Abstracts

Plenary sessions

P01 SEVERE COMPLICATIONS OF CHICKENPOX IN HOSPITALISED CHILDREN

J. C. Cameron[1], G. Allan[1], F. Johnston[1], R. Booy[2], P. T. Heath[3], A. Finn[4]. *[1]Health Protection Scotland, Glasgow, UK; [2]Royal London Hospital, London, UK; [3]Institue of Child Health, Bristol, UK; [4]St Georges Hospital, London, UK*

Introduction: Varicella (chickenpox) is generally a mild disease, but severe complications can occur even in previously healthy children. There are few data on complicated varicella in the UK and further information could help determine immunisation policy, either for specific risk groups, or as a universal programme.

Aims: To estimate the annual incidence of severe complications of varicella in hospitalised children, to describe the complications and affected children, to estimate annual mortality, and to provide economic data.

Methods: Active surveillance was carried out throughout the UK and Ireland during the period November 2002 to November 2003, through the British Paediatric Surveillance Unit. Paediatricians were prompted monthly to notify cases meeting the definition below and a questionnaire was sent requesting further clinical and epidemiological data.

Case Definition: Any child aged <16 years hospitalised with complicated varicella, as defined by list of clinical conditions (bacteraemia/septic shock, toxic shock syndrome/toxin-mediated disease; necrotising fasciitis; encephalitis; purpura fulminans/disseminated coagulopathy; pneumonia (abnormal *x* ray); neonatal varicella; fulminant varicella; Reye's syndrome; ataxia; death due to varicella), or admitted to a paediatric ICU or HDU with varicella or one of its complications.

Results: Over the 13 month period, 188 cases were notified: 118 (63%; 0.86/100 000 children per year) met the case definition, 22 (12%) duplicates, 28 (15%) did not meet the case definition, 6 (3%) errors, 14 (7%) lost to follow up. Confirmed cases had a median age of 3 years (range 0–14). The most frequent complications stated were bacteraemia/septic shock (n = 34), pneumonia (n = 31), encephalitis (n = 27), and ataxia (n = 26), followed by toxic shock syndrome/toxin-mediated disease (n = 14), necrotising fasciitis (n = 7), purpura fulminans (n = 6), fulminant varicella (n = 5), and neonatal varicella (perinatal infection) (n = 3). Fifty four cases had a bacterial infection. No cases of Reye's syndrome were reported. There were seven deaths due, or possibly due, to varicella, including one intrauterine death (late second trimester). Five of other six children who died (ages 4 months and 2, 4, 5, 10, and 14 years) had a recorded pre-existing medical condition (HIV, cerebral palsy (2), cardiac/skeletal myopathy, gastroschisis/necrotising enterocolitis). Sequelae on discharge were reported for 42 cases (36%), most frequently residual ataxia (n = 15), or skin scarring (n = 13). The median hospital stay was 7 days (range 1–68).

Conclusions: Severe complications, and even death, due to chickenpox do occur in the UK and Ireland, albeit as a rare outcome. The study makes an important contribution to data already available, and forms a baseline against which the impact of any immunisation programme could be evaluated.

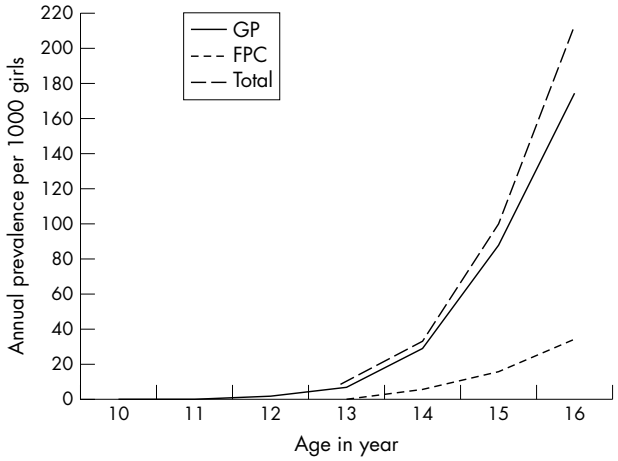
Thanks to all paediatricians who have notified cases and completed questionnaires.

P02 ADOLESCENT USE OF THE COMBINED ORAL CONTRACEPTIVE PILL. A RETROSPECTIVE OBSERVATIONAL STUDY

N. Krishnamoorthy[1], S. Ekins-Daukes[3], C. R. Simpson[2], R. M. Milne[2], P. J. Helms[3], J. S. McLay[1]. *[1]Medicine and Therapeutics, University of Aberdeen, Aberdeen, UK; [2]General Practice and Primary Care, University of Aberdeen, Aberdeen, UK; [3]Child Health, University of Aberdeen, Aberdeen, UK*

Objective: To determine the extent of combined oral contraceptive use by girls 10–16 years of age in Scotland.

Methods: Assessment of combined oral contraceptive prescribing in 35 414 girls 10–16 years of age for the year 1 November 1999 to 31 October 2000 from data retrieved from 161 primary care practices taking part in the Scottish Programme for Improving Clinical Effectiveness in Primary Care (SPICE-pc), using the national Scottish primary care computer system GPASS, and from national aggregated data from family planning clinics collected by the Scottish Executive's Information and Statistics Division (ISD).



Abstract P2 Prevalence of OCP use.

Results: During the study period the oral contraceptive pill (OCP) was prescribed by a primary care physician to 1531 girls (4.3%) aged 10–16 years. The age adjusted prevalence rates per 1000 girls registered with their family doctor rose from 0.9/1000 girls aged 12 years or younger, to 6.9, 30, 86.3, and 174.8/1000 for girls aged 13, 14, 15, and 16 years, respectively. The overall prevalence of combined oral contraceptive prescribing by primary care physicians was 43.2/1000 girls aged 10–16 years. A further 1765 girls aged 13–16 years obtained a prescription for the OCP from a Scottish family planning clinic, giving an overall prevalence rate for FPC prescribing of 8.0/1000 girls aged 10–16 years. Although in Scotland it is estimated that 15.4% of 14 year old girls and 38% of 15 year old girls are sexually active summing the primary care and FPC results obtained in this study suggest, that even in the very best case scenario, only 4% of 14 year olds, and 10% of 15 year olds are prescribed the OCP, indicating a significant short fall between sexual activity and prescribed oral contraception.

Conclusions: The UK is recognised as having the highest rate of teenage pregnancy in Western Europe, but despite the medical and social concerns about the sexual health of teenagers the level of oral contraceptive use in this young age group remains low.

P03 CALCULATING THE REQUIRED TRANSFUSION VOLUME IN CHILDREN: OUR CURRENT PRACTICE GIVES INSUFFICIENT VOLUMES

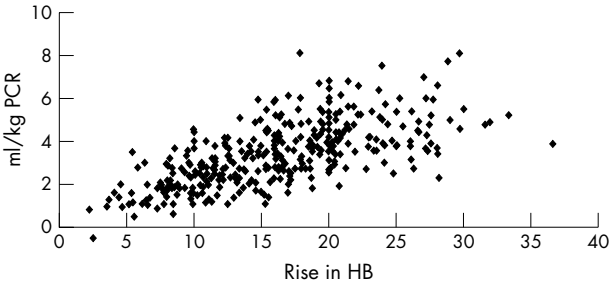
P. Davies[1], S. Robertson[1], S. Hegde[1], E. Massey[2], P. Davis[1]. *[1]Royal Hospital for Children, Bristol, UK; [2]Avon Haematology Unit, Bristol, UK*

Aims: 1) To assess how the volume of packed red cells (PRC) given to children affects the increase in serum haemoglobin concentration (Hb), and 2) to calculate how much blood to give.

Background: The traditional transfusion volume calculation is: weight (kg) × difference to be achieved (g/dl) × the transfusion factor, usually quoted at 3 or 4. We were unable to find an evidence base for the use of these numbers.

Methods: Over a 2 year period all patient charts on a paediatric intensive care unit were examined retrospectively. The immediate pre- and post transfusion Hb estimations, and the precise volume of PRC transfused were recorded. All other sources of fluid input and loss during the transfusion were documented.

Results: 7679 patient charts were examined with a total of 564 transfusions recorded. All patients who were bleeding, had drain losses, or had colloid infusions concurrent with the transfusion were excluded, giving a dataset of 388.The correlation coefficient between mls/kg blood



Abstract P3

transfused and rise in Hb was 0.64, with a gradient of 5.02. There was no association between effect size and patient weight, age, starting Hb, or sex. No significant difference was found in Hb at 1 and 7 hours post-transfusion.

Conclusions: Our data suggest that the transfusion volume calculation should be: weight (kg) × difference to be achieved (g/dl Hb) × a factor of 5 giving the volume (ml) of UK PRC. Care must be taken not to risk hypervolaemia, while minimising donor exposure and number of transfusion episodes. The factor can be adjusted according to mean haematocrit specified by the supplier of the blood. This can differ significantly internationally (for example, whole blood = 0.40, UK PRC = 0.60, USA PRC = 0.80). The local factor can be calculated by (3/haematocrit).

P04 EFFICACY OF ADDITIONAL THERAPY AND SUPPORT FOR CHILDREN WITH CEREBRAL PALSY AND THEIR FAMILIES

A. M. Weindling[1], C. Cunningham[2], S. Glenn[2], R. Edwards[3]. *[1]School of Reproductive and Developmental Medicine, University of Liverpool, Liverpool, UK; [2]School of Health and Applied Social Sciences, Liverpool John Moores University, Liverpool, UK; [3]Centre for Economics of Health, University of Wales, Bangor, UK*

Background and Aim: Many parents and some professionals feel that additional physiotherapy helps children with cerebral palsy (CP). This study aimed to investigate the usefulness of additional eclectic therapy to improve movement.

Method: Children <4 years with spastic CP were randomised to (a) extra home based therapy from a physiotherapy assistant (PA, n = 25), (b) support at home by a family worker (FSW, n = 23), or (c) a control group (CG, n = 28). Intervention was for a single session a week for 6 months. Outcomes were: (i) child focussed (gross motor function measure (GMFM), development (Griffiths), and adaptive functioning (Vineland)); (ii) family related (parental stress, family needs, parental satisfaction). Diaries and an interview were used to assess satisfaction.

Results: Ninety families were referred; 76 completed the intervention. Age of entry into study was 19.8 (SD 8.8) months. The mean pre- and post-intervention scores can be seen in the table. The majority of parents who received an intervention were very happy about this, whichever group they were in. Further assessments at 12 and 18 months after the start of the intervention showed no difference.

Conclusion: There was no evidence that additional physical therapy improved any child outcome measure. Intervention by an FSW did not affect parental stress or family needs.

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	Control		PA			FSW		
	Pre	Post	Pre	Post	p*	Pre	Post	p*
GMFM	36	46	36	50		39	48	0.87
Vineland	17	25	19	26		18	26	0.53
Griffiths	144	186	136	189		143	186	0.32
Parental stress index	136	134	137	140	0.26	134	137	

*p Value comparison with control by ANCOVA.

P05 ABDOMINAL INJURY DUE TO CHILD ABUSE: FINAL RESULTS FROM THE BPSU STUDY

J. R. Sibert[1], P. M. Barnes[2], C. Norton[1], D. Yates[3], F. D. Dunstan[1], A. M. Kemp[1]. *[1]Cardiff University, Cardiff, UK; [2]Swansea NHS Trust, Swansea, UK; [3]Trauma Audit and Research Network, Salford, UK*

Aims: Internal abdominal injury due to abuse causes problems because of lack of information and a sparse literature. We aimed to ascertain epidemiological information on the problem, the social factors that could prevent the abuse, and clinical factors that could help with the diagnosis.

Methods: This was a cross sectional study in the UK from March 2001 to February 2003 with children aged 0–13 years. It used the British Paediatric Surveillance Unit where cards are sent monthly to paediatricians. We ascertained cases of internal abdominal injury due to abuse confirmed at a multidisciplinary meeting. We compared the features of abdominal injury in children due to abuse with injury due to road traffic accident (RTA) and falls ascertained from the Trauma Audit and Research Network (TARN).

Results: Twenty children sustained abdominal injuries from abuse over a 2 year period (11 girls and 9 boys); 16 were under five years of age. The incidence was 2.30/1 000 000/year (95% CI 1.42 to 3.74) in the under fives. The injuries were mostly serious, with six (30%) of the 20 children dying. In half the children there had been previous concern regarding abuse. Half of the abused children had an injury to the gut (all but one case small bowel) compared with 21% due to RTA and 7% in those who had a fall ($p<0.0001$). Five children had no bruises on the external abdominal wall despite having significant intra-abdominal injury.

Conclusions: This study has confirmed that abdominal injury is a rare but definite form of abuse with a significant mortality. These are severe injuries that would have caused much pain and perhaps some could have been prevented if previous episodes of concern regarding abuse had been dealt with more vigorously. We suggest that paediatricians should look more closely at all potentially abused children to exclude intra-abdominal injury perhaps using liver enzymes and amylase as a screening tool. Special consideration needs to be given to the aetiology of injuries to the small bowel in children, particularly if a fall is the explanation and the child is under five.

P06 THE UK PROSPECTIVE STUDY OF CEREBRAL OEDEMA COMPLICATING DIABETIC KETOACIDOSIS

J. A. Edge[1], R. Jakes[2], Y. Roy[1], B. Widmer[3], M. E. Ford-Adams[1], N. P. Murphy[1], A. Bergomi[1], D. B. Dunger[3]. *[1]Department of Paediatrics, John Radcliffe Hospital, Oxford, UK; [2]MRC Epidemiology Unit, Cambridge, UK; [3]Department of Paediatrics, Addenbrooke's Hospital, Cambridge, UK*

Aims: Cerebral oedema during treatment of diabetic ketoacidosis (DKA) remains the commonest cause of death and disability in children with diabetes. However, the cause is still unclear. We carried out a national prospective case control study to determine risk factors for the development of cerebral oedema complicating DKA.

Methods: Sixty suspected cases of cerebral oedema were notified through the British Paediatric Surveillance Unit over a 3 year period. Forty three cases were confirmed after scrutiny of notes, radiological, and post-mortem records. Control episodes of DKA were identified through parallel monthly reports from 243 consultants in 231 UK hospitals. Cases and controls (1:4 ratio) were matched for sex, age, and newly diagnosed (new) or already known diabetes. Baseline biochemical and treatment data were extracted from clinical notes. Risk factors were identified initially in univariate and then in multivariate models using STATA.

Results: There were no significant differences in age, sex, or new/known diabetes between cases (n 43) and controls (n 169), but these variables were allowed for in all subsequent analyses. The risk for cerebral oedema was strongly related to pH or bicarbonate levels at presentation (p for trend across quartiles of pH or bicarbonate, <0.001). A low plasma sodium (OR 0.85; p 0.012), and high plasma potassium (OR 2.92; p 0.023) at presentation also conferred increased risk. Greater volumes of fluid administered during the first four hours (OR 6.55 in the highest volume tertile, $p<0.02$ for trend) also independently contributed to the risk of cerebral oedema. If insulin was administered during the first hour of fluid treatment, there was a greater risk for cerebral oedema (OR 12.7 p 0.023). Bicarbonate treatment was more likely in cases than controls but was not a risk factor when corrected for degree of acidosis. Rates of change of blood glucose and plasma sodium levels were no different between cases and controls, but cases had a greater fall in plasma potassium levels (β coefficient -3.93, $p<0.03$).

Conclusion: This study highlights that baseline biochemical factors, and in particular the degree of acidosis at presentation, are the major contributors to risk of cerebral oedema. In addition, large volumes of

fluid given during the first four hours of treatment, and administration of insulin during the first hour of fluid treatment, are significant risk factors. These factors should be taken into account when treatment protocols are designed, although they do not allow recommendation of ''safe'' fluid volumes or insulin doses.

P07 EVALUATION OF HOME *v* HOSPITAL CARDIORESPIRATORY SLEEP STUDIES IN INFANTS AND CHILDREN

R. Matsas[1], D. Andrews[2], J. Sidey[1], P. Johnson[2], A. Thomson[1]. [1]*Department of Paediatrics, John Radcliffe Hospital, Oxford, UK;* [2]*Nuffield Department of Obstetrics and Gynaecology, University of Oxford, Oxford, UK*

Introduction: Cardiorespiratory sleep studies in infants and children have traditionally been conducted in hospital either on a ward or in a dedicated sleep laboratory. These are relatively expensive locations for a sleep study, and different from a child's normal sleep environment. With increasing miniaturisation in electronics and the availability of more user-friendly equipment we have been able to expand our use of home monitoring.

Methods and Equipment: Our basic sleep study records pulse oximetry, ECG, chest and abdominal excursions, and limb movements. Additional sensors are added when appropriate (for example, CO_2, EEG). We use the Medicare Rembrandt system, which has a ward system (Artisan amplifier) and a portable system (Monet recorder). Ward based studies are set up by a specialist nurse while for most home studies the nurse instructs parents how to apply the sensors. From our sleep study database we have compared home *v* hospital sleep studies over a 4 year period.

Results: From January 2000 to December 2003, 421 studies were performed involving 351 patients. Forty one studies were intentionally performed with limited channels as oxygenation data only were required. Overall, 45% of studies (190/421) were performed at home with the majority of those (70%) being children referred for possible obstructive sleep apnoea. In contrast, 75% of neurological patients were studied on the ward due to the availability of CO_2 monitoring. Home studies were more common in children 1–6 years of age (57%), whereas 66% of <1 year olds, and 60% of >6 year olds were studied on the ward. The success rate was 91% (173/190) for home studies and 99% (229/231) for ward studies. Of the 17 failed home studies, 11 (64%) were due to insufficient signals, 3 (18%) were due to no data obtained at all, and 3 (18%) were due to the study being too short. Nine of the home studies were repeated with 100% success, including six repeated at home. Mean sleep efficiency (total sleep time divided by sleep period time $\times 100$) in the 380 studies performed with basic or expanded channels was significantly higher in children studied at home (94% (SD 8.4) *v* 88% (12.9), $p<0.001$), an effect mostly accounted for by the younger children (<3 years) when examined by age. The difference in cost between a home and ward study is that of a hospital bed, £150 per day.

Conclusions: Data of good diagnostic quality can be obtained from a five channel cardiorespiratory sleep study performed at home in $>90\%$ of cases. In addition we have found that home studies are associated with greater sleep efficiency. The development of our home sleep study service has reduced overall costs and allowed a service with little or no waiting list.

P08 OLIGOSACCHARIDES REDUCE STOOL VISCOSITY AND ACCELERATE THE GASTRO-INTESTINAL TRANSPORT IN PRETERM INFANTS—CONTROLLED RANDOMIZED TRIAL

W. A. Mihatsch[1], G. Boehm[2], J. Hoegel[3], F. Pohlandt[1]. [1]*Department of Pediatrics, University of Ulm, Ulm, Germany;* [2]*Numico Research, Friedrichsdorf, Germany;* [3]*Department of Biometry, University of Ulm, Ulm, Germany*

Background: Feeding intolerance is common in preterm infants. A mixture of prebiotic non-digestible oligosaccharides (GosFos; referring to galacto- and fructo-oligosaccharides) has been suggested to reduce stool hardness and increase stool frequency.

Objective: The aim of the current study was to investigate whether GosFos improve feeding tolerance in preterm infants on full enteral nutrition. We hypothesised that GosFos reduce stool viscosity and accelerate gastrointestinal transport.

Methods: In a placebo controlled double blinded trial 30 preterm infants on full enteral nutrition (gestational age 27 (24–31) weeks, postnatal age 42 (11–84) days, and weight at study entry 1570 (1080–2300) g were randomly allocated to have their feedings supplemented with GosFos (1 g/100ml) or placebo for 14 days. Stool viscosity was measured by the force (expressed as Newton, N) to press it through a predefined steel capillary (high pressure capillary rheometry) as previously reported. Gastrointestinal transport was assessed as the time from feeding carmine red to its appearance in the diaper (GTT; gastrointestinal transit time). The hypotheses were tested as a priori ordered hypotheses. Data are shown as median (minimum–maximum).

Results: There was no significant difference between the groups with regard to birth weight, gestational age, postnatal age, and weight at study entry. GosFos significantly ($p<0.05$) reduced the stool viscosity measured by extrusion force (32 (2–67) *v* 158 (24–314) N) and the GTT (12 (4–33) *v* 26 (5–52) h).

Conclusions: Formula supplementation with GosFos improved feeding tolerance measured by reduced stool viscosity and accelerated gastrointestinal transport. No adverse effects were observed. Further trials are required to investigate whether GosFos facilitates enteral feeding advancement and early enteral nutrition thereby reducing the incidence of catheter related nosocomial infections and improving long term outcome.

The study was supported by a grant from Numico Research, Friedrichsdorf, Germany.

P09 RECREATIONAL DRUG USE—A MAJOR RISK FACTOR FOR GASTROSCHISIS

E. S. Draper[1], J. Rankin[2], A. Tonks[3], D. J. Field[1], P. Burton[1], K. R. Abrams[1], J. J. Kurinczuk[4]. [1]*University of Leicester, Leicester, UK;* [2]*University of Newcastle, Newcastle, UK;* [3]*West Midland Perinatal Institute, Birmingham, UK;* [4]*National Perinatal Epidemiology Unit, Oxford, UK*

Aim: This project tested the hypothesis that the incidence of gastroschisis is positively associated with the use of recreational drugs in the weeks following conception.

Methods: A case control study was carried out in three regions: Trent, West Midlands, and Northern over the period Jan 2001 to Aug 2003. For each case, three live born controls were selected, matched by initial intended place of delivery, region, and maternal age (to within 1 year). Case note review and maternal interviews were used to collect information about risk factors for gastroschisis. Human hair was collected for analysis to validate interview data concerning recreational drug use.

Results: The estimated overall prevalence for gastroschisis over the period of the study was 4.24 per 10 000 total births. This represented 164 gastroschisis mothers of whom 144 participated in the study; a response rate of 87.8%. 432 controls participated, representing a response rate of 76.9%. At maternal interview 16.7% of gastroschisis mothers and 5.5% of control mothers admitted using a recreational drug during early pregnancy. Conditional logistic regression analysis showed a statistically significant doubling of the risk of gastroschisis associated with the use of any recreational drug during early pregnancy (adjusted OR 2.20; 95% CI 1.13 to 4.26). There was also a statistically significant excess risk of gastroschisis associated with the use of a class A or B drug during early pregnancy of over three fold (adjusted OR 3.59; 95% CI, 1.36 to 9.47). These excess risks were increased to adjusted OR 2.56 (95% CI, 1.34 to 4.91) and adjusted OR 3.82 (95% CI, 1.58 to 9.22), respectively, when additional Class A or B drug users, identified at hair analysis, were added to the analysis. The estimated attributable risk for gastroschisis of class A or B drug use during early pregnancy was 6.7% (95% CI, 1.7 to 23.4).

Conclusion: There is a significantly increased risk of gastroschisis associated with the use of recreational drugs in early pregnancy. Following the addition of class A or B drug users identified at hair analysis this risk is increased further. However, although mothers who take class A or B drugs in early pregnancy have an almost fourfold risk of a gastroschisis pregnancy the estimated proportion of gastroschisis cases that are attributable to such drug use is less than 7%.

P10 ''SWEET TALK'': TEXT MESSAGING TO SUPPORT INTENSIVE INSULIN THERAPY

V. L. Franklin[1], A. Waller[2], C. Pagliari[3], S. A. Greene[1]. [1]*Maternal and Child Health Sciences, University of Dundee, Dundee, UK;* [2]*Division of Applied Computing, University of Dundee, Dundee, UK;* [3]*Tayside Centre for General Practice, University of Dundee, Dundee, UK*

Introduction: Poor adherence with insulin is associated with poor glycaemic control in young people. Intensifying insulin regimens and patient support improves glycaemic control, but increasing traditional contact with patients is costly. ''Sweet Talk'' is a text-messaging intervention developed to support patients between clinic visits to optimise self-efficacy, adherence, and $HbA1_c$.

Methods: Patients aged 8–18 years, on conventional insulin therapy and with type 1 diabetes (T1D) for >1 year (n = 126), were invited to participate in the ''Sweet Talk'' randomised control trial. 92 patients were randomly allocated to group 1 (control, n = 28), group 2 (conventional insulin therapy and ''Sweet Talk'', n = 33), or group 3 (intensive insulin therapy (IIT) and ''Sweet Talk'', n = 31). Patients in groups 2 and 3 contracted self-management goals in clinic and these goals were reinforced with personalised daily text messages.

Results: ''Sweet Talk'' combined with IIT was associated with improved glycaemic control (median fall of 0.8% in $HbA1_c$ over 1 year). Groups 1 and 2 receiving conventional insulin therapy +/− ''Sweet Talk'' showed deterioration in glycaemic control (median rise in $HbA1_c$ of 0.3% ($p<0.005$)). Self-efficacy for diabetes increased in groups 2 and 3 receiving the ''Sweet Talk'' intervention (Δ: group 1, −8.1; group 2, +2.1; group 3, +3.2, $p<0.005$).

Conclusions: ''Sweet Talk'' is an innovative, cheap strategy using text messages to provide push support to adolescents with T1D, a notoriously difficult group to reach, engaging young people by using a medium integral to teenage culture. The high reach of our study (73%) compares favourably with other behavioural interventions. ''Sweet Talk'' combined with intensive insulin therapy increased self-efficacy for diabetes and improved glycaemic control over the year of the study. This system could be adapted to a variety of healthcare settings including acute and chronic disease management and preventative strategies.

P11 HOW OLD IS THIS FRACTURE? RADIOLOGICAL DATING OF FRACTURES IN CHILDREN: A SYSTEMATIC REVIEW

I. Prosser, S. Maguire, M. K. Mann, S. K. Harrison, A. M. Kemp, J. F. Sibert. *Cardiff University , Cardiff, UK*

Aims: To define the evidence in the context of child protection for radiological dating of fractures in children.

Methods: A systematic review was carried out, conducting an all language literature search of original articles and conference abstracts for the period 1966–2004: ASSIA, Caredata, Medline, Child Data, CINAHL, Embase, PsychINFO, SIGLE, Social Science Citation Index, and TRIP databases. Hand search of references and textbook bibliographies from 1947. We included all studies showing evidence of radiological dating of fractures in children <17 years and excluded review articles, expert opinion, and mixed adult and child studies. We used two independent reviews (a third if disputed), standardised criteria for study definition, data extraction, and critical appraisal.

Results: Of 492 studies reviewed, three were included. Two of these described different staging criteria to date fractures. Each offered broad time frames for dating. The only agreement between the studies was that periosteal reaction is present in at least 50% by two weeks and remodelling is found beyond eight weeks. Their relevance to child protection is limited by having a total of only 33 children less than 5 years, the peak age for abusive fractures. A third study of 23 infants with birth trauma documented the earliest appearance of calcification around the fracture site at 4 days, and the latest at 11 days.

Conclusion: Radiological dating of fractures is an inexact science. The majority of radiologists do so based on personal experience, and the literature provides little consistent data to act as a resource. There is an urgent need for a large study to validate the criteria used in the radiological dating of fractures in children <5 years.

P12 THE EFFECT OF AN INCREASED DOSE OF PREDNISOLONE DURING VIRAL INFECTIONS TO REDUCE RISK OF RELAPSE IN NEPHROTIC SYNDROME: A RANDOMISED DOUBLE BLIND PLACEBO CONTROLLED TRIAL

A. S. Abeyagunawardena[1], R. S. Trompeter[2]. [1]*University of Peradeniya, Peradeniya, Sri Lanka;* [2]*Institute of Child Health, London, UK*

Introduction and Aim: Children with frequently relapsing but steroid dependent nephrotic syndrome (NS) are usually maintained on low dose alternate day prednisolone. Relapses are frequently triggered by viral upper respiratory tract infections (URTIs), possibly mediated by cytokine release. The hypothesis that a small and short term increase in the dose of prednisolone would reduce cytokine release, thus reducing the risk of relapse, was tested by a randomised double blind placebo controlled cross over trial.

Method: Sequential patients receiving low dose (<0.6 mg/kg) on alternate day prednisolone as maintenance therapy were recruited. At entry parents were provided with separate containers labelled A and B, containing either prednisolone (5 mg) or placebo tablets. At the first sign of a presumed viral URTI, all children were examined and randomly allocated to take medicine A or B with the first viral URTI and vice versa with the second. If criteria to diagnose a viral URTI were met, the new medicine was prescribed (same as regular dose) on the days the child was not taking the regular dose of prednisolone for 7 consecutive days (3–4 extra doses). Urine was tested for each morning and the finding of 3+ proteinuria for three consecutive days was diagnostic of relapse.

Results: Forty eight patients were recruited and 40 completed the trial. 29 were male and 11 female. Age at entry ranged from 1.5 to 13.2 years (mean 6.4 years). There were 19 (47.5%) relapses in the placebo group and 7 (17.5%) relapses in the prednisolone group (p 0.003 (comparison of two proportions using Standard Error, CI 0.105 to 0.49).

Conclusion: Prescribing daily prednisolone (regular dose) instead of alternate day prednisolone for 7 days during viral URTIs can significantly reduce risk of relapse in steroid dependent NS.

P13 DOES SUPPLEMENTAL NUTRITION IN EARLY LIFE REDUCE LATER RISK OF CARDIOVASCULAR DISEASE?

S. Kinra[1], K. V. Rameshwar Sarma[2], J. Cockcroft[3], I. Wilkinson[4], G. Davey Smith[1], Y. Ben-Shlomo[1]. [1]*University of Bristol, Bristol, UK;* [2]*National Institute of Nutrition of India, Hyderabad, India;* [3]*University of Cardiff, Cardiff, UK;* [4]*University of Cambdrige, Cambridge, UK*

Aims: It has been suggested that undernutrition in early life can permanently programme an individual's future risk of cardiovascular disease. Observational studies linking size at birth to later outcomes have been extensively replicated, but it is unclear whether these associations reflect the role of maternal diet in pregnancy or fetal nutrition due to placental or genetic factors. We therefore examined cardiovascular disease risk among the offspring born to a cohort of chronically undernourished, non-smoking women. About half of these women were resident in an area with an ongoing programme of supplemental nutrition for pregnant women and children under the age of 6 years.

Methods: The birth cohort was prospectively established to assess the impact of food supplementation (500 calories, 25 g protein, for 300 days a year) on pregnancy outcome. Fifteen villages with the programme and 14 villages without the programme were selected from one area of rural south India, and all women who became pregnant during 1986–1990 were recruited. Baseline data were collected on these women during stages of pregnancy, and their offspring during the first year of life. In the present follow up, we traced the children born in this cohort and invited them to attend a locally arranged clinic, where we collected information on their health and lifestyle, and measured their height, weight, skinfolds, waist–hip circumference, and blood pressure. Arterial stiffness (radial artery augmentation index) was assessed by the non-invasive technique of applanation tonometry, and a fasting blood sample was collected to measure glucose, lipids, and insulin. So far, follow up has been completed in 27 villages: 1343 children have been traced, of whom a further 1043 (78% response rate) have been clinically examined.

Results: The full results will be available after completion of follow up in December 2004. Preliminary data available on 502 children (299 non-supplemented group and 203 supplemented group) were analysed. Children in the supplemented group were slightly younger (mean age: 14.8 *v* 15.1 years; p 0.013). There was no difference between the two groups in their sex distribution, height, weight, diastolic blood pressure, or cholesterol. However, children in the supplemented group had lower mean systolic blood pressure (104.0 *v* 105.9 mm Hg; p 0.054), lower arterial stiffness (augmentation index: 0.7 *v* 5.7; $p<0.001$), and lower fasting serum triglycerides (82.3 *v* 89.9 mg%; p 0.075). These differences persisted even after adjustment for age and sex of the participants.

Conclusions: Preliminary results from this controlled trial suggest that better nutrition in early life among chronically undernourished populations may confer long term benefits for cardiovascular disease risk.

P14 THE TIMING OF MATERNAL NUTRIENT RESTRICTION IN UTERO DETERMINES LATER ADIPOSE TISSUE MASS AND ITS SENSITIVITY TO INSULIN

D. S. Gardner[1], J. Dandrea[1], K. Tingey[2], T. Stephenson[1], M. E. Symonds[1], S. Ozanne[2]. [1]*Centre for Reproduction and Early Life, Institute of Clinical Research, Nottingham University, Nottingham, UK;* [2]*Department of Clinical Biochemsitry, University of Cambridge, Cambridge, UK*

Introduction: Maternal nutritional restriction during late gestation results in reduced fetal fat mass at term. The ability of adipose tissue to take up glucose in conjunction with insulin sensitivity is one important regulator

of fat growth but whether this may be determined in utero is unknown. The aim of the present study was therefore to determine the effect of nutritional restriction in utero on the expression of key insulin signaling proteins in adipose tissue in later life.

Methods: Fourteen singleton-bearing sheep were entered into the study. Five were nutrient restricted over the first (ENR) and four over the last (LNR) 30 days of gestation when they received 50% of their total calculated metabolisable energy requirements for body weight and stage of pregnancy. At all other stages of gestation they were fed to 100% of requirements, together with a control (C) group (100% throughout gestation). The offspring were raised to 1 year of age when their perirenal adipose tissue was sampled. Protein was extracted and the expression of the insulin receptor β subunit (Irβ), the p110 β catalytic subunit of phosphoinositide (PI) 3-kinase, and the glucose transporter (GLUT-4) all determined by western blotting. Results are given as mean arbitrary units (a.u.) with their standard deviation (SD). Significant differences between groups was assessed by ANOVA

Results: The abundance of Irβ (control 1.7 (0.3); ENR 2.2 (0.4); LNR 3.8 (0.2) a.u. ($p<0.05$)) and the p110 β catalytic subunit of PI 3-kinase were significantly upregulated by late, but not early, nutrient restriction; while GLUT-4 abundance (control 4.3 (0.2); ENR 4.6 (2.8); LNR 2.1 (0.4) a.u. ($p<0.05$)) was down regulated in the same group. LNR also had ~2-fold more adipose than the other groups.

Conclusions: The timing of maternal nutrient restriction is a major factor determining long term insulin and glucose sensitivity in adipose tissue of the resulting offspring. This is likely to determine an individuals susceptibility to later obesity.

P15 GASTROINTESTINAL OUTCOMES IN A RANDOMISED CONTROLLED TRIAL OF PRE-EMPTIVE MORPHINE ANALGESIA IN PRETERM INFANTS

G. Menon[1], E. M. Boyle[1], N. McIntosh[2], K. J. S. Anand[3]. [1]*Royal Infirmary of Edinburgh, Edinburgh, UK;* [2]*University of Edinburgh, Edinburgh, UK;* [3]*University of Arkansas for Medical Sciences, Arkansas, US*

Objectives: (1) To study the gastrointestinal side effects of morphine, and (2) to look at the epidemiology of feeding and major gastrointestinal morbidity in preterm infants.

Background: Morphine, commonly used to provide analgesia and sedation in neonatal intensive care, slows the neuromuscular function of the mature gastrointestinal tract. Stimulation of motility leads to maturation of the preterm gut, and is key to the advancement of enteral feeds. Gut slowing may increase complications related to intravenous lines and parenteral nutrition. It may also increase the risk of meconium inspissation, and the risk of necrotising enterocolitis.

Methods: Enteral feeding and gastrointestinal morbidity were studied as part of the NEOPAIN trial, a multicentre, double blind, randomised controlled trial of pre-emptive morphine or placebo in ventilated preterm infants. A loading dose of study drug (100 μg/kg of morphine) was followed by an infusion for up to 14 days at a gestation dependent dose (10–30 μg/kg/hour). Bolus doses of open label morphine could be given if clinically indicated. Information was recorded about morphine administration, enteral feeding, gastrointestinal morbidity, and other clinical factors.

Results: The group randomised to morphine were later in starting feeds (median (quartiles): morphine 5 (3–8), placebo 4 (2–7); p 0.02) and attaining full feeds (morphine 20 (13–29), placebo 17 (12–26); p 0.003). There was a loose correlation between the total dose of morphine used and these outcomes (age at starting feeds r^2 0.12, $p<0.001$; age at full feeds r^2 0.07, $p<0.001$). No relationship was found between morphine use and the risk of major gastrointestinal complications (necrotising enterocolitis or intestinal obstruction, morphine 9/449, placebo 8/449; χ^2; p 0.81). On multivariate analysis, the age at start of feeds was independently associated with centre (p 0.03), the use of an umbilical venous catheter ($p<0.001$), and the total dose of morphine ($p<0.001$). Age at full feeds was independently associated with gestational age (p 0.03), hypotension (p 0.01), and Neonatal Medical Index (a neonatal morbidity score, p 0.005).

Conclusions: Morphine delays the attainment of full enteral feeds, but in this study does not discernibly increase major gastrointestinal complications. The attainment of full feeds is influenced by morphine dose, but other factors appear to be important. The age at starting feeds is centre dependent but is also independently associated with the amount of morphine given. The age at full feeds is related to gestation and neonatal morbidity.

Abstract P15

Subjects	Morphine	Placebo
n	449	449
Gestation (weeks): median (range)	27 (23–32)	27 (23–32)
Birthweight (g): median (range)	984 (452–2030)	985 (420–2440)
Open label morphine n (%)	201 (45)	242 (55)

P16 OXYGEN VARIABILITY AND CHRONIC LUNG DISEASE: TOO MUCH TOO OFTEN?

D. Quine[2], B. Stenson[1]. [1]*Simpson Centre for Reproductive Health, Edinburgh, UK;* [2]*University of Edinburgh, Edinburgh, UK*

Background: High blood oxygen tensions and oxygen tension variability have been linked to morbidity in preterm infants. Oxygen saturation monitoring is commonly used to guide oxygen therapy but the appropriate target levels remain uncertain.

Aim: To determine whether oxygen saturation variability and/or time saturated above 94% while in supplemental oxygen is a risk factor for the development of chronic lung disease (CLD) defined as the requirement for supplemental oxygen at 36 weeks.

Method: Prospective observational study of 87 infants who were born at less than 29 weeks gestation and survived to 36 weeks during a 2 year period from October 2002 to October 2004 at the Simpson in Edinburgh. Oxygen saturation values were downloaded every second to a computer from the time of admission until monitoring was discontinued. Inspired oxygen was documented hourly in the nursing records. For the first 2 weeks of life, oxygen saturation variability (SD of oxygen saturation), and fraction of time saturated above 94% while in supplemental oxygen were calculated for each infant. Multiple logistic regression (MLR) was used to examine the relationship between these indices and the requirement for supplemental oxygen at 36 weeks.

Results: Six infants were excluded because they were transferred out of the intensive care unit during the study period. Data from 81 infants were analysed. After artefact removal, saturation data were available for 93% of the total time. 48 infants were still in oxygen at 36 weeks corrected gestational age. Oxygen variability in the first week of life and fraction of time saturated above 94% while in supplemental oxygen in the first 2 weeks of life were independent risk factors for CLD after controlling for other factors (p 0.045, and 0.004, respectively). See table.

Abstract P16

Factor	CLD	No CLD	Univariate	MLR
O_2 saturation variability week 1	3.93	3.72	0.191	0.045
O_2 saturation variability week 2	5.35	4.94	0.278	NS
Time in O_2 in first 2/52 (hrs)	168	64	<0.001	<0.001
Time above 94% while FiO_2>0.21	0.110	0.075	0.020	0.004
Gestation	26.6	26.9	0.319	NS
Weight	828	967	0.004	0.002
Mean $AaDO_2$ in first 2/52	99.2	67.8	<0.001	NS
Crib 2 score	10.9	10.2	0.079	0.007
Total ventilation days	12.7	4.8	0.012	NS

Conclusions: Strategies aimed at limiting the morbidity associated with oxygen administration should consider the saturation variability, as well as the absolute saturation ranges that are maintained.

P17 GROWING UP AND MOVING ON IN RHEUMATOLOGY: A MULTICENTRE COHORT OF ADOLESCENTS WITH JUVENILE IDIOPATHIC ARTHRITIS

K. L. Shaw, T. R. Southwood, J. E. McDonagh. *On behalf of BSPAR University of Birmingham, Birmingham, UK*

Background: There is increased interest in developing UK transitional services for adolescents with juvenile idiopathic arthritis (JIA). However,

while the distinct age and developmental needs of adolescents with JIA have been recognised, there remains a need to identify the workload that is being transferred to adult care to ensure appropriate health care for such young people. Accordingly, the aim of this study was to define the transitional care workload of a multicentre cohort of adolescents with JIA including disease, self-advocacy, and vocational issues.

Methods: Patients with JIA aged 11, 14, and 17 years and their parents were recruited from 10 major rheumatology centres prior to the implementation of a transitional care programme. Clinical data, including the core outcome variables, were provided by the senior clinician. Patient and parent data were collected using individual questionnaires designed for self-completion and included demographic status, Child Health Assessment Questionnaire (CHAQ), arthritis-related knowledge, health related quality of life, satisfaction with healthcare, and pre-vocational experience.

Results: Of 359 families invited to participate, 308 (86%) adolescents with JIA and 303 (84%) parents/guardians accepted. A fifth had persistent oligoarthritis. Median disease duration was 5.7 (0–16) years, with 37% developing their disease during adolescence. Physicians rated 80% of the sample to have active disease and less than 10% of adolescents were pain free. Despite their imminent transfer to adult care, many 17 year olds had ongoing transitional issues: 56% were seeing the rheumatologists with their parent, 20% were not self-medicating, 69% of those requiring intra-articular injections had not done so under local anaesthetic (as is done in adult care), and 14% had received no careers counselling. This age group also had significant disease related issues; 55% had moderate to severe functional disability, 67% were still on DMARDs, and as a group, had greater pain than younger patients (median VAS score of 30/100).

Conclusions: This study has provided a picture of adolescent rheumatology at the beginning of the 21st century and has identified previously under reported areas of transitional care which need to be addressed in an age and developmentally appropriate manner prior to transfer to adult care. Outcome data following the implementation of a coordinated transitional care programme are awaited.

P018 REDUCING LATE EFFECTS IN CURABLE CHILDHOOD CANCER—RESULTS OF THE FABLMB 96 TRIAL FOR B CELL NON-HODGKIN LYMPHOMA

M. P. Gerrard[1], C. R. Pinkerton[2], C. Weston[3]. [1]*Sheffield Children's Hospital, Sheffield, UK;* [2]*Royal Marsden Hospital, Sutton, UK;* [3]*UK Children's Cancer Study Group, Leicester, UK*

Introduction: B cell non-Hodgkin lymphoma (B NHL) is a highly malignant condition affecting 60–70 children a year in the UK. Intensive chemotherapy can cure the majority; however, this risks severe acute and long term morbidity, the latter including cardiac toxicity and infertility.

Aims: The FABLMB 96 study involved three cooperative national groups—the Children's Cancer Group (CCG), the Societé Française Oncologie Paediatrique (SFOP), and the UK Children's Cancer Group (UKCCSG); and was designed to determine whether intensity of treatment could be reduced without adversely affecting cure rate.

Methods: Treatment was stratified into three risk groups—with progressive intensity of treatment. There were experimental treatment arms in the two largest risk groups (groups B and C) where both intensity and duration of chemotherapy were reduced.

Results: A total of 1138 patients were enrolled from 1996–2001. With a minimum of 3 years' follow up, analysis has shown that the patients with low risk, that is, very localised B NHL (group A—10% of patients), have an excellent outcome with very limited chemotherapy with 98% event free survival (EFS). Patients with standard risk B NHL (group B—almost 70% of patients) can be safely and effectively treated with reduced intensity treatment with consequent lower risk of toxicity. The EFS of the randomised patients in group B was not significantly different in each of the four arms with EFS in the least intensive arm having a similar EFS to the standard arm (94% *v* 91%). However, patients with high risk B NHL (group C—with bone marrow and/or CNS disease, included 20% of patients) required more intensive treatment (3 year EFS 89% in the standard intensity arm *v* 79% in the reduced intensity arm).

Conclusions: This trial demonstrates the feasibility and success of a complex multinational randomised study and has led to significant change in practice. This should result in an improvement in both the acute morbidity of treatment and the long term quality of life of survivors from standard risk B NHL. However, optimal treatment for patients in the highest risk group remains to be determined, and can only be done in the context of a multinational randomised study.

P19 THE UK INFANTILE SPASMS STUDY: FOLLOW UP AND OUTCOMES AT 14 MONTHS OF AGE

A. L. Lux[1], S. Edwards[1], E. Hancock[1], A. Johnson[3], C. Kennedy[4], R. Newton[5], F. O'Callaghan[2], C. Verity[6], J. Osbourne[1]. [1]*Royal United Hospitl and the University of Bath, Bath, UK;* [2]*Frenchay Hospital and Bristol Royal Hospital for Children, Bristol, UK;* [3]*MRC Biostatics Unit, University of Cambridge, Cambridge, UK;* [4]*University of Southampton, Southampton, UK;* [5]*Royal Manchester Children's Hospital, Manchester, UK;* [6]*Addenbrooke's Hospital, Cambridge, UK*

Background: Early outcomes from the UK Infantile Spasms Study showed that cessation of spasms by 14 days was more common in infants allocated hormonal treatments than with vigabatrin. This paper reports outcomes assessed by the time of study completion.

Methods: Infants were regularly reviewed after enrolment in a randomised controlled trial of treatment for infantile spasms with hormonal treatments (prednisolone and tetracosactide) or vigabatrin. Neurodevelopmental assessment using Vineland Adaptive Behavior Scales (VABS) and a final clinical assessment were made at age 12–14 months.

Results: Of 107 enrolled infants, 106 had a final clinical assessment and 100 received a neurodevelopmental assessment using VABS. Five infants died during the study period. The proportions of responders who never relapsed were similar in the three treatment groups: prednisolone 12/30 (40%), tetracosactide 10/25 (40%), and vigabatrin 19/52 (37%). At final assessment the proportions with spasms were 7/30 (23%), 7/25 (28%), and 12/51 (24%), respectively, and the proportion without spasms or other seizures were 16/30 (53%), 12/25 (48%), and 32/51 (63%) with 4, 4, and, 19, respectively, on vigabatrin. VABS scores were significantly higher in infants with no identified underlying aetiology and in infants who had cessation of spasms by study day 14. Overall, there were no significant differences in VABS scores by treatment group. In the subgroup of infants with no identified underlying aetiology, there was a potentially clinically important but statistically non-significant difference in VABS scores (hormonal treatments mean 87.8 (SD 17.1) *v* vigabatrin 78.9 (14.3); *t* 1.89 (df=44), p 0.07).

Conclusions: Cessation of spasms at study day 14 was more likely with hormonal treatments, but relapse was more common in this group. Relapse free response and epilepsy outcome were similar in all three treatment groups. There were no significant differences in neuro-development.

P20 THE ESSENTIAL ROLE OF ALL UK PAEDIATRICIANS IN PERFORMING SURVEILLANCE FOR vCJD VIA THE STUDY OF PROGRESSIVE INTELLECTUAL AND NEUROLOGICAL DETERIORATION (PIND)

C. M. Verity[1], L. Stellitano[1], A. M. Winstone[1], A. Nicoll[2], R. G. Will[3]. [1]*Addenbrookes Hospital, Cambridge, UK;* [2]*Communicable Disease Surveillance Centre, London, UK;* [3]*National Creutzfeldt-Jakob Disease Surveillance Unit, Edinburgh, UK*

Introduction: The PIND study performs active UK surveillance for childhood cases of variant Creutzfeldt-Jakob disease (vCJD) via the British Paediatric Surveillance Unit (BPSU).

Method: Since May 1997 this study has used the monthly BPSU surveillance card. Clinical data about suspected PIND cases are obtained from notifying paediatricians by the PIND team using telephone questionnaires, self-completed questionnaires, or site visits. The anonymised clinical case details are reviewed by an expert neurological advisory group of six paediatric neurologists to try and ensure that no vCJD case is missed and that no novel variant of CJD is emerging. Collaboration with the National Creutzfeldt-Jakob Disease Surveillance Unit increases the chance of detecting cases.

Results: After seven and a half years of surveillance, 1815 children with suspected PIND had been reported, at a rate of about 20/month. The notifying doctors were: general paediatricians 649 (36%), paediatric neurologists 572 (31%), community paediatricians 424 (23%), others 175 (10%), and not known 3. Of the 859 cases of definite PIND, six had a diagnosis of vCJD. One was a girl aged 12 years at onset—the youngest identified case of vCJD. There were 759 children with a definite underlying diagnosis other than vCJD and among them there were 115 different neurodegenerative conditions. There were 94 undiagnosed PIND cases and 47 of them had died. In general these undiagnosed PIND cases had been thoroughly investigated by their paediatricians but only five of those who died underwent autopsy.

Conclusions: Only a small proportion of PIND children who die undergo autopsy, which is a concern because the only certain way to exclude vCJD is by neuropathological study of the brain. Cases of vCJD

could therefore be missed; however, it is reassuring that PIND children are being carefully investigated and the majority of them have a diagnosed neurodegenerative disease other than vCJD. So far the PIND study has identified only six children with vCJD. However, new cases are still appearing in older patients and there is now concern about possible transmission of vCJD by blood products, so PIND surveillance continues. The success of the study depends on the involvement of paediatricians in both secondary and tertiary services—about two thirds of PIND notifications are by paediatricians who are not paediatric neurologists.

P21 PROSODIC ABILITY IN CHILDREN WITH HIGH FUNCTIONING AUTISM

J. McCann[2], A. O'Hare[1], F. Gibbon[2], S. Peppe[2], M. Rutherford[3]. [1]*University of Edinburgh, Edinburgh, UK;* [2]*Queen Margaret University College, Edinburgh, UK;* [3]*Royal Hospital for Sick Children, Edinburgh, UK*

Aims: In Kanner's original description of autism he identified disordered expressive prosody as a common clinical finding, typically resulting in speech that was monotonous or showed exaggerated intonation. Although this feature is incorporated into diagnostic instruments for autism, there has been very little research into the basis of this abnormality and in particular how comprehension of prosody affects prosodic expression, language development, and functional communication. The aim of this study was to investigate both receptive and expressive prosodic skills in children with autism and compare the resulting profiles with those of typically developing children matched for verbal mental age.

Method: Thirty one children aged 6−13 years with high functioning autism and a verbal mental age of >5 years were identified and matched with 72 typically developing children for verbal mental age, sex, and socioeconomic status. All of the children completed the Profiling Elements of Prosodic Systems in Children (PEPS-C) test,[1] which is a comprehensive test of both expressive and receptive prosodic ability. The children with autism completed a further battery of speech, language, and non-verbal assessments.

Results: An independent samples *t* test showed that the children with autism performed significantly poorer overall on the PEPS-C than their verbal mental age matched peers (p 0.000). In addition, the prosody results correlated highly with the language measures (r 0.559; p 0.001) but not with the non-verbal measure or the articulation measure. However, when matched for verbal mental age not all elements of prosody were equally affected in the children with autism, for example they were able to comprehend prosodic phrase boundaries for syntactically ambiguous phrases but had significant difficulties both comprehending affect (p 0.003) and employing prosody to convey affect (p 0.001).

Conclusions: The dysprosodic speech of children with autism can confer a life long communication impairment even after improvement in other areas of language. Prosody is a complex construct serving a wide variety of communicative functions including affective, pragmatic, and functional. This is the first report to detail how these components are impaired in autism. Further work is underway to examine longtitudinal changes in prosodic function, the relationship of prosody to theory of mind development, and to develop effective interventions.

1. **Peppé S**, McCann J. Assessing intonation and prosody in children with atypical language development: the PEPS-C test and the revised version. *Clinical Linguistics and Phonetics* 2003;**17**:345–54.

P22 COMPARISON OF PRETERM INFANT THYROID LEVELS TO GESTATIONAL AGE VALUES HAD THE FETUS REMAINED IN UTERO

C. Delahunty[1], F. L. R. Williams[2], J. Simpson[1], S. A. Ogston[2], J. J. Bongers-Schokking[3], N. Murphy[4], H. Van-Toor[5], S. Y. Wu[6], T. J. Vissser[5], R. Hume[1]. [1]*Maternal and Child Health Sciences, University of Dundee, Ninewells Hospital and Medical School, Dundee, UK;* [2]*Community Health Sciences, University of Dundee, Ninewells Hospital and Medical School, Dundee, UK;* [3]*Department of Paediatrics, Division of Endocrinology, Erasmus University Medical Centre/Sophia Children's Hospital, Rotterdam, Netherlands;* [4]*Department of Paediatrics, The Rotunda Hospital, Dublin, Ireland;* [5]*Department of Internal Medicine, Erasmus University Medical Centre, Rotterdam, Netherlands;* [6]*Nuclear Medicine Service, VA Medical Center, University of California- Irvine Medical Center, Long Beach, US*

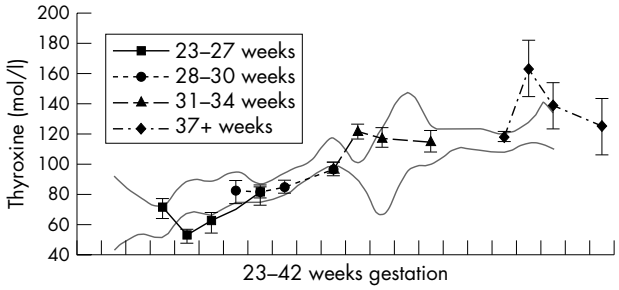
Aims: Transient hypothyroxinaemia in preterm infants is common and associated with neurodevelopmental deficits in motor and cognitive function. At present the diagnosis and management of transient hypothyroxinaemia in preterm infants is compromised by the lack of gestation sensitive physiological ranges for thyroid hormones. The aim of this study was to compare thyroid hormones levels in preterm infants to equivalent gestational age values had the fetus remained in utero.

Methods: Sera T4, FT4, TBG, TSH, T3, rT3, and T4 sulphate levels were measured in cord, 7, 14, and 28 days in groups of preterm infants 23–27 (n = 101), 28-30 (n = 196), and 31–34 (n = 253) weeks gestation and compared with those of term infants and also with cord sera levels of equivalent gestational ages (n = 812, 23–42 weeks gestation).

Results: In all preterm groups, TSH and rT3 decrease below, TBG increases within, and T3 and T4S increase above cord levels of equivalent gestational age. Term infants are hyperthyroxinaemic relative to cord and non-pregnant adult levels of T4. Postnatal T4 increases are attenuated in 31–34 week infants, absent in 28–30 week infants (although levels are equivalent to gestational age), and crucially reversed in 23–27 week infants. This immature group is hypothyroxinaemic relative to other groups and to cord levels of equivalent gestational age. Compared with term infants, postnatal FT4 increases are lower in 31–34 week infants, attenuated in 28–30 week infants, absent in 23–27 week infants.

Conclusion: This study provides more evidence that the late second early third trimester is a critical transition period in fetal thyroid hormone metabolism, which may be interrupted by preterm birth and contribute to postnatal thyroid dysfunction. The 23–27 week group is distinctive; they are hypothyroxinaemic on T4 levels yet FT4 levels are within the cord levels of equivalent gestational age and T3 increases to levels above equivalent gestational age values. As the developing fetal brain requires thyroxine for normal development postnatal thyroxine levels in preterm infants should be similar to those of equivalent gestational age had the fetus remained in utero.

Acknowledgements: CEC (QLG3-2000-00930), CSO Scottish Executive (K/MRS/50/C741), Wellcome Trust and Scottish Preterm Thyroid Group.



Abstract 22 Mean data were plotted against the background of twice the SEM of cord sera values for each gestational age calculated separately.

P23 EXTENT OF UNDERDOSAGE OF ANTIRETROVIRAL THERAPY IN HIV INFECTED CHILDREN

E. N. Menson[1], A. S. Walker[1], T. Duong[1], K. Doerholt[1], C. Wells[2], M. Sharland[1], D. M. Gibb[2]. [1]*Medical Research Council Clinical Trials Unit, London, UK;* [2]*St George's Hospital, London, UK*

Aims: Although effective antiretroviral therapy (ART) has greatly improved the prognosis for HIV-1-infected children in industrialised countries, rates of virological suppression are lower than in adults, despite superior immunological responses. We explored the extent of ART underdosing in children as a potential contributory factor.

Methods: We evaluated all doses of ART prescribed to children aged 2–12 years in the UK and Irish Collaborative HIV Paediatric Study (CHIPS) from January 1997 to December 2003, calculated per unit weight or surface area. Underdosing was defined as doses below 95% of the lower limit of the current recommended dose (CRD) in 2004 Paediatric European Network for the Treatment of AIDS (PENTA) guidelines in order to evaluate dosage adequacy based on current best evidence. The severity of underdosing was calculated: <95–80%, <80–60%, and <60% CRD.

Results: The CHIPS cohort includes 78% of diagnosed HIV-1 infected children in the UK and Ireland. In 1997–2003, 558 (73%) of 757 children in CHIPS had been prescribed one or more ART drugs. Those most frequently prescribed were, in declining order: zidovudine, lamivudine, abacavir, didanosine, stavudine, nevirapine, efavirenz, nelfinavir, and kaletra, together comprising a total of 4260 exposed child years. Children were underdosed for 40.5% of their time on ART. Efavirenz and nelfinavir were most commonly underdosed, with 58% and 48% of child time receiving <95% CRD and 26% and 20% receiving <80%, respectively. Nelfinavir and nevirapine underdosing decreased

Abstract P24

Outcome measure	n	Mean score	β (effect size)	p Value	95 CI of β
Receptive language	101	−1.31	0.74	0.01	0.17 to 1.30
Expressive language	87	−0.50	0.40	0.14	−0.13 to 0.93
Reading	102	−0.56	0.55	0.009	0.14 to 0.96
Recep/non-verbal diff	98	−0.36	0.60	0.01	0.14 to 1.05
Expr/non-verbal diff	87	0.04	0.37	0.16	−0.14 to 0.88

from 1997–9 (31% and 36%, respectively, of child time <80% CRD) to 2000–3 (7% and 10%, respectively, at <80% CRD), concordant with changes in prescription guidelines. Efavirenz underdosing related to the use of weight bands that corresponded only approximately to the CRD of 15 mg/kg: similar discrepancies were observed between nevirapine dosage calculated per m^2 (recommended) or per kg (often used). Newer ART drugs were underdosed least, for example only 3% of child time on kaletra was at <80% CRD. Underdosing was often related to delay in dose increase with growth. Reasons for this identified at one centre included limitations of drug formulations (33%), rounding down calculated doses (56%), and clinical factors (<5%).

Conclusions: Over the past 7 years HIV-infected children have been underdosed on ART for a significant proportion of time, but the extent has decreased with time. This may be ascribed to increased PK data (often limited when drugs were first used or licensed for children) and more concordant guidelines on ART dosing from Europe, US, and WHO. Whether underdosage in part explains why virological response to ART is less dramatic in children than in adults warrants further exploration. Issues relating to the prescription of the correct drug doses for children as they grow are not isolated to HIV; rather, there are wide ranging implications for paediatric prescribing.

P24 BIRTH DURING PERIODS WITH UNIVERSAL NEWBORN SCREENING FOR BILATERAL PERMANENT HEARING IMPAIRMENT >39 dB HTL IMPROVES LANGUAGE AND READING SKILLS AT 5 TO 10 YEARS IN CHILDREN WITH PHI

C. Kennedy[1], D. McCann[1], M. Campbell[2], C. Law[3], M. Mullee[1], J. Stevenson[1], P. Watkin[4], S. Worsfold[1], B. Yuen[1]. *[1]University of Southampton, Southampton, UK; [2]Institute of Primary Care and General Practice, Sheffield, UK; [3]Institute of Child Health, London, UK; [4]Whipps Cross Hospital, London, UK*

Aims: To determine whether being born during periods with rather than without Universal Newborn Screening (UNS) for permanent hearing impairment >39 dB HTL (PHI) improves language and reading skills at 7–9 years in children with PHI.

Method: Population based follow up study of 1993–96 birth cohort in eight districts of which half had been born during periods with UNS. The studied birth cohort in four of the eight districts had comprised the population of a controlled trial of UNS (CTUNS).

Outcome Measures: Age adjusted composite scores derived from the tests listed were obtained for 1) receptive language (British Picture Vocabulary Scale, Test for Reception of Grammar); 2) expressive language (bus story sentence information scores and five longest sentences); 3) reading (Weschler Objective Reading Dimensions basic reading and reading comprehension); and 4) non-verbal abilities (Ravens Coloured Progressive Matrices). Outcome scores of children with PHI were expressed as *z* scores, that is, the number of SDs of scores from a comparison group of children with normal hearing, matched for place of birth and age at assessment, by which the group mean score of the children with PHI differed from the group mean score of the children with normal hearing. Negative scores thus represent a deficit in the outcome in children with PHI compared with those with normal hearing (column 3 of table). Explanatory variables included in a multiple regression model were: 1) exposure to birth during periods with UNS; 2) maternal educational level and except when looking at verbal/non-verbal difference (diff) scores; and 3) non-verbal abilities.

Results: Sixty seven boys and 55 girls with PHI (65 moderate, 28 severe, and 27 profound) and 63 children with normal hearing were assessed at 5–10 years. In the regression model, birth during periods with UNS was associated with improved outcomes (see table): β is the adjusted mean difference between those born in periods with and without UNS in z scores of children with PHI (for example, first row: 0.74 SD reduction in deficit with UNS). In the CTUNS sub-population, the effect of birth during periods of UNS remained statistically significant, in spite of smaller numbers for receptive/non-verbal differences (n 41, β 0.74, p 0.03) and for reading skills (n 41, β 0.78, p 0.04).

Conclusion: Following birth during periods of UNS children with PHI have improved receptive language and reading skills at age of 7–9 years. An effect of UNS on later language abilities has not previously been shown in a controlled trial.