ECMO: Rapid Review **Twitter/Instagram: @emboardbombs**

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Introduction

When conventional CPR fails to revive a patient in cardiac arrest, extracorporeal membrane oxygenation (ECMO) emerges as a potential lifesaving intervention. Traditionally confined to intensive care units, ECMO is now being utilized in emergency departments for select cases of refractory cardiac arrest. This advanced technique involves diverting blood from the patient's body to an external machine that oxygenates it and removes carbon dioxide before returning it — effectively bypassing the heart and lungs. In essence, ECMO temporarily replaces the body's native cardiopulmonary function. In the context of cardiac arrest, ECMO provides hemodynamic stabilization, allowing medical teams crucial time to address reversible causes such as STEMI, pulmonary embolism, or drug overdose.[1,2] With this in mind, let's explore which patients are ECMO candidates, how it's performed in the ED, and just how successful ECMO is.

Indications for ECMO in the ED

Identifying appropriate candidates for ECMO is key for successful outcomes. The best outcomes are seen in patients who have had a witnessed cardiac arrest, received immediate high-quality CPR (ideally at the scene), and present to the ED with an initial shockable rhythm (remember - this means V-fib or pulseless V-tach!).2,3 Ideal candidates for ECMO are generally younger, otherwise healthy patients. Additionally, patients whose cardiac arrest is suspected to be due to a potentially reversible cause are more favorable candidates for ECMO.[4,5]

For example, an ideal ECMO candidate would be a 35-year-old male with no significant past medical history who collapses in a public place due to a V-fib arrest. Bystander CPR is started immediately, EMS arrives within minutes, and the patient is transported to the ED with ongoing mechanical CPR. Given the short downtime, witnessed arrest, shockable rhythm, and presumed reversible etiology, the ECMO team can very likely be activated and cannulation can be initiated in the ED.

Implementing ECMO in the ED

The successful deployment of ECMO in the ED hinges on several critical steps:
Early Identification: as we discussed above, rapid recognition of patients who may benefit from ECMO is essential![6,7]
Team Activation: initiating ECMO requires a coordinated, multidisciplinary team, including emergency physicians, cardiologists, perfusionists, and critical care specialists. Depending on the ED protocols, often a consult to the ECMO team is placed when ECMO is even considered as a potential intervention. From there, the teams will work together and decide on the utility of ECMO and potential benefit of cannulation.[8,9]

Cannulation: once ECMO is chosen as the avenue of treatment, veno-arterial ECMO (VA-ECMO) is typically employed in cardiac arrest scenarios. This involves the insertion of cannulas into the femoral vein and artery to facilitate extracorporeal circulation.3,10
Continued Resuscitation: while cannulation and ECMO are performed, ongoing resuscitative efforts should not be stopped! Continuation of CPR, pressor use, and all other adjunct ACLS therapies are crucial to continue supporting organ perfusion. ECMO does NOT replace standard ACLS measures![11,12]

Contraindications and Considerations

Unfortunately, ECMO is not suitable for all patients. Absolute contraindications include:

- prolonged downtime (think > 60 minutes without ROSC)
- severe or irreversible baseline comorbidities
- known DNR status
- severe anoxic brain injury prior to ECMO initiation

Relative contraindications include unwitnessed cardiac arrest, active bleeding or coagulopathy, irreversible multi-organ failure, and advanced age - especially when combined with poor baseline functional status.4,5,13,14
These factors are associated with significantly diminished likelihood of survival and increased complications. As such, institutions offering ECMO must have clear protocols to guide clinical decision-making and ensure appropriate use of this resource-intensive therapy.[14,15]

Outcomes of ECMO Initiation in the ED

The effectiveness of ECMO for cardiac arrest depends on a wide array of factors, including optimal patient selection, time to cannulation, and post-resuscitation care. Studies have found that ECMO-facilitated resuscitation can improve survival rates and neurological outcomes in these carefully selected patients.16,17 When implemented in well-resourced centers with trained personnel,

ECMO can significantly increase the likelihood of survival and favorable neurological outcomes compared to conventional ACLS alone.[7,15] Conversely, patients with prolonged no-flow or low-flow times, advanced age, or irreversible causes of arrest tend to have poorer prognoses, even with ECMO.[10,12,18]

Despite its promise, ECMO is highly invasive and carries substantial risks. It remains a highly resource-intensive therapy with potential for complications such as bleeding, limb ischemia, and infection3,18. Institutions that incorporate ECMO into emergency cardiac arrest protocols must commit to rigorous patient selection and post-arrest care to optimize its benefits.[15,16]

Key Takeaways

ECMO should be considered for young patients experiencing witnessed, refractory cardiac arrest due to a reversible cause. Early recognition and prompt activation of the ECMO team are vital. However, ECMO is resource-intensive, requiring specialized equipment and trained personnel, and is not appropriate for all cardiac arrest cases. Patients with poor neurological prognosis or irreversible diseases are generally not suitable candidates.

While ECMO is not a universal remedy, in appropriately selected patients, it can mean the difference between death and survival with good neurological recovery. Understanding the indications, advocating for early activation, and being prepared are essential - because when all else fails, ECMO might be the only way forward.

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