ECMO CONSULTATION GUIDELINES

Guidance Document for Ontario Hospitals

Critical Care Services Ontario | January 2020

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Introduction

Background

About Critical Care Services Ontario

Critical Care Services Ontario (CCSO) is the managing body responsible for the overall program implementation of initiatives of the Critical Care Strategy. Originally established as the Critical Care Secretariat in June 2005, its work is the result of an on-going collaboration between critical care health care providers, hospital administrators, officials from the Ministry of Health (MOH) and other health system partners.

The mission of CCSO is to:

- Identify critical care system needs, both for the critical care system and for programs that rely on access to critical care services.
- Collaborate with health care partners to improve access, quality, value, and system integration to benefit patients.

To achieve this, CCSO collaborates with clinicians, hospital administrators, patients and families, LHINs, the MOH and other health sector partners for broad stakeholder engagement, the development of evidence-based policy and the implementation of programs requiring central provincial coordination to promote system-level accessibility and accountability.

Extracorporeal Membrane Oxygenation

Extracorporeal Membrane Oxygenation (ECMO) has been identified as having potential increased application as an intervention for critical care patients and requiring additional guidance on the appropriate clinical indications for of ECMO in Ontario. This discussion becomes relevant as ECMO is sometimes used as a mode of respiratory rescue for critically ill patients, outside the traditional and historical use as a therapeutic modality as a bridge to transplant.

In 2018, CCSO organized a Reference Group with critical care representatives and providers of ECMO services across Ontario to discuss the current ECMO service provision and to understand the resources, capabilities and practices for critical care patients who require ECMO in an Intensive Care Unit (ICU) setting.

Based on experience of providers receiving requests to have patients "put on ECMO", a readily identifed system gap was the lack of agreed to clinical criteria to guide appropriate and timely consultations with a centre capable of providing ECMO. This context for ECMO would incorporate the evolving role of ECMO as part of several strategies included in respiratory rescue for critically ill patients. The criteria would be evidenced based, address some of the current knowledge gaps regarding respiratory rescue and indications for ECMO, and provide direction on the following:

- **Patient Eligibility:** Clinical and diagnostic indications to guide decision making regarding paitents who would benefit, or should be excluded, from ECMO
- **Recommended Interventions:** The appropriate respiratory rescue therapy to consider based on the clinical status of the patient
- **Consultation Requests:** When and who to call if an ECMO consultation is required

Purpose

These *ECMO Consultation Guidelines* are the result of a collaborative effort between CCSO, led by Dr. Bernard Lawless [Provincial Lead, Critical Care Services Ontario] and the ECMO Reference Group which is comprised of critical care and ECMO providers across Ontario. The guidelines are evidenced-based and have been rigorously discussed and reviewed in a carefully thought out and transparent process.

The purpose of the *ECMO Consultation Guidelines* is to serve as a tool to also highlight interventions and/or therapies that should be considered for respiratory rescue in critically ill patients. This will help ensure that patients most likely to benefit from ECMO have appropriate access when it is needed.

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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 Dioxirde

Navigation Guide

The *ECMO Consultation Guidelines* target 2 diagnoses categories:

RESPIRATORY
CARDIAC

The RESPIRATORY section of the *ECMO Consultation Guidelines.*

There are two sections to the Respiratory diagnosis.
The first outlines respiratory diagnostic **indications** and **contra-indications** for ECMO

RESPIRATORY	
Diagnostic Indications for ECMO	Diagnostic Contra-indications for ECMO

The second outlines **recommended interventions for patients with ARDS**.

Recommended Interventions for Patients with ARDS

Initial Assessment and Management

Increasing Severity

MILD	
Criteria	Recommended Intervention
Clinical Criteria for patients with MILD ARDS will be listed here	The appropriate respiratory rescue therapy will be listed here along with other recommended interventions for patients who meet the criteria.

MODERATE	
Criteria	Recommended Intervention
Clinical Criteria for patients with MODERATE ARDS will be listed here	The appropriate respiratory rescue therapy will be listed here along with other recommended interventions for patients who meet the criteria.

SEVERE	
Criteria	Recommended Intervention
Clinical Criteria for patients with SEVERE ARDS will be listed here	The appropriate respiratory rescue therapy will be listed here along with other recommended interventions for patients who meet the criteria.
Clinical Criteria for patients who may require ECMO will be listed here	**Referral for POTENTIAL ECMO will be stated.** Review the patient considerations before deciding whether a patient requires ECMO.

For all ADULT patients who meet the criteria for ECMO, **Call CritiCall Ontario** to coordinate a consultation. **1-800-668-4357**

The CARDIAC section of the *ECMO Consultation Guidelines.*

The Cardiac section **ONLY** outlines diagnostic indications and contra-indications for ECMO.

CARDIAC	
Diagnostic Indications for ECMO	Diagnostic Contra-indications for ECMO

ECMO Consultation Guidelines

Extracorporeal Membrane Oxygenation (ECMO) Consultation Guidelines

The criteria are intended as guidelines for ADULTS. Providers are to rely on their clinical judgement for each individual patient encounter.

RESPIRATORY

Consider ECMO for the following Diagnostic Indications	DO NOT Consider ECMO for the following Diagnostic Indications
❑Acute Respiratory Distress Syndrome (ARDS) ❑Hypercapnic respiratory failure ❑Bridge to lung transplantation ❑Primary graft dysfunction after lung transplantation ❑Status asthmaticus	Absolute ❑Disseminated malignancy ❑Known severe brain injury ❑Prolonged cardiopulmonary resuscitation (CPR) without adequate tissue perfusion ❑Severe chronic organ dysfunction (emphysema, cirrhosis) ❑Severe chronic pulmonary hypertension ❑Non-recoverable advanced comorbidity such as central nervous system (CNS) damage or terminal malignancy Relative ❑Where anticoagulation precluded, advanced age, obesity ❑End-stage renal disease

Recommended Interventions for Patients with ARDS

Initial Assessment and Management

1. Diagnose and treat underlying ARDS | 2. Measure patient height and calculate predicted body weight
3. Standard lung-protective ventilation strategy|4. Diuresis or resuscitation as appropriate

MILD

Criteria	Recommended Intervention
❑**PaO_2/FiO_2 Ratio 200 - 300 mm Hg** ❑pH > 7.20 ❑PEEP ≥ 5cm H_20	**Noninvasive ventilation** 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_2 Ratio 150 - 200 mm Hg** ❑pH < 7.20 ❑PEEP > 5cm H_20	**Controlled Mechanical ventilation** Recommended: • Lung Protective Strategy: Low Tidal Volume Ventilation Consider: • Check esophageal pressure to help guide ventilator management • Recruitment maneuvers* • High PEEP Strategy* * Consider with caution

SEVERE

Criteria	Recommended Intervention
❑**PaO_2/FiO_2 Ratio < 150 mm Hg** ❑Uncompensated hypercapnia with pH < 7.20 ❑PEEP > 5cm H_20	**Controlled Mechanical ventilation** Strongly Recommended: • Prone positioning (unless contraindicated) Recommended: • Lung Protective Strategy: Low Tidal Volume Ventilation • Neuromuscular blocking agent • High PEEP Strategy Consider: • Inhaled pulmonary vasodilators • Recruitment maneuvers
❑**If PaO_2/FiO_2 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 increased to 35 breaths per minute and mechanical ventilation settings adjusted to keep a plateau airway pressure of ≤ 32 cm of water.	**CONSIDER REFFERAL FOR POTENTIAL ECMO** Patient Consideration: • Mechanically ventilated < 7 days • BMI ≤ 40kg/m2 or Weight ≤ 125 kg • Age: 18-65

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

CARDIAC

Consider ECMO for the following Diagnostic Indications	DO NOT Consider ECMO for the following Diagnostic Indications
❑Myocardial infarction-associated cardiogenic shock ❑Fulminant mycocarditis ❑End stage pulmonary hypertension ❑Extracorporeal cardiopulmonary resuscitation ❑Post-cardiotomy cardiogenic shock ❑Bridge to ventricular assist device (VAD) implantation or heart transplantation ❑Primary graft failure after heart transplantation ❑Prevention of acute right ventricular failure after left ventricular assist device (LVAD) implantation	Absolute: ❑End stage heart failure and not a candidate for transplant or destination therapy of VAD support ❑Disseminated malignancy ❑Known severe brain injury ❑Unwitnessed cardiac arrest ❑Prolonged CPR without adequate tissue perfusion ❑Unrepaired aortic dissection ❑Severe aortic regurgitation ❑Severe chronic organ dysfunction (emphysema, cirrhosis) ❑Peripheral vascular disease ❑Non-recoverable advanced comorbidity such as CNS damage or terminal malignancy Relative: ❑Where anticoagulation precluded, advanced age, obesity ❑End-stage renal disease

For Paediatric and Neonate patients, please consult your appropriate Paediatric ECMO Centre OR call CritiCall Ontario.

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www.criticalcareontario.ca

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Frequently Asked Questions

Question:	Answer:
1. Does the patient have to meet all of the indications listed for mild, moderate and severe ARDS in order to determine the appropriate interventions for the patient?	The PaO2/FiO2 Ratio can be used as a guide to determine ARDS severity and the recommended interventions
2. Do patients who meet the clinical requirements for Severe ARDS always require ECMO?	No. ECMO should be considered if the PaO2/FiO2 Ratio falls under 80 mm Hg.
3. Who should I contact if I require a consultation for ECMO?	CritiCall Ontario should be called if a consult for ECMO is required. **CritiCall Ontario's phone number is:** 1-800-668-4357
4. Since these guidelines are for Adults, what do I do for paediatric and neonate patients?	For paediatric and neonate patients, please consult your appropriate Paediatric ECMO Centre OR call CritiCall Ontario.
5. Why are there only specific guidelines for patients with ARDS and not for any other diagnosis where ECMO should be considered?	The purpose of the ECMO Consultation Guidelines is to not only prompt appropriately timed consultations for possible ECMO, but to also serve as a tool reminding the provider of other respiratory rescue interventions that, if utilized in managing severe ARDS, may improve the patient's oxygenation/ ventilation and negate the potential the need for ECMO altogether.

Source Information

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