



Critical Care Venovenous ECMO Curriculum

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Background: Extracorporeal membrane oxygenation (ECMO) is used to support patients with severe respiratory and/or cardiac failure unresponsive to conventional treatments. Despite being one of the most complex supportive therapies used in intensive care unit, there is still a lack of formal ECMO education amongst fellowship training programs. The introduction of an ECMO high-fidelity didactic and simulation curriculum among personnel has been proven to reduce the times to manage bedside emergencies and improve clinical skills [1]. This document describes an ECMO curriculum consisting of basic introductory ECMO skills with progression to mastery of more advanced concepts designed for critical care fellows. The curriculum incorporates didactics, simulation sessions, and knowledge assessment quizzes. As a critical care fellowship program, developing a training pathway to ensure education and promote competency in the use and understanding of ECMO is crucial. The remainder of this document will relay the goals, objectives for, and methods by which, the formal ECMO curriculum will be implemented in the training of critical care fellows at Henry Ford Hospital.

Educational Goals:

To develop an understanding of the physiology of extracorporeal life support

To develop knowledge of the indications and contraindications for potential vVECMO candidates. Patient selection criteria.

To develop clinical decision making of when vVECMO should be used in the therapeutic management of critically ill patients

To develop an understanding of the vVECMO circuit components and how to troubleshoot circuit related complications

To develop knowledge in the potential adverse effects of vvECMO

To review the ethical and social issues related to ECMO

Educational Objectives:

Understand the basic operation of the vvECMO circuit, including pump and gas flow, pressure monitoring, circuit checks, and hemofiltration setup

Ability to select an appropriate cannula and ECMO configuration

Perform daily patient and circuit management on ECMO rounds and make appropriate decisions regarding ongoing care

Participation with ECMO didactic and simulation lectures and complete required quizzes

Understand the ECMO consent process, including family support, palliative care involvement, and withdrawal from ECMO conversations

Understand emergencies and complications related to ECMO such as bleeding, pneumothorax, cardiac arrest, arrhythmias, renal injury, severe coagulopathy, and hypotension

Assess proper vvECMO cannula positioning

Gain knowledge of the vvECMO weaning process

Develop knowledge of the appropriate mechanical ventilator settings for a patient on vvECMO

Understand the role of vvECMO in lung transplant patients

Implementation and Feedback

The goal for this curriculum is to develop a fellowship-based training pathway which will provide fellows with the opportunity to achieve competence in vvECMO. This will be exemplified in their ability to provide effective support to MICU vvECMO patients.

Successful implementation of a critical care ECMO curriculum requires several components:

Regularly scheduled didactics including lectures, hands on clinical experience, and simulation

Independent work: reading and self-study

Assessment of knowledge and skills during ECMO rounding times and completion of ELSO module quizzes

Determination of Competence

Involved in care for 5 ECMO patients throughout training period

Attendance at MICU ECMO didactic lectures and simulation sessions

Completion of ELSO ECMO modules and submission of certificate of completion

<https://www.else.org/Education/ECMO101IntroductoryModules.aspx>

Informal knowledge and technical skills assessment by ECMO Care Team staff during rounds

Expectations:

First year fellows:

- Can describe the management process of patients with refractory hypoxemic respiratory failure (MK)
- Can present indications and contraindications of a patient being evaluated for VVECMO for refractory hypoxemic failure and bridge to transplant
- Accurately shares medical information with patients and families and assesses the comprehension of the information (ICS)

Second year fellows:

- Demonstrate appropriate medical judgment as to when a patient would need to be placed on VVECMO (PC)
- Can recognize and manage common VVECMO complications. (MK)
- Incorporates effective communication with multidisciplinary team members managing VVECMO patients. (ICS)
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Third year fellows:

- Able to analyze current medical literature related to management of VVECMO patients and can convey this information to peers and attendings. (PBLI)
- Is able to recognize and manage uncommon VVECMO complications. (MK)
- Can describe the VVECMO weaning process (indications, mode etc.) (MK)

ECMO references recommended for reading/review

Extracorporeal Life Support. The ELSO Red Book 5th Edition

Websites

www.else.org

www.sccm.org

www.asaio.com

References

1. Di Nardo M, David P, Stoppa F, et al. The introduction of a high-fidelity simulation program for training pediatric critical care personnel reduces the times to manage extracorporeal membrane oxygenation emergencies and improves teamwork. *J Thorac Dis.* 2018;10(6):3409-3417. doi:10.21037/jtd.2018.05.77.

2. Banfi C, Bendjelid K, Giraud R. High-fidelity simulation for extracorporeal membrane oxygenation training, utile or futile? *J Thorac Dis* 2017;9:4283-5. 10.21037/jtd.2017.10.54.