

**‘MECHANICAL SUPPORT:
RESPIRATORY ECLS
2016-06-07
Toronto**

Summary by Session Chairs: Anne-Marie Guerguerian and Gail Annich

Ira Cheifetz, USA:

Topic 1: HOW TO OPTIMIZE LUNG RECOVERY, MEASURE IT’S FUNCTION, AND DEFINE IRREVERSIBLE DAMAGE DURING EXTRACORPOREAL LIFE SUPPORT IN THE NON - TRANSPLANT CANDIDATE?

THREE KEY POINTS:

- 1- Although data are limited, the key to lung recovery for the VV ECMO patient is to minimize the shear injury on the lung (i.e., delta-P) while maintaining an adequate mean airway pressure to promote / maintain lung recruitment.**
- 2- Improving lung function in the VV ECMO patient can be assessed by daily compliance measurements, serial radiographic assessments, and trials off ECMO support (i.e., decreasing sweep gas flow and/or reducing the oxygenator FiO₂).**
- 3- Defining irreversible lung disease remains elusive, but the decision may be guided by lung biopsy (although significant risks exist).**

There is no data on this topic generated in ecmo paediatric patients. The basic principles of lung protective strategies could be pushed to consider ‘Ultra lung protection’ with an open lung strategy. Data from Amato NEJM and from adult ECCOR trials suggest lower driving pressure (delta P) with ultra lung-protective strategies. If the patient’s lungs are open maintain strategies to maintain them open; until then the membrane oxygenator may allow to reduce the delta P and optimize the PEEP. When the lungs are not open, gentle recruitment should be considered. Initial tidal volumes will be quite low 1-3 ml/kg. Be patient and optimize the ECMO to keep delta P low with PEEP optimization.

VV ECMO over VA allows for a simple ability to wean the support (Sweep or FiO₂) and determine to readiness to separate. Unclear how quickly or gradually this should be undertaken. Imaging, chest radiograph and CT scan can help to understand extent of disease and give information regarding any potential areas where interventions can be performed and allow for some measure of whether there is improvement over time or not.

Defining irreversibility is not simple. Lung biopsy is a high risk procedure; it can be done but is rarely helpful for decision making for ARDS prognosis on ECMO and has a very high risk.

Questions asked to speaker:

- Q: Is bronchoscopy of physio helpful to “open” the lung? A: Chest physio may or may not be beneficial; bronchoscopy quite helpful.

Hanneke IJsselstijn, Netherlands:

Topic 2: LONG TERM OUTCOMES: WHAT LONGER TERM FUNCTIONAL OUTCOMES IN CHILDREN AND THEIR FAMILIES AFTER CRITICAL ILLNESS SUPPORTED WITH EXTRACORPOREAL LIFE SUPPORT SHOULD BE MEASURED AND WHAT SHOULD YOU EXPECT?

KEYPOINT: Children who survived critical illness supported with ECLS should receive neurodevelopmental follow-up up till adolescent age and probably beyond.

Functional outcomes, should include, exercise, cognitive, family/social interactions, lung function etc. School performance measured as: extra help, special education, normal. ECMO Survivors from their cohort (now almost 20 years from cannulation) had average normal IQ but seemed to show slow working memory speeds. Motor function is also be affected. However, while quality of life measures may be affected, the survivors report a favorable feelings of self-confidence at a young age. Parents may be vulnerable to PTSD. While most of the focus has been to offer support for patients and families who had obvious serious neurologic impairment, the others who can also have difficulties.

It is important to consider that children's brain are still maturing and that they is a risk of later growing into their deficit.

Moving forward, ELSO guidelines will need to be updated (last recommendation from 1997).

Stratification with neuroimaging should be considered as collecting targeted data, age appropriate neuro-psychological testing with standardization, and common data elements and outcomes to enhance collaboration.

Tanya DiGenova, Canada:

DEFINING COST EFFECTIVENESS IN PAEDIATRIC ECMO

KEYPOINTS:

ECMO is cost-effective. In a era where health care spending is growing faster than the economy, economic evaluations related to health care interventions are extremely important.

Three questions to consider: Is ECMO expensive? Is ECMO cost-effective? Are these the same questions?

Health care costs are on the rise. These costs have escalated in types and expense of technology and are not unique to one country but cross borders and are worldwide. There are societal considerations for life year gained. There is no defined upper threshold for life year gained when using ECMO as a therapy. The literature review was done and studies retrieved are reviewed (Cost Utility Analysis, Cost Effectiveness, ECMO Cost Studies). Gaps, limitations and strength were reviewed. The major proportion of costs are associated with personnel costs. There is a wide variability in the costs reported and the largest costs are associated with children with cardiac diseases (heart failure) compared to others. In most conditions, ECMO was cost effective, except for the cardiac group.

Ravi Thiagarajan, USA:

RELATIONAL REGISTRIES VS PROSPECTIVE TRIALS: WHAT WILL PROVIDE THE ANSWERS?

KEYPOINTS:

- 1. Randomized ECMO trials are challenging.**
- 2. Many important clinical questions can be answered with prospective observational and registry data.**
- 3. ELSO registry has helped shape the current clinical practice of ECMO**

Number of decisions are based on experience, networks, and collaborative discussion.

Prospective Randomized Controlled Trials are very few, 5 in total to do with ECMO. CESAR Trial was a positive trial for survival and outcome and did affect increased utilization of ECMO in adults. The difficulties associated with undertaking ECMO RCT are associated with the the lack of equipoise in many large experience centers for certain indications, and the relative low frequency of the use of ECMO. Finally, RCTs are expensive to complete.

Registry reviews. Prime source for ECMO is the ELSO Registry initiated in 1984 under Dr. RH Bartlett. Multiple studies now to look at survival and predictors for mortality using ECMO for pediatric respiratory failure (Zabrocki). Studies looking at disease processes that should be considered to put on ECMO (Cashen). Studies looking at devices and outcomes (Thiagarajan)

utilizing propensity matching, easier than a randomized controlled trial. And so on...

There are limitations to the data such as adverse events are not adjudicated, there are missing data and there is no robust data verification; nonetheless, it still allows to assess the technology and has informed practice.

[Wynne Morrison, USA:](#)

RESUSCITATION WITH AND WITHOUT E-CPR: SHOULD NEW PALS GUIDELINES CHANGE CONSENT PRACTICES WHETHER YOUR ORGANIZATION OFFERS OR DOES NOT OFFER E-CPR?

KEYPOINTS:

**E-CPR is a therapy that should be considered in pediatric cardiac arrest because of growing experience with this practice and reports of reasonably good outcomes
The resources required to provide E-CPR make it ethically justifiable for the medical team to decide when it is appropriate to offer/consider it.**

Data does inform ethics.

2015 AHA guidelines both provide recommendation for state for adults (IH-CA, OH-CA) and children (IH-CA). Guidelines are usually written based on evidence, however frequently experience and patient management are well ahead of evidence that is carried out through research and therefore considerations need to be made in alignment with these practices.

Pediatric outcomes with ECPR for cardiac cause are better than for respiratory cause. Among survivors most had good neurologic outcomes.

What is the purpose of ECMO/ECPR?

Purposes would include: time to decision/recovery, transplant, alternative circulatory support. Factors that affect suitability, witnessed arrest? technical feasibility, pre-existing organ dysfunction, quality of life (family input is important).

Can we choose not to offer ECPR?

high resources, intensive, not every center able to provide, highly acute situation and complicated decision. Outcomes reported are dependent on the denominator and one must remember that patients are selected in most high volume centers using ECPR. Resources are imperative to supporting such a service. Importantly, remembering the importance of staff distress and morale is key as the staff are a resource.

Informed consent is difficult to undertake in the acute unanticipated circumstances. There may be a benefit to identifying candidates before their arrest if they are at high risk, with the clinicians, and include it in the medical record. It remains unclear when is the best time to approach families with these decisions.