Point of care ultrasound: a core competency for the neonatologist? Nick Evans: Newborn Care, RPA Hospital and University of Sydney, Sydney, Australia.

Introduction Protagonists of point of care clinician performed ultrasound (CPU) point to the value of 24/7 immediate diagnosis, antagonists point to limited formal accreditation and risk of misdiagnosis. Implementation of CPU should embrace the benefits while minimising the risk of harms.

Cardiac ultrasound Permits a window on haemodynamic pathophysiology where there are few alternatives. There is a range of acute care indication and with systematic use of ultrasound, the extent to which clinical and vital signs have misled us has become apparent.

Other organ ultrasound Beyond the heart, NPU extends to acute head ultrasound to exclude cerebral haemorrhage. Abdominal and thoracic ultrasound to diagnose abnormal fluid. Bladder ultrasound to confirm urine prior to supra-pubic aspiration. Screening of the entry points of the IVC and SVC into the heart can exclude an intra-cardiac tip position. Ultrasound allows real time localisation of UVC tip position during insertion. There is evolving use of lung ultrasound to diagnose a range of pulmonary conditions and gut ultrasound for NEC.

Training and accreditation It’s hard to see that ultrasound skills are not going to become a core competency for neonatologists. There is a need for formal training and accreditation structures. We have such a structure in Australasia in the form of the Certificate of Clinician Performed Ultrasound (CCPU). The training needs in neonatology should be determined by neonatologists, not by other specialties.

The Kidney

IS-026 NEW DIRECTIONS IN NEONATAL NEPHROLOGY RESEARCH

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Abstract IS-026 Figure 1 Renal stem cells in preterm kidney. From Faa G. et al. Renal stem cells in preterm kidney. J Pediatr Neonat Individual Med. 2014, in press; with permission

Abstract IS-026 Figure 2 Urinary metabolomics in newborn piglet model of asphyxia. PLS-DA model between piglets with Recovery Time (RT) after asphyxia < 15’ (black circles) and piglets with RT > 68’ (open triangles). Model parameters for the explained variation (R2X and R2Y), and the predictive capability, Q2, were: R2X = 0.789; R2Y = 0.869; Q2 = 0.689. From: Murgia F, et al. Is the quickness of resuscitation after hypoxia influenced by the oxygen concentration? Metabolomics in piglets resuscitated with different oxygen concentrations. J Pediatr Neonat Individual Med. 2013;2(2):e020233, with permission

Our experience is presented in neonatal nephrology research: embryology, regenerative medicine, metabolomics, perinatal programming (Figures 1–3, with permission). We studied kidney embryology with conventional histology, immunohistochemistry (WT1, MUC1, CD10, CD44, mTOR protein, BCL2, Kim1, Thymosins beta 4 and 10, hCTR1, Glypican 3, Galectin, Nestin, etc.) (Faa G. J Cell Physiol 2012), electron microscopy, embryonic kidney cell line to study the effect of drugs in the normal rate of cell proliferation. We hypothesised the concept of physiological renal regenerative medicine, using the stem cell naturally present in the kidney (Fanni D. JMFNM 2012). Metabolomics (Fanos V. SFNM 2013) is performed by us in studying experimental models of renal damage (i.e. asphyxia, drugs), in the early diagnosis of infection and sepsis induced AKI in the newborn, and in monitoring the patient renal function (Fanos V. Molecules 2013, Clin Biochem 2014). Big data analysis is performed connecting immunohistochemistry and metabolomics in experimental models. Finally we studied the long term cardio-renal effects of extreme prematurity on a cohort of apparently healthy adults born ELBW (Bassareo PP. JPNIM 2013). The life

The Parents View on NICU Care

The physical environment of the NICU has an important impact on the growth and development of the newborn infants who live there, as well as their families and caregivers. Optimising the infant’s environment requires first an understanding of its sensory and caregiving needs, then designing an environment that will best support those needs. It is now clear that newborns benefit from extended intimate human contact, especially with their mothers, and that this can be facilitated by providing sufficient time and privacy for parents to interact with their baby.

Especially parents of former preterm infants know exactly what it means to get a preterm baby. The pregnancy can extend before the baby is born. This can lead to periods of stress and anxiety for the parents. The NICU can provide a safe and supportive environment for parents to bond with their baby. It is important for NICU staff to provide education and emotional support for parents during this challenging time.

Medicines given to neonates need to be adapted for this age group. This includes both dosage and pharmaceutical form. Dosage, because clearance is lower in neonates, but also because there is extensive between-individual variability in clearance in the first months of life. Pharmaceutical forms, because formulations, there is a need to quantify and limit excipient concentrations need to account for dosage variability, but also to the clinical characteristics of neonates.

The need for an appropriate balance between dose, volume, drug manipulations and dose flexibility in neonates calls for dedicated, tailored formulations. Besides the active compound (s), drug formulations contain solvents and additives, usually referred as “excipients”, needed as co-solvents, surfactants (general term for compounds that improve absorption, unrelated to the lung surfactant administered for hyaline membrane disease), preservatives, colourants and/or sweeteners. These excipients are added e.g. to ensure stability over a given shelf life, to improve palatability or to facilitate solubility or to bulk up formulations that otherwise contain highly potent active ingredients and are referred to as preservatives, sweeteners, fillers and solvents, coating materials or colouring agents. Consequently, during the development of these formulations, there is a need to quantify and limit excipient exposure based on the currently available knowledge on their safety or toxicity. Furthermore, focused studies on the clinical pharmacology of excipients in neonates should be conducted, and its feasibility will be illustrated by the propylene glycol research project. Finally, until tailored vials and formulations are available, for example in the form of specialized, tailored formulations, there is a need to quantify and limit excipient concentrations.