



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"> 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"> a. 50% mortality risk associated with PaO₂/FiO₂ ratio < 150 on FiO₂ > 90% b. 80% mortality risk associated with PaO₂/FiO₂ ratio < 100 on FiO₂ > 90% 2. CO₂ retention on mechanical ventilation despite high PPIt (> 30 cm H₂O) AND/OR pH < 7.25* 3. On ventilator < 10 days** 4. < 65 years of age (see below) 	<ol style="list-style-type: none"> 1. Inadequate tissue perfusion (hypotension, low cardiac output) despite adequate intravascular volume 2. Persistent shock despite volume administration, inotropes and vasoconstrictors 3. Anticipated COVID-19 cases: myocarditis, cardiomyopathy 4. Septic shock is an indication in some centers
Advantages: <ul style="list-style-type: none"> • No ventricular support • Bedside application (percutaneous) • Improved oxygenation • Improved ventilation • "Lung Rest" (to allow lung to recover / prevent exposure to high, injurious pressures) 	Advantages: <ul style="list-style-type: none"> • Biventricular support • Bedside application (percutaneous) • Improved oxygenation • Hemodynamic support for persistent malignant arrhythmias • Heart failure <i>and</i> severe pulmonary failure • Bridge to recovery

*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"> 1. Major pharmacological immunosuppression (absolute neutrophil count < 400/mm³; lymphocyte count < 1000/microliter) 2. Central nervous system hemorrhage that is recent or expanding 3. Non-recoverable comorbidity such as major CNS damage or terminal malignancy 4. No specific age contraindication but increasing risk with increasing age; usual age cutoff varies by institution, most use either 65 or 70 	<ol style="list-style-type: none"> 1. Unrecoverable heart and not a candidate for VAD or transplant 2. Advanced age 3. Chronic organ dysfunction (emphysema, cirrhosis, renal failure) 4. Prolonged CPR without tissue perfusion 5. Relative: contraindication for anticoagulation (anticoagulation is generally far more important in VA compared to VV ECMO)

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 O₂ 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.

