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ORAL PRESENTATIONS

A STUDY INTO THE NURSE'S ROLE AND RESPONSIBILITY IN THE DECISION-MAKING PROCESS ON LIFE-TERMINATING MEASURES IN NEW-BORN INFANTS

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Objectives: In the intensive care unit for ill new-borns far-reaching decisions are taken by doctors, nurses, and other practitioners. These decisions revolve around the health and death of new-borns who are highly dependent on the practitioners. Due to enormous medical-technical developments boundaries have been extended further and further over the past decade. Because of this the views on the preservation of life, the lengthening of life and the quality of life are under discussion. Nurses supposedly play an important role in the decision-making process. However, it is not clear what the implications of that role are.

Methods: Research was carried out among nurses working in the intensive care unit neonatalogy of the Wilhelmina Children's Hospital in Utrecht. Ten respondents who all had ample experience in decision-making processes on life-terminating treatment in new-borns were interviewed. Nurses told about their experiences with the decision-making process in the neonatal unit. The findings were analysed according to the stages as described by Maso (1994).

Results: The results of this qualitative study yielded two categories: 'representing' and 'supporting'. Within the category 'supporting' two subcategories arose, namely 'assisting' and 'taking care of '.

Conclusions: In the decision-making process the nurses mainly act as representatives. They also play an important role in the support process. They assist and take good care of parents and other persons involved. The representative role is essential to the decision-making process, while the supporting role can be regarded as being part of the job's profile of nurses in general and of pediatric nurses in particular. The intensity of the representative role is to a large degree related to the nurse's experience and position within the team which takes the decision.

OUTCOME AFTER CARDIAC ARREST IN A CARDIAC INTENSIVE CARE UNIT: RAPID RESPONSE EXTRACORPOREAL MEMBRANE OXYGENATION VS STANDARD RESUSCITATION

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Aim: To determine the effect of rapid response extracorporeal membrane oxygenation (ECMO) on survival rates and neurological status of children who have had a cardiac arrest in a cardiac intensive care unit.

Methods: Data was collected prospectively in 87 children who had a cardiac arrest > 3 minutes duration in a cardiac intensive care unit and who were considered to be ECMO eligible. Rapid response ECMO after cardiac arrest was available during normal weekday working hours, but not generally available out of hours. As a result, 34 patients received ECMO support within 2 hours of a cardiac arrest (ECMO group), and the remaining 53 patients received standard therapy (non-ECMO group). Outcome of the two groups were compared.

Results: A 44% (15/34) survival to hospital discharge was seen in the patients who received ECMO as compared to 39% (21/53) in the non-ECMO patients. Forty percent (6/15) of the ECMO patients had neurological abnormalities at discharge, 5 being mild and 1 with moderate disability. In the children who did not receive ECMO, 33% (7/21) had neurological abnormalities, 2 mild, 4 moderate and 1 with severe disability. The ECMO survivors had significantly longer durations of cardiopulmonary resuscitation, 15 ± 3 minutes Vs 8 ± 1 minutes in the non-ECMO group ($p=0.02$). ECMO also improved survival after multiple short cardiac arrests with a 69% (9/13) survival in the ECMO group compared to 13% (1/8) in the non-ECMO group, $p=0.03$. There was a higher incidence of complications in the ECMO patients, with 20% of patients requiring cardiac transplantation, 43% renal replacement therapy, 47% chest re-exploration for thoracic bleeding and 20% developed sepsis.

Conclusion: The use of emergent ECMO after cardiopulmonary arrest in the cardiac intensive care unit resulted in survival after significantly longer durations of resuscitation without increasing the incidence of moderate to severe neurodisability.

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THYROID FUNCTION DURING SEVERE MENINGOCOCCAL SEPTICAEMIA

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Introduction: Critical illness in children on the Paediatric Intensive Care Unit (PICU) with medical and surgical conditions has previously been associated with the sick euthyroid syndrome, a combination of normal thyroid stimulating hormone (TSH) land low triiodothyronine (T3) levels. [1, 2]. Our objective was to investigate whether septicaemia induces changes in thyroid function, which are different from those caused by other types of critical illness.

Methods: Patients admitted to PICU at Royal Liverpool Children's hospital were included. TSH, thyroxine (T4), T3 and thyroid binding globulin (TBG) levels were measured after admission. Levels were compared between patients with meningococcal septicaemia (MS) and controls without infectious disease.

Results: A total of 15 patients have been recruited. Five patients with MS and ten controls. 4/5 patients with MS were inotrope dependent and ventilated on admission. Controls were patients ventilated after major surgery (8) headinjury (1) and with upper airway obstruction (1). T3 was below normal range for age in all patients with MS and in 7/10 controls. T4 was below normal in 4/5 patients with MS and in 5/10 controls. All but one patient had normal TSH levels. T3, T4, TBG,T4/TBG ratio and TSH levels were not significantly different between cases and controls (p0.05 for all the above). The T3/TBG ratio was with a mean (SD) of 26 (27) pmol/mg significantly lower in patients with MS compared to controls (mean ratio 65 (31) pmol/mg) (p=0.03).

Conclusions: Thyroid function in children with meningococcal septicaemia is compatible with the sick euthyroid syndrome and similar to the one found in children on PICU without infectious disease. The depression of the T3/TBG ratio in meningococcal septicaemia. suggests a reduction in binding of T3 to thyroglobulin during this illness.

References:
1)Zucker AR et al: J Pediatr 1985;107: 552–4.
2)Ross OC et al. Intensive Care Med 2001;27:1124–32.

EFFECT OF TRAINING AND GUIDELINES ON INTER-OBSERVER AGREEMENT OF SCORING SYSTEMS IN ROUTINE USE

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Introduction: PRISM and PIM scores of all patients that are admitted to one of eight Dutch PICUs are registered in an national database. So far only centers that were closely involved in the development and validation of these scoring systems have published data regarding inter-observer reliability. To our knowledge no data assessing the reliability in routine daily practice have been published.

Objective: (1) To assess inter-observer agreement of the PRISM and PIM score in routine daily practice, (2) To evaluate the effect of strict guidelines and training on inter-observer agreement.

Methods: Copies of clinical records including data for PRISM and PIM scoring from 10 representative PICU patients were distributed to 27 physicians (9 registrars, 6 fellows, 12 intensivists) from five Dutch PICU's. All were asked to score PRISM and PIM as they were used to do in daily practice (T_0). Subsequently training sessions were organized in which guidelines, actual and possible misinterpretations of both scoring systems were presented and discussed. Thereafter PRISM and PIM of 10 other PICU patients were assessed by the same physicians (T_1). Inter-observer agreement of both T_0 and T_1 was determined based on mean, range, percentage exact agreement and intraclass correlation coeficients (ICC) from the total group of physicians and per qualification level.

Results: At T_0 low inter-observer agreements were found with ICCs varying from 0.24–0.73 (PRSIM) and 0.16–0.33 (PIM). At T_1 a significant improvement was found as indicated by ICCs that varied from 0.74–0.86 (PRISM) and 0.88–0.95 (PIM).

Conclusion: PRISM and PIM scores have been well developed and validated, however inter-observer reliability in routine daily practice appeared to be substantially lower that acceptable; the level of experience was not a relevant explication for this finding. With training and strict guidelines, significant and clinically relevant improvement was achieved. Similar situations where PRISM and PIM scoring is performed without assessment of inter-observer agreement may exist in European PICUs. Consequently the results of this study should urge to implement training and strict guidelines.

	Before training (T_0)				After training (T_1)			
	PRISM		PIM		PRISM		PIM	
	ICC	95%CI	ICC	95% CI	ICC	95% CI	ICC	95%CI
Total (n=27)	0.51	0.32-0.78	0.18	0.08-0.46	0.80**	0.65-0.93	0.89**	0.80-0.97
Residents (n=9)	0.24*	0.07-0.57	0.33	0.14-0.65	0.77**	0.59-0.94	0.88**	0.77-0.96
Fellows (n=6)	0.40	0.16-0.73	0.33	0.11-0.67	0.74**	0.51-0.91	0.95**	0.89-0.98
Intensivists (n=12)	0.73	0.57-0.91	0.16	0.11-0.39	0.86**	0.73-0.95	0.88**	0.76-0.96

* p<0.05 for comparison with intensivists at T_0
**p<0.05 for comparison of T_0 and T_1.

SEPSIS WITH PULMONARY HYPERTENSION: DO NOT FORGET VIRUSES!

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Case: We propose the case of a neonate born by caesarean section at 36+5weeks gestation after her mother underwent an appendectomy for suspected appendicitis. During the first 24 hour of live she developed septicaemia with pulmonary hypertension, DIC and purpura fulminans. Her condition deteriorated despite antibiotics, inotropic support, adequate ventilation, iNO and prostacyclin-infusion and she died at the age of 36 hours before ECMO could be initiated. Tracheal aspirate and faeces grew echovirus type 11 as did a maternal faeces sample.

Discussion: Neonatal echo-virus 11 infection can present with severe sepsis-like illness, with hepatitis or hepatic necrosis, disseminated intravascular coagulation and extensive hemorrhagic manifestations which is often fatal. Pulmonary hypertension has been described as well. A careful history of maternal illness is important for the diagnosis. The short incubation period of enteroviral infections and the distinctly seasonal prevalence should be taken into consideration.

Conclusion: With this case we would like to attend again to viruses as possible cause of sepsis in neonates.

CLINICAL DETERMINANTS OF MECHANICAL VENTILATION IN INFANTS WITH RESPIRATORY SYNCYTIAL VIRUS LOWER RESPIRATORY TRACT DISEASE

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Introduction: RSV is the most important cause of viral respiratory tract infections in infants and young children. Approximately 5 – 35% of hospitalised infants is admitted to the paediatric intensive care unit (PICU) with severe lower respiratory tract disease (LRTD) necessitating mechanical ventilation. It is hypothesized that RSV-LRTD can be divided into bronchiolitis and pneumonia/ARDS.

Objective: (*i*) is it possible to categorize infants in bronchiolitis or pneumonia/ARDS upon PICU admission employing clinical data and respiratory indices, (*ii*) is it possible to predict upon PICU admission the duration of mechanical ventilation?

Methods: Demographical and clinical data from infants younger than 12 months of age with a virologically proven RSV infection admitted to the PICU of the Wilhelmina Children's Hospital in the period between 1996 and 2001 were retrieved. The oxygenation index (OI), ventilation index (VI), arterio-alveolair oxygen gradient (A-a gradient), PaO_2/FIO_2 ratio and PaO_2/alveolair PaO_2 (a-A ratio) were determined. Patients with more than one pulmonary infiltrate on chest radiograph were classified as pneumonia. Statistical analysis comprised of linear and logistical regression analysis and χ^2 test where applicable. A $p < 0{,}05$ was accepted as statistically significant.

Results: 22 Children were classified as having pneumonia/ARDS and 42 bronchiolitis. After multivariate analysis, only the A-a gradient (318 ± 167 torr versus 220 ± 117 torr, $p = 0{,}05$) were significantly different between the two groups. Duration of mechanical ventilation was comparable (12.1 ± 7.2 days for the pneumonia/ARDS group versus 10.7 ± 5.5 dagen for the bronchiolitis group). Only decreasing age upon PICU admission was independently associated with prolonged mechanical ventilation, where all respiratory indices were unpredictive.

Conclusion: The arterio-alveolar oxygen gradient is the only independent discriminant between RSV pneumonia/ARDS and bronchiolitis in ventilated infants. The duration of mechanical ventilation is independent of disease type and can only predicted by age upon PICU admission.

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TEMPORAL NUTRITIONAL AND INFLAMMATORY CHANGES IN CHILDREN WITH SEVERE HEAD INJURY FED A REGULAR OR AN IMMUNE-ENHANCED DIET

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Aim: To compare nutritional and inflammatory indices in 40 children with severe head injury fed an immune enhancing (IE) or a regular formula modified for critically ill children (RF).

Methods: Feedings were advanced to a target volume of energy intake equal to ½, 1, $^5/_4$, $^6/_4$ and $^6/_4$ of the predicted basal metabolic rate on days 1–5. Nutritional indices, Nitrogen Balance (NB), Interleukins (IL) 1b, 6, 8, TNF-α, survival, length of stay (LOS), of mechanical ventilation (LOMV), and protein-energy balances were compared between the two groups.

Results: Feeding discontinuation for more than one day did not differ between the IE and RF groups (6.7% vs. 15.4%). Nosocomial pneumonia (47% vs. 46%), survival (80% vs. 95%), LOS (16.7 vs. 12.2 days) and LOMV (11 vs. 8 days) did not differ between groups. Twenty four-hour NB became positive in 30.8% of patients in the RF group and in 69.2% of patients in the IE group by day 5. Group IE showed a better non-significant improvement of NB, Zn, Cu, RBP, but not of transthyretin. Significant were the incremental trends of differences of osmolality ($p<.05$), Na ($p<.02$), urea ($p<.02$), creatinine, and triglycerides for group IE. Despite temporal incremental trends of CRP (87[tmsnew]177[/tmsnew]31 vs. 46[tmsnew]177[/tmsnew]16 mg/ml) and IL-1b (1.5[tmsnew]177[/tmsnew]1.5 vs. 3.9[tmsnew]177[/tmsnew]3 pg/ml) in groups IE and RF, levels of IL-8 (-7[tmsnew]177[/tmsnew]9 vs. -4[tmsnew]177[/tmsnew]3 pg/ml) and IL-6 (-9.3[tmsnew]177[/tmsnew]8.4 vs. -15[tmsnew]177[/tmsnew]8 pg/ml) decreased in both groups. In multivariate regression analysis, only IL-8 among cytokines was independently negatively correlated to immunonutrition ($r=-.40$, $p<.04$).

Conclusion: Immunonutrition has a favorable influence on NB and nutritional indices in children with severe head injury, better than the one of a regular diet, followed by decrease of IL-6 and especially IL-8. Also, compared to a regular diet, it exerts a significant impact on the metabolic profile but does not improve outcome.

RISK FACTORS ASSOCIATED WITH CLINICAL OUTCOME AFTER INVASIVE MENINGOCOCCAL DISEASE IN CHILDREN AND ADULTS

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Objective: To determine risk factors associated with clinical outcome after invasive meningococcal disease (IMD) in children and adults. To reevaluate the accuracy of two prognostic scoring systems, the Rotterdam score and the Niklassen score.

Design: Multicenter retrospective cohort study.

Setting: PICU's and ICU's of community and tertiary hospitals of West-Austria.

Patients: 126 children and adults were included consecutively admitted to PICU's and ICU's with confirmed IMD from 1993 – 2002.

Interventions: Clinical and laboratory data obtained at admission were analysed for risk factors associated with clinical outcome. Clinical outcome was determined with the Glasgow Outcome Scale (GOS) scored at day of hospital discharge. Univariate analysis was applied to identify predictors of clinical outcome.

Measurements and results: Overall mortality was 11,1%. Variables of prognostic significance regarding clinical outcome were imaging studies of the brain with pathological substrate ($p=0,002$), blood cultures positive for Neisseria meningitidis (N. men. $p=0,011$) and low systolic blood pressure on admission ($p=0,007$). Laboratory values associated with adverse clinical outcome included low leucozyte count ($p=0,026$), low platelet count ($p=0,003$), low potassium ($p=0,045$) and a more negative base deficit ($p=0,014$). The Rotterdam Score ($p=0,007$) and the Niklassen Score ($p=0,042$) were reconfirmed.

Conclusions: New variables (Imaging studies of the brain with pathological substrates, blood culture positive for N.men.) are found to be of prognostic significance. Prognostic scoring systems (Niklassen Score, Rotterdam Score) may be used to predict clinical outcome. Other variables previously published (leucocyte count, platelet count, potassium levels, base deficit, blood pressure e.g.) displayed correlation with clinical outcome and were therefore reconfirmed.

SURGICAL STRATEGIES FOR NECROTIZING ENTEROCOLITIS: AN INTERNATIONAL SURVEY

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Aim: Controversies exist in the surgical management of necrotizing enterocolitis (NEC). We have carried out the first international survey on NEC to characterise the variation in surgical management.

Methods: A questionnaire was sent to 140 consultant paediatric surgeons in 15 countries, 74% were completed.

Results: 1) Variation in management: Duration of antibiotic treatment varies between surgeons (median 10 days, range 2–21) as does time until commencement of enteral feeding (median 10 days, range 2–21). Absolute indications for surgical intervention include: pneumoperitoneum (peritoneal drain 56%, laparotomy 78%), failure of maximal medical therapy (peritoneal drain 17%, laparotomy 72%), fixed loop on X-ray (peritoneal drain 7%, laparotomy 40%) and abdominal mass (peritoneal drain 1%, laparotomy 35%). Ten percent of surgeons sometimes consider patients too unwell for peritoneal drain compared with 89% who consider them too unwell for laparotomy ($p<0.0001$). 2) Peritoneal drainage is used by 95% of surgeons. Thirty-eight percent use it in neonates of all weights, whilst 38% restrict its use to those weighing <1000g. It is used for stabilisation by 91% and as definitive treatment by 61%. Six percent would never perform a delayed laparotomy after peritoneal drain. 3) Laparotomy: Operations performed include diverting jejunostomy (49% in <1000g and 47% in >1000g), resection and stoma (86% in <1000g and 90% in >1000g), resection with primary anastomosis (54% in <1000g and 74% in >1000g; $p=0.005$) and 'clip and drop' (37% in <1000g and 35% in >1000g).

Conclusions: There is considerable variation in surgical strategies amongst different surgeons, some of which are not supported by published literature. Peritoneal drain is commonly used with controversial indications and expectations. The usage of resection and primary anastomosis is influenced by the weight of the neonate.

WORK OF BREATHING DURING HIGH-FREQUENCY OSCILLATORY VENTILATION AND SPONTANEOUS BREATHING

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Introduction: Maintenance of spontaneous breathing during conventional mechanical ventilation improves ventilation perfusion matching and prevents respiratory muscle weakness resulting in shorter stay in the ICU. Our clinical experience is that spontaneous breathing during high-frequency oscillatory ventilation (HFOV) in large paediatric and adult patients leads to discomfort caused by an increased imposed work of breathing (WOB) and considerable changes in mean airway pressure (MAP). HFOV in these patients is only well tolerated when patients receive deep sedation or even muscular paralysis. We performed a series of bench test experiments to assess the changes in MAP and measure imposed WOB during HFOV.

Methods: Tidal volumes of 100, 200 and 400ml were generated by a computer controlled test lung which was connected to a 3100B HFOV ventilator (Sensormedics co, Yorba Linda, CA). Ventilator settings were: MAP 23 cmH_2O, oscillatory pressure 0 and 50 cmH_2O, frequency 6 Hz and bias flow 20 respectively 60 l/min. Flow at the airway opening and pressure within the test lung was measured with a Florian respiration monitor (Acutronic, Baar, Switserland). MAP was measured using the 3100B airway pressure monitor. Imposed WOB was computed from the inspiratory phase of the intrapulmonary pressure/volume changes.

Results: Imposed WOB ranged from 0,3 - 2,0 J/l, increasing significantly with higher tidal volumes and lower bias flow. Maximal changes in MAP were ± 20 cmH_2O. The magnitude of these changes was related to tidal volume and inversely related to bias flow.

Conclusions: Spontaneous breathing resulted in a considerable imposed WOB for the higher tidal volumes explaining the discomfort seen in large paediatric and adult patients during HFOV. MAP changes make ventilator adjustments and settings difficult. These findings suggest the need for a device that modifies bias flow based on patients needs allowing spontaneous breathing during HFOV.

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ASSESSMENT OF SEDATION IN CRITICALLY ILL NEONATES DURING MUSCLE PARALYSIS: A CONTINUOUS NURSING CHALLENGE?

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Introduction: Assessment of sedation during neuromuscular blockade (NMB) in critically ill neonates is hardly investigated and hard to evaluate rendering awareness as a major concern. For assessment of adequacy of sedation physiological signs such as hypertension or tachycardia are often used. An objective measurement of depth of sedation in paralysed children is potentially the Bispectral index monitor (BIS). In this study, we address the effectiveness of BIS monitoring during NMB in neonates.

Methods: BIS is a relatively new approach for assessment of effects of sedatives and anaesthetics on the brain. It uses an electroencephalogram (EEG) to quantify the hypnotic effects of anaesthetic drugs. The monitor displays a number ranging from 98 (fully awake) to 0 (iso-electric). BIS values above 60 are recognised to be an indication of recall.

Results: Of nine neonates, median age and weight were respectively 1 day and 3700 grams, median duration of NMB was 50 hours. Diagnoses were congenital abdominal wall defect (3), congenital diaphragmatic hernia (1), meconium aspiration syndrome (2), pulmonary hypertension (2) and oesophageal atresia (1). All neonates received midazolam i.v. (median of 0,15 mg/kg/h) and morphine iv (median of 15 mcgr/kg./h) during NMB. Six neonates received vasopressor drugs, dopamine of norepinephrine for example, during NMB. During NMB, the intra-individual correlations of BIS and HF ranged from 0.54 to 0.32 and for BIS and MAP correlations ranged from 0.58 to 0.28. In two neonates, BIS levels were above 60, together with high HF and MAP values, during X-rays.

Conclusion: The correlation between BIS, HF and MAP were highly variable in this study, potentially due to vasopressor drugs. Assessing sedation during NMB remains difficult until new techniques such as Auditory Evoked Potential and BIS have proven their validity in this patient group.

CHANGES IN QUALITY OF LIFE OF PICU SURVIVORS

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Background: After a progressive decrease in PICU mortality rates in the last decades more attention is being directed to evaluate morbidity and health related quality of life (HRQOL) of survivors to paediatric intensive care (PIC). In order to evaluate the changes in HRQOL of patients submitted to PIC we launched a project in three major Portuguese PICUs.

Material and Methods: HUI3 is a 40 items HRQOL questionnaire about 8 attributes (Vision, Hearing, Speech, Ambulation, Dexterity, Emotion, Cognition, Pain) and the score varies between -0.36 and 1.00. If changes between questionnaires were >0.05 patients "Improved", between -0.05 and 0.05 had "No change" and

Results: From the 1279 admissions (01/May/02 to 30/Apr/04), 1004 were excluded due to age(841), death in PICU(44) or miscellaneous causes(119). In 62 cases, the time since admission was less than 6 months. Six months after the admission, 168 (out of 213) patients were interviewed. Only one patient died in this time interval. Most of the children "Improved"(31%) or had "No change"(25%) in their overall HRQOL index. The most affected attributes were Cognition(35%;14%), Emotion(32%;23%) and Pain(19%; 28%), respectively for worsening and improvement of attribute. Evaluation by diagnostic group (Trauma, Elective postoperative and Others) showed a "Worsened" HRQOL in 73%, 34% and 30% patients, respectively ($p<0.001$).

Conclusions: Changes are more frequent in attributes of Pain, Cognition and Emotion but this could be due, at least in part, to a more subjective evaluation from proxies. Most of the children admitted to PICU maintain or improve their HRQOL justifying the high costs associated with their care.

INCREASED LEVELS OF CARDIAC TROPONIN-I AFTER PAEDIATRIC CARDIAC SURGERY: THE CONTRIBUTION OF THE SURGICAL INSULT

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Background: Cardiac Troponin-I (cTnI) is a specific marker for myocardial injury and significant elevations are reported after paediatric cardiac surgery. Several factors are associated with myocardial injury such as aortic cross clamp, hypothermia, reperfusion injury, myocardial preservation, the systemic inflammatory response from cardiopulmonary bypass (CPB) and ventriculotomy. We have observed that the peak level of cTnI is associated with the type of surgery performed and we hypothesised that this is the most important factor determining postoperative elevated cTnI.

Methods: We retrospectively studied 144 consecutive paediatric patients (aged 5 days to 15,6 years), who underwent surgery for various congenital heart anomalies. These procedures were divided into the following 4 categories according to the surgical insult to the myocardium: extracardiac, atrial, septal and ventriculotomy. The level of cTnI was measured on admission to the intensive care unit and 4 and 8 hours thereafter. Duration of CPB and aortic cross clamping and the lowest temperature during CPB were also recorded as possible confounders. Regression coefficients were determined for the relationship between the peak level of cTnI (after logarithmic transformation) and the different categories, with and without adjustment for the confounders.

Results: The cTnI levels varied from 3.7 tot 250 mcg/l (median 35.2). The mean peak values of cTnI for the 4 categories were respectively 21 (sd 19), 31 (sd 29), 58 (sd 42) en 121 (sd 52) mcg/l. Categories 3 and 4 showed significant regression coefficients in the crude analysis (categories versus cTnI) with relatively small changes after adjustment for the confounders (extended analysis).

Conclusion: The postoperative peak level of cTnI is mainly determined by the surgical insult, with the highest levels occurring when the ventricular septum and wall are involved. Studies using cTnI to demonstrate the cardioprotective effect of interventions should be controlled for the type of surgery.

PERFORMANCE OF FOUR ALGORITHMS FOR PROBABILITY OF DEATH IN PORTUGUESE PICU'S

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Background: algorithms of probability of death (POD) have been used worldwide to evaluate quality of care delivered by PICUs. Nowadays there are two main algorithms systems, namely PRISM and PIM, each with an original and a recalibrated version (PRISM/PRISM-III and PIM/PIM2). Since March 2002, we have been collecting data from three major PICUs in Portugal to evaluate the performance of POD algorithms in our population.

Material and Methods: gender, admission outcome, diagnostic group and all data required to calculate PRISM, PRISM-III(12h) and PIM, were prospectively collected from all admissions between 01/May/02 and 30/Apr/04. Since 01/May/03 we also collected data to compute the PIM2. PRISM, PIM and PIM2 were calculated according to the algorithms published in the literature. PRISM-III(12h) was computed using PICUEs 3.2.3 software. Discrimination was assessed through the area under the receiver operating characteristic curve (ROC) and calibration through the Hosmer-Lemeshow Chi-square statistic and standardised mortality ratio (SMR).

Results: each PICU contributed with a similar number of patients (396, 345, 412), totalising 1153 admissions. Median age was 41 months and 46% were male patients. Median length of stay was 2.7 days. Mortality rate during PICU stay was 10%. The results for PRISM, PRISM-III(12h), PIM and PIM2 were respectively: ROC(CI95%) - 0.89(0.85–0.92), 0.90(0.87–0.93), 0.83(0.79–0.87) and 0.89(0.84–0.93); Hosmer-Lemeshow Chi-square statistics (8df) – 25.5($p=0.001$), 40.1($p<0.001$), 35.5($p<0.001$) and 25.3($p=0.001$); and SMR - 0.87, 1.16, 1.49 and 1.74.

Conclusions: discrimination between death and survival was good for all algorithms, but calibration was poor for all of them, being best for PIM2 and PRISM. The opposite direction of SMR in these two algorithms make difficult to choose which performs best in the Portuguese population. These results, associated to the trend shown in recalibration of PRISM and PIM, makes us believe that case-mix is an important factor to consider when evaluating POD models.

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USEFULNESS OF A SEDATION ALGORITHM FOR CRITICALLY ILL CHILDREN

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Introduction: Optimal sedation of critically ill children should preferably be performed by a treatment algorithm based on systematic assessment of sedation. In November 2002 an algorithm was introduced on our PICU. With this sedation protocol, nurses are authorised to titrate sedatives independently. The aim of this study was first to evaluate adherence to the treatment algorithm, and second to determine the clinical usefulness of the protocol according to caregivers on the PICU.

Methods: A prospective observational study. Sedation scores were obtained in a random sample of patients on the PICU from December 2003 until March 2004. COMFORT-'behavior' scale and the Nurse Interpretation Sedation Scale (NISS) were used to assess sedation in individual patients. A questionnaire was executed to assess nurses' and physicians' attitude regarding the utility of the sedation protocol.

Results: Thirty children were included to evaluate the treatment algorithm. A total of 649 paired COMFORT-'behavior' and NISS scores were obtained. Patients were well sedated in 578 (89.1%) observations, and medication was left unchanged in majority of these observations. In 56 (8.6%) assessments , infants were considered undersedated with a median COMFORT 'behavior' of 20 (range15–28). In these undersedated infants, additional sedatives were administered in 66% (37/56) of the observations. Non-pharmacological interventions were preformed in the rest. Oversedation was observed 15 times (2.3%) and in 53.3% of those cases continue sedatives were decreased. The questionnaire was returned by 4 physicians and 26 nurses of the PICU. The response rate was 60%. A large majority (96.2%) of the respondents considered the sedation protocol understandable and 88.5% considered it useful for clinical practice. Sixty-two percent believed the protocol improved the quality of care.

Conclusions: The findings of this study suggest that implementation of a sedation protocol is feasible in daily clinical practice of nursing.

NON INVASIVE POSITIVE PRESSURE VENTILATION IN A PAEDIATRIC INTENSIVE CARE UNIT

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Non-invasive ventilation (NIV) has become a standard for the treatment of acute respiratory insufficiency (ARI) in adults. Application of the technique in paediatrics arises many difficulties regarding the size of the material, ventilator trigger sensibility and compliance to the interface by the child. We apply NIV in our Paediatric Intensive Care Unit (PICU) since 2000 and review our results hereby.

Objective: To evaluate retrospectively the benefit of NIV on ARI in children

Method: all patients admitted in the PICU between 2000 and 2003 for acute respiratory insufficiency and treated by NIV with 2 levels of pressure (excluding CPAP) were included. Two types of ventilators were used (BiPAP STD 30 Respironics and VPAPII ST Resmed) according to the age of the patients.

Results: Fifty-two children with a mean age of 5,5 years and median age of 3,5 years were treated by NIV for ARI. Before starting NIV, the parameters recorded showed a mean respiratory rate of 40 $\pm$ 15 cpm, pH of 7,32 $\pm$ 0,11, PCO2 of 61 $\pm$ 21 mmHg, SpO2 of 90 $\pm$ 14%, heart rate 137$\pm$ 35. NIV was applied for a mean time of 76,8 hours $\pm$ 87,3 h (median 48h) with facial mask in 38 children (75%) and nasal mask in 14 children (25%). PH, PaCO2, respiratory frequency and SpO2 decreased significantly after one hour of NIV. Failure of NIV occurred in 10 children (19%) who needed intubation (3 of them died eventually from ARI or from the underlying diseases). Two children were weaned rapidly because they were uncomfortable but did well without mechanical support.

Conclusion: Significant decrease of hypercapnia and hypoxia occurred one hour after starting NIV and was sustained thereafter. NIV is a valuable technique to treat acute respiratory insufficiency in children. This technique permitted to avoid intubation in 75% of our cases.

INFLUENCE OF APOLIPOPROTEIN E GENETIC POLYMORPHISMS ON AGE-SPECIFIC SECONDARY PHYSIOLOGICAL DERANGEMENTS AND OUTCOME FOLLOWING CHILDHOOD TRAUMATIC BRAIN INJURY

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Aims: We aim to determine the influence of apolipoprotein E (APO E) genetic polymorphisms on the amount of age-specific secondary physiological derangements and outcome following childhood traumatic brain injury.

Patients and Methods: A prospective case-control study is carried out on 65 critically-ill head injured children and 160 age matched healthy active controls. APO E genotyping was done on DNA extracted from buccal smear. Acute minute-by-minute physiological data was downloaded from the bedside monitors of the head injured children to identify the frequency and durations of age-specific derangements such as raised intracranial pressure (ICP), low cerebral perfusion pressure (CPP), and pyrexia. Outcome was assessed at 6 months post injury using the modified Glasgow Outcome Score (GOS). APO E genotype was then correlated with secondary physiological derangements and outcome category using multivariate logistic regression modeling.

Results: The distribution of APO E genotypes was similar between the controls and head injured children but a significantly higher proportion of APO E e2 allele was identified when compared to previous data available for the general population and adult head injury studies. 13 of the 16 children with APO E e2 allele made a good recovery (GOS 4 and 5) at 6 months post injury. No APO E e2 homozygous had a poor outcome (GOS 1 – 3). 14.38% of the controls possessed APO E e4 allele and a significantly higher percentage (37.5%) of APO E e4 allele was found among those head injured children with a poor outcome. Children with APO E e4 allele had significantly more frequent and longer durations of ICP, CPP and pyrexia derangements ($p<0.01$) than children without APO E e4 allele.

Conclusion: Possession of APO E e2 allele is associated with better recovery following childhood head injury while children with APO E e4 allele have significantly more age-specific derangement following head injury.

CHANGES IN THE INTERLEUKIN 6/ SOLUBLE INTERLEUKIN 6 RECEPTOR AXIS MAY MODULATE CARDIOVASCULAR DYSFUNCTION IN MENINGOCOCCAL SEPTIC SHOCK

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Aims: Meningococcal septic shock is associated with profound depression in cardiac contractility, which is closely linked to disease severity and outcome. We have shown that IL-6 is a mediator of myocardial dysfunction in meningococcal septicaemia[1]. IL-6 exerts many of its effects via the soluble IL-6 receptor (sIL-6R). By facilitating the activity of IL-6, it is likely that alterations in sIL-6R levels could affect severity of septic shock. We investigated changes in IL-6 and sIL-6R levels in meningococcal septicaemia, and their relationship with disease severity.

Methods: Blood samples were obtained from 82 children with severe meningococcal disease on admission to PICU. These were analysed for serum IL-6 and sIL-6 receptor levels by ELISA. Disease severity of was recorded by PRISM score and inotrope requirement.

Results: Acute meningococcemia is associated with reduction in sIL-6R levels. sIL-6R returned to normal in recovery. Mean levels of sIL-6R were 6,309 pg/ml in acute disease, compared to 20,330 pg/ml in convalescence and 18,720 pg/ml in healthy controls. IL-6 levels were increased in acute disease (mean of 52,780 pg/ml) but undetectable in convalescence and healthy controls. There was positive correlation between sIL-6 levels and inotrope requirement ($p=0.01$), while the inverse was true for sIL-6R ($p<0.05$). Patients with more severe disease (PM50) had higher IL-6 and lower sIL-6R than patients with mild disease (PM <10; $p<0.05$)

Conclusions: Changes in the levels of IL-6 and sIL-6R may affect the severity and progression of cardiovascular failure in acute meningococcemia. Reductions in circulating sIL-6R may be due to its downregulated production, in order to dampen the effects of massive IL-6 release in severe sepsis. A more detailed understanding of the IL-6/sIL-6R axis is required to open the way for treatments to reverse sepsis-associated cardiomyopathy by inhibition of IL-6 activity on the heart.

1. Pathan N., et al. Lancet. 2004 Jan 17;363(9404):203–9.

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HYPERGLYCAEMIA IS ASSOCIATED WITH INCREASED MORBIDITY AND MORTALITY IN NEONATES WITH NECROTIZING ENTEROCOLITIS

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Aim: Recently the importance of immuno-hormonal interactions has been described in critically ill adult patients. Maintaining blood glucose levels below 11.9mmol/l using insulin appears to improve morbidity and mortality. The aim of this study was to investigate the relationship between glucose levels and outcome in neonates with necrotizing enterocolitis (NEC).

Methods: All glucose measurements (n=6508) in 95 neonates with confirmed (Bell stage II or III) NEC admitted to the surgical intensive care unit (ICU) were reviewed. Maximum glucose concentration during admission (G_{max}) was determined for each infant and correlated with outcome. G_{max} is expressed as mean ± SEM. Statistical comparisons were made using Students t-test, Fisher's exact test and by linear regression.

Results: Mortality: thirty-two infants died (34%). Treatment was withdrawn within 24 hours in 11 infants with pan-intestinal NEC and gangrenous intestine. These infants were excluded from the analysis. Eleven infants died within 10 days of admission to the ICU and 10 died after >10 days. Mean G_{max} in the 11 infants who died at <10 days (11.2±12.37mmol/l) was significantly lower than those who died after >10 days (18.48±1.95mmol/l), p=0.03. The late (>10 days admission) mortality rate was significantly higher in infants with G_{max} >11.9 mmol/l (27%) than those with G_{max} <11.9 mmol/l (2%), p=0.0005. Length of stay: median length of stay was 9.3 days. More infants with G_{max} >11.9 mmol/l required a stay of >10 days compared with those with G_{max} <11.9 mmol/l (79% vs 29%, p<0.0001). Linear regression analysis indicated that G_{max} was the only independent factor significantly related to length of stay (p<0.0001).

Conclusion: In infants with NEC admitted to intensive care, hyperglycaemia is associated with an increase in late mortality and longer intensive care stay. Aggressive glycaemic control may improve outcome in this group of infants.

THE USE OF PHYSICAL RESTRAINTS IN PICU

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Introduction: Physical restraint techniques may be used in the critical care environment to prevent treatment interference and to protect patients in some circumstances; primarily to prevent self-extubation. The use of such techniques is not without risk to psychological and physical wellbeing, and remains controversial. The American College of Critical Care Medicine has recently produced clinical practice guidelines in this area. We have conducted a survey to define the current clinical practice in the United Kingdom.

Methods: A postal questionnaire was sent a named senior nurse on all 32 UK PICUs identified through the Paediatric Intensive Care Society. Questions involved the use of physical restraint techniques, specifically manual holding of patients, the use of cross-joint splints and of tying wrists to bedframes. Consent issues surrounding the use of physical restraint techniques were also addressed.

Results: We received responses from 28 units (88%) of whom 19 (68%) said that physical restraint techniques were used. Ten units (36% of those responding) reported the use of manual holding of patients, 14 units (36% of those responding) reported the use of cross-joint splints while one unit secured wrists to bedframes with 'posey' restraints. Verbal consent was obtained by 53% of units prior to the application of physical restraint techniques, no units obtained written consent.

Conclusion: The majority of UK PICUs currently use physical restraint techniques, most commonly using cross-joint splints. There is a clear lack of prospective, high quality evidence of the relative risks and benefits involved in physically restraining critically ill children and how these techniques fit into a comprehensive programme of analgesia and sedation.

DECREASED IGG ENDOTOXIN IMMUNITY IS ASSOCIATED WITH THE SYSTEMIC INFLAMMATORY RESPONSE SYNDROME IN POST OPERATIVE & HEAD INJURED PAEDIATRIC INTENSIVE CARE PATIENTS

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Aim: To determine if low antibody to endotoxin core (EndoCAb) is associated with a greater incidence of the systemic inflammatory response syndrome (SIRS) in patients admitted to PICU.

Introduction: The systemic inflammatory response syndrome (SIRS), which may lead to organ dysfunction, can be caused by a variety of clinical scenarios in critically ill patients, including major surgery and trauma, infections, neurological injury, burns, and pancreatitis. Endotoxin, found in the outer membrane of gram-negative bacteria, may be an important trigger of the systemic inflammatory response syndrome. Humans have natural antibodies directed against the core of endotoxin (EndoCAb), levels of which vary greatly between people. These antibodies appear to protect against complications in adults undergoing surgery and those with sepsis *[1].*

Methods: Serum was obtained prospectively from 142 consecutive patients admitted to a 22 bed tertiary referral PICU with 1 organ system failure for >12 hours. Patients were classified on admission to PICU as having infectious or a non-infections diagnosis. The occurrence of SIRS within 48 hours of admission was defined using standard criteria. Detailed clinical and demographic data were recorded.

Results: Overall, there was no significant difference in IgG or IgM EndoCAb between patients who subsequently developed SIRS. However, in those patients admitted without infection (postoperative and head injured) IgG EndoCAb was significantly lower in patients who developed SIRS than those who did not (72 vs 131 Mu/mL; p=0.012 in a Mann-Whitney U test). This was independent of age and sex.

Conclusion: Low serum IgG endoCAb levels are associated with an increased incidence of SIRS in post operative & head injured patients.

CURRENT INTERNATIONAL PATTERNS OF PROPOFOL USE IN PICU

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Introduction: In 2001 the UK Medicines Control Agency and Committee on Safety of Medicines (CSM) repeated advice that propofol was contraindicated in children aged 16 years and under when used as an infusion for sedation. They also stated that propofol was not recommended for sedation for procedures in children.

Methods: We have conducted an e-mail based questionnaire to examine the current patterns of propofol use within Paediatric Intensive Care Units (PICUs) in the United Kingdom and in North America. We contacted all UK PICUs and those PICUs in North America offering training fellowships.

Results: We received responses from 15 UK Units (75%) and 33 units in North America (52%). Amongst those units responding, 47% of UK units used propofol for ongoing sedation, compared to 61% of North American units. Units frequently used propofol in defined clinical circumstances, in limited doses, in older children and for short periods only. Propofol was used for sedation during procedures in 100% of units although 35% of UK units said that they would use it less frequently in this setting than in the past. Only 18% of North American Units reported that they would be less likely to use propofol for procedural sedation than in the past.

Conclusion: Despite clear warnings from the CSM propofol is still used for ongoing sedation in 47% of UK PICUs responding in this study. Reasons for this include the unique profile of the agent and the clear paradox involved in its licensing for use in maintaining general anaesthesia in children over 3 years of age, but not for sedation in PICU in similar doses, for similar periods, in the same children.

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