

RTs and ECMO

Critical thinking in patient selection

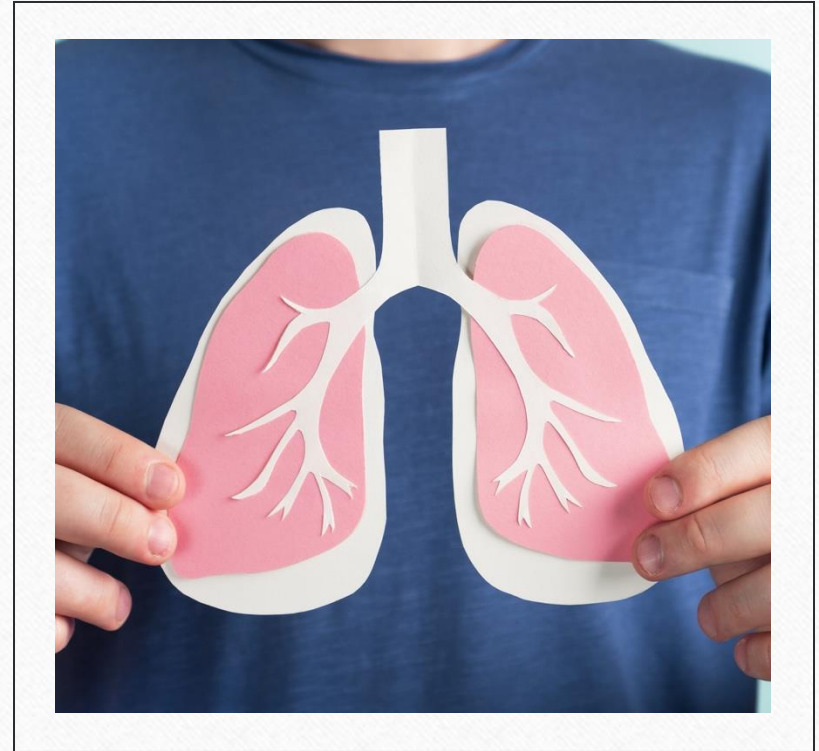
ABOUT THE PRESENTER

- **39 years Respiratory Therapist**
- **24 years ECMO Specialist**
- **17 years ECMO Educator**
- **8 years Simulation Coordinator – ECMO Advantage**
- **7 years PRN ECMO Specialist – Monroe Carell Jr. Children’s Hospital at Vanderbilt**



DISCLOSURES:

- I have nothing to disclose



RTs and ECMO

Critical thinking in patient selection

Objectives

- **Identify the key indications and contraindications for initiating ECMO in critically ill patients.**
- **Analyze patient-specific factors that influence the decision-making process for ECMO candidacy.**
- **Evaluate the role of the respiratory therapist in the multidisciplinary team during ECMO candidate assessment.**

3 Myths About ECMO

by Dr. John Mehall

1. ECMO is a drain on financial resources
2. ECMO is too complex
3. ECMO has poor survival

3 Myths About ECMO

by Dr. John Mehall

With improved ECMO survival rates, there is a significant opportunity to save lives that is currently being missed. It is estimated that as many as 1 million Americans could benefit from ECMO every year, yet only about 10,000 are receiving ECMO—this represents a mere 1% of the potential patient population! If even half of the 1 million potential patients received ECMO treatment, we could save 1,000 American lives every day.

Specific ECMO Contraindications

- Neonatal

- Lethal chromosomal disorder (13, 18)
- Severe brain damage
- Significant IVH (>grade III)
- Uncontrollable bleeding
- Vessels too small

- Neonatal Relative

- < 2 kg
- < 34 weeks

Specific ECMO Contraindications

- Pediatric

- Poor Prognosis from the primary disease
- Established multiorgan failure
- Severe pre-ECMO neurologic injury or intracranial hemorrhage
- Severe surgical or visceral bleeding
- Family preference

- Adult

- Irreversible underlying condition, anticipated non-recovery, and ineligible for organ transplant
- Irreversible neurologic injury
- Advanced age
- Prolonged mechanical ventilation
- Untreatable metastatic cancer

ECMO Indications

- The primary indication for ECLS is acute severe heart or lung failure with high mortality risk despite optimal conventional therapy. ECLS is considered at 50% mortality risk; ECLS is indicated in most circumstances at 80% mortality risk.



ECMO Indications

- Other elective indications include supporting heart and/or lung function during temporary nonfunction, such as extensive bronchoalveolar lavage, tracheal or mediastinal operations, or coronary artery occlusion during procedures.

Specific ECMO Indications

Patient and age group

Neonatal

- ✓ Inadequate tissue oxygen delivery despite maximal therapy
- ✓ Severe hypoxemic respiratory failure with acute decompensation
- ✓ Severe pulmonary hypertension

Pediatric - VV

- ✓ Reversible pathology, either known or suspected
- ✓ ECMO poses less risk than not providing ECMO.

Adult - VV

- ✓ Severe acute, reversible respiratory failure refractory to optimal medical management

ECMO Indications

What does all that mean?

Practically, what do indications look like?



Patient Evaluation

Neonatal

1. Inadequate tissue oxygen delivery despite maximal therapy
 - a. Increased lactate, worsening metabolic acidosis, signs of end-organ dysfunction
2. Severe hypoxic respiratory failure with acute decompensation ($PaO_2 < 40$)
3. OI with sustained elevation and no improvement
4. Severe pulmonary hypertension with evidence of right and/or left ventricular dysfunction
5. Vent settings exceeding $PIP < 26$, HFOV MAP 14-15, $pH > 7.2$

Patient Evaluation

Neonatal

1. Severe refractory systemic hypotension
2. Preductal desaturation with inability to recover
3. Rapid cardiovascular deterioration
4. Congenital heart defect

Patient Evaluation

Neonatal

- One of the primary indices in the neonatal populations
 - Oxygen Index ($\text{MAP} \times \text{FiO}_2 \times 100$)
 - An OI of 40 – 45 standard among many ECMO centers
 - OI 25 is more realistic with lung protective ventilation and iNO

Patient Evaluation

Pediatric

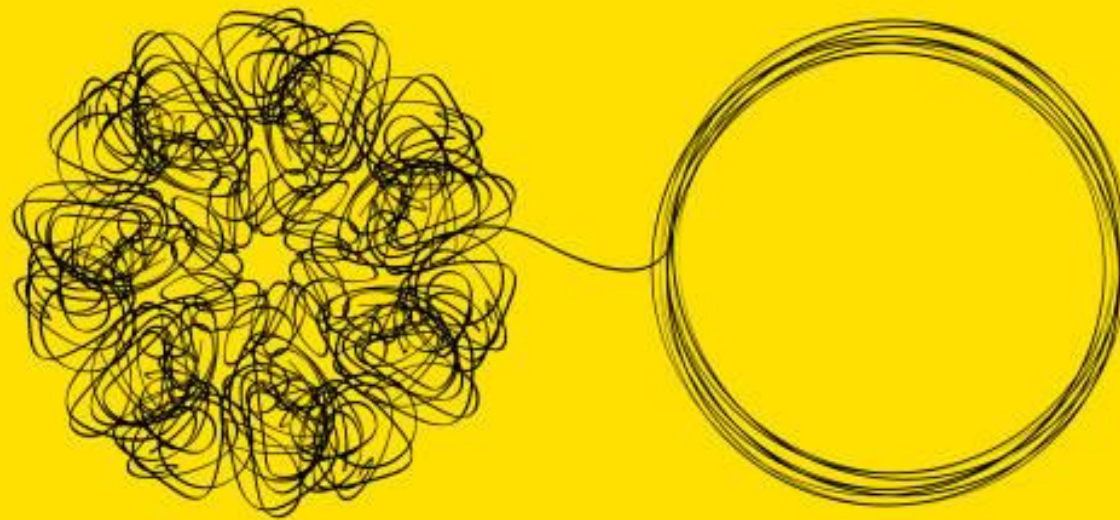
1. Severe PARDS where the cause is believed to be reversible or a candidate for transplantation or other destination therapies
2. Lung protective strategies result in inadequate gas exchange.
3. Persistent FiO_2 requirement $>60\%$
4. Persistent acidosis with hemodynamic or cardiac compromise
5. Congenital heart disease
6. Non-congenital and acquired heart disease
7. Bridge to VAD or transplantation
8. P/F ratio <100 , trajectory

Patient Evaluation

Adult

1. Failed conventional therapies despite optimization and remain at high risk for death
2. Potentially reversible cause of respiratory failure without comorbidities that limit short-term life expectancy
3. No contraindications to ECLS
4. Up to 7 days of invasive mechanical ventilation
5. ACS – acute coronary syndrome
6. P/F ratio < 100, Trajectory
7. Murray Score

Case Review



Case Review

Patient History

Admitted for progressive dyspnea and increasing respiratory failure. Working dx – Pneumonia.

CXR – bilateral shadowing in lower lung fields

ABG – 7.48, 38.5, 41.9, 78 %, Lac 5.2. Started on antibiotics.

H Day 5/1, massive atelectasis in both lungs, L-sided pneumothorax, R- mediastinal shift.

Transferred to MICU. Required deep sedation, intubated, chest tube. FiO₂ 0.5 – 0.8, PEEP 14, PSV 18, PIP 32. PaO₂ 94.

Echo Dilated aorta, LVEF 70%.

Day 10/5 Sudden deterioration - CXR expansion of the inflammatory process in the bilateral lower and middle lungs

Day 13/8 Decreased ventilation - FiO₂ 0.8 – 1.0, trached, CRRT for k 8.2 mmol/l, Cr 1.7

Case Review

Patient History

Day 16/11 – Due to growing signs of severe RF and multisystem organ failure, VV ECMO started.

Hospital stay

Total hospital days: 102 days

MICU days 63

ECMO days 22

Case Review

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Case Review Considerations

Non-ECMO Center

1. Distance to referral
2. Bed availability
3. Transport for ECMO
4. Cannulate and ship
5. The receiving hospital comes, cannulates, and transports back to the receiving facility.

ECMO Center

1. Bed availability
2. Timing

Patient Potential

DCD

EISOR

Acute liver failure

Drug overdose

Airway obstruction, repair

Liver transplant

References

- 1. <https://www.elsevier.com/locate/S0950268805001444>
- 2.