with an increased risk of adverse neurodevelopmental outcome. We hypothesised that the impact of postnatal sepsis/NEC on outcome was mediated by white matter abnormality (WMA), which could be demonstrated with magnetic resonance imaging (MRI).

Study design: A prospective cohort of 192 unselected preterm infants (gestational age <30 weeks), who were evaluated for sepsis and NEC, underwent MRI at term equivalent age and neurodevelopmental outcome at 2 years corrected age using the Bayley Scales of Infant Development (BSID-II).

Results: Sixty-eight preterm (35%) infants had 100 episodes of confirmed sepsis and nine (5%) infants had confirmed NEC. Coagulase-negative staphylococci accounted for 73% (73/100) of the episodes of confirmed sepsis. Infants with sepsis/NEC had significantly more WMA on MRI at term compared with infants in the no-sepsis/NEC group. They also had poorer psychomotor development, which persisted after adjusting for potential confounders, but which became non-significant after adjusting for WMA.

Conclusions: Preterm infants with sepsis/NEC are at greater risk of motor impairment at 2 years, which appears to be mediated by WMA. These findings assist in defining a neuroprotective target in preterm infants with sepsis/NEC.

PB.16 PREDICTORS OF LONG-TERM NEURODEVELOPMENT IN NEONATAL ENCEPHALOPATHY: AT BIRTH, 1.5 AND 4 H OF AGE

[1]E Chakkarapani, [1]N Mccallion, [2]A Whitelaw, [1]M Thoresen. *[1]Clinical Science at South Bristol, University of Bristol, Bristol, UK; [2]Clinical Science at North Bristol, University of Bristol, Bristol, UK*

Background: Early prediction of neurodevelopment outcome in infants with neonatal encephalopathy (NE) is essential to initiate neuroprotective intervention within the therapeutic window. The accuracy of predictive models within the first 4 h of life is moderate and uses mostly clinical variables.[1] Although ambulatory EEG improves the prediction at 6 h of life, specialist equipment and expertise is needed.[2]

Aim: To predict neurodevelopment outcome in NE infants using clinical and biochemical variables at birth, 1.5 h and at 4–5 h.

Methods: NE was defined as fulfilling entry criteria to the "CoolCap" trial.[3] Demographic, early clinical and biochemical data were collected retrospectively for a cohort of 53 NE infants (mean weight 3386 g and gestation 39.9, 43% females), who received standard intensive care at normothermia. Outcome was assessed at 18 or 24 months of age using Bayley II or schedule of growing skills assessments. Adverse outcome: death or moderate to severe disability. Favourable outcome: normal or mild disability. Multivariable model using backward stepwise regression was applied. Variables were included if $p<0.05$ and excluded with a cut-off of 0.1.

Results and Conclusion: The table shows the predictors of adverse outcome at three time points: birth, 1.5 and 4–5 h of life. These early variables can predict outcome early and help initiate neuroprotective intervention such as hypothermia and counsel parents.

Abstract PB.16

Time	Variable	OR (95% CI)
Birth	Apgar at 10 min <5	6.16 (1.4 to 26.7)
	pH (cord/<60 min)	0.02 (0.0001 to 0.72)
Early 1.5 h	Lactate at 1.5 h	1.29 (1.04 to 1.6)
	Ventilated at 1.5 h	17.08 (2.08 to 139)
Intermediate (4–5 h)	Lactate at 4 h	1.26 (1 to 1.58)
	Ventilated at 5 h	8.49 (1.3 to 55.3)

OR, odds ratio.

1. **Shah PS,** *et al*. *Arch Pediatr Adlolesc Med* 2006;**160**:729–36.
2. **Toet MC,** *et al*. *Arch Dis Child Fetal Neonatal Ed* 1999;**81**:19–23.
3. **Gluckman PD,** *et al*. *Lancet* 2005;**365**:663–70.

BAPM/NNS: Cardiovascular and Respiratory

PC.01 THE VALIDITY OF ECHOCARDIOGRAMS PERFORMED BY NEONATOLOGISTS

[1]S Joshi, [2]DG Wilson, [3]P Kalous, [3]S Sen. *[1]University of Cardiff, Cardiff, UK; [2]University Hospital of Wales, Cardiff, UK; [3]Royal Gwent Hospital, Newport, UK*

Introduction: Many neonatologists now perform echocardiograms but the reliability of this has not been established. This study assesses the validity of echocardiograms performed in a level 3 neonatal unit by two neonatologists.

Methods: All echocardiograms are recorded and entered on a database. Selected abnormal examinations are referred to regional paediatric cardiologists who maintain a regional database. Both databases were queried to confirm the concordance or discordance of the findings of referred infants.

Results: From 1 October 2003 to 31 December 2007, 852 echocardiograms were performed on 681 infants. Structural or functional cardiac abnormalities were identified in 334 (49%). 35 (5.1%) were life-threatening structural abnormalities and all were correctly identified. Of all infants who had echocardiograms, 319 (46.8%) required some action. 145 (21.3%) infants (including those with life-threatening abnormalities) were seen by paediatric cardiologists. Complete concordance was found in 127 (87.6%), partial concordance in 13 (8.9%) and discordance in five (3.4%). All discordant cases were false-positive diagnoses in non-acute situations. None of the infants who were discharged from neonatal follow-up after normal echocardiograms were identified to have presented to paediatric cardiology with undetected abnormalities. The sensitivity of the neonatal echocardiogram was 100% and the specificity was 99%. The positive predictive value and negative predictive value were 96.6% and 100%, respectively.

Conclusions: Echocardiography by neonatologists can have a high sensitivity and specificity and with appropriate paediatric cardiology support, this can be a safe and reliable tool. Because most neonatologists have no formal accreditation in echocardiography, audits of this kind are necessary and reassuring.

PC.02 THE EPICURE STUDY: BLOOD PRESSURE, WAVE REFLECTIONS AND ARTERIAL STIFFNESS IN RELATION TO BIRTH BEFORE 26 WEEKS OF GESTATION

[1]JA Fawke, [2]C McIniery, [3]J Cockcroft, [1]N Marlow. *[1]University of Nottingham, Nottingham, UK; [2]University of Cambridge, Cambridge, UK; [3]University of Cardiff, Cardiff, UK*

Background: Antenatal and postnatal growth are associated with increased arterial stiffness and cardiovascular risk (eg, myocardial infarction and stroke) in adults born at term.

Aim: We investigated cuff blood pressure (BP) and arterial waveforms in 70 extremely preterm children and in 91 age and sex-matched term-born classmates.

Methods: Arterial waveforms were evaluated by radial, carotid and femoral applanation tonometry using the SphygmoCor device (AtcorMedical) by three trained researchers blind to extremely preterm status. BP was measured using an automated Omron BP monitor. Data quality was assessed according to preset criteria and questions of pulse waveform quality jointly resolved by JF and an independent assessor (CM).

Results: There were no differences in cuff systolic or diastolic BP, mean BP or derived central BP in extremely preterm children compared with controls. However, extremely preterm children had

Abstract PC.02

	EP children Mean (SD	Controls Mean (SD)	Difference of means (95% CI)
Augmentation index, %	7.5 (9.6)	2.1 (8.5)	5.3 (2.5 to 8.1)***
Pulse wave velocity, m/s	4.5 (0.5)	4.7 (0.9)	0.2 (0.1 to 0.4)
Systolic BP, mm Hg	108.6 (10.3)	109.3 (9.8)	0.98 (0.52 to 1.42)***†
Diastolic BP, mm Hg	65.3 (7.5)	62.5 (7.2)	0.12 (0.46 to 0.19)**†

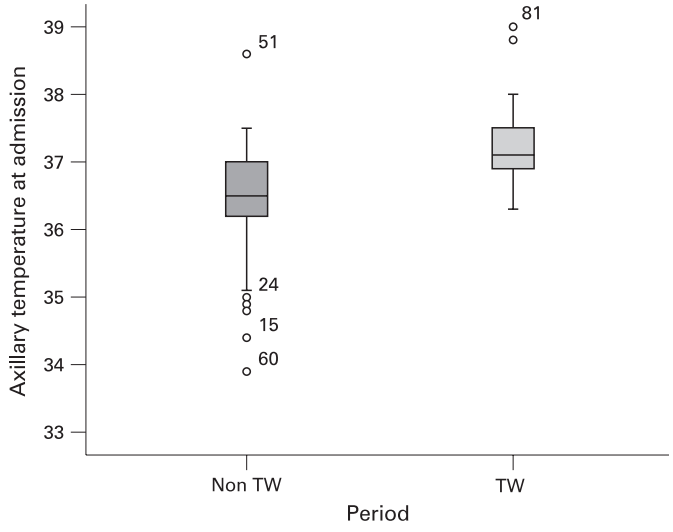
BP, blood pressure; EP, extremely preterm.
**p = 0.001; ***p<0.001; †Difference after correcting for height.

lower systolic and higher diastolic BP after correcting for height differences. In contrast extremely preterm children had higher augmentation index than classmates; this remained significant after correcting for differences in heart rate, height and mean BP.
Conclusions: This first report of increased augmentation index in extremely preterm children indicates increased wave reflections and raises the possibility of future increased cardiovascular risk, not indicated from an examination of peripheral BP.

PC.03 TRANSWARMER MATTRESS USE DURING RESUSCITATION ELIMINATES ADMISSION HYPOTHERMIA IN EXTREMELY PRETERM INFANTS

CPH Ibrahim, CW Yoxall. *Liverpool Women's Hospital, Liverpool, UK*

Introduction: Admission hypothermia increases morbidity and mortality in preterm infants. An audit following the introduction of polythene bags at resuscitation showed only a marginal improvement in admission hypothermia in babies born <28 weeks. Self-heating acetate gel mattresses (Transwarmer) were introduced at resuscitation following the audit. We present the findings of an audit on the use of these mattresses.
Methods: Admission temperatures of all inborn infants below 28 weeks for a one-year period before and 3 months after the introduction of Transwarmer mattresses were audited.
Results: 85 babies were included. 63 were born before the introduction of Transwarmer (non-TW group) and 22 were born after (TW group). No baby in the TW group had an admission temperature below 36°C compared with 20.4% in the non-TW group (p = 0.017). The median (range) axillary temperature was 37.1°C (33.9–38.6°C) in the TW group 36.5°C (36.3–39°C) in the non-TW group (p<0.001) (see fig).



Abstract PC.03
Non-TW, before introduction of Transwarmer mattress; TW, after introduction of Transwarmer mattress.

Discussion: Thermal mattresses have been successfully used to reduce hypothermia during the transport of newborn infants.[1] There are no published studies on the use of these mattresses at resuscitation of preterm infants. We have shown that these self-heating acetate gel mattresses effectively eliminate admission hypothermia in extremely preterm infants.

1. **Herault J,** Petroff J, Jeffrey J. The effectiveness of a thermal mattress in stabilising and maintaining body temperature during the transport of very low birth weight newborns. *Appl Nurs Res* 2001;**14**:210–19.

PC.04 AN AUDIT OF SILDENAFIL IN THE MANAGEMENT OF CONGENITAL DIAPHRAGMATIC HERNIA

LE Hunter, JH Simpson, C Davis, G Walker, T Richens. *Royal Hospital for Sick Children, Glasgow, UK*

Introduction: The postnatal management of severe congenital diaphragmatic hernia (CDH) remains challenging, with very few robust evidence-based interventions but many therapies based on case reports or small case series. Sildenafil, a relatively selective pulmonary vasodilator, has a potential role in the management of pulmonary hypertension associated with CDH, although there is currently limited published experience.
Aims: To audit our use of sildenafil retrospectively in the management of CDH, in particular indications for starting, dosing regimen, assessment of efficacy and impact on outcome.
Results: Over a 7-year period (2000–7) 26 of 83 infants with CDH (31%) received sildenafil. No specific indications for starting treatment were identified; however, those receiving sildenafil appeared to be the more severely affected group both clinically—need for ventilatory support (42 versus 18 days; p<0.001), treatment with inhaled nitric oxide (23 versus 2 days; p<0.001), duration of oxygen therapy (78 versus 33 days, p<0.001) and on echocardiogram—highest peak tricuspid regurgitant velocity (4.3 versus 3.5 m/s; p = 0.005). There was no standardised assessment of response to treatment; however, infants on sildenafil had more echocardiograms (nine versus three; p<0.001). No adverse effects were described. 31% of those who received sildenafil died compared with 23% of those who did not, p = 0.44.
Conclusions: Sildenafil is being used in a significant minority of our infants with severe CDH. Variations in practice regarding indications for starting and ongoing assessment currently exist. A standardised approach, including consistent echocardiographic assessment, would facilitate a robust prospective audit and inform future study design.

PC.05 CLINICAL AUDIT ON THE POSTNATAL MANAGEMENT OF BABIES WITH A FAMILY HISTORY OF CONGENITAL HEART DISEASE

LS Harry, AT Gibson. *Jessop Wing, Sheffield Teaching Hospitals NHS Trust, Sheffield, UK*

Aim: To review postnatal management of babies following antenatal notification of a family history of congenital heart disease (CHD) through the "Paediatric Alert" system.
Methods: Antenatal problems that may have implications for the newborn baby are notified through a "Paediatric Alert" system. The database that holds this information was retrospectively interrogated over the 7-year period, 1999–2005, to identify mothers who had been notified because of a family history of CHD. Postnatal management was obtained from the clinical notes.
Results: During this period, 287 babies were notified for a family history of CHD; maternal CHD (51); previous sibling with CHD (177); other family history of CHD (59). Postnatal echocardiography was performed in 218 babies (87%) in keeping with unit

guidelines. An echocardiogram was not performed in 33 babies and data were not available in a further 36 for the following reasons: moved away (11); no notes/results available (16); early pregnancy losses (4) and inappropriate notification (5). Echocardiography was abnormal in 14 (6%) babies, demonstrating ventricular septal defects in 13 and one atrial septal defect. Of these babies, 11 were asymptomatic at the time of the echocardiography. All babies with CHD were followed up appropriately.

Conclusions: The majority of babies with a family history of CHD had normal postnatal echocardiography. Although there were no babies with lethal CHD, 10 asymptomatic cases of ventricular septal defects were identified before discharge. Postnatal echocardiography plays a role in reassuring anxious parents, and when resources are available, should be offered to at-risk babies.

PC.06 AN AUDIT OF THE MANAGEMENT OF HEART MURMURS ON POSTNATAL WARDS

[1]KM O'Reilly, [2]T Richens, [1]C Cunningham, [1]J Brown, [1]JH Simpson. *[1]Queen Mother's Hospital, Glasgow, UK; [2]Royal Hospital for Sick Children, Glasgow, UK*

Background: Heart murmurs detected incidentally during newborn examination are often innocent but may signify an underlying cardiac malformation. Investigation and management of these murmurs varies widely and is often dependent on local resources. In order to standardise the management of heart murmurs in our hospital a guideline (based on clinical examination with selective cardiology review) was introduced. This aimed to ensure safe management while not overwhelming the cardiologists with unnecessary referrals.

Aims: (1) To establish adherence to and safety of the guideline; (2) to quantify workload implications; (3) to establish the causes of murmurs in our population.

Methods: Patients were prospectively identified over a one-year period (August 2006–July 2007). Case notes were reviewed and examination findings, investigations, follow-up and diagnosis recorded.

Results: 54 babies (1.6% of all livebirths) were identified. The guideline was generally well adhered to. In total, 28 babies (52%) were referred for cardiology assessment: 14 before discharge from hospital and 14 after review in the neonatal outpatient clinic. In 21 babies this assessment included an echocardiogram. 13 babies (24%) had an underlying cardiac malformation, of whom 11 were identified before discharge home. The two later diagnoses were mild aortic stenosis and a small ventricular septal defect. No baby discharged from follow-up without cardiology review subsequently presented with a cardiac problem.

Conclusions: A significant minority of babies with a heart murmur have an underlying cardiac malformation. Our guideline appears to ensure the timely identification of these babies and rationalises our use of specialist services.

PC.07 RELATIONSHIP BETWEEN RIGHT VENTRICULAR FUNCTION AND PULMONARY ARTERY PRESSURE IN INFANTS WITH PULMONARY HYPERTENSION

[1]N Patel, [2]JF Mills. *[1]Royal Hospital for Sick Children, Glasgow, UK; [2]Royal Children's Hospital, Melbourne, Australia*

Introduction: In infants with pulmonary hypertension (PHT), right ventricular function is an important determinant of disease severity, but is rarely directly assessed. It is not known whether measurement of pulmonary artery pressure (PAP) alone allows the prediction of right ventricular function in PHT.

Objective: To investigate the relationship between pulmonary artery pressure and right ventricular function in newborn infants with severe pulmonary hypertension.

Methods: Paired echocardiographic measures of right ventricular function and PAP were performed on 46 occasions in 17 infants with PHT. PAP was calculated from the maximum tricuspid regurgitation velocity. Right ventricular function was assessed using: tissue Doppler imaging (TDI), a direct measure of systolic and diastolic myocardial velocities; the myocardial performance index (RV_{MPI}), a global measure of right ventricular function calculated from right ventricular inflow and outflow Doppler time intervals.

Results: There was no significant linear correlation between PAP and systolic myocardial function (systolic TDI velocities) nor between PAP and global right ventricular function (RV_{MPI}). There was a negative correlation between PAP and early myocardial diastolic function (TDI E′ velocity) but with poor goodness of fit ($p = 0.01$; $r^2 = 0.15$).

Conclusions: Right ventricular function is highly variable in PHT and does not correlate with PAP. Right ventricular function cannot be easily predicted from PAP and should be directly assessed in infants with PHT. TDI and RV_{MPI} allow the non-invasive measurement of right ventricular function in infants.

PC.08 NON-INVASIVE ASSESSMENT OF CARDIAC OUTPUT IN NEWBORN INFANTS: AGREEMENT BETWEEN THE USCOM DEVICE AND CONVENTIONAL ECHOCARDIOGRAPHY

[1]N Patel, [2]JF Mills. *[1]Royal Hospital for Sick Children, Glasgow, UK; [2]Royal Children's Hospital, Melbourne, Australia*

Objectives: To evaluate agreement between conventional echocardiography and a new continuous wave Doppler device (USCOM 1A) for the measurement of cardiac output in newborn infants.

Methods: This was a prospective comparison study. Paired measures of cardiac output were made using conventional echocardiography (combined two-dimensional and continuous wave Doppler) and the USCOM device. Right and left ventricular outputs (RVO and LVO) were measured consecutively in newborn infants with structurally normal hearts and no haemodynamic shunts. Agreement was assessed using Bland–Altman analysis and expressed as mean bias and limits of agreement (mean difference between measures ± 2 SD).

Results: Fifty-six newborn infants were enrolled with mean (SD) gestation of 37.7 weeks (3.5), mean age 24.5 days (24.1), mean weight 3.4 kg (0.7). Heart rate did not differ significantly at the two consecutive measurements. Mean $Echo_{LVO}$ was 251 ml/kg per minute (69) and mean $USCOM_{LVO}$ was 233 ml/kg per minute (57) with a mean bias of 14.2 ml/kg per minute and limits of agreement of −94 to 122 ml/kg per minute. Mean $Echo_{RVO}$ was 279 ml/kg per minute (70) and mean $USCOM_{RVO}$ was 338 ml/kg per minute (83), with a mean bias of −59 ml/kg per minute and limits of agreement of −219 to 101 ml/kg per minute.

Conclusions: The USCOM 1a device allows rapid non-invasive assessment of ventricular outputs in newborn infants. Agreement between USCOM and conventional echo is better for LVO than RVO. Erroneous measurement of accelerated branch pulmonary artery flow may have led to error in RVO measurement using the USCOM device.

PC.09 MURMURS IN THE HEALTHY NEWBORN: ECHOCARDIOGRAPHY WITHIN A MODEL OF CARE

[1]AM Hickey, [1]DG Garvie, [2]SQ Qureshi. *[1]Lewisham Hospital NHS Trust, London, UK; [2]Evelina Children's Hospital, London, UK*

Aim: To illustrate the benefits of a model of care providing early echocardiography (echo) scans in well, term infants with murmurs.

Background: Clinical examination alone is a poor screening tool for newborn cardiovascular disease. Previous studies have suggested that a significant number of neonates with murmurs may have

Abstract PC.09

VSD	25 (21%)
ASD	13 (11%)
PDA	15 (13%)
Pulmonary stenosis	8 (6.6%)
Arch abnormalities	4 (3.4%)

ASD, atrial septal defect; PDA, patent ductus arteriosus; VSD, ventral septal defect.

underlying structural abnormalities and early echo scan is recommended. There are no recognised care pathways for providing this.
Methods: Echocardiographic (echo) screening was performed over a 3-year period on healthy newborns with murmurs. A neonatal intensive care unit population was excluded. Scanning was performed by two neonatologists with an interest in paediatric cardiology. Those newborns with abnormal findings were seen for repeat study or at a monthly cardiology clinic, organised at our hospital with a designated paediatric cardiologist.
Results: In a population of 10 804, structural cardiac abnormalities were found in 65 (55%) of 117 studies (see table).
Conclusions: A care pathway was implemented. Heart murmurs were rare and were detected in 1% of the population. More than 50% of infants had significant but non-life-threatening lesions. Paediatric cardiology clinic review was arranged as deemed appropriate. Parents were counselled. Infants with normal echo were discharged. This service offers an efficient model of care, which we have incorporated into routine practice, eliminating diagnostic delays and reducing parental anxiety. Neonatologists, who are increasingly acquiring skills in echocardiography, are ideally placed to provide this service.

PB.10 WITHDRAWN

PC.11 USE OF HYDROCORTISONE INFUSION FOR TREATMENT OF INOTROPE-RESISTANT HYPOTENSION IN PRETERM BABIES

A Mishra, N Ismail, S Victor. *Neonatal Medical Unit, St Mary's Hospital, Manchester, UK*

Background: Hydrocortisone is used for the treatment of preterm infants with hypotension resistant to volume expansion and inotropic support. The present treatment guideline at our neonatal unit advises the use of hydrocortisone as an initial bolus of 1 mg intravenously followed by an infusion of 0.25 mg/kg per hour till the blood pressure stabilises. The efficacy and side effects of the use of hydrocortisone as an infusion are unknown.
Aim: To evaluate the efficacy and side effects of hydrocortisone infusion for the treatment of hypotension in preterm babies less than 28 weeks' gestation in the first 7 days after birth.
Methods: Retrospective case notes review of 19 preterm babies who received hydrocortisone infusion for the treatment of inotrope-resistant hypotension (defined as dopamine and dobutamine at 20 μg/kg per minute) during 2006–7.
Results: The median gestational age was 25 weeks (range 22–28). The median birth weight was 585 g (range 338–1125). Mean blood pressure increased from 25.2 ± 4.6 to 24.7 ± 4.4, 26.3 ± 5.6, 29.8 ± 5.3, 28.4 ± 6.2 and 30.9 ± 5.4 mm Hg, after bolus administration and 1, 2, 4 and 6 h of hydrocortisone infusion, respectively. In 15 out of 19 patients, weaning of inotropes was started at a mean of 10.7 h (SD 8.8 h) after commencement of hydrocortisone infusion. Hyperglycaemia was noted in 13 patients, 10 of whom needed insulin.
Conclusions: Hydrocortisone infusion was effective in raising the mean blood pressure in preterm neonates with inotrope-resistant hypotension and inotropes were weaned in 15 out of 19 patients who received hydrocortisone infusion. Side effects included hyperglycaemia.

PC.12 AN AUDIT EXAMINING THE INCIDENCE AND MANAGEMENT OF PATENT DUCTUS ARTERIOSUS IN THE PRETERM INFANT AND THE POTENTIAL ROLE OF PROPHYLACTIC INDOMETHACIN

S Ali, R El-Rifai. *St Helier Hospital, Carshalton, UK*

Objective: To clarify whether our population of preterm infants would benefit from the use of prophylactic indomethacin to treat a haemodynamically significant patent ductus arteriosus (PDA) and prevent its complications.
Methods: Audit analysing data over a 5-year period (2000–5), looking at the number of babies born at less than 29 weeks' gestation, with a PDA, risk factors, medical management and the number of infants needing surgical ligation. Other outcomes examined were complications arising from medical management.
Results: 103 patients' notes, born within the review period, were analyzed; 34 patients had a clinically suspected PDA and 69 patients did not. The overall incidence of PDA in this population was 33%. Statistically significant risk factors for developing a haemodynamically significant PDA were lack of antenatal steroids and sepsis. 76% received drug treatment for closure of their symptomatic PDA. 26% did not complete the course due to complications of the medication. 12% of those with a PDA went on to have a duct ligation. Those with a PDA had significant morbidity with necrotising enterocolitis, sepsis and oxygen dependency. However, the data suggested that this was related to the haemodynamic consequences of having a PDA rather than due to drug treatment because, more importantly, drug treatment did not improve morbidity and mortality.
Conclusions: Treatment of a PDA should be guided by diagnostic echocardiography in high-risk patients. The ideal management strategy for such a population of patients remains controversial; however, we advocate early treatment of clinically suspected and confirmed PDA rather than prophylactic medical treatment.

PC.13 EARLY DUCTUS ARTERIOSUS DIAMETER AND THE NEED FOR SUBSEQUENT SURGICAL LIGATION IN INFANTS <30 WEEKS' GESTATION

AM Heuchan. *Queen Mother's Hospital, Glasgow, UK*

Aims: The lack of evidence of benefit from prophylactic indomethacin or ibuprofen in extremely premature infants has increased interest in early predictors of symptomatic patent ductus arteriosus (PDA) development. This study explored the relationship between early colour Doppler PDA diameter and the need for surgical PDA ligation in a centre exclusively using surgical ligation for PDA closure.
Methods: Infants <30 weeks' gestational age (GA) (n = 30) had an echocardiographic assessment in the first 6–48 h of life. Structural normality and duct diameter (colour flow Doppler) were assessed. The relationship between early duct diameter, development of clinical PDA and the need for surgical ligation was analyzed retrospectively. Indications for ligation were persistent ventilator dependence or persistent hypotension associated with a clinical PDA and left ventricular overload.
Results: 30 infants were studied: GA (26 ± 1.6) and birthweight (0.925 ± 0.238 g) (median ± SD). Symptomatic PDA developed in 73% of patients and 30% required surgical ligation (all <29 weeks). The median age at PDA ligation was 24 days. Early duct diameter >1.5 mm and >1.3 mm at <30 and <29 weeks, respectively, predicted any clinical PDA (sensitivity and specificity 100%) independent of GA ($p = 0.74$) or birthweight ($p = 0.2534$). Early duct diameter >1.8 mm predicted surgical duct ligation or death before ligation (n = 5) (sensitivity 92.7%, specificity 72.7%).
Conclusions: This study indicates that failure of early PDA constriction predicts symptomatic PDA, supporting previous studies. In addition, early duct diameter >1.8 mm is predictive of infants requiring surgical intervention for persisting cardiac failure.

PC.14 ARE WE OVERVENTILATING BABIES DURING NEONATAL TRANSFER?

K Hajibagheri, D Duffy, N Ratnavel. *London Neonatal Transport Team, London, UK*

Aims: Our study was primarily to determine if we are delivering overventilated babies to receiving units.
Methods: A retrospective analysis was conducted over a year and included premature babies between 23 and 33 weeks' gestation, less than 72 h old when transferred. We divided these into three groups. Group 1 was when no changes had occurred to ventilation during transfer. Group 2 was when there had been an increase in the minute ventilation. Group 3 was when there had been a decrease in minute volume
Results: 123 babies were included in the study. Results showed that 46% had a carbon dioxide level less than 5. Group 1 results: even when no changes had been made in the ventilation the mean carbon dioxide level fell from 5.5 to 4.99, which was statistically significant. Group 2 showed a drop in the carbon dioxide level as was expected. Group 3 showed an unexpected decrease in carbon dioxide from 5.0 to 4.69. Although this was not statistically significant, it is of interest as the direction of change in carbon dioxide levels was the reverse of what was expected (see table).
Conclusions: The results indicate that we are overventilating premature babies during transfer. Could monitoring of carbon dioxide levels during transfer help prevent the overventilation of these premature babies and therefore help prevent some of the morbidity that may arise?

Abstract PC.14

Changes	Mean CO_2 arrival	Mean CO_2 receiving	p Value
No change in MV	5.5	4.99	0.034
Increased MV	6.78	4.78	0.001
Decreased MV	5.0	4.69	0.128

CO_2, carbon dioxide; MV, minute volume.

PC.15 THE RELATIONSHIP BETWEEN CHRONIC LUNG DISEASE OF PREMATURITY AND *UREAPLASMA* SPP: A SURVEY OF SENIOR NEONATOLOGISTS

NC Maxwell, DE Nuttall, OB Spiller, S Kotecha. *Department of Child Health, School of Medicine, Cardiff University, Cardiff, Wales, UK*

Background: The role of *Ureaplasma* spp in the development of chronic lung disease of prematurity (CLD) remains controversial.
Aim: We sought the views of senior UK neonatologists on whether *Ureaplasma* spp is important in the development of CLD of prematurity.
Methods: A structured questionnaire was sent to 300 consultant neonatologists and paediatricians with a special interest in neonatology in UK neonatal units.
Results: Fifty-seven per cent (172/300) of questionnaires were returned. Most respondents felt that there was neither evidence of *Ureaplasma* spp causing CLD nor any evidence to show that it did not. The respiratory colonisation rate of preterm infants with *Ureaplasma* spp was unclear as few tested for *Ureaplasma* spp regularly, although 59% said that they would be interested in an affordable test to identify *Ureaplasma* spp. There was a very strong call for a randomised trial involving infants born between 23 and 28 weeks' gestation to address this controversy (68%). Within a trial, slightly more respondents thought the result of a tracheal aspirate should be available before starting treatment rather than commencing macrolide treatment at birth. Just under half were concerned about the possible adverse effects of drug treatment to eradicate *Ureaplasma* spp in this group of patients.
Conclusions: There is no clear view among neonatologists regarding the role of *Ureaplasma* spp in the development of CLD. However, there was a clear call for a randomised controlled trial to determine whether the eradication of *Ureaplasma* spp decreases the development of CLD.

PC.16 OXYGEN DISSOCIATION CHARACTERISTICS IN PRETERM INFANTS AND THEIR RELATIONSHIP WITH THE DEVELOPMENT OF ADVERSE OUTCOMES

D Quine, B Stenson. *Simpson Centre for Reproductive Health, Royal Infirmary Edinburgh, Edinburgh, UK*

Background: Oxygen saturation (Sp_{O_2}) is widely used to guide oxygen treatment. We aimed to describe the range of partial pressure oxygen observed in preterm infants who were targeted to maintain Sp_{O_2} 86–94% and to determine whether infants who develop adverse outcomes have different haemoglobin oxygen dissociation characteristics from those who remain well.
Methods: In 98 consecutive infants born at <29 weeks' gestation, the arterial oxygen tension (Pa_{O_2}) from each arterial blood gas result during the first week of life (n = 2095) was matched to the Sp_{O_2} at the time of sampling. For each sample, oxygen affinity was expressed as P_{50} (Pa_{O_2} at saturation of 50%). The 95% confidence intervals of Pa_{O_2} were determined for the saturation range being studied in current trials (85–95%). Multiple regression including birthweight, birthweight Z-score, gestation and fetal haemoglobin was used to see whether the mean P_{50} in first week of life was associated with the risk of death, bronchopulmonary dysplasia or retinopathy of prematurity.
Results: The mean (95% CI) Pa_{O_2} at an Sp_{O_2} of 85% was 4.5 kPa (3.6 to 5.5) and at an Sp_{O_2} of 95% was 6.9 kPa (5.2 to 8.6). There was no relationship between mean P_{50} and the risk of an adverse outcome (bronchopulmonary dysplasia odds ratio (OR) 1.1, p = 0.7; retinopathy of prematurity OR 1.2, p = 0.3; death OR 1.1, p = 0.5; combined adverse outcome OR 1.1 p = 0.4).
Conclusions: In the first week of life the Sp_{O_2} range 85–95% results in a range of Pa_{O_2} that is lower than traditional normoxia guidelines. The oxygen affinity of infants who develop an adverse outcome is no different from those who remain well.

PC.17 NEONATAL RESPIRATORY MORBIDITY AND MODE OF DELIVERY: AN ITALIAN POPULATION-BASED LONGITUDINAL STUDY ON LOW-RISK PREGNANCIES

[1]S Farchi, [1]D Di Lallo, [1]F Franco, [1]A Polo, [2]R Lucchini, [2]F Calzolari, [2]M De Curtis. *[1]Public Health Agency of Lazio Region, Rome, Italy; [2]Department of Neonatology "Sapienza" University, Rome, Italy*

Background: International studies have shown a higher risk of neonatal respiratory morbidity among babies born by elective Caesarean section (CS). The aim of this study is to evaluate the association between the mode of delivery and the risk of neonatal respiratory pathologies in a cohort of term neonates in the Lazio region, central Italy.
Methods: Information about 141 206 term babies born in the Lazio region in 2003–5 has been extracted from birth records and the birth hospital discharge database. We excluded: emergency CS; operative and multiple vaginal births; breech presentation; maternal and neonatal diseases. Respiratory morbidity was defined as: air leak; transient tachypnoea; respiratory distress syndrome; other respiratory problems and the need for mechanical ventilation. Odds ratios (OR) adjusted by age, parity, birthweight, gestational age, sex and the Apgar score were calculated using logistic regression models.
Results: Among the 100 867 births included in the cohort the rate of elective CS was 26.8%. The rate of neonatal respiratory morbidity was 26/1000 among elective CS and 11/1000 among vaginal deliveries. After controlling for potential confounders, the

risk of neonatal respiratory morbidity among elective CS births was twice as high as among vaginally delivered infants (OR 2.05; 95% CI 1.75 to 2.41). The risk declined as gestational age increased, although elective CS deliveries were at higher risk than vaginal deliveries at all gestational ages.
Conclusions: Our study confirms that term elective CS delivered infants have a higher risk of neonatal respiratory conditions than term vaginally delivered infants, and it highlights that the risk is higher the shorter the gestational age.

PC.18 PULMONARY ACINAR STRUCTURE AND FUNCTION AFTER PRETERM BIRTH

[1]M Narayanan, [2]M Mada, [2]J Owers-Bradley, [1]M Silverman, [3]CE Kuehni, [2]JY Wang, [4]S Verbanck, [1]CS Beardsmore. *[1]University of Leicester, Leicester, UK; [2]University of Nottingham, Nottingham, UK; [3]University of Berne, Berne, Switzerland; [4]University Hospital, UZ Brussel, Brussels, Belgium*

Background: In fatal cases, extreme prematurity has been associated with simpler acinar structure and larger and fewer alveoli. There are no equivalent data on survivors. We measured acinar structure and function in long-term survivors of preterm chronic lung disease.
Methods: We compared 11 ex-preterm (24–32 weeks' gestation) children with chronic neonatal lung disease with 20 term-born healthy children of similar age (11 years), height and weight. Children performed spirometry, plethysmography and multibreath nitrogen washout (MBNW) and underwent hyperpolarised He-3 magnetic resonance scanning (HHe3MR). The contribution of acinar airways (S_{acin}) and conductive airways (S_{cond}) to ventilation inhomogeneity was calculated from MBNW. We derived the apparent diffusion coefficient (ADC), a measure of the restriction of diffusion of helium at the acinar level and a surrogate for alveolar size, from HHe3MR data.
Results: Spirometric and plethysmographic indices that differed between ex-preterms and controls are shown in the table. S_{acin} was significantly higher (ie more acinar inhomogeneity) in preterms, but not S_{cond} and ADC.
Discussion: Children born preterm had increased ventilatory inhomogeneity at the acinar level (S_{acin}) when compared with controls, suggesting persistence of acinar airway disease. However, mean ADC and thus alveolar size did not differ, implying that catch-up in alveolarisation may be possible.
Funding: The Wellcome Trust.

Abstract PC.18 Indices of lung function and acinar structure in preterm and term infants

	Preterm	Control	p Value
FEV_1/FVC (Z-score)	−0.79 (1.1)	0.13 (0.69)	0.02
FRC_{pleth} (Z-score)	−0.14 (0.65)	−1.08 (0.95)	0.003
S_{acin} (l^{-1})	0.186 (0.088)	0.095 (0.045)	0.007
S_{cond} (l^{-1})	0.056 (0.049)	0.036 (0.027)	0.24
ADC (cm^2s^{-1})	0.127 (0.014)	0.124 (0.013)	0.25

ADC, apparent diffusion coefficient; FEV_1, forced expiratory volume in 1 s; FVC, forced vital capacity; FRC_{pleth}, functional residual capacity by plethysmography; S_{acin}, acinar airways; S_{cond}, conductive airways. Values are mean (SD).

PC.19 CHORIOAMNIONITIS AND LUNG FUNCTION IN PREMATURELY BORN INFANTS

[1]M Prendergast, [1]S Broughton, [2]E Pollina, [1]GF Rafferty, [1]A Greenough. *[1]King's College, London, UK; [2]King's College Hospital, London, UK*

Background: New bronchopulmonary dysplasia (BPD) may be a maldevelopment sequence resulting from interference/interruption of normal signalling for terminal maturation and alveolarisation of the lungs.[1] Certain evidence suggests that BPD may be more common if there has been antenatal infection and, in preclinical models, antenatal endotoxin administration is associated with abnormal lung growth.
Objective: To test the hypothesis that prematurely born infants whose mothers had chorioamnionitis would have poorer lung function (lower lung volumes) in the perinatal period and at 36 weeks postmenstrual age (PMA) and be more likely to have BPD than infants whose mothers had not had chorioamnionitis.
Methods: Lung volume was assessed by the measurement of functional residual capacity (FRC) and chorioamnionitis was diagnosed by placental histology.
Patients: Placental histology was available in 103 cases; 41 had chorioamnionitis. The infants had a median gestational age of 28 weeks (range 24–32).
Results: Only FRC results at 36 weeks PMA differed significantly, the median FRC of the chorioamnionitis group being higher than the no chorioamnionitis group (see table). There was no significant difference in the percentage of infants with BPD between the two groups (39% chorioamnionitis; 45% no chorioamnionitis; $p = 0.68$).
Conclusions: These results do not support the hypothesis that chorioamnionitis alone impairs lung growth in prematurely born infants; it is important to determine the effect of multiple insults.

Abstract PC.19

	N	CA	No CA	p Value
FRC results (ml/kg)				
3 days	46	18 (8–30)	17 (6–27)	0.46
7 days	64	20 (12–30)	19 (9–31)	0.33
36 weeks PMA	58	26 (16–39)	22 (14–34)	0.02

CA, chorioamnionitis; FRC, functional residual capacity; PMA, postmenstrual age.

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PC.20 SURVEY OF CURRENT USE OF NASAL CONTINUOUS POSITIVE-AIRWAYS PRESSURE IN NORFOLK, SUFFOLK AND CAMBRIDGESHIRE NEONATAL NETWORK

[1]AA Chingale, [2]AE Curley. *[1]Ipswich Hospital NHS Trust, Ipswich, UK; [2]Addenbrooke's Hospital NHS Trust, Cambridge, UK*

There are wide variations in the practical use of nasal continuous positive-airways pressure (nCPAP) in neonatal units.[1] We carried out a questionnaire-based survey of all eight neonatal units in the Norfolk, Suffolk and Cambridgeshire neonatal network between April and October 2007 to determine their practices of nCPAP usage and weaning.
Results: Three units routinely use early nCPAP for very premature newborns after prophylactic surfactant. All units prefer short binasal prong devices to deliver nCPAP. Six units reported nasal excoriation/damage due to nCPAP use (frequency one to two cases per year). 4–6 cm H_2O is the preferred starting pressure of nCPAP in all the units. Only one unit exceeds pressures of 7 cm H_2O to the maximum of 9 cm H_2O in order to achieve optimal gas exchange. They achieve this by graded pressure increments of 1 cm H_2O. Most units wean neonates off nCPAP by using the "time off" method. One unit uses "time off" and pressure reduction with equal frequency for weaning. In all units, nCPAP weaning occurs on an ad hoc basis and a weaning plan is formulated after a joint decision of doctors and nurses. None of the units have their own guidelines for nCPAP weaning and all would welcome mutually agreed network guidelines.
Conclusions: Our survey confirms wide variations in nCPAP usage and weaning across the Norfolk, Suffolk and Cambridgeshire neonatal network. Systematic comparison of the efficacy of nCPAP weaning regimens is necessary to create an evidence base for safe nCPAP use, which is clinically and logistically effective.

1. **De Paoli AG,** Morley C, Davis PG. Nasal CPAP for neonates: what do we know in 2003? *Arch Dis Child Fetal Neonatal Ed* 2003;**88**:F168.

PC.21 HOW INSPIRED OXYGEN CONTROL BEHAVIOURS AFFECT OXYGEN LEVELS ACHIEVED IN VENTILATED PRETERM INFANTS

D Quine, B Stenson. *Simpson Centre for Reproductive Health, Royal Infirmary Edinburgh, Edinburgh, UK*

Introduction: Hyperoxia has been linked to the risk of bronchopulmonary dysplasia (BPD), retinopathy of prematurity (ROP), necrotising enterocolitis (NEC) and neurological outcome in preterm infants. We aimed to explore the contribution of oxygen adjustment behaviours to the amount of time infants are hyperoxic, after controlling for the intrinsic instability of the infants.
Methods: We studied the oxygen adjustment behaviours of 24 trained neonatal nurses while caring for 13 ventilator-dependent infants during 133 shifts. We determined the average time per shift that each individual infant spent hyperoxic. We then compared the oxygen control behaviours of 11 nurses (increased hyperoxia group) in whom for ⩾50% of their shifts the infant in their care spent more time with oxygen saturation (Spo_2) >94% than the average for that infant with the remaining 13 nurses (decreased hyperoxia group). Behaviours compared were the number of changes in fractional inspired oxygen (Fio_2) per shift, mean size of change in Fio_2, mean Fio_2 variability, mean Fio_2 administered and mean Spo_2 maintained. Differences between groups were compared by independent samples t-test.
Results: Nurses in the increased hyperoxia group made significantly larger changes in Fio_2 compared with nurses in the decreased hyperoxia group (9.6% versus 7.7%, p = 0.007). There were no other significant differences in control patterns between the groups. When cared for by nurses in the increased hyperoxia group infants had slightly higher mean saturation, although this was not statistically significant. They spent no more time with saturation <86%.
Conclusions: After controlling for the intrinsic instability of the infant we found that large changes in Fio_2 contribute to a greater time spent with hyperoxia.

BAPM/NNS: Infection and Gut

PD.01 MANAGEMENT OF CONGENITAL CYTOMEGALOVIRUS INFECTION: AN EVIDENCE-BASED APPROACH

[1]RS Gandhi, [1]JR Fernandez Alvarez, [2]S Luck, [1]C Lawn, [1]H Rabe. *[1]Brighton and Sussex University Hospitals NHS Trust, Brighton, UK; [2]Royal Free Hospital, University College London, London, UK*

Objective: To develop an evidence-based structured approach to the management of neonates with congenital cytomegalovirus.
Materials and Methods: MEDLINE/OVID database and Cochrane Collaboration Library were searched for related papers and graded for their level of evidence.
Results: 39 papers were identified including nine reviews. Neonates with abnormal neurological signs, ie, microcephaly, seizures, abnormal cranial ultrasound, sensorineural hearing loss, chorioretinitis or signs of disseminated infection, ie, intrauterine growth restriction, thrombocytopenia or abnormal liver function tests should be evaluated for congenital cytomegalovirus infection. Asymptomatic neonates: Current evidence does not support the treatment of babies who only have positive cytomegalovirus PCR. Symptomatic neonates: Evidence recommends treatment of all newborns with positive cytomegalovirus PCR and central nervous system (CNS)-related/sensorineural symptoms to prevent further neurological deterioration. Intrauterine growth restricted newborns are thought to have systemic involvement including CNS and could also therefore be considered for treatment. There is evidence to suggest that newborns with no CNS symptoms but other signs of systemic involvement could be treated to avoid neurological sequelae if their viral load in the peripheral blood is high. Neonates with normal neurology but lower viral loads should be closely followed up for evidence of sensorineural hearing loss. Treatment should be with intravenous ganciclovir. Increasing evidence suggests that oral valganciclovir for 6 weeks as an effective alternative. Close follow-up for evidence of toxicity and neurological deterioration is required.
Conclusions: Evidence for neonates who would benefit from treatment is growing. We have tried to formulate this structured protocol in order to treat neonates with signs and symptoms that would affect the long-term prognosis.

PD.02 PROCALCITONIN IS A USEFUL ADDITIONAL MARKER IN LATE-ONSET NEONATAL SEPSIS

[1]R Madhu, [1]R Agarwal, [3]B Ofoegbu, [2]M Guy, [4]A Vail. *[1]Regional Neonatal Unit, Hope Hospital, Salford, UK; [2]Department of Biochemistry, Hope Hospital, Salford, UK; [3]Neonatal Unit, Wythenshawe Hospital, Wythenshawe, UK; [4]Department of Statistics, Hope Hospital, Salford, UK*

Aim: To evaluate the usefulness of procalcitonin compared with C-reactive protein (CRP) as a marker for late-onset neonatal sepsis.
Methods: Seventy-three infants admitted to two neonatal units over a 2-year period with suspected late-onset neonatal sepsis were included in this prospective study. Infants were categorised to have ''sepsis'' or ''no sepsis'' based on clinical and laboratory findings. Serum procalcitonin and CRP were determined at the onset of symptoms. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) with 95% CI were calculated for procalcitonin (cut-off value of 0.5 ng/ml) and CRP (cut-off value of 10 mg/l).
Results: A total of 112 septic episodes from 73 infants were included in the study. There were 59 episodes in the sepsis group and 53 episodes in the no sepsis group. The results were as shown in the table. Serum procalcitonin concentrations were significantly higher at the onset of symptoms in the ''sepsis group'' (2.5 ng/ml) compared with those in the ''no sepsis'' group (0.5 ng/ml).
Conclusions: Procalcitonin is more sensitive but less specific than CRP in predicting late-onset neonatal sepsis. Procalcitonin would be a useful additional tool along with other laboratory parameters in the evaluation of late-onset neonatal sepsis.

Abstract PD.02 Sepsis versus no sepsis

	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
PCT	74 (61 to 85)	70 (54 to 80)	73 (60 to 83)	71 (57 to 82)
CRP	64 (50 to 76)	83 (70 to 91)	80 (66 to 90)	68 (55 to 78)

CRP, C-reactive protein; NPV, negative predictive value; PCT, procalcitonin; PPV, positive predictive value.

PD.03 VITAMIN K: MAKING IT NICE

AC James, S Banerjee, JWA Matthes. *Singleton Hospital, Swansea, UK*

Background: Vitamin K prophylaxis prevents vitamin K deficiency bleeding. Several studies have reported a resurgence of late vitamin K deficiency bleeding coincident with policies using oral vitamin K. NICE recommends giving all babies intramuscular vitamin K.
Objectives: (1) To assess parents' preferred route of vitamin K administration; (2) to review policies of vitamin K prophylaxis in maternity units in the United Kingdom; (3) to audit compliance of oral vitamin K prophylaxis in Swansea.
Methodology: Parents attending an antenatal clinic were asked to complete a questionnaire. Maternity units in the United Kingdom were telephoned regarding their current practice. 200 sets of notes of babies born in the Singleton Hospital were reviewed.