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*Presenting author names have asterisks in the contributor lists.

ID 57. Echocardiography-guided ductus arteriosus treatment: a randomized controlled trial on two prescription strategies to reduce the incidence of necrotizing enterocolitis

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Background: Patent ductus arteriosus (PDA) approach remains controversial due to uncertainties about treatment benefits versus harms. We aim to evaluate whether a treatment scheme on echography-guided (EchoG) PDA closure (to reduce drug exposure) and 24-h-continuous ibuprofen infusion (24h-IB) (to reduce peak concentration of ibuprofen), compared to EchoG PDA closure plus conventional bolus ibuprofen treatment (bolus-IB), reduces severe bowel adverse event rate in infants below 33 weeks' gestation with hemodynamically significant (hs) PDA.

Methods: Multicentre, blinded randomized controlled trial. Infants with less than 28 weeks' gestation underwent routine echocardiographic assessment between 18 to 72 h of birth; infants between 28 and 33 weeks were screened only in case PDA was suspected clinically. hsPDA was considered if ductal diameter was larger than 1.5 mm and indicators of pulmonary overflow, systemic hypoperfusion, or both were present.

Results: One hundred forty-six infants (median gestational age 26 [25–28] weeks; median birth weight 881 [704–1100] g) were randomized to 24h-IB (n = 70) or bolus-IB (n = 76) study group at 86 (58–140) h from birth. Groups were comparable in terms of perinatal or neonatal relevant clinical data with the exception of higher prevalence of male sex in the bolus-IB group (p = 0.004). Treatment effectiveness was also similar with 53% (24h-IB) and 47% (bolus-IB) of the infants showing no ductal flow after ibuprofen treatment with similar total number of doses. Severe bowel adverse event rates were also similar [10% (24h-IB); 2.6% (bolus-IB), p = 0.1], although those in bolus-IB group reached full enteral nutrition earlier (p = 0.03). Postnatal age (p = 0.02) and peripheral SaO2 (p = 0.004) at treatment start, and pulmonary hemorrhage (0.03) before PDA treatment were associated to the development of severe bowel events independently of treatment group allocation.

Conclusions: Ibuprofen intravenous continuous infusion compared to bolus infusion in preterm infants with hsPDA shows similar rates of success and does not reduce the prevalence of severe bowel events.

Funding source: This study was supported by the Spanish Health Ministry (PI16/00644) and Mutua Madrileña Fundation (AP163272016). The authors did not receive any form of payment to perform the trial.

ID 63. Impact of packed red blood cell transfusions on cerebral and somatic tissue oxygenation in premature infants with and without a patent ductus arteriosus

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Background: Packed red blood cell (PRBC) transfusions treat anaemia and support adequate cellular metabolism. The impact of PRBC transfusions on left ventricular (LV) afterload and pulmonary vascular resistance (PVR), cerebral and somatic regional tissue oxygenation (rSO2) in the context of a patent ductus arteriosus (PDA) warrants further investigation.

Methods: Infants <32 weeks gestation who received a PRBC transfusion beyond the first 10 days of life were included. Each infant underwent a 24 h assessment of cerebral and somatic rSO2 and fractional tissue oxygen extraction (FTOE), commencing at the start of the transfusion. Echocardiography was carried out at baseline, 18 and 24 h post transfusion, to measure PVR, LV end systolic wall stress (ESWS) in addition to LV and right ventricular (RV) systolic strain. The impact of the presence of a PDA on cerebral and somatic rSO2/FTOE was assessed.

Results: Thirty infants with a median [IQR] gestation and birth weight of 26.3 [24.8–28.0] weeks and 855 [659–1103] g were included. Baseline haemoglobin was 10.0 [9.3–10.5] g/dL. There was an increase in pulmonary artery acceleration time (48 ± 13 to 57 ± 16 ms, p < 0.01) from baseline to 24 h post transfusion. LV ESWS did not change (378 ± 149 to 361 ± 132 dynes/cm^2, p = 0.67). There was no change in LV or RV strain over the study period (p > 0.05). Ten infants had a PDA (median diameter 2.1 [1.8–2.7] mm). Cerebral rSO2 increased in a similar manner in infants with and without a PDA following PRBC transfusion with a corresponding fall in cerebral FTOE (Figure). Although somatic rSO2 increased during the study period in the overall group, the rSO2 values were significantly lower in those with an open PDA at baseline and following transfusion compared to those with a closed PDA. There was a significant decrease in somatic FTOE following transfusion in the closed PDA group only (Figure).

Conclusion: PRBC transfusion results in a fall in PVR without significant change in myocardial function or LV afterload. Cerebral oxygenation improved following transfusion regardless of PDA status. Somatic oxygenation improved to a greater extent in babies with a closed PDA.

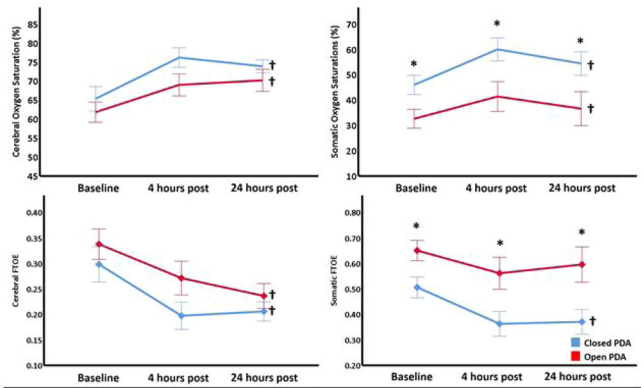

Figure: Cerebral and Somatic Regional Oxygenation and Fractional Tissue Extraction (FTOE) in the Cohort.
* p<0.05 between groups at each time point; † p<0.05 change over time within each group.

(ID 63) Cerebral and somatic rSO2 and FTOE

None declared.

ID 131. Postnatal cardiac morphology in intrauterine growth restricted neonates

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Background: Intrauterine growth restriction (IUGR) following placenta insufficiency affects cardiac development. We hypothesized that IUGR influences early cardiac remodeling. Our aim was to assess the impact on cardiac morphology in premature and term neonates.

Methods: Sixty-two pregnant women and their 69 neonates with gestational age (GA) 30-42 weeks were included in a prospective, observational cohort study. IUGR (n = 28) was documented with measurements of foetal growth and centralization of the foetal circulation. The non-IUGR group (n = 41) had normal prenatal growth and circulation. We performed echocardiographic measurements of cardiac morphology on postnatal day one, two and three.

Results: IUGR GA (mean (SD)) were 34.8 (3.2) and non-IUGR 38.6 (2.5) weeks (p < 0.001), and birth weight (BW) 1.9 (0.6) and 3.2 (0.7) kg (p < 0.001). The table shows measurements of cardiac morphology, adjusted for GA, BW, sex and singleton/twin. The adjusted values are estimated marginal means by use of mean GA and BW (37 weeks and 2.7 kg). We also made indices to adjust for heart size by dividing by left ventricle (LV) septum length. The IUGR neonates had significantly smaller left atrium (LA) diameter and shorter LV septum length compared to the non-IUGR neonates. They also had significantly smaller end-diastolic left ventricle internal diameter (LVIDd) and right ventricle (RV) midwall diameter. The reduction in LA and RV diameters were more pronounced than the reduction in septum length. The reduction in LV diameter was similar to the reduction in septum length. IUGR neonates hence exhibited a symmetrical change in shape for the LV and an oblong change in shape for the RV.

Conclusion: We found impact of IUGR on heart morphology when adjusting for GA, BW, sex and singleton/twin. The IUGR group overall had smaller hearts. The LV dimensions exhibited a symmetrical change in shape and the RV dimensions exhibited an oblong change in shape.

(ID 131) Table: Adjusted echocardiographic morphological measurements (mean (SEM)).

Measurements adjusted for GA, BW, sex and singleton/twin. Significance level p value <0.05

	IUGR n = 28	Non-IUGR n = 41	p value
Left side measurements, mm			
Septum length	27.8 (0.4)	29.7 (0.3)	0.001
LA diameter	9.4 (0.2)	10.8 (0.2)	<0.001
LVIDd, mm	16.0 (0.3)	17.3 (0.2)	<0.001
Left sided indices			
	0.336 (0.008)	0.361 (0.006)	0.024
	0.569 (0.014)	0.590 (0.011)	0.275
Right sided measurements, mm			
RV cavity length, mm	23.5 (0.4)	24.4 (0.4)	0.111
RV mid-wall diameter, mm	8.3 (0.3)	9.9 (03)	0.001
Right sided indices			
	0.296 (0.012)	0.330 (0.010)	0.032
Ratios between corresponding right sided and left sided measurements			
	0.845 (0.018)	0.825 (0.014)	0.402
	0.519 (0.018)	0.565 (0.015)	0.056

None declared.

ID 149. Effect of intrauterine growth restriction on regional perfusion and tissue oxygenation in term neonates after birth

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Background: Intrauterine growth restriction (IUGR) is mainly due to placental insufficiency, which can lead to chronic intrauterine hypoxia and prenatal hemodynamics disturbances, thus causing structural and functional changes of cerebral and renal circulation.

Near infrared spectroscopy (NIRS) is a non-invasive tool to study organ hemodynamic processes by measuring oxygenation and hemoglobin concentration changes.

Methods: In this prospective case–control study 105 IUGR term infants and 105 age/gender-matched controls were recruited.

Regional cerebral and renal oxygenations (rSO2) were studied by NIRS for the first 12 h after birth. Fractional tissue oxygen extraction (FTOE) was calculated.

Resistance index (RI) in renal and anterior cerebral arteries (ACA) were assessed by doppler at 6 and 24 h.

Results: NIRS monitoring was starting at a mean time of 68 ± 22 min.

There were higher cerebral rSO2 values (main effect group: p = 0.04; interaction time × group: p = 0.72) and lower FTOE in the IUGR versus control group (main effect group: p = 0.03; interaction time × group: p = 0.463).

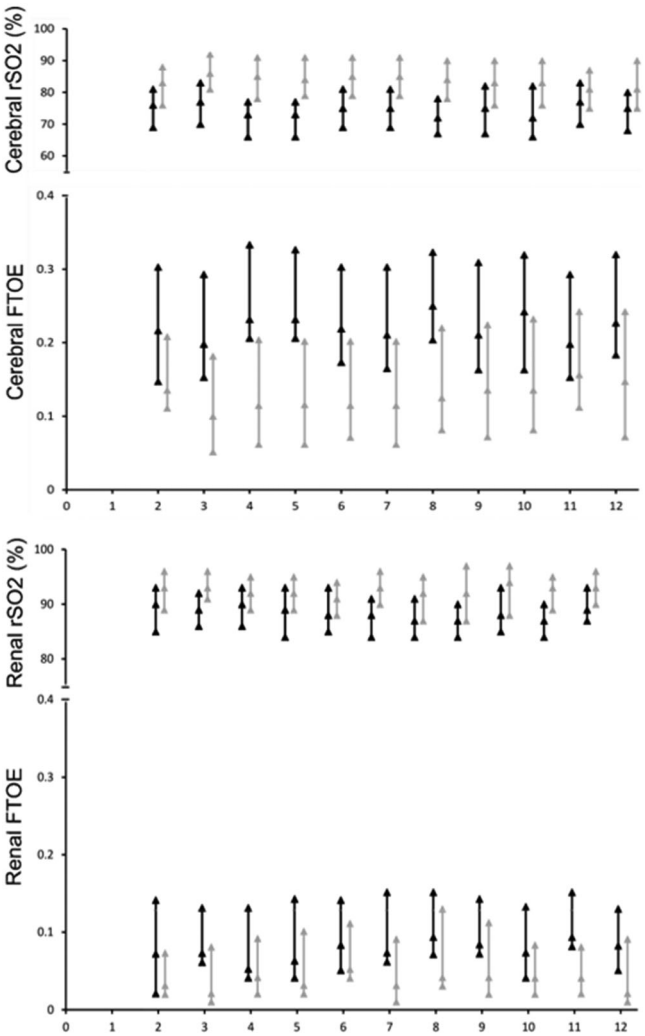
Renal FTOE was lower in IUGR (main effect group: p = 0.04; interaction time × group: p = 0.39) whereas renal rSO2 was higher in IUGR versus control neonates (main effect group: p = 0.003; interaction time × group: p = 0.44).

RI in ACA was lower in the IUGR group (0.66 ± 0.11 versus 0.76 ± 0.14 at 6 h p = 0.007; 0.65 ± 0.08 versus 0.73±0.13 at 24 h p = 0.04).

There was no significant difference in the renal blood flow between two groups.

Conclusion: IUGR has a direct impact on the cerebral and renal oxygenation and perfusion after birth. IUGR infants have an increased cerebral oxygenation and perfusion during the first day after birth as indicated by a higher cerebral rSO2 and lower RI in ACA, reflecting a preferential redistribution of blood flow to the brain. The lower cerebral FTOE in IUGR may indicate the persistence of an adaptive phenomenon to reduced substrate delivery in case of foetal chronic hypoxia.

Higher rSO2 and lower FTOE in the kidney without any significant difference in the renal blood flow may indicate an impaired renal maturation with reduced oxygen consumption.



(ID 149) Fig. 1. Changes in the mean cerebral and renal rSO2 and FTOE for the IUGR (grey) and the AGA (black) group during the first 12 h after birth.

None declared.

ID 177. Preterm oxygenation of the cerebrum: key for erythrocyte-transfusion threshold, a randomized controlled trial

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Background: Preterm infants are at risk of anemia. One of the objectives of a red blood cell (RBC) transfusion is to prevent impaired cerebral tissue oxygenation and improve neurological outcome. Cerebral tissue oxygen saturation (rcSO2) surveillance might aid in determining whether a RBC transfusion is required.

Methods: We performed an open, randomized controlled trial in which infants with a gestational age below 32 weeks were randomly assigned to receive RBC transfusions at either the usual Hb-threshold, or at a rcSO2 lower limit of 72% with a safety net hemoglobin threshold 1 mmol/L lower than usual care. The primary outcome was the short-term neurological outcome at 3 months corrected age (CA), determined by assessing infants' general movements (GMs). GMs were considered optimal in case of a motor-optimality score ≥25. Secondary outcomes were in-hospital mortality, neonatal morbidity, and course of hemoglobin and rcSO2.

Results: One-hundred and nine infants with a mean gestational age of 29.1 weeks and a mean birth weight of 1295 g were randomised. More infants in the intervention group had optimal GMs at 3 months CA (50% vs 27%, p = 0.02) (Table 1). Infants in the intervention group had higher mean rcSO2 during the study period, p = 0.04. Regardless the tendency that more infants in the intervention group received RBC transfusions compared to the control group (39% vs 22%, p = 0.05), infants in the intervention group had lower mean hemoglobin during the study period: 8.7 vs 9.4 mmol/L, p < 0.01. There were no differences in neonatal mortality and clinical morbidities (Table 1).

Conclusion: Using a lower limit of cerebral oxygen saturation measured by near-infrared spectroscopy to dictate RBC transfusions for anemic preterm infants improves the quality of GMs at 3 months CA. Preventing cerebral hypoxia may explain this finding. A lower rcSO2 limit has the potential to be used as an individualized indicative marker for the need of RBC transfusions in anemic preterm infants. Further multicenter trials are required to confirm our results.

Table 1. Primary and secondary outcomes.

	Intervention group $n = 54$	Control group $n = 55$	p
Primary outcome			
Optimal GMs at 3 months CA (MOS ≥ 25)	22 (50%)	13 (27%)	0.02
Secondary outcomes			
Fidgety movements present	44 (98%)	50 (100%)	0.47
MOS	25 (24–26)	24 (22–26)	0.04
In-hospital-mortality	3 (6%)	1 (2%)	0.36
IVH > Grade II or cystic PVL	3 (6%)	5 (9%)	0.72
NEC, Bell's stage ≥ II	8 (15%)	6 (11%)	0.54
BPD at 36 weeks PMA	15 (28%)	8 (15%)	0.09
ROP stage ≥ III	2 (4%)	1 (2%)	0.62
No. of infants who received a RBC transfusion	21 (39%)	12 (22%)	0.05
No. of RBC transfusions within infants who were transfused	2 (1–3)	2 (1–3)	0.29
Hb before RBC transfusion, mmol/L	6.6 (6.5–7.4)	6.5 (6.1–7.2)	0.19

Displayed as median (interquartile range) or as *n*, percentage when appropriate.

GMs general movements, CA corrected age, MOS motor optimality score, IVH intraventricular hemorrhage, PVL periventricular leukomalacia, NEC necrotizing enterocolitis, BPD bronchopulmonary dysplasia, PMA postmenstrual age, ROP retinopathy of prematurity, RBC red blood cell, Hb hemoglobin.

(ID 177) Table 1. Primary and secondary outcomes

None declared,

ID 232. Thrombin generation in the premature infant; the effect of platelets

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Background: Premature infants are at risk of haemorrhage, particularly intraventricular haemorrhage, and have reduced coagulation factor levels and hypo-reactive platelets in vitro. In spite of these recognized changes, plasma thrombin generation (characterized by calibrated automated thrombography (CAT)) in preterm infants, is similar or enhanced compared with term infants. The aim of this study, the EVENT study, is to characterize platelet-dependent thrombin generation in premature infants.

Methods: This was a prospective observational study, performed in platelet rich (PRP) and platelet poor (PPP) plasma obtained from umbilical cord blood, collected in sodium citrate (PRP: 200 × g × 10 min; PPP: 3000 RPM × 6 min × 2). Premature infants (24–31 weeks) and healthy term controls were recruited. Using a CAT assay, thrombin generation was stimulated by tissue factor only (final concentration 1 pM), rendering the assay dependent upon the phospholipid content of plasma. Hospital ethical approval and parental consent was obtained.

Results: In a preliminary analysis of the first thirty patients (n = 13 preterm, n = 17 term), CAT parameters in umbilical cord blood PRP were similar between preterm and term infants (Table 1). However, the time to peak thrombin was significantly shorter in premature infants, a marker of hypercoagulability. In a subset of infants (n = 7 term, n = 6 preterm), thrombin generation was assessed in paired PPP and PRP using 1 pM TF only, to evaluate the impact of platelets on neonatal thrombin generation. No difference was observed in any CAT parameters, suggesting that neonatal PPP phospholipid content (potentially from circulating extracellular vesicles) is sufficient to support thrombin generation in the absence of exogenous phospholipid.

Conclusion: These preliminary data suggest that thrombin generation in PRP is similar or enhanced in preterm compared with term infants. Moreover, neonatal plasma phospholipid appears to support thrombin generation in the absence of exogenous phospholipid. This ongoing large prospective study aims to further characterize the platelet-dependency of neonatal thrombin generation in both umbilical cord blood and neonatal peripheral blood.

	Preterm N = 13	Term N = 17	p
Gestational age (weeks) IQR	29.6 (28–29.9)	39.3 (38.9–39.7)	<0.001
Birth weight (g)	1375 (1070–1450)	3830 (3400–4060)	<0.001
Whole blood platelet count ($\times 10^9$/L) (IQR)	247 (220–284)	255 (223–277)	0.86
PRP platelet count ($\times 10^9$/L) (IQR)	100 (61–142)	107 (93–179)	0.13
CAT parameters			
Lag time (min) IQR	3.83 (3.26–4.33)	4.28 (3.85–4.5)	0.13
ETP (nM min) IQR	1002.94 (831.51–1182.74)	969.94 (898.28–1000.1)	0.34
Peak thrombin (nM) IQR	80.81 (62.96–121.87)	76.47 (56.63–85.73)	0.22
Time to peak (min) IQR	9.25 (8.33–10.17)	10.45 (9.33–11.74)	0.046*

(ID 232) Table 1. CAT parameters in PRP in umbilical cord blood. Median values displayed (interquartile range).

Prof. Fionnuala NíAinle has received research funding (paid to the University) from Bayer and Sanofi (unrelated to this study).

ID 300. Does the current guidance about management of thrombocytopenia deliver the desired results?

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Background: Platelet transfusions are a frequent procedure for premature neonates. There are a number of reasons why prematurity is a risk factor for requiring platelet transfusion; nectrotising enterocolitis (NEC) and sepsis to name a few. While recent trials have addressed the question of ideal cut off for platelet transfusion, optimal dosing of the platelets remains contentious.

Methods: This quality improvement project is a retrospective analysis of all neonates born or transferred into a tertiary neonatal intensive care unit (NICU). Very premature infants of less than 32 weeks' gestation who received platelet transfusion were selected (n = 106) over a 12-month period in 2019. The primary outcome of increment in platelet counts was then analysed in relation to the dosing, indications and relationship to NEC or sepsis.

Results: The study collected data for transfusions from January to December 2019. During the study period, we identified 106 neonates. Eleven of these neonates received a platelet transfusion.

Our mean birth gestation of neonates was 25 weeks, gestational age at transfusion was 32 weeks and a mean weight of 1.27 kg.

Fifty platelet transfusions were given to 11 eligible infants. Mean birth gestation and corrected gestation was 25 and 32 weeks respectively.

In all, 74% of the transfusions followed the guideline and 94% received 15 ml/kg of platelets. The data revealed that 3/50 (6%) transfusions resulted in platelet count of $>150 \times 10^9$. On further subgroup analysis, inflammatory markers (CRP) demonstrated a low correlation co-efficient of −0.09 (p = 0.56). Infants managed for NEC had a mean rise of 77.8×10^9/L in comparison to 33.9×10^9/L for infants without NEC. There was a trend towards statistical significance (p = 0.05).

Conclusion: Our study showed that the current practice of 15 ml/kg led to an inadequate rise in a significant proportion of babies. It also showed that while there is good compliance to national recommendation for platelet volume, about a quarter of babies are still being transfused inappropriately. It also did not reveal any correlation with sepsis while suggesting that infants without NEC appeared to have a suboptimal response. This did not reach statistical significance and hence warrants a larger study.

None declared.

ID 355. Glomerular and tubular function in intrauterine growth restricted term newborns

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Background: In the hostile environment linked to intrauterine growth restriction (IUGR), kidneys are extremely sensitive organs to damage. IUGR newborns are more likely to have a congenital reduction in nephron which in turn can lead to a compensatory hyperfiltration by the remaining nephrons and impaired nephrogenesis.

A prompt identification of the neonates with IUGR who have impaired glomerular or tubular function can help to improve their future outcome and management soon after birth.

The aim of this study was to assess whether IUGR affects the glomerular or tubular function soon after birth in term IUGR neonates.

Methods: We studied 105 small for gestational age (SGA) IUGR infants and 105 age/gender-matched controls. SGA was defined as birth weight < 10th centile for gestational age and adequate for gestational age as a birth weight between the 10th and the 90th percentile for gestational age. IUGR was defined according to the following criteria: estimated fetal birth

weight below the 3rd percentile or below the 10th percentile in combination with one or more abnormal Doppler measurements prior to delivery.

A blood sample was collected for serum creatinine, urea between 48 and 72 h after birth and a paired urine sample was collected for microalbumin and neutrophil gelatinase-associated lipocalin (NGAL) measurement (ELISA). Renal function was estimated by using the Schwartz formula for the term babies. A renal ultrasound of both the kidneys was performed to measure renal length.

Results: One-hundred and fifty-nine urine and 141 blood samples were available for analysis. Renal function was not significantly different between IUGR and control neonates (36.5 ± 11.52 versus 40.6 ± 9.14 mL/min/1.73 m2, p = 0.28). Urine microalbumin (48 [25–62] versus 26 [21–35] mg/L) and NGAL (29.16 [12.10–49.01] versus 13.36 [7.04–24.45]) were significantly higher in IUGR infants compared with controls (p = 0.01 and p = 0.04 respectively). No difference was found in kidney length between the two different groups (Table 1).

Conclusion: IUGR term infants have a higher risk of a subclinical kidney damage even though they are apparently clinically well. These data confirm that every IUGR term neonate should be considered at high risk for later kidney disease and should be closely followed-up.

Variables	IUGR group (n = 105)	Control group (n = 105)	P value
Gestational age	39 (1.6)	39 (1.5)	0.49
Female	55 (52)	55 (52)	–
Birth weight, g	2640 [2400–2780]	3180 [3000–3400]	0.001†
Birth length	48 [47–49]	51 [50–53]	0.001†
Birth head circumference	33 [32–34]	34.7 [33.8–35]	0.001†
Right kidney length mm	40 [38–43]	42 [40–44]	0.13
Left kidney length mm	40.5 [37–43]	45 [42–47]	0.24
eGFR, ml/min/1.73 m^2	36.5 (11.52)	40.6 (9.14)	0.28
Serum Cr, mg/dl	0.69 (0.10)	0.57 (0.11)	0.13
Serum urea, mg/dl	17.1(2.0)	16.2 (7.7)	0.71
Urine NGAL, ng/ml	29.16 [12.10–49.0 1]	13.36 [7.04–24.45]	0.04†
Urine NGAL/Cr ratio, ng/mg Cr	33.2 [15.61–58.26]	17.69 [11.24–27.16]	0.04†
Urine microalbumin, mg/l	48 [25–62]	26 [21–35]	0.01†

(ID 355) - Table 1. Clinical features, ultrasound and laboratoristic data in the two groups.

None declared.

ID 410. Resveratrol reversed endothelial colony forming cells dysfunction at adulthood in a rat model of developmental programming of arterial hypertension related to intrauterine growth restriction

Estelle Guillot[1], Hanna Coppola[1], Stéphanie Simoncini[2], Kathiusca Zamora[1], Anne Christine Peyter[1], Umberto Simeoni[1], Catherine Yzydorczyk[1]*

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Background: Infants born after intrauterine growth restriction (IUGR) are at risk to develop arterial hypertension thereafter. The endothelium plays a role in the pathogenesis of hypertension. The endothelial colony forming cells (ECFCs), circulating components of the endothelium, regulate the vasculo- and angiogenesis. In a rat model of IUGR, we observed in 6-month-old males a decreased number and impaired functionality of ECFCs, associated with arterial hypertension and microvascular rarefaction, related to oxidative stress and stress-induced premature senescence. Resveratrol, a polyphenol compound with antioxidant properties, was found to improve cardiovascular functions. However, whether resveratrol could reverse the ECFCs dysfunction observed at adulthood following IUGR is still unknown.

Method: IUGR has been induced in rats by administration of a maternal low protein diet during gestation vs. a control (CTRL) diet. ECFCs from males have been isolated from bone marrow and treated or not with resveratrol (1 µM, 48 h) before investigation of their number (flow cytometry), proliferation (BrdU incorporation), capillary-like outgrowth sprout formation (Matrigel) and NO production (immunofluorescence and western blot). Oxidative stress has been investigated by evaluation of superoxide anion level (chemiluminescence) and antioxidant proteins expression (western blot), and senescence by beta-galactosidase activity and related-factors expression (western blot). Data were analyzed using a nonparametric Mann-Whitney U test. The significance level was set at p < 0.05.

Results: In IUGR-ECFCs (n = 5), the resveratrol treatment improved proliferation (+80%, p < 0.01), restored capillary-like outgrowth sprout formation, increased NO production (+40%, p < 0.05) with increased eNOS expression (+50%, p < 0.05). Resveratrol also decreased superoxide anion production (−60%, p < 0.01), restored superoxide dismutase protein expression (+20%; p < 0.05), decreased beta-galactosidase activity and increased the expression of sirtuin-1 (+60%, p < 0.01), an anti-aging protein. Resveratrol treatment had no effect on CTRL-ECFCs.

Conclusions: IUGR-ECFCs treatment with resveratrol was able to improve their functionality by decreasing oxidative stress and reversing stress-induced premature senescence. It would be interesting to test whether resveratrol administration during gestation could restore the number of ECFCs and so decrease cardiovascular disorders related to IUGR.

None declared.

ID 415. The relationship between pulmonary hypertension and diastolic dysfunction in infants with Down syndrome

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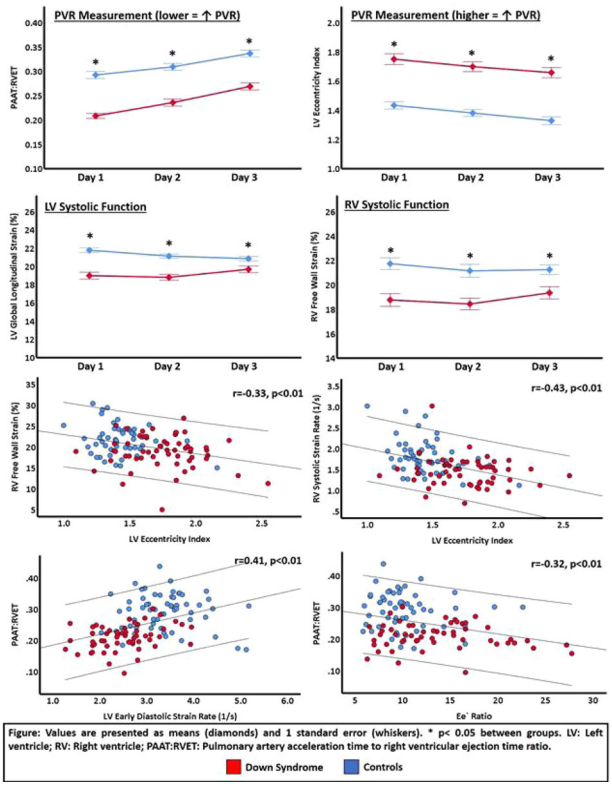
Introduction: Pulmonary hypertension (PH) in infants with Down Syndrome (DS) has an incidence of up to 30% according to retrospective reports with multifactorial aetiology. However, the contribution of diastolic dysfunction to PH severity in this population is currently unexplored. We hypothesise that infants with DS exhibit early diastolic dysfunction that is related to the degree of PH during the early neonatal period.

Methods: This was a prospective study of 70 infants with DS and 60 controls who underwent comprehensive echocardiography evaluations over the first 3 days following delivery. Left ventricular (LV) diastolic function was measured using mitral valve inflow velocities and LV lateral wall tissue Doppler imaging to assess left atrial pressure (Ee`). Speckle tracking echocardiography (STE) was used to assess LV and right ventricular (RV) systolic and diastolic function. Pulmonary vascular resistance (PVR) was assessed using pulmonary artery acceleration time (PAAT) indexed to right ventricular ejection time (RVET), and LV eccentricity index (EI).

Results: Infants with DS had a lower gestation (37.7 ± 2.1 vs. 39.6 ± 1.2 weeks, p < 0.01) and birthweight (3.02 ± 0.68 vs. 3.56 ± 0.42 kg, p < 0.01). Infants with DS had higher markers of PVR throughout the study period (Figure). LV and RV systolic function was also lower in infants with DS (Figure). There was a negative correlation between PVR and RV function measured with STE. Lower LV diastolic function was associated with higher PVR (Figure).

Conclusions: Infants with DS exhibit LV diastolic dysfunction during the early neonatal period that may contribute to the evolution of PH in this population. STE-derived diastolic function measures are relatively load independent suggesting that diastolic function is contributing to increasing PVR in this population.



(ID 415) - Assessment of pulmonary hypertension and myocardial function over the first week of age in infants with DS and controls.

There are no conflicts of interest to declare.

ID 440. Medications and clinical decision support systems; how caffeine influences heart rate characteristics in preterm infants

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Background: High frequency vital signs monitoring data, most often heart rate characteristics such as sample entropy (SampEn), are used to predict acute adverse events in neonates. However, to date, possible influences of pharmacological interventions on vital sign behaviour are not taken into account when assessing their predictive value. Caffeine is one of the most commonly prescribed drugs in neonatal care, but its effect on heart rate characteristics is unknown. We hypothesize that caffeine affects heart rate characteristics, expressed as SampEn in a dose-dependent way.

Methods: We performed a retrospective cohort study in the neonatal intensive care unit at the Karolinska University Hospital, Stockholm, collecting high frequency monitoring data as well as patient characteristics from electronic health records. Caffeine concentrations were simulated using a previously validated pharmacokinetic model. Inter-beat intervals (IBI) were calculated from raw electrocardiography measurements, covering the entire hospitalization of the included patients. We performed a multilevel, multivariable linear regression analysis assessing the association of simulated caffeine concentration levels and basic demographic factors such as gestational age (GA), repetitive body weight measures, sex and postnatal age with SampEn values of IBI time-series.

Results: We included 78 infants (45 female) with a median (interquartile range) GA of 27.9 (26.3, 29.9) weeks, and birth weight of 997 (789, 1250) g. A total of 9393 windows with simulated caffeine concentrations and calculated SampEn of IBI values were analyzed. We found a

significant negative association of caffeine concentration with SampEn of IBI when corrected for GA, body weight and postnatal age (p for all predictors <0.001, R2 total: 27%).

Conclusion: We conclude that caffeine concentration influences vital sign behaviour such as SampEn of IBI time-series after correction for basic demographic factors. The increasing predictability, reflected by the lower SampEn, associated with higher caffeine concentrations could be due to fewer fast decelerations in heart rate. Information about current treatments such as caffeine could therefore add valuable information to clinical decision support systems relying on vital sign characteristics for prediction of acute clinical deterioration in infants.

None declared.

ID 441. Spectrum and outcomes of neonatal shock: a retrospective cohort study

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Background: We planned this study to evaluate the incidence, spectrum, and outcomes of shock among neonates.

Methods: The study was done in a tertiary-care referral hospital of a low-and-middle-income country (LMIC) between 1st January 2018 and 31st December 2019. We enrolled all neonates developing shock during this period. We retrieved the data from the electronic database of our unit, examined case record summaries and case record files. We compared survivors and non-survivors to find independent predictors of mortality.

Results: We recorded 3271 neonatal admissions during the study period. Of them, 415 episodes of neonatal shock were recorded in 392 neonates. The incidence of neonatal shock was 12.0% [95% confidence interval (CI): 10.9–13.2%;]. Of 415 episodes of neonatal shock, 237 (57%) episodes were identified as septic shock, 67 (16%) episodes as cardiogenic shock, and 6 (1.4%) episodes as an obstructive shock. Rest 105 (25%) episodes had overlapping features of various forms of shock. The incidence of culture-proven septic shock was 32% (n = 132; 95% CI: 27–37%). *Acinetobacter baumannii* was the most common pathogen (n = 58). There were 256 non-survivors in our series. The case fatality rate in our cohort was 62% (95% CI 57–67%). The overall adjusted mortality rate of our unit during the corresponding period was 2.3% (after removing major congenital malformations, received compassionate care, and HIE-III). Characteristics of survivors and non-survivors are presented in Table 1. On univariate analysis, gestational age, birth weight, female gender, hyaline membrane disease, early-onset sepsis, Acinetobacter sepsis, and cardiogenic shock were significantly different between survivors and non-survivors. SGA neonates showed a trend of association with mortality. On multivariable logistic regression analysis, four variables—gestational age, small for gestational age, female gender, and Acinetobacter sepsis—showed an independent association with mortality in neonatal shock.

Conclusions: We observed a 12.0% incidence of shock among neonates admitted in a tertiary care referral hospital of an LMIC country. The incidence of septic shock was significantly higher than cardiogenic shock. The neonatal shock was associated with a high case fatality rate. Gestational age, small for gestational age, female gender, and Acinetobacter sepsis independently predicted mortality in neonatal shock.

Table 1. Characteristics of survivors and non-survivors.

S. no.	Characteristics	Non-survivors (n = 256)	Survivors (n = 159)	Unadjusted OR (95% CI)	p value
1.	Gestational age (weeks)[a]	31.3 ± 4.0	33.2 ± 4.1	0.89 (0.85, 0.94)	<0.001
2.	Birth weight (g)[b]	1175 (904, 1605)	1576 (1120, 2372)	0.99 (0.99, 1.00)	<0.001
3.	Small of gestational age (%)	117 (46)	59 (37)	1.4 (1.0, 2.1)	0.1
4.	Female gender (%)	119 (47)	55 (35)	1.6 (1.1, 2.4)	0.02
5.	Multigravida 9%)	58 (23)	34 (22)	0.9 (0.6, 1.7)	0.9
6.	Caesarean section/instrumental delivery (%)	125 (49)	71 (45)	1.2 (0.8, 1.7)	0.5
7.	1-min Apgar <7	151 (59)	79 (50)	1.4 (0.9, 2.1)	0.2
8.	1-min Apgar <3	49 (19)	25 (16)	1.2 (0.7, 2.1)	0.4
9.	5-min Apgar <3	4 (2)	5 (3)	0.5 (0.1, 1.8)	0.3
10.	Hyaline membrane disease (%)	86 (34)	31 (19)	2.1 (1.3, 3.3)	0.003
11.	Early onset sepsis (%)	150 (59)	74 (47)	1.6 (1.1, 2.4)	0.02
12.	**Culture-proven sepsis (%)**				
	Any culture-positive (%)	89 (35)	43 (27)	1.4 (0.9, 2.2)	0.1
	Acinetobacter sepsis (%)[c]	45 (18)	13 (8)	2.8 (1.4, 5.8)	0.008
	Other than Acinetobacter (%)	47 (18)	33 (21)	1.0 (0.6, 1.6)	1.0
13.	Patent ductus arteriosus (%)	63 (25)	29 (18)	1.5 (0.9, 2.4)	0.1
14.	Pulmonary arterial hypertension (%)	18 (7)	19 (12)	0.6 (0.3, 1.1)	0.1
15.	Air leaks (%)	30 (12)	14 (9)	2.0 (0.5, 7.4)	0.3
16.	Postnatal age at onset of shock (d)	3 (2, 4)	3 (1, 5)	1.0 (0.9, 1.0)	0.4
17.	**Type of Shock (%)**				
	Septic shock	153 (60)	84 (53)	1.3 (0.9, 1.9)	0.2
	Cardiogenic shock	31 (12)	36 (23)	0.5 (0.3, 0.8)	0.004
	Obstructive shock	4 (2)	2 (1)	1.2 (0.2, 6.8)	0.8
	Mixed	69 (27)	36 (23)	1.2 (0.8, 2.0)	0.4
18.	Intraventricular hemorrhage (%)	23 (9)	8 (5)	2.0 (0.6, 6.2)	0.3

[a]Mean ± standard deviation, [b]median (25th, 75th centile), [c]Acinetobacter sepsis include six additional strains identified in blood culture growing >1 organism.

(ID 441)

None of the authors have any conflict of interest to resolve.

ID 569. Observed ranges of neonatal blood pressure by gestational age: a systematic review

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Background: Neonatal blood pressure is known to vary according to gestational age and to rise within the postnatal period. However, determination of standard values is particularly complicated for premature neonates considering many receive blood pressure modifying agents or have established conditions that affect blood pressure. Therefore, a systematic review was undertaken to determine the observed ranges of blood pressures by gestational age throughout the first 3 months postnatal age, when not treated with blood-pressure modifying agents nor affected by complicating pathology.

Methods: A systematic literature search was conducted within MEDLINE, Pubmed, Embase, Cochrane Library, and CINAHL from 1946–2017 regarding blood pressure in neonates <3 months of age. (PROSPERO registration ID CRD42018092886).

Results: 3587 non-duplicate manuscripts were screened, with 623 extracted for in-depth review. Of these, 123 were deemed relevant to our primary question and were reviewed for full data extraction, of which 24 studies were included. Three manuscripts contained data for extremely premature neonates (<28 weeks), 4 manuscripts for very premature neonates (28 to 31+6 weeks), 2 manuscripts for moderately premature neonates (32 to 33+6 weeks), 5 manuscripts for late preterm neonates (34 to 36+6 weeks), and 19 manuscripts for term neonates (37+ weeks). Several manuscripts were excluded due to purely graphical presentation of data.

Collated mean blood pressure (mmHg) was calculated from observed means for preterm vs term babies at 1–23h (mean = 44 vs 49), day 1 (41 vs 45), day 2 (43 vs 46), day 3 (44 vs 54), day 7 (48 vs 63), and 1 week–3 months (66 vs 56).

Conclusion: There remains a paucity of published data related to the assessment of neonatal blood pressures according to gestational age, particularly for prematurity. Example demonstrative statistics showed marked discrepancy between preterm and term blood pressure. However, meta-analysis of studies is complicated by variability in study summary statistics presented. Future multi-collaborative large-scale studies are needed to improve the evidence base for standard blood pressure values within all gestational age ranges.

No conflicts of interest.

ID 579. Survey of transfusion practices in European preterm infants (step survey)

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Background: Transfusions of red blood cells (RBC), platelets and plasma are often provided to infants born at less than 32 weeks' gestation. Although several randomized controlled trials on thresholds for RBC and platelet transfusions have recently been published, international consensus guidelines are lacking. As an initiative of the newly formed Neonatal Transfusion Network (NTN), a survey on current transfusion practice was performed across NICUs in 18 European countries.

Methods: The survey was distributed amongst neonatal units in 18 European countries between October and December 2020, asking specifically about transfusion thresholds, indications, volumes and rates of transfusion for infants born <32 weeks.

Results: The analysis included responses from 343 NICUs across 18 European countries: Austria, Belgium, Finland, Germany, Hungary, Italy, Malta, The Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom. The median response rate per country was 57% (range: 21–100%).

RBC transfusion thresholds varied (Fig. 1), and were usually higher in younger infants and those requiring a higher level of respiratory support.

In 53% of NICUs, clinically stable neonates without signs of bleeding were reported to receive platelet transfusion at a platelet threshold higher than 25×10^9/L, despite the results of the PLANET2 study. Platelet transfusion thresholds showed substantial variation between NICUs, trending towards higher thresholds in infants undergoing procedures, surgery or active bleeding.

Plasma is routinely given to infants with coagulopathy and active bleeding in 93% of NICUs, coagulopathy alone in 30%, active bleeding alone in 45%, and volume replacement in 26% of NICUs. Plasma is administered for sepsis in 26% of NICUs.

The median volumes of RBC, platelets and plasma given per transfusion were 15 ml/kg. The rates of transfusion however varied significantly with interquartile ranges: RBC: 3.75–5 ml/kg/h, platelets: 7.5–20 ml/kg/h, plasma 5–15 ml/kg/h.

Conclusion: Blood component transfusion thresholds, indications, volumes and rates vary considerably across European NICUs. There is a rationale for assimilation of the existing evidence into guidelines. These findings may motivate quality improvement projects to bridge the evidence-practice gap and for further investigation to establish optimal rates and volumes for blood component transfusion in infants born preterm. Our survey provides a starting point for this work.

(ID 579) Figure 1: [low flow = 0–2l/min nasal cannula oxygen; NIV <30 = non-invasive ventilation with FiO2 < 30%; NIV > 30 = non-invasive ventilation with FiO2 > 30%]

None declared.