Abstract P59 Table 1 Mean (SD) scores for the Surrey Information on Function Tool (SIFT) and the Canadian Occupational Performance Measure (COPM) pre and post pulmonary rehabilitation (PR) (n = 52)

	SIFT F	COPM P	SIFT C	COPM S
Pre PR	4.47 (1.18)	4.54 (1.19)	3.31 (1.70)	3.87 (1.75)
Post PR	6.19 (1.68)*	5.99 (1.63)*	6.27 (2.29)*	6.36 (2.11)*
Change	−2.45 (2.07)†	−1.44 (1.70)†	2.91 (2.37)‡	1.70 (1.61)‡

*,†,‡defined in text.

Performance Measure (COPM) pre and post PR, and its sensitivity to change with PR. Both tools have two components: SIFT Function (F) and Contentment (C); COPM Performance (P) and Satisfaction (S). Patients rate chosen activities.

Patients attending PR and who consented (n = 52) completed both SIFT and COPM in random order pre and post PR. Randomisation was by sealed envelopes.

Validity SIFT F correlated well with COPM P (Pearson correlation (r) = 0.53†, p = 0.000) and SIFT C with COPM S (r = 0.63‡, p = 0.000, table).

Sensitivity to change Both components of both tools were highly sensitive to change (paired *t* test p = 0.000*, table 1) with no statistically significant difference between the two tools.

Conclusion SIFT is a valid, sensitive and simple functional tool to use for PR.

Clinical issues in paediatric lung disease

P60 A REGIONAL SURVEY OF PAEDIATRIC CONSULTANTS' PRACTICES AND ATTITUDES IN THE MANAGEMENT OF SPINAL MUSCULAR ATROPHY TYPE 1

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The management options for spinal muscular atrophy (SMA) are changing with an increase in the use of non-invasive and invasive ventilation. However, there are few empirical data to support the practice of long-term ventilation in improving quality of life in these patients. Without active respiratory management, children with SMA usually die within the first 2 years of life. We designed a survey to assess current attitudes and practices in the management of this condition in a single geographical region of the UK.

Methods In November 2008 a web-based anonymous survey was sent to all paediatric consultants within the region who would have potential contact with a child with SMA. Following a brief clinical scenario of an infant with SMA type 1, a number of management options were suggested regarding general health care, antibiotics for infection, feeding options, immunisations, ventilation for acute illness and long-term home ventilation. For each option, respondents were asked if they would (a) not discuss, (b) discuss but not recommend or (c) recommend the intervention.

Results 72% (133/185) of consultants completed the survey. They were representative of the surveyed population in terms of place of work and specialty practice. 83% of respondents would recommend nasogastric feeding, 79% oral antibiotics and 39% intravenous antibiotics during infections. 73% would recommend influenza and pneumococcal vaccination and 44% would recommend RSV prophylaxis. Non-invasive ventilation (NIV) would be recommended for the acute management of a respiratory infection by 52% but only 14% would recommend intubation and ventilation, although 82% said they would discuss this with the family. A high proportion of respondents would discuss long-term ventilation with NIV (72%) or tracheostomy (73%) ventilation but only 18% would recommend NIV and 8% would recommend long-term tracheostomy ventilation. Recommending referral to specialist services varied by specialty; 83% to palliative care, 79% to neurology and 65% to respiratory medicine.

Conclusions This preliminary survey suggests a variation in what interventions are recommended to families of children with SMA type 1 but indicates that a high proportion of respondents would discuss the majority of management options with the family.

P61 IMPACT OF PHYSIOLOGIST SUPERVISION ON THE QUALITY OF RESPIRATORY SLEEP STUDIES IN CHILDREN

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Introduction The diagnosis of sleep-disordered breathing in children can be made from assessment of gas exchange (specific but insensitive) or by multichannel respiratory sleep studies. The current UK provision of complex respiratory studies is low and many units do not have supervised or attended studies. Ideally, interpretation of studies requires continuous signals from all channels; however, data are frequently suboptimal. In our unit sleep physiologists have traditionally set up the sleep studies on children in the evening and the studies have then been unsupervised. Recently we have moved to having sleep physiologists supervising/attending studies overnight. We aimed to assess the impact of this change.

Method 80 respiratory studies on children aged 0–17 years performed on an Alice 4 system between April 2008 and July 2009 were retrospectively analysed, 40 studies before and 40 studies after overnight supervision was introduced. Scoring was done using American Sleep Disorders Association standard criteria. Our routine respiratory study consists of 11 separate channels including measures of airflow, gas exchange, bands and movement. Any channel that was lost for more than 30 min was judged to have failed.

Results 27/40 (68%) unsupervised studies had at least one lead that failed compared with 6/40 (15%) supervised studies ($p<0.0001$). The mean number of failed channels in the unsupervised studies was 1.05 (SD 0.96), significantly greater than a mean 0.18 (SD 0.45) of the supervised studies ($p<0.001$). 15/40 of the unsupervised studies had one lead that failed, 8/40 had two leads that failed and 2/40 had three or more failed leads, compared with 5/40 of the supervised studies with one failed lead and 1/40 with two leads that failed. The most common of the channels to fail were the thermister (10/40 unsupervised, 2/40 supervised), end tidal CO_2 (8/40 unsupervised, 4/40 supervised) and thoracic bands (6/40 unsupervised, 0/40 supervised).

Conclusion This study demonstrates a significant improvement in the quality of respiratory sleep studies following the introduction of overnight physiologist supervision. Significantly fewer data were lost, particularly those assessing airflow, therefore reducing the need for repeat studies and giving greater confidence in interpretation of respiratory data.

P62 SAFETY AND VALIDITY OF NON-INVASIVE METHODS OF CARBON DIOXIDE MONITORING IN INFANTS AND YOUNG CHILDREN

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Non-invasive methods of measuring carbon dioxide have previously been validated in adults but not in young children. This study aimed to assess the safety and validity of non-invasive methods of carbon dioxide (CO_2) monitoring in children aged <7 years.

Transcutaneous (TOSCA; Linde Medical Sensors, Basel) and end-tidal (Capnocheck; Pulmolink, Ashford, Kent) carbon dioxide tensions (PCO_2) were measured and compared with contemporaneous (arterial, capillary and venous) blood gases in children ventilated on a PICU or having hospital sleep assessments with blood gas measurements as part of their routine clinical care. Limits of agreement (LOA) were calculated for the TOSCA and Capnocheck using the first measurement during each study. Probe safety was assessed initially in four 6-hour studies, then 8, 10 and 12-hour studies by hourly visual inspection.

33 measurements were made on 29 children, 15 girls, median age 0.9 years (range 0.2–6.2). Comparative invasive and non-invasive data were available for 62 TOSCA readings and 46 capnography readings. Non-invasive PCO_2 measurements less than 3.0 kPa were excluded as sampling errors (3 TOSCA and 3 Capnocheck results) and one Capnocheck result was excluded post hoc due to technical failure of the Capnocheck. Mean differences (and 95% LOA) were 0.07 kPa (−1.82 to 1.78) and 0.98 kPa (−0.71 to 2.67) for the TOSCA and Capnocheck, respectively. The relationship between invasive and non-invasive measurements over serial blood gases within subjects did not appear to change over time.

There was one report of an area of mild redness on the skin from the TOSCA skin probe noted after it was removed at the end of an 8-hour study, but this resolved within a few minutes. There were no other reported adverse effects.

Transcutaneous monitoring of CO_2 using the TOSCA is safe in young children when used for up to 12 h. TOSCA and Capnocheck devices both have wide limits of agreement compared with invasive carbon dioxide measurements.

P63 RESPIRATORY DATA FROM PULSE OXIMETER PLETHYSMOGRAM TRACES IN ACUTELY WHEEZY PRESCHOOL CHILDREN

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Introduction It has been shown that respiratory data can be derived from pulse oximeter plethysmogram (pleth) traces in healthy newborn infants.[1] If such techniques could be applied in acutely wheezy children, it could help to provide useful additional respiratory monitoring.

Aim To examine if respiratory data can be obtained from the pleth trace in acutely wheezy preschool children.

Method Pleth data were collected with a Nonin 4100 Digital Pulse Oximeter (Nonin Medical Inc, USA) connected via "Bluetooth" to a notebook computer. Respiratory rate and heart rate were monitored clinically. 15 sections of pleth data with little or no artefact from nine spontaneously breathing children were analysed using software that we developed with MATLAB (The MathWorks Inc, USA). The recordings were made during an acute wheezy episode. In the software, frequency analysis is used to assess the main frequencies present in the pleth signal. The median (range) age of the children was 28 (20–64) months.

Results In 12 of the 15 recordings, frequency analysis of the pleth signal showed clear peaks at a similar frequency to the respiratory rate obtained from clinical assessment. Low pass filtering of the pleth data also yielded a signal with a similar frequency to the respiratory rate in 13 of the recordings, although in some sections the frequency was variable.

Conclusions These results suggest that it may be possible to obtain respiratory data from the pleth waveform in acutely wheezy children.

1. **Wertheim,** *et al*. *Arch Dis Child Fetal Neonatal Ed* 2009;**94**:F301–3.

P64 INTRAVENOUS THERAPY FOR ACUTE ASTHMA IN CHILDREN: WHAT ABOUT THE VERY YOUNG?

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Introduction The current (2009) BTS asthma guidelines recommend considering the use of intravenous (IV) therapies for acute severe/life-threatening asthma in children aged 2 years and over failing to responding to initial therapy. However, there is little detail as to when and how to use them, and no mention at all for those under 2 years.

Objectives To determine if our unit was using IV therapies (aminophylline, salbutamol and magnesium) appropriately according to local and BTS guidelines, to identify the indications for their use and the number of children <2 years requiring IV therapy for wheeze.

Method Retrospective notes audit of all children requiring IV therapy for asthma/wheeze over a 6-month winter period (November 2008–April 2009).

Results 28 episodes occurred in 26 children aged 10 months to 15 years. All children receiving IV therapy fulfilled BTS criteria for severe or life-threatening acute asthma, all received steroids, and all but one received maximal initial inhaled therapy. In accordance with local guidelines, aminophylline was used as first-line IV treatment in most cases. At the time of the decision to implement IV therapy, all remained tachypnoeic with an oxygen requirement despite maximising inhaled therapy. The most commonly documented indications for IV use were continued marked accessory muscle use, inability to complete a sentence and poor response to frequently nebulised bronchodilators. All received an adequate dose of steroid (oral or IV) prior to commencing IV therapy. Eight children (8 episodes) were <2 years old, two of whom received all three IV agents (aminophylline, salbutamol and magnesium) and one required mechanical ventilation.

Conclusions This audit identifies the characteristics of those children with acute asthma/wheeze requiring IV therapy despite adequate initial management. 31% of those children were under 2 years old. Our findings highlight the need for research on which to base guidelines for IV therapy, particularly for children <2 years of age.

P65 ARE CHILDREN WITH SEVERE PERSISTENT ALLERGIC ASTHMA RECEIVING OMALIZUMAB ROUTINELY PRESCRIBED AN EPINEPHRINE AUTO-INJECTOR FOR USE IN THE EVENT OF ANAPHYLAXIS?

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Background Omalizumab (Xolair) is licensed in the EU for the treatment of patients (≥12 years) with severe allergic (IgE-mediated) asthma, inadequately controlled despite high-dose

inhaled corticosteroids and long-acting β_2 agonists. Omalizumab is administered as a subcutaneous injection every 2 or 4 weeks and has been shown to be of benefit in children and adults when asthma symptoms are inadequately controlled despite optimised asthma therapy (recommended in the 2008 BTS/SIGN guidelines). Monoclonal antibody treatments have been associated with a risk of anaphylactic reactions and the Omalizumab Joint Task Force recommends that patients receiving omalizumab should be prescribed an epinephrine auto-injector (EpiPen) and trained in its use. This should be carried with them before and for 24 h post injection.

Methods Questionnaires on behalf of the Severe Asthma Nurse Network were sent to 18 healthcare professionals (HCPs; 17 nurses and 1 paediatric consultant) in the UK (England, Northern Ireland and Scotland) who are directly involved in the delivery/administration of subcutaneous omalizumab to children. The HCPs were asked to indicate whether the children receiving omalizumab were routinely prescribed an EpiPen for use in the event of an anaphylactic reaction to treatment.

Results 17 completed questionnaires were returned describing 92 children (aged 7–17 years) receiving omalizumab. Only three of the 17 centres were routinely prescribing EpiPens to children receiving omalizumab in case of anaphylactic reaction. It was also observed that a number of children were already prescribed EpiPens for a previously diagnosed allergy and not specifically because of the risk of anaphylaxis with omalizumab.

Conclusions The routine prescription of EpiPens to children receiving omalizumab varies significantly across the UK but does not seem to be common practice. This suggests that the risk of anaphylaxis following omalizumab administration in children with severe allergic asthma is considered minimal by HCPs in the UK. Further discussions regarding the recommendations of the Omalizumab Joint Task Force are suggested.

P66 OMALIZUMAB ADMINISTERED VIA INJECTION DOES NOT PREVENT CHILDREN WITH SEVERE PERSISTENT ALLERGIC ASTHMA FROM INITIATING OR CONTINUING WITH THERAPY

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Background Needle phobia or the dislike of injections is very common in children and can create a barrier to treatment administered via this route. Omalizumab (Xolair) is licensed in the EU for the treatment of patients (≥12 years) with severe allergic (IgE-mediated) asthma, inadequately controlled despite high-dose inhaled corticosteroids and long-acting β_2 agonists. Omalizumab is administered as a subcutaneous injection every 2 or 4 weeks and has been shown to be of benefit in children and adults when asthma symptoms are inadequately controlled despite optimised asthma therapy (recommended in the 2008 BTS/SIGN guidelines).

Methods Questionnaires on behalf of the Severe Asthma Nurse Network were sent to 18 healthcare professionals (HCPs; 17 nurses and 1 paediatric consultant) in the UK (England, Northern Ireland and Scotland) who are directly involved in the delivery/administration of subcutaneous omalizumab to children. The HCPs were asked to report any children in their care who had refused or declined treatment with omalizumab because of their fear/dislike of injections. In addition, the questionnaire also queried if any child receiving omalizumab had discontinued treatment because of the administration method.

Results 17 completed questionnaires were returned describing 92 children (aged 7–17 years) receiving omalizumab. Only three children from three separate centres were identified as declining treatment with omalizumab because of needle phobia. One of these children has subsequently agreed to start treatment following a referral to a psychologist. Two children who commenced omalizumab therapy decided to discontinue treatment because of the injections, although one of these children subsequently restarted treatment following an increase in asthma symptoms.

Conclusions Needle phobia or the dislike of injections does not appear to be a barrier for children starting or continuing treatment with subcutaneous omalizumab.

P67 ADVICE ON DISCHARGE AFTER ACUTE ASTHMA

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Background Management guidelines for acute asthma suggest that patients can be discharged once stable on 3–4-hourly inhaled bronchodilators.[1] However, there is no advice regarding how this should be reduced back to levels indicative of well-controlled asthma.

Objective To evaluate advice given at ward discharge to parents of children admitted with acute wheezing, examine adherence to discharge planning guidelines and revise the discharge information leaflet to include advice on the weaning of bronchodilator treatment.

Methods Questionnaires were administered to parents at the time of ward discharge. Another questionnaire was given to nursing and medical staff working on the local paediatric wards and to paediatric consultants in the region. A local respiratory team meeting agreed the schedules for the weaning of bronchodilator treatment.

Results Of the 23 responses by parents, 89% reported that they had received advice regarding how often to use bronchodilator treatment over the 24–48 h after discharge and 82% over the following 2–7 days; 91% were given advice on the bronchodilator dose to use after discharge, 41% received an emergency card or personal asthma action plan and 67% of children's medication was reviewed during the admission. Of the 54 staff responses (39% consultants), 98% reported that they advised parents on the dose and frequency of bronchodilator to use, 92% provided a schedule, of which 34% was standard to all patients; most adjusted a schedule according to clinical severity of episode. Just 42% of staff personally provided parents with an emergency care plan. All staff considered admission a reason for a review of the child's regular treatment and emergency care plan.

Conclusion Staff did provide advice on how to reduce bronchodilator use after discharge but this advice was inconsistent and was not provided to all parents. A discharge plan was devised to support parents in reducing the dose and frequency of bronchodilator use over a 4-day period after discharge. The plan was incorporated into the existing ward discharge leaflet. Future work could examine parent confidence and bronchodilator use at home after discharge, as well as readmission rates.

1. **BTS/SIGN**. Guideline on the management of asthma. 2008.

P68 PRIMARY TRACHEOMALACIA AS A CAUSE OF PERSISTENT WHEEZE IN CYSTIC FIBROSIS DURING INFANCY

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Persistent wheeze, poorly responsive to bronchodilator therapy, raises concerns about progression of cystic fibrosis (CF)-related lung disease. We describe three infants with such symptoms who

were demonstrated to have primary tracheomalacia. The diagnoses were made using fibreoptic bronchoscopy during spontaneous respiration.

Case 1 was diagnosed with CF aged 2 months due to failure to thrive. She had persistent wheeze unresponsive to bronchodilators or high-dose inhaled corticosteroids. Investigations, including a 24 h pH probe and barium contrast studies, were normal. Fibreoptic bronchoscopy performed at 1 year of age demonstrated tracheomalacia of the proximal two-thirds of the trachea. She is now aged 11 years with normal spirometry and minimal peribronchial thickening on the chest radiograph (CXR).

Case 2 was diagnosed with CF aged 6 months after admission to the PICU for acute respiratory infection causing respiratory failure. He had previously been noted to have persistent wheeze despite bronchodilator therapy and a trial of 500 μg fluticasone propionate per day. Fibreoptic bronchoscopy performed at extubation demonstrated tracheomalacia in the distal third of the trachea. There was approximately 75% obstruction seen on expiration. He is now 7 years old with a normal CXR and spirometry.

Case 3 was diagnosed with CF as a neonate. Stridor was noted from 4 months followed by persistent treatment-resistant wheeze. Clinically it was thought that he had tracheomalacia and fibreoptic bronchoscopy performed at 7 months of age confirmed tracheomalacia at the distal third of the trachea. He remains well with a normal CXR aged 2 years.

While persistent respiratory symptoms in early childhood might be indicative of worsening CF-related lung disease, tracheomalacia is an important differential diagnosis, particularly if there is a poor response to bronchodilator therapy. It would appear from this limited case series that the diagnosis is not associated with an adverse long-term prognosis.

Early recognition of this cause of symptoms can limit unnecessary investigation and the use of empirical treatments such as oral and inhaled corticosteroids. Although others have commented that tracheomalacia should be considered in patients with CF and wheeze, to our knowledge this is the first reported case series in infants with CF.

P69 RACIAL AND ETHNIC VARIATIONS IN PARENTAL PERCEPTIONS OF ASTHMA TREATMENT

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Asian children with asthma have worse morbidity than their Caucasian peers. Minimal information exists on racial and ethnic differences in parental perception of asthma.

Aims To compare parental perceptions of asthma among Caucasian and Asian children in the domain ''concerns about medication''.

Methods In this cross-sectional study a face-to-face interview was conducted with parents whose children attended a hospital-based asthma clinic. Postcode data were used to look up the Indices of Multiple Deprivation 2007 (IMD 2007) and this was used to evaluate the socioeconomic status of the families. 94 parents (44 Caucasian, 50 Asian) were interviewed using a validated questionnaire. Using postcode data, the families were grouped into affluent and non-affluent classes (IMD score <40 as affluent and >40 as non-affluent). All the children were at step II and above in the SIGN/BTS guidelines.

Results Asian families (n = 28, 56%) were twice as likely to be concerned about their child being dependent on inhalers as Caucasian families (n = 12, 27.2%). 23 (43.4%) of the non-affluent families were also concerned about inhaler dependence. 29 (58%) of the 50 Asian families and 14 (31.8%) of the Caucasian families had significant concerns about the duration of inhaler use. Both Caucasian (32) and Asian (32) families had similar agreement about the need for regular prophylaxis. 12 (27.2%) of the Caucasian families and 25 (50%) of the Asian families felt inhalers should be used only when their children had symptoms. A significant proportion of Caucasians (26 families, 59.1%) and Asians (25 families, 50%) felt more comfortable accessing secondary care during exacerbation of asthma in their child, even when the symptoms were mild.

Conclusion There is poor understanding and concerns about inhaler dependence, more so in the Asian communities in the population studied. There appears to be better understanding of the need for prophylaxis in both communities and across the economic divide. The concerns that were raised may need to be addressed in efforts to eliminate disparities.

Tuberculosis: epidemiology

P70 ETHNIC DIFFERENCES IN VITAMIN D LEVELS AMONG PATIENTS WITH TUBERCULOSIS IN SOUTH-EAST LONDON

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Introduction and Objectives Vitamin D deficiency may be associated with tuberculosis (TB) disease; this relationship remains ill-defined. Somalis represent a significant proportion of our TB workload, hence we have an interest in this group. We carried out a retrospective analysis of vitamin D levels in patients with TB to determine any associations between age, gender, disease site or ethnicity.

Methods Patients with TB at two hospitals in south-east London from January 2004 to January 2009 were analysed. Vitamin D levels taken within 1 month of TB diagnosis were included. Patients were categorised by country of birth: Somalia, Africa (not Somalia), south Asia (India, Pakistan, Bangladesh, Sri Lanka) and the rest of the world. Data collected included age, gender, disease site and HIV status.

Results We identified 1190 patients, with complete data in 195 (16.4%). There were 36 (18.5%) patients from Somalia, 63 (32.3%) from Africa (not Somalia), 26 (13.3%) from south Asia and 70 (35.9%) from the rest of the world. All groups had deficient levels of vitamin D (<60 ng/ml); these were significantly lower in those from Somalia and south Asia compared with Africa (not Somalia) or the rest of the world ($p<0.001$, fig 1). Levels of vitamin D were similar between men and women. There was a suggestion of a U-shaped relationship between vitamin D levels and age ($p = 0.21$). There was no significant difference in vitamin D levels in patients with pulmonary TB (mean 12.9 ng/ml) compared with extrapulmonary TB (mean 11.3 ng/ml). There was no association between vitamin D level and HIV status.

Conclusions Patients from Somalia and south Asia had lower levels of vitamin D than patients from other countries. This may not be related to skin tone alone, as patients from Africa (not Somalia) had levels comparable with the rest of the world. The reason for these differences is unclear, but could be related to genetic differences in vitamin D receptor polymorphisms, diet or culture. Vitamin D deficiency does not appear to be associated with extrapulmonary TB or HIV disease, although further sub-analyses in individual ethnic groups with larger numbers may be useful.