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WORKSHOP 4

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-nine infants with a mean gestational age of 29.1 weeks and a mean birth weight of 1295 grams 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 mmol/L versus 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.
Abbreviations: 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.

Table 1. Primary and secondary outcomes
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None declared

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