

Accident and Emergency/Intensive Care

G59 PSYCHOLOGICAL OUTCOME OF CHILDREN ADMITTED TO HOSPITAL WITH MENINGOCOCCAL DISEASE

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Aims: To describe psychiatric adjustment 3 months after hospital discharge in children admitted to hospital with meningococcal disease.

Methods: This cohort study includes children aged 3 to 16 admitted to 3 PICUs and 22 general paediatric wards in the London area. During the index admission, severity of illness is assessed with the Glasgow Meningococcal Septicaemia Prognostic Score (GMSPS). Parents are interviewed and demographic details are obtained. The child's previous psychiatric adjustment is determined by parent and teacher completed Strengths and Difficulties (SDQ) questionnaires. At three months follow-up questionnaires are completed by parents outlining the child's psychiatric adjustment since discharge using the SDQ; the presence of stress disorders is ascertained using the Impact of Event Scale (IES); the parents' psychiatric adjustment is measured with the General Health Questionnaire (GHQ) (a general measure of psychiatric adjustment) and the Impact of Event Scale (screening for symptoms of post traumatic stress).

Results: 51 children and their parents were assessed at admission and after three months. 39 Children required PICU admission and 12 children required paediatric ward care alone. Mean age (s.d.) for the whole group was 7.97 (4.32). There were equal numbers of boys and girls. In the whole group, there were highly significant rises in total deviance scores, emotional problems and hyperactivity on the SDQ at 3 months $p=0.003$, $p=0.000$ and $p=0.006$ respectively. Teacher completed SDQs showed that there were no significant increases in any subscale scores for the whole group. 16.4% of the children in the whole sample achieved scores on the IES which would suggest a diagnosis of PTSD after 3 months. The significant increases in SDQ scores and the high IES scores were confined to PICU (not children admitted to general paediatric wards only) and PICU children also had hyperactivity scores rated by teacher questionnaires.

Conclusions: Admission to hospital with meningococcal disease is associated (in severely affected children requiring PICU) with significant increases in symptoms of emotional problems and hyperactivity as well as symptoms of PTSD.

G60 PSYCHOSOCIAL OUTCOME FOLLOWING ADMISSION TO THE PAEDIATRIC INTENSIVE CARE UNIT (PICU)

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Aims: To document psychiatric morbidity 6-12 months after hospital discharge in children and adolescents admitted to PICU with acute medical disorders.

Method: We performed a case control study of children < 16 years admitted to PICU and a control group matched for age, sex and admission period admitted to the general paediatric wards. 6-12 months after hospital discharge, psychiatric status of children was assessed through self-rating questionnaires and a semi-structured interview on Post-Traumatic Stress Disorder (PTSD). Parental mental health was assessed with questionnaires.

Results: 68 children (35 PICU and 33 non-PICU) were recruited out of 89 approached; full child interviews were obtained on 64 and parental PTSD data on 62. The mean age (sd) for the whole group was 9.2 (2.7) and there were 41 boys and 27 girls. The main reason for admission in both groups (49% of PICU and 45% of non-PICU) was an acute respiratory disorder. Since discharge from hospital, 5/31 (16%) of PICU and 2/33 (6%) of non-PICU subjects had developed PTSD. In addition, two symptoms were found to be significantly more common in the PICU group than in the non-PICU group. These were irritability ($p=0.002$) and avoidance of reminders of the admission ($p=0.01$). Significantly more parents of PICU children were found to be at high risk for PTSD (9/33 or 27% vs 2/29 or 7%). Parents of PICU subjects were significantly more likely to report changes in their parenting (more protective, more "allowances" made, more worried about their child's health, more disagreements with partner about parenting). There were no differences between the groups in other behavioural or emotional symptoms in the child, or in psychiatric problems in the parents.

Conclusion: PICU admission in children is associated with an increase in PTSD symptoms in children and in parents.

G61 GLUCOCORTICOIDS MODULATE THE NEUROTROPHIN RESPONSE TO TRAUMATIC BRAIN INJURY (TBI) BUT DO NOT AFFECT OUTCOME

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Introduction: Neurotrophin expression in the rat hippocampus is altered by experimental TBI and neurotrophins are neuroprotective. Glucocorticoids are regulators of brain neurotrophin levels and are often prescribed following TBI, although clear evidence of benefit is lacking.

Aim: To determine the effects of altering glucocorticoid status on neurotrophin expression in the hippocampus and on outcome after TBI.

Methods: Fluid percussion injury (FPI) in adrenal-intact or adrenalectomised (ADX) rats with or without corticosterone replacement. Hippocampal neurotrophin expression was assessed by in-situ hybridisation. Cognitive outcome was determined using the T-maze test. Histological outcome was measured by counts of normal, necrotic and apoptotic neurones in the hippocampus on H&E sections. The mode of neuronal death was assessed using cresyl violet sections, TUNEL and immunohistochemistry for apoptotic markers.

Results: NGF and BDNF mRNA expression were increased in the hippocampus by FPI (ANOVA, $p<0.05$). Prior ADX obliterated the NGF response to FPI ($p<0.0001$) but enhanced the BDNF response ($p<0.05$). NT-3 mRNA expression was decreased by FPI ($p<0.0001$) and further reduced by ADX ($p=0.0009$). Neurones in the hippocampal CA3/2 region and the hilus of the dentate gyrus (DG) underwent non-apoptotic cellular death after FPI associated with a significant impairment of T-maze performance ($p=0.03$). ADX caused apoptotic neuronal loss in the DG, which was not associated with a deficit in T-maze function. Prior ADX did not significantly affect the histological or cognitive outcome after FPI.

Conclusions: Glucocorticoids have a critical but paradoxical role in modulating the neurotrophin responses to TBI. However, although ADX altered the trauma-induced neurotrophin response, it did not affect cognitive function or the degree of hippocampal neuronal loss. These results further question the use of glucocorticoids after TBI.

G62 ASSESSMENT OF DRUG PRESCRIPTION AND ADMINISTRATION ERRORS IN PAEDIATRIC INTENSIVE CARE—A COMPARISON OF TWO PRESCRIBING METHODS

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Background: The potential for drug errors to occur on a Paediatric Intensive Care Unit (PICU) is increased due to the diversity of the patients, the polypharmacy and general stressful nature of the department. Our critical incident reporting system suggested a significant number were prescription related.

Aim: To assess current drug prescription and administration errors on our unit and then implement and assess a new prescribing system (doctors orders charts), with the aim of reducing prescription errors on our twelve bedded PICU.

Method: Two similar six month audit periods took place before and after the introduction of a new prescribing system into routine clinical practise. The reporting of errors was voluntary and anonymous. Errors were documented using standardised incident reporting forms that were widely available on the unit.

Results: Errors were classified as either prescription or administration errors and the severity of the error was graded according to Hartwigs classification. (1) The total number of errors in the first audit period was 246 (83% prescription errors) which fell to 134 in the second audit period (68% prescription errors). Introduction of the new chart reduced the number of prescription errors from 1 per 7.5 patient days to 1 per 17.9 patient days. There were also fewer severe errors during the second audit period.

Conclusion: The new chart has reduced the number of prescription errors and has contributed to safety and patient care on the unit. It has generally been well received by doctors, nurses and pharmacists alike. (1)Severity-indexed, incident report based medication error reporting program. Hartwig SC et al, *Am J Hosp Pharm* (1991) 48:2611-2616.

G63 AUDITING IN PRACTICE: THE IMPACT OF ONGOING AUDITING ON ENTERAL NUTRITION IN A PAEDIATRIC INTENSIVE CARE UNIT

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Background: There is incontrovertible evidence to support early initiation of enteral feeding (EF) in critically ill children (CIC), in order to maximise calorie intake and improve nutritional status. There are multiple barriers that prevent successful enteral alimentation in this subgroup of patients.

Aims: To audit EF practices in a paediatric intensive care unit (PICU) over six years in two complete audit cycles, with specific interventions introduced following each.

Methods: The time to initiate EF as well as the proportion of total caloric intake provided by EF for each day of PICU stay was calculated in a set of patients in 1995, 1997-98 and again in 2001. At the end of the audit in 1995, age-specific feeding algorithms were introduced. Following the audit in 1997-98, nasojejunal feeding was introduced as an additional method to improve EF. A designated Nutrition Link Nurse worked with the Dietician to promote and maintain these changes.

Results: See table.

	1995	1997-98	2001
Patient nr	83	72	100
Feed started	19 hours	16 hours	9 hours
% PN/NG/NJ	10.9/87/1.2	19.4/80.6/0	1/79/20
50%EAR day 3	23.3 %	37.7 %	53 %
70%EAR day 3	9.8 %	10.5%	38%

Conclusions: It is possible to achieve optimal enteral alimentation in CIC by introducing simple and clear guidelines as well as a post-pyloric feeding protocol, to maximise both adequacy and successful delivery of EF. A multi-disciplinary approach as well as continuing audit practice is crucial to achieve this objective.

G64 THE IMPACT OF A SPECIALISED PAEDIATRIC RETRIEVAL SERVICE ON THE MANAGEMENT OF SICK CHILDREN AT THE REFERRING HOSPITAL

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Introduction: Has the increasing use of specialist mobile intensive care teams (MICT) to transport sick children to paediatric intensive care units resulted in referring hospital (RH) staff being de-skilled in initial airway and vascular access procedures?

Aims: To compare the proportion of airway and vascular access procedures performed by referring hospital (RH) staff on critically ill children in two discrete time periods before and after widespread use of a MICT.

Methods: Retrieval data were collected from all children for whom a paediatric retrieval was mounted by our MICT in the one year periods between Oct 1993-Sep 1994 and Oct 2000-Sep 2001 inclusive.

	Oct 1993-Sep 1994			Oct 2000-Sep 2001		
	Needed/Total (%)	RH	MICT	Needed/Total (%)	RH	MICT
Endotracheal intubation	51 / 63 (81%)	31 (61%)	20 (39%)	269 / 340 (79%)	227 (84%)	42 (16%)
Central venous access	44 / 63 (70%)	5 (11%)	39 (89%)	180 / 338 (53%)	33 (18%)	142 (81%)
Arterial access	51 / 61 (81%)	11 (22%)	40 (78%)	238 / 335 (71%)	45 (19%)	189 (81%)

The proportion of children in whom RH staff performed the initial airway and/or vascular access interventions was calculated.

Results: see table.

Conclusions: Concerns that RH staff would be de-skilled in the management of sick children with the increasing use of a MICT are unfounded. On the contrary, a larger proportion of initial procedures to establish a secure airway and vascular access are being performed by referring hospital staff.

G65 VARIATION IN OSMOSTAT 'SET-POINT' IN NORMONATRAEMIC PATIENTS PRESENTING FOR INTENSIVE CARE

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Introduction: The ability to conserve water is regulated by the threshold or 'set-point' for, and degree of, antidiuretic hormone (ADH) release in relation to plasma osmolality (Posm). A variety of abnormalities in salt and water metabolism have been described in critically ill patients (e.g., syndrome of inappropriate ADH, cerebral salt wasting and partial diabetes insipidus).

Aim: Hypothesis generating study of water metabolism in acute critical illness.

Methods: Prospective collection of clinical data with urine and plasma biochemical investigations performed as part of routine care in 56 children (median age, interquartile range [IQR]: 5.2, 1.5-11.0 years) with 31 having acute neurological problems.

Findings: 1. On admission, the median urine osmolality (Uosm) in all 56 patients was 560 (IQR 391-745) mosm/L. 24 hours later there was no significant change in these values (median difference, IQR; 36, -5 to 117 mosm/L). 2. Out of 43 children with serum sodium in the normal range, we found that 41 fell into the following Uosm/Posm groups: 12 'normal range', 13 'solute diuresis', and 16 'inappropriate antidiuresis' (i. e., high Uosm for Posm). 3. The calculated apparent Posm osmostat 'set-point' for ADH release in these normonatremic patients fell into the following ranges: 'normal' 285 ± 2 mosm/L (mean ± SD); 'solute diuresis' 291 ± 3 mosm/L; and 'inappropriate antidiuresis' 275 ± 2 mosm/L.

Hypothesis generated: In critically ill children the antecedents for imbalances in serum sodium appear to be present on admission. We hypothesise, therefore, that the expression of any abnormality is not determined solely by the type and volume of fluid administered.

G66 A COMPARISON OF CT VERSUS BRONCHOGRAPHY IN VENTILATOR DEPENDENT INFANTS

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Aims: To assess the relative accuracy and the impact on clinical management of CT scanning as compared to tracheobronchography, in a population of ventilator dependent infants.

Methods: 16 infants on minimal ventilatory support, but requiring a high positive end expiratory pressure (PEEP) on the neonatal intensive care unit were recruited. Spiral CT and bronchographic images were obtained for each infant, within 2 days in 12 infants, but delayed imaging occurred in 4 infants. A series of 2 to 5 different PEEP settings were used to quantify the tracheobronchomalacia seen. Bronchography was assumed to be the 'gold standard'.

Results: 15 infants were premature, with 5 having cardiopulmonary malformations. There was good or partial correlation between CT and bronchography in 10 patients, and no correlation in 6. Two cases of focal tracheomalacia, 1 of which had cardiac defects, had good correlation although CT underestimated the opening pressures. There was good correlation of specific tracheomalacia in 9 of 16 (one case was non-diagnostic due to a low ETT on CT). With malacia of the main bronchi there was partial or complete correlation in 8/16 cases on the right, and 7/16 cases on the left. Bronchography consistently demonstrated more marked abnormalities, particularly of the left main bronchus. One double aortic arch was identified by CT.

Conclusion: Bronchography provided superior dynamic information. CT was superior in imaging anatomical abnormalities, and lung parenchyma. When investigating small, ventilator dependent infants, for tracheobronchomalacia we continue to favour bronchography with varying PEEP.

G67 PAIN ASSESSMENT AND TREATMENT IN PAEDIATRIC EMERGENCY DEPARTMENT; PROPOSAL OF MODIFICATION OF APLS-GUIDELINES

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Aims: Investigation of pain assessment and treatment of children in the Emergency Department.

Methods: We investigated a prospective study of pain and its treatment in 854 children aged 0-15 years. A pain assessment tool following APLS guidelines was used. Based on these guidelines, analgesic was given according to the level of pain.

Results: Symptoms described on the casualty cards suggested that 542 required pain assessment but only 226 were assessed properly. 137 patients (60%) had appropriate pain treatment, 66 (30%) had inadequate pain treatment, 17 (8%) had unnecessary medication, 6 patients refused treatment. Difficulties arose from children confusing pain versus emotions and subjectivity of the person taking the score. Emergency Paediatric Staff found the APLS treatment chart confusing as the pain severity is not in order. This was complicated further by different scales used for pain assessment and pain therapy (as recommended in the APLS guidelines). On a scale of 1-to-5, zero pain scored "1" increasing to "worst ever pain" scoring "5". However, the treatment list had six steps, from no treatment to invasive therapy.

Conclusions: Pain is common among children presenting to the Emergency Department. It is difficult to measure and treat. Possible solutions to facilitate correct treatment could be: (i) the use of printed pain assessment tool or scoring system on the casualty card, (ii) harmonisation of scoring and treatment charts; scores 0-to-5 and not 1-to-5, as no pain = "0" not "1", (iii) putting the APLS treatment chart in order to avoid possible confusion, incorporating the numerical pain scores. Management of pain in children. In: *Advanced Paediatric Life Support: Publication of Advanced Life Support Group*. 3 ed. London: BMJ Books; 2001:297-302. Hicks CL, von Baeyer CL, Spafford PA, van Korlaar I, Goodenough B. The Faces Pain Scale-Revised: toward a common metric in pain measurement. *Pain* 2001;93(2):173-83.

G68 HOW ARE WE MANAGING DIABETIC KETOACIDOSIS? A NATIONWIDE SURVEY

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Aim: The emergency management of Diabetic Ketoacidosis (DKA) remains a challenge. Hence, a nationwide Questionnaire (Q) survey of the Consultant General Paediatricians (GP) in the UK was undertaken.

Methods: Open ended, written Q, pre-tested to exclude ambiguous questions, however, certain cross items were included to help ascertaining degree of certainty. Target group was carefully identified. Results: 453 (67.8%) Qs were returned. 111 (16.6%) were excluded. Of 342 valid returns 293 (85.7%) were from GP. Of these 165 (56.3%) were of < and 128 (43.7%) of >10 years in service as a Consultant. Most of them (99.3%) treated DKA in their hospitals with the help of guidelines (99.7%) and flow charts (61.3%). These children were cared for in the Paediatric ICU (17.7%), Adult ICU (15%), Paediatric HDU (46.4%) and Wards (55.2%). The criteria for ICU admission were Respiratory Failure (79.2%), Dehydration and Shock (26.3%), Encephalopathy (74.7%), and Unsatisfactory response to initial fluid resuscitation (53.2%). Airway management included Close observation (71%), Oxygen by mask (60.8%),

Emergency Intubation (50.9%), and Elective Intubation (15.4%). Indications for Elective Intubation were Severe Dehydration & Shock (29.4%), clinical suggestion of Encephalopathy (74.1%), and clinical evidence of Pulmonary Oedema (60.1%). Initial resuscitation fluid used was Normal Saline (94.5%). The volume of initial resuscitation fluid bolus of 20 ml/kg once only (14%) and repeat bolus used in 39.6% using up to 40 ml/kg (total fluid). Bicarbonate was used by 26.7%. Plasma Osmolality monitoring was responded favourably by 67.3%.

Comments: This study highlights variations in the practices of GP in the emergency management of DKA. The effects of severe acidemia and rapid osmolar shift on myocardial functions, haemodynamic status, oxygen delivery, and influence on vascular tone in addition to its described effects on cerebral perfusion remains to be further studied. Improving and simplifying early management of this group of patients along with early transfer of these children to a specialist facility needs further consideration.

G69 HAVE MODERN SAFETY CHANGES TO PLAYGROUNDS REDUCED HEAD INJURY AND FRACTURE TO CHILDREN?

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Aims: The assumption is often made that modern "safe" playground design and surfacing will reduce all forms of injury. Is there any evidence that this is true? This study aims to: Determine what injuries occur to children playing on modern playgrounds Perform a systematic review of playground injury literature Evaluate whether the profile of injury has changed with introduction of new surfacing and equipment design.

Methods: 1. Analysis of local injury surveillance data relating to playground accidents collected between 1994-1998.

Systematic review of playground injury publications.

Results: Serious head injury is now rare but fractures remain a significant problem. No skull fractures and only 5 concussions over 5 years. However the burden of injury due to fracture remains high. The proportion of fractures relative to minor injury has not decreased on modern equipment and surfaces. Distal radio-ulnar fractures predominate but humeral supracondylar and mid radio ulnar fractures are also common. Primary factors in fracture aetiology are height of fall and age of child. Climbing equipment notably monkey bars are associated with the highest fracture rates. Lower limb fracture is uncommon. 33% of all fractures require admission (84% for manipulation under anaesthetic).

Conclusion: Impact absorbing surfaces were designed to prevent head injury and are successful but limb fracture remains of concern. The evidence is clear that the combination of height and current surfacing exceeds the threshold for limb fracture. New EU regulations increase maximum height of free fall to 3m. Fresh thought must be given to playground design or more injuries will result.

G70 COST IMPLICATION OF A&E ATTENDANCE FOR CHILDREN WITH ACUTE BREATHING DIFFICULTIES

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Aims: The National Health Service (NHS) aims to provide the highest standards of service with limited resources and thus cost containment is important in all sectors of the health care system We report a study of the costs for children presenting to the accident and emergency department with breathing difficulties, and compare these with costs of those who were admitted.

Methods: A questionnaire was completed from September 2000 to March 2001. This recorded symptoms, grade of consulting doctor, investigations, treatments, final diagnosis and for those admitted, length of stay and additional information on further treatment and investigations. Estimation of costs was based on available data on the cost of an A&E attendance, inpatient stay¹, costs of various investigations and treatments.

Results: The total cost to the NHS of all 1253 children presenting to the Nottingham A&E department during the study period with acute breathing difficulties was approx. £400,500 (£319.63 per child). Of all the attendances studied, 30% were admitted. Those admitted had on average 3 times as many investigations performed in the A&E department compared to those discharged from A&E (an average of

1.22 investigations for those admitted versus 0.38 for discharged children) and twice as many treatments (1.4 compared with 0.77). The average length of stay for a child admitted to the ward was two and a half days (median 1 days). On average the total cost of attending with breathing difficulty but discharged from A&E was £72.78 per child. In contrast, the average cost of attending A&E followed by admission was £902.00 per child. This compares to the annual cost of providing primary care for children at £18-£25 per child.

Conclusion: Attendance and treatment in A&E incurs considerable costs to the NHS which are substantially increased if admission follows attendance. Encouraging health professionals to follow clinical guidelines should ensure that the investigations performed, treatment provided and decisions to admit are appropriate and has the potential to reduce costs arising from inappropriate tests and admissions.

1. Netten, A and Curtis, L (2000). *Unit Costs of Health and Social Care*, Personal Social Services Research Unit, University of Kent.

G71 AUDIT OF ALERT CALLS TO BIRMINGHAM'S CHILDREN'S HOSPITAL ACCIDENT & EMERGENCY DEPARTMENT

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The Birmingham Children's Hospital Accident & Emergency Department sees 37,000 new attendances a year and approximately 100 are alert calls. This call alerts the A & E department to the expected arrival of a seriously ill or injured child. This enables rapid mobilisation of expertly trained staff and organisation of resuscitation equipment prior to their arrival.

The joint report from the Royal College of Surgeons England and British Association of Orthopaedics 'Better care of the severely injured child' sets standards for minimum patient information in alert calls.

Aims: To determine whether ambulance alert calls were meeting the set standards. Can recommendations be made about essential information to be communicated in all alert calls?

Methods: Retrospective audit of all alert call documentation from 1/1/99-30/9/01 inclusive.

Results: Total of 344 alert calls of which 60% medical and 40% trauma alert calls. The age was provided in 98.8% of alert calls. The gender was available in 45.1% of calls. The following table shows percentage of alerts in which the parameters were available.

Conclusions: The standards set are not being met. Can we introduce a checklist to be implemented by ambulance crew, ambulance control and A & E?

Abstract G71

	Medical(%)	Trauma(%)
Pulse	11.0	18.2
GCS/AVPU	21.3	37.5
Respiratory rate	10.0	16.8
Oxygen Saturation	1.9	12.5
Treatment given	37.5	10.2

G72 RECOGNISING MENINGOCOCCAL DISEASE IN CHILDREN. HOW VITAL ARE THE VITAL SIGNS?

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Aims: Meningococcal disease (MD) is the commonest infectious cause of death in children in the United Kingdom. The disease can present as meningitis, septicaemia or both. However most deaths result from shock secondary to septicaemia. The speed with which the diagnosis is made and treatment commenced is likely to be the major determinate of outcome, with early diagnosis being dependant on recognition of disease complications. This paper aims to show how vital signs essential for the recognition of disease complications are not being routinely recorded in UK hospitals.

Methods: Clinical data was collected on 496 children (143 deaths and 353 survivors) under the age of 17 years who presented between 1st December 1997 and 28th February 1999. We examined the case notes for the first nursing assessment of the patient on entry to hospital in Accident and Emergency or on a Paediatric Ward, and recorded the presence of the following vital signs: Temperature, Pulse rate, Respiratory rate, Blood Pressure, Trans-cutaneous Oxygen Saturations, Conscious level (CNS), and whether a rash was looked for.

Results: Within the total group, 50 (10%) had no observations recorded by a nurse in the first hour. 446 (90%) had some nursing assessment recorded in the first hour. Of these, only 63 (14%) had a full set of observations as determined above, recorded. Individual vital signs were recorded with the following frequency: Temperature 95%, Pulse rate 83%, Respiratory rate 60%, BP 66%, Saturations 51%, CNS status 56%, Rash looked for in 60%.

Conclusions: Early diagnosis requires the assessment of vital signs and seeing whether a non blanching rash is present. Triage systems currently in use do not appear to rely on vital signs for nurses to decide on severity of illness. Failure to measure these vital signs may cause delay in diagnosis and treatment of children with Meningococcal disease.