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## Commentary: To ECMO or not to ECMO: That is the question

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In the current issue of the *Journal*, Hayanga and colleagues<sup>1</sup> use the Nationwide Inpatient Sample database to assess hospital charges and outcomes after extracorporeal membrane oxygenation (ECMO) in more than 15,000 patients based on indication and time period. ECMO in the perioperative period for heart (HT) and lung transplant (LT) resulted in the longest length of stay and duration of ECMO support and, not surprisingly, carried the greatest charges per patient by far (~1.5 million USD). ECMO for postcardiotomy shock (PCS) and cardiogenic shock (CS) resulted in shorter length of stay and duration of ECMO support and carried lower per-patient charges. However, cumulative charges were greatest for PCS and CS due to the significantly greater overall use of ECMO for these indications. Furthermore, in-hospital mortality was greatest for these latter indications. This study raises several cost-effectiveness and ethical considerations that must be eventually incorporated into decision making with regards to ECMO use.

ECMO can provide lifesaving potential in the setting of otherwise-fatal cardiac or respiratory failure. However, the significant costs, resource use, and prolongation of futility with the associated emotional burden placed on family are major drawbacks.<sup>2</sup> Although such scenarios were once anecdotal rare events, they are now commonplace. Recent attempts to alter ECMO reimbursement highlight the increasing burden placed on the health care

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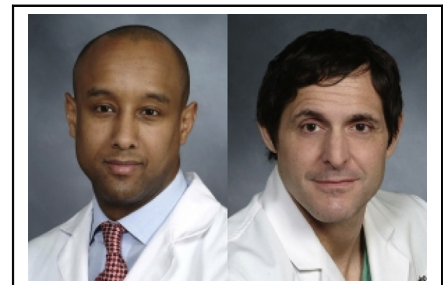
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### CENTRAL MESSAGE

Given the significant costs of extracorporeal membrane oxygenation and the highly variable outcomes associated with this heroic therapy, standardization of indications and management is mandatory.

economy by the proliferation of ECMO use.<sup>3</sup> In the setting of PCS after elective heart surgery and primary graft dysfunction after HT and LT, ethical considerations may frequently “mandate” ECMO support when needed in patients who were otherwise “good enough” to take to the operating room in the first place, hence these being the original indications for ECMO. However, in the growing population of patients with CS and acute respiratory failure in whom iatrogenic etiologies are less frequently in play, more conventional algorithms incorporating risk/benefit and cost-effectiveness may be applied to ECMO use more liberally.<sup>4-6</sup>

The current study highlights the discrepancies in cost effectiveness of current ECMO practices, as the greatest cumulative charges are seen in patients with the greatest mortality (PCS and CS). However, several significant limitations exist as noted by the authors, including lack of any granularity of data with use of an administrative dataset such as the Nationwide Inpatient Sample (ie, patients with veno-arterial and veno-venous ECMO are not differentiated). Furthermore, hospital charges, not ECMO costs, are analyzed. This is the most significant limitation, as ECMO use likely contributes a small fraction to the cost of a HT or LT hospitalization, whereas it may significantly increase the cost of a CS or acute respiratory failure hospitalization. In the absence of cost data, incremental charges associated with ECMO

(compared with patients with similar disease states not treated with ECMO) may be more relevant. Regardless, standardization of ECMO indications, management, and criteria for and timing of withdrawal of care in the setting of futility are desperately needed in this era of ECMO expansion.

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