



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

See Article page XXX.

## Commentary: In it for the long haul: Posthospital recovery after venovenous extracorporeal membrane oxygenation for coronavirus disease 2019-related acute respiratory distress syndrome

Charles Yin, MD, PhD,  
Hellmuth R. Muller Moran, MD, MSc, and  
Rakesh C. Arora, MD, PhD, FRCSC

Acute respiratory distress syndrome (ARDS) is a dreaded complication of COVID-19 infection, leading to high rates of intensive care unit (ICU) admission for invasive mechanical ventilation, and in severe cases, advanced therapies like extracorporeal membrane oxygenation (ECMO). Venovenous ECMO (VV-ECMO) has increasingly become a standard treatment for severe cases of ARDS refractory to optimal medical management (ie, intravenous glucocorticoid and monoclonal antibody treatment) and lung-protective and prone-positioning mechanical ventilation. Guidelines on the use of ECMO in COVID-19 published by the Extracorporeal Life Support Organization support initiating VV-ECMO for COVID-19-related ARDS with criteria that parallel those of ARDS not related to COVID-19.<sup>1</sup> Over the past 2 years, our understanding of the outcomes of patients who survive to decannulation and eventual hospital discharge has evolved considerably.

From the Section of Cardiac Surgery, Department of Surgery, Max Rady College of Medicine, University of Manitoba, Winnipeg, Manitoba, Canada.

Disclosures: Dr Arora has an unrestricted grant from Pfizer Canada Inc, and has received honoraria from Abbott Nutrition, Edwards Lifesciences, and AVIR Pharmaceuticals for work unrelated to this article. All other 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 Dec 10, 2021; revisions received Dec 10, 2021; accepted for publication Dec 15, 2021.

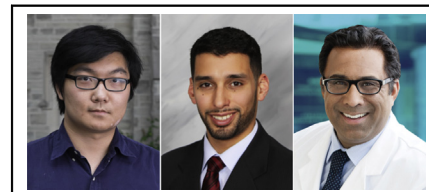
Address for reprints: Rakesh C. Arora, MD, PhD, FRCSC, Section of Cardiac Surgery, Department of Surgery, Max Rady College of Medicine, University of Manitoba, I.H. Asper Clinical Research Institute, CR3015, 369 Tache Ave, Winnipeg, Manitoba, Canada R2H 2A6 (E-mail: [rakeshearora@gmail.com](mailto:rakeshearora@gmail.com)).

J Thorac Cardiovasc Surg 2021; ■:1-2

0022-5223/\$36.00

Copyright © 2021 by The American Association for Thoracic Surgery

<https://doi.org/10.1016/j.jtcvs.2021.12.024>



Charles Yin, MD, PhD, Hellmuth R. Muller Moran, MD, MSc, and Rakesh C. Arora, MD, PhD, FRCSC

### CENTRAL MESSAGE

Patients who received VV-ECMO or mechanical ventilation for COVID-19 ARDS continue to have significant physical, psychological, and cognitive deficits at 4 months following hospital discharge.

Several earlier studies have examined short-term outcomes in patients requiring ECMO for severe COVID-19-related ARDS with observed mortality rates comparable to patients supported on VV-ECMO before the pandemic.<sup>2</sup> More recently, publications with larger datasets, over a longer time period, have indicated that survival has not been as successful as observed earlier.<sup>3</sup> Further, less is known about the long-term outcomes with very prolonged durations of ECMO support often required in many COVID-19 survivors. The study by Taylor and colleagues<sup>4</sup> seeks to shed light on this important knowledge gap.

The authors present retrospective data from a cohort of 46 patients with COVID-19-related ARDS who received VV-ECMO compared with 262 patients who received mechanical ventilation. Despite having a greater severity of illness, patients who received VV-ECMO were observed to have mortality rates comparable to patients who received mechanical ventilation alone. However, when looking at functional capacity in survivors at 4 months after hospital discharge, the authors document that, regardless of treatment category, just one-quarter of patients have returned to work or usual activity and a significant portion continued to require supplemental oxygen (23.1%), struggled with ICU-associated weakness (96.7%), and had some degree of persistent cognitive dysfunction (63.3%).

In patients without COVID-19 who require a prolonged ICU admission, long-term issues such as weakness, impaired

pulmonary function, and cognitive decline have been well described. This phenomenon, termed postintensive-care syndrome, was first defined at a meeting of the Society of Critical Care Medicine in 2010.<sup>5</sup> The results of this study are among the first to define postintensive-care syndrome for patients with COVID-19–related ARDS requiring VV-ECMO support. These deficits are likely further compounded by complications associated with long COVID syndrome experienced by a significant proportion of COVID-19 patients postrecovery. This article should be an alert to ICU teams not to lose sight of the long game and that adherence to best practices of ICU liberation/rehabilitation are as important now as ever to provide an opportunity for optimal recovery. As providers, we must recognize that these patients will have ongoing medical needs that may extend far beyond their initial ICU and hospital admission. Truly, as far as

COVID-19–related ARDS is concerned, we must prepared to be in it for the long haul.

### References

1. Badulak J, Antonini MV, Stead CM, Shekerdemian L, Raman L, Paden ML, et al. Extracorporeal membrane oxygenation for COVID-19: updated 2021 guidelines from the extracorporeal life support organization. *ASAIO J*. 2021;67:485-95.
2. Schmidt M, Hajage D, Lebreton G, Monsel A, Voiriot G, Levy D, et al. Extracorporeal membrane oxygenation for severe acute respiratory distress syndrome associated with COVID-19: a retrospective cohort study. *Lancet Respir Med*. 2020;8:1121-31.
3. Barbaro RP, MacLaren G, Boonstra PS, Combes A, Agerstrand C, Annich G, et al. Extracorporeal membrane oxygenation for COVID-19: evolving outcomes from the international extracorporeal life support organization registry. *Lancet*. 2021;398:1230-8.
4. Taylor L, Jolley S, Ramani C, Mayer K, Etchill E, Mart M, et al. Early post-hospitalization recovery after extracorporeal membrane oxygenation in survivors of COVID-19. *J Thorac Cardiovasc Surg*. 2022. XX:XX-X.
5. Needham DM, Davidson J, Cohen H, Hopkins RO, Weinert C, Wunsch H, et al. Improving long-term outcomes after discharge from the intensive care unit: report from a stakeholders' meeting. *Crit Care Med*. 2012;40:502-9.