ECMO Interprofessional Simulation: Exemplary Clinical Simulations for Magnificent Outcomes

Linnea Lockett, MSN, RN, NPD-BC, RNC-NIC, CLC
Linnea.Lockett@BSWHealth.org
Baylor Scott & White McLane Children's, Temple, TX

Purpose

Interdepartmental and interprofessional high fidelity in situ simulations were developed and incorporated into quarterly educational opportunities intended to support our team maintain competence, improve processes, and ultimately provide the best outcomes and survival rates for our low-volume extracorporeal membrane oxygenation (ECMO) program.

Gap Analysis

Assessment of the ECMO program at our children's hospital led to identification of several barriers: collaboration & teamwork between teams due to physical constraints, differences in protocols/processes, & multiple departments involved; knowledge, skill & process deficit due to turnover & changes in staffing in nursing, providers, & ECMO specialists / coordinator, and being a low-volume center with only a case a year on average. This gap analysis of our low-volume neonatal ECMO program showed a need for improved education, collaboration, communication, teamwork, and standardized process / protocol development to reach a desired state of a competent interprofessional team able to provide optimal outcomes with above international average survival rates.

Recommendations from Evidence

According to Joyce et al. (2020), high volume ECMO centers have lower mortality rates and low volume centers have poorer outcomes, although the minimal case volume for ECMO is not clearly defined. It is believed that by maximizing exposure to ECMO of all involved personnel / disciplines allows for better outcomes, and simulation can provide these low volume centers with that exposure (Joyce et al., 2020). Due to being such a complex, high risk, resource-intense procedure, ECMO requires continual didactic, hands-on, and simulation training for the entire interdisciplinary team to minimize complications & improve outcomes (Dhar et al., 2022). Interdisciplinary simulation allows for quicker initiation & better success by collaborating with the integral team: ECMO program coordinator, medical director, surgical team, pump specialists, nurses, respiratory, blood bank, lab, radiology, & pharmacy (Dhar et al., 2022). Simulation & facilitator-guided debriefing provides a safe, risk-free environment that allows for standardization of process and checklists, while improving effective communication, teamwork, role-development, skills, confidence, and knowledge (Bhakta & Alshuqayfi, 2022) (Yousef et al., 2022).

References

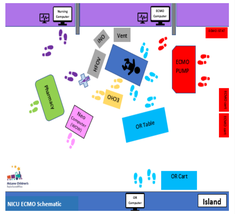
Implementation Plan

Plan
- Team: NPDS, ECMO Coordinator, Neonatologist, & Surgeon determined plan to maintain competence in low-volume center with quarterly education & simulation
- Stakeholders: hospital, unit & ECMO leadership supported plan
- Scheduled simulations, created scenarios, gathered supplies

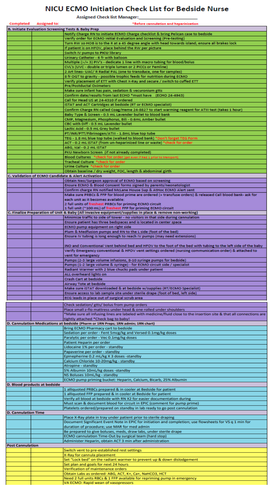
Create
- Initiation checklists & schematics based on ECMO cases / sims
- Scenarios: Persistent pulmonary hypertension (PPHN) from meconium aspiration, congenital diaphragmatic hernia, & sepsis, refractory tachyarrhythmia, air entrainment (troubleshooting)
- Include: VS, labs, x-rays, echo & HUS results

Sim
- NPDS & ECMO Coordinator facilitated scenario
- RNs & Providers collaborated, assessed, ordered in EHR, intervened; Pharmacy drew up meds during initiation phase
- Pump Specialists "wet lab" primed pump with sim blood
- Surgical team prepped, cannulated, connected to circuit

Debrief
- Rapid sequence debriefing or "mini huddles" performed q 15 min throughout sim & then full debrief at the end
- Added "mini huddles" to real ECMO cannulations
- Alterations to initiation checklists, schematics, consultation graphics per discoveries during debriefs

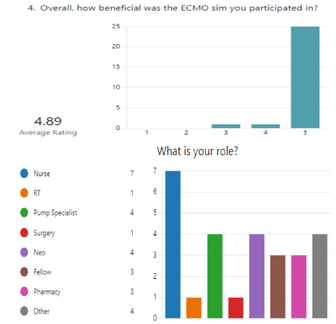


NICU ECMO Bed and Respiratory Equipment Set-up



Outcomes

Patient	Month/Year	Days on ECMO	Diagnosis	Successful Decannulation	Discharge Home
1	Apr-18	10	MAS / PPHN	yes	yes
2	Oct-18	9	GBS Sepsis/PPHN	yes	yes
3	Mar-20	4	MAS / PPHN	yes	yes
4	Aug-20	8	MAS / PPHN	yes	yes
5	Aug-22	8	MAS / PPHN	yes	yes
6	Mar-23	13	PPHN	yes	yes
7	May-24	4	MAS / PPHN	yes	yes
8	Jul-24	17	CDH / Post-op	yes	no *withdrawal



Quarterly interprofessional simulations have helped maintain our high survival outcomes with our ECMO program for our low-volume center. Simulations have allowed for the removal and improvement of identified barriers with practicing interdepartmental and interprofessional communication, collaboration, teamwork, skills and creating standardized processes for ECMO cannulation, management and trouble shooting. Development and recurrent evaluation of a consultation graphic, initiation checklists, and schematics for effectively prepping the patient & equipment for cannulation occur with each simulation and debriefing. Standardization of our processes as a team leads to faster cannulation times and better success rates. These simulations are highly sustainable and provide a huge return on investment with minimal educational costs and optimal outcomes by use of expired supplies, available equipment on the unit, high-fidelity & low-fidelity simulators owned by the unit, and a few hours education time dedicated quarterly for the interprofessional team. Rapid cycle debriefing or "mini huddles" were beneficial during simulations and in real time ECMO initiation to allow the team to regroup and refocus.

Implications for Future Practice

Continuation of interprofessional & interdisciplinary ECMO simulations with rapid sequence debriefings or "mini huddles" utilizing standardized resources. Including more trouble shooting simulations & differing diagnoses. Incorporating support services more in simulations as a standard including surgical services again in addition to surgeon.