CCSO Critical Care Services Ontario

EXTRACORPOREAL MEMBRANE OXYGENATION (ECMO) CONSULTATION GUIDANCE DOCUMENT

Guidance Document for Ontario Hospitals

Critical Care Services Ontario

Version Control

ECMO Consultation Guidelines	
Version 1.0	2020
Version 2.0	2024
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About Critical Care Services Ontario

Established in 2005, Critical Care Services Ontario (CCSO) led the implementation of Ontario's first Critical Care Strategy and now centrally coordinates and develops integrated system solutions for critical care (Adult, Paediatric and Neonatal) and specialty programs aligned with critical care (Neurosurgery, Trauma and Burns, and the Life or Limb Policy). CCSO's work is the result of an ongoing collaboration between critical care providers, hospital administrators, partners from the Ministry of Health, Ontario Health, and other health system leaders.

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Table of Contents

1. Introduction

The purpose of this document is to provide guidelines for the consideration of Extracorporeal Membrane Oxygenation (ECMO) for adult critical care patients. It also includes suggestions for appropriately timed consideration of consultation for ECMO. These guidelines are for use by intensivists in Level 3 critical care units managing patients with respiratory or cardiac failure that may continue to deteriorate despite treatment options already attempted.

These guidelines were previously developed through a collaborative Reference Group established in 2018 by Critical Care Services Ontario (CCSO) which included representation from critical care physicians and clinical ECMO specialists from across Ontario.

CCSO is committed to periodic review of the ECMO Consultation Guidelines as deemed appropriate by critical care and ECMO specialists. The ECMO Consultation Guidelines were reviewed and updated by a Reference Group of experts in critical care medicine and specialists from Ontario ECMO programs. The Reference Group focused on ensuring this version of the Consultation Guidelines is accurate, reliable, and supported by the best available clinical evidence and will have uniform uptake across referring sites and the ECMO centres across Ontario.

The goals of the updated ECMO Consultation Guidelines include:

- **Standardization:** Promote standard criteria used by ECMO programs for reviewing consultations and enhance alignment in clinical practice across these programs. Similarly, promote an improved understanding by critical care providers of the clinical indications and contraindications when considering ECMO as a potential intervention for their patients.
- **Optimize Patient Outcomes**: Maximize patient outcomes by providing evidence-based recommendations that reflect the latest advancements in ECMO care.
- **Update and Modernize the ECMO Consultation Guidelines**: These guidelines should reflect the most current evidence-based practices and research in the field.
- **Transparency**: Uniform application of the ECMO Consultation Guidelines, with all consultation/referrals facilitated by CritiCall Ontario, will lead to a better understanding of the potential demand for ECMO services, the volumes of patients referred for ECMO and those that eventually require ECMO. This will also provide information about referral patterns across regions, help to ensure equity of access to this specialized service, and facilitate evaluation of the Consultation Guidelines that will inform potential future updates

2. Potential Interventions for ARDS

Considerations for Assessment and Management of Acute Respiratory Distress Syndrome (ARDS):

- Measure patient height and calculate body weight;
- Consider Non-invasive ventilation, if appropriate;
- Lung protective ventilation strategies;
- Diagnose and treat underlying potential causes of ARDS; and,
- Achieve optimal fluid balance; diuresis and/or resuscitate as appropriate.

For additional considerations for assessment and management, review the table below:

MILD	
Criteria	**Recommended Intervention**
☐ PaO_2/FiO_z Ratio 200 – 300 mm Hg ☐ pH > 7.20 ☐ PEEP ≥ 5cm H_2O	Recommended: • Lung Protective Strategy: Low Tidal Volume Ventilation Consider: • Consultation for Level 3 ICUs • Continue current strategy and deescalate interventions when possible after patient improves
MODERATE	
Criteria	**Recommended Intervention**
☐ PaO_2/FiO_z Ratio 150 – 200 mm Hg ☐ pH < 7.20 ☐ PEEP > 5cm H_2O	Recommended: • Lung Protective Strategy: Low Tidal Volume Ventilation Consider: • Check esophageal pressure to help guide ventilator management • Higher PEEP Strategy (consider with caution)
SEVERE	
Criteria	**Recommended Intervention**
☐ PaO_2/FiO_z Ratio < 150 mm Hg ☐ Uncompensated hypercapnia with pH < 7.20 ☐ PEEP > 5cm H_2O	Strongly Recommended: • Prone positioning (unless contraindicated) • Lung Protective Strategy: Low Tidal Volume Ventilation Recommended: • Deep sedation and neuromuscular blocking agent • Higher PEEP Strategy Consider: • Inhaled pulmonary vasodilators
Strongly consider consultation with an ECMO centre: ☐ If PaO_2/FiO_z Ratio ≤ 80 mm Hg • ≤ 80 mm Hg for > 6 hours • < 50 mm Hg for > 3 hours • $PaCO_2$ ≥ 60 mm Hg for > 6 h** *** With respiratory rate increase to 35 breaths per minute and mechanical ventilation settings adjusted to keep a plateau airway pressure of* ≤ 32 cm of water.	

ALL ADULT CONSULTATIONS FOR ECMO SHOULD BE COORDINATED THROUGH
CRITICALL ONTARIO: 1-800-668-4357

When considering an ECMO intervention, please initiate the consultation process early

3. Respiratory ECMO Consultation Guidelines

The criteria are intended as guidelines for ADULTS.

Providers are to rely on their clinical judgment for each patient encounter.

RESPIRATORY	
Consider ECMO for the following Diagnostic Indications	**DO NOT Consider ECMO for the following Diagnostic Indications**
Indications ☐ Acute Respiratory Distress Syndrome (ARDS) ☐ Hypercapnic respiratory failure refractory to initial management (e.g. Status Asthmaticus refractory to ICU management) ☐ Severe airway obstruction (upper airway, tracheal stenosis, extrinsic compression) refractory to initial management ☐ Bridge to lung transplantation ☐ Primary graft dysfunction after lung transplantation	**Contraindications** ☐ Known or suspected severe brain injury ☐ Prolonged cardiopulmonary resuscitation (CPR) without adequate tissue perfusion ☐ Non-recoverable advanced comorbidity such as central nervous system (CNS) damage or terminal malignancy ☐ Chronic end-stage organ dysfunction (emphysema, cirrhosis) and not already deemed to be a transplant candidate **Potential Contraindications** ☐ Advanced age ☐ End-stage renal disease ☐ Multi-organ failure ☐ Prolonged respiratory support with identifiable treatable cause (total duration > 10 - 14 days) ☐ Disseminated malignancy (dependent on life expectancy < 1 year)

Patient factors to consider for ECMO consultation: respiratory support < 10 days; BMI <18 kg/m2; age: 18 – 65.

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CRITICALL ONTARIO: 1-800-668-4357

When considering an ECMO intervention, please initiate the consultation process early.

4. Cardiac ECMO Consultation Guidelines

CARDIAC	
Consider ECMO for the following Diagnostic Indications	**DO NOT Consider ECMO for the following Diagnostic Indications**
Indications ☐ Refractory Cardiogenic shock (*see Figure 1: Society for Cardiovascular Angiography & Interventions (SCAI) SHOCK Stage Classification as needed*) ☐ Fulminant myocarditis ☐ Pulmonary hypertension ☐ Graft failure after heart transplantation ☐ Amniotic fluid embolism ☐ Massive Pulmonary Embolism ☐ Cardiotoxicant poisoning (e.g. SSRI and SNRI overdoses, calcium-channel or beta-blockers) ☐ Accidental hypothermia *(Hypothermia Outcome Prediction after ECLS (HOPE) calculator available at https://hypothermiascore.org/);*	**Contraindications** ☐ End-stage heart failure AND not a transplant or LVAD candidate ☐ Disseminated malignancy (dependent on life expectancy < 1 year) ☐ Known or suspected severe brain injury ☐ Prolonged CPR without adequate tissue perfusion ☐ Unrepaired aortic dissection ☐ Severe aortic regurgitation ☐ Severe end-stage organ dysfunction (emphysema, cirrhosis) ☐ Severe peripheral vascular disease ☐ Non-recoverable advanced comorbidity such as CNS damage or terminal malignancy and not already deemed to be a transplant candidate **Potential Contraindications** ☐ Where anticoagulation precluded ☐ Advanced age ☐ Morbid obesity ☐ End-stage renal disease

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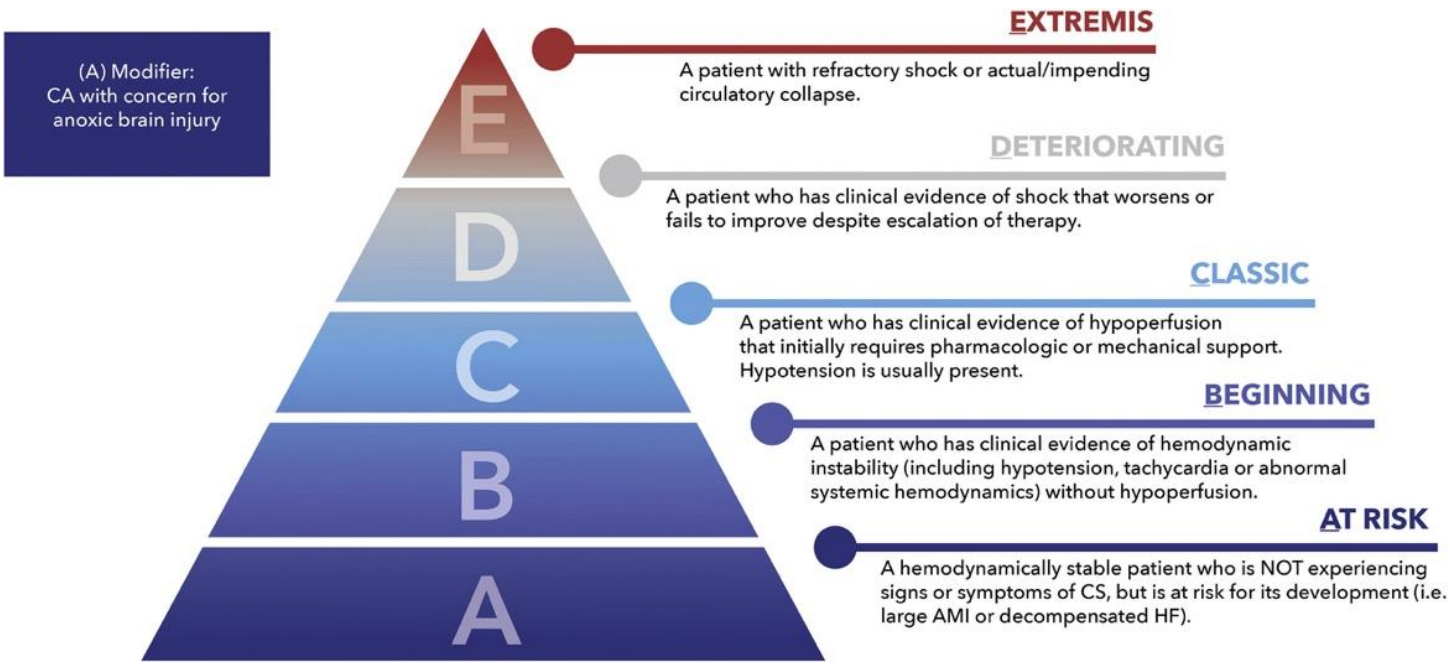
When considering an ECMO intervention, please initiate the consultation process early.

5. Appendix

Figure 1: Society for Cardiovascular Angiography & Interventions (SCAI) SHOCK Stage Classification



From Naidu SS et al., JSCAI 2022; 1:100008

A helpful SCAI Shock Classification Checklist is also available at https://scai.org/sites/default/files/2023-04/SCAI%20SHOCK%20Bedside%20Checklist%202022.pdf

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6. Acronyms

The following acronyms are used in the ECMO Consultation Guidelines:

ECMO	Extracorporeal Membrane Oxygenation
ARDS	Acute Respiratory Distress Syndrome
CPR	Cardiopulmonary Resuscitation
CNS	Central Nervous System
ICU	Intensive Care Unit
BMI	Body Mass Index
VAD	Ventricular Assist Device
PaO_2	Partial Pressure of Arterial Oxygen
FiO_2	Fraction of Inspired Oxygen
pH	Potential of Hydrogen
PEEP	Positive End-Expiratory Pressure
$PaCO_2$	Partial Pressure of Carbon Dioxide

7. Frequently Asked Questions

Question	Answer
1. What is the process for seeking a second opinion during an ECMO consult?	CritiCall Ontario facilitates requests for ECMO consultation. A request for a 2nd opinion should result in both the initial site consulted as well as the 2nd site being consulted participating in the call with the referring physician so that the case in question can be reviewed together by the 2 ECMO consultants. This should promote clarity and transparency regarding a decision on whether the patient may or may not be a candidate for ECMO. Requests for a second opinion can originate from either referring or accepting centers, particularly in challenging cases. This commitment to transparency and collaboration aims to enhance the overall decision-making process and the quality of care provided.
2. Does the patient have to meet all of the indications listed for mild, moderate and severe ARDS to determine the appropriate interventions for the patient?	The clinical criteria contained with these Consultation Guidelines are included as potential considerations for the provider. Providers should refer to detailed information contained in current guidelines for managing ARDS when determining interventions for their patients.
3. Do patients who meet the clinical requirements for Severe ARDS always require ECMO?	No. However if you have a patient that you are concerned has severe ARDS, or is progressing to severe ARDS, and otherwise has criteria that may make them eligible for ECMO, consider calling CritiCall Ontario to consult with an ECMO provider. Early consultations are encouraged.
4. Who should I contact if I require a consultation for ECMO?	CritiCall Ontario should be called if a consult for ECMO is required (1-800-668-4357). If ECMO is a potential consideration, initiation of a consultation early in the patient's course is encouraged.
5. These guidelines are for Adults patient populations. What do I do for paediatric and neonate patients?	For paediatric and neonate patients that may require consultation for ECMO, please contact CritiCall Ontario to facilitate a consultation with a Paediatric ECMO Centre.

8. Acknowledgements

We wish to thank the ECMO Reference Group for their support and expert guidance in the review and revision of the ECMO Consultation Guidelines.

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