

LESS IS MORE IN ICU



Less is More: not (always) simple—the case of extracorporeal devices in critical care

Eddy Fan^{1,2,3*} and Christian Karagiannidis^{1,2,3}

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The history of critical care is littered with examples of the “cost” of trying to normalize abnormal physiology during critical illness in the attempt to improve outcomes—supranormal oxygen delivery, liberal red cell transfusion, ventilation to normal blood gas parameters, and intensive glycemic control [1]. This sobering list of “failed” critical care interventions has bolstered the call for “Less is More” in the intensive care unit (ICU), as has been done in other medical specialties [2]. Indeed, the Critical Care Societies Collaborative have endorsed a list of five low-value care propositions as a part of broader choosing wisely initiative of the American Board of Internal Medicine (ABIM) Foundation. In fact, many of these evidence-based recommendations promulgating restraint have been associated with improved outcomes.

Extracorporeal membrane oxygenation (ECMO) is a complex, costly, and resource-intensive intervention for patients with severe cardiac and/or pulmonary failure. ECMO has emerged as a promising intervention that may provide more efficacious supportive care to these patients (Fig. 1). Improvements in technology have made ECMO safer and easier to use, allowing for the potential of more widespread application in patients with cardiopulmonary failure. Over the last decade, its use in adults has grown exponentially [3, 4]. This represents an important economic as well as technical challenge to health systems facing aging populations and increasing shortages in funding. In many respects, ECMO represents the antithesis of the “Less is More” movement in critical care.

In patients with severe acute respiratory distress syndrome (ARDS), venovenous (VV) ECMO is associated

with improved outcomes [5–7]. In contrast, epidemiological data from Germany [4] and the US [3] demonstrate mortality rates for patients treated with ECMO that are higher than the control group without ECMO in the EOLIA trial [5]. Paradoxically, one could speculate that “Less is More” may have led to a reduction in “real-world” mortality. However, individual decisions in patients regarding ECMO therapy are often not that simple and, for clinicians, “doing something”, even with a likelihood of a poor outcome, is sometimes preferred to “doing nothing”. Indiscriminate use of “salvage” ECMO, where clinicians initiate ECMO when refractory, life-threatening hypoxemia, or other severe decompensation occurs despite conventional, evidence-based interventions, may lead to substantial increases in resource utilization without any meaningful change in outcomes [8]. The results of the EOLIA trial support the use of early ECMO. Once critically ill patients cross the salvage “event horizon” (e.g., develop refractory multiorgan failure), otherwise, efficacious therapies are likely to be futile. Finally, the highest mortality rates for patients supported with ECMO (or who are critically ill in general) are those who are more than 75 years and/or are frail, making these important factors when considering whether to offer ECMO to these patients.

Given these benefits, it is difficult to dismiss ECMO completely for certain subgroups of patients. Importantly, ECMO is associated with a number of potential complications, and there is a paucity of data regarding the long-term outcomes of patients supported with ECMO [10]. Finally, as the technology continues to evolve to become simpler, safer, and less costly, extracorporeal support may eventually shift the paradigm for optimal support in patients with respiratory failure away from mechanical ventilation and its associated complications. Indeed, ECMO is becoming the preferred support modality in patients with cardiogenic shock requiring

*Correspondence: eddy.fan@uhn.ca

² Toronto General Hospital, University Health Network, 585 University Avenue, PMB 11-123, Toronto, ON M5G 2N2, Canada

Full author information is available at the end of the article

The Evolving Paradigm of Extracorporeal Support for Adults with Acute Respiratory Failure

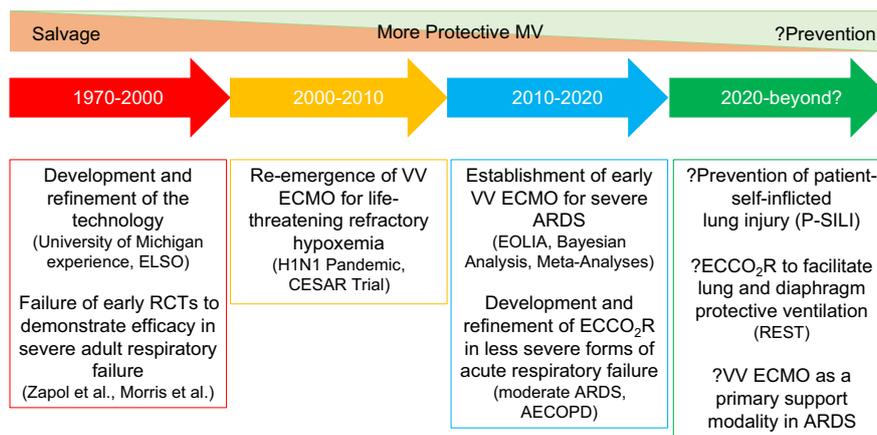


Fig. 1 The evolving paradigm of extracorporeal support for adults with acute respiratory failure

temporary mechanical circulatory support [11] or as a bridge to lung transplantation [9].

Critical care costs account for nearly 1% of GDP in the United States [13], and ECMO is a good example of a high-cost intervention delivered in the ICU. However, despite its high cost, VV ECMO may be cost-effective in certain patient populations and, therefore, represent a high value intervention [10, 11]. Indeed, with an incremental cost-effectiveness ratio (ICER) of \$36,000 per quality-adjusted life year (QALY), VV ECMO for severe ARDS has a lower ICER than other interventions commonly accepted as good value for money, such as dialysis for end-stage renal failure (ICER ~\$50,000–\$100,000/QALY). Therefore, clinicians working in centers providing ECMO can adhere to the principles of “Less is More” by being judicious and evidence-based in their use of ECMO. It is important to reinforce the need to use less risky and invasive evidence-based interventions before resorting to ECMO, which is currently not first-line therapy for any indication [1]. Patients getting “more of the stuff that costs more, but not more of what they needed” will quickly lead to high-cost, low-value, low-quality care. There is currently insufficient evidence for the rapid and widespread adoption of ECMO for many indications [e.g., extracorporeal CPR (ECPR)], more rigorous data are needed [12]. Low flow extracorporeal CO₂ removal (ECCO₂R) devices may prevent the need for intubation, or facilitate more rapid extubation, and early ambulation in patients with severe acute exacerbations of chronic obstructive pulmonary disease. [13] ECCO₂R may also play a role in reducing the intensity of mechanical ventilation required in patients with ARDS, resulting

in less (iatrogenic) ventilator-induced lung injury, leading to better outcomes [14]. These hypotheses are being testing in a number of ongoing clinical trials. Moreover, preventing the inevitable indication “creep”, whereby ECMO begins to be offered to patients who would not traditionally qualify for the intervention. The motivations for this adoption are unclear—the allure of new technology, financial (reimbursement) incentives, and perceived prestige for the hospital/institution. Finally, ECMO is not only costly and resource intensive, but can also be psychologically challenging, particularly for bedside ICU nurses. In situations, where ECMO represents a potentially inappropriate intervention or a “bridge to nowhere”, high psychological stress will increase, resulting in challenges in maintaining the most important human resource in the ICU [15]. Using a “Less is More” approach might be a key strategy to prevent burnout in ICU nurses moving forward.

To many, ECMO represents a perfect example in the ICU of “More is More”. Given the potential risks associated with ECMO, it is critical that patients (or their surrogates) have engaged in shared-decision making regarding its use, the development and use of evidence-based decision aids may also help to ensure rational use in these situations [16]. Finally, it is incumbent on all members of the health system to continually evaluate objective data from providers of high-cost, resource-intensive procedures such as ECMO, to ensure that the best possible outcomes are being obtained for the investments being made. An important consequence of high-cost, low-value care is opportunity costs, money and resources are taken away from other worthy, and more valuable, healthcare

goods, and services [17]. High-quality disease- and/or device-specific registries, such as from the Extracorporeal Life Support Organization (ELSO; www.elseo.org), may be helpful in this regard. In the end, while “Less is More” may not seem to apply to ECMO, it is even more critical that we are both “choosing and spending wisely” for improved outcomes in the critically ill.

Author details

¹ From the Interdepartmental Division of Critical Care Medicine and the Institute of Health Policy, Management and Evaluation, University of Toronto, Toronto, Canada. ² Toronto General Hospital, University Health Network, 585 University Avenue, PMB 11-123, Toronto, ON M5G 2N2, Canada. ³ Department of Pneumology and Critical Care Medicine, Cologne-Merheim Hospital, ARDS and ECMO Centre, Kliniken der Stadt Köln gGmbH, Witten/Herdecke University Hospital, Cologne, Germany.

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