Extracorporeal Membrane Oxygenation Transport for Severe COVID-19: Why We Can and Should!

To the Editor:

With great interest, we read the study by Gannon and colleagues showing considerable mortality reduction in patients with early coronavirus disease (COVID-19)-associated acute respiratory distress syndrome (ARDS) referred to experienced centers for venovenous extracorporeal membrane oxygenation (ECMO) (1). A recent review by Zhai and colleagues reported a 30-day mortality of 46% (2), consistently scoring worse than historic ARDS cohorts (3). The mortality of 42.9% reported by Gannon and colleagues fits well in this range. The high mortality rates for COVID-19 have repeatedly raised concerns whether ECMO should be recommended for severe COVID-19 at all. This is especially true in regard to thromboembolic and bleeding risks, limited supply during the pandemic, and high demands on technical expertise and ICU personnel (4).

Those who advise against a broader use of ECMO for COVID-19 should keep in mind that most published COVID-19–associated ARDS cohort studies are uncontrolled because withholding ECMO in case of age limits, single-organ failure, and no prohibiting comorbidities will most likely be ethically unacceptable. Even prospective, controlled studies would have to allow control patients receiving standard care and optimal mechanical ventilation to eventually enable crossover, further compromising comparability. Gannon and colleagues, therefore, cannot be congratulated enough for making a virtue of necessity and studying the survival of relatively young, ECMO-eligible patients in times of limited resources and great need.

These data highlight two critical findings:

1. Patients with COVID-19–associated ARDS fulfilling EOLIA (ECMO to Rescue Lung Injury in Severe ARDS) trial inclusion criteria should be considered generously for referral to a regional ECMO center, ideally before ventilation failure is imminent. On the one hand, attending physicians should use means of telemedicine to exchange live data on patient history, comorbidities, and currently applied ventilation strategies to delay or ideally avert respiratory failure. On the other hand, for invasively ventilated patients, adjunctive tools such as prone positioning and muscle relaxation should be initiated before the decision for ECMO is made. A decision to cannulate patients awake (i.e., before endotracheal intubation) to avoid invasive ventilation can be made on a case-by-case basis (5). The average age of patients included by Gannon and colleagues was 40 years. Patients were obese (average body mass index 35.0 kg/m^2) but had limited comorbidities and were invasively ventilated for no longer than 2 days on average. These inclusion criteria are certainly stricter than those of most recognized COVID-19 ECMO cohort studies. Everyday experience with ECMO in COVID-19 teaches that patients older than 40 years of age are most likely to benefit as well and hence should be included in an ECMO eligibility evaluation.
2. Transportation of patients with COVID-19 with lung failure is feasible and safe but will often require ECMO cannulation before transfer. If patients are considered late for ECMO eligibility, ventilator settings are often at the limit, leaving little to no ventilation reserve. Transporting these patients can lead to ventilation failure during transport. This might have happened to the three patients who reportedly died during transport or were ineligible for ECMO upon arrival. To our knowledge, there is no report suggesting that external ECMO cannulation and subsequent transfer during venovenous ECMO are more harmful than cannulation in an experienced ECMO center. Controlled cohort studies are urgently needed to investigate the efficacy and safety of ECMO transportation so that critical care providers, emergency medical service officials, and healthcare policy makers can make well-informed decisions allocating resources for ECMO referral of patients with COVID-19. ■

Author disclosures are available with the text of this letter at www.atsjournals.org.

Sebastian Mang, M.D.
Saarland University Hospital
Homburg/Saar, Germany
and
Pneumology, Allergology, Critical Care
Interdisciplinary COVID-19 Center
Homburg/Saar, Germany

Tobias Wengenmayer, M.D.
University Hospital of Freiburg
Freiburg, Germany

Guy Danziger, M.D.
Saarland University Hospital
Homburg/Saar, Germany
and
Pneumology, Allergology, Critical Care
Interdisciplinary COVID-19 Center
Homburg/Saar, Germany

Ralf M. Muellenbach, M.D.
Campus Kassel of the University of Southampton
Kassel, Germany

Philipp M. Lepper, M.D.*
Saarland University Hospital
Homburg/Saar, Germany
and
Pneumology, Allergology, Critical Care
Interdisciplinary COVID-19 Center
Homburg/Saar, Germany

ORCID ID: 0000-0003-3620-0912 (P.M.L.).

*Corresponding author (e-mail: philipp.lepper@uks).

Originally Published in Press as DOI: 10.1164/rccm.202207-1305LE on July 26, 2022

References

1. Gannon WD, Stokes JW, Francois SA, Patel YJ, Pugh ME, Benson C, *et al.* Association between availability of extracorporeal membrane

oxygenation and mortality in patients with COVID-19 eligible for extracorporeal membrane oxygenation: a natural experiment. *Am J Respir Crit Care Med* 2022;205:1354–1357.
2. Zhai K, Xu X, Zhang P, Wei S, Li J, Wu X, *et al.* Venovenous extracorporeal membrane oxygenation for coronavirus disease 2019 patients: a systematic review and meta-analysis. *Perfusion* 2022;0(0):1–16.
3. Combes A, Hajage D, Capellier G, Demoule A, Lavoué S, Guervilly C, *et al.*; EOLIA Trial Group, REVA, and ECMONet. Extracorporeal membrane oxygenation for severe acute respiratory distress syndrome. *N Engl J Med* 2018;378:1965–1975.
4. Vuylsteke A. ECMO in COVID-19: do not blame the tool. *Lancet* 2021;398: 1197–1199.
5. Mang S, Reyher C, Mutlak H, Natanov R, Lotz C, Gill-Schuster D, *et al.*; AWECO-Study Group. Awake extracorporeal membrane oxygenation for COVID-19-induced acute respiratory distress syndrome. *Am J Respir Crit Care Med* 2022;205:847–851.

Reply to Mang *et al.*

From the Authors:

In their letter "Extracorporeal membrane oxygenation transport for severe COVID-19—why we can and should!" Mang and colleagues highlight several important issues related to our recently published work on the association between the availability of extracorporeal membrane oxygenation (ECMO) and mortality during periods of resource limitation during the coronavirus disease (COVID-19) pandemic (1).

We agree that patients most likely to benefit from ECMO are those who are so severely hypoxemic that their transportation from a referring hospital to an ECMO-capable center raises safety concern. Of the 35 patients in our study for whom the health system capacity to provide ECMO at a specialized center was available, 24 patients were cannulated at the referring hospital and transported to the ECMO center that received the referral. Of these, 17 patients (70.8%) survived. The remaining 11 patients were transferred to other regional ECMO centers which lacked the capability to cannulate at the referring center. Of these, 3 patients (27.3%) were cannulated for ECMO after arrival and survived, 5 patients (45.5%) were cannulated for ECMO after arrival and died, and 3 patients (27.3%) died or developed a contraindication to ECMO after transfer but before cannulation. Although confounded by other potential differences in care by center, we agree that these provocative findings suggest the need for future research evaluating the risks and benefits of ECMO cannulation prior to transportation. We also agree with the authors that additional research is needed to identify patients who will derive benefit from the provision of ECMO and to understand the ideal timing of ECMO cannulation. ■

Author disclosures are available with the text of this letter at www.atsjournals.org.

Originally Published in Press as DOI: 10.1164/rccm.202207-1415LE on July 26, 2022

Whitney D. Gannon, M.S., M.S.N.*
John W. Stokes, M.D.
Sean A. Francois, M.D.
Yatrik J. Patel, M.D.
Meredith E. Pugh, M.D., M.S.C.I.
Clayne Benson, M.D.
Todd W. Rice, M.D., M.Sc.
Vanderbilt University Medical Center
Nashville, Tennessee

Matthew Bacchetta, M.D.
Vanderbilt University Medical Center
Nashville, Tennessee

and

Vanderbilt University
Nashville, Tennessee

Matthew W. Semler, M.D., M.Sc.
Jonathan D. Casey, M.D., M.Sc.
Vanderbilt University Medical Center
Nashville, Tennessee

ORCID ID: 0000-0002-7664-8263 (M.W.S.).

*Corresponding author (e-mail: whitney.gannon@vumc.org).

Reference

1. Gannon WD, Stokes JW, Francois SA, Patel YJ, Pugh ME, Benson C, *et al.* Association between availability of extracorporeal membrane oxygenation and mortality in patients with COVID-19 eligible for extracorporeal membrane oxygenation: a natural experiment. *Am J Respir Crit Care Med* 2022;205:1354–1357.

High-flow Nasal Cannula Oxygen Therapy for Stable Hypercapnic COPD: Just Good Enough?

To the Editor:

High-flow nasal cannula (HFNC) oxygen therapy is being increasingly used to deliver oxygen to patients in the intensive care unit and emergency department, most for acute hypoxemic respiratory failure. The long-term benefit of domiciliary HFNC on patients with stable COPD has also been explored (1–3). In this issue of the *Journal*, Nagata and colleagues (pp. 1326–1335) brought us new insights into long-term home HFNC oxygen therapy (HFNC/LTOT) for patients with COPD with chronic hypercapnic respiratory failure (4). They found that HFNC/LTOT could reduce the frequency of moderate or severe COPD exacerbations. What we can conclude for certain is that HFNC could reduce exacerbations of patients with

Originally Published in Press as DOI: 10.1164/rccm.202207-1366LE on July 29, 2022