

## ACCIDENT AND EMERGENCY/INTENSIVE CARE

### G1 EVOLUTION OF AN ACUTE SHORT STAY UNIT – CLINICAL AND ORGANISATIONAL IMPACT ON SECONDARY MEDICAL PAEDIATRIC CARE FOR A LARGE SOCIALLY DEPRIVED POPULATION

Beattie JO\*, Robertson L, Ford JA *Departments of Emergency Medicine\* and Medical Paediatrics, Royal Hospital for Sick Children, Yorkhill NHS Trust, Glasgow G3 8SJ*

**Setting:** In addition to providing tertiary paediatric services for over 600,000 children, our children's hospital provides all acute secondary paediatric care for a local population of around 200,000 children (0-14y). These children come from one of the most socially deprived areas of Western Europe.

**Aims:** This paper describes the clinical and organisational impact on secondary acute medical paediatric care after introduction of a ten-bed Short Stay unit (SSU) adjacent to the Accident and Emergency (A&E) department.

**Results:** In 1998 there were 10,079 acute medical referrals from local GPs or A&E departments. 57% of referrals were <3 years old and 30% <1 year. After evaluation, treatment and observation 6,464 children were discharged while 3,615 (36%) were admitted for conventional in-patient care.

The table shows referrals and outcomes for some selected clinical conditions.

	Febrile fits	Asthma (>2y)	Croup	Poisoning	Gastro
Referrals	402	642	297	308	764
Ward admissions (%)	104(26)	368(57)	49(16)	27(9)	177(23)

Admissions for bronchiolitis fell from 751 (684 patients) in 95/96 to 335, supported by a near-patient testing process for RSV virus during the epidemic. 50% of RSV+ patients were not admitted after assessment.

A 27-bed medical ward has now been closed. The unit has become a focus for clinical training and audit around acute paediatric care and there are increasing links with the large local GP out-of-hours service.

**Conclusion:** An acute SSU offers major clinical and organisational opportunities. The benefits depend as much on clinical philosophy as physical resources and are applicable in a wide range of clinical settings.

### G2 A FATAL CASE OF METHADONE TOXICITY. IS OBESITY IMPLICATED?

Copeman AJ, Robins A.W. *The Whittington Hospital, London*

**Case:** An extremely obese, 2-year 10 month-old boy presented following an accidental ingestion of 40mg of methadone. The clinical effects were immediately reversed with intravenous naloxone. He was subsequently managed with a 24-hour infusion of naloxone, as advised by the National Poisons Information Service. His height was 75<sup>th</sup> centile and he weighed 31kg (5 S.D. above the mean). The child had no features to suggest an obesity syndrome or endocrinopathy.

The boy remained entirely well during the naloxone infusion and for 12 hours following its discontinuation. He then had a witnessed, in-hospital cardio-respiratory arrest 36 hours following the ingestion of methadone, from which he was resuscitated and transferred to a paediatric intensive care unit. He was subsequently declared brain dead and treatment withdrawn.

Toxic levels of methadone were found at post mortem, there were no other findings.

**Discussion:** Paediatricians are reminded of the biphasic pharmacokinetic properties of methadone and its long half-life, which we postulate may be accentuated in obese individuals. The association between methadone toxicity and obesity has not previously been reported. We suggest that it may be a new and unrecognised risk factor in methadone overdose.

### G3 PARENTS' AND REFERRING DOCTORS' ABILITY TO JUDGE THE NEED FOR ACUTE PAEDIATRIC ADMISSION

Varnam R, Trueman J, Reilly S, Esmail A, Doughty IM *Department of Paediatrics, Central Manchester Healthcare NHS Trust, Manchester M13 0JH*

**Aims:** Many children referred to the acute general paediatric service are not admitted. We studied the reason for referral for all acute referrals together with parents' and referring doctors' assessments of both the severity of illness and the need for admission.

**Methods:** Telephone questionnaire of the referring doctor. Questionnaire for parents on arrival at the paediatric assessment unit and disposal questionnaire for the admitting doctor.

**Results:** 350 referrals were studied, 58% from GPs and 42% from the Accident and Emergency Department. 49% were admitted. The commonest reason for referral was 'potential for serious illness developing' (27% of referrals, 40% of admissions). 78% of referring doctors and 50% of parents thought that admission was necessary. The positive predictive value (PPV) for admission was 63% for referring doctors and 78% for parents. The prediction of immediate discharge (negative predictive value) was 77% for referring doctors and 59% for parents. A severity of illness score (0-10) matched strongly with

belief about whether the child should be admitted or not (parents, mean score 6.9 vs 5.5,  $\chi^2_{trend}$  9.0  $p < 0.05$ ; referring doctors, mean score 5.5 vs 3.8,  $\chi^2_{trend}$  26.5  $p < 0.001$ ), although it did not predict admission ( $\chi^2$  0.003  $p = 0.85$ ;  $\chi^2$  2.81  $p = 0.09$ ).

**Conclusions:** Parents and referring doctors who perceive that a child needs admitting to hospital rate their severity of illness higher than those who feel referral is not justified. Although there is correct prediction of admission by many parents and referring doctors, there is no correlation between eventual admission and rated severity of illness. Further work should be directed at comparing these opinions with physiological measures of illness.

### G4 FLUID AND ELECTROLYTE BALANCE AND CALORIE INTAKE IN CHILDREN ADMITTED TO THE PICU

AB Tuladhar, B Guard, L Radbone, R Ross-Russell *Addenbrookes Hospital, Cambridge, UK*

**Introduction:** Accurate measurement of fluid balance and calorie intake is a cornerstone of intensive care management. Plans are often meticulous but rarely reviewed to establish whether they have been followed. In order to assess this, we undertook a study to answer following questions.

1. Do we *prescribe* and *deliver* the amount of fluid that we *planned* to?
2. What proportion of fluids are given as additional colloid?
3. Is nutrition adequate?

**Methods:** A retrospective case-note review of 30 patients admitted PICU was undertaken covering 92 complete 24 hour periods. Planned intake (% of normal requirements) was compared to the prescription chart and with the actual fluid balance chart for each day to generate a ratio, with 1.0 therefore representing absolute accuracy. Data were analysed using non-parametric statistics.

**Results:** There was no error in fluid prescribing. However, considerable variation was detected in the amount of fluid given with patients generally receiving more fluid than planned. Nutritional intake was exceptionally poor, with 80% of our patients receiving less than half of their requirements. Sixteen patients (53%) received additional colloids (range 8.3 mls -101.5 mls/kg/24 hrs).

	Median	Interquartile range
Prescribed/target ratio	1.00	0.97-1.04
Actual/target ratio	1.08	0.94-1.22
Total/target ratio	1.11	0.97-1.43
Kcal/kg/day	21.0	8.63-43.53
%EAR	19.9	11.27-43.56

EAR = estimated average requirement for a healthy child

**Conclusions:** 1. Although prescriptions are written accurately, children often receive substantially more fluid than planned. 2. Nutrition in PICU is extremely poor.

### G5 ASSESSMENT OF RESPIRATORY DRIVE AND MUSCLE FUNCTION IN THE PICU AND PREDICTION OF EXTUBATION FAILURE

A Greenough, Manczur T, Rafferty G, Pryor D *Department of Child Health, King's College Hospital, London, UK*

Causes of extubation failure include poor central drive and impaired respiratory muscle function. These can be assessed by measurement during airway occlusion of the inspiratory pressure generated in a set time period (drive) or the maximum pressure achieved (strength). The aim of this study was to determine if such assessments enabled characterization of children who subsequently failed extubation. Measurements were made in 40 children, median age 13 months (range 1-150). During a temporary disconnection from the ventilator, the airway was occluded at end expiration and the occlusion maintained for 5 breaths. Airway pressure was measured during the occlusion and the signal amplified and displayed in real time on a laptop computer. From the first inspiratory effort during the occlusion, the pressure generated during 0.1 second ( $P_{0.1}$ ) and the maximum pressure ( $P_i$ ) was calculated. From the series of breaths during the occlusion period, the maximum  $P_{0.1}$  ( $P_{0.1max}$ ) and maximum  $P_i$  ( $P_{imax}$ ) were determined. Five children failed extubation; they were slightly, but not significantly, older than the rest of the cohort. The five children were characterized only by a lower  $P_{0.1}$  (median 2.95 cmH<sub>2</sub>O, range 0.83-6.24 versus median 5.41 cmH<sub>2</sub>O, range 1.24-41) ( $p < 0.06$ ). The median  $P_{0.1}$  of the 40 children was 5.39 cmH<sub>2</sub>O, this value had 80% sensitivity and 54% specificity in predicting extubation failure. These preliminary results suggest measurement of  $P_{0.1}$  is useful in the PICU setting and may facilitate identification of children at risk of extubation failure.

### G6 ASSESSMENT OF IMPEDANCE CARDIOGRAPHY IN INFANTS

Duthie M, Patel R, Ladusans E, Montague T, Hack H, Patel D, Arana A, Hawkins K, Kerr S, Gladman G *Departments of Cardiology, Anaesthetics and Intensive Care, Royal Manchester Children's Hospital*

**Rationale:** Impedance Cardiography is attractive as a means of non-invasive measurement of Cardiac Output in infants, but has not been assessed adequately (invasively) in this group.

**Design:** A Comparison Study of 10 Infants at routine Cardiac Catheterisation who had an added period of general anaesthesia, when Impedance (Imp.), Direct Fick (D.Fick) and Femoral Artery Thermodilution (Th.Diln.) Cardiac Outputs (CO) were measured.

**Patients:** Age Range: 0.5-36 months, Weights 3.8-15.2 Kg. 7 had no shunts, 3 had left to right shunts and are included in the analysis as Systemic Fick and Femoral Thermodilution CO's are unaffected by left to right shunt.

**Methods:** Imp. Cardiography was undertaken using an ICG M501 (ASK Ltd, Hungary); Oxygen Consumption for D.Fick using a Deltatrac II Metabolic Monitor (Datex Engstrom Finland); Femoral Th.diln. using the COLD Z201 (Pulsion, Germany).

**Results/Analysis:** Pearsons Correlation Coefficient (r) + Bland / Altman Bias Plots for the pairings of Imp. v. D Fick, Imp. v. Ther.diln. and D.Fick v. Ther.diln.:

Pairing	r	Mean Bias (95%CI) & Range	U/min
Imp./D.Fick	0.57	0.50 (+/-0.45)	-0.99 to 1.89
Imp./Th.diln.	0.64	0.06 (+/-0.36)	-1.10 to 1.22
D.Fick/Th.diln.	0.99	0.44 (+/-0.12)	0.06 to 0.82

**Conclusion:** Impedance Cardiography should not be used in infancy for 'Stand Alone' CO measurements.

### G7 CASE MIX AND ADMISSION SERUM LACTATE FOLLOWING CARDIOPULMONARY BYPASS

**Davis PJ, Davies P\*, Morris KP Intensive Care Unit, Birmingham Children's Hospital, Birmingham, UK; \* Department of Mathematics, University of Birmingham, Birmingham, UK**

**Objectives:** Previous studies have shown serum lactate on ICU admission to be a predictor of mortality and morbidity following paediatric cardiac surgery, but centres have differed in the cut-off value of lactate found to discriminate survivors from non-survivors, and to identify those at risk of a serious post-operative adverse event. We investigated factors affecting serum lactate on ICU admission in children undergoing cardiopulmonary bypass.

**Methods:** Serum lactate was measured in 228 children, median age 1.2 years (IQ range 0.1 to 4.6 years). Other data collected included type of operation, and a range of per-operative variables. 10 children died before ICU discharge; 23 were classified as having a major adverse post-operative event (death or cardiac arrest or chest re-opening). Analysis of covariance was used to analyse the data.

**Results:** Independent factors found to influence serum lactate on ICU admission were: type of operation ( $p < 0.001$ ); total cardiopulmonary bypass time ( $p < 0.001$ ); use of circulatory arrest ( $p < 0.001$ ); and level of inotropic support ( $p < 0.001$ ). Mean (+/-SD) values of admission serum lactate (mmol/l) for different operations varied from VSD repair (3.1 +/- 0.8), to arterial switch (5.4 +/- 2.5), to the Norwood procedure for HLHS (9.4 +/- 4.3). In addition, serum lactate differed considerably in those who had a major adverse post-operative event according to operation type (VSD 4.3 +/- 1.5, switch 7.8 +/- 3.9, Norwood 11.7 +/- 5.4).

**Conclusions:** The type of cardiac operation has a significant effect on serum lactate level, independent of the length of cardiopulmonary bypass and circulatory arrest. Case mix at each centre will influence the levels of serum lactate encountered and affect the cut-off value that best discriminates those at risk of a major adverse post-operative event.

### G8 ASSESSMENT OF ADRENAL FUNCTION AND HAEMORRHAGE IN THE ACUTE PHASE OF MENINGOCOCCAL DISEASE

**Bone MP<sup>1</sup>, Wilson B<sup>1</sup>, Wright N<sup>1</sup>, Diver MJ<sup>2</sup>, Selby A<sup>3</sup>, Addison GM<sup>1</sup>, Clayton PE<sup>1</sup> Royal Manchester Children's Hospital<sup>1</sup>, Dept of Clinical Biochemistry, Royal Liverpool Hospital<sup>2</sup>, Paediatric Intensive Care, Alder Hey<sup>3</sup>**

The incidence of adrenal haemorrhage (AH) in meningococcal disease (MD) varies in different studies based on autopsy findings. However the incidence in those that survive MD is not known. The aim of this study was to define the incidence of AH in all patients with MD admitted to two regional PICUs and to correlate this with the status of the hypothalamic-pituitary-adrenal axis.

42 children (16 male, median age 2.5, range 0.2-15yrs) had an adrenal ultrasound (AU) performed within the first 48 hrs. 24 children had serial AUs performed on days 1, 3 and 7. Cortisol (C) and ACTH (A) levels were measured on admission, then at 08.00 & 20.00 hr over the next 48 hrs. At 48 hrs, a low dose short synacthen test (LDST) (500ng/ACTH/m<sup>2</sup>) was performed in 33 patients.

Two of the 42 children died. One death was attributable to meningitis with coning, the other overwhelming sepsis. This patient had enlarged echogenic adrenal glands, consistent with AH. 28% (12/42) had abnormalities on AU consistent with AH. Adrenal's were both enlarged and echogenic (n=7), echogenic (n=4) and hypoechoic (n=1). 8 of the 24 patients had abnormal serial AUs, (enlarged and echogenic, n=7) and (echogenic, n=1). By day 7, in all

cases the adrenal glands showed a reduction in size and resolution of echogenicity.

There was no difference in the peak C on the LDST or the mean C on profile between those with normal and abnormal AUs. However those children with adrenal abnormalities on AU had significantly increased A values on admission and at 08.00 hr day 1 ( $p = 0.05-0.01$ ), lower haemoglobin ( $p = 0.01$ ), were younger (mean age 1.5 vs 4.7 yrs) and had increased duration of inotropic support ( $p = 0.02$ ), ventilation ( $p = 0.002$ ) and PICU stay ( $p = 0.009$ ). Thus AH occurs frequently in children who survive MD, but appears to resolve completely. These patients had increased A levels at presentation, with an increased requirement for inotropic and respiratory support.

### G9 ESTIMATING THE BURDEN OF BORDETELLA PERTUSSIS INFECTION PRESENTING TO PAEDIATRIC INTENSIVE CARE UNITS IN LONDON TO INFORM VACCINATION POLICY IN THE UNITED KINGDOM

**Crowcroft NS** on behalf of the Pertussis in PICU Study Team *PICUs of Great Ormond Street, Guy's, Royal Brompton, St George's and St Mary's Hospitals, and the Public Health Laboratory Service*

**Aims:** To determine the burden of pertussis infection in infants under 5 months of age admitted to paediatric intensive care units (PICUs) in London and to determine the likely source of such infections.

**Subjects:** Infants under 5 months of age admitted to London PICUs between 1<sup>st</sup> November 1998 and 31<sup>st</sup> October 1999 with: Respiratory failure (defined as respiratory insufficiency requiring admission to PICU but excluding persistent pulmonary hypertension of the new-born, meconium aspiration, hyaline membrane disease and respiratory failure due to known structural airway problem); apnoea and/or bradycardia; near-miss Sudden Infant Death Syndrome (SIDS). Household contacts were investigated by questionnaire and pernasal swab and, for adult contacts, serology.

**Results:** 10/91 (11%, 95% CI 4.6 - 17.4%) infants had pertussis by polymerase chain reaction (PCR) and serology and only 3/91 (3%) by culture. For only 2/10 infants was pertussis suspected on admission. The mean age of the infants was 5 weeks (range 4 days to 13 weeks). Two had received one dose of vaccine before admission. An adult brought pertussis into the family in three families and a sibling aged 1-7 years old in three families. In four families the infant was the first or only case identified. For six infants, one or more contacts had pertussis confirmed by PCR and/or serology.

**Conclusion:** Pertussis is under-diagnosed in young infants presenting to PICU. Both adults and children are infecting young infants. This has implications for the use of erythromycin prophylaxis as well as for the pertussis vaccination programme in the UK.

### G10 EXTRATHORACIC NEGATIVE PRESSURE VENTILATION AS A MODE OF RESPIRATORY SUPPORT—WHEN WILL IT WORK?

**Wagstaff M, Mok Q Intensive Care Unit, Great Ormond Street Hospital for Children, London, WC1N 3JH, UK**

**Aims:** Negative pressure ventilation (NPV) using a cuirass has been described as being an effective and non-invasive mode of respiratory support in different patient populations. The aim of this study was to determine whether there were factors that would predict the group of patients where NPV would be beneficial in the paediatric ICU setting.

**Methods:** A retrospective review in a tertiary PICU of patients who had a period of negative pressure ventilation using the Hayek oscillator. Various factors were analysed to determine if there were obvious predictors of a successful outcome.

**Results:** 26 patients were identified over a 3-year period. The intervention was considered successful when the patient weaned on NPV during the admission and did not require other respiratory support, and failed when the patient needed to be intubated for positive pressure ventilation. In 10 patients NPV was successful, while it failed in 16 patients after a variable period of time. The median age of the successes was 26 months (interquartile range 14.5 - 131.75m) and of the failures was 13.5 m (IQ range 2.75 - 33.25m). Neuromuscular weakness as the indication for NPV was associated with a successful outcome, while respiratory or cardiovascular reasons were associated with failure ( $p = 0.015$ ).

**Conclusions:** NPV can be used successfully as a non-invasive form of respiratory support especially for patients with neuromuscular weakness.

### G11 CONFIDENTIAL ENQUIRIES INTO CHILDHOOD DEATHS IN HOSPITAL: HOW REPRODUCIBLE ARE THEY?

**RI Ross Russell\*, J Challener<sup>†</sup>, D White\*** and the Paediatric Confidential Enquiry Group *\*Addenbrookes Hospital, Cambridge, and <sup>†</sup>Hinchinbrooke Hospital, Huntingdon*

**Introduction and aims:** At present there is no process allowing confidential enquiries into paediatric deaths. In collaboration with the Department of Health we have undertaken a study evaluating whether the conclusions from confidential enquiries into paediatric hospital deaths are reproducible.

**Methods:** Four recent paediatric deaths were selected for appraisal. Three occurred on a regional Paediatric Intensive Care Unit, and one at a local

District General Hospital. All case notes were fully anonymised, and reviewed by 2 separate panels of seven independent regional and national experts. Both panels comprised representatives from paediatric intensive care, anaesthesia, paediatrics, nursing, general practice and pathology together with lay representation. Each panel member graded the quality of care within 5 predefined time periods, prior to and following group discussion. A consensus grade was also given by the panel as a whole.

**Results:** Opinions about the quality of care varied substantially between individuals. Paediatric intensivists consistently graded care more critically than others. Following discussion no-one became more lenient but all grades tended towards that given by the intensivist. The overall panel score was similar for 3 of the four cases, but in one case there was substantial difference in opinion between the groups.

**Conclusions:** Paediatric intensivists on confidential enquiry panels appear to be more critical than other members, and group discussion tends to increase criticism of care. In some cases enquiry panels can reach quite different conclusions from the same data. Conclusions from such panels must therefore be interpreted carefully.

### G12 EARLIER RECOGNITION OF MENINGOCOCCAL DISEASE MAY CONTRIBUTE TO IMPROVED OUTCOMES

RJ Ross Russell, A Meyer, P Wilson, D White Addenbrookes Hospital, Cambridge, UK

In order to reduce the mortality from severe meningococcal disease there have been substantial efforts to improve recognition of the disease by GPs and by the general public. The Eastern Region has a natural geographic catchment area, supplied by a single paediatric intensive care unit (PICU). We have developed a regional strategy for this population, encouraging early consultation and referral, with standardised clinical guidelines. It was our impression that referral to PICU was rapid, and we therefore reviewed the timings of illness and referral, to identify areas which could be targeted for further improvements.

**Methods:** Case note review of 92 children admitted with severe meningococcal septicaemia and shock. Data were compared using non-parametric statistics. Severity of illness was measured using PRISM II.

**Results:** The severity of illness was similar to previous reports with 78% of patients being ventilated, 17% haemofiltered and 76% requiring inotropes. Ten patients died (10.9%, 95% CI 5.3-19.1%) against an overall predicted death rate of 16.6 (18.0%, ns). Delays between illness onset medical review and ITU admission are shown below.

Delay (hours)	$p < 0.001$		ns	
	ILL-GP	GP-HOSP	HOSP-ITU	ILL-ITU
Median	15.0	1.5	2.9	22.0
Interquart.	7.0-24.0	1.0-2.9	1.0-6.0	17.0-33.5
No. of patients	70	70	90	89

ILL = time of onset of illness, GP = time of first GP review

- Conclusions:**
1. The mortality for severe MD may be falling.
  2. The major delay in care occurs prior to first medical consultation.
  3. Most medical staff treat MD promptly
  4. In our region, further improvements in care may require education of the general public enabling earlier self-referral to medical care.

### G13 ARE PAEDIATRICIANS OVERTREATING SUSPECTED MENINGOCOCCAL DISEASE?

Riordan FAI, Thomson APJ, Sills JA, Hart CA\* Institute of Child Health and \*Department of Medical Microbiology, University of Liverpool

**Introduction:** Encouraging prompt treatment of meningococcal disease (MCD) may lead to over treatment of children with petechiae and self-limiting illnesses (SLI).

**Aim:** To compare features of MCD and SLI in a group of children with petechiae, (but not purpura) suspected to have MCD by paediatricians.

**Methods:** Prospective study of 196 children referred for inclusion into a study of MCD at 4 hospitals over a 19-month period: 111 had MCD (69 culture positive), 19 had other bacterial infections and 66 had SLI.

**Results:** There were 39 children with purpura (37 with MCD, 2 with SLI). 115 children had petechiae; 28 had culture-negative MCD and were excluded from the analysis. Of the remaining 87 with petechiae; 32 had culture-proven MCD, 55 had SLI. In this group median ages were no different (MCD 16.5 vs SLI 22 months). Children with MCD were more likely to have higher respiratory rates (median 40 vs 28 per min;  $P=0.0001$ ) and meningism (16/32 vs 10/55;  $P=0.004$ ). Heart rate, blood pressure and white cell count (WBC) did not differ significantly between the two groups. Raised WBC ( $>15$ ) was found in 12/32 with MCD and 24/55 with SLI. A combination of respiratory rate  $>40$  and features of shock or meningitis (poor capillary refill, meningism, variable conscious level) identified 28/32 children with MCD. Of the 4 not identified, 3 had a maculopapular rash and delayed treatment. 27/55 with SLI also had these clinical features.

**Conclusion:** When paediatricians suspected MCD 130/196 (66%) of cases had bacterial infections. Although tachypnoea, shock and meningism were

commoner in MCD than SLI, the sensitivity and specificity of these features did not allow accurate discrimination between MCD and SLI. Paediatricians should treat children they suspect have MCD promptly with antibiotics, and then seek to confirm the diagnosis.

### G14 HUMAN ALBUMIN SOLUTION OR NORMAL SALINE IN THE RESUSCITATION OF CHILDREN WITH MENINGOCOCCAL DISEASE?

Betts H, Booy R, Levin M, Nadel S Paediatric Intensive Care Unit, St Mary's Hospital, London

There is controversy regarding optimal resuscitation fluid for critically ill children.

**Aims:** To compare outcomes of children with meningococcal disease (MD) who were resuscitated with 4.5% human albumin solution (HAS) or 0.9% normal saline

**Methods:** 13 pairs of children with meningococcal disease were matched according to age groups (0-2yrs, 2-5yrs, 5-10yrs, 10-16yrs) and severity of illness using the Glasgow Meningococcal Septicaemia Prognostic Score (GMSPS) and Predicted Risk of Mortality (PRISM) score. Children were selected if they had received  $>30$ mls/kg of resuscitation fluid prior to the referral telephone call.

**Results:** The saline group received at least 30ml/kg of 0.9% saline during resuscitation, the remainder was 4.5% HAS and blood products. The 4.5% HAS group received no saline during resuscitation.

Parameter	0.9% Normal Saline n=13 (Median Values)			4.5% HAS n=13 (Median Values)		
	Day	Day	Range	Day	Day	Range
PIP (cmH2O)	1	2		1	2	
PEEP (cmH2O)	27	22	Ext-45	30	31	SV-HFO
FiO2	5	8	Ext-15	8	10	SV-HFO
Hours on Ventilator	1.0	0.35	0.21-1.0	1.0	0.45	0.21-1.0
Days on PICU	76		15-264	92		SV-576
Serum Albumin (g/l)	4		1.5-17	5		0.5-29
Hb (g/dl)	36	38	25-45	40	40	32-43
Total Volume (mls/kg)	9.2	10.3	5.4-13.7	8.6	10.4	7.1-11.9
Blood Products (mls/kg)	128	10	50-381	145	20	60-270
	35	0	0-126	20	14	0-62

There was no significant difference between the two groups in any parameter.

**Conclusion:** We still do not know the most appropriate fluid to use for resuscitation in children with MD. A properly controlled study is required.

### G15 POISONING IN CHILDREN

Riordan MF, Berry K, Rylance GW Accident and Emergency Department, Birmingham Children's Hospital, UK

Poisoning episodes are a frequent cause of medical consultation in childhood. Deaths are rare. The aim of this study was to define the relative importance of different medicines and household products in poisoning episodes involving children and young adults.

The study used data derived from the Department of Trade and Industry's Home and Leisure Accident Surveillance Survey and Deaths Database. A total of 44,117 non-fatal poisoning episodes, in patients under the age of 19, were reported by participating Accident and Emergency Departments (18) between 1978 and 1997. An additional 435 deaths were reported in the same period. Each episode was broadly classified according to cause and a rank order established. The mortality index was calculated as the percentage of deaths due to a toxin relative to the sum of deaths and non-fatal poisonings.

The ten commonest causes, accounting for 46% of poisonings, were paracetamol (9%), household cleaning products (6%), cough and cold remedies (5%), bleach (4.5%), plants and berries (4%), white spirit (4%), oral contraceptives (3.5%), antibiotics (3%), benzodiazepines (2.5%) and vitamins (2%). Of the household cleaning products disinfectants accounted for 22%, washing-up liquid 8% and toilet blocks 5%.

Carbon monoxide poisoning was the commonest cause of death with a mortality index of 28%. Other mortality indexes include methadone 68%, butane gas 15%, antidepressants 8%, alcohol 2%, paracetamol 0.5%, laburnum 0.3% and white spirit 0.1%.

On average any Accident and Emergency Departments will see 3 children with a history of poisoning each week. The current data indicates that the majority of attendances relate to ingestions of intermediate or low toxicity.

### G16 THE DANGER OF BOUNCY CHAIRS AND CAR SEATS

TA Wickham E. Abrahamson Department of Paediatric Accident and Emergency, Chelsea and Westminster Hospital London

**Aims:** To document our impression that the incorrect use of Bouncy Chairs (BC) and Car Seats (CS) were injuring a significant number of infants.

**Methods:** We conducted a prospective study over a 12 month period. All babies under the age of one-year presenting to the department with a head injury were recruited. A proforma was designed which acted as part of the

notes; details of the incident were recorded along with examination and Xray findings. The data was analyzed using SPSS statistics program.

**Results:** A total of 131 cases were recorded (mean age was 6.9 months), 17 (13%) of which were associated with either BC or CS; all the BC cases (11/11 100%) were due to a fall from a surface with the baby in the chair. In the CS group (2/6 33%) was due to such a fall, the rest in this group were due to the CS being dropped while being moved. The carer was aware in only 1 of the 13 cases involving a fall from a surface that there was any chance of injury from this mechanism.

**Conclusion:** Falls from inappropriately placed bouncy chairs or car seats form a significant proportion of head injuries in infants, resulting in unnecessary and preventable morbidity. Parents and other carers appear unaware of the danger of putting these seats on raised surfaces. To reduce these risks, clearer warnings on such products are required. Furthermore health visitors should include discussion of this issue within their safety advice to parents.

#### G17 NON-TRAFFIC PAEDIATRIC PEDESTRIAN INJURIES

McGinley J, Pierce CM *Paediatric Intensive Care Unit, Great Ormond Street Hospital for Children NHS Trust, Great Ormond Street, London, WC1N 1EH, UK*

**Introduction:** The leading cause of morbidity and mortality in children is road traffic injury. Larger family vehicles are becoming increasingly popular. However, their reduced visibility may pose an unrecognised risk to the pedestrian child.

**Aim:** To highlight and identify the risk from non-traffic pedestrian injuries (NTPi) by reviewing the causes for head injury and trauma admitted to our intensive care unit.

**Method:** We reviewed the case notes of patients admitted between Nov 98-Nov 99 with motor vehicle injuries to identify the NTPi, recording the circumstances surrounding the injury, the severity and type of injuries and outcome.

**Results:** 3/30 admissions were due to NTPi. In all 3 cases the injuries occurred during daylight hours and were due to a vehicle reversing out of a driveway. Two of the vehicles were large family vehicles with restricted rear visibility. In 2 cases the driver was a relative. All three children were less than 6 years old and sustained significant head injuries. 2 had associated injuries including, liver lacerations, haemothorax, and a degloving injury of a foot. All made a full recovery although one child was left with a mild left hemiparesis.

**Conclusions:** We feel we need to warn drivers, parents and carers of the potential risks of cars parked in driveways. 10% of our admission with life threatening head injuries were due to NTPi occurring in residential driveways involving a child hit by a reversing vehicle.

#### G18 THE IMPLEMENTATION OF AN EVIDENCE AND CONSENSUS BASED CARE PATHWAY IN ACCIDENT AND EMERGENCY FOR THE CHILD WHO HAS HAD A SEIZURE

Armon K\*, Stephenson TJ\*, MacFaul R\*\*, Eccleston P\*, Werneke U", Smith S\*, Williams L\*\* *\*Child Health, University of Nottingham. \*\*Pinderfields General Hospital, \*London School of Hygiene and Tropical Medicine. \* Paediatric and \*\*A&E Departments, Queens Medical Centre, Nottingham*

**Introduction:** Seizures affect 3% of children and are the fifth commonest medical presenting problem to paediatric accident and emergency (A&E) accounting for 5% of such attenders.

**Aim:** To evaluate the implementation of an evidence and consensus based guideline on the management of the child who has had a seizure.

**Method:** A series of graded recommendations were made following a systematic review. These were presented to a national panel of 30 medical and nursing staff using the Delphi consensus development technique. The resulting guideline was implemented as a care pathway in a paediatric A&E department. Data on process and outcome of care were collected during four month periods before and after implementation, and compared using Chi-square and Man-Whitney-U.

**Results:** 207 children with seizure attended pre care pathway and 191 post. There were no differences in age, sex, time of arrival, temperature or admission rates, 68% admitted pre and 72% post care pathway. 61% were managed as febrile seizures. The mean time from being seen to discharge fell from 88 minutes to 63 minutes (MWU  $p < 0.001$ ). The number of children investigated for calcium, magnesium and U&E fell (calcium 23% to 10%  $p = 0.01$ , Magnesium 19% to 10%  $p = 0.07$ , U&E 29% to 17%  $p = 0.04$ ). No other investigation differences were found. For those managed as febrile seizures the documentation of source of fever improved (25% pre and 51% post  $\chi^2 p = 0.01$ ).

**Conclusion:** The implementation of a care pathway for seizure reduced time spent in the A&E department and numbers of investigations. Admission rates remained unchanged. Further work on appropriateness of admissions is planned.

#### G19 THE IMPLEMENTATION OF AN EVIDENCE AND CONSENSUS BASED CARE PATHWAY IN ACCIDENT AND EMERGENCY FOR THE CHILD WITH DIARRHOEA

Armon K\*, Stephenson TJ\*, MacFaul R\*\*, Eccleston P\*, Werneke U", Smith S\*, Williams L\*\* *\*Child Health, University of Nottingham. \*\*Pinderfields General Hospital, \*London School of Hygiene and Tropical Medicine. \* Paediatric and \*\*A&E Departments, Queens Medical Centre, Nottingham*

**Introduction:** Acute diarrhoea accounts for 16% of all medical attendances to paediatric accident and emergency (A&E).

**Aim:** To evaluate the implementation of an evidence and consensus based guideline on the management of the child with diarrhoea.

**Method:** A series of graded recommendations were made following a systematic review. These were presented to a national panel of 40 medical and nursing staff using the Delphi consensus method. The resulting guideline was implemented as a care pathway for A&E and subsequent ward care.

Data on process and outcome of care were collected during four-month periods before and after implementation and compared using Chi-square and Man-Whitney-U.

**Results:** 290 children attended with diarrhoea pre care pathway and 227 post. There was no difference in age, sex, or time of arrival. Numbers admitted increased from 27% to 35%. However, during the same time period a short stay observation unit opened and even brief stays were classified as an admission. The time from being seen to discharge fell from 68 to 49 minutes (MWU  $p < 0.001$ ). The number of children investigated for FBC and U&E fell (17 to 6,  $\chi^2 p = 0.02$  and 18 to 7,  $p = 0.02$  respectively), and intravenous infusions fell (13 to 2,  $\chi^2 p = 0.002$ ). Other investigations remained the same. Documentation of symptoms, signs and management plan was improved.

**Conclusion:** The implementation of a care pathway for acute diarrhoea reduced time in the A&E department and numbers of investigations and intravenous infusions. Admission rates increased but admission classification had changed. Documentation improved. Further work on appropriateness of admission is planned.

#### G20 TOWARDS AN OBJECTIVE, STRUCTURED AND VALIDATED PAEDIATRIC A&E TRIAGE SYSTEM

Morcombe J, Burke DP. *Accident and Emergency Department, Sheffield Children's Hospital*

**Aims:** To develop an objective, structured and validated paediatric A&E triage system.

**Methods:** Two thousand A&E records were examined (1000 in the summer, 1000 in the winter). Presenting complaints were grouped functionally. Ten distinct groups were identified, comprising 89% of these attenders. Algorithms incorporating the national triage scale were developed by a multi-disciplinary group using the Delphi process. Each algorithm was based upon a generic algorithm, utilising the Manchester methodology, prioritising according to risk to life, risk to limb and pain. A prospective study was undertaken to validate the first ten algorithms against proxy outcome measures for perception of urgency/severity. Parental perception (ambulance usage), triage nurses' perception (time to see doctor) and doctors' perception (admission rate). A total of 2333 patients were recruited to the validation study over a four week period.

**Results:** For each proxy outcome measure there was a statistically significant correlation with the triage category: arrival by ambulance ( $\chi^2 = 81.8$ ,  $p < 0.00$ ); time to seeing a doctor from triage, categories 1&2 ( $\chi^2 = 16.3$ ,  $p < 0.00$ ), categories 2&3 ( $\chi^2 = 24.0$ ,  $p < 0.00$ ), categories 3&4 ( $\chi^2 = 25.2$ ,  $p < 0.00$ ), categories 4&5 ( $\chi^2 = 8.8$ ,  $p < 0.00$ ) and admission rate ( $\chi^2 = 237.9$ ,  $p < 0.00$ ).

**Conclusion:** The new triage system meets all criteria laid down at the beginning of the project. It is structured (generic algorithm and Manchester methodology), objective (algorithms prioritised according to clinical urgency) and validated against proxy outcome measures for parental, nursing and medical perception of urgency/severity.

#### G21 ACCIDENT AND EMERGENCY SERVICES FOR CHILDREN IN TRENT REGION

Playfor SD *Department of Child Health, Queen's Medical Centre, Nottingham NG7 2UH*

**Aims:** To investigate the provision of accident and emergency (A&E) services for children within Trent health region, and to compare these to published recommendations.

**Methods:** A postal questionnaire was sent to all A&E, and minor injury units within Trent region providing services for children. Results were compared to various recommendations including those recently published by the Multidisciplinary Working Party into Accident and Emergency Services for Children.

**Results:** Thirty-six units provided A&E services for children within Trent, seeing a total of 356,000 children a year. There are 17 mixed units, 17 minor injury units and 2 children's units. Within mixed A&E units complete audio-visual separation from adult patients was provided by 6 units (35%), inpatient paediatric facilities were available at 11 units (65%) and a minimum

of one registered children's nurse was always on duty in 3 units (18%). Separate waiting facilities for children were available in 11 units (65%) and separate triage facilities in 1 unit (6%)

**Conclusions:** Few mixed A&E units within Trent region currently meet the recommendations of Multidisciplinary Working Party. The most common short-fall identified was in the provision of registered children's nurses.

**G22 INJURY SURVEILLANCE DATA (ISD) COLLECTION IN ACCIDENT & EMERGENCY USING EXISTING INFORMATION TECHNOLOGY—A PRELIMINARY REPORT**

Nicholl H, Clarke J, Mercer R, Glasgow JFT *Accident & Emergency Department, Royal Belfast Hospital for Sick Children, BT12 6BE*

In A&E, 31,000 children < 13 years of age are seen annually, of whom 35-40% have injuries. Accident prevention programmes are known to depend upon precise ISD. An injury surveillance module adapted from the Australian Victorian Emergency Minimum Dataset was programmed by the Directorate of Information Services, and added to the N Ireland Regional A&E Computer System (NIRAES). Data collection commenced on 1:2:99. During triage a trained nurse enters ISD that provides details of where the injury occurred, activity at the time, intent, external cause of injury (one of 30 codes), and by what mechanism this occurred (free text description). Two studies are outlined: a) Validation - ISD was extracted from NIRAES, converted to a text file and opened as an Excel document - enabling scrutiny and data manipulation. This showed that of the 4,567 injuries seen 1:2:99-30:6:99, 684 (15%) had incomplete/ missing data. In those in whom ISD was *complete*, data were compared with the mechanism of injury described. Here only 71% of the external cause of injury codes were correct. Validation was therefore a crucial step, without which conclusions would have been dubious. Steps have been taken to improve data collection in this area. b) Having "cleaned" the data, it was possible begin preliminary analysis of the first *four* months (Feb-May). Preliminary analysis shows a higher than stated proportion of those attending (55%) did so following injury - likely a seasonal effect. The causes of injury have been analysed; for example, 78 children attended after ingestion of poisons, 44 after burns (22 were scalds); 12 with smoke inhalation. Because ISD is embedded in NIRAES containing information on - GPs, post codes, enumeration districts, diagnoses, etc there is much potential in using this approach. ISD collection has been accepted by nursing staff, no additional document requires completion by medical staff (as some systems do), and, if validation is ensured, this provides a ready source of data that can be used to inform and plan local accident prevention initiatives.