need clearly exists for additional research based on multi-center collaboration. Mock circulation studies and computational analyses that quantitatively describe the complex interactions of ECMO flow coupled with the effects of an Impella or an IABP are other promising approaches to guide research in this rapidly expanding field.^{7,8}

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Commentary: Left ventricular unloading: Getting it just right

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Although cardiopulmonary rescue with peripheral venoarterial extracorporeal membrane oxygenation (VA-ECMO) may be life-saving for patients with acute cardiogenic shock as a bridge to recovery or more durable therapies, adequate left ventricular (LV) unloading is essential to avoid worsening LV distension and its potential sequelae, such as severe pulmonary edema and root thrombosis.^{1,2} Depending on clinical circumstances, patients require a combination of decreasing afterload, augmenting native contractility, or introducing other forms of mechanical support such as an intra-aortic balloon pump (IABP) or a percutaneous left ventricular assist device (eg, Impella).³

Pavan Atluri, MD (left), and Jason J. Han, MD (right)

CENTRAL MESSAGE

Approach toward left ventricular unloading during extracorporeal membrane oxygenation therapy may have important clinical implications.

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Disclosures: The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication June 9, 2021; revisions received June 9, 2021; accepted for publication June 10, 2021; available ahead of print June 15, 2021.

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J Thorac Cardiovasc Surg 2023;165:709-10

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2021.06.015>

However, understanding which approach is best in these scenarios remains one of the most elusive questions in the field. The heterogeneity of these patients' presentations renders it challenging to compare various strategies. Prospective trials are difficult to enroll, given these patients' acuity and dynamic clinical trajectories. Thus, the evidence on the clinical efficacy of these strategies remains mixed. In this context, large, retrospective cohort studies with granular hemodynamic data such as the study published in this issue of the *Journal* by Char and colleagues⁴ are highly

valuable. The authors analyzed nearly 300 patients who received ECMO alone or in combination with an IABP or Impella at their institution. They found that although LV unloading did improve the patients' hemodynamic status, it did not categorically improve survival to discharge or at 180 days. Yet, when distinguishing between the 2 modes of LV unloading, patients who received IABP had improved survival, especially if it was placed pre-emptively rather than reactively, whereas those who received an Impella experienced more bleeding complications. The survival difference should be interpreted with caution, given inherent selection bias in choosing whether or not and how to mechanically unload the LV that cannot be mitigated with multivariable analysis. Yet, these findings, in addition to their observation that hemodynamic benefits from IABP and Impella were comparable, gives us pause when choosing between these 2 options. An IABP can be placed and removed at the bedside using a much smaller sheath without fluoroscopic guidance.

Overall, this study contributes valuable nuances to the discussion of LV unloading among patients on VA-ECMO. The authors ought to be congratulated on the thoroughness and the granularity of the data presented, which

lends strength to their assertions. In a remarkably short period of time, patients who would have succumbed to cardiopulmonary collapse are now increasingly able to be rescued on VA-ECMO and safely bridged to more durable platforms. We must not forget the profound impact this therapy can have on our patients' lives in their most dire circumstances. Every detail and every choice matter, no matter how small some of them may seem, and we must continue to refine our approach incrementally.

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