Highlights from this issue

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AUTOMATED FiO_2 ADJUSTMENT

In an issue bursting with great content the Editor's choice this month is closed-loop automated FiO_2 control. The potential for this technology to improve clinical outcomes of high-risk preterm infants is obvious and most manufacturers are working on delivering this functionality for their respiratory support devices. The initial focus has been on ventilators, but preterm infants now spend considerably more time on non-invasive respiratory support than on ventilators. As this constitutes the greatest part of their exposure to supplemental oxygen, closed loop control for non-invasive support is arguably more important. Peter Reynolds and colleagues report their experiences with a controller that operates alongside a high flow nasal cannula device. This commercially sponsored study was a randomised cross over study where infants served as their own control in a comparison between closed loop and manual oxygen adjustment. The controller substantially increased the time spent in the intended target range, reducing the need for manual adjustments. The greater control was achieved through frequent and sometimes quite large automated adjustments in FiO_2 and was associated with an increase in the frequency but not the cumulative duration of episodes of higher than intended SpO_2. Marek Gajdos and colleagues also report a small crossover study of an automated controller integrated with a ventilator. They too found improved SpO_2targeting. Interestingly this was not associated with improvement in their chosen measures of tissue oxygenation. They speculate that this may have been because of the relatively later postnatal age and possibly better autoregulated study participants. The authors of both studies caution that trials are needed to determine whether this technology can be used to improve clinical outcomes and this is a key message of the accompanying editorial by Peter Dargaville and colleagues. More frequent and larger fluctuations in FiO_2 may achieve improved control of SpO_2 but it is associated with greater variability in direct pulmonary exposure to oxygen. Currently available systems do not incorporate machine learning, so there is room for a great deal more development. As the use of these devices results in a distribution of achieved SpO_2 values that is different to that which is obtained by manual adjustment of FiO_2, it is to be expected that their use will be associated with different clinical outcomes if they are used to target the same range of SpO_2 values that are being targeted manually. We should not rush to implement the technology without evaluating it properly. ***See page F360, F366 and F346***

CONTINUOUS GLUCOSE MONITORING

The same cautions might apply to continuous glucose monitoring. Lynn Thomson and colleagues report a pilot randomised study of using continuous glucose monitoring to target glucose control in preterm infants. Data from 20 infants are reported. Over a study period of around 6 days, babies targeted using continuous monitoring spent 77% of their time in the target range 2.7 to 10mmol/l, compared with 59% when measurements were intermittent. Continuous monitoring uncovered episodes of occult hypoglycaemia that are of uncertain significance. Nursing staff evaluated the intervention positively. The authors conclude that the device is suitable for evaluation in a larger RCT. In an accompanying editorial, Teri Hernandez and colleagues welcome such trials whilst cautioning that there is potential for the technology to improve or worsen clinical outcomes. ***See pages F353 and F344***

PHYSIOLOGICALLY BASED CORD CLAMPING

Emma Brouwer and colleagues report their feasibility study of physiologically based cord-clamping in preterm infants using a purpose-built table. They have called their device con-cord, which is a neat pun on its intended use that also celebrates the value of engineering. Their study has already attracted plenty of attention when published on-line ahead of print. They aimed to stabilise preterm infants born before 35 weeks, with cord clamping not performed until the infant was stable with heart rate >100 beats per minute, breathing spontaneously on continuous positive airway pressure, with tidal volumes >4 mL/kg, SpO_2 ≥25th percentile and fraction of inspired oxygen (FiO_2) <0.4. The protocol was successful in 33 of 37 infants and was associated with a median cord clamping time of 4 minutes and 23 seconds after birth. No infant required intubation in the delivery room and, consistent with prior animal studies, only one infant developed bradycardia during stabilsiation. There were lessons learned about the need to optimise thermal care. The feasibility of this approach is clearly established and RCTs are now required to evaluate the effect on clinical outcomes. ***See page F396***

EXOME SEQUENCING

Fionnuala Mone and collegues review the role of exome sequencing in the assessment of congenital malformations in the fetus and neonate. To achieve optimal diagnostic success and minimise difficulties they highlight the need for comprehensive perinatal MDTs, incorporating clinical pathologists, genomic scientists, geneticists, neonatologists and fetal medicine subspecialists to assist with variant interpretation and pretest and post-test counselling. ***See page F452***

RISK OF MORTALITY IN HIGH VOLUME VERSUS LOW VOLUME NICUS

Roland Hentschel and colleagues provide more evidence that risk-adjusted mortality of very low birth weight preterm infants is lower when they are cared for in units with higher throughput. Outcomes of 5340 infants cared for in the state of Baden-Wüerttemberg, Germany, from 2003 to 2008 were examined. Risk adjusted mortality was higher in units that cared for 50 cases or less per year, odds ratio 1.48 (95% CI 1.16 to 1.90). Sub-group analyses showed no difference in outcome for infants at lowest risk. ***See page F390***

SURFACTANT BIOPHYSICS IN HEALTH AND DISEASE

In a beautifully illustrated review article Chiara Autilio and Jesús Pérez-Gil give a fascinating update on the biophysical function and performance of pulmonary surfactant in health and disease. This topic was understood widely by the clinicians who first introduced surfactant treatment into clinical practice but has slipped under the radar now that its use is so routine. Essential reading! ***See page F443***