



## INDICATIONS FOR ECMO for ICU COVID-19 PATIENTS

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Note: There are no absolute contraindications to VV or VA ECMO. Each patient should be considered individually with respect to risks, benefits, and available resources.

### Indications

Veno-Venous (VV)	Veno-Arterial (VA)
<ol style="list-style-type: none"> <li>1. Hypoxic respiratory failure when predicted risk of mortality is 50% or greater (e.g., determined by SOFA, SAPS-2, APACHE score, etc.)*               <ol style="list-style-type: none"> <li>a. 50% mortality risk associated with PaO<sub>2</sub>/FiO<sub>2</sub> ratio &lt; 150 on FiO<sub>2</sub> &gt; 90%</li> <li>b. 80% mortality risk associated with PaO<sub>2</sub>/FiO<sub>2</sub> ratio &lt; 100 on FiO<sub>2</sub> &gt; 90%</li> </ol> </li> <li>2. CO<sub>2</sub> retention on mechanical ventilation despite high PPIt (&gt; 30 cm H<sub>2</sub>O) AND/OR pH &lt; 7.25*</li> <li>3. On ventilator &lt; 10 days**</li> <li>4. &lt; 65 years of age (see below)</li> </ol> <p><b>Advantages:</b></p> <ul style="list-style-type: none"> <li>• No ventricular support</li> <li>• Bedside application (percutaneous)</li> <li>• Improved oxygenation</li> <li>• Improved ventilation</li> <li>• "Lung Rest" (to allow lung to recover / prevent exposure to high, injurious pressures)</li> </ul>	<ol style="list-style-type: none"> <li>1. Inadequate tissue perfusion (hypotension, low cardiac output) despite adequate intravascular volume</li> <li>2. Persistent shock despite volume administration, inotropes and vasoconstrictors</li> <li>3. Anticipated COVID-19 cases: myocarditis, cardiomyopathy</li> <li>4. Septic shock is an indication in some centers</li> </ol> <p><b>Advantages:</b></p> <ul style="list-style-type: none"> <li>• Biventricular support</li> <li>• Bedside application (percutaneous)</li> <li>• Improved oxygenation</li> <li>• Hemodynamic support for persistent malignant arrhythmias</li> <li>• Heart failure <i>and</i> severe pulmonary failure</li> <li>• Bridge to recovery</li> </ul>

\*Despite optimization of mechanical ventilation (to include advanced mechanical ventilation such as airways pressure release ventilation [APRV]) AND despite attempts at rescue maneuvers (i.e., inhaled nitric oxide, inhaled epoprostenol, prone positioning, neuromuscular blockade)

\*\*Many institutions specify mechanical ventilation duration must be < 7 days

### Contraindications

Veno-Venous (VV)	Veno-Arterial (VA)
<ol style="list-style-type: none"> <li>1. Major pharmacological immunosuppression (absolute neutrophil count &lt; 400/mm<sup>3</sup>; lymphocyte count &lt; 1000/microliter)</li> <li>2. Central nervous system hemorrhage that is recent or expanding</li> <li>3. Non-recoverable comorbidity such as major CNS damage or terminal malignancy</li> <li>4. No specific age contraindication but increasing risk with increasing age; usual age cutoff varies by institution, most use either 65 or 70</li> </ol>	<ol style="list-style-type: none"> <li>1. Unrecoverable heart and not a candidate for VAD or transplant</li> <li>2. Advanced age</li> <li>3. Chronic organ dysfunction (emphysema, cirrhosis, renal failure)</li> <li>4. Prolonged CPR without tissue perfusion</li> <li>5. Relative: contraindication for anticoagulation (anticoagulation is generally far more important in VA compared to VV ECMO)</li> </ol>

Note: other potential exclusions are: severe underlying liver disease, acute hepatic failure, Jehovah's witness (unwilling to receive blood products), AIDS-related cause of respiratory failure, poor baseline functional status (i.e., severe COPD on home O<sub>2</sub> therapy)

### COVID-19 Specific Considerations

- Exclusions for COVID-19 during limited resources are hospital or region-specific.
- Because prognosis is worse with age, older age should be considered when balancing resource availability with potential to improve outcomes.
- Because prognosis is worse with time on invasive mechanical ventilation, patients on mechanical ventilation >7 days should be excluded (note: this is a general guideline which may not apply to specific COVID-19 patients depending on local circumstances)
- Renal failure is not an exclusion
- Use of ECMO in patients with a combination of advanced age, multiple co-morbidities, or multiple organ failure should be rare.

