inducible heme-oxygenase and non-heme oxygenase-dependent pathways related to oxidative stress may initially play a more central role in carbon monoxide production, with boys more susceptible to oxidative injury and its sequelae.

8.7 PREDICTING NEONATAL MORTALITY: A COMPARISON OF THE CRIB-II SCORE WITH AND WITHOUT TEMPERATURE AT ADMISSION

BN Manktelow, ES Draper, DJ Field. *University of Leicester, Leicester, UK*

Introduction: In 2003 the Clinical Risk Index for Babies was updated as CRIB-II. However, CRIB-II includes admission temperature, which complicates the use of this score as it can be influenced by early neonatal care. This work investigates the ability of CRIB-II with and without admission temperature (CRIB-II$_{(-T)}$) to predict in-hospital mortality among very preterm infants.
Methods: All infants born ⩽32 weeks' gestation and admitted for neonatal care were identified from the Neonatal Survey 2005–2006. Infants with lethal congenital malformations were excluded. Predictive probabilities for mortality were calculated for each infant using the published algorithm for CRIB-II and then recalibrated for CRIB-II and CRIB-II$_{(-T)}$ using the study data. The predictive abilities of the scores, investigated overall and by groups defined by gestational age and admission temperature, were summarised by *c*-statistics, Cox's regression and Brier scores.
Results: 3268 infants were included: 317 (9.7%) died before discharge. Using the published algorithm both versions of the score showed excellent discrimination (c = 0.92) but underpredicted the total number of deaths (CRIB-II, 255.2: CRIB-II$_{(-T)}$, 216.6). After recalibration CRIB-II and CRIB-II$_{(-T)}$ displayed excellent predictive characteristics both overall and for the groups defined by gestation. Whereas CRIB-II$_{(-T)}$ also displayed excellent predictive characteristics for the groups defined by temperature, CRIB-II showed a statistically significant lack of calibration (Cox's regression 36.1°C to 37.5°C, p = 0.021; ⩾36.0°C or >37.5°C, p = 0.011).
Conclusions: After recalibration CRIB-II without temperature showed excellent predictive qualities and should be used when benchmarking neonatal care to avoid the risk of results being influenced by early neonatal care.

8.8 THE BLISS CLUSTER RANDOMISED CONTROLLED TRIAL OF THE EFFECT OF "ACTIVE DISSEMINATION OF INFORMATION" ON STANDARDS OF CARE FOR PREMATURE BABIES IN ENGLAND (BEADI)

[1,2]D Acolet, [1]E Allen, [2]R Houston, [1]D Elbourne. *[1]Medical Statistics Unit, London School of Hygiene and Tropical Medicine, London, UK; [2]Confidential Enquiry into Maternal and Child Health (CEMACH) Central Office, London, UK*

Background: Traditional dissemination of information has limited impact on change in practice. Clarification of which dissemination strategies work best in neonatal units is needed. The trial aim was to assess the effectiveness of an innovative active strategy for dissemination of neonatal recommendations.
Methods: Cluster randomised controlled trial, all English neonatal units, randomised by hospital (n = 182), stratified by networks and unit level of care. Multifaceted intervention: audit/feedback, interactive educational meetings, organisational changes. Outcomes: hospital policies (hypothermia prevention, resuscitation team at birth) and practices in preterm babies (resuscitation team and surfactant in labour ward, admission temperature). Data: EPICure2 study (baseline), CEMACH survey (post-intervention). Statistical analysis (intention to treat): post-intervention differences between active and control group accounting for clustering effect (practice outcomes).
Results: There were no differences between active/control units in level of care, number of admissions or babies <1.5 kg per year and between preterm babies in active/control groups in relevant baseline demographics characteristics. There were no significant post-intervention differences between active/control units in hospital policies. There were post-intervention differences in practice for preterm babies: eg, mean admission temperature higher in the active group, mean difference 0.29°C (95% CI 0.22 to 0.55), more use of polyethylene occlusive wrapping 79% versus 62% (p = 0.05), more surfactant given in labour ward 78% versus 60% (p = 0.04) and a trend to more ideal birth resuscitation teams composition 68% versus 57% (p = 0.09).
Conclusions: An innovative "active" strategy for dissemination of neonatal recommendations is more likely to lead to practice changes in preterm babies than current knowledge transfer mechanisms in England.

Session 8C NNA: Feeding Difficulties

8.9 NASAL INJURIES IN PRETERM INFANTS ASSOCIATED WITH CONTINUOUS POSITIVE-AIRWAYS PRESSURE

[1]EA Alsop, [1]J Cooke, [2]S Gupta. *[1]Neonatal Directorate, the James Cook University Hospital, Middlesbrough, UK; [2]Neonatal Directorate, University Hospital of North Tees, Stockton, UK*

Background: Nasal trauma is a recognised complication of nasal continuous positive-airways pressure (CPAP) therapy, but its prevalence and severity has not been compared in controlled trials.
Methods: Preterm infants <30 weeks gestation and/or <1500 g at birth, randomly assigned to infant flow driver CPAP (IFD) or bubble CPAP (BCPAP) were followed to assess the incidence and severity of nasal injury. Nasal injury data on all babies were recorded prospectively on a nasal injury scoring chart devised for this study. The severity of nasal injury was graded as mild (1–4), moderate (5–8) or severe (⩾9). Data were analyzed using t-tests and χ^2 tests.
Results: Records were obtained on 85 infants (IFD 46, BCPAP 39). There was no difference in the gestational age (27.7 weeks in IFD versus 27.6 weeks in BCPAP) and birthweight (1046 g in IFD versus 1024 g in BCPAP) between the two study groups. Half of the study infants sustained moderate (31.8%) to severe (24.7%) nasal injuries. This was similar in the two groups (54.3% on IFD versus 59.0% on BCPAP; p = 0.668). The time of worst nasal injury was similar (IFD 4.2 ± 3.9 days versus BCPAP 4.5 ± 5.1 days, p = 0.813).
Conclusions: Nasal injury was equally common in babies receiving CPAP with either IFD or BCPAP devices and requires further intervention to reduce its frequency and severity.

Session 9

Session 9A BMFMS: Labour and Delivery

9.1 MYOMETRIAL CONTRACTILITY STUDIES IN DIABETIC PREGNANT WOMEN

[1]S Alqahtani, [2]F Dawood, [1]S Quenby, [1]S Wray. *[1]University of Liverpool, Liverpool, UK; [2]Liverpool Women's NHS Foundation Trust, Liverpool, UK*

Several studies worldwide have shown a higher Caesarean section rate in diabetic compared with non-diabetic women. Local audit conducted at our hospital revealed an emergency Caesarean section rate of 37.4% compared with 13.2% for non-diabetic women. We

have investigated whether there is an intrinsic contractility problem in the myometria of pregnant diabetic women.
Methods: Myometrial biopsies were obtained during term elective Caesarean section from 20 diabetic and 68 non-diabetic women and were subjected to in-vitro laboratory testing. All the diabetic women had good antenatal glycaemic control. Contractility was measured simultaneously with intracellular calcium signalling using fluorescent Indo-1. Contractility was also measured in 0-glucose solutions and with the addition of 700 pM insulin. Myometrial glycogen content was measured in millimoles.
Results: The entire set of diabetic samples contracted worse than the non-diabetic samples. The amplitude and the duration of contractions were significantly reduced (to 76.6 ± 6% and 44 ± 10%, respectively, relative to control 100%). Similar changes were observed in intracellular calcium transients. A significant reduction in the glycogen stores (11.3 ± 1.3 mmol) occurred in diabetic samples compared with 16.6 ± 2.0 mmol in non-diabetic samples. In 0-glucose solution, a more rapid reduction in force amplitude and cessation of contractility was observed in the diabetic compared with paired control samples. Myometrial contractility was reduced in both control and diabetic samples exposed to insulin.
Conclusions: Even under standardised conditions, myometrial contractility is worse in term diabetic uteri and may underlie the increased risk of emergency Caesarean section. This may be exacerbated by decreased metabolic reserves.

9.2 A PHYSIOLOGICAL APPROACH TO STIMULATING LABOUR: PULSE, A RANDOMISED CONTROLLED TRIAL OF PULSATILE VERSUS CONTINUOUS OXYTOCIN ADMINISTRATION

[1]SE Crawshaw, [2]PN Baker, [2]C Stanley, [3]F Safari, [3]P Seed, [3]AH Shennan, [3]RM Tribe. *[1]University of York, York, UK; [2]University of Manchester, Manchester, UK; [3]King's College, London, UK*

Introduction: Induction and augmentation of labour are associated with high rates of medical intervention. Continuous oxytocin infusion protocols are routinely used to stimulate uterine contractions, but can cause uterine hyperstimulation and fetal distress. As continuous exposure to oxytocin is associated with oxytocin receptor downregulation, pulsatile oxytocin infusion protocols may provide an effective and more physiological approach to stimulation of uterine contractions.
Aim: To improve the current method of oxytocin induction and augmentation of labour. We hypothesised that low-dose pulsatile infusion of oxytocin is associated with lower Caesarean section and intervention rates compared with a continuous oxytocin infusion protocol.
Methods: A randomised controlled trial (n = 1031 women) was conducted in two large UK maternity units with local ethics committee approval. Pregnant women requiring oxytocin for induction or augmentation were recruited, with written informed consent, and were randomly assigned to either a continuous or pulsatile (discrete 10 s boluses every 6 minutes) oxytocin infusion protocols. The infusion dose was increased every 30 minutes according to NICE guidelines. Primary outcome measures were Caesarean section rate (induction group) and intervention rate (Caesarean section/instrumental delivery rate for the augmentation group).
Results and Conclusions: In the induction group, Caesarean section rates (38% versus 38%, n = NS) and spontaneous vaginal delivery rates are similar in the pulsatile and continuous infusion groups. As the low-dose pulsatile infusion is as effective as the standard continuous infusion, our results suggest that current clinical protocols for induction should be reassessed.
Funding: GlaxoSmithKline Giving Committee/Tommy's the baby charity).

9.3 RESIDENT OBSTETRIC CONSULTANT COVER: DOES IT MAKE A DIFFERENCE TO VAGINAL DELIVERY RATES OR PERINATAL MORBIDITY?

F Siddiqui, A Green, J Moore, L Kean. *Nottingham University NHS Trust (City Campus), Nottingham, UK*

NICE and the RCOG recommend 24 h resident consultant cover on the labour ward. At Nottingham City Hospital there was resident on-call consultant cover for 2 days of the week. This study reviews the vaginal and operative delivery rates and perinatal morbidity on the nights with resident consultant cover compared with senior specialist registrar cover.
Methods: Between January 2004 and November 2006 consultants covered 2 nights a week. Nights covered by a consultant were compared with nights covered in the same week by a specialist registrar. We calculated the number of Caesarean sections, operative vaginal deliveries, fetal blood sampling, unexpected admissions to the neonatal unit, arterial cord pH<7.1 and major post-partum haemorrhage (>1000 ml). Non-parametric tests were used to compare the two groups.
Results: There was a significant increase in the vaginal delivery rate with consultant cover (65% versus 50.9%; $p<0.05$). There was no difference in the operative vaginal delivery rates, although there were significantly more forceps deliveries with consultant cover. There were more category 2 Caesarean sections with consultant cover, although a reduction in the category 1 Caesarean section rate. There were significantly less fetal blood sampling. There was a lower incidence of low Apgar (7 versus 11; $p>0.05$), neonatal unit admissions (3 versus 6; $p>0.05$) and cord pH <7.1 (4 versus 6; $p>0.05$) associated with consultant cover, although these changes were not significant. There was a significant reduction in the incidence of post-partum haemorrhage (10 versus 14; $p<0.05$).
Discussion: Resident consultant labour ward cover is associated with an increase in the normal vaginal delivery rate. This is associated with lower neonatal and maternal morbidity. There is, however, an overall increase in Caesarean sections.

9.4 THE EFFECT OF BARUSIBAN ON PLASMA CONCENTRATIONS AND UTERINE CONTRACTILITY IN THREATENED PRETERM LABOUR: A RANDOMISED, DOUBLE-BLIND, PLACEBO-CONTROLLED TRIAL

[1]S Thornton, [2]TM Goodwin, [3]G Greisen, [3]M Hedegaard, [4]JC Arce. *[1]Warwick Medical School, Coventry, UK; [2]University of Southern California, Los Angeles, California, USA; [3]Rigshospitalet, Copenhagen, Denmark; [4]Ferring Pharmaceuticals, Copenhagen, Denmark*

Objective: Atosiban is a mixed oxytocin/vasopressin antagonist with marked tocolytic activity. Preclinical studies suggest that barusiban, a specific oxytocin antagonist, also markedly reduces uterine contractility. The object was to determine plasma concentrations, contractions and side effects following barusiban or placebo in threatened preterm labour (PTL).
Methods: 163 women in threatened PTL (34 + 0–35 + 6 weeks) with cervix ⩽15 mm were randomly assigned to a single intravenous dose of barusiban (0.3, 1, 3, 10 mg) or placebo. Rescue tocolytics were prohibited. The primary endpoint was women who did not deliver within 48 h. Plasma concentrations were determined by mass spectrometry. Uterine contractions and maternal/neonatal outcomes were determined.
Results: The mean plasma concentrations at 2 h were 11, 39, 139 and 537 ng/ml in women who received 0.3, 1, 3 and 10 mg barusiban, respectively. The concentration was not related to contraction frequency (mean frequency at 2–2.5 h: 4.4, 5.0, 6.6, 5.9 and 6.1 for placebo and barusiban, respectively). There was no

significant difference in the percentage of women who did not deliver within 48 h (72% for placebo and 65%–88% for barusiban groups). Barusiban was well tolerated, although side effects were increased at higher concentrations. Postpartum blood loss and time to lactation were not significantly increased. There were no major safety concerns.

Conclusions: A single dose of selective oxytocin antagonist barusiban (0.3–10 mg) increased plasma concentrations to those calculated to be effective but did not delay delivery or reduce uterine contractions in women with threatened PTL and short cervical length. The results contrast with those of the mixed oxytocin/vasopressin antagonist, atosiban.

9.5 WITHDRAWN

Session 9B BAPM/NNS: Nutrition

9.6 DIFFERENTIAL EFFECTS OF MATERNAL NUTRIENT RESTRICTION ON INFLAMMATION IN RENAL AND ADIPOSE TISSUE IN OBESE JUVENILE OFFSPRING: THE ROLE OF TLR4 AND CCR2

D Sharkey, P Williams, P Bos, S Sebert, D Gardner, M Symonds, H Budge. *University of Nottingham, Nottingham, UK*

Introduction: Obesity is associated with a chronic inflammatory state. Key proinflammatory genes involved include Toll-like receptor 4 (TLR4) and chemokine receptor 2 (CCR2). We have previously shown, in sheep, that early-to-mid maternal nutrient restriction protects the kidney from the deleterious effects of juvenile obesity. The extent to which alterations, or differential tissue regulation, occur in these key genes after adolescent onset obesity is unknown. We examined the combined effects of maternal nutrient restriction during pregnancy and early-onset obesity on their distribution.

Methods: Eighteen pregnant sheep were randomly assigned to a normal (C, 7 MJ/day, n = 8) or nutrient restricted diet (NR, 3.5 MJ/day, n = 10) from days 30 to 80 gestation (term 147 days). After weaning, offspring had restricted activity and increased energy-dense food to promote obesity. Sheep were humanely killed at 1 year and tissues sampled. mRNA abundance of genes of interest in renal and perirenal adipose tissue were measured by real-time PCR. Animal ethics committee approval was given.

Results: Birthweight and weight at 1 year were not different between groups. Both TLR4 (C 1.0 ± 0.2, NR 2.0 ± 0.3, $p<0.05$) and CCR2 (C 1.0 ± 0.2, NR 3.9 ± 1.1, $p<0.05$) were upregulated in perirenal adipose tissue of nutrient restricted offspring but downregulated in the kidney (C 1.0 ± 0.2, NR 0.6 ± 0.1, $p<0.05$, C 1.0 ± 0.2, NR 0.4 ± 0.1, $p<0.05$, respectively).

Conclusions: Maternal nutrient restriction adversely affects adipose tissue through key proinflammatory genes but conversely protects the kidney from such effects. Identifying the mechanisms may offer potential tissue-specific therapies aimed at reducing the burden of the metabolic syndrome.

Funding: Funded by the British Heart Foundation

9.7 THE EFFECT OF CAESAREAN SECTION AND A SINGLE ENTERAL FEED ON LIVER METABOLISM IN RESPONSE TO TOTAL PARENTERAL NUTRITION

[1]MJ Hyde, [2]JL Griffin, [3]L Clarke, [1]PR Kemp. *[1]National Heart and Lung Institute, Imperial College, London, UK; [2]Department of Biochemistry, University of Cambridge, Cambridge, UK; [3]School of Agriculture, Policy and Development, University of Reading, Reading, UK*

Total parenteral nutrition (TPN) in neonates frequently causes liver disorders. We have demonstrated that preterm piglets on TPN for 7 days develop fatty livers.[1] Despite some evidence of differing metabolism between preterm and term neonates, no study has previously compared liver function during TPN in preterm and term neonates, neither have they studied the effect of limited enteral feeding on liver metabolism during TPN.

Piglets were delivered by Caesarean section 4 days preterm (PT) or vaginally at term (T). They received either a single bolus of milk (F) or no enteral nutrition (UF) before commencing TPN. Jugular catheters were inserted 3 h postpartum and piglets were maintained on TPN plus intralipid 20% for 7 days, killed and tissue sampled.

Liver lipid content in preterm piglets was above 5% (w/w), the definition of steatosis,[2] but was significantly ($p<0.05$) reduced by pre-feeding (PT-UF 7.6 ± 0.8; PT-F 5.2 ± 0.3; T-UF 4.2 ± 0.2; T-F 3.5 ± 0.2% (w/w) ± SEM). Principal component analysis of NMR spectra of liver extracts showed that vaginal delivery at term and/or pre-feeding increased gluconeogenic precursors and ketone production. Phosphoenolpyruvatecarboxykinase activity was increased by feeding and birth (PT-UF 8.59 ± 0.59; PT-F 10.25 ± 2.28; T-UF 13.62 ± 0.96; T-F 12.00 ± 0.49 mU/mg protein).

This suggests that preterm Caesarean delivery results in a failure to switch between anabolic metabolism, seen in late gestation fetuses and glucagon-stimulated catabolic metabolism in term infants, resulting in increased hepatic lipid and glycogen storage (PT-UF 92.9 ± 22.4; PT-F 89.6 ± 30.2; T-UF 33.7 ± 8.7; T-F 47.5 ± 19.1 mg glucose/g tissue). The effects of Caesarean delivery preterm are partly mitigated by enteral feeding.

1. **Hyde MJ,** *et al*. *Neonatology* 2008;**93**:77–86.
2. **Cairns SR,** Peters T. *Clin Sci (London)* 1983;**65**:645–52.

9.8 DOES POSTNATAL GROWTH AFFECT POST-DISCHARGE MORBIDITY IN PRETERM INFANTS?

[1]ST Dharmaraj, [1]ND Embleton, [1]AC Fenton, [1]RJQ McNally, [2]RJ Cooke. *[1]Royal Victoria Infirmary, Newcastle upon Tyne, UK; [2]University of California Davis, Sacramento, California, USA*

Background: Preterm infants are more likely than term infants to develop ongoing morbidity after initial hospital discharge. It is unclear whether this is associated with specific patterns of postnatal growth.

Aim: To study the association between postnatal growth patterns and post-discharge morbidity in preterm infants born at <33 weeks' gestation.

Methods: Infants recruited from a tertiary neonatal intensive care unit over a 12-month period were prospectively followed until 18 months corrected age. Infants were stratified depending on their change in weight Z-score at 28 days and 18 months resulting in four groups with differing postnatal growth patterns (see table): group 1 (persisting poor growth), group 2 (poor post-neonatal growth), group 3 (post-neonatal catch-up growth) and group 4 (adequate growth). Prospective data on rehospitalisation, general practitioner and A&E visits were compared using non-parametric tests.

Results: 119 infants were recruited and morbidity was analyzed for 108 (92%). There were no significant differences in morbidity. Logistic regression analyzed the association between rehospitalisation and change in weight Z-score (odds ratio (OR) 1.3, 95% CI 0.9 to 1.8; $p = 0.1$), birthweight <1000 g (OR 2.9, CI 1.1 to 7.5; $p = 0.03$) and cerebral palsy (OR 8.1, 95% CI 1.7 to 38.2; $p = 0.008$).

Conclusions: Postnatal growth pattern was not associated with measures of post-discharge morbidity in this cohort, suggesting that