis descriptive and chi-square test were used.

RESULTS. 88 patients were included, 70% of whom were men, with a mean age of 31 + 8 years. The admission diagnosis was acute chest pain in 70% ($n = 64$) and palpitations in the remaining 30% ($n = 28$). The ECG showed alterations in 17% of cases. A total of 10 patients experienced an AMI (11%). Ten patients were found positive for cocaine use. There was no difference in gender (155 vs 4%, $p = 0.15$). The incidence of drug abuse was higher in week-ends (25.9 vs 5.1%, $p = 0.005$). There was no relationship between AMI and cocaine use (12.5 vs 11.4%, ns).

CONCLUSIONS. Cocaine use in patients under 45 years presenting to an emergency department with adverse cardiovascular events is high, especially during week-ends. AMI rates in cocaine-associated chest pain was 12.5%

1086

LOCAL CHEMOTHERAPY WITH CISPLATIN IN NON SMALL LUNG CANCER PATIENTS AND MALIGNANT CARDIAC TAMPONADE

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OBJECTIVES. Pericardial effusion and cardiac tamponade are known complications of many advanced malignancies. Echo-guided pericardiocentesis can be easily obtained and well-tolerated even in critically ill patients. Recurrence of malignant pericardial effusion and subsequently tamponade is extremely frequent (40–70%).

AIM. Effectiveness and safety of intrapericardial cisplatin administration in non small lung cancer (NSLC) patients.

METHODS. Since 2000, 56 patients with NSLC and clinical signs of cardiac tamponade, 40 men and 16 women (median age of 59 years), were studied. Patients underwent subxiphoid pericardiocentesis under electrocardiographic, echocardiographic and haemodynamic monitoring. After a cytological examination and confirmation of neoplasmatic cells' presence, cisplatin (10 mg in 20 ml normal saline) was instilled into the pericardial cavity for three consecutive days. After the second and third dose of intrapericardial cisplatin administration, cytologic examination was performed and neoplastic burden was evaluated. Clinical and echocardiographic follow up examinations were made on a monthly basis.

RESULTS. Following pericardiocentesis and fluid drainage, clinical and hemodynamic improvement was achieved in all our patients. The median volume of the pericardial fluid drained was 950 cc (range 400–3,200) and was hemorrhagic in 89.28% of the patients. Five patients had paroxysmal atrial fibrillation (8.9%) cardioverted by amiodarone (4 patients) or electrically (1 patient). Recurrence of pericardial effusion was observed in 1 patient (1.7%) treated by second pericardiocentesis and local cisplatin infusion. Significant neoplastic burden reduce was observed after the third dose of cisplatin instilled into the pericardial cavity. Median survival was 6.2 months (range 4–124 weeks).

CONCLUSIONS. Intrapericardial chemotherapy with cisplatin in NSLC patients is safe and effective, representing the method of choice in preventing pericardial fluid recurrence.

1087

CARDIAC DYSFUNCTION FOLLOWING LARGE BURN INJURY IN CHILDREN IS ASSOCIATED WITH INCREASED LENGTH OF ICU STAY

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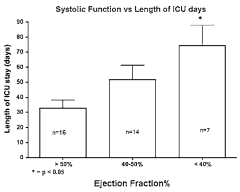
AIMS. Strong experimental evidence suggests that burn injury results in myocardial depression [1, 2]. However, clinical evidence of cardiac dysfunction and its impact on patient outcome is less established [3–5]. We sought to determine the relationship between cardiac function and clinical outcome in pediatric burn patients.

METHODS. Systolic and diastolic functions were determined using transesophageal echocardiography (TEE) in children, ages 2–18 years, within the first 72 h of admission following burns to >40% total body surface area. Systolic function (Ejection Fraction %) was assessed from volumetric tracings using the modified Simpson's equation of the left ventricle in the parasternal long axis view at the end of diastole (EDV) and systole (ESV). Ejection fraction (EF%) was calculated by (EDV − ESV)/(EDV). Diastolic function parameters were obtained using pulsed wave Doppler measurements across the mitral valve and tissue Doppler measurements of the mitral annulus during diastole. A ratio of mitral inflow velocity (E-wave) to tissue Doppler of (e') was used as an index of diastolic function. Clinical outcome variables including length of ICU stay, ventilator days and other variables were recorded and compared to TEE findings.

RESULTS. We measured systolic and diastolic function using TEE in 53 patients. Clinical outcome variables and TEE findings were obtained in 37 patients. Fifty-eight percent of patients in this cohort had evidence of systolic dysfunction [6]. A similar percentage had evidence of diastolic dysfunction ($E/e' > 8$) [7]. Poor systolic function (EF% < 40%) was associated with a two-fold increase in ICU stay. Diastolic dysfunction did not alter clinical outcome. Other independent variables associated with increased length of stay were burn size and number of surgeries.

CONCLUSION. This study substantiates that moderate to severe cardiac dysfunction occurs in children sustaining large burn injury. Additionally, systolic dysfunction, diagnosed early in the acute hospitalization, is an independent risk factor for increasing ICU stay. Whether optimizing systolic function in pediatric burn patients could lead to improved patient outcome remains to be determined.



Systolic function vs icu stay

REFERENCES. 1. Surg Forum 17:1–2 (1966)
2. Shock 22:438–445 (2004)
3. Ann Surg 197:520–531 (1983)
4. J Pediatr Surg 24(8):806–810 (1989)
5. Acta Anesthesiol Scand 47:1257–1263 (2003)
6. Pediatr Cardiol 23:394–402 (2002)
7. Circulation 102:1788–1794 (2000)

1088

TOTAL ATRIOVENTRICULAR BLOCK IN BURN UNIT PATIENTS: A MATTER OF IODINE TOXICITY

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INTRODUCTION. Povidone-iodine is a commonly used topical antimicrobial agent, especially in burn unit patients. Previous case reports describe total atrioventricular (AV) block in patients treated with povidone-iodine. The exact mechanism has not yet been elucidated.

OBJECTIVES. To report the association of total AV block and iodine toxicity in burn unit patients.

METHODS. Description of a case series of burn unit patients treated with povidone-iodine who developed total AV block, admitted during a 15-month period in the burn unit.

RESULTS. A total of 6 patients developed initially unexplained sudden total AV block. Five patients were admitted for deep second and third degree burns covering a median of 53% (range 25–80%) of the total body surface area (TBSA) and one patient was admitted for necrotizing fasciitis, requiring extensive debridement (17.5% of the TBSA). None of the patients had a cardiac history or was treated with drugs interfering with cardiac conduction. All patients were topically treated with povidone-iodine 10% gel daily and underwent several surgical interventions. A nodal rhythm developed on day 39 (median; range 35–65). In 4 patients total AV block appeared peri-operatively (2 patients during surgery and 2 patients 48 h post-operatively). Epinephrine could temporarily restore sinus rhythm in 3 patients; placement of a temporary pacemaker was only possible in 3 patients due to access problems. Echocardiography showed no structural heart disease. Alarmed by the first 2 patients urinary iodine was measured in the 3rd and the 4th patient, revealing high concentrations: 72,700 and 678 mcg/g creatinine respectively (normal range <222 mcg/g creatinine). In the last 2 patients serum iodine concentration was measured: 927 mcg/L and 66,500 mcg/L respectively (normal range 50–80 mcg/L). All patients had acute renal failure (ARF) at the time of AV block. High plasma iodine level can cause acute tubular necrosis and iodine is excreted by the kidneys. Hemodialysis is an effective treatment for clearing iodine. Continuous dialysis was efficient in restoring AV conduction in 2 patients.

CONCLUSIONS. This case series demonstrates the association between topical treatment with povidone-iodine, iodine toxicity and total AV block especially when given over a longer period (>30 days) and in patients with a large % TBSA burns. ARF and recent surgery may enhance iodine toxicity. We advocate regular measurements of the serum iodine concentrations in patients treated with povidone-iodine for prolonged periods of time. Discontinuation of povidone-iodine treatment is recommended in patients with signs of—or high risk for—iodine toxicity.

1089

IMMEDIATE EFFECTS OF TIPS ON GLOBAL END-DIASTOLIC VOLUME AND RENAL RESISTANCE INDEX IN CIRRHOTIC PATIENTS

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INTRODUCTION. According to the arterial vasodilation hypothesis, in cirrhotic patients, splanchnic vasodilation and a reduction in "effective" blood volume cause a counter-regulatory increase in endogenous vasopressors leading to renal vasoconstriction, refractory ascites and functional renal failure. TIPS has been proposed as a treatment. Renal vasoconstriction in cirrhotic patients has been shown to increase renal resistive index (RI) assessed by doppler ultrasound.

OBJECTIVE. To evaluate systemic and renal hemodynamic changes following TIPS insertion.

METHODS. Retrospective analysis of a prospectively maintained database on hemodynamic monitoring in cirrhotic ICU patients. Cases were included in this analysis if patients were off vasopressors and did not have clinically relevant gastrointestinal hemorrhage at the time of TIPS insertion.

RESULTS. Between 2004 and 2008 eight ICU patients (4 m; 4 f; median age 59 years (52–63)) with stable hemodynamic condition and invasive hemodynamic monitoring (PiCCO, Pulsion Medical Systems, Munich) originally introduced for other reasons, received a TIPS because of hepatorenal syndrome ($n = 4$), intractable ascites ($n = 2$), or recidivating hemorrhage from gastric varices ($n = 2$). Child-Pugh-score was 10 (8–12), MELD-score was 17 (15–24), ICU mortality was 0. Transpulmonary thermodilution measurements within 2 h before and after TIPS insertion were available in all patients, renal Doppler examinations immediately before and after TIPS insertion in 5 patients.

After TIPS insertion, there were significant increases in global end-diastolic volume index (663 mL/m^2 (643–791) vs 646 mL/m^2 (580–738); $p = 0.036$), heart rate (HR) (98 BPM (71–103) vs 86 BPM (67–92); $p = 0.025$), cardiac index (CI) (3.9 L/min/m^2 (3.6–5.3) vs 3.3 L/min/m^2 (3.1–4.2); $p = 0.012$) and cardiac power index (CPI) (0.86 W/m^2 (0.75–0.97) vs 0.68 W/m^2 (0.62–0.79); $p = 0.021$). There was a trend towards increased stroke volume index (SVI) (45.4 mL/m^2 (37.1–70.0) vs 44.1 mL/m^2 (35.0–57.4); $p = 0.123$). RI decreased significantly (0.75 (0.71–0.78) vs 0.79 (0.78–0.87); $p = 0.043$). There were no significant changes in mean arterial pressure, central venous pressure, systemic vascular resistance index, total arterial compliance or pulse pressure index.

CONCLUSION. TIPS placement resulted in an increase of central blood volume and CI. Whereas in our series of patients the latter effect seems to be predominantly due to a raised HR, there was also a trend towards an increase in SVI, suggesting improved cardiac filling conditions. Increasing cardiac power index upon increased preload suggests that cirrhotic cardiomyopathy was not an important factor in this series of patients. The associated decrease of RI, although partly explained by the increase in HR, indicates improved renal perfusion.

1090

ACUTE LIVER FAILURE INDUCED BY INTRAVENOUS AMIODARONE ADMINISTRATION IN CORONARY CARE UNIT: A RETROSPECTIVE STUDY OF 3 YEARS

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Amiodarone is the antiarrhythmic agent of choice in treatment of haemodynamically unstable patients suffering from acute tachyarrhythmias due to impaired cardiac function. The intravenous form of amiodarone-hydrochloride (IvAm) has an interindividually different antiarrhythmic and rate controlling efficacy, and the dosage of amiodarone is empirical. Main adverse effects are severe bradyacardia, asystole, hypotension, low cardiac output, acute heart failure, bronchosapsm and impaired liver function. Acute liver failure (ALF) is a known, but very rare complication of IvAm that may be reversible by stopping the iv. administration in most of the cases. The few papers in the literature suppose ALF may be caused by polysorbate 80, the vehicle of th IvAm. Oral administration does not to have such an adverse effect, therefore IvAm can be changed to oral form in induced ALF cases. Our aim was to investigate the incidence of ALF and relation of IvAm and ALF in cardiac patients in a retrospective manner. History, treatment sheets, laboratory parameters of 11722 patients treated in the Heart Center between 2005 and 2007 were analyzed. Patients were considered severe ALF patients if transaminase levels exceeded 80xULN during stay in our CCU. Cut off point was determined for differentiation of ALF patients from heart failure and myocardial infarct patients with elevated transaminase levels.

RESULTS. On the basis of the enzyme levels 55 patients revealed to suffer from severe ALF during the 3 years, 26 of them had IvAm treatment. On the basis of treatment sheets, start and elimination of IvAm treatment, status of acute myocardial infarct and heart heart failure and transaminase kinetics 8 patients proved to have ALF induced by IvAm. Indication for amiodarone administration was atrial fibrillation ($n = 6$) and ventricular tachycardia. Average multipliers of ULN were 379 ± 190 at ASAT, 191 ± 87 at ALAT, 57 ± 22 at LDH. Time range from start of IvAm to detection of ALF was 17 ± 4.6 h. 25% of these patients has died in ALF. Liver enzymes decreased to 10xULN during 2.5 ± 0.6 days.

CONCLUSIONS. ALF is a rare but potentially life threatening adverse effect of IvAm. Authors suggest thorough monitoring liver enzymes from the start of IvAm treatment. Fast elevation in liver enzyme levels indicate acute hepatotoxic effect of IvAm. In these cases the immediate elimination of IvAm administration and start of intensive care is life saving.

1091

THE IMPACT OF ACUTE RENAL FAILURE ON RELATIONSHIP BETWEEN N-TERMINAL BRAIN NATRIURETIC PEPTIDE AND LEFT VENTRICULAR PERFORMANCE

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INTRODUCTION. The levels of brain natriuretic peptide (BNP) are often analysed in relation to left ventricular enddiastolic pressures. One of important confounding variables is renal dysfunction [1]. N-terminal brain natriuretic peptide (NtBNP) is more stable marker comparing to native BNP.

OBJECTIVES. We studied the influence of acute renal failure on relationship between NtBNP and ejection fraction of left ventricle (LVEF) in critically ill patients.

METHODS. The levels of NtBNP (electrochemiluminiscence immunoassay) were analysed in 26 mechanically ventilated patients in acute renal failure (fulfilling „Failure" criteria within RIFLE scoring) and requiring continuous haemodiafiltration (CVVHDF). Samples were drawn before start of CRRT, after 24 and 48 h both from the ports proximal and distal to the polysulfone filter, arteriovenous difference was calculated (AVdiff). LVEF was measured with echocardiography using biplanar Simpson method. The results were compared between the subgroup where daily diuresis (Vu) remained low or decreased ($n = 16$) and the subgroup where Vu increased to the level of 1.5 ml/kg h or higher after 48 h of treatment ($n = 10$). The control group consisted of 44 ICU patients with serum creatinine less than 150 μmol/l. Wilcoxon non-parametric test, Kruskal–Wallis ANOVA and Spearman correlation test were applied. Data are expressed as medians and interquartile ranges.

RESULTS. The levels of NtBNP (1717.5, 389.5–4138 ng/l) were significantly higher ($p < 0.001$) in subgroup with low Vu (405, 100–1130 ml/24 h) than NtBNP levels (748.8, 384.2–2217 ng/l) in subgroup with increasing Vu (3950, 2795–4815 ml/24 h). Both subgroups had significantly higher levels than cardiac controls with normal renal function (350.7, 130.2–661.2 ng/l, $p < 0.001$). EFLV did not differ between study group (55, 40–63%) and controls (50, 35–65%). Correlation analysis showed a significant relationship between NtBNP and LVEF in control group ($r = -0.50$, $p < 0.001$) which we could not demonstrate on either of study subgroups. Renal functions did not differ between betwen study subgroups before initiation of CVVHDF however, duration of therapy was shorter and NtBNP lower in subgroup with increasing diuresis ($p < 0.01$). The average AVdiff (%) of NtBNP on filter was insignificant. Mortality of patients on CVVHDF was related to NtBNP ($p < 0.01$).

CONCLUSIONS. NtBNP cannot be used as marker of LV function in patients developing acute renal failure. Particularly high levels were observed in low Vu and oliguric patients which confirms previous data suggesting relationship between residual diuresis and natriuretic peptides [1]. The elimination of NtBNP on CVVHDF is negligible. The levels of NtBNP predict survival.

REFERENCE. 1. Balik M et al (2003) Relationship between natriuretic peptides and residual diuresis during continuous hemodiafiltration. Blood Purif 21:401–408

1092

B TYPE NATRIURETIC PEPTIDE AS A SCREENING TOOL TO DETECT VENTRICULAR DYSFUNCTION IN CRITICALLY ILL PATIENTS

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OBJECTIVE. Although echocardiography (ECHOc) is used to identify left ventricular dysfunction in critically ill patients, inherent limitations suggest the need for additional tools as a screening method. The B-type natriuretic peptide (BNP) partially reflects ventricular pressure and could be used as a screening method prior to ECHOc in ICU patients.

METHODS. One-hundred patients admitted to a medical-surgical ICU of a university hospital were prospectively studied. During stable phase of the mean disease an ECHOc was performed with a simultaneously determination of plasma BNP levels. Echocardiographist was blinded to BNP values. Patients were classified according to the ECHOc findings in: normal function, systolic dysfunction, impaired relaxation, pseudonormal pattern and restrictive pattern. BNP values are expressed as median (interquartile range).

RESULTS. Sixty-four patients (64%) showed ECHOc dysfunction: 14 (22%) systolic dysfunction, 35 (55%) impaired relaxation, 6 (9%) pseudonormal pattern, 9 (14%) restrictive pattern. Patients with ventricular dysfunction were older (67.2 ± 12.1 vs 56.9 ± 13.1, $p < 0.001$), showed a higher APACHE II on admission (20.1 ± 8 vs 16.8 ± 7.5, $p = 0.04$), suffered previous history of heart failure (4.8% vs 95.2%, $p < 0.001$) and arterial hypertension (75.4% vs 24.5%, $p = 0.006$).

BNP levels were significantly higher in patients with systolic dysfunction respect to those with diastolic dysfunction [1100 (275–1240) pg/mL vs 263 (126–696) pg/mL respectively; ($p = 0.004$)]. BNP levels were significantly higher in patients with diastolic dysfunction compared to those with no ventricular dysfunction [263 (126–696) pg/mL vs 115 (50–197) pg/mL respectively; $p = 0.038$].

The area under the ROC curve of BNP detecting any degree of ventricular dysfunction was 0.78 (95% CI 0.69–0.87; $p < 0001$). A value of BNP of 95 pg/mL had a sensitivity of 90%, specificity of 48% and an accuracy of 74% to detect any degree of ventricular dysfunction.

CONCLUSIONS. A rapid test of BNP can detect easily the presence of ventricular dysfunction and may be a useful screening method to evaluate left ventricular dysfunction in critically ill patients.

1093

POST-OPERATIVE B-TYPE NATRIURETIC PEPTIDE PREDICTS MORTALITY AFTER GASTROINTESTINAL SURGERY

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INTRODUCTION. Cardiac complications are a cause of significant morbidity and mortality in patients undergoing major non-cardiac surgery. Measurement of cardiac biomarkers in the perioperative period may help with diagnosis and identification of patients at risk.

OBJECTIVES. The aim of this study was to assess the prognostic value of post-operative B-type natriuretic peptide (BNP) level after major gastrointestinal surgery.

METHODS. Between October 2007 and June 2008 99 consecutive patients undergoing elective or emergency major abdominal surgery for lower gastrointestinal or colorectal pathology were recruited. Patients were evaluated for perioperative cardiac risk according to the Lee Revised Cardiac Risk Index. ECGs and troponin I were recorded before and after surgery to identify myocardial injury and infarction. A single post-operative BNP level was measured 12–48 h following surgery and prognostic value evaluated for all-cause mortality over a 3 month follow-up period.

RESULTS. Mean post-operative BNP level was 240 pg/ml. There were three non-fatal myocardial infarctions following surgery (3%), but 35 (35%) of patients had biochemical evidence of myocardial injury (post-operative troponin I $\geq$ 0.03 ng/ml). Ten patients died over the three month follow-up period—nine of these following emergency surgery. Within the emergency population, post-operative BNP $\geq$ 400 pg/ml identified patients with an odds ratio of death within 90 days of surgery of 15.2 (95% CI 3.06–75.5, $p < 0.01$). The elective population had a low mortality, but elevated post-operative BNP at a threshold of $\geq$300 pg/ml was associated with myocardial injury (odds ratio 5.31, 95% CI 1.24–23.0, $p = 0.02$). The Lee Revised Cardiac Risk Index was not predictive of BNP or troponin elevation, myocardial infarction, or death for either the elective or emergency group.

CONCLUSIONS. A single BNP value in the early post-operative phase identifies patients at increased risk of death following major emergency gastrointestinal surgery, enabling clinicians to target resources at such patients early.

1094

SERIAL TROPONIN I SAMPLING IN A LARGE ICU COHORT: ELEVATED TROPONIN I CONCENTRATIONS ARE COMMON IN CRITICALLY ILL PATIENTS AND ARE ASSOCIATED WITH POOR OUTCOME

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INTRODUCTION. Elevated serum concentrations of cardiac troponin I (cTnI) are associated with poor outcome in critically ill patients. Recent work suggests such elevations are common, even in patients not admitted with cardiac problems.

OBJECTIVES. We surveyed the incidence of elevated cTnI in our 17-bed mixed medical/surgical ICU using daily sampling. We compared our findings to patients' outcomes.

METHODS. The study group included all ICU patients treated between 01/01/08 and 31/06/08. Clinical details were recorded on admission, and ICU and hospital mortality were recorded as outcomes.

Daily serum cTnI was determined for all patients with a Siemens Advia Centaur TnI-Ultra assay, using 0.04 mcg/L as the 99th percentile cutoff above which values were considered elevated.

RESULTS. Of 741 admissions in the study period, 401 (54%) were male, with a mean age of 60 (SD 18) years. 460 (62%) were surgical patients and 48 (6%) were readmissions. The median APACHE II score was 15 (IQR 12.20). 71 (10%) patients had an acute cardiac problem documented at the time of admission, including 29 (4%) who had acute myocardial ischaemia and 33 (4%) who had suffered a cardiac arrest, and these patients were excluded from further analysis.

226 (34%) patients had an elevated cTnI on admission, and 321 (49%) had at least one elevated cTnI during their ICU stay. 12 patients (2%) had an incomplete set of cTnI values, and were excluded from outcome analysis.

64 patients (10%) died in the ICU. ICU mortality was associated with higher age, higher APACHE II score, being a non-surgical patient, elevated admission cTnI and elevated cTnI at any point (all $p < 0.001$).

The area under a Receiver Operating Characteristic curve using peak cTnI level to predict ICU mortality was 0.78.

39 patients were discharged directly home or to other hospitals and were excluded from hospital mortality analysis. Of the 631 patients with hospital outcome data, 102 (16%) died in ICU or on the ward. Hospital mortality was associated with higher age, higher APACHE II score, being a non-surgical patient, elevated admission cTnI, elevated cTnI at any point (all $p < 0.001$), longer unit stay ($p = 0.004$), and being a readmitted patient ($p = 0.038$).

The area under a ROC curve using peak cTnI level to predict hospital mortality was 0.76 and the optimal cutoff (highest sum of sensitivity and specificity) was 0.075 mcg/L.

Multivariate logistic regression analysis identified age, being a non-surgical patient, APACHE II score and a cTnI value above this 0.075mcg/L threshold as independent predictors of death in hospital.

TABLE 1 PREDICTORS OF HOSPITAL SURVIVAL

	OR for hospital survival (95% CI)
Age	0.96 (0.94–0.98)
Surgical patient	4.4 (2.4–8.3)
APACHE II score	0.87 (0.82–0.91)
Troponin above 0.075 mcg/L	0.29 (0.16–0.56)

CONCLUSIONS. Our data suggest cTnI is elevated in many critically ill patients, and that this is an independent predictor of death in hospital.

1095

ECHOCARDIOGRAPHY AND CARDIAC TROPONIN USEFULNESS IN PULMONARY EMBOLISM

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BACKGROUND. Pulmonary embolism (PE) is the most serious consequence of deep venous thrombosis (DVT). Echocardiography (ECC) is nowadays a standard practice in acute PE in order to evaluate cardiac function. Cardiac troponin I(Tpi) reflects myocardium injury. Acute PE with right ventricular (RV) dysfunction seems to have an increased mortality and positive Tpi is also related to a worst prognosis. Thrombolysis therapy (TT) in these patients (RV dysfunction and positive Tpi) could offer a potential benefit even in normotensive patients.

OBJECTIVE. Analyze the usefulness of ECC and Tpi in PE clinical assessment. Analyze survival impact of TT in PE normotensive patients with RV dysfunction and/or positive Tpi.

METHODS. Observational retrospective study from 2004 to 2008. We studied 48 patients ($n = 48$) with acute PE and ECC practiced within the first 24 h, all of them admitted to our critical care unit. Our patient's features were:mean age 52.4 ± 18 years;men 54.2%; APACHE II 14 ± 6. Initial clinical symptoms: dyspnea 93.8%; chest pain 43.8%;syncope 39.6%; DVT signs 52.1%. Hypotension (systolic blood pressure <90 mmHg or mean blood pressure <70 mmHg) was present in 50% of our patients. Initial hemodynamic parameters:mean heart rate 104 ± 26 bpm;mean blood pressure 79.3 ± 23.5 mmHg. Initial respiratory parameters: PaO_2/FiO_2 223 ± 104 mmHg, $PaCO_2$ 37.8 ± 16 mmHg. Initial laboratory values:lactate 2.6 ± 2.7 mmol/l; D-dimer > 1,000 μg/L 75.6%; positive Tpi (>0.2 m g/l) 46.4%. Complementary explorations: EKG and thorax X-ray presented PE signs in 72.9% and 33.3% respectively. ECC showed RV dysfunction in 75% of our patients defined as hypokinesis, and/or right/left ventricular end-diastolic diameter (RVEDD/LVEDD) > 0.9, and/or pulmonary hypertension(tricuspid systolic velocity >2.6 m/s). Anticoagulation was initiated in 94% of our patients and 66.7% were treated with TT. Mechanical ventilation was initiated in 20.8% of our patients and 41.7% required vasoactive support.

RESULTS. 28 day mortality was 8.3%. RV dysfunction ($n = 31$) was not related with increased mortality (8.3%). Positive Tpi ($n = 22$) was not related with increased mortality(7.7%). Subgroup analysis: (a) Hypotensive patients ($n = 24$) have a higher 16.7% mortality (not statistically significant). RV dysfunction (83.3%) and/or positive Tpi (53.3%) were both more frequent than in normotensive patients. TT seems to improve survival (85% TT vs 75% no TT) in these patients. (b) Normotensive patients ($n = 24$) showed a non expected high incidence of RV dysfunction (66.7%) and/or positive Tpi (38.5%), but not related with increased mortality. TT was practiced in 50% of these patients (all of them with RV dysfunction) but no survival differences were observed with the non-TT group.

CONCLUSIONS. RV dysfunction and/or positive Tpi do not seem to increase mortality in our PE patients. ECC and/or positive Tpi do not seem useful to stablish TT indications in normotensive PE patients. TT seems to improve survival in hypotensive PE patients (not reaching statistical significance).

1096

ANALYSIS OF URINARY PH AFTER SODIUM-BICARBONATE INFUSION: A NOVEL METHOD FOR THE EVALUATION OF VOLEMIA

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INTRODUCTION. Volemia is one of the independent variables determining cardiac output. Its evaluation is therefore fundamental in critically ill patients. Beyond clinical examination, many techniques have been proposed for its assessment, but none of them has received wide consensus. Normally, variations of volemia are associated to total body sodium (Na) stores, which are finely regulated by the kidney. If an extra-amount of Na is added to plasma, arriving to the kidney, and the kidney is conditioned by hypovolemia, the extra-Na will be entirely reabsorbed, therefore not reaching the urine. In contrast, in normo-/hypervolemia, Na will be almost completely excreted. The extra-amount of urinary Na will increase the urinary strong ion difference (SID_U), thereby causing a consensual elevation in urinary pH (pH_U).

OBJECTIVES. To investigate the validity of a novel test, consisting in pH_U monitoring after 20 min. infusion of sodium-bicarbonate ($NaHCO_3$) and to compare the effects on pH_U of the infusion and a rapid bolus injection of the same dose.

METHODS. Thirty-seven patients without kidney disease, admitted to a post-operative ICU, were enrolled. Their urinary catheter was connected to an analyzer (K.IN.G, Kidney INstant monitoriG) allowing continuous measurement of pH_U and principal urinary electrolytes. On the basis of a pre-test clinical evaluation including hemodynamics, acid–base status, SvO_2 and urinary rate, patients were assigned to either "normo-/hypervolemia" (group 1), or "hypovolemia" (group 2). $NaHCO_3$ (0.3 mEq/kg ideal body weight) was then infused in 20 min. and pH_U was monitored for the following hour. In 19 patients the same dose of $NaHCO_3$ was also injected as bolus to compare the effects on pH_U of the two ways of administration. Analysis was performed by *t* test or two-way ANOVA for repeated measurements, as appropriate.

RESULTS. In group 1 ($n = 21$), $NaHCO_3$ infusion progressively increased pH_U, which reached a plateau within 30 min., whereas in group 2 ($n = 16$) no such difference was observed. Similarly, the maximal pH_U variation within 60 min. detected in group 1 was significantly higher than that observed in group 2 (0.54 ± 0.41 vs 0.06 ± 0.01, $p < 0.001$). Variation in pH_U was paralleled by an increase in SID_U in group 1 (from 3 ± 21 to 12 ± 23 mEq/l, $p = 0.001$), while no such variation was observed in group 2 (from -1 ± 28 to 2 ± 27 mEq/l, $p = 0.26$). Both in group 1 ($n = 12$) and group 2 ($n = 7$) pH_U variation caused by $NaHCO_3$ did not significantly differ between the two ways of administration. Moreover, the maximal pH_U increase observed within 60 min. was similar with infusion and bolus administration (0.56 ± 0.35 vs 0.50 ± 0.24, $p = 0.50$, for group 1, and 0.05 ± 0.04 vs 0.08 ± 0.10, $p = 0.47$ for group 2).

CONCLUSIONS. These findings support the possible role of this easy and non-invasive test for studying the effective circulating volume in critically ill patient.

PC and TL have equally contributed to this work.

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1097

THE EFFECT OF STROKE VOLUME VARIATION ON PERIPHERAL PERFUSION IN HEALTHY VOLUNTEERS

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INTRODUCTION. In clinical practice the effect of fluid challenges or postural changes on stroke volume determines whether a patient is fluid responsive. Although there is increasing evidence that the regional blood flow cannot be predicted from global hemodynamic measurements, the effect on regional perfusion has never been studied. To assess the relationship between stroke volume (SV) and peripheral perfusion we studied the effect of the head up tilt (HUT) test and passive leg raising (PLR) test on parameters of peripheral perfusion in 15 healthy volunteers.

METHODS. The tilt table test consisted of 5 min of supine rest followed by a HUT of 70° on a manually operated tilt table and ending with 5 min of supine rest. PLR test consisted of 5 min of rest in a semirecumbent position of 30°, followed by 5 min PLR (lower limbs elevated at 30° and trunk in supine position) and ending with 5 min of rest in semirecumbent position. SV was measured continuously and non-invasively using NICOM, based on chest bioreactance. Mean arterial pressure and heart rate was measured using Finometer. Peripheral perfusion was measured continuously with Sidestream Dark Field imaging (sublingual area) and Laser Doppler Flowmetry (finger).

RESULTS. Figure 1 shows the results for the HUT and PLR. Both HUT and PLR induced significant changes in SV and cardiac output (CO). During the HUT there were significant changes in mean arterial pressure (MAP) and heart rate (HR). Total capillary density (TCD), proportion of perfused vessels (PPV) and perfused capillary density (PCD) did not change throughout the experiment. In addition, flow measured with LDF showed no changes.

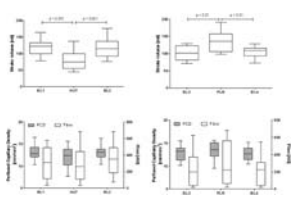

Fig. 1

CONCLUSION. In this preclinical model there was no relation between the changes in global hemodynamics and parameters of peripheral perfusion. This can probably be attributed to the adequacy of the autoregulation in healthy volunteers.

1098

CARDIOVASCULAR REGULATION IN UNSELECTED INTENSIVE CARE PATIENTS

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INTRODUCTION. In the past decades, alteration of cardiovascular autonomic function with relative predominance of the sympathetic tone has been identified as a predictor of outcome in selected patients after myocardial infarction, sepsis, and other entities. However, implementation of such analyses for risk stratification in monitoring devices require the evaluation in unselected intensive care (ICU) patients as well. The following study was performed to analyze individual risks associated with changes in cardiovascular regulation in unselected ICU patients.

PATIENTS. Between January 2006 and May 2007 22 medical ICU patients (60 ± 15 years; mean SAPSII 48 ± 23) with invasive cardiovascular monitoring were included in the study and physiologic data were extracted from the surveillance network. Patients suffering from atrial fibrillation or other tachycardic arrhythmic events had been excluded.

METHODS. From continuous blood pressure curve, the consecutive systolic (SBP) and diastolic (DBP) blood pressure values as well as the beat-to-beat intervals (BBI) of heart rate have been extracted. To exclude artifacts and premature heart beats, the obtained time series of 60 min were filtered. In order to characterize the autonomous cardiovascular regulation, methods of heart rate, systolic and diastolic and pulse pressure variability were applied. The characterization of systolic blood pressure and heart rate coupling was performed by Dual Sequence Method for analyzing the spontaneous baroreceptor (BR) sensitivity. For statistical tests, the Mann–Whitney *U* test was applied.

RESULTS. In our study, patients with negative and positive prognosis did not show differences in BRS and cardiovascular variability. Only the average BR slope showed a tendency (BRS [ms/mmHg]: 8.7 ± 2.6 (alive) vs. 6.4 ± 3.0 (deceased), n.s.). Nevertheless, the influence of artificial respiration (ar) (number of tachycardic BR events: 39 ± 22 vs. 11 ± 13 (ar), $p = 0.001$; number of consecutive slopes in SBP: 568 ± 248 vs. 332 ± 190 (ar), $p = 0.02$; and catecholamine therapy (cat) (number of tachycardic BR events: 34 ± 23 vs. 12 ± 16 (cat), $p = 0.01$; mean SBP [mmHg]: 141 ± 12 vs. 125 ± 13 (cat), $p = 0.04$; rmssd SBP 4.1 ± 1.3 vs. 2.0 ± 1.3 (cat), $p = 0.002$; rmssd DBP 2.6 ± 1.4 vs. 1.3 ± 0.6 (cat), $p = 0.005$) could be shown. Scoring the patients by SAPS2 obtained intergroup differences between the quartiles 1 and 4 (number of tachycardic BR events: 37 ± 24 (Q1) vs. 6.2 ± 5.9 (Q4), $p = 0.02$; rmssd SBP 4.3 ± 1.6 (Q1) vs. 1.4 ± 0.7 (Q4), $p = 0.007$; rmssd DBP 2.4 ± 0.9 (Q1) vs. 0.9 ± 0.3 (Q4), $p = 0.009$).

CONCLUSIONS. In unselected ICU patients, severity of disease indicated by SAPS score, artificial respiration and catecholamine therapy, but not mortality, were associated with reduced cardiovascular variability. This is in contrast to previous reports showing less impact of mechanical ventilation in ICU patients. For unselected ICU patients, the individual course of cardiovascular regulation may be more important for risk assessment.

Cardiac arrest and coronary artery disease: 1099–1112

1099

OXIDATIVE STRESS AFTER OUT OF HOSPITAL CARDIAC ARREST TREATED BY HYPOTHERMIA

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INTRODUCTION. Out of hospital cardiac arrest (OHCA) is a major health problem whose prognosis is still very severe. This pathology represents a unique ischemia-reperfusion model. It is well known that ischemia and moreover reperfusion generates an oxidative stress. This phenomenon can lead to deleterious cellular and organs injuries. The beneficial effects of therapeutic hypothermia could be partly explained by the mitigation of oxidative stress. However oxidative stress has never been shown in clinical practice.

OBJECTIVES. The aim of this study is to evaluate oxidative stress markers and lactate after OHCA treated by moderate hypothermia.

METHODS. This is a prospective observational study conducted in one medical surgical ICU. After ethic committee approval and written informed consent, OHCA patients were included consecutively. They received sedation, mechanical ventilation and therapeutic hypothermia (24 h at a temperature of 34°C). Blood sampling was done at 3 time-points: arrival in ICU (T0), after hypothermia (T1) and on day 2 (T2). The different biological parameters included a lipid peroxydation marker (TBARS), antioxidant defences (glutathione, glutathione peroxidase and thiols) and lactate. The outcome was assessed by the Glasgow Outcome Scale at 6 months. GOS 4–5 were considered as good outcome whereas GOS 1–3 as poor outcome.

Data are expressed as median and interquartile range. Statistical analysis was carried out using Mann–Whitney and Wilcoxon tests, $p < 0.05$ was considered significant.

RESULTS. Twenty seven patients were included aged 62 years (50.5–71). In this population the TBARS decreased from 2.43 (2.16–2.73) to 2.14 µmol/L (1.81–2.35) between T0 and T1 ($p = 0.01$) and then increased to 2.31 µmol/L (2.1–2.68) at T2 ($p = 0.01$). Glutathione and thiols decreased gradually from T0 to T2. Glutathione peroxidase activity increased from 300 U/L (251-357) at T0 to 390 U/L (367–422) at T1 ($p = 0.01$). There was no difference between T1 and T2 values. Lactate declined from 3.7 mmol/L (2.2–5.7) on arrival to 1.21 mmol/L (0.93–1.36) on day 4, $p < 0.05$. Seven patients were considered to have a good outcome and 20 a poor one. TBARS were higher in the poor outcome group at T0: 2.54 µmol/L (2.32–2.89) vs 1.92 µmol/L (1.89–2.26); $p = 0.02$. Antioxidant defences were not different at all time-points. Lactate on arrival was significantly higher in the poor prognosis patients: 3.99 mmol/L (3.01-7.13) vs 2.1 mmol/L (1.09–2.25); $p = 0.01$.

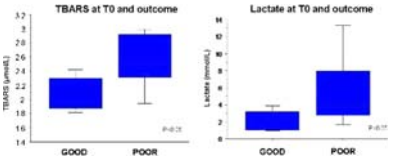

Fig. 1 TBARS and lactate on arrival

CONCLUSIONS. OHCA is associated to an oxidative stress. It is characterized by an increase in lipid peroxidation marker and a decrease in non enzymatic antioxidant defences. The answer implies an increase in the enzyme glutathione peroxidase. It seems that hypothermia mitigates oxidative stress as it suggested by the changes in TBARS. This marker appears to be able to discriminate good to poor outcome patients. It is confirmed that lactate on arrival is an interesting prognosis marker after out of hospital cardiac arrest.

1100

THE EFFECT OF MAGNESIUM SULFATE ON NEUROCOGNITIVE FUNCTION AFTER BRIEF CARDIAC ARRESTS

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OBJECTIVES. Magnesium sulfate ($MgSO_4$) is a calcium- and an NMDA-antagonist. It may therefore have neuroprotective properties in global brain ischemia [1]. Internal cardioverter/defibrillator (ICD) implantation requiring repeated inductions of ventricular fibrillation (VF) for threshold testing is an ideal model to study the effects of short-lasting cerebral ischemia on brain tissue and neurologic function. As part of a greater trial, we also evaluated cognitive function in patients undergoing elective ICD insertion in monitored anesthesia care.

METHODS. In a double blind fashion, 13 patients randomly received a 16 mmol bolus of $MgSO_4$ 30 min prior to induction of VF followed by a continuous infusion of 5 mmol over 2 h. 16 control patients received placebo instead. Surgery was carried out in local anesthesia; apart from 0.1 mg/kg etomidate IV given immediately before induction of VF no further anesthetics were administered. The following psychometric tests were employed perioperatively: Mini Mental State Exam, Forward and Backward Digit Span Tests, and Trail Making Test. In addition, acoustic evoked potentials (peak P300 latencies) were determined before and, together with neurocognitive testing, two days after surgery. P300 latencies are inversely associated with attention allocation and immediate working memory. *t* tests and analysis of variance were employed to assess differences between and within groups. A P-value < 0.05 was considered significant.

RESULTS. There were no significant differences in the demographics of the two groups as well as in the number of applied shocks and the cumulative duration of VF. Magnesium serum levels increased during administration of $MgSO_4$ and remained elevated (i.e. > 1 mmol/L) until 6 h after surgery ($P < 0.05$ vs. baseline). P300 latencies increased slightly in both groups without differences between groups ($P > 0.05$). There were no appreciable changes in the Mini Mental State Exam and the Digit Span Forward Test when compared with preoperative scores independent of group assignment. Patients in both groups scored marginally worse in the Digit Span Backward Test. Patients in the placebo group concluded the Trail Making Test faster after surgery whereas patients in the magnesium group required more time to connect the numbered dots in the right order as compared to preoperative evaluation. This difference, however, was not statistically significant.

CONCLUSION. $MgSO_4$ administered pre-emptively in this setting does not seem to have a major beneficial effect on neurocognitive function after brief periods of cardiac arrest. However, either higher dosages or a prolonged administration might still be effective in mitigating the ongoing neuronal injury [2].

REFERENCES. 1. Meloni BP et al (2006) Magnes Res 19:123–137
2. Dworschak M et al (2003) Crit Care Med 31:2085–2089

1101

EVALUATION OF CARDIAC EFFECTS OF HYPOTHERMIA IN CARDIAC ARREST SURVIVORS BY TRANSESOPHAGEAL ECHOCARDIOGRAPHY: A PILOT STUDY

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INTRODUCTION. Moderate hypothermia improves outcome of comatose patients after resuscitation from out of hospital cardiac arrest [1]. But there is little documentation and no echocardiographic data about haemodynamic and cardiac effects of hypothermia [2, 3].

PATIENTS AND METHODS. setting: a tertiary care 15-bed medical ICU in a university hospital. Patients included in the Icerea study (hypothermia during 24 h in patients surviving cardiac arrest) were evaluated by transoesophageal echography during normothermic and hypothermic periods.

RESULTS. 10 patients (mean age: 60 ± 14; SAPS II: 62 ± 12; ICU mortality: 60%) were included. Ventilatory settings, inotropic and vasoactive drugs doses were identical during both periods.

TABLE 1 ECHOCARDIOGRAPHIC DATA DURING NORMOTHERMI

	Hypothermia	Normothermia	*p*
Temperature (°C celsius)	32.4 ± 1.3	36.8 ± 0.8	<0.005
Cardiac frequency (beats/min)	58 ± 18	94 ± 13	<0.001
Cardiac index (l/min/m^2)	1.8 ± 0.46	6.2 ± 2.5	0.002
LV fractional area contraction (%)	0.45 ± 0.1	0.49 ± 0.09	0.55
Aortic maximal blood flow (m/s)	0.79 ± 0.15	1.14 ± 0.2	0.006
Pulmonary artery maximal blood flow (m/s)	0.71 ± 0.15	0.98 ± 0.2	0.009
RV fractional area contraction (%)	0.45 ± 0.1	0.49 ± 0.09	0.55
Velocity time integral of aortic flow (cm)	17.7 ± 5	19.1 ± 5.4	0.27
Left ventricular maximal elastance	1 ± 0.23	0.79 ± 0.36	0.08

CONCLUSION. Mild hypothermia induces a major reduction of cardiac index, PA and Aortic blood flow velocity but doesn't influence contractile myocardic properties and pulmonary circulation.

REFERENCES. 1. Bernard SA et al (2002) Treatment of comatose survivors of out of hospital cardiac arrest with induced hypothermia. N Engl J Med 346(8):557–563
2. Lewis ME et al (2002) The effects of hypothermia on human left ventricular contractile function during cardiac surgery. J Am Coll Cardiol 39:102–108
3. Eriksonn LT et al (1999) Cardiovascular effects of induced hypothermia after lung transplantation. Ann Thoracic Surgery 67:804–809

1102

VASOPRESSIN, EPINEPHRINE, AND CORTICOSTEROIDS FOR INHOSPITAL CARDIAC ARREST: RESULTS ON PATIENTS WITH POST-RESUSCITATION SHOCK

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INTRODUCTION. A recently published protocol of cardiopulmonary resuscitation (CPR), which includes the use of steroids during and after CPR, may benefit patients with post-resuscitation shock [1, 2]. We seek to provide additional evidence supporting this hypothesis and its generalizability by adequately increasing the size of the originally studied population [1] in the context of a three-center, randomized, controlled trial. Herein, we report the results of the second interim analysis.

METHODS. According to the study protocol [1], adult in-patients who were successfully resuscitated from refractory cardiac arrest were randomized to receive either (1) stress dose hydrocortisone (300 mg/day for 3–7 days and then gradual taper; study group), or (2) placebo (control group). Post-resuscitation shock was defined as sustained (>4 h), new post-arrest circulatory failure or post-arrest need for at least a 50% increase in any pre-arrest vasopressor/inotropic support targeted to maintain mean arterial pressure >70 mmHg. Assessed endpoints were mean arterial pressure, central venous oxygen saturation, and the systemic inflammatory response during the first 10 days post-randomization, organ failure free days during days 1–60 post-randomization, and survival to discharge either to home or to a rehabilitation facility.

RESULTS. Data from 85 patients were analyzed. Baseline patient clinical profiles were similar. Linear mixed-model analysis showed significant effects of group on central venous oxygen saturation ($P < 0.001$), mean arterial pressure ($P < 0.001$), and log-transformed plasma interleukin-6 levels ($P < 0.001$). Study group patients who completed a full course of hydrocortisone according to protocol ($n = 17$) vs. corresponding controls ($n = 12$) had significantly more days free of all organ failure and circulatory, neurologic, hepatic, renal, coagulation, and respiratory failure ($P < 0.05$). Lastly, study group patients vs. controls had higher rates of discharge to either home or a rehabilitation/high dependency unit (13/36 vs. 1/34, $P = 0.006$).

CONCLUSION. These results suggest that the new CPR protocol, which includes corticosteroid supplementation for > 3 days following resuscitation, may be of particular benefit in patients with post-resuscitation shock.

GRANT ACKNOWLEDGEMENT. Supported in part by the Thorax Foundation.

REFERENCES. 1. Mentzelopoulos SD et al (2009) Arch Intern Med 169:15–24

2. Multidrug Cocktail for In-Hospital Cardiac Arrest (2009) J Watch Emergency Med 2009:1–1

1103

OUTCOME OF OUT-OF-HOSPITAL CARDIAC ARREST IN A YOUNG DUTCH URBAN AREA

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INTRODUCTION. In the Netherlands, prevalence of out-of-hospital cardiac arrest (OHCA) is approximately 15,000 cases yearly. Previous study in the Netherlands has shown a survival rate of 16.6%, the survival rate after successful resuscitation was 44% [1].

Almere is a new Dutch urban area, with a population that differs from other cities in the Netherlands; only 7.2% of the population is older than 65 years, compared to a mean of 8.8% in the Netherlands [2]. Data regarding survival after an OHCA in Almere is lacking. Therefore we performed a prospective follow-up study of all OHCA presented at the emergency department in the Flevoziekenhuis (FZ, Flevo-hospital).

METHODS. From January 2004 to December 2008, all OHCA presented at the emergency department were analysed. Patient characteristics, time to return of spontaneous circulation (ROSC), cause of the arrest, initial recorded rhythm and outcome were recorded. Data on OHCA that did not survive initial resuscitation come from the ambulance service records. Both hospital survival and survival after discharge were taken from the hospital information system.

RESULTS. During this period 315 cases of OHCA were recorded, 146 patients (46%) did not survive initial out-of-hospital resuscitation and died at the scene. 168 were presented at the emergency department. 12 patients were excluded because of missing data, and 1 patient was directly transported to another hospital. Survival rate after successful initial resuscitation was 52%. After discharge only 2 patients deceased during a mean follow up period of 2.5 years.

The results are shown in Table 1 below.

TABLE 1 SURVIVAL OHCA IN ALMERE, THE NETHERLANDS

	Presented ($n = 155$)	Resuscitated (n =83)	Discharged ($n = 43$)
Male sex	104 (67%)	59 (71%)	34 (79%)
Age (years)	61 ± 15	59 ± 13	58 ± 13
No cardiac history	103 (67%)	56 (68%)	28 (65%)
Time to ROSC (min)	35 ± 26	25 ± 24	16 ± 11
Rhythm: Asystole	23 (15%)	6(7%)	0 (0%)
Rhythm: PEA	48 (31%)	15(18%)	4 (9%)
Rhythm: VF/VT	75 (48%)	54 (65%)	36 (84%)
Rhythm: Unknown	9 (6%)	8 (10%)	3 (7%)
Deceased	72 (47%)	40 (48%)	2 (5%)

CONCLUSION. The survival after an out-of-hospital cardiac arrest in Almere—a new Dutch urban area with a relatively young population—is 14%. After a successful OHCA, 52% survived to hospital discharge. With a mean follow-up of 2.5 years, 95% of these patients are still alive.

1104

CARDIAC ARREST OUTCOMES AT A UNIVERSITY TEACHING HOSPITAL BEFORE AND AFTER DEPLOYMENT OF AUTOMATED EXTERNAL DEFIBRILLATORS

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INTRODUCTION. Automated External Defibrillators (AEDs) permit defibrillation by 'first responders' with basic resuscitation training. The place of AEDs in the management of in-hospital cardiac arrest is unclear.

OBJECTIVE. To examine outcomes from cardiac arrest at a university teaching hospital before and after the deployment of AEDs.

METHODS. St. Vincent's is a university teaching hospital in Melbourne Australia with approximately 300 acute and 80 sub-acute inpatient beds. Biphasic AEDs with manual override capability were deployed to 17 clinical areas in November 2007. This deployment did not include the emergency department, theatres, intensive care, coronary care, cardiac catheter laboratories or the cardiothoracic ward, where manual defibrillators were retained. A staff training program preceded the deployment.

We compared cardiac arrest cases in areas with AED access in the year following the deployment (the post-AED period) to cardiac arrest cases in these areas during the two years preceding the deployment (the pre-AED period). During both periods a Medical Emergency Team was available to assist inpatients displaying serious, but non-arrest, signs and symptoms and a Code Blue team was available to assist patients suffering cardiac arrest.

RESULTS. Fifty-five (55) cardiac arrests occurred in the two-year pre-AED period and 31 in the one-year post-AED period. An AED was utilised in all cases of cardiac arrest in the post-AED period.

Pre-AED period and post-AED period cardiac arrest patients were similar with respect to median age (74 years vs. 78 years), gender (male 62% vs. 55%), assignment to a medical unit (75% vs. 61%), event location on an acute inpatient ward (78% vs. 90%) and initial arrest rhythm of VT/VF (18% vs. 16%), PEA (47% vs. 55%) and asystole (31% vs. 29%). Cardiac arrest outcomes improved somewhat from the pre-AED period to the post-AED period with respect to ROSC (42% vs. 55%, $p = 0.276$) and survival to hospital discharge (22% vs. 29%, $p = 0.457$), though this did not reach statistical significance.

CONCLUSIONS. This small study does not provide compelling evidence to support the use of AEDs for in-hospital cardiac arrest, but neither does it refute the use of AEDs in this setting. The potential for AEDs to improve outcomes may be limited when there is a relatively low proportion of cardiac arrests due to a shockable rhythm (less than 20% in our study) and when a cardiac arrest team is available that can respond to these emergencies in a timely fashion.

1105

OPTIMIZATION OF INITIAL ENERGY FOR CARDIOVERSION OF ATRIAL TACHYARRHYTHMIAS WITH BIPHASIC SHOCKS

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OBJECTIVE. Recommendations for optimal first-shock energies with biphasic waveforms are conflicting. We evaluated prospectively the relation between type and duration of atrial tachyarrhythmias and the probability of successful cardioversion with a specific biphasic shock waveform to develop recommendations for the initial energy setting aiming at the lowest cumulative energy with 2 or less consecutive shocks.

METHODS. We analyzed 453 consecutive patients undergoing their first transthoracic electrical cardioversion, including 358 attempts for atrial fibrillation (AF) and 95 attempts for atrial flutter (AFL) and atrial tachycardia (AT). A step-up protocol with a truncated exponential biphasic waveform starting with 50 J was used. Total cumulative energies were estimated under the assumption of a 2-tiered escalating shock protocol with different initial energy settings and a "rescue shock" of 250 J for AFL/AT or 360 J for AF. The initial energy setting leading to the lowest total cumulative energy was regarded as the optimal first-shock level.

RESULTS. Cardioversion was successful in 448 patients (cumulative efficacy, 99%). In patients with AFL/AT, the lowest total cumulative energy was attained with an initial energy setting of 50 J. In patients with AF, lowest values were achieved with an initial energy of 100 J for arrhythmia duration of 2 days or less and an initial energy of 150 J for arrhythmia durations of more than 2 days.

CONCLUSION. We recommend an initial energy setting of 50 J in patients with AFL/AT, of 100 J in patients with AF 2 days or less, and of 150 J with AF more than 2 days.

1106

AB INITIO IMPROVED ECG PREDICTION OF THE SUCCESS OF CARDIAC RESUSCITATION COMBINING SPECTRAL AND TEMPORAL FEATURES THOROUGH PATTERN CLASSIFICATION

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INTRODUCTION. The estimation of the duration of ventricular fibrillation (VF) or ventricular tachycardia (VT) could have important implications regarding the selection of the best therapeutic intervention during cardiopulmonary resuscitation (CPR). The current guidelines of the American Heart Association (AHA) prescribe immediate defibrillation after onset of VF or VT. The whole purpose of using a defibrillator is to eliminate the chaotic electrical activity of the heart during VF or the too-rapid ventricular activity in VT which precludes a circulation. No drugs being used during CPR have been shown to improve clinical outcome. Recent evidence has suggested that a period of CPR before defibrillation may be beneficial after prolonged collapse.

OBJECTIVE. The ECG tracings recorded during resuscitation using an AED contain information predictive of shock therapy. The focus is on the morphology of the VF waveforms. More specifically, the amplitude or the spectral properties of VF predicted the duration of untreated cardiac arrest and the likelihood of successful resuscitation. Such a VF morphology analysis is based on different single amplitude or spectral features of the VF waveforms [1, 2]. But at present, all the VF strategies to optimise defibrillation timing have not sufficient predictive power. The several indicators yield complementary information since a little correlation exists between them [3]. A smart strategy could be to extract the different information from the several ECG features and develop combinations [4].

METHODS. 300 patients with out-of-hospital cardiac arrest on arrival in an emergency medical service were examined. The rhythm was identified as VF and confirmed by two trained investigators. ECG data were stored in modules in digitized form over a period of 20 min and analyzed retrospectively. ECG traces containing CPR artefacts, produced during precordial compression, were removed by digital filtering. Times of collapse, dispatch, scene arrival, CPR, and initial defibrillation were determined from dispatch records, recordings of arrest events, interviews with bystanders, and hospital records. Pre-shock VF waveform morphology was studied and different parameters of VF ECG signals have been extracted (centroid frequency, peak power, etc.). Then, we introduce an ab-initio reliable pattern classification machine combining the amplitude and spectral features.

RESULTS. The use of the pattern classification machine which combines amplitude and spectral features of VF ECG signals show that the shock outcome prediction accuracy can be improved. This technique could determine which patients should receive shock first and which should receive a period of CPR prior to shock, thereby increasing probability of survival.

REFERENCES. 1. Strohmenger H et al (1997) Chest 111:584–589
2. Sherman LD (2006) Resuscitation 69:479–486
3. Hamprecht F et al (2001) Resuscitation 50:297–299
4. Eftestol T et al (2005) Resuscitation 67:55–61

1107

MYOCARDIAL INFARCTION: STRATEGY AND RESULTS IN HOSPITALS WITH/WITHOUT PCI AVAILABILITY

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INTRODUCTION. Clinical evidence shows that an invasive coronary procedure improves the prognosis of the patient. Nevertheless, most of the population does not have the opportunity of it because of the delay that would represent the transfer to a center with this possibility.

OBJECTIVES.

- Analysis of results between hospitals with different therapeutic possibilities, as well as the adjustment to the clinical guidelines.

METHODS.

- Descriptive analysis from the ARIAM registry (multicentric national registry of patients admitted to Cardiologic Intensive Care Unit with suspected ACS). Patients included are those admitted in the province of Granada (Andalusia, Spain) during the period from January 1, 2005 to July 1, 2007, with initial diagnosis of STEMI. Comparison between hospitals with/without availability of PCI Cardiology service. Univariate analysis (Student's t, chi-square), $p < 0.05$.

RESULTS.

- 1016 patients were admitted with MI diagnosis in such period (442 PCI-available hospital and 574 other hospitals). The reperfusion strategy was: Fibrinolysis: 64.1% (95.2% Tenecteplase), Primary PCI: 5.3%. Median of ICU stay: 2 days; Mortality: 5.2%.

TABLE 1 RESULT

n	PCI-available hospital 442	Other hospitals 574	p
Age	64.3 ± 12.8 P50:67 (54–74)*	65.24 ± 13.1 P50:69 (57–76)*	0.058
TIMI Score (n:357)	3.62 ± 2.4 P50:3 (2–5)*	3.68 ± 2.5, P50:4 (2–5)*	ns
Killip I	82.4%	72.8%	0.001 **
Killip IV	4.1%	5.2%	
ARIAM Priority I	31%	19.9%	0.001
Prehospital Tx	14.4%	6.3%	0.001
Primary PCI	9.5%	2.1%	0.001
Exitus	4.1%	6.1%	0.096

- After the comparison according to the hospital resources (with/without PCI), it is concluded:

1. Significant differences in severity of the MI ** (greater score Killip I versus II-IV, $p = 0.01$) and less absolute indications (Priority I) of fibrinolysis ($p = 0.01$) in hospitals that lack of PCI.
2. PCI Hospital tends to do more often thrombolysis before ICU admission, which determinate a significant saving time in global delays.
3. The hospital with Interventionist Cardiology has a greater delay at the time of fibrinolysis.
4. Center with availability of PCI carried out more Angioplasties (primary and secondary, $p = 0.001$).

CONCLUSIONS.

- There is variability in reperfusion strategy between hospitals with different resources, although we have not found significant differences in complications, ICU length of stay or mortality.
- Our most used treatment is pharmacological reperfusion, with low PCI frequency. Nevertheless, patients treated in hospital with PCI resource have more probability of receiving the procedure.

1108

INCIDENCE AND RISK FACTORS OF MAJOR BLEEDING IN ACUTE CORONARY SYNDROME PATIENTS

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OBJECTIVE. The use of multiple antiplatelet and antithrombotic agents alongside the invasive catheterization procedures have lead to an increase in the risk of bleeding in patients with acute coronary syndromes (ACS). We study the incidence and risk factors associated to major bleeding in ACS patients admitted to the intensive care unit (ICU).

METHODS. Prospective, observational study of ACS patients admitted to the ICU during the year 2005. The primary end point were major bleeding defined as the occurrence of hemorrhagic stroke or any bleeding that required transfusion of blood products, use of vasoactive drugs, gastrointestinal endoscopy or any kind of surgery. Variables studied as risk factors were: age, gender, type of ACS (with or without ST segment elevation), creatinine levels at admission, comorbidities, use of antiplatelets, heparin pre and post-procedure, thrombolytic therapy and cardiac catheterization. A multivariate logistic regression analysis was used for statistical analysis.

RESULTS. 326 patients were included. Mean age was 66 + 11 years, 27% were women, 63% presenting without ST segment elevation and in 64.5% of cases a cardiac catheterization was carried out ($n = 211$). A 4.6% of patients suffered from a major bleeding episode ($n = 15$). Four patients had a hemorrhagic stroke. In the univariate analysis the variables associated with bleeding were: creatinine levels at admission (1.6 + 1.3 vs 1.08 + 0.7, $p = 0.002$), antiIIb/IIIa glycoprotein treatment (14.7% vs 5.8%, $p = 0.01$), cardiac catheterization (12.4% vs 5.2%, $p = 0.02$) and use of heparin following cardiac catheterization (13.9% vs 5.5%, $p = 0.039$). Multivariate analysis show that major bleeding is associated with creatinine levels (per mg/dl) (OR = 1.59; IC 95% 1.10–2.33, $p = 0.03$) and use of heparin following cardiac catheterization (OR = 3.73; IC 95% 1.43–9.69, $p = 0.007$)

CONCLUSIONS. The incidence of major bleeding is in the range of that published in the literature. Acute renal failure and use of heparin following cardiac catheterization are the factors that increase the risk of major bleeding in our population of ACS patients.

1109

PREDICTORS OF IN-HOSPITAL MORTALITY IN PATIENTS WITH ACUTE ST-ELEVATION MYOCARDIAL INFARCTION

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BACKGROUND AND OBJECTIVES. Acute ST-elevation myocardial infarction (MI) is a medical emergency, requiring early reperfusion therapy with either primary percutaneous coronary intervention (PCI) or iv. fibrinolysis in order to decrease the magnitude of ischemic necrosis and the incidence of complications after acute MI such as heart failure, arrhythmias and mortality. Our aim was to evaluate independent predictors of in-hospital mortality in patients with acute ST-elevation MI.

METHODS. We retrospectively evaluated the records of all the patients admitted to our hospital between January and October 2008 due to acute MI. We included 190 patients (mean age 62.9 ± 12.8 years; 137 men, 53 women) with chest pain, ST-elevation on ECG with or without Q-wave or with presumably new bundle branch block and all with increased troponin I, estimated by immunomethod (normal levels up to 0.1 μg/l). The patients were treated by primary PCI if possible and other appropriate medical therapies according to guidelines. We registered demographic variables, clinical and laboratory data on admission and during in-hospital stay. Predictors of in-hospital mortality were estimated by univariate statistical testing and multivariate logistic regression (forward Wald method).

RESULTS. In-hospital mortality of 190 included patients was 9.5%. Between survivors and nonsurvivors there were significant differences in diabetes (16.3% vs 38.9%, $p = 0.021$), prior stroke (2.3% vs 16.7%, $p = 0.016$), chronic renal failure (3.5% vs 16.7%, $p = 0.028$), mean admission systolic blood pressure (133.5 ± 28.7 mmHg vs 112.1 ± 29.7 mmHg, $p = 0.005$), puls (78.9 ± 20.9 min^{-1} vs 98.4 ± 26.9 min^{-1}, $p = 0.004$), admission heart failure of Killip classes II-IV (23.8% vs 94.4%, $p < 0.001$) and troponin I (8.4 ± 17.5 μg/l vs 21.4 ± 22.9 μg/l, $p = 0.005$) as well as in primary PCI (92.4% vs 72.2%, $p = 0.017$), in in-hospital heart failure of Killip classes II-IV (26.2% vs 100%, $p < 0.001$), mean peak troponin I (45.1 ± 34.4 μg/l vs 68.6 ± 36.1 μg/l, $p = 0.007$), infection (13.4% vs 77.%, $p < 0.001$) and arrhythmias (33.7% vs 61.1%, $p = 0.012$). Most significant independent early predictors of in-hospital mortality were admission heart failure (OR 0.07, 95% CI 0.013–0.368, $p = 0.002$) and admission puls (OR 1.035, 95% CI 1.009–1.062, $p = 0.008$).

CONCLUSIONS. Admission heart failure of Killip classes II-IV and puls were most significantly independent early predictors of in-hospital mortality in acute ST-elevation MI.

REFERENCES. 1. Van de Werf F, Bax J, Betriu A et al (2008) Management of acute myocardial infarction in patients presenting with persistent ST-segment elevation: the Task Force on the Management of ST-Segment Elevation Acute Myocardial Infarction of the European Society of Cardiology. Eur Heart J 29:2909–2945

2. Silber S, Albertsson P, Aviles FF et al (2005) Guidelines for percutaneous coronary interventions. The Task Force for Percutaneous Coronary Interventions of the European Society of Cardiology. Eur Heart J 8:804–847

1110

CLINICAL PROFILE AND CORONARY ARTERY DISEASE IN PATIENTS SUFFERING PRIMARY VENTRICULAR FIBRILLATION AFTER THE ONSET OF MYOCARDIAL INFARCTION

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INTRODUCTION. Primary ventricular fibrillation (PVF) occurs in the absence of cardiac failure or shock. It appears shortly after the onset of acute myocardial infarction (AMI). It is the most lethal complication and is related with morbidity. We try to classify the patients' clinical features and those variables implied as risk factors for PVF.

METHOD. We studied 756 patients admitted to our Intensive Care Unit (ICU) suffering an AMI in the time interval from January 2006 up to December 2007. We compared those suffering PVF (cases) with those who did not (control group). Demographic, environmental and clinical variables were analyzed. Statistical data were reported as mean, median and percentage. Chi-square test was used to determine if two categorical variables were independent and a multivariate analysis detected risk factors implied in its development.

RESULTS. Age median was similar in case and control groups (63 and 65 years old, respectively). Similar was also men percentage (70%). It was the first ischemic event in 75.9% in both groups. Anterior wall was damaged in 53.7% and inferior wall in 46.3% of them. Anterior coronary artery was the most frequently lesion site (53%), being the right coronary artery the one in a 33% and circumflex artery in up to 13%. In about 54.5% of all an extensive coronary artery disease was present. TIMI flow of the artery responsible at the moment of percutaneous coronary intervention (PCI) was TIMI 0 (38.2%), TIMI 1 (9.1%), TIMI 2 (18.2%), and TIMI 3 (34.5%). From the total (756 patients) studied with AMI, 67 suffered PVF (case group) while 689 did not (control group). Diabetes (OR: 0.36, IC 95%: 0.17–0.74) and Smoking (OR: 2.78, IC 95%: 1.63–4.73) were related with the appearance of PVF. It was not so with ejection fraction. PCI was statistically significantly associated with PVF cases (OR: 1.62, IC 95%: 3.16–6.14). Peak CKMB was higher in case than in control group ($p = 0.001$). Coronary lesion site was found to have no cause-effect relation as responsible in the appearance of PVF. Higher mortality was found in case group ($p = 0.07$). Multivariate analysis identified age (OR: 1.05, IC 95%: 1.01–1.09), peak CKMB values (OR: 1.15, IC 95%: 1.11–1.19) and Killip at ICU admission class as death risk factors.

CONCLUSIONS. Smoking was found to be a risk factor and diabetes a protector factor in the appearance of PVF. There were no electrical or coronary patterns to differentiate case from control group. Case group had a significantly higher average of CKMB and an increment in the number of deaths, in relation to control group. Age, serum peak CKMB and Killip class at ICU admission can be considered death risk factors.

REFERENCES. 1. Gheeraert PJ et al (2006) Risk factor for primary ventricular fibrillation during acute miocardycal infacrtion: a systematic review and metaanalysis. Eur Heart J 27:2499–2510

1111

EFFECTIVENESS OF COMBINATION THERAPY IN ACUTE CORONARY SYNDROME WITH ELEVATED ST SEGMENT

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OBJECTIVE. To evaluate efficacy of combination therapy in patients younger than 75 years, with Acute coronary syndrome with elevated ST, less than 12 h of development and high-risk criteria. Assessment of efficacy of combination therapy with fibrinolysis compared to other pharmacological reperfusion therapy.

METHODS. Non-randomized open clinical trial with patients admitted in Intensive Care Unit, since January 2002 to October 2007, with acute coronary syndrome with ST elevation. All the patients were stratified and those who were stratified as high risk by: risk score TIMI > 4, the presence of an electrocardiogram to suggest involvement of proximal coronary artery, were considered to perform catheterization hemodynamic urgent after combination therapy. To assess the effectiveness of fibrinolysis used clinical criteria, cessation of pain, electrical criteria, decrease at least 50% or 70% of the sum in millimeters of ST, depending of the affected territory, and enzymatic criteria, ratio of myoglobin after fibrinolysis >4. Other criteria of effectiveness of fibrinolysis was no reoclusión and TIMI 3 flow of the culprit infarct artery before percutaneous intervention. Qualitative variables are expressed as absolute value and percentage, whereas quantitative variables are expressed as mean ± standard deviation. Comparisons between groups were made with the t test for continuous variables and the χ^2 or Fisher's exact for categorical variables when necessary. Alpha Error has been considered a maximum of 5%.

RESULTS. A total of 1276 patients were admitted with Coronary Syndrome with ST elevation during the time period of the study, which was held to 920 of them fibrinolysis. Of these 920 met criteria and combination therapy was performed in 136 patients. Combination therapy (rt-PA half-dose + abciximab + heparin at very low doses and facilitated percutaneous intervention within 24 h). When comparing this group with that of standard therapy, do not find significant differences in demographic variables of age, sex and cardiovascular risk factors (except dyslipidemia). The efficacy data from fibrinolysis showed significant differences in the three criteria discussed in both the cessation of pain ($p = 0001$), as in the ratio of myoglobin ($p = 0002$) or the decrease of ST ($p = 0001$). Addition showed a lower rate of reoclusión 14.6% VS 0.73% ($p = 0.0001$) and a higher percentage of patients with the artery open (TIMI 3) at coronariography, 44.9% vs. 67.2% ($p = 0.0001$). We found no differences in mortality for cardiovascular causes within UCI 10.6% in the fibrinolysis group of standard compared to 6.6% in the combined therapy group ($p = 0.15$).

CONCLUSION. Combination therapy exploits the benefits of mechanical reperfusion and prevents deleterious effects of the early activation of platelets caused by the use of fibrinolytic alone. Combination therapy in our environment has been proven effective with an acceptable rate of complications.

1112

SAFETY OF COMBINATION THERAPY IN ACUTE CORONARY SYNDROME WITH ELEVATED ST SEGMENT

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OBJECTIVE. To evaluate the safety of combination therapy in patients younger than 75 years, with SCASTE less than 12 h of development and high-risk criteria. Assessment of safety profile of combination therapy with fibrinolysis compared to other pharmacological reperfusion therapy.

METHODS. Non-randomized open clinical trial with patients admitted to the Intensive Care Unit of Carlos Haya Hospital, from January 2002 until October 2007, with the diagnosis of high risk, acute coronary syndrome with ST elevation. We considered as high risk by: risk score TIMI > 4, the presence of an electrocardiogram to suggest involvement of proximal coronary artery, new left branch block or primary FV. Complications recorded were: brain vascular accident, mayor bleeding, minor bleeding and thrombocytopenia. Qualitative variables are expressed as absolute value and percentage, whereas quantitative variables are expressed as mean ± standard deviation. Comparisons between groups were made with the t test for continuous variables and the χ^2 or Fisher's exact for categorical variables when necessary. Alpha Error has been considered a maximum of 5%.

RESULTS. A total of 1276 patients were admitted with Coronary Syndrome with ST elevation during the time period of the study, which was held to 920 of them fibrinolysis. Of these 920 met criteria and combination therapy was performed in 136 patients. Combination therapy (rt-PA half-dose + abciximab + heparin at very low doses and facilitated percutaneous intervention within 24 h). When comparing this group with that of standard therapy, do not find significant differences in demographic variables of age, sex and cardiovascular risk factors (except dyslipidemia). Complications of both groups are sown in Table 1:

TABLE 1 COMPLICATIONS

	Standard fibrinolysis (%)	Combined theraphy (%)	*p* value
Any complication	6.88	11.02	0.62
Hemorrhagic Stroke	0.51	0	0.4
Minor bleeding	2.29	5.14	0.059
Major bleeding	2.29	2.94	0.64
Thrombocytopenia	0.12	2.25	0.001
Ischemic stroke	0.76	0.73	0.97

We found more thrombocytopenia in the combination therapy group as an intrinsic effect or abciximab which is used in combination therapy and no in standard therapy.

We found no differences in mortality for cardiovascular causes within UCI 10.6% in the fibrinolysis group of standard compared to 6.6% in the combined therapy group ($p = 0.15$).

CONCLUSION. Combination therapy showed as safety as standard fibrinolysis in our serie, with no major adverse outcomes.

1114

EFFECTS OF EVIDENCE BASED NUTRITION PROTOCOL IMPLEMENTATION ON ENERGY DELIVERY AND OUTCOME IN ICU PATIENTS WITH PROLONGED STAY

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INTRODUCTION. Implementation of protocols for nutritional support is associated with less energy deficit, but the impact on clinical relevant outcomes is controversial. We recently reported a low standardized mortality ratio in patients with prolonged ICU stay despite substantial caloric deficits.

OBJECTIVES. The aim of this study was to assess the effects of implementation of an evidence based nutritional management protocol in our ICU.

PATIENTS AND METHODS. Energy, protein and fluid intake were prospectively measured in all patients staying >72 h in a mixed medical-surgical 30-bed adult ICU. Data collection included four months before (Pre-I) and four month after implementation (Post-I) of a nutritional management protocol. Caloric intake and outcome variables were compared between the two time periods. Data from a retrospective analysis from the year before served as a control.

RESULTS.

TABLE 1 RESULTS

	N	SAPS II	Kcal/d	ICU stay	Hosp. stay	Hosp. mortality
Retrospective	562	50 ± 17	302 ± 334	9 ± 9	27 ± 25	0.22
Pre-I	141	54 ± 18	1593 ± 230	8 ± 8	28 ± 28	0.23
Post-I	285	50 ± 16	1695 ± 226	6 ± 8	25 ± 29	0.20
p pre- vs. post-I		0.014	n.s	0.012	n.s.	n.s.

CONCLUSIONS. Implementation of an evidence based nutritional management protocol did not increase the average caloric intake when the phases directly before and after implementation were compared. However, our data suggest that engagement in nutrition aspects of ICU care and protocol preparation increased the awareness to malnutrition and led to a substantial increase in average energy delivery. Nevertheless, this did not translate to altered outcome.

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Nutrition 2: 1113–1125

1113

PROBIOTICS ENHANCE STARVATION-INDUCED JEJUNAL MUCOSA ATROPHY

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BACKGROUND. Gut epithelium responds to the absence of luminal nutriments by changing its morphology and functionality Thus, after a long-lasting period of starvation mucosal atrophy is prominent and sometimes hardly reversible. Alterations of the gut following a fasting period are successfully reversed, when enteric nutrition is re-established. Basic and clinical research underlines the importance of early enteral nutrition by preserving the functional competence of the gastrointestinal tract. The aim of the present study is to investigate the potentially promoting effect of probiotics on the morphological features of the jejunal mucosa following a short period of fasting.

MATERIAL AND METHODS. Sixty adult male Wistar rats were used: (1) 6d feeding ad libitum [control]; (2) 3d fasting and 3d refeeding [re-fed]; (3) 6d fasting combined with parenteral liquid treatment the last 3d [starved]. Each group had one non-probiotic and one probiotic treatment [Lactobacillus acidophilus DDS-1 (Nebraska Cultures Inc., USA) 2.2 X 10^9 CFU/rat]. Upon termination of treatment a jejunal segment was received and processed for histology; number of villi, the total mucosal thickness, the crypt depth and villous length were measured.

RESULTS. All groups having suffered starvation showed altered morphology indicating jejunal atrophy: number of villi, mucosal thickness, villi length and crypt depth were reduced in relation to control. Refeeding seems to restore intestinal atrophy, while L. acidophilus supplementation resulted in α statistically significant improvement of all morphology related parameters in the gut. On the contrary, probiotics given in starvation—parenteral treatment group exhibited no significant difference in relation to non-probiotic group.

CONCLUSIONS. In the present short-term fasting/refeeding rat model L. acidophilus treatment seems to enhance restoration of jejunal mucosal atrophy. This finding would be of great importance in patients being deprived from food due to their illness.

1115

ORNITHINE-ASPARTATE COMPLEX ADMINISTRATION IN THERAPY OF ACUTE NECROTIZING PANKREATITIS IN CHRONIC ABUSE PATIENTS

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Specific characteristics of metabolic derangements occurring in critical illness are domination of developing catabolic state particularly in acute necrotizing pankreatitis. As a result, we faced such a problem as developing a clinically apparent protein-calorie deficiency which is resistant to standard nutritional support. The treatment of acute necrotizing pankreatitis in chronic abuse patients is difficult to handle for the clinician and should include sufficient energoplastic supply. In our research we aimed to assess the efficacy of adding of ornithine-aspartate complex in carbohydrate metabolism in chronic abuse patients with acute necrotizing pankreatitis.

METHODS. 16 comparable chronic abuse patients with acute necrotizing pancreatitis(control groupe $N = 8$, mean age 45.1 ± 8.5;Ornithine group $N = 8$, mean age 44.0 ± 8.1) received early parenteral nutrition from the moment of admission to hospital with universal system "three-in-one". Ornithine group also received ornithine-aspartate complex by parenteral administration (40 g/day). On the second day the patients were admitted parenteral nutrition and tube feeding 24 h/day. The volume of parenteral nutrition was gradually decreasing. Biochemical and metabolic endpoints were measured at baseline and on 6th day (nitrogen balance, amino acids spectrum, plasma whole protein, transferring concentrations, glucose and insulin levels) at the Clinical Laboratory

RESULTS. In all patients metabolic disturbances with protein status and carbohydrate metabolism shifts were revealed. Dynamic of the whole protein, albumin/protein ratio and nitrous balance in both group showed similar tendency of metabolic improvement. Dynamic of essential and nonessential amino acids concentration remained normal showing adequate energoplastic supply in both groups. Glutamine concentration in Ornithine group remained stable and even increased by the 6th day of nutritional support, while in Control group glutamine concentration was decreasing, and by the 6th day of nutritional support it was below normal values. In Ornithine group higher levels of endogenous insulin at normal values of glucose and faster Fisher index improvement were detected.

CONCLUSION. In Ornitine group duration of delirium tremens causes was 4 ± 1 days versus Control group (6 ± 1 days). Restoration of metabolic activities confirms adequate nutritional support in both groups but ornithine-aspartate complex adding provides faster improvement of protein and carbohydrate metabolism.

1116

ENTERAL FEEDING OF PATIENTS WITH NON-ABDOMINAL PATHOLOGY

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OBJECTIVE. To evaluate the frequency of the feeding goal achievement and its importance in ICU patients with non-abdominal pathology.

METHODS. We screened 655 consecutive admissions to ICU in years 2006–2008. 242 of them had no primary pathology in abdomino-pelvic region and stayed in ICU for more than 24 h, and were therefore included in this study. Retrospective analysis of prospectively collected data was performed. The delivery of more than 50% of caloric needs enterally after maximum of two days in ICU was considered as achievement of the goal of enteral feeding.

RESULTS. The main reasons for ICU admission of study patients were intoxication (16.5%), severe sepsis/septic shock (14.5%), trauma (14.0%), pulmonary (12.8%) and cardiac diseases (8.7%). The overall mortality of them was 8.7% (21/242). On admission day, 79.8% of the patients received less than 50% of their caloric requirements enterally, on the second and third day 59.7 and 51.1%, respectively. Concomitant gastrointestinal symptoms included absent/abnormal bowel sounds (22% on admission day and 15% on the second day) and vomiting (16.4 and 16.5%, respectively). Intra-abdominal hypertension was observed in 38 patients (15.7%) during their ICU stay. The patients, in whom the goal for enteral feeding was not achieved after two days in ICU, had significantly higher mortality than the patients in whom the goal was achieved (12.5% vs. 4.4%, $p = 0.021$). The mean enteral caloric delivery by day three was 962 ± 595 kcal/day in survivors compared to 441 ± 450 in non-survivors ($p = 0.001$). No independent risk factors for mortality could be identified in this particular study group.

CONCLUSIONS. The ICU patients with non-abdominal pathology are often underfed. Vomiting, absent/abnormal bowel sounds and intra-abdominal hypertension occur frequently in these patients. Severe underfeeding for more than two days in ICU is associated with higher mortality.

1117

NUTRITIONAL SUPPORT IN THE PORTUGUESE ICU

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INTRODUCTION. In the past few years, the nutrition in the critically ill is getting a growing attention as it became a tool for better prognosis and increasing the survival.

OBJECTIVE. evaluate the nutritional approach performed by different Portuguese ICUs.

DESIGN. We sent a 51 multiple choice questions formulary to 39 different ICUs concerning the ICU characteristics, the existence of specialized nutrition groups, the nutritional support and the time of implementation, the used formulas for accessing the nutrition, time elapsed from ICU admission to initiation of nutrition and most common complications.

RESULTS. 29 (74%) of the selected ICUs answered the questionnaire. 62% of those have an artificial nutrition responsible. The enteric nutrition is preferred and many keep enteric nutrition despite hemodinamic instability. Only 17% are able to access the patient's effective weight, in consequence, in 33% of the ICUs the nutritional needs are calculated using a protocol that doesn't consider the patient's weight. In terms of glycemic control, the majority (66.7%) uses an intensive insulin infusion protocol in all patients and 20.8% aim 120 mg/dL of glycaemia as superior limit.

CONCLUSIONS. The results of this questionnaire meet our expectations and traduce the increasing importance attributed to the nutrition in the critically ill.

1118

LACTATE LEVELS IN PATIENTS WHO PREOPERATIVELY RECEIVE 5-AMINOLEVULINIC ACID

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INTRODUCTION. To improve visualization of cancer during surgical resections, 5-aminolevulinic acid (5-ALA) is increasingly administered pre-operatively to patients. This technique may improve improve survival in patients who undergo neurosurgery for resection of glioma. Due to its toxic effects on mitochondria, 5-ALA may increase lactate levels. This has been demonstrated in rats [1]. The impact of 5-ALA on circulating lactate has not been studied in man.

OBJECTIVES. To assess the impact of peroperative 5-ALA administration on systemic lactate levels in neurosurgical patients.

METHODS. In a retrospective study we compared neurosurgical patients who received 5-ALA (5-ALA group) with patients who did not receive 5-ALA (control group). All patients were operated for an intracranial process and were subsequently admitted to the neurosurgical ICU. 5-ALA patients received 20 mg/kg of 5-ALA orally 2 h before the induction of anesthesia. During the patients' ICU stay, arterial lactate levels were frequently measured with a point-of-care Radiometer ABL 800-series analyzer. For each patient we determined maximum lactate levels on the day of ICU-admission (day 0) and on the next day (day 1). Means were compared with Student's t test.

RESULTS. 146 consecutive patients who underwent a craniotomy to remove a space-occupying lesion were analyzed. Their mean ($\pm$ SD) age was 53 ± 15 years and 55% of the patients were female. 22 patients (14%) received 5-ALA. On day 0 the mean maximum lactate was 2.7 ± 1.7 versus 2.1 ± 0.9 mmol/L in 5-ALA group compared to the control group ($p = 0.005$). On day 1 these levels were 1.7 ± 0.8 and 1.6 ± 0.8 mmol/L respectively ($p = 0.4$) for the 5-ALA group and the control group.

CONCLUSION. Lactate levels were significantly higher in patients who received 5-ALA compared to those who did not. This difference had disappeared on the next day. This may indicate that the applied dose of 5-ALA transiently induces considerable metabolic stress. The metabolic consequences of 5-ALA deserve further inquiry.

REFERENCE. 1. Pereira B, Curi R, Kokubun E, Bechara EJ (1992) 5-Aminolevulinic acid-induced alterations of oxidative metabolism in sedentary and exercise trained rats. J Appl Physiol 72:226–230

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1119

ICU NUTRITIONDAY BENCHMARKING PROJECT: ASSOCIATION OF NUTRITION WITH OUTCOME (2007 VS 2008)

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INTRODUCTION. ICU Nutrition Day is a ECCRN supported multinational project to evaluate and compare nutrition care between individual ICUs.

OBJECTIVES. The major question addressed is the type, route and quantity of nutrition and their association with outcome. We compared results obtained in two consecutive years: 2007 and 2008.

METHODS. Patients were divided into 6 groups: no nutrition, parenteral (PN), enteral (EN), combined (PN + EN), oral, and others. We included data of the units that provided 60 day outcome for more than 75% of the patients. O/E ratio with 95% confidence intervals was calculated based observed mortality divided by predicted mortality from SAPS2 score. O/E ratio was compared with chi-square test.

RESULTS. 1253 (666 and 587) patients from 92 (44 and 48) units were included. Characteristics were similar in age (64 vs 65 years), female (34 vs 35%), proportion intubated (41 vs 41%). The proportion of emergency admitted patients decrease from 72 to 45%. Percent patients in nutrition groups and O/E ratio is shown in Fig. 1. O/E ratio decreased for PN + EN in 2008 with $p < 0.005$ (Fig. 1). Length of stay in the ICU at ND was shorter in the no nutrition and oral groups (4.5 and 6.2 days) and above 10 days for all other groups.

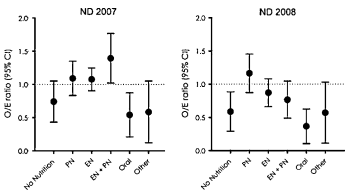

Fig. 1 O/E ratio in different nutritional approach groups (O–E ratio)

CONCLUSION. EN and PN were similar in terms of outcome. Surprisingly O/E ratio was lowest for patients without nutrition or with oral nutrition. There is an association between outcome of nutrition care and length of stay.

1120

HUNGER AND THIRST IN THE ICU: RESULTS FROM ICU NUTRITIONDAY 2007–2008

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INTRODUCTION. individual patient reports indicated that feeling hungry and thirsty contribute to discomfort during ICU stay and may lead to post traumatic stress disorder. The proportion of patients suffering from hunger and thirst has never been systematically studied.
OBJECTIVES. We report the results from ND 2007 and 2008 where subjective feeling was collected from all patients able to communicate.
METHODS. ICU NutitionDay is an ECCRN supported cross-sectional audit in 10 languages. 6 questions addressed hunger, thirst, and abdominal pain. Data from 2007 and 2008 were compared with chi-square test.
RESULTS. 54% (2007 and 2008) of patients (440 and 537) were able to answer. Patients that were thirsty or had a dry mouth were twice frequent as those being hungry or wanting to eat $p < 0.0001$. Those having nausea or abdominal pain were least frequent $p < 0.0001$ (Fig. 1).

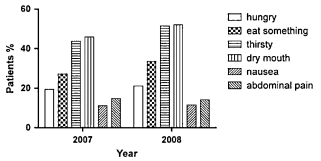

Fig. 1 Patient feeling and wellbeing

Results were similar in 2007 and 2008.

CONCLUSION. An extremely high proportion (1:4.5) of ICU patients suffer thirst. This should be addressed with appropriate nursing care or fluid supply in the future.

1121

SERUM LIPOPROTEINS LEVELS. AN IMPORTANT MARKER OF INFECTION AND PROGRESSION TO SEPSIS

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INTRODUCTION. A prospective study was designed to evaluate serum lipoproteins in septic shock patients and to correlate its trend with the progression of sepsis.

METHODS. Prospective study over a period of 2 years set in a 21 bed University Hospital ICU. 510 pts were included in the study that met the ACCP/SCCM consensus criteria for septic shock. Blood samples were collected from these patients upon admission and on septic days 1, 3, 6 and on discharge from the unit or death and were analyzed for total cholesterol, HDL, LDL and triglycerides. Results are expressed as mean ± SD. Paired Student's *t* test and Multiple level regression analysis was used. $P < 0.05$ was considered significant
RESULTS. The group of pts was divided into septic and non septic. The septic pts developed sepsis in the unit and were used as the study group. The non septic did not developed sepsis in the unit and were used as controls. We had 153 patients in the non septic group and 357 patients that developed sepsis and/or septic shock. The mean age was 67.4 ± 19.8 years. The mortality rate for the study group was approximately 48.65%. Admission mean values of serum lipoproteins are shown on Table 1. Table 2 presents mean values of serum lipoproteins of the study group on septic days 1, 3 and 6. The lowest values of cholesterol and HDL and high triglyceride values were seen in patients that died in the study group. Table 3 indicates mean serum lipid values of both groups upon discharge. LDL showed no significant difference between the two groups.

TABLE 1 MEAN ADMISSION VALUES OF SERUM LIPOPROTEINS

Serum lipoproteins	Admission mean values of serum lipoproteins (all patients) (mg/dl)
Cholesterol	203.5 ± 54
HDL	48.3 ± 12.3
LDL	161.8 ± 22.3
Triglycerides	164.4 ± 27.4

TABLE 2 SEPTIC DAYS AND MEAN VALUES OF SERUM LIPOPROTEINS

Serum lipoproteins	Mean values day 1 (mg/dl) (study/control)	Mean values day 3 (mg/dl) (study/control)	Mean values day 6 (mg/dl) (study/control)
Cholesterol	137.3 ± 39.2/203.5 ± 45.7	113.4 ± 36.6/194.4 ± 43.6	101.6 ± 27.4/188.5 ± 42.4
HDL	29.7 ± 9.5/51.4 ± 11.9	23.4 ± 9.7/43.8 ± 12.3	19.4 ± 8.9/40.5 ± 12.1
LDL	165.8 ± 25.4/152.4 ± 23.2	172.8 ± 26.2/165.8 ± 27.9	183.7 ± 25.8/173.6 ± 25.4
Triglycerides	189.6 ± 29.4/162.3 ± 22.8	213.4 ± 27.8/169.8 ± 26.2	247.8 ± 32.4/172.3 ± 26.4

TABLE 3 MEAN VALUES OF SERUM LIPOPROTEINS UPON DISCHARGE

Serum lipoproteins	Discharge mean values study group	Discharge mean values control group
Cholesterol	108.6 ± 22.7	203.3 ± 52.9
HDL	28.2 ± 12.4	39.4 ± 14.8
LDL	165.8 ± 23.6	149.5 ± 22.8
Triglycerides	197.3 ± 38.4	163.3 ± 22.3

ROC curve for the model AUC (95% CI): 0.841 (0.744–0.938)

CONCLUSION. Low cholesterol and low HDL levels and high triglyceride levels are significantly related to the onset of infection and progression to sepsis. The lowest cholesterol and HDL levels were associated with increasing mortality, whereas discharge from the unit was correlated with higher cholesterol and HDL levels. This study revealed the negative prognostic value of hypercholesterolemia, low HDL levels and hypertriglyceridemia, suggesting that lipoproteins are a sensitive marker of infection and progression to sepsis.

1122

NUTRITIONAL MARKERS AS A SURROGATE OF SEVERITY OF ILLNESS: ASSOCIATION WITH ICU MORTALITY

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INTRODUCTION. Nutritional status has been associated with several outcomes in critically ill patients, including prolonged ventilatory dependence, increased infection rate, prolonged ICU length of stay (ICU LOS) and mortality.

AIM. To study the influence of several markers of nutritional status on mortality.

METHODS. Observational study regarding several nutritional markers (serum albumin, nitrogen balance and caloric deficit) routinely recorded on our ICU and its association with mortality. Appropriate descriptive statistics are presented Comparisons between groups were performed using Chi-square test, Student's *t* test or non-parametric Mann–Whitney *U* or Kruskal–Wallis tests as appropriate. Analysis of the association between nutritional markers and mortality, estimated by the odds-ratio, unadjusted and adjusted for sex and SAPS II were calculated using logistic regression. Multiple logistic regression modelling was performed, using the stepwise forward method, with mortality as dependent variable and age, sex, nutritional markers and ICU variables (reason for ICU admission, SAPS II, ICU LOS) as independent variables. For hypothesis testing a value of $P < 0.05$ was considered significant. Statistical analysis was performed using SPSS 16.0 ® software package.

RESULTS. 139 patients were included, from which 60 were male, mean age was 60 years-old. Reason for admission was medical in 110 patients, surgical in 22 and trauma in 8 patients. Mean SAPS II was 46 and median ICU LOS was 11 days. Severity of illness (SAPS II) (OR 1.039; 95% CI 1.005; 1.074), nitrogen balance (OR 1.125; 95% CI 1.029; 1.231) and the need of mix nutrition support (OR 6.201; 95% CI 1.429; 36.906), were significantly associated with mortality in the logistic regression model.

CONCLUSION. Nutritional markers were associated with a higher mortality. This hypothesis should be evaluated with more appropriate methodological approaches.

1123

USE OF MICRODIALYSIS TO STUDY LIPID METABOLISM IN SEPTIC ICU PATIENTS. PRELIMINARY RESULTS

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INTRODUCTION. Microdialysis can be used to continuously monitor changes in the concentration of various metabolites in adipose tissues A prospective study was designed to evaluate the response of adipose tissue during the metabolic stress induced by sepsis. Glycerol is produced by adipose tissue lipolysis and lactate is also shown to be produced in significant amounts in adipose tissue. The release of glycerol and lactate from subcutaneous adipose tissue was followed using microdialysis in septic and non-septic patients.

METHODS. Prospective study in a 21 bed University Hospital Medical Intensive Care Unit. A subcutaneous devise (microdialysis catheter CMA 60) was placed in the subcutaneous fat of the upper thigh in 37 newly admitted ICU patients that met the ACCP/SCCM consensus criteria for sepsis. Dialysis samples were collected every 4 h for 6 days using a CMA 106 microdialysis pump and were analyzed immediately in a CMA ISCUS Microdialysis Analyzer. Lactate and glycerol were measured in the microdialysate. Arterial lactate was measured using a blood gas analyzer. Venous blood samples were collected once daily and were analyzed for total cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL) and triglycerides.

RESULTS. The group of patients was divided into septic and non septic. Twenty five patients progressed into septic shock and were classified as septic. Twelve patients recovered from their sepsis within 24 h from admission, were classified as non-septic and were used as controls. Five patients died. Septic patients had higher concentrations of lactate and glycerol in their subcutaneous adipose tissue than the non septic group. In addition they exhibited low blood values of cholesterol and HDL and high triglyceride than the non-septic group. These dialysate values were significantly decreasing in the patients that exhibited sustained shock and/or died.

CONCLUSION. In our study it was evident that patients with septic shock have a stimulation of subcutaneous adipose lipolysis and a higher lipid oxidation. As the shock progresses however there seems to be inability of the tissue to utilize lipids indicating major differences in lipolysis and lipid oxidation between patients with reversible shock and patients with sustained circulatory failure.

1124

HOW ARE WE FEEDING OUR ICU PATIENTS: A PORTUGUESE EXPERIENCE

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INTRODUCTION. Nutritional support (NS) is a very important part in the management of the critically ill patient. Critical illness is a major factor to malnutrition that can lead to more infections and multi-organ failure. Although we know the benefits of NS to the critically ill, the amount of prescribed nutrition in intensive care units (ICU) is not always delivered to the patients due to several reasons.

METHODS. Prospective analysis of consecutively admitted patients in two mixed ICUs. Exclusion criteria were: NS for <2 days, age <16 years and length-of-stay (LOS) <3 days. Besides the demographic data, timing of NS beginning, route of delivery and type of enteral nutrition formula, prescribed and delivered diet and reasons for suspension and reduction were collected for the first 7 days of NS. Chi-square, Mann–Whitney U, t test and logistic regression analysis were used in statistical analysis.

RESULTS. One hundred and two patients (687 days of NS) were studied: 53 medical, 27 trauma and 22 surgical patients. They were mainly male (69.6%) with a mean age 57.9 ± 17.8 years and a mean SAPS II score 49.6 ± 14.4. NS was started meanly 34 ± 18.3 h after ICU admission and most of the times by enteral route feeding (89.2%). Target dose was achieved in 42.2% of the patients (median: day 5). NS delivery was: enteral 583 days (84.9%), parenteral 69 days (10.0%) and mixed 22 days (3.2%). EN was started in 75.8% of the cases with a standard polymeric diet. In 23.6% of the days NS was suspended due to gastrointestinal dysfunction (GI) (46.9%), airway management (6.8%), diagnostic exams (25.3%) and lack of route delivery (8.0%). NS period (OR = 1.30; CI = 1.18–1.43) was the only risk factor to suspension in a multivariate logistic regression model. EN was reduced in 9.8% of the days usually by GI dysfunction (84.8%). More than 80% of the prescribed volume was delivered in 68.3% of NS days. Multivariate logistic regression analysis showed that the longer the time of NS the higher the risk of receiving less than 80% of NS protocol (OR = 1.56; CI = 1.41–1.72). The use of parenteral (OR = 0.14; CI = 0.04–0.47) or mixed (OR = 0.10; CI = 0.02–0.40) nutrition was associated with a NS delivery higher than 80%. Median ICU LOS was 18.5 days with an ICU mortality rate of 25.5%.

CONCLUSIONS. NS was initiated 34 h after ICU admission mainly by enteral route with a standard polymeric diet. Target dose was only achieved in 42.2% of the patients during the first seven days of NS which was suspended or reduced in 23.6 and 9.8% of the total days respectively. More than 80% of the prescribed NS was delivered in a high number of days. NS period was a risk factor for suspension and delivery of <80% of NS prescribed.

1125

WHAT IS THE IMPACT OF ACHIEVING TARGET DOSE IN THE FIRST FIVE DAYS OF ICU NUTRITION SUPPORT?

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INTRODUCTION. Several studies have shown that the amount of prescribed nutrition support (NS) in intensive care units (ICU) is not actually administered to the patients and that NS, mostly early nutrition, influences morbidity and mortality in critically ill patients The goal of this study was to evaluate the impact of achieving target dose in the first five days of NS.

METHODS. Prospective analysis of consecutively admitted patients in two mixed ICUs. Exclusion criteria were: NS for <2 days, age <16 years and length-of-stay (LOS) <3 days. Besides the demographic data, timing of NS beginning, route of delivery, route of feeding and type of enteral nutrition formula, prescribed and delivered diet and reasons for suspension and reduction were collected for the first 7 days of NS. Chi-square, Mann–Whitney U and t test were used in statistical analysis.

RESULTS. Ninety seven patients were studied: 49 medical, 26 trauma and 22 surgical patients. They were mainly male (69.1%), age of 58.3 ± 17.8 years and a SAPS II score 49.5 ± 14.4. NS was started 33.7 ± 18.2 h after ICU admission and most of the times by enteral route feeding (89.7%). Twenty-four patients achieved target dose during the first 5 days of NS (ATD5). They were older ($p = 0.122$) with a higher SAPS II score ($p = 0.1$). Gender and cause of ICU admission were similar in both groups. There were no differences in the timing of the beginning of NS in both groups. However parenteral nutrition was started more frequently in ATD5 patients (33.3% vs. 2.7%; $p < 0.001$). Despite gastrointestinal (GI) intolerance had no statistical significance ($p = 0.139$) it was less frequent in ATD5 patients (33.3% vs. 50.7%). After 5 days of NS, ATD5 patients showed a higher decrease in serum C-reactive protein ($p = 0.451$), an increase in lymphocytes count ($p = 0.197$) and a significantly increase in serum albumin ($p = 0.001$) and proteins ($p = 0.001$). Although ATD5 patients had a higher ICU mortality ($p = 0.017$) no differences were found regarding hospital mortality, ICU and hospital LOS between the two groups.

CONCLUSIONS. Early achievement of target dose (less than 5 days) was not associated with a higher GI intolerance. These results suggest an improvement in protein synthesis and immunological response. However we did not observed a positive impact concerning mortality and LOS.

Clinical outcome in specific ICU populations: 1126–1139

1126

MORTALITY PREDICTION IN PATIENTS SUBMITTED TO ORTHOTOPIC LIVER TRANSPLANTATION (OLT)

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AIMS. We evaluated the outcome of patients submitted to OLT. Our goal was to define if there was a significant relationship between different variables analysed and in-hospital mortality.

METHODS. A retrospective study was conducted in a private clinic of Rio. We collected data from comorbidities, surgery, transfusions, sepsis, rejection, organ dysfunction, APACHE II, SOFA and MELD scores, ICU and hospital length of stay, and outcome.

RESULTS. Fifty patients were studied. Mean (± SD) of collected scores were: MELD = 19.6 ± 7.9 points, SOFA = 5.1 ± 2.8 points, and APACHE II = 14.5 ± 6.0 points. Primary diseases were mainly: cirrhosis (76%) by hepatitis C (58%), alcohol (12%) and hepatitis B (4%). Main complications were: billiary fistulas (6%), hepatic artery thrombosis (6%), acute rejection (14%), pneumonia (26%), and acute renal failure (49%). The hospital mortality rate was 18%. ICU length of stay, APACHE II and SOFA scores were higher among those who died. However, when analyzing simultaneously these variables, only high APACHE II ($p = 0.002$) contributed significantly to predict mortality. After plotting data in a ROC curve, we found a APACHE II ≥ 20 the best cutoff for mortality.

CONCLUSIONS. Patients with APACHE II ≥ 20 should have a more aggressive work for stabilization.

1127

A PREDICTIVE MODEL FOR PROLONGED MECHANICAL VENTILATION IN A COHORT OF 5123 CARDIAC SURGICAL PATIENTS

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INTRODUCTION. Prolonged mechanical ventilation (PMV) after heart surgery is associated with increased patient morbidity and mortality (4.9% vs. 22–38%).

TYPE OF STUDY. Prospective observational cohort study

STUDY AIM. To assess PMV predictors and its impact on ICU and hospital length of stay and survival in a cardiac surgical patient cohort admitted to our 8 bedded ICU, since 1997 through June 2004.

METHODS. All the patient pre-, intra- and post-operative variable were prospectively put into an electronic database. Patients were eventually divided into: (i) Early Extubation (EE) group, undergoing a successful extubation within 24 h; (ii) Delayed Extubation (DE) group, needing a mechanical ventilation longer than 24 h. P values < 0.05 were considered statistically significant.

RESULTS. A total of 5123 patients, with a median (IQR) age of 67 years (59–73) were considered during the study period. 63.5% underwent a CABG operation, 22.8% valve surgery and 13.6% aortic and lung surgery. A multivariate logistic regression model allowed us to identify chronic renal failure (OR = 1.5, 95% CI = 1.1–2.3), CCS or NYHA > 2 (OR = 2.1, 95% CI = 1.4–3.1), CPB time > 90' (OR = 3.9, 95% CI 1.1–4.4), RBC transfusions > 4 units (OR = 6.8, 95% CI = 4.1–11.3) and experiencing a VAP (OR = 83.3, 95% CI = 41.6–166.6) as independent predictors of PMV. EE group showed a higher cumulative hazard of being discharged from (i) ICU (Log-Rank = 1189.4, $p = 0.0000$); (ii) cardiac surgical ward (Log-Rank = 550.3, $p = 0.0000$); (iii) a significantly higher cumulative survival within 180 days from ICU admission (Log-Rank = 99.1, $p = 0.0000$). The cumulative hazard of being discharged (i) from ICU to the cardiac surgical ward overlapped for the first ICU day, whereas eventually it increased significantly in the EE group (Log-Rank = 1189.4, $p = 0.0000$); (ii) from the cardiac surgical ward to a rehabilitative ward after overlapping in the first 5–6 days from ICU discharging, it increased significantly higher in the EE group (Log-Rank = 550.3, $p = 0.0000$).

CONCLUSION. This audit allowed us to define a bedside predictive model helping us to identify "a priori" patients that are more likely to undergo PMV. These results ushered crucial changes in our daily policy as we implemented (i) a shared preoperative (by 12 h) policy of volume management therapy in patients with renal insufficiency (ii) our strategies to control the inflammatory response following cardiac surgery (iii) the use of early (within 96 h since commencing of MV) tracheostomy in the patient likely undergoing PMV.

1128

APACHE III SCORE AND BURNS: A REASONABLE TOOL FOR OUTCOME PREDICTION

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Prediction of outcome for patients with major thermal injury is important to inform clinical decision making, alleviate individual suffering and improve hospital resource allocation. The Acute Physiological and Chronic Health Evaluation (APACHE) III score is widely used to assess severity of illness, derive an individual's predicted risk of death and to compare risk-adjusted outcomes between intensive care populations [1, 2]. Validation for the burns specific cohort is unclear [3, 4].

A retrospective cohort study was performed on patients admitted to the Intensive Care Unit via the Victorian Adult Burns Service, to assess factors associated with mortality. Our primary aim was to evaluate the APACHE III score as a mortality prediction tool for the burns population.

Between January 1, 2002 and December 31, 2008, 228 patients were admitted to the ICU at The Alfred with acute burns. The mean age was 45.6 years (±18.0) and 80.7% ($n = 184$) were male. Patients had severe injuries: median TBSA (total body surface area burnt) was 20% (IQR 10–40%) and 86.4% ($n = 197$) had airway involvement. Overall mortality was 11.8% ($n = 27$) over the 6-year period.

Non-survivors were older, had greater TBSA, had higher APACHE III scores and greater incidence of deliberate self harm (as a contributing aetiological factor). There was no significant relationship with either inhalational injury or gender.

Multivariate logistic regression analysis identified only TBSA (OR 1.03, 95% CI 1.02–1.06) and APACHE III score (OR 1.04, 95% CI 1.01–1.04) as independent predictors of death. Both variables were good individual discriminators of mortality with areas under their respective receiver operator curves of greater than 0.75 (TBSA: 0.73, 95% CI 0.62–0.84) and (APACHE III score: 0.83, 95% CI 0.77–0.90).

The APACHE III score is a useful tool for mortality prediction in severely injured burns patients admitted to ICU. It may be possible to use the APACHE III score to develop a predicted risk of death and thus compare risk-adjusted outcomes even without knowledge of the percentage area burnt.

REFERENCES. 1. Knaus WA et al (2002) APACHE 1978–2001: the development of a quality assurance system based on prognosis: milestones and personal reflections. Arch Surg 137(1):37–41
2. Knaus WA et al (1991) The APACHE III prognostic system. Risk prediction of hospital mortality for critically ill hospitalized adults. Chest 100(6):1619–1636
3. Tanaka Y et al (2006) Acute physiology, age and chronic health evaluation (APACHE) III score is an alternative efficient predictor of mortality in burn patients. Burns 33(3):316–320
4. Ryan C (1998) Objective estimates of the probability of death from burn injuries. N Engl J Med 338:362–336

1129

THE INFLUENCE OF HOSPITAL ORGANIZATION ON SIMPLIFIED ACUTE PHYSIOLOGY SCORE II (SAPS II) IN TRAUMA PATIENTS WITH ACUTE RENAL FAILURE

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INTRODUCTION. Simplified acute physiology score II (SAPS II) is used to assess severity of illness in intensive care unit (ICU) patients. The score is based on the worst variables during the first 24 h of ICU stay, including age, type of admission, prior diagnoses and physiological parameters. SAPS II is utilized to calculate the probability of hospital mortality in patients' groups. The standardized mortality ratio (SMR), which is the ratio between observed and predicted hospital mortality, is used to assess the clinical performance of the ICU.

OBJECTIVES. The purpose of the study was to assess the whether hospital organization influenced SAPS II score in trauma patients with acute renal failure.

METHODS. Oslo University Hospital Ullevaal is the regional trauma referral centre for approximately 1.93 million adult (>18 years) persons. Unlike most other hospitals in Norway it is organized in a manner that all trauma patients stay in the emergency room (ER) for initial stabilization, and is often through diagnostic (laboratory and radiographic examinations) and therapeutic (surgery and radiographic interventions) procedures before they are admitted to ICU. Adult trauma patients with acute renal failure treated with continuous renal replacement therapy between January 1, 1996, and December 31, 2007, were retrospectively reviewed. Two different SAPS II scores were calculated for each person, one starting at ER arrival (to simulate an organization that patients are brought directly to ICU) and one at ICU arrival (to simulate an organization that patients are stabilized before they are admitted to ICU). Data were compared utilizing a two-sided, paired Wilcoxon test.

RESULTS. 42 patients were included during the study period. The median SAPS II score was significantly higher in the ER compared to the ICU (44.5 vs. 39.5, $p < 0.01$). The variables that were significantly different were systolic blood pressure and serum bicarbonate. The SAPS II predicted hospital mortality was calculated to 33.7% (ER values) and 23.8% (ICU values). The observed hospital mortality in the study group was 23.8%, resulting in a SMR of 0.71 (ER values) and 1.00 (ICU values).

CONCLUSIONS. This study indicates that the organization of the hospital had a significant influence on SAPS II score, which is the basis for calculations used to predict hospital mortality and evaluate clinical performance of the ICU. Clinicians should be aware of the limitations of scoring systems in their ability to evaluate severity of illness, calculate probability of survival and monitor quality of care.

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1130

STUDY ON MORTALITY, WITHIN AND POST ICU, IN PATIENTS UNDERGOING SCHEDUALED SURGERY

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MATERIAL AND METHOD. In a tertiary hospital, patients undergoing scheduled surgery (with the exception of cardiac surgery), requiring critical care beds, were studied retrospectively over a period of 18 months.

RESULTS. 416 patients admitted. Age: 59.1 ± 16.0. 132 craniotomy, 48 thoracotomy, 135 laparotomy, 51 aortic vascular, 35 maxillo-facial, 6 urological y 10 other types of surgical operation were performed. 81.7% were admitted for less than 24 h, average stay 2.1 ± 8.0 days. 76.2% admitted on mechanical ventilation. The NEMS was, on average 30.6 ± 6.2 and the APACHE II 9.2 ± 5.9.401 patients were transferred to hospital wards. 8 patients (1.9%) were readmitted to ICU within the first 48 h.

Mortality in ICU: 15 patients (3.6%) (5 GIS, 1 THS, 5 VAS 2 NUS y 2 URO). 73% male, age 49.1 ± 9.8, NEMS 36.5 ± 8.2, APACHE II 20.1 ± 11.2. 80% on mechanical ventilation (MV), 60% received transfusions. Stay in ICU 16.0 ± 37.6 days.

Mortality in ICU, patients readmitted following scheduled surgery: 5 patients (1.2%) only one readmitted within the first 48 h. The four other patients were readmitted, on average, after 6.1 ± 3.4 days. (2 GIS, 1 THS, 2 VAS). On initial admission, the NEMS and APACHE II were 36.2 and 11.1 (resp.), on readmission 46.3 y 22.3 (resp.) Stay in ICU: 3.2 ± 2.1 days.

Mortality on hospital wards following discharge from ICU: 23 postsurgical patients (5.5%) 82.3% of whom were in ICU for less than 48 h, 82.3% admitted on mechanical ventilation (11 GIS, 2 THS, 3 MFS, 1 VAS, 5 NUS, 1 URO). Males: 69.6%. Age: 68.1 ± 12.1. NEMS 34.6 ± 5.3, APACHE II 9.5 ± 5.3. Their stay, premortem, on hospital wards, was 21.7 ± 24.1 days. Of the 43 deceased, 18 were following GIS (13.3%), (6 had cancer of the liver and 8 of the pancreas. 19 and 14 patients had been operated on with these types of tumour respectively). 4 were after THS (8.3%), 8 after VAS (15.6%), 7 after NUS (5.3%) and 3 following other types of surgery (18.7%).

CONCLUSIONS. Scheduled surgery allows for a short stay in ICU and a low mortality rate (3.6%). Only 1.9% was readmitted within 48 h.

Analyzing cause of death following discharge from ICU to surgical wards, 6.4% (0.9 + 5.5), we consider that the transfer of patients to an intermediate care unit (HDU) until stabilized would produce improved results and a more discerning selection of patients for surgery would decrease mortality rates (ICU = Intensive care unit, HDU = High dependency unit, MV = Mechanical ventilation, GIS = Gastrointestinal surgery, THS = Thoracic surgery, NUS = Neurosurgery, VAS = Vascular surgery, URO = Urology, MFS = Maxillofacial surgery).

1131

COMPARISON OF SCORING SYSTEMS AND SUBJECTIVE PREDICTIONS MADE BY MEDICAL PERSONNEL IN SURGICAL ICU—CAN WE BENEFIT FROM ROUTINE SCORING?

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INTRODUCTION. In this study we compared clinical outcome and LOS (length of stay) prediction of several scoring systems with the actual outcome and LOS in our ICU (intensive care unit). We also compared the outcome and LOS prediction made by intensivists and bedside nurses to the actual outcome and LOS. The goal of this study is to estimate potential benefits of routine evaluation and calculation of scouring systems and its comparison to the power of direct clinical judgments.

METHODS. Our surgical ICU consists of ten beds. Majority of patients underwent elective or emergency abdominal operations. Some patients were admitted to the ICU after large abdominal blood vessel repair procedures and thoracic surgery patients.

We have made a prospective study on 117 patients admitted from 1 December 2008 till 30 March 2009. At admission patient basic demographic characteristics, diagnosis and type of operative procedure were recorded. During the first hour following the ICU admission we recorded an attending intensives' (six of them) and bedside nurse's prediction of survival probability (in %) and prediction of ICU LOS (in days). After every consecutive 24 h after ICU admission the following scores were calculated: APACHE II, APACHE III, APACHE IV, SAPS II, SAPS III, POSSUM, MODS, SOFA, MPM-II at admission, MPM-II after 24, 48 and 72 h and LODS. Multiple regression analysis was used to determine the degree of correlation between a clinical scoring system predictions and actual outcome and LOS. The same method was applied to the medical personnel predictions of outcome and observed outcome. The analysis of intensivists' and nurses' predictions of LOS and observed LOS was made using Student's t test for independent variables.

RESULTS. As expected all clinical scores were significantly positively correlated with actual outcome in our ICU. All scoring systems' results, except APACHE II and APACHE III, were significantly positively correlated with actual LOS. The outcome predictions made by both ICU-doctors and bedside nurses significantly positively correlated with the observed outcome ($p < 0.05$). The analysis of medical personnel predictions concerning LOS revealed that there is no statistical difference between predictions made by intensivists and scoring systems. On the other hand, predictions made by bedside nurses were significantly higher than observed LOS.

CONCLUSION. Subjective clinical prediction of outcome and LOS may be at least as good as objective scoring systems developed in the past. Clinical evaluation of patient status at the ICU-admission may have predictive power which parallels the elaborated scoring systems.

1132

TRENDS IN CORONARY RISK FACTORS IN ACUTE MYOCARDIAL INFARCTION PATIENTS ADMITTED IN-ICU DURING A PERIOD OF 10 YEARS (1995–2004). THE PRIMVAC REGISTER

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INTRODUCTION. Life style in the western society is changing and these changes can modify our disease's pattern. It is important to know the trend of the pattern to predict, if possible, our future requirements in health care.

OBJECTIVE. To analyze trends in coronary risk factors (CRF) in acute myocardial infarction (AMI) patients admitted from 01/01/1995 to 31/12/2004 in the ICU's of the Valencian Community (Eastern Spain).

METHODS. Retrospective analysis of a large dataset (19,719 cases included in the PRIMVAC register). AMI was diagnosticated using the classic MONICA definition. We analyze changes for the main CRF during this period. Cuantitative variables were analyzed using Oneway procedure while trends in cualitative data were studied using Mantel's Chi square. SPSS statistical packet was used and an 0.05 α risk established.

RESULTS. Mean age was 65.4 (SD 12.3) and 24.3% were women. No changes in age or sex proportion were detected during the period. High blood pressure (42.7–53.1%), hipercholesterolaemia (26.7–32.7%) and diabetes (27.6–32.7%) showed a significative increase ($p < 0.001$). Regarding smoking habit, in spite of a non significant global trend ($p = 0.06$), women have increased their frequency (5.6–11.0%; $p < 0.001$) while men have slightly decreased their habit (46.5–44.0%; $p < 0.01$). No changes were detected in the frequency of previous AMI (roughly 17.0%) or periferical vascular disease (5.0%)

CONCLUSIONS. Hypertension, diabetes and hipercholesterolaemia raised during the analised period. Smokers women have doubled their frequency in our population.

1133

ICU ADMISSION IN PATIENTS WITH MALIGNANCY

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INTRODUCTION. In general there is reluctance to offer ICU care to cancer patients considered too sick to benefit from it.

OBJECTIVES. To examine the outcome of ICU admission in patients with malignancy and analyze prognostic factors associated with outcome.

METHODS. Data were collected retrospectively from all cancer patients admitted to the ICU of a general hospital during the period April 2002–March 2009. Demographic, patient, disease and treatment related factors were reviewed and APACHE II and SOFA scores at admission as well as mortality rate were calculated. Stepwise logistic regression was used to identify predictors associated wit increased hospital mortality.

RESULTS. 63 patients with cancer were admitted with a mean APACHE II score 21.08 ± 8.91and SOFA score 7.11 ± 3.40. They were 45 males and 18 females with mean age of 70.04 ± 11.33 (16–18) years. The predominant type of cancer was gastrointestinal cancer (46.8%) and the main reason for admission was the post-operative recovery (42.2%) with a mean ICU LOS of 7.87 ± 9.53 days. 17 patients died in ICU, 23 survived more than 6 months and the hospital mortality was 50.79%. Variables with a significant difference between the two groups of survivors and non-survivors were gender ($p = 0.027$), mechanical ventilation ($p = 0.005$), tracheotomy in ICU ($p = 0.001$), remission of the malignancy ($p = 0.05$), metastasis ($p = 0.027$), type of respiratory failure ($p = 0.025$), sepsis ($p = 0.027$) and stage of tumor ($p = 0.021$). Table 1 and Fig. 1 summarize the results of the multivariate analysis.

TABLE 1 PREDICTORS OF HOSPITAL MORTALITY

Predictor	Regression coefficient	Odds ratio point estimate	95% Confidence interval
tracheotomy	1.684	5.386	1.206–24.049
Stage of tumor	1.581	4.861	1.228–19.251
SOFA score	0.320	1.377	1.096–1.731

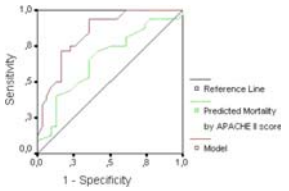

Fig. 1 ROC curve for the model

CONCLUSIONS. SOFA score, tracheotomy in ICU and stage of tumor predict hospital mortality in patients with malignancy admitted to the ICU.

1134

DRUG INTERACTIONS WITH POTENTIAL TO CAUSE HEMATOLOGIC EFFECTS IN CRITICALLY ILL PATIENTS: AN INCIDENCE AND PATIENT SAFETY ANALYSIS

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INTRODUCTION. There is a close relationship among infection, inflammation, and coagulation that provides the rationale for increased use of anticoagulant treatments in ICU patients. Drug–drug interactions are very common in ICU setting and they put critically ill patients at risk. In order to assure patient safety, ICU physicians must increase their knowledge about drug interactions that can cause hematologic effects and impact clinical outcomes. There are scarce data about the incidence of these types of drug interactions and the frequency that they cause adverse events.

OBJECTIVES. The aim of this study is to determine the incidence of drug interactions with potential hematologic effects and the incidence of adverse events caused by these interactions.

METHODS. Between January 2008 and December 2008 we prospectively analyzed ICU prescriptions with the aim to identify potential drug–drug interactions. The screening was done by the clinical pharmacist, present on daily rounds, with the help from specific software (Epocrates Rx® drug reference). The interactions detected were classified in eight groups according to the affected system (neurological, cardiovascular, gastrointestinal, renal/metabolic, pharmacokinetic, hematological, musculoskeletical, others). We considered the hematologic group and identified the most common potential effects and the involved medications. We also recorded the incidence of adverse drug events and morbidity and mortality associated with these events.

RESULTS. The ICU admitted 300 patients in study period. We analyzed 692 physician orders with 8059 prescribed items. We have identified 3716 drug interactions. The neurological and cardiovascular systems were the most potentially affected accounting for 67% of tracked interactions. The hematologic group comprised 9% ($n = 339$). The most common effects were increased risk of bleeding, hemolysis, cytopenias and alterations in coagulation lab tests. The involved medications comprised a wide range of ICU prescribed drugs. We were not able to identify any adverse drug event with hematologic effects but even with our active search procedure sub notification remains an issue to be taken into consideration. Our overall rate of adverse drug events was 5 per 1000 patient days and no ICU mortality rate could be attributed to these events.

CONCLUSIONS. Drug interactions leading to hematological effects are common in ICU patients, involve a wide range of medications and although adverse drug events seem to be not so frequent their possibility cannot be neglected when physicians are making diagnostic thinking and therapeutic approach. The clinical pharmacist is essential in keeping the multiprofessional team updated regarding this important aspect of ICU care.

1135

CHARACTERISTICS AND OUTCOMES OF CANCER PATIENTS IN A BRAZILIAN GENERAL ICU

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INTRODUCTION. Cancer patients represent a large proportion of ICU population, as malignancies are becoming increasingly common. In a recent large multicentre observational study in European ICUs, 15% of ICU patients had malignancy. Studies have reported high mortality rates for cancer patients in ICU, especially when they had neutropenia, required mechanical ventilation and renal replacement therapy, but advances in oncological supportive care have improved survival rates in these patients, and many of them can now be cured or have their disease controlled.

OBJECTIVES. We designed this study to assess if cancer as cause of ICU admission is related to worse prognosis than non-cancer patients.

METHODS. This is a retrospective cohort study including all patients admitted in a 31 beds general ICU over a period of 5 years. Data were collected from a database witch included characteristics, treatment and outcomes of patients from their admission to death or hospital discharge.

RESULTS. We included 2997 patients, 606 (20%) of them had a malignancy, 567 (93%) had solid tumor and 39 (7%) had haematological cancer. Solid cancer patients were younger than non-cancer patients (62 ± 15 vs. 68 ± 5, $p < 0.001$). There was no difference in age between patients with haematological malignancies and non-cancer patients (63 ± 15 vs. 68 ± 5, $p = 0.95$). Patients with haematological cancer were more severely ill than solid cancer and non-cancer patients at admission, as assessed by higher APACHE II score, respectively (12 ± 5 vs. 21 ± 6 vs. 15 ± 7, $p < 0.001$). In comparison to non-cancer patients, haematological cancer patients had sepsis more frequently (13% vs. 51%, $p < 0.001$) and needed mechanical ventilation more often (34% vs. 56%, $p = 0.005$) and for longer period (8 ± 12 vs. 11 ± 12, $p = 0.031$). These patients also had a longer ICU stay (8 ± 20 vs. 15 ± 19, $p = 0.087$) and higher hospital mortality compared to patients without cancer (39% vs. 10%, $p < 0.001$). Solid tumor patients had lower mortality rates than non-cancer patients (7% vs. 10%, $p < 0.001$).

CONCLUSION. In accordance to previous studies, haematological cancer patients in our study had the highest mortality. We found that solid tumor patients can have a better prognosis than non-cancer patients admitted to ICU. The limitation of this result is that we did not discriminate the type and stage of the cancer among those with solid tumor.

REFERENCE. Taccone FS, Artigas AA, Sprung CL, Moreno R, Sakr Y, Vincent JL (2009) Characteristics and outcomes of cancer patients in European ICUs. Critical Care 13:R15

1136

DETERMINANTS OF SURVIVAL OF HEMATO-ONCOLOGICAL PATIENTS IN THE ICU 2004–2008. THE LEIDEN EXPERIENCE

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INTRODUCTION. Survival of patients with hemato-oncological disorders admitted to the Intensive Care Unit (ICU) has increased due to better quality of supportive care and advances in treatment. Still mortality remains high. The aim of our study was to determine ICU-mortality and determinants of survival in patients with hemato-oncological disorders admitted to a tertiary ICU.

METHODS. We performed a retrospective cohort study of all patients with a hemato-oncological disorder admitted to the ICU of the Leiden University Medical Center between January 2004 and January 2009. Multivariate logistic regression analysis was used to determine predictors of survival.

RESULTS. In the study period 191 patients (116 male, 75 female) were identified. Mean age was 52.6 years (±15.5). Mean length of stay (LOS) in the ICU was 8.6 days (±13.4) and LOS in the hospital 26.8 (±22.9). Mortality in the ICU was 50.8% and during hospital stay 61.8%. Hematological diagnoses included (%) acute myelogenous leukemia (AML) (31), non-Hodgkin's lymphoma (25), multiple myeloma (16), acute lymphoblastic leukemia (9), chronic myelogenous leukemia (6), chronic lymphoblastic leukemia (5) and Hodgkin's lymphoma (3). Previous treatment included (%) bone marrow transplantation (46), chemotherapy and/or irradiation (combination therapy) (47), or no treatment (7). Mean APACHE II score was 22.9 (± 7.6). Indications for admittance to the ICU included (%) respiratory failure (76), circulatory failure including cardiac arrest (12), septic shock (7), coma (3) and metabolic disorders (2). Bacterial infections were recorded at admission to the ICU in 19% of cases, and in 33% of cases during ICU-stay, viral infections at admission to the ICU in 9% of cases, and in 11% of cases during ICU-stay and opportunistic infections at admission to the ICU in 7% of cases, and in 13% of cases during ICU-stay. Multivariate logistic regression analysis showed increasing APACHE II score ($p < 0.001$, OR 1.14, CI 1.07–1.21), age ($p = 0.016$, OR 1.04, CI 1.01–1.07), hematological diagnosis multiple myeloma compared to AML ($p = 0.11$, OR 0.17, CI 0.05–0.55), combination therapy compared to no treatment ($p = 0.003$, OR 0.13, CI 0.02–0.81) and opportunistic infection during ICU admission ($p = 0.001$, OR 17.79, CI 3.16–100.09) to be independent predictors of survival.

CONCLUSION. Strong predictors of survival in patients with hemato-oncological disorders admitted to our Intensive Care Unit were APACHE II score and presence of opportunistic infection during ICU admission. Better understanding of determinants of survival can help to predict outcome in these patients, facilitate decision making and improve communication with patients and relatives.

1137

CHARACTERISTICS AND OUTCOMES OF PATIENTS WITH CANCER REQUIRING ADMISSION TO INTENSIVE CARE UNITS: A PROSPECTIVE MULTICENTER STUDY

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INTRODUCTION. The knowledge on patients with cancer requiring intensive care is mostly restricted to single center studies.

OBJECTIVE. To evaluate the characteristics and outcomes of patients with cancer admitted to several intensive care units (ICU).

METHODS. Prospective multicenter cohort study conducted in the ICUs from 28 hospitals in Brazil over a two-month period. Multivariate logistic regression was used to identify predictors of in-hospital mortality.

RESULTS. During the study period, out of 5385 ICU admissions in the participating ICUs, 1157 (21.5%) were patients with cancer. Out of these patients, 753 (65.1%) were considered eligible for the study; 404 (34.9%) had ICU length of stay (LOS) < 24 h and were not considered. Excluding readmissions and patients with missing data (cancer-related and outcome data), a total of 717 patients constituted the study population. There were 667 (93%) patients with solid tumors and 50 (7%) patients had hematological malignancies. The main reasons for ICU admission were postoperative care (57%), sepsis (15%) and respiratory failure (10%). Overall ICU and hospital mortality rate were 21% and 30% and were higher in patients admitted because of medical complications (44% and 58%) than in emergency (23% and 37%) and scheduled (6% and 11%) surgical patients, respectively ($P < 0.001$). During the ICU stay, vasopressors were used in 222 (31%), MV in 304 (42%), and dialysis in 60 (8%) patients. The SAPS 3 score was 48.7 ± 19.0 points and and SOFA score on day 1 was 7 (5–10) points. Adjusting for covariates other than the type of admission, the number of hospital days prior to ICU admission [odds-ratio (OR) = 1.18 (95% confidence interval, 1.01–1.37)], higher SOFA scores [OR = 1.25 (1.17–1.34)], poor performance status [3.40(2.19–5.26)], the need for mechanical ventilation [OR = 2.42 (1.51–3.87)] and active underlying malignancy [OR = 2.75 (1.19–6.32) for patients with a newly diagnosed disease, and OR = 2.23 (0.96–5.20) for patients in recurrence or progression] were associated with increased hospital mortality in multivariate analysis.

CONCLUSIONS. This large multicenter study reports improved survival rates for patients with cancer requiring intensive care. In these patients, mortality was mostly dependent on the severity of organ failures, performance status and need for mechanical ventilation, rather than cancer-related characteristics.

GRANT ACKNOWLEDGEMENT. INCA and CNPq.

1138

MULTICENTER SPANISH STUDY OF PATIENTS WITH HEMATOLOGICAL MALIGNANCES IN INTENSIVE CARE UNIT: PRELIMINARY DATA (EMEHU STUDY: GTEI-SEMICYUC)

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INTRODUCTION. the mainly of studies of patients with hematological malignances (PHM) were retrospective and in an unique center, so the real epidemiological information was limited.

OBJECTIVE. we described a preliminary data about general characteristics and therapeuticals approach in ICU admittance of HMP.

METHODS. We developed a multicenter, prospective study between june/2007 until october/2008 in 50 Spanish's ICUs. A descriptive analysis was performed.

RESULTS. Among 237 HMP in 30 ICUs were included. Mean age was 54 ± 16 (R16–89) years; 55% men. The HMP's precedence were: 60% hematological ward, 15.8% Emergence Department, 11.5% from other hospital and others in 10.3%. The main hematological malignances were: 29% Acute Myelogenous Leukemia (AML), 12.7% Non-Hodgkin Lymphoman (NHL), 8% Multiple Myeloma (MM) and 7.59% with Chronic Lymphocytic Leukemia (CLL). In 47.5% (IC 40.7–54.4%) of HMP had neutropenia in ICU admittance, and 85% with lower than 500 μL, the mean duration were 12.5 ± 9.9 (IC 10.4–14.6; *R* 1–60) days. The main reasons of ICU's admittance were: 65% by infection, 53% acute respiratory failure (ARF), 19% with ARDS criteria, 6.3% by coma and 5.9% with cardiac failure. The origen of sepsis in the ICU's admission were communitary in 37% and nosocomial acquired in 63%. The pulmonary focus was the most frequently in 59.7%, after the abdominal 14% and unknown origen 13.6%. The main infections in ICU admittance were: nosocomial-acquired pneumonia in 28.6%, community-acquired pneumonia 26.4%, primary bacteraemia 10% and peritonitis 5.7%. The sepsis stage were: sepsis in 25.3%, severe sepsis 16.2%, septic shock 58.2%. The APACHE II on admission in ICU was 23.8 ± 8.3 (IC 22.6–24.9; *R* 5–46) and SOFA score 9.1 ± 4.0 (IC 8.7–9.7; *R* 0–18). The SIRS signs were: fever in 37%, 13.5% hypothermia, 79.8% tachycardia, 72.6% tachypnoea. Others symptoms were: dyspnea in 56.5%, abdominal pain 12.7% and diarrhoea 6.3%. The 75.5% of HMP received antibiotic therapy previously, but in ICU we changed this initial therapy in 55%. The main reasons of this antibiotic change were worse clinical evolution in 66.3%, 14.7% no coverage and 9.5% desescalation. In ICU we initiated monotherapy in 11.6%, 24.4% combination with 2 antibiotics, 31.7% with 3 and 32.4% ≥ 4. The sepsis management in the first hours: 72% received antibiotic in the first hour, use of vasoactive drugs in 48%, 40% initiated cortisteroids for septic shock, 50% with glucemic control (<150 mg/dl), haemofiltration in 22.7%. The HMP needed invasive mechanical ventilation (IMV) in 56% of cases and non-IMV in 24% in the first hours of ICU admission. The crude mortality in ICU was 53%.

CONCLUSIONS. these HMP had high severity scores and severe neutropenia. The majority of cases presented severe infection on ICU admission, mainly respiratory focus. The main cause of antibiotical therapy change was worse evolution. We identified a high mortality and resources use.

GRANT ACKNOWLEDGEMENT. GTEI and EMHEU Group.

1139

MULTICENTER SPANISH STUDY IN PATIENTS WITH HEMATOLOGICAL MALIGNANCES IN INTENSIVE CARE UNIT: PRELIMINARY DATA OF ICU MORTALITY WITH THE FIRST 237 PATIENTS (EMEHU STUDY: GTEI-SEMICYUC)

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INTRODUCTION. Many retrospective studies identified different factors associated with ICU mortality in hematological malignances patients (HMP), such as multi-organ dysfunction or acute respiratory failure (ARF).

OBJECTIVE. to analysis of prognostic factors associated of mortality in ICU in HMP.

METHODS. We developed a multicenter and prospective study between june/2007 until october/2008 in 50 Spanish's ICUs. We performed a descriptive analysis, chi-square, logistic regression analysis of variables with bivariate significance of $p < 0.2$.

RESULTS. Among 237 HMP in 30 ICUs were included. These next variables no presented significant difference in ICU mortality: kind of cancer, hematopoietic stem-cell transplantation, age, previous clinical history (p.e.: diabetes or myocardiopathy), reason of ICU admittance, lengh of stay in ICU, microbiological isolation, need or time (both < or ≥5 days) of invasive mechanical ventilation (IMV) (IC 95%, 0.7–4.3, $p = 0.1$) or Non-IMV (both < or ≥2 days). The sepsis stage neither had differences: 89 HMP had septic shock, 53 patients dead (60.9%) and 36 (54.3%) alive ($p = 0.6$). While the variables significantly associated with higher mortality were: men sex (0.02), ICU admission from Hematological ward (<0.05), neutropenia (0.005), infection (0.03) or ARF (0.0004) on ICU admittance, nosocomial-acquired infection (0.02), APACHE II ≥20 (0.001), SOFA score by 1° and 5° day ≥ 10 (both 0.0001). The independent variables associated with mortality, in logistic regression, were described in Table 1.

TABLE 1

Variables	HR	CI 95%	*p*
ARF on ICU admission	2.17	1.16–4.06	0.02
APACHE II ≥ 20	2.12	1.06–4.27	0.03
SOFA ≥ 10	2.47	1.31–4.66	0.01

CONCLUSIONS.

1. Classicals variables (such as IMV) associated with ICU's mortality in others studies with HMP were not in our preliminary data [1, 2].
2. The ARF. higher severity scores and multiorgan failures were independent factors associated with significant higher mortality.

REFERENCES. 1. Taccone et al (2009) Crit Care
2. Azoulay E et al (2004) Medicine

ICU admissions and readmissions: 1140–1153

1140

OCTOGENARIANS IN CRITICAL CARE UNIT—A THREE YEAR NATIONAL RETROSPECTIVE ANALYSIS

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INTRODUCTION. With increasing longevity of population, intensivists must ensure cost effective strategy of healthcare resources.

OBJECTIVES. To analyse clinical characteristics, hospital outcome and 28 day survival of octogenarians admitted to Critical Care Unit (CCU).

METHODS. Retrospective analysis of 1395 patients admitted to Midstaffordshire Hospital(MSH) CCU compared with 208748 patients admitted to 178 CCUs across UK under ICNARC (Intensive Care National Audit and Research Centre). Admissions were divided as: Medical, Unplanned surgical, Planned surgical and further as <80 years and >80 years. Variables: APACHE II score; length of stay and mortality in CCU and hospital; organ support, ventilation; care by Outreach team; 28 day mortality. Univariate comparisons were done using *t* tests, Mann–Whitney tests or Chi-square tests for continuous/categorical variables. Results presented as main effect with 95% confidence interval. Kaplan–Meier survival curves were drawn after deriving survival rates and hazard ratios. Multivariate analysis performed to see factors influencing outcome (death). Cox's proportional hazard model was used to estimate hazard ratio.

RESULTS. 16% >80 years at MSH, 13% at ICNARC (Pearson $chi^2(1) = 15.2002 p = 0.000$); Total Medical admissions: 57.78 and 57.85%, Planned surgical: 28.78 and 23.31%, Unplanned surgical: 13.44 and 18.87% at MSH and ICNARC respectively (Pearson $chi^2(1) = 15.2002$ $p = 0.000$). Among octogenarians, medical admissions: 43.19 and 45.74%; planned surgical: 38.50 and 26.44%; unplanned surgical 18.31 and 27.81% at MSH and ICNARC respectively(Pearson $chi^2(2) = 18.7494$ $p = 0.000$). Octogenarian CCU mortality: 66.07 and 68.29% in Medical; 14.29 and 6.54% in Planned surgical; 19.64 and 25.17% in Unplanned surgical at MSH and ICNARC respectively (Pearson $chi^2(2) = 5.7615$). Octogenarian hospital mortality: 52.17 and 60.17% for Medical; 23.91 and 11.33% for Planned surgical; 23.91 and 28.50% for Unplanned surgical patients at MSH and ICNARC respectively (Pearson $chi^2(2) = 14.2972$ $p = 0.001$). Mean APACHE II at admission for Octogenarians: 17.7 (SD 6.1) for MSH and 19.3 (SD6.6) for ICNARC. There was significant difference between CCU and hospital length of stay ($p < 0.001$). Of 1395 records, there were 280 deaths (42 were >80 years). Log rank test showed no difference between survival times of either age groups ($p = 0.73$). There was increased death hazard of (a) 1.12 ($p < 0.001$, CI-1.10–1.13) for one unit increase in Apache II score[1] (b) 1.96 ($p < 0.001$, CI-1.52–2.52) for ventilated patients and decreased death hazard of 0.16 ($p < 0.001$, CI-0.07–0.39) in subjects with Planned surgery versus Unplanned surgery.

CONCLUSIONS. CCU and hospital mortality is high amongst Medical followed by Unplanned surgical octogenarians. Prolonged hospital stay after discharge from CCU has adverse financial impact on resources. There was no difference between 28 day survival of both age groups and a decreased death hazard of 0.16 with Planned surgery.

REFERENCES. 1. Ryan D et al (2008) The very elderly in intensive care: admission characteristics and mortality. Crit Care Resusc 10(2):106–110

1141

TEENAGERS-PAEDIATRIC OR ADULT ICU?

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INTRODUCTION. The UK Paediatric Intensive Care Society has agreed consensus standards for the care of critically ill patients up to the age of 16 years [1].

The UK National Service Framework for Children defines a child as 'all those under 19 years of age' [2].

To date, there are no specific national standards addressing the care of teenagers on Intensive Care.

OBJECTIVES. This study aims to compare the diagnostic categories and outcomes for teenagers admitted to the Paediatric Intensive Care Unit (PICU) and Adult Intensive Care Unit over a 3-year period.

METHODS. All patients aged between 16–19 years of age admitted to both Adult ICU and PICU were retrospectively enrolled between January 2005 and June 2008. A revised version of the Paediatric Index of Mortality (PIM2) was used to calculate predicted mortality in the 2 groups.

RESULTS. A total of 50 and 46 patients aged between 16–19 years were admitted to the Adult ICU and PICU respectively. The average predicted risk of mortality for those aged 16–19 years on Adult ICU was 3.98% and the actual mortality was comparable at 4%. On PICU, the average predicted risk of mortality was 5.23% and the actual mortality was higher than predicted at 6.52%.

On PICU, 50% of the total admissions had a primary diagnosis of congenital disorder followed by 13% with Neuromuscular disorders. On Adult ICU, trauma accounted for 31% of total admissions, followed by Diabetic ketoacidosis at 17%. Interestingly, self-harm/overdose accounted for 11.5% of teenage admissions to Adult ICU compared with none on PICU.

CONCLUSIONS. The outcomes for patients aged 16–19 years are similar in both Paediatric and Adult Intensive Care. However, there is significant variation in the diagnostic profile.

Further larger scale studies are needed to develop a standardised and pragmatic approach to patients aged 16–19 years.

REFERENCES. 1. Paediatric Intensive Care Society (2001) Paediatric Intensive Care Society Standards Document. Bishops. PICS, London
2. Department of Health (2004) National Service Framework for children, young people and maternity services. Department of Health, London

1142

A RETROSPECTIVE STUDY INTO THE DEMOGRAPHICS AND OUTCOMES OF SELF-INJURED PATIENTS REQUIRING ADMISSION TO A REGIONAL TRAUMA INTENSIVE CARE UNIT.

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INTRODUCTION. Patients with mental illness or depression may sustain self-inflicted injuries that require admission to an Intensive Care Unit (ICU). These include burns and blunt or penetrating trauma. Ali et al showed that self-inflicted burns had a poorer outcome [1]. Clinicians can have negative preconceptions about the outcome of such patients. We completed a study comparing the outcomes of self-injured patients compared to accidentally injured patients admitted to a regional trauma centre.

OBJECTIVES. To identify, describe and compare the outcomes of traumatically self-injured patients to conventionally injured patients admitted to the ICU of a regional trauma centre.

METHODS. A state registry of all adult trauma admissions to a regional centre was interrogated to provide data on age, sex, ICU length of stay, Injury Severity Score (ISS) and diagnosis. Outcomes evaluated included length of stay in ICU and hospital, observed and severity adjusted hospital mortality.

RESULTS. Between 1 July 2002 and 30 June 2007 a total of 98 self-injured patients and 2251 conventionally injured patients were admitted to the ICU at the Alfred Hospital following traumatic injuries. Self-injured patients made up 4.17% of the trauma admissions during the study period. Self-injured patients were younger (mean 38.7 years ± 13.3 versus 42.6 years ± 20.4, $p = 0.043$) and more likely to be female (40.9% versus 25.9%, $p = 0.002$). Injury severity was similar in the two groups (ISS 28.8 ± 17.13 versus 27.9 ± 12.8, $p = 0.291$).

There was no difference in hospital length of stay for self injured patients compared to conventionally injured patients (median16.8 days, IQR 7.2–39.1 versus 14.8 days, IQR 7.9–26, $p = 0.205$). ICU length of stay (5 days, IQR 2–12 for both groups, $p = 0.58$) was the same for both groups. Patients who sustained self-inflicted injuries had a higher mortality (22.4% versus 14.8%, $p = 0.041$). After adjustment for age and severity of illness, self-injury remained significantly associated with increased mortality (odds ratio 2.0, 95%CI 1.15–3.48, $p = 0.014$).

CONCLUSIONS. Self injury is an independent risk factor for mortality after trauma. This supports previous studies [2]. Patients who have self-inflicted injuries may be subject to negative preconceptions by clinicians, and decisions to withdraw care may be more likely to be made or made earlier. Alternatively they may be more prone to mortality and morbidity in a way that is not well described by the ISS. It is possible that investments in psychiatric care may reduce the incidence of such injuries, their associated mortality and the demand on scarce ICU resources.

REFERENCES. 1. Ali SN, Soueid A, Rao K, Moiemen N (2006) Self-inflicted burns, outcome and cost. Burns 32(4):463–466
2. Cusick TE, Chang FC, Woodson TL, Helmer SD (1999) Is resuscitation after traumatic suicide attempt a futile effort? A five-year review at a level 1 trauma center. Am Surg 65:643–646

1143

A REPORT OF EPIDEMIOLOGY OF POISONED IN OUR ICU BETWEEN 1997–2009

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INTRODUCTION. Poisoned patients are frequently cared for in the Intensive Care Unit (ICU). This poisoning might be iatrogenic, intentional, and unintentional. Many cases of recognized poisoning go unreported and many cases of poisoning are never reported. The types of the poisoning are appear very differences between countries.

METHODS. This study presents a retrospective analysis of poisoned patients who were admitted to the ICU of Ataturk University research Hospital between 1997 and 2009.

RESULTS. Demographic data and specific poisons have been presented at the Table 1. The total poisoned mortality rate in our hospital 9%. Methyl alcohol poisoning has a higher mortality than other poisoning.

TABLE 1 CAUSES OF POISONING

	Number	Recovered	Died
Drugs	211	196	15
Organophosphate	66	61	5
Botulism	8	6	2
Carbon monoxide	58	50	8
Ethyl alcohol	15	14	1
Methyl alcohol	6	–	6
Mushrooms	10	7	3
Snakebite	1	1	–
Total	375	335	40

CONCLUSION. Childhood poisoning is usually accidental and is usually associated with a low morbidity and mortality. In adults, self-poisoning is usually deliberate (suicide or parasuicide) and has a higher morbidity and mortality rate [1]. The most important part of the poisoned patient's care are the general supportive management, prevention of poison absorption, and, when appropriate, specific antibodies therapy.

REFERENCE. 1. Matthew J (1997) Ellenhorn's medical toxicology, 2nd edn, pp 5–6

1144

COCAINE-RELATED ADMISSIONS TO AN INTENSIVE CARE UNIT: A FIVE YEAR STUDY OF INCIDENCE AND OUTCOMES

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Cocaine misuse is increasing and it is evidently considered a relatively safe drug of abuse in Ireland. To address this perception, we reviewed the database of an 18-bed Dublin intensive care unit (ICU), covering all admissions from 2003 to 2007. We identified cocaine-related cases, measuring hospital mortality and long-term survival in early 2009.

Cocaine-related admissions increased from around one annually in 2003–2005, to 10 in 2007. Their average age was 28 years and 78% were male. The mean Acute Physiology and Chronic Health Evaluation (APACHE) II score was 18.2 and length of ICU stay was 6.1 days. Ten patients died during their hospital stay. A further five patients had died by the time of follow-up, a median of 24 months later. One was untraceable.

Cocaine toxicity necessitating intensive care is increasingly common in Dublin. Hospital mortality in this series is 52%. These findings may help to inform public attitudes to cocaine.

1145

INTRAVENOUS DRUG ABUSE AS A RISK FACTOR IN A SCOTTISH INTENSIVE CARE UNIT

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INTRODUCTION. Drug misuse is a widespread problem in Scotland with 5.6 per 1000 adults injecting drugs regularly. Although a small percentage of the population, they are more likely to come into contact with the healthcare system due to the immediate and long term effects of drug use. We hypothesised that intravenous drug use would be more common among the intensive care population and that they would have a higher mortality than predicted by their APACHE score.

METHODS. A prospective case note review of 503 consecutive admissions to Glasgow Royal Infirmary Intensive Care Unit (ICU) was undertaken over an 18 month period. Evidence of intravenous drug use and a variety of diseases was sought from the patients' case notes by hand using details of current and previous admissions, clinical letters, results of investigations and correspondence from the patient's general practitioner, using agreed criteria. Demographic, Acute Physiology and Chronic Health Evaluation II (APACHE-II) score and outcome data were also retrieved.

RESULTS. Complete data were available for all 503 admissions. 8.0% ($n = 40$) of these patients were intravenous drug abusers. See Table 1 for all results. All data are expressed as Mean ± 95% Confidence Interval or Median (Interquartile Range). Data analysed using Chi-squared test, unpaired t test and Mann–Whitney U test where appropriate.

TABLE 1 PATIENT DEMOGRAPHICS

	IVDA ($n = 40$)	Non-IVDA ($n = 463$)	p
Male (%)	75	64.8	0.192
Age (years)	36.6 ± 2.00	53.3 ± 1.53	<0.001
APACHE II	15 (11–21)	18 (13–24)	0.02
Actual mortality (%)	35	34.3	0.92
Predicted Mortality (%)	23.7 ± 7.47	32.2 ± 2.2	0.02
SMR	1.48	1.06	
Length of ICU stay	5.25 ± 2.1	5.94 ± 0.85	0.27
Hepatitis B positive (%)	10	0	<0.001
Hepatitis C positive (%)	47.5	0.22	<0.001

CONCLUSION. As can be seen injecting drug users are likely to present to ICU at a younger age and with a lower APACHE score which is reflected in a lower predicted mortality. They have the same actual hospital mortality as the general population which leads to a higher SMR. They are also considerably more likely to be infected with a blood borne virus. These factors should be borne in mind when admitting these patients to intensive care.

1146

DESCRIPTIVE EVALUATION OF CIRRHOTIC PATIENTS ADMITTED TO A GENERAL INTENSIVE CARE UNIT WITH ACUTE DECOMPENSATION OF CHRONIC LIVER DISEASE

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AIMS. Patients with cirrhosis requiring intensive care are generally viewed as having a poor prognosis related to their underlying immunosuppression, coagulopathy and poor nutritional status. We aimed to describe prognostic risk factors in patients admitted to a general ICU with decompensated liver disease. As sepsis and upper gastrointestinal bleeding (UGB) are amongst the most common reasons for admission, these were also analysed separately.

METHODS. We conducted a retrospective analysis of data collected from consecutive patients admitted with decompensated cirrhosis to our general university hospital ICU over a 3 year period (2005–2007). ICU mortality was evaluated along with reasons for ICU admission and organ support. Statistics were performed using T test (Mann Whitney). Results are expressed as median [interquartile range].

RESULTS. There were 66 admissions involving 56 patients (49 male). 47 patients had alcohol related liver disease (8 with Hepatitis C). Median (IQR) age was 52y [46–59.5] and ICU length of stay was 5 [2–11] days. 22 patients died (1 on his 2nd admission) giving an overall ICU mortality of 39%. Patients who died had significantly higher serum bilirubin levels on admission to ITU (survivors (median 41 [26–88]) vs. non-survivors (median 135.5 [92–495], $p < 0.001$). However, there was no significant difference between survivors and non-survivors in age, presence of encephalopathy or ascites, hospital days prior to admission, length of stay on ICU, markers of infection, and serum creatinine levels. 25 patients were either admitted with sepsis or developed an episode of sepsis during their stay (only 2 documented episodes of spontaneous bacterial peritonitis). One patient developed sepsis on two admissions. 17 patients died (68%). All were treated with antibiotics; 6 were treated with steroids for varying lengths of time (all died). 18 patients were given inotropic support (4 survived), 17 renal replacement therapy (5 survived) and 12 received both (3 survived). 26 patients had UGB (3 were admitted twice with UGB) during their ITU stay. All underwent endoscopy with bleeding oesophageal varices diagnosed in 25 procedures (duodenal ulcer in 2), all of whom were treated with band ligation, terlipressin and systemic antibiotics. 12 patients died (46%) of which 7 had a co-existent diagnosis of sepsis.

CONCLUSIONS. Our overall ICU mortality of 39% is similar to published literature from other centres. We demonstrate the poor prognosis when organ support is required in patients with sepsis and liver disease. Our mortality from variceal bleeding was higher than more recent published series [1] despite all receiving appropriate therapy; notably the majority of those who died had an additional diagnosis of sepsis.

Unfortunately conventional markers of severity of illness failed to predict ICU outcome in cirrhotic patients with acute decompensation.

REFERENCE. 1. Abid S et al (2009) Am J Gastroenterol 104(3):617–623

1147

ACUTE RESPIRATORY FAILURE IN THE CAPITAL AREA OF FINLAND

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INTRODUCTION. Acute respiratory failure (ARF) is the most common organ failure in units treating acutely ill. Different modes of ventilatory support is employed in intensive care units (ICUs) but also in many other units. The prevalence of ARF outside ICUs is usually ignored in the epidemiological studies. We conducted a study to calculate the overall incidence of ARF in the capital area of Finland.

METHODS. All patients treated with any form of ventilatory support (CPAP, non-invasive ventilation, or invasive mechanical ventilation) were included to the prospective, cohort study of ARF patients. All ICUs and high dependency units (HDU) in the 11 hospitals of District of Helsinki and Uusimaa with adult population of 1 190 967 participated in the study.

RESULTS. During an 8-week period (April 16–June 10, 2007) 704 patients had an episode of ARF needing ventilatory support leading to incidence of 384/100 000/y. ICU was the primary unit in 304 patients and HDU in 400 patients. Need for respiratory support was less than 6 h in 179 of 704 (25%) patients. Seventy of 400 (17.5%) HDU patients were transferred to ICU. The overall ICU and HDU mortalities were 37 of 373 (9.9%) and 39 of 330 (11.8%), respectively.

CONCLUSIONS. The overall incidence of ARF is much higher than estimated in studies based on ICU patients.

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1148

INCIDENCE OF ALI/ARDS IN VITORIA, BRAZIL

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INTRODUCTION. Recent studies indicated an incidence of ALI/ARDS around 17–64.2 cases per 100,000 person-years.

OBJECTIVES. to evaluate the incidence of ALI/ARDS needing invasive mechanical ventilation in Vitoria, city in the southeast of Brazil.

METHODS. A 15-month prospective observational study (October 2006 to December 2007) was carried out in 14 adults ICU, total of 175 ICU beds. Diagnosis of ALI/ARDS was stabilized according to the AECC criteria, in patients aged 18–75 years, who required invasive ventilation for more than 24 h.

RESULTS. From the 7,133 admissions, 130 patients fullfilled ALI/ARDS criteria (1.82%). ALI represented 37.6% and ARDS 62.4% of the patients. The incidence of ALI/ARDS was 7.57 cases per 100,000 persons-years. Males (62.3%), mean age of 44.24 15.95 years, 32.3% smokers and 26.9% alcoholics. The average period till ALI/ARDS diagnosis was 3.83/5.37 days (late ARDS = 67.3%). APACHE II for ARDS/ALI (21.31/19.69) and LIS (2.39/1.86). Risk factors for ALI/ARDS were: pneumonia (35.3%), sepsis (31.5%), broncoaspiration (12.3%), shock (7.7%), lung contusion (6.9%) and multiple trauma (6.9%).

CONCLUSIONS. The incidence of LPA/ARDS in Vitoria needing invasive mechanical ventilation was 1.82%. Pneumonia and sepsis were the most common risk factors for ALI/ARDS.

1149

CIGARETTE SMOKING AS A RISK FACTOR IN A SCOTTISH INTENSIVE CARE UNIT

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INTRODUCTION. Cigarette smoking is a common practice in the UK with 24% of the population aged over 16 doing so regularly. It is a known predisposing factor for numerous diseases in humans, which contribute to the comorbidity with which patients present to intensive care. This comorbidity will have an impact upon the likelihood of surviving critical illness.

METHODS. A prospective case note review of 503 consecutive admissions to Glasgow Royal Infirmary Intensive Care Unit (ICU) was undertaken over an 18 month period. Evidence of smoking and a variety of diseases was sought from the patients' case notes by hand using details of current and previous admissions, clinical letters, results of investigations and correspondence from the patient's general practitioner, using agreed criteria. Demographic, Acute Physiology and Chronic Health Evaluation II (APACHE-II) score and outcome data were also retrieved.

RESULTS. Complete data were available for all 503 admissions. 45.5% ($n = 229$) of these patients were smokers. See Table 1 for all results. All data are expressed as Mean ± 95% Confidence Interval or Median (Interquartile Range). Data analysed using Chi-squared test, unpaired t test and Mann–Whitney U test where appropriate.

TABLE 1 PATIENT DATA AND STATISTICAL ANALYSIS

Co-morbidity	Smoking ($n = 229$)	Non-smoking ($n = 274$	p
Male (%)	71.2	61.9	0.016
Age (years)	51.7 ± 2.0	55.7 ± 2.2	<0.001
APACHE II	18 (13–23)	18 (12–25)	0.227
Actual mortality (%)	38.9	30.7	0.05
Predicted mortality (%)	29.8 ± 3	33.0 ± 3	<0.001
SMR	1.305	0.93	
Length of ICU stay	6.0 ± 1.1	5.8 ± 1.1	0.043
Ischaemic heart disease (%)	31.4	30.7	0.842
Chronic obstructive pulmonary disease (%)	25.3	9.1	<0.001

CONCLUSION. Our results demonstrate that cigarette smokers are overrepresented in the ICU population, possibly due to their comorbidity. As a group, they are more likely to be younger and male but with similar APACHE scores on admission. They are significantly more likely than non-smokers to have COPD but, surprisingly, they are not more likely to have ischaemic heart disease in our population. Ultimately they are less likely to survive critical illness, despite having a lower predicted mortality, leading to a marked difference in SMR. This is important when assessing patients for admission to ICU.

1150

READMISSION TO A TERTIARY INTENSIVE CARE UNIT: OUTCOME AND RISK FACTORS

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INTRODUCTION. The ability to identify who is likely to deteriorate after ICU discharge is limited. The estimate rate of readmission in our ICU is 2.5–3.0%, which is consistent with the rates presented in literature. In an effort to improve the ICU's clinical effectiveness and cost-efficiency, interest in readmission to ICU has grown considerably [1, 2, 3].

OBJECTIVES. The aim of our study was to investigate possible risk factors for readmission in our ICU, comparing readmitted to non-readmitted patients in our ICU.

METHODS. Single centre retrospective study in a 12 bed mixed ICU of a tertiary university hospital from a pool of patients admitted during 2007 and 2008. During the study period 792 patients were admitted in the unit: the median of age was 55 (38–70), the males were 63.4% and the mean of SAPSII was 44 ± 15. In the group I were included all 25 patients that have been readmitted during the period of study. In the group II were included 282 randomly selected non-readmitted patients (deaths and patients discharged to another hospital [not at risk of readmission] were not included). All admissions and readmissions were unplanned. Statistical analysis of variables: χ^2, Mann–Whitney, unpaired and paired Student's t.

RESULTS. No significant differences were found concerning age and sex. We found higher rates of ventilator associated pneumonia (56.0 vs 27.1% [p 0.017]), unplanned post-operative admission in surgical-related conditions (82.6 vs 50.9% [$p < 0.01$]) and admission from an hospital ward (52.0 vs 22.7% [$p < 0.01$]), in the group I first admission comparing to the group II admission. SAPSII and the SOFA (at 24 h and at discharge) scores were not significantly between groups. The ICU length of stay appears to be longer in the readmitted patients (10 (4–15) vs 7 (3–12) [p 0.060]).

In the group I the readmission and admission diagnoses were different in 64% of cases; septic shock (32%) and severe sepsis (52%) were the most frequent at readmission. The SAPSII (41.1 ± 14.4 vs 34.9 ± 11.9 [p 0.024]) and SOFA at 24 h (5.9 ± 3.7 vs 4.7 ± 2.6 [p 0.045]) at readmission was lower than at initial admission. The ventilator associated pneumonia was more frequent when the diagnosis of readmission was different from the admission diagnosis (81.25 vs 11.1% [$p < 0.01$]).

CONCLUSIONS. We did not find an increase in severity of illness at readmission comparing to initial admission. It was not possible to identify any admission diagnosis as an independent risk factor of readmission, but an unplanned post-operative initial admission could be related to an increased readmission risk. Failure of prior therapy at an hospital ward before the initial admission might increase ICU readmission [1]. We also emphasized the need of optimize measures for reduction of ventilator associated pneumonia, considering the observed impact in readmission.

REFERENCES. 1. Crit Care Med 29(3):511–528 (2001)
2. Critical Care 12:R123, 1–31 (2008)
3. Intensive Care Med 29:241–248 (2003)

1151

READMISSION TO THE INTENSIVE CARE UNIT AFTER HOSPITAL DISCHARGE IS NOT ASSOCIATED WITH WORSE OUTCOME

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OBJECTIVES. Patients readmitted to the intensive care unit (ICU) during the same hospital stay have a bad prognosis. The outcome of patients readmitted to the ICU after hospital discharge is, however, not well defined. The aim of this study was to compare the outcome of patients readmitted to the ICU during the same hospitalization with patients readmitted to the ICU after discharge from the hospital.

METHODS. Retrospective study of all patients admitted to a University Hospital medical ICU between January 1, 2005 and May 1, 2008.

RESULTS. Of the 1405 patients discharged alive from the ICU, 192 were readmitted: 94 during the same hospital stay and 98 after discharge from the hospital. Respiratory failure, cardiovascular diseases and sepsis were the most common reasons for readmission. Patients readmitted to the ICU during the same hospitalization were more likely to have been treated with mechanical ventilation (invasive or non-invasive) or vasopressor agents. Interestingly, these patients more frequently had a "do not resuscitate" order than other patients (18 vs 0%, $p < 0.05$). Patients readmitted to the ICU after discharge from the hospital had a hospital mortality rate of 13%, not significantly different to the mortality rate of patients who were not readmitted in the ICU (9%). In contrast, the mortality rate was 43% for patients readmitted to the ICU during the same hospital stay.

CONCLUSIONS. In our experience, patients who are readmitted to the ICU after discharge from the hospital do not have a worse prognosis than patients who are not readmitted; more than 85% are discharged alive from the hospital after ICU readmission.

1152

EARLY READMISSION TO A CARDIOTHORACIC INTENSIVE CARE UNIT IS ASSOCIATED WITH INCREASED MORTALITY AND LENGTH OF STAY

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INTRODUCTION. Readmission to an intensive care unit (ICU) is associated with increased morbidity, mortality, length of stay (LOS) and cost [1]. However, keeping patients in an ICU when they are considered fit for discharge to a lower level of care leads to increased healthcare costs, and may prevent other patients accessing the ICU.

OBJECTIVES. To determine the readmission rate of patients to a cardiothoracic ICU after discharge, and assess whether early readmission to a cardiothoracic ICU is associated with increased mortality and LOS.

METHODS. Data was collected prospectively from all patients admitted to an 18 bed cardiothoracic ICU over 5 years (1 April 2004–31 March 2009). All data was entered into the local ICU database (Medicus®).

All patients who had been readmitted within 48 h of discharge were identified from the ICU database. The median length of readmission ICU stay was compared with the median ICU total LOS for all ICU patients in the study period.

The mortality rate was compared between all ICU patients and those patients who were readmitted within 48 h of initial ICU discharge.

RESULTS. The total number of ICU admissions in the study period was 5749 patients. 113 patients were readmitted within 48 h of discharge (1.96%). The median LOS for all patients admitted to the ICU in the study period was 1.9 days. For patients readmitted within 48 h the median LOS for the initial admission was 1.7 days (range 0.2–52.6), and the readmission stay was 4.2 days (range 01–73).

A comparison of the readmission mortality rate against the overall mortality rate is shown in Table 1.

TABLE 1 MORTALITY RATES

	n	ICU mortality (%)	Hospital mortality (%)
All ICU admissions	5749	7.4	9.7
Early readmissions	113	18.0	26.5

CONCLUSION. This study shows a low early readmission rate (<2%) in this large group of cardiothoracic ICU patients. The mortality rate for patients readmitted to ICU within 48 h of discharge was more than twice the overall mortality. The readmission median LOS was twice the overall ICU LOS.

The low early readmission rate suggests that the local policy for discharging patients from the ICU is appropriate. There has been an established critical care outreach team in place throughout the duration of this study. The increased mortality rate and LOS in the readmitted patients demonstrates that this group should be identified and optimized before ICU discharge.

REFERENCES. 1. Rosenberg AL, Watts C (2000) Patients readmitted to ICUs: a systematic review of risk factors and outcomes. Chest 118(2):492–502
2. Kaben A, Correa F, Reinhart K, Settmacher U, Gummert J, Kalff R (2008) Readmission to a surgical intensive care unit: incidence, outcome and risk factors. Critical Care 12:R123

1153

PREDICTION OF EARLY READMISSION AFTER A STAY IN THE ICU: VALIDATION OF THE SWIFT SCORE AND CONSTRUCTION OF THE FAIR SCORE IN A MULTICENTER COHORT

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INTRODUCTION. Unplanned readmissions to an ICU are associated with a bad prognosis. Except in the cases of therapeutic limitation (TL), readmission or death in the following days may be regarded as a failure of the decision to discharge the patient (pt). The SWIFT score was developed by Gajic (CCM 2008) to predict the readmission risk. Our goal was to test the predictive values of the SWIFT score in a French multicenter cohort, and to elaborate and validate a new score, that we called "FAIR" (Feasible Avoidance of ICU Readmission).

MATERIAL AND METHODS. Inclusion: ICU length of stay >24 h (only the 1st stay was taken into account), no TL during the ICU stay, pt discharged alive from the ICU. Cohort of consecutive pts from 4 hospitals of the Outcomeréa database. Prospective collection of the data required to assess the SWIFT score, demographics, prognosis and therapy along the ICU stay. Descriptive statistics and predictive values of the score were assessed for the event "readmission to the ICU or death within 7 days after discharge". Construction of the FAIR score was based on a multivariate analysis. Measurement of discrimination (ROC curve) and calibration (Hosmer–Lemeshow test) for SWIFT and FAIR scores.

RESULTS. 3544 pts included. 32% surgical pts. 132/3412 (3.7%) pts readmitted or deceased within 7 days after ICU discharge. 3 main symptoms at readmission: respiratory failure (31%), cardiogenic shock (13%), coma (9%). 10% died during the 2nd ICU stay.

Univariate analysis: compared to pts "not readmitted and alive at day 7", the following values are higher ($p < 0.05$) in the pts "readmitted or deceased within 7 days": age; SAPS 2, LOD and McCabe; % pts with an arterial catheter; hospital LOS; % pts referred from another hospital unit; P/F and Glasgow Coma score at ICU discharge.

Multivariate analysis: referral from another unit: OR [CI 95%] = 3.24 [2.14–4.89], SAPS 2 at admission: OR = 1.04 [1.03–1.05], SOFA at discharge: OR = 1.13 [1.07–1.20].

Prediction of readmission or death at day 7 by the FAIR score = e logit/(1 + e logit), where logit = −6.045 + (0.039 × SAPS II admission) + (0.125 × SOFA discharge) + (1.175 if referred from another unit)

AUC of the ROC curves [IC 95%]: SWIFT = 0.68 [0.67–0.70] and FAIR = 0.76 [0.74–0.77], $p = 0.0006$.

Hosmer–Lemeshow test: SWIFT 10.7 ($p = 0.09$) and FAIR 9 ($p = 0.34$).

DISCUSSION. In this series, the proportion of pts discharged alive from the ICU without TL and readmitted or deceased at days 7 is around 4%. The ability of the SWIFT score to predict these events are poor in our population. We built the FAIR score which is more discriminant and well calibrated. The benefit of the routine use of these scores to improve the decision to discharge the pts remains to be documented.

Safety in the ICU: 1154–1167

1154

ASSESSMENT OF PATIENT SAFETY CULTURE AMONG HEALTHCARE PROVIDERS IN AN ACADEMIC ICU IN SPAIN

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BACKGROUND. There is growing interest on patient safety in healthcare, especially among critically ill patients. These patients need a quick decision making process followed by complex protocols, teamwork management and a large amount of resources. In this context, patient safety plays a critical role and assessing its perception among the frontline providers is crucial. We conducted a patient safety assessment in our 52 beds ICU in order to establish a baseline needed to implement patient safety improvements.

OBJECTIVES. To evaluate the perception of patient safety (culture) among ICU providers at the "Hospital Universitario Marqués de Valdecilla" in Santander (Spain).

METHODS. During November 2008 we created, validated and administered a 20 questions survey among all providers in our ICU to assess the level of patient safety culture. The survey was administered to all physicians, resident physicians, nurses, nursing assistants and other ICU staff (including clinical leaders). Results are presented as rates among providers and differences between groups were evaluated using X^2 test.

RESULTS. The rate of response was 53.3% with a total of 132 completed surveys (physician: 60.6%, nurse: 55.7% and other personnel: 50.6%). Of the responders, 82.7% considered that the origin and prevention of errors are on the hands of the providers caring for critically ill patients. 68.2% of those polled considered that the implementation of an anonymous reporting system of adverse effects could improve patient safety. 94.1% positively considered adherence to established protocols as part of a culture of patient safety. Clarity of medical orders was considered by 97.8% as a critical action to prevent errors. Adequate communication among caregivers was considered essential to minimize errors by 77.1% of the workers, and the use of a patient daily goal sheet is considered an interesting option. 87.2% thought that multidisciplinary patient daily rounds improve communication and minimize error. Lack of experience among providers was considered a source of error by more than 95% of nurses and physicians. Medical education and training in patient safety was assessed favourably by 93.3% of participants in order to improve care and prevent error. To achieve patient safety as a strategic priority, 84.9% considered essential the involvement of hospital managers, clinical directors and supervisors.

CONCLUSIONS. Survey results suggest that improving communication, adherence to established protocols, education and training in patient safety, multidisciplinary patient daily rounds, experienced professionals and the involvement of hospital management and clinical leaders could minimize clinical errors. Several efforts to improve patient safety culture have been initiated in our environment based on these results.

REFERENCES. 1. Pronovost PJ et al (2003) Qual Saf Health Care 12:405–410
2. Sexton JB et al (2006) BMC Health Serv Res 6:44
3. Huang D et al (2007) Crit Care Med 35:165–176.

1155

EARLY EXPERIENCES WITH CRITICAL INCIDENT REPORTING SYSTEM IN AN INDIAN ICU

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INTRODUCTION. The potential for medical errors and harm to the patients is increased in the intensive care unit (ICU) as the patients are sicker, have complicated conditions and need multi-disciplinary care. Critical incident reporting system helps identify various types of errors and risks to patient safety and their root causes thus reducing the likelihood of their recurrence.

OBJECTIVES. To determine the occurrence and type of incidents in the ICU using a voluntary reporting system and to investigate and take necessary action to prevent their recurrence.

METHODS. ICU comprises of 9 bed critical care unit (CCU), 14 bed recovery room (RR) and 14 bed high dependency unit (HDU). A voluntary critical incident reporting system (CIRS) was started as a quality improvement initiative. Prior to implementation the ICU staff (Doctors and Nurses) were educated about the CIRS. The severity of incidents was categorized as none (no harm done), minor (minimal harm, no treatment required), moderate (harm requiring treatment), severe (long term harm, death) and catastrophic (multiple deaths). The likelihood of recurrence was classified as almost certain, likely, possible, unlikely and rare. These incidents were investigated and contributory factors identified and action was taken by the risk management team.

RESULTS. 50 incidents were reported between February and December 2008. The median number of incidents/month was 3.5. Harm was reported in 38% of patients. 26% patients required treatment and 2 patients later died. 51% occurred in the CCU, 41% in RR and 8% in HDU. Severity of reported incidents was minor 12%, major 16% and severe 10%. The likelihood of recurrence was classified as almost certain (16%), likely (30%), possible (38%), unlikely (14%) and rare (2%). Incidents that harmed the patients requiring treatment were related to medication (36%), equipment (28%), line/tube/drain incidents (28%) and others (8%). 48% incidents were reported by doctors and 46% were anonymous. System factors contributing to the incidents were lack of knowledge and failure to follow protocol (82%), working conditions (66%) and teamwork issues (52%). Major incidents had $\geq$ 5 contributory factors. Action was taken in 94% of the incidents and completed in 60% till date.

CONCLUSIONS. Critical incident reporting system provides a mechanism to improve patient safety and the quality of care administered, however under reporting is an inherent problem in this system.

1156

NORTHERN IRELAND CRITICAL CARE INCIDENT MONITORING STUDY (NICCIMS): WHAT MEASURES ARE IMPLEMENTED TO HELP PREVENT ADVERSE INCIDENTS IN DRUG PRESCRIPTION AND ADMINISTRATION IN INTENSIVE CARE?

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INTRODUCTION. NICCIMS was a 10 months prospective regional audit study carried out in 7 Intensive Care Units (ICU) in Northern Ireland. Its aim was to collect and analyse anonymously adverse events and near misses in these ICUs. It suggested that the incidents related to drugs were the most frequent (36.4%) [1]. Although a large number of these events resulted in no adverse outcome, the same failures that lead to near misses or situations of low harm may lead, in other circumstances, to more serious harm.

OBJECTIVES. To determine the possible causes of these events we examined the practice in drug prescription and administration within the ICUs participating in NICCIMS.

METHODS. Electronic questionnaires were sent to the lead consultants, lead clinical nurses, medical educational supervisors and pharmacists. The questions related to the presence of a drug formulary, the computerised prescription system and the existence of protocols for the prescription and administration of drugs. Responses were compared between staff within units to assess agreement. 100% response rate was achieved.

RESULTS. All units have a drug formulary but none of the pharmacists were aware of its existence and in 4 out of the 7 units, there is a disagreement between medical and nursing staff as for the existence of this document. Erroneous settings seem to exist in the prescription computer program but only a third of respondents are aware of it. Furthermore, when the pharmacist was aware of this, doctors in those 2 units rely on these settings to prescribe. A sedation protocol is present in 5 units but there was an agreement between staff in only 2 units. All units claim to have a protocol for the management of Insulin therapy. However, the target to be achieved was not uniform between units and within a given unit.

CONCLUSION. ICUs are complex environments where the most vulnerable patients are exposed to critical incidents. NICCIMS stressed that medication errors are frequent, serious, and predictable[1]. The prescription and the administration of drugs do not seem to be uniform between and within the ICUs participating in the study and the discordance between clinicians, nursing staff and pharmacists suggest an inefficient practice. The prescription and administration of drugs in ICUs requires a solid framework, which could include a drug formulary, regular staff induction, reliable computerised prescribing systems and effective protocols [2].

REFERENCES. 1. Hutchinson A, McAllister C, Mirakhur RK (2009) Use of an anonymized database system for reporting patient safety events in critical care: the Northern Ireland Critical Care Incident Monitoring Study. Br J Anaesth 102(4):582P

2. Moyen E, Camiré E, Stelfox HT (2008) Clinical review: Medication errors in critical care. Crit Care 12(2):208–214

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1157

USE OF A COMPUTER DATABASE FOR DECLARATION OF ADVERSE EVENTS. RESULTS AND STRATEGY

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INTRODUCTION. ICU patients experience situations related to daily care they receive that can harm them or even cause their death. Some of these events are avoidable and measures can be taken. We used an adverse events computer database to evaluate these events and create recommendations.

OBJECTIVES. Improve the evaluation of the adverse events related to patients in the ICU setting in order to change tasks and procedures and get a safer health care environment.

METHODS. For the period from April 2008 to April 2009 all the staff of an 18 bed polyvalent ICU was proposed to notify voluntarily and anonymously all adverse events (AE) in a computer database. These AE were classified according to the type of event, the harm they caused, their avoidability and the status of the person who declared. Based on the PDCA problem-solving process (Plan-Do-Check-Act) and previous to this period, all the staff was explained the importance of AE, instructed in the use of the database and encouraged to notify AE. Nosocomial infections were excluded because they are declared in a specific national nosocomial infection database. During the evaluation period the AE group analyzed these events and proposed recommendations to perform tasks and procedures in a safer way based on the notifications made in the database.

RESULTS. A total of 127 declarations were notified. Doctors made 84 declarations, nurses 35 and other auxiliary staff 8. From these notifications 35 were related to vascular and urinary catheters and drains, 26 to medication prescription or administration, 25 to airway management, 17 to equipment failures, 10 to direct patient care, 5 to diagnostic tests, 3 to procedures and 3 to transfusions. None of these AE caused death, 25 did not harmed patients and 102 harmed patients to a diverse extent. 36 were considered to be possibly avoidable, 79 certainly avoidable, 9 possibly unavoidable and 2 certainly unavoidable. 12 recommendations were made.

CONCLUSIONS. A computer AE database encourages staff to notify these events by being voluntary and anonymous. This information is more easily managed and stored in a computer setting. We think that useful recommendations and modification of protocols can be made using this information. These interventions can be of benefit to patients by reducing the importance of AE in terms of morbidity, mortality and cost.

REFERENCE. Joint Commission International Center for Patient Safety. http://www.jcipatientsafety.org

Prevalencia de incidentes y acontecimientos adversos en los Servicios de Medicina Intensiva. Grupo de trabajo de planificación y gestión. SEMICYUC.

1158

PARENTERAL MEDICATION SAFETY IN INTENSIVE CARE MEDICINE. HUMAN VS. MACHINE-MADE PREPARATION OF STANDARDIZED INFUSION SOLUTIONS: PHARMACEUTICAL QUALITY AND ECONOMICAL EFFICIENCY

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INTRODUCTION. Parenteral medication errors are common and a serious safety problem in intensive care units [1]. The Department of Intensive Care Medicine of the University Hospital Hamburg-Eppendorf has standardized concentrations for all drugs routinely applied by continuous infusion. These solutions are manually prepared at the bedside by ICU nursing staff.

OBJECTIVES. The study aimed at investigating whether an automated production in the pharmacy can improve the pharmaceutical quality of infusion solutions and also be economically efficient. Concentration conformity of solutions either manually prepared in clinical routine or produced by a centralized, machine-made process was analyzed. Economic efficiency was addressed by comparing production costs for both methods on the basis of annual prescription rates for all syringe driver solutions.

METHODS. Pharmaceutical concentrations (mg/ml) of 115 manually prepared and 100 machine-made infusion solutions (50 ml) for syringe drivers with standardized prescriptions of Noradrenaline, Amiodarone and Hydrocortisone were analyzed by using High Performance Liquid Chromatography. Production costs were estimated on the basis of observed average labour times and machine related costs. A break even point of annual production numbers was calculated, beyond which a machine-made production was more economic.

RESULTS. 60 (52%) of the manually prepared and 83 (83%) of the machine-made solutions showed an actual concentration variation of less than 5% from the declared concentration. The remaining 17% of the machine-made samples showed a deviation of 5 to 15% in contrast to 34% of the manually prepared. Of the remaining manually prepared solutions 13% deviated between 15 and 45% and one sample was as low as 45% of the declared concentration. The difference between the mean concentrations of the two groups was statistically significant ($p = 0.007$). At an annual production rate of 47,000 infusion solutions (200/day) the calculated cost savings on labour time by using the automated production method economically outweighed the additional machine-related investment and maintenance costs.

CONCLUSIONS. Machine-made infusion solutions from the pharmacy achieved better concentration conformity than manually prepared solutions. Individual concentration deviations of manually prepared solutions observed in routine practice can lead to clinically relevant parenteral medication errors. Machine-made preparation of standardized infusion solutions is an effective means to reduce this type of medication error. Potential cost saving effects make this approach even more attractive. Although not measured, we propose additional benefits of an automated preparation through more reliable use of appropriate solvents and syringe labelling as well as enhanced asepsis. These effects would further increase patient safety.

REFERENCE. 1. Valentin et al (2009) Errors of administration of parenteral drugs in intensive care units. BMJ 338:b814

1159

REAL-TIME ULTRASOUND-GUIDED INTERNAL JUGULAR VEIN CATHETERIZATION IN THE ICU

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INTRODUCTION. Central venous catheterization (CVC) is often necessary to treat critically ill patients. However, this procedure can lead to serious and sometimes life-treating complications.

Several studies showed a clear benefit from two-dimensional ultrasound guidance for CVC compared with landmark method supporting the idea that it should be part of the routine care and being recommended by the Agency for Healthcare Research and Quality (USA) and by the National Institute of Clinical Excellence (UK).

OBJECTIVES. To determine the success rate, the number of attempts and the number of complications of real-time ultrasound-guided cannulation of the internal jugular vein, done by ICU physicians.

METHODS. Prospective study, single-center consecutive case series evaluating critically ill adult patients, admitted in a 31-bed general ICU requiring cannulation of internal jugular vein. Catheterization was performed using real-time ultrasound guidance with all patients. The baseline characteristics were evaluated, as well as the presence of risk factors for difficult venous cannulation such as shock, untreated coagulopathy, mechanical ventilation, prior catheterization, previous difficulties during catheterization, vessel's size and position, catheter size and kind (central venous, haemodialysis or pulmonary artery catheter), number of attempts and operator experience.

RESULTS. 65 patients were included (30 male) with a median age of 71 ± 16 years, the Body Mass Index (BMI) was 27 ± 6 kg/m^2 and the median catheter in place was 7 ± 6 days. 53% were in mechanical ventilation. Internal jugular vein cannulation was successful in 89% patients. Jugular cannulation was successful at the first attempt in 49 patients (79%). Among the risk factors for failures of cannulation, previous catheter (60% vs. 40%, $p = 0.007$) and more than one the needle passes (86% v. 14%, $p < 0.001$) were associated with failure. We found a low rate of complications (3.5%), one arterial puncture and 1 neck haematoma.

CONCLUSIONS. Ultrasound guidance for jugular vein cannulation was safe and feasible in ICU patients. Our results suggest that ultrasound guidance could be used by ICU physicians with low complications, similar to the results in the literature.

REFERENCE. 1. Hind D, Calvert N, McWilliams R et al (2003) Ultrasonic locating devices for central venous cannulation: meta-analysis. BMJ 327:361–364

1160

EVACUATION IN URGENCY OF AN INTENSIVE CARE UNIT AT THE TIME OF A TORNADO

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INTRODUCTION. The white plan is intended to organize the operation of a hospital in the event of massive surge of victims. But what is it when the hospital itself is reached by a natural disaster?

METHOD. We describe here the evacuation of the intensive care unit of the hospital of Sambre-Avesnois (CHSA) during the tornado of August 3rd, 2008.

It is about an intensive care unit of 10 beds in a general hospital of 350 beds

SITUATION. During the night from August 3rd to 4th 2008, a tornado of force 4 (on a scale of 5) fell down on the communes of Hautmont, Maubeuge and Boussières on Sambre. The hospital of Maubeuge was directly reached. Several services (Gastro-enterology, Internal medicine, Psychiatry) have being closed partially. The intensive care unit on the other hand has being entirely evacuated following extensive damage.

DISCUSSION. Several problems were put forward by this event.

The access to the hospital was problematic because of the obstruction of the access roads. The installation of the white plan was slowed down by it.

The absence of protocol of evacuation of the various services made random the evacuation of the patients of the reanimation with initially a distribution between the rooms of déchocage of the urgencies and the department of surgery, close to the reanimation. Then only in the one second time the opening of the recovery room of the operating room suite to accommodate all the patients in only one place. Moreover damage in the other services has to limit the mobilization of other personal to lend strong hand during the evacuation.

On the logistic level the main issue came from the lack of respirators of transport, delaying the evacuation of the service.

CONCLUSION. The damage having been mainly material in the touched communes, the hospital did not have to face an surge of victims. The management of the crisis was limited to the evacuation of the patients towards the sure zones. Nevertheless, the question of arises what would have been the situation if there had been more human damage imposing a massive reception of the victims combined with the state of catastrophe in which the hospital was. This report imposes not only in our hospital, but in all the other health systems, a recasting of the protocols of white plan.

1161

IMPROVING THE SAFETY OF THE INTRA-HOSPITAL TRANSFER OF ACUTELY ILL PATIENTS. INTRODUCING THE CHESTER TRANSFER SCORE

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INTRODUCTION. Adverse events related to inter-hospital transfer are well studied and are known to be relatively common [1]. However adverse events related to intra-hospital transfer are not well studied. We looked at the movement of acutely ill patients within the Countess of Chester Hospital—a 600 bed acute hospital in the UK. Analysis of critical incidents in our hospital suggested that the adverse events related to intra-hospital transfers may be both numerically and proportionately larger. The commonest reason that led to critical incidents related to intra-hospital transfer was that the escorting staff lacked the necessary knowledge and skill to match the complexity of the level of transfer. A critical care outreach team (CCOT) and the Early Warning Score—EWS [2] is well established in our hospital. The trigger score is 4 or more and this demands an immediate referral to the CCOT. The EWS is integrated into the vital signs chart and every adult in-patient is scored on a regular basis. Based on the EWS and on a number of key interventions we developed the Chester Transfer Score. This allowed staff in critical care and non-critical care areas to determine the appropriate level of expertise required for the transfer any individual patient.

THE CHESTER TRANSFER SCORE.

TABLE 1 CHESTER TRANSFER SCORE

Early warning score	Intervention	Transfer score	Transfer personnel
3 or less	None	0	No specific requiement
4 or more	Or recovering from a general anaesthetic	1	Nurse (inform CCOT)
Any	A: Tolerating a Guedel/NP airway B: O_2 requirement $>60\%$, CPAP or BiPAP. C: Requiring rapid fluid infusion or inotropes D: P or U on AVPU	2	Doctor and nurse
Any	Mechanical Ventilation	3	Anaesthetist and ITU nurse or ODP

All potential transfers are categorised into four transfer score levels: 0, 1, 2 and 3 denoting increasing levels of complexity. The transfer score depends upon the EWS or the requirement for certain key interventions. For example, a patient with an EWS of less than 3 and not in need of any key interventions is given a transfer score of 0. This level of transfer can be carried out by non-trained staff. However if a patient is in need of any of the listed key interventions then the patient is scored on the basis of these regardless of the EWS.

CONCLUSIONS. The Chester Transfer Score has been integrated into the transfer policy of our hospital and into a locally developed educational programme known as the Safe Transfer Of Patients (STOP) course. It has been in use for 2 years. We believe that this novel method has allowed us to classify the complexity of any transfer and in turn it helps, in particular ward based staff, to determine the appropriate level of escort. This along with the STOP course has led to an improvement in the safety of transfer of acutely ill patients within our hospital.

REFERENCES. 1. Guidelines for the transport of critically ill adults. The intensive care society (2002)

2. Morgan RJM, Williams F, Wright MM (1997) An Early Warning Scoring System for detecting developing critical illness. Clin Intens Care 8:100

1162

INCIDENCE OF ACCIDENTAL EXTUBATION IN PATIENTS ON MECHANICAL VENTILATION IN THE ICU IN BRASÍLIA, BRAZIL

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OBJECTIVE. To investigate and analyze the events of accidental extubation in the Intensive Care Unit of Hospital Santa Luzia, Brasília-DF.

METHODS. The study was carried out from July 01, 2008 to December 31, 2008. In this period 864 patients were admitted and 178 of them were submitted to mechanical ventilation.

RESULTS. In this period 864 patients, 51.74% male and 48.26% female. There was a predominance of patients aged over 71 years (27.66%). Patients up to 20 years (18.63%) from 21 to 30 years (5.32%) from 31 to 40 (6.6%) from 41 to 50 (10.3%) from 51 to 60 years (14.47%) from 61 to 70 years (17.01%). The mean APACHE II index was 10 ($\pm$7.46) and mean SAPS II was 30.87 ($\pm$13.31). In this period, 178 (20.60%) patients were submitted to the mechanical ventilation. We observed 03 (1.68%) cases of accidental extubation. In none of the cases have required re-intubation. It was necessary to use noninvasive mechanical ventilation in O_2 patients only 01 situation the patient was in process of weaning. In O_2 cases there was failure to control the exchange of fixing the TOT and the other failed in containing the patient table of psychomotor agitation during the hygiene of nursing care. Only 01 case occurred in the night duty, which was found 100% occupancy of the ICU and a decrease in the number of nursing assistants by licensed health. There were no cases of death.

CONCLUSION. The monitoring conducted by the team of physiotherapy and the existence of routines for exchange of fixing endotracheal tube favors low incidence of adverse events of accidental extubation. Although there has been no cases of death, the search for preventive mechanisms confirms the quality of care.

1163

SAFETY "CHECK LIST" IN AN EMERGENCY AND TRAUMA INTENSIVE CARE UNIT OF TERTIARY UNIVERSITY HOSPITAL

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INTRODUCTION. "Safety Check List" is a simple medical tool that is used in high risk organizations. It's possible to work with it in other highly complex fields such as a critical care unit.

OBJECTIVES.

- To assess the starting of a safety tool: "safety check list"
- To detect events related-events to medication, airway and mechanical ventilation, devices, patient transferring, hypoglycemia, medical equipment, unexpected deaths and a delay in the data collection laboratory and patient hygiene.
- To promote the safety culture in our organization.

METHODS. This study has two parts:

A systematic study to collect the errors and adverse events by means of quality and safety tool ("check list").

Before-after study about the impact of "check list" on safety culture assessment with Safety Attitudes Questionnaire.

We use Trauma-Injury Severity Score (ISS–TRISS) methodology to assess the severity and survival probability in our patients. We considered the results on the anonymous events reporting, focal groups, medical literature review and the risk priority number of Failure Mode and Effect Analysis to decide the check list contents. The clinical trials scale on adverse events (Sociedad Española de Medicina Intensiva, SEMICYUC) for severity assessment. We established quality criteria for our safety reporting tools for the good working of our medical team and a good activities state.

Results are expressed as means (SD) and medians (interquartile ranges). Exploratory data analysis was conducted by tabulating data and conducting chi-square test to compare categorical variables. For comparison of group differences on continuous variables, t test was used.

RESULTS. During 6 months, a total of 161 patients were reported. The patients characteristic were: age 39 $\pm$ 17.3 years, 76.4% man, and ISS 24.9 $\pm$ 17. We recorded 249 shift of a total of 280 (88.9%). Briefing reporting time was 6.8 $\pm$ 4.2 min. Global events rate was 45.47/100 days of staylengs; this means 12.77/100 patients, avoidable in the most cases. According to the frequency of events, in order: medication-related, place and standing of device-related, care-related, airway and mechanical ventilation-related, and equipment-related. We found a statistically significant difference in shift between more adverse events and a greater work-load.

Some aspects of the safety culture were improved in a significant way. This was measured as the subjective perception for working in an active way in security, in the frequency of reported events and in the staff communication.

CONCLUSION. Safety "Check List", to handle the harm events, is a feasible tool, to use in a way easy for the ICU personal in contact with patients, with plenty capacity to have influence on the safety culture and improve the communication. Currently, this tool is part of the routine work in our intensive unit. This study is another step to assess the application of high risk industry tools on the health area.

1164

THE IMMEDIATE COMPLICATION RATES OF PERCUTANEOUS DILATATIONAL TRACHEOSTOMY (TRACOE®) ON A TERTIARY SURGICAL INTENSIVE CARE UNIT

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INTRODUCTION. Percutaneous dilatational tracheostomy (PDT) is undertaken in 16% of UK intensive care units to aid ventilatory weaning and reduce complications from prolonged tracheal intubation [1]. Previously reported major and minor complication rates have been 6 and 30% respectively and directly attributable deaths have occured [2, 3]. In 2002 we developed guidelines for Ciaglia Blue Rhino™ PDT and demonstrated a reduction in immediate complications compared to previous standards [2, 4].

AIMS AND METHODS. To prospectively audit the effect of an equipment change to Tracoe® in 2006. Our primary aim was to assess the immediate complication rates and compare to our previous case series [2, 4]. Our secondary aims were to assess the incidence of coagulopathy, incidence of bleeding in this group and the influence of correction of the coagulopathy on the incidence of bleeding. (Classification of coagulopathy: prothrombin time $\geq$16 s, activated partial thromboplastin time >39 s, platelets $<50 \times 10^9$/l). Complication rates were compared via X^2 test. Transfusion of blood products in coagulopathic patients and the effect upon the incident of bleeding were compared via the Mann–Whitney *U* test. ($p < 0.05$ was regarded as significant.)

RESULTS. 190 patients underwent Tracoe® PDT. There was no significant change in our complication rate ($p = 0.34$) but a significant reduction in complications compared to other centres persisted ($p = 0.007$) [2, 4]. Five patients (2.6%) suffered major complications; oxygen desaturation to <90% in 4 cases and placement of tracheostomy into the pre-tracheal fascia in one case; 20.5% ($n = 39$) suffered 42 minor complications: 31 episodes of minor bleeding, 9 difficult tube placements, 1 case of surgical emphysema and 1 case of air leakage. There was a significant increase in patients with coagulopathies ($n = 69$; $p = 0.004$) and significantly fewer (61% vs. 93%) had the coagulopathy corrected ($p < 0.001$.) There was a trend to an increased incidence of minor bleeding in this group ($p = 0.06$) that was not significantly influenced by transfusion of blood products ($p = 0.08$)

CONCLUSION. In conclusion the Tracoe® PDT is as safe as the Ciaglia Blue Rhino™. The transfusion of blood products did not influence the incidence of bleeding in this group; transfusion policy therefore requires further review [5].

REFERENCES. 1. The Trac-Man study. http://www.tracman.org.uk. Accessed April 2009
2. Fikkers BG et al (2002) Anaesthesia 57:1094–1097
3. Ryan D, Kilner A. (2003) Br J Anaesth 91:925–926
4. Cosgrove et al. (2006) Anaesth Intensive Care 34:1–5
5. Auzinger G et al. (2007) Critical Care 11:R110

1165

RED BLOOD CELL TRANSFUSION IN CRITICALLY ILL PATIENTS: PRACTICE IN A BRAZILIAN CENTER

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AIMS. This study aims to evaluate the practice of red blood cell (RBC) transfusion in an Intensive Care Unit (ICU) in Brazil, to compare it with the medical literature, and to identify factors associated with the clinical outcome.

METHODS. Retrospective study in a medical/surgical ICU in Brazil. The study period was between January 2007 and August 2008. Patients were included in the study 24 h after being admitted in the ICU. Medical and laboratory parameters were taken upon admission, during routine clinical examination, and upon discharge of each patient.

RESULTS. Of the 596 patients admitted in the ICU during the study period, 191 (32.04%) received RBC transfusions. Among these, the mean age was 67.5 ± 17.8 years. 61.3% ($n = 117$) of patients were female. The average APACHE II score was 15.5 ± 7.2. During their stay, 93 patients (48.7%) needed mechanical ventilation (MV), 99 (52.1%) were administered vasoactive drugs, and 55 (28.9%) developed acute renal failure and received hemodialysis. Sepsis occurred in 43.2% ($n = 82$) of patients. The mean hemoglobin level upon admission was 9.9 ± 2.2 g/dL, and the mean pre-transfusion hemoglobin level was 7.8 ± 1.3 g/dL. 65.96% ($n = 126$) of patients received more than one RBC unit (mean: 4.16 ± 5.64 RBC units). The main indications for transfusion were anemia (49.2%) and hemorrhage (30.9%). The average stay in the ICU was 20.58 ± 27.29 days. The mortality rate in the studied group in the ICU was 21.98% (42 patients). Independent factors related to ICU mortality were: hemodialysis ($p < 0.0001$), need of MV ($p < 0.0001$) and age ($p = 0.004$).

CONCLUSIONS. RBC transfusion is a frequent event in the ICU. The observed transfusion threshold was low when compared with the medical literature, indicating a restrictive transfusion strategy. Elderly patients, as well as those under MV and those submitted to hemodialysis showed a higher mortality rate.

1166

OUTCOME AFTER CARDIOPULMONARY RESUSCITATION IN INTENSIVE CARE UNITS—PRELIMINARY RESULTS

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BACKGROUND. Cardiopulmonary resuscitation (CPR) is often performed in Intensive Care Units (ICU). Even though arrests are monitored and response is immediate, patients are disadvantaged by severe medical conditions. Survival to discharge remains unsatisfactory low ranging from 3.1 to 16.5%. Therefore, it was the aim of this investigation to analyze survival rate after CPR in medical and surgical ICUs in a university clinic setting.

METHODS. The prospective investigation was approved by the Ethics Committee of the Medical University Vienna, Austria, and conducted at eight ICUs in 2007 and 2008. Eligible were all patients with at least one episode of cardiac and/or respiratory arrest requiring CPR. Patients in whom due to the unfavorable prognosis CPR was not initiated were excluded from the trial. The data was extracted from the existing IT-assisted documentation software. Survival rate to ICU discharge was chosen as primary and length of ICU stay as a secondary outcome.

RESULTS. In six surgical ICUs 1,805 patients were admitted over a period of 10 months. Twenty-six (1.44%) of these patients required CPR, 13 (50%) of those surviving to ICU discharge. In two medical ICUs 600 patients were admitted during the same period. Twenty-two (3.67%) required CPR, 8 (36.36%) surviving to ICU discharge. Median length of stay after requiring CPR was 20d (Q1:8 days; Q3:44 days) in surgical ICUs and 3d (Q1:1 days; Q3:16 days) in medical ICUs.

CONCLUSION. Even though patients suffering from cardiac arrest in an ICU setting are disadvantaged by severe medical preconditions, survival rates are higher than in other hospital settings. The increased rates can be explained by immediate response intervals resulting in minimal no-flow times and routine in performing CPR. Trials on neurologic outcome and quality of life after CPR at ICU should be encouraged.

SUMMARY. Cardiopulmonary resuscitation (CPR) is often performed in Intensive Care Units (ICU). Even though arrests are monitored and response is immediate, patients are disadvantaged by severe medical conditions. Eligible were all patients with at least one episode of cardiac and/or respiratory arrest requiring CPR. In eight medical and surgical ICUs, survival to ICU discharge after CPR was 36% in medical ICUs and 50% in surgical ICUs, being higher than in other hospital settings. Despite severe preconditions, survival rates can be explained by immediate response due to online monitoring and high quality of CPR.

1167

DISCREPANCIES BETWEEN CLINICAL AND POST-MORTEM FINDINGS IN CRITICALLY ILL PATIENTS: A 5-YEAR SURVEY

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INTRODUCTION. The autopsy has long been regarded as an important tool for clinical confrontation, education and quality assurance [1]. We investigated the correlation between the clinical diagnosis and autopsy findings in adult patients who died in our ICU during a 5-year period.

MATERIALS AND METHODS. We reviewed the clinical diagnosis of all patients who died in 2004–2008, in a medico-surgical 31-bed Department of Intensive Care and who underwent post-mortem examination. Comparisons between pre- and post-mortem diagnoses were classified according to the classification proposed by Goldman et al. [2].

RESULTS. Of the total of 1787 patients who died in the study period (13.2% of the total number of patients admitted), 643 (36%) had a post-mortem examination. Unexpected findings occurred in 128 (20%) patients, including class I in 7.8% (invasive aspergillosis, pulmonary embolism, myocardial or mesenteric infarctions, mediastinitis…), and class II in 12.2% (malignancy, cerebral hemorrhage, pancreatitis, cirrhosis…). The relative number of discrepancies was identical during the 5 years. There was no correlation between the discrepancies and the age of the patients, the length of ICU stay, or the decisions of withholding or withdrawing life-support.

CONCLUSIONS. Despite the development of modern diagnostic techniques, the incidence of unexpected findings with clinical significance remained stable over the last years. Post-mortem examination remains a valuable source of pertinent information that may improve the management of ICU patients.

REFERENCES. 1. O'Grady (2003) BMJ 327:802–803
2. Goldman et al (1983) N E J M 308:1000–1005.

Monitoring during mechanical ventilation: 1168–1181

1168

ULTRASOUND SLIDING SIGN SPECIFICITY IN ALVEOLAR-INTERSTITIAL SYNDROMES ON MECHANICAL VENTILATION

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INTRODUCTION. Low compliance pulmonary states on mechanical ventilation are exposed to volu-, baro-, bio-trauma. Pleural ultrasound with dynamic sliding sign in 2D mode (seashore sign in M-mode) is sensitive method for detecting anterior pneumothorax (PNX) but with poor visibility in present of elevated extravascular lung water (EVLW)—alveolar-interstitial syndrome (AIS). Sliding gives the security of PNX exclusion although typical artefacts for AIS, ultrasound lung comets (ULC) indicate expanded lung.

OBJECTIVES. We determined specificity of sliding sign in AIS in ventilatory settings.

SUBJECTS AND METHODS. Including criteria for AIS were at least two ULC in one intercostal space. 42 mechanically ventilated semiprone patients fulfilled criteria: 16 indistinct respiratory failures (ALI/ARDS with heart failure), 15 pneumonias (10 unilateral, 5 bilateral), 6 cardiogenic pulmonary edema and 5 obvious ALI/ARDS—altogether 74 hemithoraces. PNX was ruled out on anteroposterior chest X-ray (CXR) and the diagnose of AIS confirmed. Ventilation modes were BIPAP, PS or PPS by mean PEEP of 7 mbar (5–14 mbar). Ultrasound was performed with linear 5–10 MHz transducer. Three scans in 2D and M-mode in second and third anterior intercostal space and fourth or fifth axillary space in semiprone position on every hemithorax were proceeded in two times. First observing (222 scans) was inside an hour after starting mechanical ventilation and repeated between 2 and 72 h later but before delivered support has fallen under 10 mbar over PEEP (weaning time). Present ULC were not more including condition. Timing for second scanning in cardiac edema and ALI/ARDS was guided by clinical improvement, auscultation, better compliance (LIP-UIP shapes) and lower FiO_2, lowering EVLWI or PCWP, or lower CVP + tricuspidal gradient and LVEDP; pneumonias were scanned prior to lowering delivered pressure under 10 mbar over PEEP. PNX was again excluded by CXR.

RESULTS. Out of 222 scans first and second series showed 25.2 and 23.8% scans without sliding sign in 2D and 22.0 and 20.7% with absent or atypical seashore sign in M-mode respectively. 7 scans with invisible sliding but typical seashore sign were found in same intercostal spaces of both series. The highest rate of scans with invisible sliding was in patients with ARDS, the lowest in cardiogenic pulmonary edema. Most of undetected slidings were noticed in fourth or fifth intercostal space. ULC were still visible in second series in 94.6% regardless of expected lower EVLW.

CONCLUSION. Sliding sign gives the additional security for excluding anterior PNX in AIS on mechanical ventilation but is invisible in 25% scans. No significant difference in specificity was found between first and second scan timing when EVLW was expected to be lower. Method shows 75.5% specificity.

REFERENCE. 1. Lichtenstein DA (2005) General ultrasound. In: The critically Ill. Springer, Berlin

1169

PLEUROPULMONARY ULTRASONOGRAPHY IN ICU PATIENTS: IS IT FEASIBLE AND ACCURATE?

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AIMS. Investigation of the pleuropulmonary (PP) pathologies in ICU is based on clinical examination, chest X-ray which is poorly accurate and thoracic CT scan which has become the gold standard. However, its use is limited by the risks of intrahospital transport of patients, X-ray radiation and availability. PP ultrasonography (US) is an alternative. Technique and semiology of this exam is described and mastered by only few authors. The aim of this study was to evaluate diagnostic accuracy of PP US in an adult ICU without experience.

METHODS. We conducted a prospective observational study in an adult ICU of a general hospital during 5 months. All patients requiring a thoracic CT scan according to their physician in charge were included. A PP US was performed by the same operator before the CT scan was done and consisted in examination of 6 areas by lung. Semiological signs for pleural effusion (with quantification), alveolar consolidation and pneumothorax were recorded. The diagnostic performances were evaluated by calculation of sensitivity, specificity, positive and negative predictive values (PPV and NPV), positive and negative likelihood ratios (PLR and NLR) and diagnostic accuracy (DA) in comparison to the CT scan interpreted by a radiologist blinded of the US results. When possible, US was performed by two investigators blinded from each other for evaluation of interobserver agreement (Kappa coefficient).

RESULTS. 37 patients were included with a median (Q1-Q3) age of 61 [51–74], SAPS II 42 [36–62], SOFA 7.5 [4.75–10], 66% were mechanically ventilated. 45 thoracic CT scans and US of 533 pulmonary areas were performed. 65 cases of pleural effusion, 85 cases of alveolar consolidation and 6 cases of pneumothorax were diagnosed by CT scan.

TABLE 1 DIAGNOSTIC PERFORMANCES OF PP US

Syndrome	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	PLR	NLR	DA (%)
Pleural effusion ($n = 65$)	77	84	93	58	4.81	0.27	79
Pneumothorax ($n = 6$)	67	98	67	98	33.5	0.34	96
Alveolar consolidation ($n = 85$)	68	87	83	75	5.23	0.37	78

PP US was realized by 2 investigators in 12 cases corresponding to 133 pulmonary areas with a good interobserver agreement (Kappa coefficient between 0.72 and 0.8).

CONCLUSIONS. Even in an inexperienced ICU, PP US is feasible, reproducible, and may be accurate enough to reduce the need for thoracic CT scan. Diagnostic accuracy of PP US depends of the pathology considered. The best performances concern diagnosis and quantification of the pleural effusions.

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1170

CORRELATION BETWEEN VRI MEASUREMENT AND AIRFLOW RATE IN HEALTHY LUNGS

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INTRODUCTION. Correlation between sound amplitude and flow in healthy lungs has been reported but the relationship has not been firmly established. In the present study, we correlate sound energy data with airflow rate.

OBJECTIVES. To assess the correlation between airflow rate and lung sound energy as recorded with Vibration Response Imaging (VRI). To assess the effect of this relationship on normalized lung sound distribution maps.

METHODS. Hundred lung sound measurements were performed in 20 healthy adults using 40 piezoelectric sensors positioned on the posterior chest wall. Flow rates, varying between 10 and 50 L/min, were controlled using a pneumotach mouthpiece. Integrated lung sound energy was correlated to integrated airflow rate during inspiration.

RESULTS. A strong relationship ($R^2 = 0.97 \pm 0.04$) was obtained between lung sound energy and airflow rate raised to the third power. Only minimal changes were detected in corresponding normalized acoustic maps.

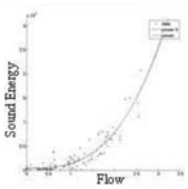

Fig. 1 Sound energy vs flow rate

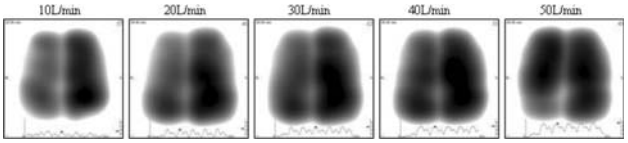

Fig. 2 Normalized sound distribution maps

CONCLUSION. Correlation between absolute sound energy and airflow rate does not affect the normalized VRI lung sound distribution maps.

1171

BEDSIDE INTERPRETATION OF FLOW AND AIRWAY PRESSURE WAVEFORMS TO DETECT PATIENT-VENTILATOR ASYNCHRONY: IS IT REALLY USEFUL IN THE DAILY CLINICAL PRACTICE?

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INTRODUCTION. Although commonly considered helpful for clinical identification of patient-ventilator asynchrony, the value of the interpretation of the airflow (Fl) and airway pressure (Paw) waveforms displayed on the ventilator screen in recognizing patient ventilator asynchronies has never been systematically evaluated.

AIM AND OBJECTIVES. To assess the ability of ICU physicians with different expertise in identifying asynchronous events (ineffective efforts, auto-triggering, and double triggering) during pressure support ventilation (PSV) through visual inspection of Fl and Paw waveforms.

METHODS. We submitted 43 5-minute reports of Fl-time and Paw-time plots to 20 physicians of our Intensive Care Unit (ICU), 10 in staff for a minimum of 3 years, considered expert (Ex), and 10 resident, considered non expert (n-Ex). All the physicians were requested to detect and mark the asynchronies identified. Their evaluations were compared with those of 3 independent observers who analyzed the same reports including, in addition to Fl and Paw, diaphragm electrical activity (EAdi) waveforms, as obtained through trans-esophageal electromyography (gold standard). Data were analyzed either per breath (BrA) and per report (RepA). Sensitivity (Sens), specificity (Spec), positive (PPV) and negative predictive value (NPV), and positive (PLR) and negative likelihood ratio (NLR) were determined for the overall group and for the Ex and n-Ex separately

RESULTS. Overall, PLR and NLR values indicated a relatively small efficacy of the Fl and Paw waveforms interpretation in detecting asynchronies both with RepA (2.34 PLR, 0.59 NLR) and BrA (2.98 PLR, 0.85 NLR). Compared to BrA, RepA resulted in higher Sens (0.55 vs 0.22 $p < 0.01$) and PPV (0.44 vs. 0.32 $p = 0.01$), but lower Spec (0.76 vs. 0.91 $p < 0.01$) and NPV (0.82 vs. 0.86 $p < 0.05$). With BrA, Sens (0.28 vs. 0.16 $p < 0.05$) was the only difference between Ex and n-Ex, while Spec (0.88 vs 0.93), PPV (0.31 vs. 0.32) and NPV (0.87 vs. 0.86) were not different. With RepA, only PPV (0.51 vs. 0.38 $p < 0.05$) was different between Ex and n-Ex, while Sens (0.63 vs. 0.46), Spec (0.76 vs. 0.75) and NPV (0.85 vs. 0.79) were not.

CONCLUSIONS. The ability to detect asynchronies through Fl and Paw waveforms visual inspection is overall low and of questionable clinical impact. The ability of Ex, as opposed to n-Ex, to detect asynchronies was only slightly increased. Our results suggest other signals reflecting respiratory muscle activity are necessary to properly detect patient-ventilator asynchronies at the bedside.

1172

RETROSPECTIVE AUDIT OF CHEST RADIOGRAPHS TO ASSESS ENDOTRACHEAL TUBE POSITIONING IN ICU PATIENTS—TIME FOR A SECOND LOOK?

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INTRODUCTION. In the ICU chest X-rays are mandatory post-intubation to assess endotracheal tube (ETT) placement. Malpositioned tubes may not always be detected clinically [1, 2, 3, 4]. Correct positioning is vital to avoid complications. Clinicians reviewing chest X-rays must be aware of criteria for determining correct ETT positioning. Correct placement of ETTs can be defined using Goodmans criteria (ETT tip lies 5 ± 2 cm from carina with head neutral [1]. If carina cannot be seen, thoracic vertebra may provide guidance; tip at level T3/T4 deemed safe [1].
METHODS. Retrospective audit in an ICU in a district general hospital. Data collection anonymised so ethics committee approval deemed unnecessary. ICU patients admitted and intubated from June to October 2008 were included giving a sample size of 54. Chest X-rays were reviewed by a Specialist Registrar in radiology who commented on: neck position-neutral/flexed/extended, ETT-high/low, ETT tip position from carina. Notes with malpositioned ETT were retrieved. Written documentation was analysed to see if: ETT position noted-correct/incorrect; documentation made regarding tube adjustment; repeat CXR requested.
RESULTS. 54 chest X-rays analysed, one excluded (paediatric patient).21 patients had incorrectly placed ETT (39.6%) on chest X-ray. 2 were high (3.8%) and 19 low (35.9%). Of the 21 notes requested, 20 were obtained. High ETTs were documented as such in the notes but none had repeat CXR requested or distance to advance ETT specified. In one instance the first anaesthetist reviewing the X-ray documented "tube OK."Only 22.2% of low ETTs were recognised. Distance for retraction specified in 75% of cases. 25% of ETTs were appropriately moved. There were 3 documentations of low tubes being "in situ", "in a good position".
DISCUSSION. Most chest X-rays (60%) performed to assess ETT placement show correct placement. When ETT was malpositioned (39.6%) the majority were low (90%) as opposed to high (10%); a finding supported by other studies [2, 5]. This audit illustrates that intensivists are more likely to detect a high tube (100% vs 21%). Incidence of missing incorrectly placed ETT was high when correlated with radiology. This audit reveals paucity of documentation in notes and highlights need for information dissemination regarding criteria of correct ETT placement.
REFERENCES. 1. Goodman LR, Conrardy PA, Laing F et al (1976) Radiographic evaluation of endotracheal tube position. Am J Roentgenol 127(3):433–432
2. Brunel W, Coleman DL, Schwartz DE, Peper E, Cohen NH (1989) Assessment of routine chest roentgenograms and the physical examination to confirm endotracheal tube position. Chest 96:1043–1045
3. Lotano R, Gerber D, Aseron C et al (2000) Utility of postintubation chest radiographs in the intensive care unit. Crit Care Med 4:50–53
4. Salem MR (2001) Verification of endotracheal position. Anesthesiol Clin N Am 19(4):813–839
5. Henschke CI, Paternack GS, Schroeder S et al (1983) Bedside chest radiography:diagnostic efficacy. Radiology 149:23–26

1173

THE ERASMUS INHOMOGENEITY INDEX: A NEW INDEX OF VENTILATION INHOMOGENEITY BASED ON OXYGEN WASHOUT CURVES

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INTRODUCTION. Mechanical ventilation can exaggerate lung damage and therefore individual titration of ventilator settings are of special importance. Bedside strategies guided by oxygenation indices are currently applied to prevent this lung damage in the individual patient, but are not sensitive in inhomogeneous alveolar ventilation. An inhomogeneity index of ventilation based on available oxygen washout measurements would help to improve ventilatory settings in the individual patient. The aim of this study was to develop a new oxygen based inhomogeneity index and evaluate this in a porcine ARDS model.
METHODS. The Erasmus Inhomogeneity Index (EII), an alveolar ventilation ineffiency index with a multiple compartment model was developed based on the oxygen washout curves provided by the existing LUFU lung volume measurement method (Dräger Medical, Lubeck, Germany). In this model tidal volume is divided over 2 parallel compartments with common dead space. In a homogeneous lung tidal volume is distributed equally (EII = 0), whereas in a non-homogeneous lung tidal volume is increasingly divided to one of the compartments (EII = 100). Lung volume (LUFU, Dräger Medical), dynamic compliance and arterial oxygenation were measured in 6 anesthetized pigs before and after induction of lung injury by oleic acid. The EII was calculated offline from the oxygen washout curves.
RESULTS. Induction of lung injury by oleic acid significantly increased the EI index from 43 to 73 (Fig. 1). End expiratory lung volume, dynamic compliance and arterial oxygenation were all decreased after oleic acid administration (Figs. 1, 2).

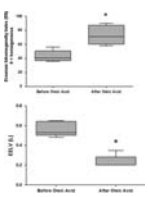

Fig. 1 EII and EELV

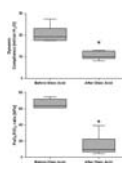

Fig. 2 Cdyn and PF

CONCLUSION. The new non-invasive inhomogeneity index based on oxygen washout can detect an increase in ventilatory inhomogeneity induced by oleic acid in a porcine ARDS model.

1174

MONITORING OF REGIONAL VENTILATION AFTER OPEN SUCTIONING AND PULMONARY RECRUITMENT IN POSTOPERATIVE PATIENTS BY ELECTRICAL IMPEDANCE TOMOGRAPHY (EIT)

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INTRODUCTION. Open suctioning procedure (OSP) may lead to a loss of end-expiratory lung volume (EELV) and an impairment of oxygenation due to alveolar derecruitment [1, 2]. Pulmonary recruitment (RM) and application of positive end-expiratory pressure (PEEP) can maintain EELV and oxygenation. Effects of OSP and RM can be monitored by global respiratory parameters, but little is known about regional effects on ventilation during OSP induced lung collapse and adjacent RM.

OBJECTIVES. The aim of the present study was to determine the change of regional ventilation in postoperative patients after OSP and the regional effect of lung recruitment using EIT [3].

METHODS. After approval of the local ethic committee 44 mechanically ventilated patients with normal lung function after cardiac surgery were studied (BIPAP, PEEP 10 cmH_2O, tidal volume 6–8 ml/kg KG). Functional residual capacity (FRC) was measured by oxygen washout technique. Baseline parameters of EIT and FRC were assumed before suctioning (T1). All patients were prospectively assigned into four groups by their FRC after suctioning (A: >94% of baseline; B: <94% of baseline) and randomization to a recruitment manoeuvre (A-RM, B-RM; PEEP 15 mbar, PIP 35–40 mbar, 30 s) or no recruitment manoeuvre group (A-NRM, B-NRM). EIT and FRC measurements were performed continuously. Measuring points were defined after OSP (14 F catheter, −200 cmH_2O, 20 s) (T2), after RM or NRM (T3), 30 min and 60 min after T3 (T4, T5). Four regions of interest (ROI) were chosen from off-line EIT analysis. A regional EIT-score was calculated, which incorporates the increase (+1) or decrease (−1) in regional ventilation within each ROI in comparison to EIT baseline data (T1).

RESULTS. In all patients a significant decrease in EELV occurred after OSP, which was pronounced in the dependent lung regions. There was no significant difference between the groups in the regional EIT-score at T2, whereby the EELV loss in the EIT corresponded well with the FRC measurement. After T3 A-RM and B-RM patients recovered significantly from the effects of OSP resulting in an even better ventilation distribution like prior to OSP (A-RM: $p = 0.013$[T5]; B-RM: $p = 0.023$[T5]). In NRM-groups there was no significant change in regional ventilation distribution after OSP until the end of examination (A-NRM: $p = 0.137$[T5]; B-NRM: $p = 0.276$[T5]). Regarding RM and NRM patients there was a significant difference ($p = 0.013$), which corresponded well with FRC, oxygenation and compliance.

CONCLUSIONS. The regional EIT-score is practical to describe changes in regional ventilation and matches with FRC, oxygenation and pulmonary compliance. Patients after cardiac surgery benefit from RM after OSP irrespective of the initial FRC. RM and PEEP after OSP lead to a long-term preservation of regional lung volume in lung-healthy patients.

REFERENCES. 1. Chest 125:1077–1080 (2004)
2. Crit Care Med 167:1215–1224 (2003)
3. Intensive Care Med 29:37–43 (2003)

1175

MAXIMUM INSPIRATORY PRESSURE AS A SURROGATE PARAMETER FOR THE DIAGNOSIS OF CRITICAL ILLNESS POLYNEUROMYOPATHY

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INTRODUCTION. Critical illness polyneuromyopathy (CIPNM) is the most common and precisely defined neuromuscular complication in ICU patients, presenting with extended skeletal muscle weakness resulting in prolonged weaning and potential increase in morbidity and mortality. The MRC (Medical Research Council) muscle strength scale has been used for the diagnosis of CIPNM, but requires patient cooperation and has significant intraobserver variability. By measuring Maximum Inspiratory Pressure (MIP), one can assess an important aspect of the respiratory component of muscle weakness, without relying on patient cooperation. The aim of our study was to explore the use of MIP as a surrogate parameter for the diagnosis of CIPNM.

METHODS. One hundred and forty-two consecutive patients with ICU stay ≥7 days (age 56 ± 20 years, 101 M/41 F) were prospectively included in the study. Apache II admission score was 16 ± 6 and duration of ICU stay was 26 ± 19 days. CIPNM was diagnosed with MRC muscle strength scale with a score of 48/60 being the cut off value for the diagnosis of CIPNM. MIP was measured with a unidirectional expiratory valve where low resistance was used to selectively permit exhalation while inspiration was blocked (Marini method). Statistical analyses employed independent *t* test, Spearman correlation and ROC curve analysis.

RESULTS. Fifty-six (56) patients could cooperate sufficiently in order to be evaluated with the MRC scale and 21 patients were diagnosed with CIPNM. Patients with CIPNM had a significant delay in weaning from the ventilator (11 ± 14 days vs. 3 ± 3 days, $p < 0.001$). MIP mean value in patients with and without CIPNM was 26 ± 14 cmH_20 vs 48 ± 13 cmH_20 ($p < 0.001$) respectively. A statistical significant correlation was found between the MRC scale and the MIP value ($r = 0.6$, $p < 0.001$). ROC curve analysis defined a value of 43 cmH_2O as the cut-off value for MIP towards identification of CIPNM, with an area under the curve of 0.75 (0.63–0.87), sensitivity of 70% and specificity of 73% for this special diagnosis. Patients with MIP ≤ 43 cmH_2O thereafter had a longer weaning period (8 ± 13 days) vs. patients with MIP > 43 cmH_2O (3 ± 3 days, $p < 0.05$).

CONCLUSION. Respiratory muscle strength as assessed by MIP was significantly lower in patients with CIPNM. The assessment of respiratory muscle strength by using bedside non invasive measurements in ICU patients, before they are able to cooperate sufficiently, could possibly be a method for early detection of CIPNM. Further studies are needed in order to evaluate the role of MIP for the diagnosis of CIPNM.

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1176

EVALUATION OF A METHOD TO QUICKEN THE CT-BASED QUANTIFICATION OF LUNG AERATION FOR THE ENTIRE LUNG

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INTRODUCTION AND OBJECTIVE. Lung aeration can be quantified from computed tomography (CT) scans. Specific subvolumes of lung aeration such as nonaerated or hyperinflated lung may help to better individualize mechanical ventilation. Potential clinical applications of such quantitative information are hindered by the time-consuming analysis of the CT slices covering the entire lung. This could possibly be improved by approaches using only a few representative CT slices. Due to the fact that previous studies comparing the results obtained from a reduced number of CT slices to those read from the entire lung were found not to agree consistently, we tested a novel method.

METHODS. Thoracic CTs taken from 130 patients were studied: 32 spontaneously breathing patients with normal lungs, 42 mechanically ventilated patients with normal lungs, and 56 mechanically ventilated patients with acute lung injury. The most extreme cranial and caudal CT slices were identified on the frontal topogram. Between them a further 8 evenly spaced CT slices were selected. These 10 CT slices were analyzed using standard segmentation and densitometry methods, and the results were extrapolated to the entire lung using a previously described method [1]. CT slices from the entire lung were analyzed for the purpose of comparison. Bland–Altman-Plots were used to assess the agreement between both methods. Results from the analysis of the CT slices from the entire lung are given as medians (extreme values).

RESULTS. In contrast to previous studies, we found an excellent agreement between the values calculated from a reduced number of CT slices and those obtained from the complete CT image set. Bias (limits of agreement) were 23 (−90 to 136) ml for the total lung volume (median 3846 (1304–6768) ml) and 7 (−39 to 54) g for the lung mass (median 960 (545–3019) g). Bias (limits of agreement) were −2 (−23 to 19) ml for the nonaerated (median 25 (2–1315) ml), −4 (−38 to 30) ml for the poorly aerated (median 196 (4–2026) ml), 28 (−63 to 119) ml for the normally aerated (median 3182 (763–5390) ml), and 0 (−36 to 37) ml for the hyperinflated (median 81 (0–2964) ml) lung subvolume. When these subvolumes were calculated as percentage of the total lung volume, bias (limits of agreement) were −0.1 (−1.1 to 0.9) % for the nonaerated (median 0.8 (0.1–51.5) %), 0.1 (−0.8 to 0.9) % for the poorly aerated (median 5.1 (0.9–43.6) %), 0.2 (−0.8 to 1.3) % ml for the normally aerated (median 85.0 (33.6–97.5) %), and 0.0 (−0.6 to 0.6) % ml for the hyperinflated (median 2.3 (0.0–48.1) %) lung subvolume.

CONCLUSION. The method evaluated in this work seems to be a promising approach to shorten the time required for the CT-based quantification of the aeration of the entire lung. It could thus aid the clinical application of quantitative analyses of lung aeration.

REFERENCE. 1. Rylander C et al (2005) Crit Care 9:R165–R171

1177

USE OF A MODIFIED NITROGEN WASHOUT/WASHIN TECHNIQUE TO MEASURE LUNG VOLUMES IN PIGS

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INTRODUCTION. Our group has recently demonstrated that lung gas volumes measured with a modified nitrogen washout/washin technique correlate well with those obtained with quantitative analysis of lung computed tomography (CT) in adult mechanically-ventilated lung-injured patients [1]. Whether this remains valid in case of smaller lung volumes, such as those of experimental animals or paediatric patients, is not known.

OBJECTIVES. To compare lung gas volumes measured with a modified nitrogen washout/washin technique with those obtained with quantitative analysis of lung CT, considered as the gold standard, in pigs.

METHODS. 18 mechanically-ventilated, sedated and paralyzed pigs (20 ± 2 kg) had their functional residual capacity (FRC) measured with a newly developed ventilator employing a modified nitrogen washout/washin technique [Engström Carestation, GE Healthcare]. They then underwent a lung CT scan during an end-expiratory pause, with no positive pressure applied. Each CT scan slice was manually delineated and gas volume (FRC) calculated with a custom-made software. Individual measurements obtained with the two methods were compared by Bland–Altman analysis and linear regression. Data are presented as mean ± standard deviation.

RESULTS. In the overall population, FRC calculated on lung CT scan was 326 ± 95 ml. Measurements obtained with the modified nitrogen washout/washin technique had an average difference of 28 ± 108 ml relative to those calculated on lung CT. Limits of agreement were −188 to 244 ml. Values obtained with the two techniques were significantly correlated (R^2 0.34, $p = 0.01$).

CONCLUSIONS. On average, lung gas volumes measured with the modified nitrogen washout/washin technique only slightly differed from those calculated on CT scan. Values obtained with the two methods were significantly correlated, but not as well as previously reported [1]. The small number of animals and the initial learning process might explain this preliminary finding, that remains under current investigation.

REFERENCE. 1. Chiumello et al (2008) Crit Care

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1178

ADJUSTED PAO_2/FIO_2 RATIO TO THE BAROMETRIC PRESSURE: BAROMETRIC PRESSURE—PAO_2/FIO_2

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INTRODUCTION. Several indexes have been used to describe hypoxemia; PaO_2/FiO_2 (PF) is one of the most frequently used due to its simplicity, and is the cornerstone of the definition of acute lung injury (ALI) and acute respiratory distress syndrome (ARDS). This definition cannot be applied at high altitude. Hyperbaric hypoxia is a phenomenon not considered in the definition of ALI/ARDS. Mexico City is located 2,235 m over the level sea with a Barometric Pressure (BP) of 580 mmHg. By applying the following formula: adjusted PF to Bp = Alveolar Pressure O_2 × PF/100, we get a PF 27% lower than that the one at sea level. In Mexico City we must consider PF from 145–217 as criteria for ALI and < 145 for ARDS.

METHODS. Prospective, longitudinal, and observational study of all patients admitted to the ICU from March 1, 2005 to March 31, 2007 requiring mechanical ventilation (MV) for more than 24 h. In order to evaluate utility of PaO_2/FiO_2 adjustment to BP (PB-PF), we divided patients in 2 groups: Group I, without acute respiratory failure (ARF) according to a PF before adjustment, and group II, without ARF after adjustment of PF to PB (PB-PF). Demographics were obtained at admittance, as well as PF ratio, presence or absence of ARDS, PEEP level, days with mechanical ventilation, complications associated with it, mean airway, peak inspiratory (PIP) and plateau pressures (Ppl), static compliance and FiO_2 levels.

RESULTS. We included 702 patients under MV, and of them, 634 had acute respiratory failure (ARF) as defined by a PF < 300, and 68 without ARF (Group I); but, when PF was adjusted, we found that 90 patients (15%) were incorrectly label as ARF (Group II); their real BP-PF was > 300. Patients without ARF were 158 instead of 68. Patients from group II ($n = 90$) had higher level of PEEP (5.12 ± 2.98) vs. 3.75 ± 1.63 of group I ($n = 68$), $p < 0.0001$; PIP has higher in group II (21.19 ± 5.59 vs. 17.69 ± 3.837 than group I, $p < 0.0001$; Ppl was also higher in group II (16.24 ± 4.93 vs 13.96 ± 3.24) $p < 0.005$; Static compliance and O_2 extraction were similar: 47.12 ± 17.05 vs. 44.9 ± 12.64, p NS and 54.13 ± 15.18 vs. 52 ± 14.19, p NS, respectively. Of all cases of barotraumas, there was none in group I, and 1.4% of all were in group II. Rest of them, was present only in ARF patients. There were no cases of self-extubation in group I and 15.7% of all, occurred in group II without reintubation in none of them.

CONCLUSIONS. PF can vary according to altitude; when categorizing patients with AHF, PF ratio is essential in the management of MV and PEEP, with elevation of pressures as a consequence, and barotraumas as a complication. 100% of complications in patients under MV without ARF were in the incorrectly label group. PF must be adjusted to PB.

1179

BEDSIDE MONITORING OF END EXPIRATORY LUNG VOLUME MAY BE INSTRUMENTAL IN OBTAINING OPTIMAL HEART LUNG INTERACTION DURING PEEP APPLICATION

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INTRODUCTION. In patients with acute respiratory failure, positive end expiratory pressure (PEEP)-induced change in lung volumes has been demonstrated to improve oxygenation, lung mechanics and heart–lung interaction. Recently, a new technology has been developed and validated to measure the end expiratory lung volume (EELV) at the bedside. In this study, PEEP-induced changes of EELV, compliance, oxygenation and right ventricle performance have been analyzed to identify optimal cardiopulmonary interaction.

METHODS. Six hemodynamically stable mechanically ventilated patients with acute respiratory failure underwent a decremental PEEP trial. Four levels of PEEP were given (15, 10, 5, and 0 cmH_2O). Each PEEP level was maintained for 30 min. At each PEEP level the following parameters were evaluated: (1) EELV by nitrogen washout/washin technique provided with the Engström Carestation ventilator (GE Healthcare, Madison, USA), which allowed the calculation of the compliance at each PEEP decrement: $(\text{compliance}_{EELV}) = (EELV_1 - EELV_2)/(PEEP_1 - PEEP_2)$; in all patients EELV has been normalized for the predicted body weight; (2) Ratio between PaO_2 and the inspired fraction of oxygen (PaO_2/FiO_2); (3) Echocardiographic index of the right ventricle (RV) performance, calculated as change in RV fractional area (RVFA = (RVDA − RVSA)/RVDA), where RVDA is the RV diastolic area and RVSA is the RV systolic area.

RESULTS. Data are expressed as mean ± SEM

TABLE 1 PEEP TRIAL

PEEP (cmH_2O)	15	10	5	0
ComplianceEELV (mL/cmH_2O)	0.44 ± 0.2	1.05 ± 0.3	0.95 ± 0.3	
EELV normalized for PBW (mL/kg PBW)	27 ± 2.9	25 ± 2.8	20 ± 2.9	15 ± 2.1
EELV (mL)	1751 ± 225	1603 ± 205	1250 ± 168	938 ± 105
RVFA (%)	0.33 ± 0.02	0.36 ± 0.05*	0.34 ± 0.03	0.32 ± 0.04
PaO_2/FiO_2	224 ± 49	250 ± 48	279 ± 53	188 ± 44

*multiple linear regression; $R^2 = 0.29$; $p < 0.05$

In all patients the EELV decreased with the reduction of PEEP from 15 to 0 cmH_2O. In each patient, the PEEP level resulting in the highest change of end expiratory volume (compliance_{EELV}) was associated with the highest value of right ventricle performance (RVFA). Moreover, a correlation between change in end expiratory lung volume (compliance_{EELV}) and change in the RV fractional area (RVFA) was found for each decrement of PEEP in every patient ($R^2 = 0.29$; $p < 0.05$). There was no correlation between EELV and PaO_2/FiO_2, or between change in end expiratory lung volume (compliance_{EELV}) and PaO_2/FiO_2.

CONCLUSIONS. Bedside measurement of end expiratory lung volume may allow to identify PEEP values resulting in optimal heart lung interaction in mechanically ventilated patients with acute respiratory failure.

1180

MONITORING INTRA-ABDOMINAL PRESSURE IN ARDS PATIENTS SUBJECTED TO DIFFERENT LEVELS OF PEEP, SEMI-RECUMBENT POSITION, AND PRONE POSITION

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INTRODUCTION. There is a high prevalence of intra-abdominal hypertension (IAH) in intensive care patients. In ARDS, the measurement of Intra-abdominal Pressure (IAP) could be important for a better interpretation of respiratory mechanics, and appropriate setting of the ventilator. Although prone position (PP) is considered simple and safe, it could be associated with an increase in IAP and potential adverse effects. The same applies to semi-recumbent position. We evaluated the changes of IAP in response to changes of body positioning, and different positive end-expiratory pressure (PEEP).

METHODS. Nine ARDS patients were included. The values for IAP in supine (head of the bed elevated to 0° and 45°), and PP, were registered at PEEP 5 and 15 cmH_2O, after 15 min in each position and level of PEEP. IAP was measured by the bladder pressure method. All patients were sedated-paralyzed, and ventilated in volume-controlled ventilation with TV of 6 ml/kg. FiO_2 and RR were adjusted to maintain O_2 sat $> 93\%$ and $PaCO_2 < 55$ mmHg. Respiratory mechanic and hemodynamic status were evaluated during the study. IAP values were compared with t test. $p < 0.05$ was considered statistically significant.

RESULTS. We analyzed 9 ARDS patients, mean age 60 ± 21 years (3 male), 5 medical—4 surgical admissions, APACHE II 22 ± 6, SOFA 11 ± 3, SAPS II 46 ± 10, 50 ± 18 h of mechanical ventilation (MV), PaO_2/FiO_2 168 ± 52, and Compliance 34 ± 5 ml/cmH_2O. Mean IAP was 11 ± 5 mmHg before the study. In supine, the effect on IAP showed a trend to significance when changing the position from 0° to 45° ($p = 0.058$). There were no differences when IAP was registered with PEEP 5 and 15 cmH_2O in supine position, either at 0° or 45°, ($p = 0.251$). Likewise, we did not find significant differences in IAP when comparing supine versus prone position for each level of PEEP ($p = 0.145$ for PEEP 5, and $p = 0.064$ for PEEP 15). We did not find difference in IAP between patients with primary vs secondary ARDS at PEEP 5 cmH_2O. Patients with secondary ARDS had higher levels of IAP than primary ARDS patients at 45° with 15 cmH_2O of PEEP ($p = 0.028$), and it was at limit of significance when we comparing these subgroups in prone at PEEP 15 cmH_2O ($p = 0.051$). Only patients who increased IAP > 5 mmHg at 45° with respect to 0°, showed a significant decrease on compliance (6 of 9 pts, from 38 ± 4 to 30 ± 4 ml/cmH_2O, $p < 0.012$). We did not find any significant variation in hemodynamic variables with the changes on IAP values.

CONCLUSIONS. The results obtained suggest that changes in position and PEEP, in ARDS patients produce at most mild changes in IAP. Secondary ARDS patients ventilated with 15 cmH_2O of PEEP in semi-recumbent position (and probably in prone too), exhibit higher IAP than primary ARDS patients. Semi-recumbent position can affect significantly the compliance when IAP increased >5 mmHg from 0° to 45°. However, larger studies would be needed to confirm these findings.

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1181

REGIONAL LUNG OPENING PRESSURES DETERMINED BY EIT FOR OPTIMAL PEEP ADJUSTMENT IN ALI

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AIMS. Positive endexpiratory pressure (PEEP) is applied in artificially ventilated patients with the intention to avoid the ventilation synchronous opening and closing of the alveoli. It is postulated that this cyclic recruitment and de-recruitment is one of the main causes of ventilator induced lung injury. Especially in patients with acute lung injury (ALI), an extremely inhomogeneous regional lung function can be found. Thus, regional differences exist in the onset of lung opening, leading to different regional time delay (RTD) in ventilation. Wrigge et al. have shown that RTD correlates with the regional lung function in an animal model of artificial intra- and extrapulmonary acute lung injury (ALI) and can be monitored by electrical impedance tomography (EIT) (Wrigge et al. Crit Care Med 36:903–909, 2008). We postulated that this time delay exists when different regional inspiratory pressure levels are needed to open up the alveoli.

METHODS. After ethical approval five lung healthy (age: 37 ± 16 years, height: 181 ± 8 cm, weight: 84 ± 11 kg) and 17 artificially ventilated patients (age: 58 ± 13 years, height: 176 ± 9 cm, weight: 79 ± 11 kg) with ALI were included. In these sedated and paralysed patients, a low flow inspiratory pressure volume manoeuvre with constant gas flow of 4 l/min starting at a PEEP level of 0 cmH_2O was realised. EIT examinations were performed using the Goe-MF II EIT device (Cardinal Health, Hoechberg, Germany). Electrical currents (50 kHz, 5 mArms) were applied through adjacent pairs of electrodes in a rotating mode. The EIT data were acquired at a rate of 25 scans per second. A back-projection image reconstruction procedure was used. Regional opening pressure was defined as the value of global airway pressure at the time point when the regional lung areas opened up. The regional opening pressures were compared with the point of maximal compliance change (Pmci,i) on the inflation limb of the pressure volume curve.

RESULTS. The linear regression analysis showed a good correlation between the opening pressure and RTD in all lung areas in the lung healthy group (ventral: $r^2 = 0.69$; middle $r^2 = 0.81$; dorsal $r^2 = 0.94$). In the ALI group, the following correlation coefficients were found (ventral: $r^2 = 0.66$; middle $r^2 = 0.23$; dorsal $r^2 = 0.56$). In all patients, there was a significant difference between the global Pmci,i (8.56 ± 2.97 cmH_2O) and the regional opening pressures measured by EIT (ventral: 3.57 ± 2.8; middle: 4.19 ± 2.16; dorsal: 6.07 ± 2.85 cmH_2O).

CONCLUSIONS. The linear correlation between regional opening pressure and RTD support our hypothesis that RTD is related to different pressure level needed to open up the regional lung areas. The knowledge of regional opening pressures allows the optimisation of PEEP during mechanical ventilation based on absolute pressure values.

Teaching to improve safety: 1182–1195

1182

EPIDEMIOLOGY OF CENTRAL VENOUS (CVC) AND ARTERIAL (AC) INTRAVASCULAR CATHETERS (IVC) IN INTENSIVE CARE UNITS (ICU). AGGREGATE DATA FROM TWO INTERNATIONAL MULTICENTRE TRIALS

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INTRODUCTION. Only indirect general epidemiological data about the characteristics of short-term IVC in large cohorts of critically ill patients have been published. This information may have important implications for future recommendations, training and design of quality improvement strategies and clinical research.

OBJECTIVES. Describe the characteristics, site selection and intended use of IVC in critically ill patients.

METHODS. Two randomized phase III trials compared omiganan 1% gel, a cationic peptide, with povidone-iodine 10% solution for prevention of catheter-related infection. The trials were performed in the USA (trial 1: 27 ICUs, 1449 patients, 2474 catheters) and in the USA, France, Spain and Germany (trial 2: 58 ICUs, 1859 patients, 3135 catheters), respectively. Results are presented as absolute numbers, percentages or mean (SD), if normally distributed

RESULTS. A total of 5609 IVC were studied in 3222 randomized patients. General characteristics of the population were:

TABLE 1 CHARACTERISTICS

	Trial 1	Trial 2	Aggregate
Age, years, mean (SD)	57.3 (17.64)	59.7 (17)	59 (17)
Sex, male (%)	55.8	60.8	58
Apache II, mean (SD)	13.9 (8.18)	14.6 (8.44)	14.4 (8.36)
28-day mortality, n (%)	187 (12.9)	329 (18.1)	516 (16.01)
Mechanical Ventilation (%)	58.2	70.2	66.7
Surgery (%)	72.9	77.6	77.5

67% of first and 63.8% of subsequent IVC were right-sided. 3830 (68.3%) of IVC were central venous and 1779 (31.7%) arterial. At admission to the ICU, 1805 (73.4%) of the first CVCs were triple lumen and 533 (21.7%) double lumen. Of all first CVC placed, 1325 (53.9%) were subclavian and 977 were (39.7%) jugular. Subclavian CVC were 1679 (43.8%) and jugular 1469 (38.4%) of all CVCs used during ICU-stay. 1428 (80.3%) AC were placed in the radial artery and 277 (15.6%) were femoral. The reasons for venous catheterization were infusion of medication and fluids (68.1%), venous access (9.7%), renal replacement therapy (7%), hemodynamic monitoring (6.6%), and total parenteral nutrition (2.6%). AC were inserted for hemodynamic monitoring (76.7%) and to draw arterial blood gases (21.5%). Per patient 1.8 ± 1.2 catheters were placed. Insertion was described as difficult (at least 3 attempts) in 6.5 and 9.7% of IVC in trial 1 and 2, respectively. Initial IVC were inserted in 5 different hospital units: ICU (2304), OR (1075), ER (121), Intermediate care unit (109), and general ward (198), and in other units (94). IVC were removed after a mean duration of 7.1 ± 4 days mainly for the following reasons: no longer necessary (55.2%), mechanical failure (7.8%), suspected local infection (2.5%), and suspected bloodstream infection (5.4%).

CONCLUSIONS. We provide reference data from a large IVC data base for future clinical quality improvement, training, and research activities. Of note is that in spite of current recommendations, only roughly 50% of CVC are placed in the subclavian vein.

1183

PROPOSAL OF A WELL-DEFINED, STEP-BY-STEP, SIMULATOR-BASED TRAINING MODEL FOR TEACHING ULTRASOUND-GUIDED VENOUS CANNULATION

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INTRODUCTION. Ultrasound (US) guidance is gaining wide acceptance as an essential tool for peripheral and central venous cannulation, and thus training issues are becoming of paramount importance. Hands-on sessions on inanimated phantoms have proven to be effective as a training tool. We propose a strictly standardized skills session for teaching US-guided venous cannulation, utilizing an inexpensive home-made simulator.

METHOD. This hand-on skills session is part of a complete protocol which includes frontal lessons, skills sessions and clinical training. This session utilizes an easy-to-make, inexpensive simulator consisting of a turkey paw or breast with a rubber tube inside, which—filled with coloured fluid—simulates a vein. The session is based on a step-by-step approach to the skills that the trainee must progressively achieve: each step includes tasks of increasing difficulty:

Step 1: probe orientation with both hands; short axis scan of the vein; recognition of image specularity after 180° probe rotation.

Step 2: hand stabilization so to avoid 'probe slipping' and to keep the vein in the centre of the monitor; static and dynamic evaluation of the vein (direction, diameter, depth, compressibility).

Step 3: 90° clockwise rotation of the probe, from short axis to long axis scan of the vein; pitfalls of long axis scanning.

Step 4: static visualization of the needle and its tip (both 'out of plane' and 'in plane'); pitfalls of needle tip visualization.

Step 5: dynamic visualization of the needle and its tip without venous target; the needle is pulled out of (and pushed into) the phantom under US control (both 'out of plane' and 'in plane').

Step 6: technique of US guided venipuncture, both in short axis scan (with the needle 'out of plane' or 'in plane') and in long axis scan (needle 'in plane'); pitfalls of the three procedures.

Step 7: technique of final venous cannulation; introduction of the guidewire and its visualization within the lumen (short axis and long axis scan); introduction of the catheter (through standard and modified Seldinger technique) and US visualization within the lumen (short axis and long axis scan).

RESULTS. This skills session is part of our training protocol for US-guided venous cannulation since 2006 and has been tested in more than 500 trainees. The quality assessment of this session has shown good comfort levels, good image quality, actual simulation of tissue density, adequate reaction to needle manipulation, low-stress training with the opportunity of multiple attempts, overall satisfaction and a high cost-effectiveness ratio.

CONCLUSION. Training on a home-made phantom is inexpensive, easily reproducible and comfortable for operators and may be exported to training for different US-guided invasive procedures such as drain placement or biopsies. Strict standardization of tasks and skill goals by means of a rationalized, step-by-step approach improves the outcome of the training.

1184

PROPOSAL OF A STANDARDIZED TRAINING MODEL FOR ULTRASOUND GUIDED INSERTION OF CENTRAL VENOUS CATHETERS

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INTRODUCTION. Ultrasound (US) guided insertion of central venous catheters (CVC) is widely accepted, but cannulation techniques and training issues are still controversial. We propose a training model based on a close standardization of the technique and of the teaching protocol.

METHODS.

1. Insertion protocol:
   (a) US evaluation of internal jugular vein (IJV) (ideally: depth <2 cm, diameter >5 mm, not collapsible during breaths, not medial to carotid artery) and subsequent choice between right vs. left IJV or between IJV vs. other veins.
   (b) Standardized technique of US guided venipuncture (see Table 1).
   (c) Intracavitary EKG guidance for intraoperative control and standard chest X-Ray for documentation of tip position.
2. Teaching protocol: 4 h of theory + 4 h of training on home-made simulators + 4 clinical procedures observed + 4 procedures performed under supervision + tutored learning curve with late audit.

RESULTS. The first 13 trainees have been enrolled in December 2008 and completed the training program in January 2009. Success rate at first attempt was 95% and complication rate was 0%. Failed attempts were mostly due to inability to visualize the needle during the procedure. All the trainees completed each procedure within the second attempt.

COMMENTS. US-guided CVC insertion is easy to learn when a standardized training is provided. This training program will be validated by an Italian panel of experts so to provide National training guidelines.

TABLE 1 STANDARDIZED TECHNIQUES OF US GUIDED VENIPUNCTURE

First choice:
Internal jugular (Low lateral approach)—Short axis—In plane
Other choices:
Brachiocephalic (Supraclavicular)—Long axis—In plane
Subclavian (Supraclavicular)—Long axis—In plane
Axillary (Infraclavicular)—Short axis—Out of plane
Axillary (Infraclavicular)—Long axis—In plane
Internal jugular (Axial approach)—Short axis—Out of plane
Short vs. long axis: US scan of the vein
In plane vs. out of plane: scan of the needle under US beam

1185

INCIDENCE OF THROMBOEMBOLIC EVENTS FOLLOWING CENTRAL VENOUS CATHETER INSERTION IN A TERTIARY CARDIOTHORACIC ADULT INTENSIVE CARE UNIT

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INTRODUCTION. There are around 200,000 insertions of CVC per year in the UK (JICS 9(3):228–231, 2008). Central Venous Catheters (CVCs) are widely used in critical patients for sampling, monitoring, pharmacotherapy and parenteral nutrition in critically ill patients. Thrombosis and sepsis are well recognised complications of CVC's. Less well recognised are the potentially more fatal sequelae of these clots which include pulmonary embolism (PE) and right heart thromboembolism (RHTE). Following the introduction of NICE guidelines recommending ultrasound guided CVC insertion diagnosis of CVC associated clots will inevitably increase potentially leading to changes in practice. Currently little information exists to guide clinicians in diagnosis and management of CVC-related thromboembolic complications.

OBJECTIVES. To measure the incidence of and ascertain the pre-disposing risk factors for CVC related thromboses. The primary endpoint is the CVC related thrombosis on discharge from AICU. Secondary endpoint is the prevalence of clinically manifest PE among the patients with CVC-related thrombosis, and whether any particular strategy reduced or prevented it.

METHODS. All patients admitted to a cardiothoracic tertiary referral centre Adult Intensive Care Unit (AICU) over a six month period will be included. USS of bilateral internal jugular and femoral veins is performed by trained medical staff on admission, each line change, line removal and on discharge. The presence and extent of clot are recorded along with patient demographics, pro-thrombotic risk factors, anticoagulation use and the number, type and use of lines in situ. Patients who develop a thrombosis will be followed up at 6 months to establish the development of any clinical or radiological evidence of a PE.

RESULTS. To date 60 patients have been included, 65% females 35% males with a mean age 59 years (range 40–80 years). Mean length of AICU stay 7 days (range 4–11). 91% of the cohort were admitted to the AICU post cardiothoracic surgery, and 8% were admitted for medical management. 8 patients (13%) have been identified with CVC-related thrombosis at present, of these patients 2 (25%) had risk factors for clot formation.

CONCLUSION. It is too early in this audit to draw any firm conclusions. CVC-related thrombosis remains a common feature of critical patient care and best practice needs to be standardised to provide optimum patient care and reduce complications from over or under treatment of this complication.

REFERENCES. 1. Randolph AG et al (1998) Benefit of heparin in central venous and PA catheters. A Meta-analysis of RCTs Chest 113:165–171

2. JICS 9(3):228–231 (2008)

1186

SUBCLAVIAN VEIN CANNULATION WITH THE PATIENT IN A SITTING POSITION: SAFETY AND INDICATIONS

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INTRODUCTION. Cannulation of the subclavian vein (SVC) is carried out routinely in ICU, normally in the supine position (SUPO). There are clinical settings in which lying the patient down could prove counterproductive.

OBJECTIVE. To assess the safety of SVC on patients in a sitting position.

METHODS. Clinical study conducted in two hospitals selecting at random whether the patient were to have the SVC carried out in the supine position (SUPO) or in a sitting position at 60 degrees (SIPO); all patients in a spontaneous ventilation and requiring a central line to be put in place were included in the study. Criteria for exclusion: general contraindications for SVC (coagulopathy, etc.), anticipated immediate need for invasive mechanical ventilation. The following clinical data was evaluated as variables before and after cannulation: arterial blood pressure (BP), respiratory rate (RR), heart rate (HR), PaO_2/FiO_2 (PF ratio), gasometry; any complications were recorded.

RESULTS. Of the 43 patients, SVC in SUPO was randomly selected for 15 patients and in SIPO for 28 patients. 14 doctors participated in the SVC. Only 3 times was it necessary to change doctor. Profile of the patients: 32.6% had chronic respiratory pathology (85.7% COPD); 53.5% presented with acute respiratory failure at the time of the SVC; 41.9% were on non-invasive ventilation (NIV). There were 3 pneumothorax (7%), and in 93% of the cases the subclavian artery was not punctured. In 93% the radiological position of the distal tip was correct. The respiratory condition of the patients in SUPO (vs. SIPO) was better: acute respiratory failure: 33.3% (vs. 64.3%); use of NIV: 33.3% (vs. 46.3%); RR pre-insertion: 20 ± 6 vs. 26 ± 6 ($P < 0.01$); RR post-insertion: 20 ± 6 vs. 25 ± 6 ($P < 0.05$); PF ratio post-insertion: 301 ± 98 vs. 214 ± 125 ($P < 0.05$); FiO_2: 33 ± 8 vs. 54 ± 28 ($P < 0.001$). There was no difference in the time taken to insert the central line. There was 1 pneumothorax in SUPO and 2 in SIPO.

CONCLUSIONS. SVC is usually carried out in SUPO, but in situations of respiratory failure, particularly with NIV, performing the procedure in SIPO can help to prevent a worsening of the patient's condition. SVC with the patient in a sitting position is a safe technique.

REFERENCE. 1. Suclavian central venous catheter placement, sitting position.

1187

PERCUTANEOUS DILATIONAL TRACHEOSTOMY, DO WE NEED BRONCHOSCOPIC ASSISTANCE?

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INTRODUCTION. Tracheostomy, as a means of airway access, is one of the oldest surgical procedures documented, dating back approximately 4000 years. Percutaneous tracheostomy (PCT) has become increasingly popular and has gained widespread acceptance in many ICU and trauma centers as a viable alternative approach. In some institutions, PCT has become the procedure of choice [1].

OBJECTIVES. To compare between the blind technique and the bronchoscopic assisted one regarding patients' safety.

METHODS. Prospective randomized observational study comparing the bronchoscopic assisted and the blindly inserted percutaneous dilational tracheostomy (PDT) using single dilator techniques. The study was conducted on 100 patients, 64 males and 34 female with mean age of 46 years. Patients with anticipated difficulty were excluded from the study. Bronchoscope was used in the blind group as a rescue method when tracheal cannulation could not be achieved after 2 trials. We used the single dilator Tracho set by 2 skilled physicians and 3rd physician on the airway to pull the tube out before tracheal puncture.

RESULTS. Among 50 patients underwent blind technique, 35 (70%) patients had a successful tracheal cannulation from 1st puncture, 15 (30%) from 2nd puncture, bronchoscope was not required in this group. No major complications (major blood loss that required blood transfusion, vascular injury, pneumothorax, pneumomediastinum) were reported among both groups. The mean procedure time starting from tube mobilization was 5 min in the blind group and 12 min in the bronchoscope group. Twelve out of 50 patients in the bronchoscope group had arterial oxygen desaturation that was responsive to increased FiO_2, no hypoxic events reported in the blind group during the procedure. Due to unavailability of the scope, bronchoscope group patients had a mean delay time of 1 day.

CONCLUSIONS. Blind PCT is at least as safe as bronchoscopic assisted one, no benefits offered from the later technique in our study. Furthermore, waiting for scope availability may delay the procedure and the scope may unnecessarily interfere with the patients' oxygenation.

REFERENCE. 1. Ciaglia P, Firsching R, Syniec C (1985) Elective percutaneous dilatational tracheostomy. A new simple bedside procedure; preliminary report. Chest 87(6):715–719

KEYWORDS. Percutaneous tracheostomy, Bronchoscope.

1188

INFLUENCE OF FIBEROPTIC BRONCHOSCOPY EMPLOYMENT ON VENTILATION PARAMETERS DURING PERCUTANEOUS TRACHEOSTOMY

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BACKGROUND. Routine employment of fiberoptic bronchoscopy (FOB) during percutaneous tracheostomy (PCT) has dramatically reduced the amount of complications and increased the safety of the procedure. At the same time, it was found that FOB employment may contribute significantly to hypoventilation and hypercarbia in the critically ill patients during the procedure. In this experimental study, we aimed to investigate the influence of FOB employment on ventilation parameters during PCT.

MATERIAL AND METHODS. Simulated trachea and training/test lung (model 56 011 adult TTL Michigan Instruments Inc.) were used for bench PCT performance. In the first series (fixed mechanical ventilation through endotracheal tubes (ETT) with 7, 8, and 8.5 mm internal diameter (ID) was performed during simulation of PCT by Griggs technique. In the second series, the same experiments were repeated with adult and pediatric FOB employment. In the third series, jet ventilation through ventilation catheter inserted in the ETT 7, 8, and 8.5 mm ID was used during simulation of PCT. The following parameters were registered: peak inspiratory pressure (PIP), tidal volume (V_T) and autopositive end expiratory pressure (autoPEEP).

RESULTS. Employment of adult FOB gave negative influence only in combination with ETT 7 mm ID. Measurements revealed quick and pronounce impact on PIP (rise to 80–85 cmH_2O), decrease of V_T (on 82%), and appearance of autoPEEP. At the same conditions, use of pediatric FOB resulted in acceptable changes of these parameters for ETT 7, 8, and 8.5 mm ID. Employment of jet ventilation was characterized by lower numbers of PIP and absence of autoPEEP in all sizes of ETT (7, 8, 8.5 mm ID)

CONCLUSIONS. Partial obstruction of ETT by FOB inserted for PCT guidance is the main reason for possible changes in ventilation parameters. Employment of adult FOB is limited by ETT 8 and 8.5 mm ID. Pediatric FOB must be used for 7 mm ID. Jet ventilation is possible to use during PCT with ETT 7, 8 and 8.5 mm ID.

1189

THE USE OF TWO-DIMENSIONAL REAL TIME ULTRASOUND (US) IMAGING DURING THE PERFORMANCE OF PERCUTANEOUS DILATATIONAL TRACHEOSTOMY (PDT) IN UK INTENSIVE CARE UNITS (ICUS)

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INTRODUCTION. Tracheostomy is a well-established technique of airway maintenance. It is performed using either "open" surgical or "semi-open" or "closed" percutaneous methods. In the semi-open technique, dissection is made onto the pre-tracheal tissue under direct vision, allowing vessel ligature. In the "closed technique", no dissection is undertaken other than skin puncture for the introducer needle. All can be associated with complications without planning.

Portable ultrasound (US) is widely available throughout ICUs in the UK In our ICU, pre-operative neck US is standard practice before PDT and mandatory when using a "closed" technique. It aids identification of normal structures and describes aberrant anatomy or vasculature at the operation site. Abnormal anatomy and vasculature increase the risk of complications during PDT [1].

OBJECTIVES. We sought to determine:

1. the usage of preoperative neck US when performing PDT in UK ICUs
2. the relative frequencies of "semi-open" vs "closed" PDTs
3. whether ICUs employing a "closed" PDT technique consider US mandatory, useful or not useful.

METHOD. An on-line survey was sent to 300 adult ICUs in the UK. Enquiries were made regarding the use of US and the method of insertion of PDT.

RESULTS. The response rate was 51% (152 responses).

The responses to our questions are depicted in Figs. 1 and 2.

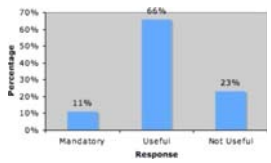

Fig. 1 Do you think a preoperative USS is mandatory, useful or not useful prior to PDT

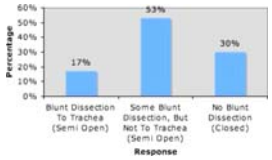

Fig. 2 Which of the following methods most closely describes your PDT insertion technique? 8% of respondents using a "closed" technique consider preoperative neck US mandatory. 70% believe it is useful and 22% consider it to be without benefit.

CONCLUSION. US is a widely available, non-invasive screening tool. Evidence suggests use prior to PDT can improve patient safety, nonetheless a wide diversity of opinion and practice exist within the UK. Several centres, even if practising closed PDT choose not to use it preoperatively.

REFERENCE. 1. Muhammad J (2000) Int J Oral Maxillofac Surg 29:217–222

1190

PATIENT SAFETY: EVALUATING ICU PHYSICIANS KNOWLEDGE ABOUT IMPORTANT DRUG–DRUG INTERACTIONS

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INTRODUCTION. Drug–drug interactions are prevalent in ICU environment and may cause harm to critically ill patients. The ICU multiprofessional team must have a comprehensive understanding about this important issue in order to conduct an appropriate diagnostic and therapeutic approach. There are few data about the knowledge that ICU physicians have about recognizing and handling the most significant of these interactions.

OBJECTIVES. This study was aimed at evaluating ICU physicians' knowledge about drug interactions.

METHODS. We surveyed ICU physicians with a 50-question questionnaire that was elaborated based on the work of our clinical pharmacy department and with a true or false design (T/F). At our unit the clinical pharmacist took part in daily rounds performing a complete analysis of the items prescribed in physician orders. This analysis was done with software (Epocrates Rx® drug reference). The drug interactions were identified and discussed by the ICU team to define the following approach to the patient. We have constructed a database of these interactions (from January 2006 to March 2009) that served as basis for our questionnaire. We have considered the aspects of frequency and potential severity as criteria for an interaction being included.

RESULTS. We surveyed 15 full time ICU physicians and we had no refusal to participate in the study. Of the respondents 8 had daily contact with an ICU pharmacist and were frequently exposed to clinical discussions about drug interactions. The general right answer rate was 60% (range 40–98%). When we considered only the drug interactions classified as moderate or severe by our database the right answer rate dropped to 56%. Among the most frequent interactions the rate was 57%. There was no difference when we compared true with false questions regarding the right answer rate. We identified 12 questions with very low scores; the right answer rate ranged from 20 to 46% (7T/5F) and they involved a wide variety of commonly prescribed ICU medications with potential effects over many physiologic systems.

CONCLUSIONS. Based on these preliminary data we have concluded that there is room for improvement regarding ICU physicians' knowledge about drug interactions and we have to do it if we want to deliver a safe and quality care to our patients. The clinical pharmacist as a member of the multiprofessional team is essential in support to clinical activities at the bedside, acting as a source of timely information and continuing education to all ICU professionals.

1191

THE "JULY PHENOMENON" IS IT ADMISSIBLE IN THE EMERGENCY ROOM OF A TERTIARY HOSPITAL?

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INTRODUCTION. The concept of increased medical errors in July, secondary to new housemen (the "July Phenomenon") often receives significant attention without supporting evidence.

TARGET. To determine if there exist differences at the initial evaluation of patients' severity represented in a resuscitation's room, which revenue is decided by a resident doctor in the position of triage, at the beginning and at the end of their second year of training, which we would name a July's Phenomenon.

METHOD. transverse observational study which includes all the patients who need (specific) assistance in the Resuscitation's Room of an Emergency Department from a tertiary hospital, during May (301 patients) and July (336) 2008, assessing the mortality and the final destination after evaluation. The months have been chosen for being the last and the first month of stay of second year residents in the position of classification (Triage).

OUTCOME. See Table 1.

TABLE 1 OUTCOME

	May (%)	July (%)
Age	58.3 ± 21.1	59.8 ± 20.4
Sex (male)	65.4	64.4
Sytoms		
Thoracic pain trauma	86/28.6% 42/	94 27.9% 50/
difficulty in breathing	13.9% 28/9.3%	14.8% 49/
others	145/48.2%	14.6% 143/
		42.7%
Final destination		
Observation room intensive	194/64.3% 38/	208/61.9% 45/
care unit coronary unit	12.6% 13/4.5%	13.4% 14/4.2%
stroke unit mortality	8/2.6% 27/	16/4.8% 31/
	8.9%	9.2%

CONCLUSIONS. The "July Phenomenon", while an interesting concept, still has limited data to support its existence. In our field, the acute score of patients who need specific assistance in the emergency room shows that it does not exist the "July Phenomenon" because at this level it exists attending supervision from experienced doctors.

1192

IMPACT OF AN EDUCATIONAL INTERVENTION IN THE ADHESION TO RECOMMENDATIONS OF HOSPITAL-ACQUIRED PNEUMONIA PREVENTION IN ICU

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INTRODUCTION. Hospital-acquired pneumonia is the most fatal of hospital infections, with mortality rates of 30–60%. Preventive strategies are described as one of the ways of controlling and restricting the consequences of hospital infections and of the pneumonia associated with this mechanical ventilation (VAP).

PURPOSES. This study is aimed at evaluating the impact of educational intervention on adhesion to the preventive measures of hospital-acquired pneumonia, according to criteria of the Central of Disease Control (CDC) to interrupt transmission from person to person, such as hygienization of the hands, use of barrier precautions, prevention of aspiration associated with enteral feeding, verifying the rates of pneumonia and VAP 3 months before and after educational intervention.

MATERIALS AND METHODS. Characterized as a quasi-experiment with historical controls. The population involved was nursing technicians and assistants, nurses and physiotherapist who worked in the morning and afternoon shifts in the intensive care unit (ICU) of Hospital São Vicente de Paulo (HSVP), observing the procedures conducted by these professionals, according to their functions. This study was developed in 3 phases: phase 1, evaluation before training ($n = 104$ evaluations); phase 2, educational intervention (2 trainings), the training being based on recommendations of the CDC on interruption of person-to-person transmission to prevent hospital-acquired pneumonia; and phase 3, evaluation 30 days after training ($n = 105$ evaluations), the same professionals, shifts and evaluation form of phase 1 being evaluated.

RESULTS. The professionals who conducted the most procedures were the nursing technicians and assistants. Comparing phase 3 to phase 1, one noticed adhesion with a statistically significant difference with ($p > 0.0001$) in hygienization of the hands, regardless of the use of gloves with water and soap (100%); in hygienization of the hands for several procedures in the ICU, which is now conducted with rubbing of all sides and spaces between the fingers; in the changing of gloves and hygienization of the hands; and in the creased use of raised headboard of the bed for patients with risk of aspiration pneumonia in 71% of cases. The rates of pneumonia and VAP remained stable when compared to pre-intervention.

CONCLUSION. Educational intervention proved to be an important measure for the use of preventive actions against hospital-acquired pneumonia, there being, generally, an important following of the training when evaluated in the short term, however verifying maintenance of the rates of pneumonia and VAP.

KEYWORDS. Educational intervention, Hospital infection, Rates of pneumonia.

1193

EVALUATION OF AN EDUCATIONAL PROGRAM ABOUT SEMI RECUMBENT POSITION IN THE PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA

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INTRODUCTION. Many strategies have been done to prevent ventilator associated pneumonia (VAP) and simple rules, such as maintainance of patients at semi recumbent position on the bed, intermittent sedation, daily assessment of readiness for weaning, prefer orotraqueal and orogastric tubes, oral hygiene and avoid gastric hiperdistension are related to VAP prevention.

OBJECTIVES. The aim of this study is to measure the angle of the bed's head before and after an educational intervention teaching about the importance of semi recumbent position of the patient on the bed.

METHODS. Initially the angle of the bed's head was measured with a standard drawing compass 10 times in each work turn (morning, afternoon, night) during 30 consecutive days in a ten bed ICU. After that, an educational individual program, involving all the ICU team, and teaching about the importance of semi recumbent patient position was done during the next 30 days and then, the angle of the bed's head was measured again once a week, in each work shift, for the next 3 months. The data were analized with Epi Info 3.3.2 program.

RESULTS. The educational program was developed during a one month period covering four groups of health care professionals who worked in different day and night shifts. Because educational program took place during work shifts, there was an excellent participation of all professionals, reaching more than 90% of attendance. 264 angles measurements were carried out at the baseline (before educational program) resulting in a mean of 29.8°. The angle's mean was 34.5° in the third month after the educational program. The angle of the bed's head increased significantly at the third month when compared to the baseline (29.8 vs 34.5, $p = 0.002$).

CONCLUSION. Educational programs can produce positive and long lasting results in optimizing the position of the patient and preventing VAP.

1194

INTENSIVE CARE NURSES KNOWLEDGE OF THE PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONİA

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AIM. To determine intensive care unit (ICU) nurses knowledge of evidence-based guidelines for the prevention of ventilator-associated pneumonia (VAP)

MATERIAL AND METHOD. A survey consisting of validated multiple-choice questionnaire is used to evaluate the ICU nurses knowledge of VAP prevention after personal data was taken as age, sex, duty at ICU, duration of intensive care experience, number of critical beds. The questionnaire of the annual congress of the Flemish Society for Critical Care Nurses (Ghent 2005) was used in the study.

RESULTS. 137 nurses were enrolled to the study. Eighty percent of the respondents recognized the oral route is the recommended way for intubation. It was known by 62.4% of respondents that ventilator circuits should be changed for each new patient. Heat and moisture exchangers were checked as the recommended type of humidifying system by 65.8% of respondents, 64.4% declared that 48 h is the recommended time to change it. Closed suctioning systems were identified as recommended system for suctioning by 74.4% of respondents and only 41% of them knew that these must be changed for each new patient only not day by day. Respondents' 32.2%, 43.6% respectively recognized subglottic drainage and kinetic beds to reduce the incidence of VAP and semi-recumbent positioning is known by 70.5% of them. There is no correlation on between nurses'years of intensive care experience and the knowledge level ($p = 0.12$).

CONCLUSION. ICU nurses lack of knowledge about the recommendations to prevent VAP was found. Continuing education at work is necessary to learn more and keep the attention to prevent VAP for all ICU nurses.

KEYWORDS. Ventilator Associated Pneumonia, Mechanical Ventilation.

1195

PRISMA AS AN INCIDENT ANALYSIS TOOL

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INTRODUCTION. Patient safety is a worldwide urgent topic. Annually 75.000 patients in The Netherlands suffer from an Adverse Event (AE). In 30.000 cases this was preventable. An estimated 1735 patients die due to preventable AE's.

Due to organizational and latent failures human factors contribute significantly in the cascade of error. Preventing AE's can be achieved by learning from errors and incidents. There are many incident analysis tools available. VU university medical center (VUmc) uses the PRISMA medical method. This model was developed at Eindhoven University of Technology by Van der Schaaf.

METHODS. PRISMA stands for Prevention and Recovery Information system for monitoring and Analysis. A key element of PRISMA is the system approach to failures and errors. Incidents are analysed in three steps. The incident is described in a causal tree. Root causes which have been identified are classified and linked by means of a theoretical model; the Eindhoven Classification Model (ECM).

In this model technical, organisational, human and external factors are investigated. The last step is implementing improvement measures based upon building a safe structure or system in which human factors are limited as a co-contributor in errors and incidents. The PRISMA method can be applied after a two day training.

RESULTS. Analysing incidents with PRISMA incorporates looking at all factors involved in AE's from system to human error. Traditionally, in many cases, errors are linked to human factors and not to system failure. Often resulting in blaming and shaming individuals. Van der Schaaf investigated 48 incidents with PRISMA after these were analysed by the Netherlands Health Care Inspectorate (IGZ). IGZ classified 70% as caused by human error and zero percent organizational based error after traditional analysis. Analysing root causes of the same incidents with PRISMA resulted in 40% human factors based and 40% organisational factors based errors. Up to seven root causes per incident were identified. Analysing a limited number of incidents at VUmc resulted in comparable conclusions and better founded improvement measures.

CONCLUSION. Multiple (root) causes contribute into the cascade of incidents and errors. Root causes are not always clear and visible. Applying the PRISMA method for analysing incidents improves the comprehension of incident cascade. Measures for improving patient safety can be better founded if root causes are clear. Reporting incidents is an important element of hospital safety management. Physician and nursing staff should be stimulated to report, analyse and discus errors and incidents in a blame free environment.