COVID 19: ECMO Playbook

Eduardo Olivera, MD
Scott Silvestry, MD
Dr. Jason Johnson, MD
Mary Nelson, RN, BSN

PRE ECMO

REFRACTORY RESPIRATORY FAILURE MANAGEMENT

- Do not Delay intubation
- Optimize Mechanical Ventilation / ARDS Guidelines
- Utilize low tidal volume ventilation (6mls/kg or below)
- Minimize IV fluid administration (Fluid Sparing Resuscitation)
- Maximize PEEP/FIO2
- Prone ventilation
- ECMO

Mechanical ventilation optimization strategies

- 6ML/KG tidal volume maximum or less
- Favor volume control ventilation to ensure no more than 6ML/KG TV is given consistently.
- Low PEEP over High PEEP – Driving Pressure < 15
- Neuromuscular Blockers to induce paralysis and improve ventilator synchrony
- Minimize volume overload - CVP less than 8 if possible
- Prone positioning early.
  - Rotaprone: optional ($1000 day cost)
  - Manual prone positioning: preferred
- Corticosteroids when ARDS
  - Meduri vs Dexa
  - Use protocol as per COVID-19 Power Plan

- **Optional treatments that can transiently improve oxygenation but should not delay ECMO referral if indicated:**
  - Inhaled Flolan (Prostacyclin)
  - HFOV

Covid-19

When to consider V-V ECMO

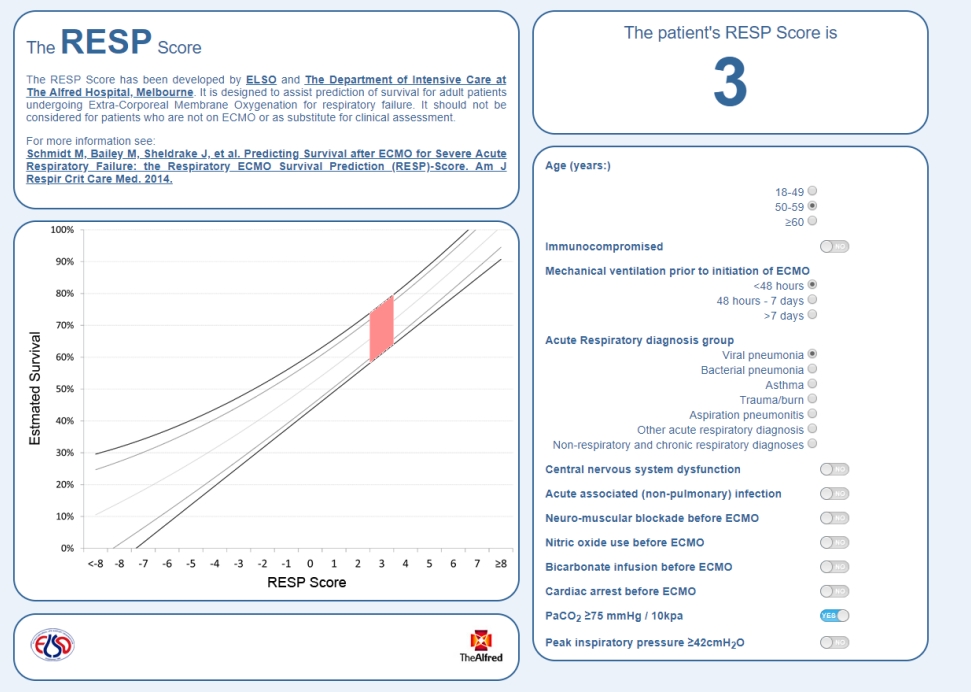
- P/F Criteria
  - PaO2/FiO2 <100 on FiO2 >90% for 12 hours + clinical judgement for early referral.
  - PaO2/ FiO2 ratio < 80 for 6 hours on FiO2 >90%.
  - PaO2 /FiO2 ratio <50 for 3 hours on FiO2 >90%.
- Ph<7.20 in spite of RR 35
- Inability to maintain plateau pressures < 30
- All other mechanical ventilation optimization measures have been deployed (prone, low tidal volume ventilation, PEEP/FIO2 optimization)

Resp Score and Survival

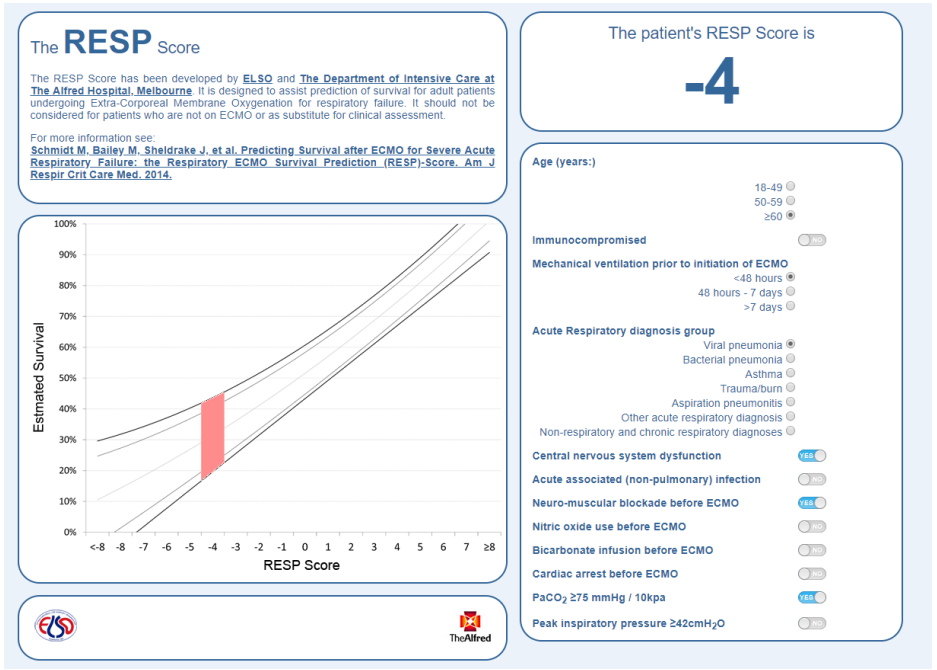
RESP Score	Risk class	In-hospital survival
≥6	I	92%
3-5	II	76%
-1 to 2	III	57%
-5 to -2	IV	33%
≤-6	V	18%

Resp Score (http://respscore.com/)

Likely to Benefit (60-75% survival)



Unlikely to Benefit (10 to 40% survival)



Covid-19

When to consider V-A ECMO

1. Cardiac/circulatory failure/Refractory cardiogenic shock.
2. Massive pulmonary embolism.
3. Cardiac arrest.

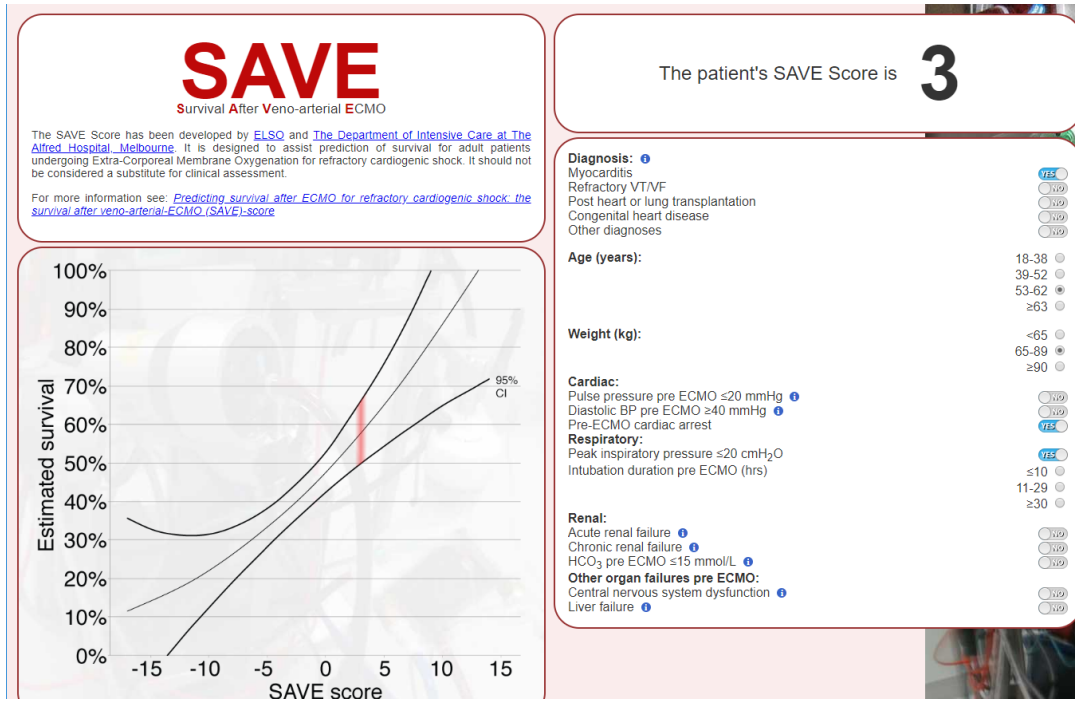
- VA ECMO will be reserved for patients with high chances of survival and on a case by case basis.
- ECPR is not advised on this patient population

Save Score Survival

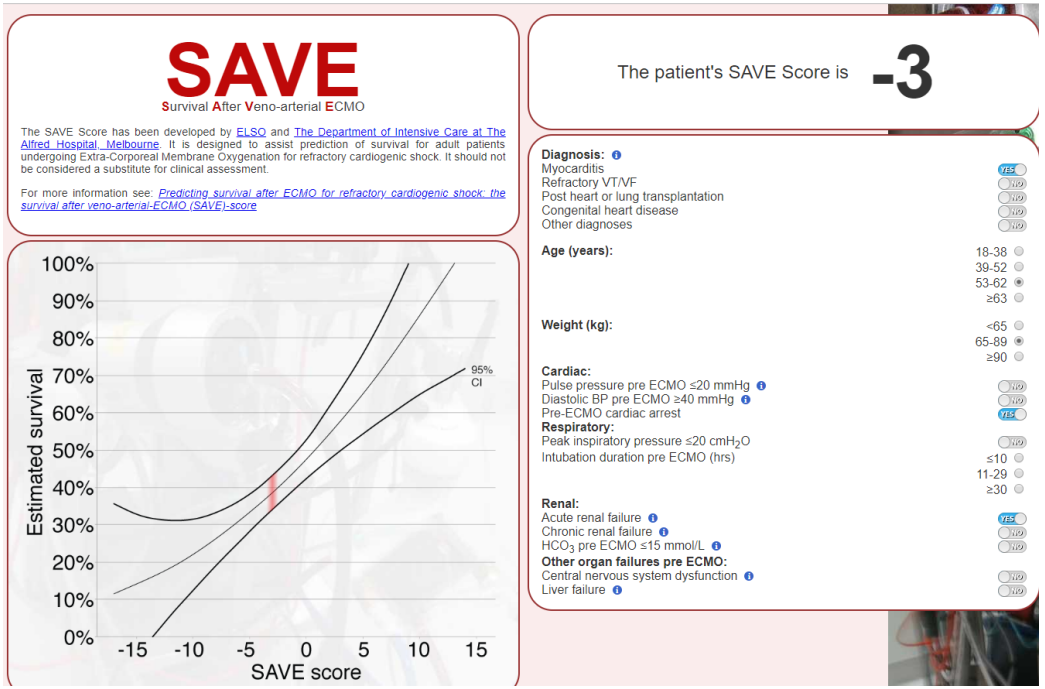
SAVE Score	Risk class	In-hospital survival
>5	I	75%
1 to 5	II	58%
-4 to 0	III	42%
-9 to -5	IV	30%
≤-10	V	18%

Save Score (http://save-score.com/)

Likely to Benefit (50-75% survival)



Unlikely to Benefit (35 to 40% survival)

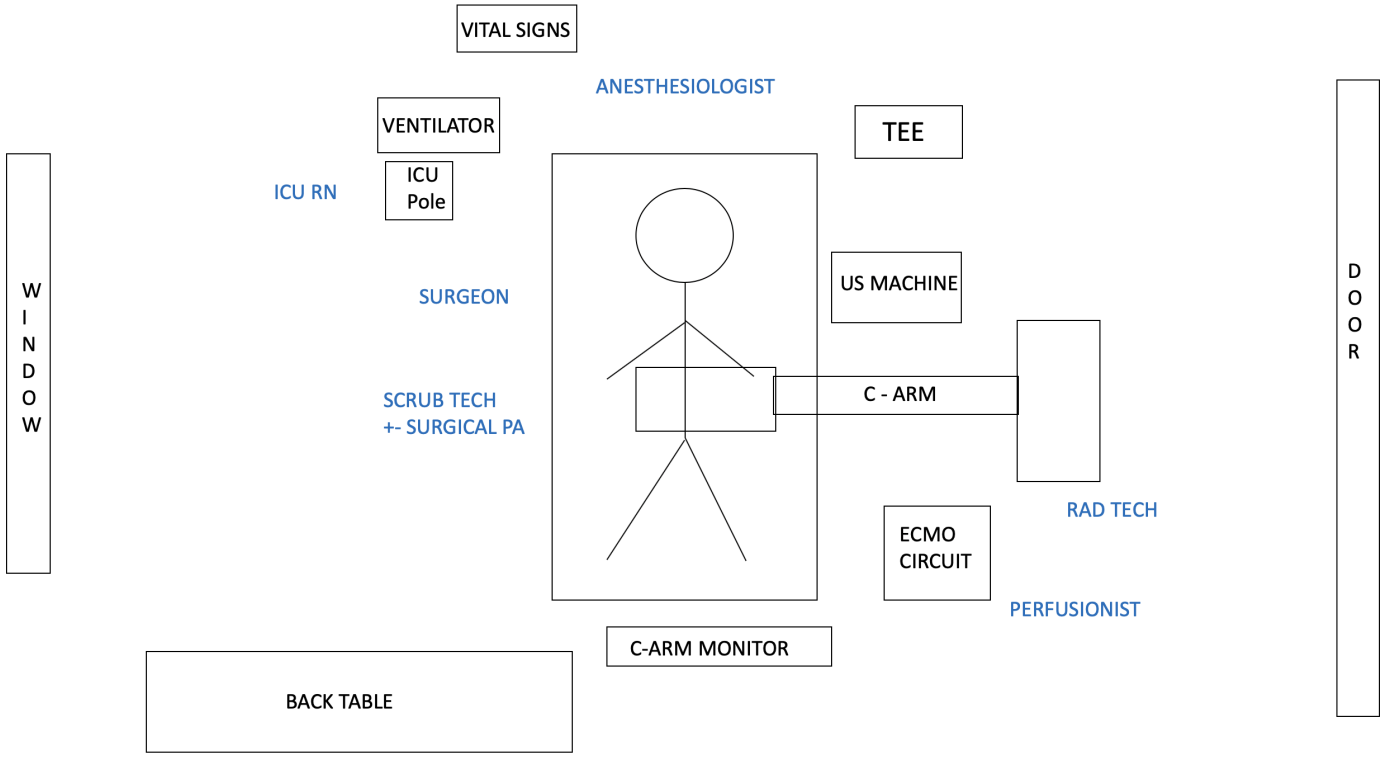


Relative/absolute contraindications (VV/VA)

- 1- The only absolute contraindication to ECMO is a pre-existing condition that is incompatible with recovery (severe neurologic injury, end stage malignancy).
- 2- Relative contraindications include:
  - Uncontrollable bleeding
  - Very poor prognosis from the primary condition.
  - Mech Vent > 7 days (VV outcomes are better when ECMO is instituted within seven days of intubation).
- Save/Resp score indicates very high mortality

ECMO CANNULATION

ECMO CANNULATION WILL TAKE PLACE IN THE ICU PROCEDURE ROOM

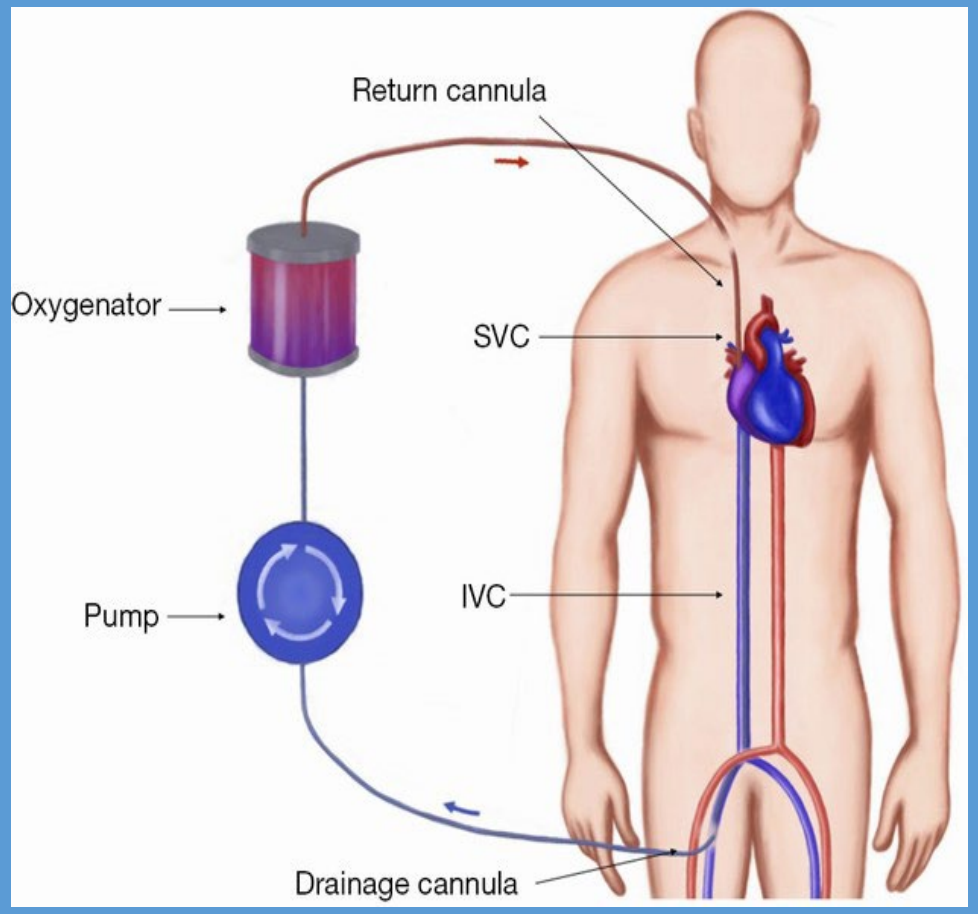


COVID-19
ECMO Cannulation in ACSU

Item	Initial When Completed
Call: • CVOR - **303-1971** • Perfusion – **609-1453** • Fluoro tech – **609-0851** • Covering CCM MD **Request 2 units of blood be ordered on ICE*	
OR Team to Bring: • OR ECMO Cart • Sterile Surgical Light Cover • Additional Lead Aprons • Bovie/Light Source • PPE • Heparin 10,000 units/10 mL Vial x 3 for Perfusion	
Relocate or Remove from Room: • Nurse Server • Unnecessary equipment/supplies	
Place in Room: • In-Touch Bed or Vascular OR Table • OR table for sterile prep • Ring Stand • Wet ECMO Circuit • Ultrasound machine with vascular probe • C-Arm • Bucket of Flushes/Syringes/Tubing/Blunt Needles • Medications as requested by MD	
Place Outside of Room: • Code Cart • OR ECMO Cart • ECMO Supply Cart • ECMO Initiation Cart • Lead Aprons • PPE and Sterile Gowns/Gloves for the team • Bovie/Light Source Cart	

Personnel Inside Room	Personnel Outside Room
• Anesthesia • Surgeon • Surgical PA • OR Scrub • Perfusionist • Bedside RN • Fluoro Tech • OR Circulator – during patient prep	• CCM MD • Pharmacist • OR Circulator – after patient prep • ANM/Charge • ECMO Specialist • Lead Respiratory Therapist

AdventHealth



Goals:

- Reduce Resources
- Reduce Exposure
- Reduce Travel and Travel Risks
- Reduce Anesthesia Time

Cannulation Strategy:

- Right Fem → RIJ
- 25/27 French Venous to 18/20 French Arterial

Anticoagulation:

- Heparin Bolus – as per protocol

Medications:

- Bolus Narcotics from the pump whenever possible
- Anesthesia to bring Rocuronium
  - RN to ensure dedicated line for IV Push

ECMO AND PATIENT MANAGEMENT

Medications

Antivirals:

- Per AH System Guidelines
- https://www.adventhealth.com/sites/default/files/assets/AdventHealth-Orlando-Treatment-Algorithm-COVID19-04-01-2020.pdf
- +/- Azithromycin

Severity Score	Treatment	Duration of Treatment*
0	Supportive care only - If clinically stable, consider discharge for self-quarantine.	N/A
1	First line: Hydroxychloroquine Second line: Lopinavir + ritonavir OR darunavir + ritonavir (based on supply and availability)	Minimum of 5 total days, may be extended up to 10 days total based on clinical progression
2-3	Hydroxychloroquine **AND/OR** Lopinavir + ritonavir OR darunavir + ritonavir (based on supply and availability)	10 days
≥4	Lopinavir + ritonavir OR darunavir + ritonavir (based on supply and availability) **AND** Hydroxychloroquine Alternative: Remdesivir (compassionate use only through emergency IND, restricted to ID) May also consider tocilizumab (restricted to ID for COVID-19)	10-14 days

Medications

Antithrombotic

- Heparin Gtt
  - PTT 70-90
  - Consider AntiXA
  - Monitor ATIII
- Aspin 81 mg Daily

Anti-inflammatory

- Zinc sulfate 220 mg PO Qday
- Lovaza 2 gm PO BID
- Ascorbic Acid 1000 mg PO Qday
- Tocilizumab 400 mg x 1 Dose – Must be ordered by ID

Other Medicine Considerations:

- IVIG
- Fish Oil

ICU BRONCHOSCOPIC PROCEDURES – COVID-19

- Invasive bronchoscopic procedures should be avoided due to risk of contamination. Consider alternative means of lower airway sampling such as:

- Mini-BAL

- Intubated patients: lower airway catheter succion sampling

- Sputum induction not recommended

- If bronchoscopy is required, the following procedures and precautions should be implemented:

- Only the minimal necessary staff should be present in the room during the procedure.
- Full barrier / contact precautions
- Utilize N95 masks or equivalent
- Keep the procedure time to a minimum
- Minimize cough. If patient is intubated, consider muscle paralysis to minimize cough
- Minimize ventilator circuit disconnect during the procedure
- Disposable Bronchoscopes preferred if available

COVID- 19 ICU RESOURCES

Society of Critical Care Medicine (SCCM) Resources	https://www.sccm.org/disaster
SCCM COVID 19 Resources	https://www.sccm.org/Blog/January-2020/Caring-for-Critically-Ill-Patients-with-Novel-Coro
ECMO Evaluation Resp Score	http://www.respscore.com/
ECMO Evaluation SAVE Score	http://save-score.com/
American Society Of Anesthesia (Intubation and Procedural Precautions)	https://www.asahq.org/about-asa/governance-and-committees/asa-committees/committee-on-occupational-health/coronavirus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