

# ECMO FUNDAMENTALS

by Nick Mark MD & Jonah Rubin MD


[onepagicu.com](https://onepagicu.com)  
 @nickmark  
 @JonahRubinMD  
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## PURPOSE & DEFINITIONS:

- ExtraCorporeal Membrane Oxygenation (ECMO) provides prolonged pulmonary and/or circulatory support by removing venous blood, pumping it across an artificial lung (oxygenator or membrane lung) for gas exchange, & returning it to the pt..
- **VV** ECMO: artificially oxygenated Venous blood is returned to the Venous side (right atrium), providing no circulatory support, & adding the artificial lung *in series* with the native lung.
- **VA** ECMO: artificially oxygenated Venous blood is returned to the Arterial side (aorta), providing circulatory support, and adding & artificial lung *in parallel* with the native lung.

## SETTINGS/MANAGEMENT:

- Cannula size/positioning
- Pump speed (RPM, flow)
- Sweep / Gas flow
- $F_{D}O_2$
- Alarm settings
- Anticoagulation strategy
- Transfusion/fluid goals
- Ventilator settings (to minimize VILI & prevent atelectasis)

Different **DRAINAGE & RETURN** configurations are possible. Choice depends on mode (VV vs VA), flow requirements, & patient anatomy. **The configuration here is VV ECMO.** (R femoral vein drainage and R IJ vein return)

## INDICATIONS:

- **VV**: [Refractory hypoxemia/mixed respiratory failure](#) used as a bridge to recovery or transplant
- **ECCO<sub>2</sub>R**: [Refractory hypercapnia](#) similar to VV but with lower flow/smaller sized cannula
- **VA**: Pulmonary & [Circulatory support](#) (VA) – cardiac arrest, overdose, massive PE, cardiogenic shock, etc. Used as a bridge to recovery, transplant, or destination device.

**ABG**  
 pH / PCO<sub>2</sub> / PaO<sub>2</sub> / HCO<sub>3</sub><sup>-</sup>  
**Pulse Ox**  
 SpO<sub>2</sub>

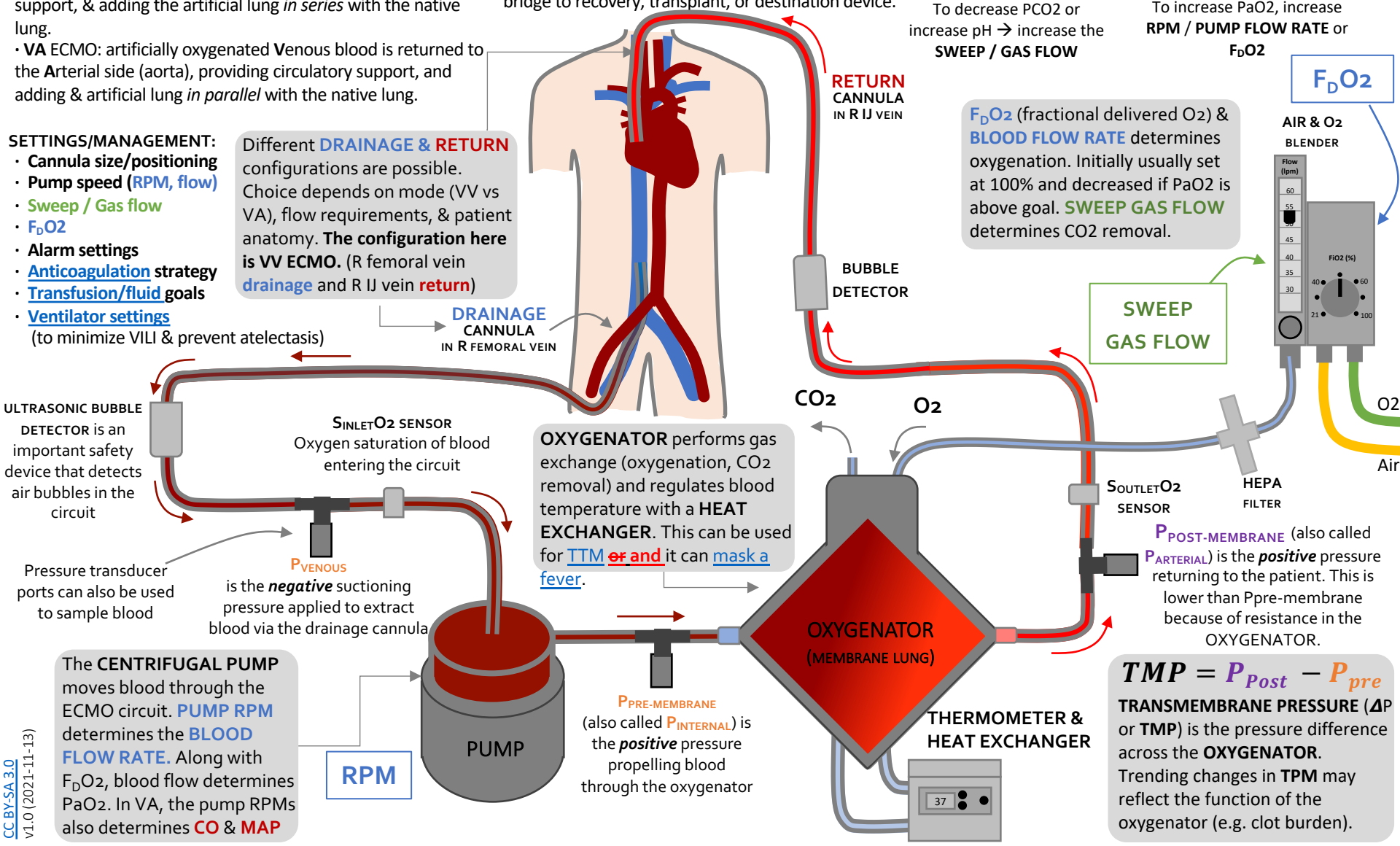
## VENTILATION

To decrease PCO<sub>2</sub> or increase pH → increase the **SWEEP / GAS FLOW**

## OXYGENATION

To increase PaO<sub>2</sub>, increase **RPM / PUMP FLOW RATE** or **F<sub>D</sub>O<sub>2</sub>**

**F<sub>D</sub>O<sub>2</sub>** (fractional delivered O<sub>2</sub>) & **BLOOD FLOW RATE** determines oxygenation. Initially usually set at 100% and decreased if PaO<sub>2</sub> is above goal. **SWEEP GAS FLOW** determines CO<sub>2</sub> removal.



**OXYGENATOR** performs gas exchange (oxygenation, CO<sub>2</sub> removal) and regulates blood temperature with a **HEAT EXCHANGER**. This can be used for **T<sub>TM</sub>** ~~or~~ and it can **mask a fever**.

**P<sub>POST-MEMBRANE</sub>** (also called **P<sub>ARTERIAL</sub>**) is the **positive** pressure returning to the patient. This is lower than P<sub>pre-membrane</sub> because of resistance in the OXYGENATOR.

**TMP = P<sub>Post</sub> - P<sub>pre</sub>**  
**TRANSMEMBRANE PRESSURE (ΔP or TMP)** is the pressure difference across the **OXYGENATOR**. Trending changes in **TPM** may reflect the function of the oxygenator (e.g. clot burden).