ECMO/Critical Care for the Beginner reading list

Books

Critical Care Secrets (6^{th} ed.)
by Parsons, Polly E.

ECMO in the adult patient
by Vuylsteke, Alain

Articles

Van Kiersbilck, C., et al. (2016) "Ten things that nurses should know about ECMO." Intensive Care Med **42(5)**: 753-755 DOI: https://doi.org/10.1007/s00134-016-4293-8

Venovenous extracorporeal membrane oxygenation (VVECMO) is a potent salvage therapy for ARDS patients who remain severely hypoxemic despite the use of more conventional treatments. In a study done in the UK, VVECMO improved the outcome of severe ARDS patients. Critically ill patients require a high degree of acute care resources and nurses who have specialized knowledge and skills. Education and preparation beyond their basic nursing degree is therefore mandatory in order to provide an optimal level of care. In this short review, we describe ten important tips for nurses caring for patients receiving ECMO.

Makdisi G., & Wang, I. (2015) "Extra Corporeal Membrane Oxygenation (ECMO): review of a lifesaving technology." Journal of Thoracic Disease **7(7)**: E166-E176 DOI: http://doi.org/10.3978/j.issn.2072-1439.2015.07.17

Extra Corporeal Membrane Oxygenation (ECMO) indications and usage has strikingly progressed over the last 20 years; it has become essential tool in the care of adults and children with severe cardiac and pulmonary dysfunction refractory to conventional management. In this article we will provide a review of ECMO development, clinical indications, patients' management, options and cannulations techniques, complications, outcomes, and the appropriate strategy of organ management while on ECMO.

Tramm, R., et al. (2015) "Extracorporeal membrane oxygenation for critically ill adults." Cochrane Database of Systematic Reviews DOI: https://doi.org/10.1002/14651858.CD010381.pub2

Extracorporeal membrane oxygenation (ECMO) is a form of life support that targets the heart and lungs. Extracorporeal membrane oxygenation for severe respiratory failure accesses and returns blood from the venous system and provides non-pulmonary gas exchange. Extracorporeal membrane oxygenation for severe cardiac failure or for refractory cardiac arrest (extracorporeal cardiopulmonary resuscitation (ECPR)) provides gas exchange and systemic circulation. The configuration of ECMO is variable, and several pump-driven and pump-free systems are in use. Use of ECMO is associated with several risks. Patient-related adverse events include haemorrhage or extremity ischaemia; circuit-related adverse effects may include pump failure, oxygenator failure and thrombus formation. Use of ECMO in newborns and infants is well established, yet its clinical effectiveness in adults remains uncertain. The primary objective of this systematic review was to determine whether use of veno-venous (VV) or venous-arterial (VA) ECMO in adults is more

effective in improving survival compared with conventional respiratory and cardiac support. We included four RCTs that randomly assigned 389 participants with acute respiratory failure.

Kaeier, K., et al. (2019) “Impact of mechanical ventilation on the daily costs of ICU care: a systematic review and meta regression.” Epidemiology and infection **147** e314 DOI: https://doi.org/10.1017/S0950268819001900

The impact of mechanical ventilation on the daily costs of intensive care unit (ICU) care is largely unknown. We thus conducted a systematic search for studies measuring the daily costs of ICU stays for general populations of adults (age ≥18 years) and the added costs of mechanical ventilation. The relative increase in the daily costs was estimated using random effects meta regression. The results of the analyses were applied to a recent study calculating the excess length-of-stay associated with ICU-acquired (ventilator-associated) pneumonia, a major complication of mechanical ventilation. The search identified five eligible studies including a total of 54 766 patients and ~238 037 patient days in the ICU. Overall, mechanical ventilation was associated with a 25.8% (95% CI 4.7%-51.2%) increase in the daily costs of ICU care. A combination of these estimates with standardised unit costs results in approximate daily costs of a single ventilated ICU day of €1654 and €1580 in France and Germany, respectively. Mechanical ventilation is a major driver of ICU costs and should be taken into account when measuring the financial burden of adverse events in ICU settings.

Combes, A., et al. (2014) “Position paper for the organization of extracorporeal membrane oxygenation programs for acute respiratory failure in adult patients.” American journal of respiratory and critical care medicine **190(5)** 488-496 DOI: http://doi.org/10.1164/rccm.201404-0630CP

The use of extracorporeal membrane oxygenation (ECMO) for severe acute respiratory failure (ARF) in adults is growing rapidly given recent advances in technology, even though there is controversy regarding the evidence justifying its use. Because ECMO is a complex, high-risk, and costly modality, at present it should be conducted in centers with sufficient experience, volume, and expertise to ensure it is used safely. This position paper represents the consensus opinion of an international group of physicians and associated health-care workers who have expertise in therapeutic modalities used in the treatment of patients with severe ARF, with a focus on ECMO. The aim of this paper is to provide physicians, ECMO center directors and coordinators, hospital directors, health-care organizations, and regional, national, and international policy makers a description of the optimal approach to organizing ECMO programs for ARF in adult patients. Importantly, this will help ensure that ECMO is delivered safely and proficiently, such that future observational and randomized clinical trials assessing this technique may be performed by experienced centers under homogeneous and optimal conditions. Given the need for further evidence, we encourage restraint in the widespread use of ECMO until we have a better appreciation for both the potential clinical applications and the optimal techniques for performing ECMO.

Tonelli, M. R. (2012) “An official multi-society statement: the role of clinical research results in the practice of critical care medicine.” American journal of respiratory and critical care medicine **185(10)** 1117-1124 DOI: https://doi.org/10.1164/rccm.201204-0638ST

While the results of rigorous clinical research are important in arriving at the best course of action for an individual critically ill patient, other forms of medical knowledge, including clinical experience and pathophysiologic reasoning, remain essential. No single source of knowledge is sufficient to guide clinical

decisions, nor does one kind of knowledge always take precedence over others. Clinicians will find clinical research compelling for a variety of reasons that go beyond study design. While clinical practice guidelines and protocols based upon clinical research may improve care and decrease variability in practice, clinicians must be able to understand and articulate the rationale as to why a particular protocol or guideline is used or why an alternative approach is taken. Making this clinical reasoning explicit is necessary to understand practice variability. Understanding the strengths and weaknesses of different kinds of medical knowledge for clinical decision making and factors beyond study design that make clinical research compelling to clinicians can provide a framework for understanding the role of clinical research in practice.