

ECMO: Current Trends and Future Direction

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Objectives:

- Discuss recent trends in extracorporeal membrane oxygenation, including caseload, changes in circuit design, and patient management.
- Discuss the future direction of extracorporeal membrane oxygenation

Extracorporeal membrane oxygenation (ECMO) has been used to treat short-term cardiac and/or respiratory failure since the early 1970s. The use of ECMO remained relatively uncommon until the 1990s. The Extracorporeal Life Support Organization patient registry shows a dramatic increase in the use of ECMO since the early 1990s, with a more rapid increase beginning around 2009. The increase in ECMO during this time may largely be attributed to positive results from trials investigating the use of ECMO in patients suffering from influenza. However, there have also been changes in both the knowledge base and the technology surrounding ECMO in recent years, encouraging more widespread use of ECMO. Probably the most dramatic change in ECMO in recent years has been the improvement in oxygenator design. Oxygenators have become simpler, smaller, more efficient, and more reliable. With these improvements in oxygenator design, there has been a simplification of the overall ECMO circuit with fewer accessories. The most modern ECMO circuits include a “blood in, blood out” philosophy with only few circuit access points. The simplification of circuits has also led to safely supporting patients on ECMO without anticoagulation for periods of time. Circuits and systems have become smaller and more portable, allowing for easier inter- and extra-facility transport of patients. The simpler circuits also require less-skilled personnel to monitor the systems, and the ability to reduce the staff required to monitor ECMO units. Contemporary ECMO includes patients that are potentially extubated, awake, and ambulatory, particularly for longer-term respiratory ECMO therefore reducing traditional deconditioning associated with life support. Improvements in cannula design and cannulation methods, including hybrid schemes, have also become more common. “Pumpless” ECMO and “respiratory dialysis”, both forms of low flow arteriovenous ECMO, are growing in popularity for patients with hypercapnic respiratory failure. The future of ECMO largely depends on the emergence of new technology, much of which has already been developed or is in the initial stages of development. Future ECMO circuits likely include a further simplification of circuits, increased portability, and automation, potentially allowing for increased use in austere environments. These types of improvements would likely be associated with further reduction in required anticoagulation parameters, decreased inflammatory response, and reduced monitoring requirements at a higher cost.