

Provincial Clinical Practice Guideline Veno-Veno Extracorporeal Life Support in Acute Respiratory Failure: Evaluation, Triage & Management

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BC Critical Care Services Executive Committee ECLS Sub Working Group

Scope:

This document is intended to support clinical practitioners in the early recognition and appropriate triage of patients with acute respiratory failure. It will provide an algorithm and framework for recognition, triage and management of adult and pediatric patients with severe respiratory failure including Extracorporeal Life Support (ECLS)/Veno-Veno Extracorporeal Membrane Oxygenation (VV-ECMO) as part of the treatment pathway. This is not intended to be prescriptive but a resource to assist clinicians in triaging patients provincially.

Target population:

Adult and pediatric patients presenting with acute and treatable respiratory failure presenting to the hospital system that may include emergency departments and critical care units in the province of British Columbia.

Pediatrics:

Patients less than 17 years of age with acute respiratory failure should be referred to BCCH and consultation should be made to the attending ICU on call (*see section on pediatric referral*).

Identify:

Adult patients can be considered to have acute respiratory failure if they require mechanical ventilation for management of hypoxia or hypercarbia and have a PO₂/FiO₂ of <200, or PCO₂ >60 with associated pH <7.25 after all appropriate management is applied.

Manage:

The following should be considered best practices when managing patients with acute respiratory failure:

1. Optimal lung protective ventilation
2. Optimal PEEP (>10)
3. Low driving pressure (<15)
4. Neuromuscular blockade
5. Prone ventilation
6. Steroids

Staging and Triage

The following are definitions use to triage patients for potential transfer for advanced respiratory care:

MILD

P/F Ratio of < 200
pH < 7.25 (due to hypercarbia)

MODERATE

P/F Ratio of < 150
pH < 7.20 (due to hypercarbia)

SEVERE

P/F Ratio of < 100
pH < 7.10 (due to hypercarbia)

IDENTIFICATION

Adult or pediatric patient with acute hypoxic or hypercarbic respiratory failure requiring mechanical ventilation

MANAGE

- Optimal lung protective ventilation
- Low driving pressure (<15)
- Optimal PEEP (>10)
- Neuromuscular blockade
- Prone ventilation

TRIAGE

Mild

- P/F Ratio of < 200
- pH <7.25 (due to hypercarbia)

Moderate

- P/F Ratio of < 150
- pH <7.20 (due to hypercarbia)

Severe *

- P/F Ratio of < 100
- pH <7.10 (due to hypercarbia)
- Optimal PEEP (>10)
- Neuromuscular blockade
- Prone ventilation

* Number of hours at level of severity:

- P/F ratio < 50 for 3 hrs
- P/F ratio < 80 for 6 hrs
- pH <7.25 with PaCO₂>60 for >6hrs

Early consultation via PTN in moderate to severe category to provincial site is encouraged

MILD

- Considering **ongoing** management in respective ICU
- If poor trajectory or clinical concerns, consider referral to regional center
 - Northern Health: Prince George ICU on-call
 - Interior Health: Kelowna General Hospital ICU on-call or Royal Inland Hospital
 - Island: Royal Jubilee ICU on-call
 - Fraser Health: Abbotsford Regional, Surrey Memorial or Royal Columbian Hospital ICU on-call
 - VCH/PHC: St. Paul's Hospital ICU on-call
 - If on lung transplantation list or high likelihood of requiring lung transplantation: Vancouver General Hospital ICU on-call

MODERATE

- Review exclusion criteria for ECLS
- If no exclusion criteria: Consultation **for triage to provincial vs regional site**
 - **Vancouver General Hospital** ICU on-call by 3-way call
 - Fraser Health: Contact Royal Columbian Hospital ICU on-call
 - Northern Health: Prince George ICU on-call
 - Interior Health: Kelowna General Hospital ICU on-call or Royal Inland Hospital
 - Island: Royal Jubilee ICU on-call
 - VCH/PHC: St. Paul's Hospital ICU on-call

SEVERE

- Review exclusion criteria for ECLS
- If no exclusion criteria: Consultation and **referral to provincial site**
 - Provincial: **Vancouver General Hospital**
- If exclusion criteria fulfilled, consider consultation and referral to regional site if ongoing advanced critical care and respiratory management is appropriate
- In Fraser Health only: Contact Royal Columbian Hospital ICU on-call and ECMO on-call Physician (VGH 3-way call encouraged)
- If unable to safely transport patient to VGH consider transfer to closest ECLS capable site for stabilization

Adult ECLS Capable sites: FHA: Royal Columbian Hospital, IHA: Kelowna General Hospital, Island Health: Royal Jubilee, VCH/PH: Saint Paul's Hospital, Vancouver General Hospital

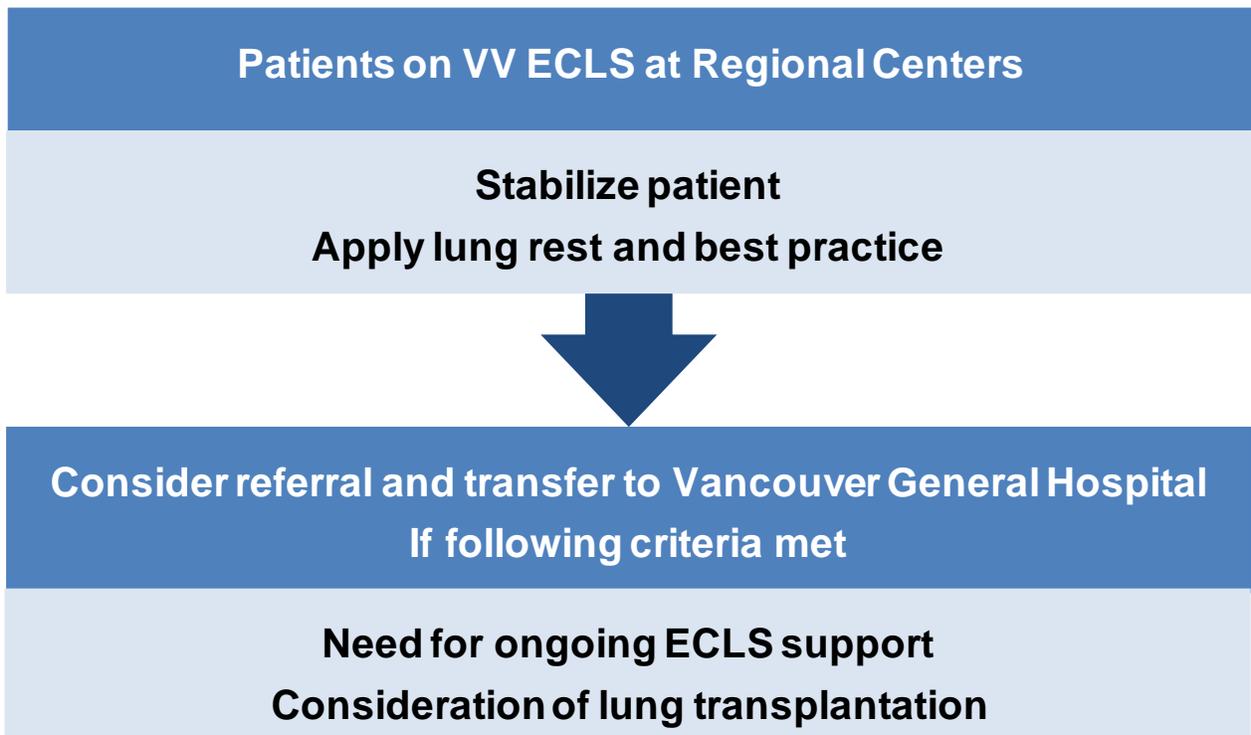
*Referral and consultation should be made through the patient transfer network (PTN)

NOTES:

- a) When patients are triaged as moderate or severe, both regional **and** provincial sites should be brought online with the sending facility to determine the definitive destination and create clear plan for transfer. If cannulation deemed necessary at regional site, the ECMO configuration plan should be discussed with VGH intensivist in advance.
- b) All potential lung transplant patients should be expedited to Vancouver General Hospital as soon as feasible

Exclusion (Relative)

- 1. Absolute contraindication to anticoagulation
- 2. Poor neurological prognosis
- 3. Advanced immunocompromised state
- 4. Age > 65
- 5. Established multisystem organ failure (MODS Score > 10)
- 6. Life expectancy < 5 years
- 7. Medical Orders for Scope of Treatment (MOST)
- 8. > 7 days of mechanical ventilation



Pediatric Referral:

Neonates and children with potentially reversible cardiorespiratory failure will be considered for ECLS. Referrals for ECLS consideration should be made to PICU Staff Intensivist on call at BC Children's Hospital. This should be initiated through the Patient Transport Network (PTN).

Early referral for discussion is recommended as many neonates requiring ECLS for respiratory support may need venoarterial (VA) support. Therefore, early transfer is paramount.

- ECLS consults/referrals should be made whenever there is a question that ECLS is a potential option of care or there is "failure to respond to conventional treatment".
- ECLS will be considered in children and neonates with potentially reversible respiratory failure and where the Oxygenation Index (OI) is >40.
- Consideration is made earlier when OI >30 if the patient is already on Nitric oxide and/or other modes of ventilation. (JET/HFOV) or the patient is located remotely.

$$OI = [FiO_2 (\%) \times \text{Mean Airway Pressure (mmHg)}] / PaO_2 (\text{mmHg})$$

Contraindications

- Irreversible lung disease
- Irreversible multi-organ dysfunction
- Brain death
- Contraindication to prolonged anticoagulation
- Prolonged mechanical ventilation at high pressures (>10days)
- Severely reduced long-term functional ability
- Patient is too small or premature for adequate vessel cannulation
- Futility
- Family directives to limit further intensive therapy

Transport and Management:

Transporting severely hypoxic or hypercarbic patients can be fraught with complications. Serial or duplicate transfers subject patients to increased risk of morbidity and mortality and should be avoided without appropriate staging and transport. Presently, the Royal Columbian Hospital provides the only ECLS retrieval program within BC. Developed to support patients within the FHA region, the Royal Columbian Hospital ECLS Program may initiate ECLS support at the referring institution, if patients are too unsafe to be transported conventionally. This care pathway is to be orchestrated through consultation with the critical care physician on-call.