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Monitoring and complications during neonatal/pediatric ECMO run

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Extracorporeal membrane oxygenation (ECMO) is a commonly used form of mechanical circulatory support in children with congenital or acquired heart disease, and cardiac failure refractory to conventional medical treatments.¹ The cardiac output is partially or completely provided by the ECMO machine. To assess how much support is needed at any given time, a constant balance of oxygen delivery and oxygen consumption is required. Permanent monitoring of flow, hemoglobin, arterial, and mixed venous saturations are key elements to provide the needed understanding and continuous guidance of body requirements, aiming at controlling and maintaining optimal management of the ECMO patient. Although ECMO is lifesaving in many circumstances, it bares challenges and certain risks of complications. Despite bioline-coated circuits, anticoagulation is required. Measurement of activated clotting time (ACT) and activated partial thromboplastin time (APTT) are both used to guide anticoagulation, but it is unclear which method is the best, and constant monitoring of the hemoglobin level allows the early detection of internal and external bleeding.² For children, sedation and analgesia, most often in combination with paralysis, is unavoidable for a smooth ECMO run. On the other hand, with such treatment on board, it is almost impossible to assess the neurological status of the patient on ECMO. Different monitoring tools, such as cerebral near infrared spectroscopy (NIRS) and serial brain ultrasound studies, are used to estimate brain integrity and function, but further research is needed to show which methods are the most practical and useful to achieve a favorable outcome.³ Nutrition in critically ill children is known to be crucial but debated how to achieve as the gut perfusion can be impaired and therefore the risk of necrotizing enterocolitis (NEC) is increased. It is discussed if somatic perfusion by NIRS monitoring can help to avoid NEC.⁴ The kidney

function is often impaired in these critically ill children and careful monitoring of kidney function and urine output leads the decision when to start which type of renal replacement therapy for renal clearance and/or fluid removal. Techniques available include peritoneal dialysis or continuous renal replacement therapy (CRRT) incorporated with the ECMO circuit. Medication dosing is under discussion in many centers as the circulatory volume is higher than normal. Adjustment of medication dosing could consequently

be of great importance. Close monitoring of medications where toxic levels can be reached is crucial to avoid further damage to the patient's organ functions.

Keywords: ECMO, monitoring, complications, neonatal, pediatric

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