Critical Care Medicine
XXX 2025 • Volume 53 • Number 00 • Pages XX–XX

REVIEW ARTICLE

Pharmacological Research Agenda on Adult Extracorporeal Membrane Oxygenation Using the Delphi Method: A Position Article of the Extracorporeal Membrane Oxygenation Pharmacology Network

OBJECTIVES: Extracorporeal membrane oxygenation (ECMO) is a critical intervention for patients with severe cardiac or respiratory failure. However, pharmacological management for ECMO-supported patients presents unique challenges due to alterations in drug pharmacokinetics and pharmacodynamics induced by the ECMO circuit and underlying critical illness. This position paper identifies key research priorities in ECMO pharmacology using a structured Delphi consensus process and provides a focused review of current evidence and knowledge gaps to inform future research and clinical practice.

DATA SOURCES: An international panel of 25 ECMO pharmacology experts from 13 countries representing the ECMO Pharmacology Network contributed to this position article. Literature was reviewed to summarize current evidence and identify knowledge gaps in ECMO pharmacology.

STUDY SELECTION: The Delphi process involved iterative, anonymous voting by the expert panel to propose key research priorities. Items selected were based on their perceived importance to improving clinical outcomes and advancing pharmacological management in ECMO-supported patients.

DATA EXTRACTION: Key research priorities were identified, and a detailed literature review was conducted for each, focusing on pharmacokinetics/pharmacodynamics, related therapeutic challenges, and knowledge gaps. Future research directions were outlined.

DATA SYNTHESIS: Six critical ECMO pharmacotherapy research priorities were identified: 1) pharmacokinetics/pharmacodynamics reporting, 2) interactions between ECMO and renal replacement therapy, 3) antimicrobial dosing, 4) analgesia and sedation for pain and agitation, 5) sedation and neuromuscular blocking agents for increased work of breathing, and 6) anticoagulation. The review for the key research priorities highlighted substantial gaps in the existing literature, emphasizing the need for comprehensive studies addressing these issues to enhance pharmacotherapy in ECMO patients, improve clinical outcomes, and contribute to the development of evidence-based guidelines for this complex population.

CONCLUSIONS: ECMO presents unique challenges to drug pharmacokinetics and pharmacodynamics, complicating pharmacotherapy in critically ill patients. Further research addressing identified gaps is essential to develop evidence-based treatment strategies and enhance patient outcomes.

KEYWORDS: extracorporeal membrane oxygenation; network; pharmacodynamics; pharmacokinetics; position paper

Diana Morales Castro, MD[1]
Abdulrahman Abdullah Al-Fares, MD[2]
Gianluca Paternoster[3]
Haifa Lyster, PhD[4]
Benjamin Hohlfelder, PharmD[5]
Julian Arias Ortiz, MD[6]
Mohd Hafiz Abdul-Aziz, PhD[7]
Daniel Herr, MD[8]
Rawan Alraish, MD[9]
Andrés Ferre Contreras, MD[10]
Marcela Palavecino, PharmD[11]
Luigi Milella, PharmD[12]
Kevin Watt, MD[13]
Afrah Alkazemi, PharmD[14]
Federico Carlos Carini, MD[15]
Jason A. Roberts, PhD[16,17,18,19]
Jordi Riera del Brio, MD[20,21]
Alba Pau Parra, MD[22]
Vivek Kakar, MD[23,24]
Pauline Dureau, MD[25]
Marc-Alexandre Duceppe, PharmD[26,27]
Mark Alm, MSc[28]
Stephanie Cha, MD[29]
Kiran Shekar, PhD[30]
Amy L. Dzierba, PharmD[31]
on behalf of the Extracorporeal Membrane Oxygenation Pharmacology Network (ECMOPharm Net)

DOI: 10.1097/CCM.0000000000006806