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NEUROLOGICAL AND CARDIAC FUNCTIONAL STATUS AFTER EXTRACORPOREAL MEMBRANE OXYGENATION IN CHILDREN WITH HEART DISEASE

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Introduction: Although extensive data are published regarding the immediate and hospital survival after paediatric extracorporeal membrane oxygenation (ECMO) for heart disease, there are no published data regarding longer term survival in this cohort or the functional quality of survival.

Objectives: We sought to describe the immediate and long term survival in pediatric patients who underwent venoarterial (VA) ECMO for primary heart disease. In addition, we reviewed follow-up assessments to grade neurological and cardiovascular functional status at multiple time points after hospital discharge.

Methods: We reviewed data of all children with heart disease receiving venoarterial ECMO for a cardiac indication between 2001-2012 with a minimal follow-up period of 1 year post ECMO. Pre-ECMO characteristics, ECMO details, ECMO complications and patient outcomes were abstracted from institutional databases and medical records. Logistic regression analysis adjusted for repeated measures was used to determine factors associated with ECMO survival and post-discharge functional neurological (using the Pediatric Cerebral Performance Category [PCPC] score) and cardiovascular (using the pediatric New York Heart Association classification) status.

Results: 303 ECMO episodes (283 patients) occurred at a median (25th, 75th %ile) age of 16 weeks (2 weeks, 18 months); non-mutually exclusive indications were failure to wean from CPB (44, 15%), low cardiac output state (162, 53%), persistent hypoxia (57, 19%), arrhythmia (20, 7%), pulmonary hypertension/hypertensive crisis (6, 2%) and cardiac arrest (175, 58%). The median duration of CPR was 37 (24-55) minutes. The median ECMO duration was 4 (2-7) days. ECMO complications included intracranial hemorrhage (47, 18%), ischemic brain injury (64, 26%), seizures (48, 16%), pulmonary or gastrointestinal bleeding (43, 16%) and need for renal replacement therapy (100, 36%). Immediate outcome of the ECMO run was recovery in 158 (39%), cardiac transplantation in 19 (6%), conversion to VAD in 8 (3%) and death in 118 (39%); of immediate survivors, 112 (61%) were alive at a median follow-up of 16 months with the majority (90%, 90%, 91%) having a PCPC score ≤ 2 at 6 months (n=89), 1 year (n=77) and 2 years (n=67) respectively. Of the 175 patients who had cardiac arrest, 100 (57%) were successfully decannulated; 58 (58%) of whom were alive at a median follow-up of 13 months with the majority (83%, 87%, 88%) having a PCPC score ≤ 2 at 6 months (n=47), 1 year (n=39) and 2 years (n=32) respectively. At 2 years follow-up, 64/65 (98%) surviving patients were in pediatric NYHA Class ≤ 2 heart failure. Factors associated with mortality prior at decannulation were ischemic HIE (HR 4.9, p=0.002), intracerebral hemorrhage (HR 2.2, p=0.02) and mechanical complications on ECMO (HR 3.3, p =0.003). Those requiring ECMO for cardiac
arrest and those with a diagnosis of intracranial hemorrhage while on ECMO were less likely to have a PCPC ≤ 2 (81% vs 98%, p=0.01 and 67% vs 92%, p=0.05 respectively).

**Conclusion:** Children with heart disease who survive to ECMO decannulation have ongoing early mortality; despite these concerns, the majority of survivors have good quality neurological and cardiac functional status even after hospital discharge. Risk for poor neurological and cardiac functional outcome at 6 months were associated with the use of ECMO for cardiac arrest and development of intracranial hemorrhage while on ECMO.