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.

Response to Letter to the Editor: Timely Identification of Hospitalized Patients at Risk for COVID-19-Associated Right Heart Failure Should Be a Major Goal of Echocardiographic Surveillance

To the Editor:

We thank Dr. Dandel[1] for his thoughtful Letter to the Editor regarding our recent paper "Echocardiographic Correlates of In-Hospital Death in patients with Acute COVID-19 Infection: The World Alliance Societies of Echocardiography (WASE-COVID) Study."[2]

We agree with Dr. Dandel that the predominant cardiac manifestation of COVID-19 infection is right ventricular (RV) dysfunction, which can be due to a variety of mechanisms, including but not limited to direct angiotensin-converting enzyme 2–mediated myocardial injury from the SARS-CoV-2 virus, increased afterload from acute respiratory distress syndrome and pulmonary embolism, microvascular and macrovascular dysfunction associated with endothelitis, and negative inotropic effects of cytokines.[3]

The mechanism of RV injury proposed by Dr. Dandel that is related to infection-related pulmonary thrombotic microangiopathy resulting in severe hypoxemic respiratory failure and increased pulmonary vascular resistance[4] is certainly plausible, particularly in the most critically ill patients with COVID-19 infection, but is unlikely to be the sole explanation for RV dysfunction in our patient population (only 46% in the intensive care unit).

In his letter, Dr. Dandel refers to the "positive predictive value (PPV) for COVID-19-related death." We would like to point out that our paper reported odds ratios (as opposed to positive predictive value) for the continuous variables RV free wall strain (RVFWS) and RV global longitudinal strain, both of which were significantly associated with in-hospital mortality (not COVID-related death) in the univariate analysis, with RVFWS and left ventricular longitudinal strain (LVLS) found to be independently associated with in-hospital mortality in the multivariate analysis.

With regards to Dr. Dandel's question about when strain-based imaging would be most useful, we would propose that given its increased availability and known value in risk stratification above and beyond ejection fraction, this imaging method would be particularly helpful in the triage of hospitalized patients with cardiac symptoms to determine which patients are at highest risk for decompensation and in-hospital mortality and to help guide further workup and management. For example, a reduced RVFWS may prompt further pulmonary workup to rule out pulmonary embolism or worsening lung disease, while a reduced LVLS may point to a cardiac etiology of the patient's symptoms.

While the echocardiograms in our study were limited by safety concerns during the onset of the pandemic,[5] now that most health care providers worldwide are vaccinated, we agree with Dr. Dandel that given the paramount role of the right ventricle in the pathophysiology of COVID-19-related cardiac dysfunction, comprehensive assessment of the right heart, including cavity size, RV function, and spectral Doppler of the tricuspid valve to obtain pulmonary artery pressures, is critical in the assessment and triage of this patient population.

Interestingly, in our latest analysis of the WASE COVID-19 patient cohort, which included up to 9 months of echocardiographic follow-up, we found that in patients with baseline impaired LVLS, RVGLS, or increased RV basal diameter, there was significant improvement at time of follow-up.[6] This suggests that cardiac abnormalities may improve over time and that echocardiography can potentially be used to monitor cardiac sequelae of COVID-19 infection.

Ilya Karagodin, MD
Roberto M. Lang, MD, FASE
University of Chicago
Chicago, Illinois

Federico M. Asch, MD, FASE
MedStar Health Research Institute
Washington, D.C.

REFERENCES

1. Dandel M. Timely identification of hospitalized patients at risk for COVID-19-associated right heart failure should be a major goal of echocardiographic surveillance. J Am Soc Echocardiogr 2021;34:1323.
2. Karagodin I, Singulane CC, Woodward GM, Xie M, Tucay ES, Tude Rodrigues AC, et al. Echocardiographic correlates of in-hospital death in patients with acute COVID-19 infection: the World Alliance Societies of Echocardiography (WASE-COVID) Study. J Am Soc Echocardiogr 2021;34:819-30.
3. Park JF, Banerjee S, Umar S. In the eye of the storm: the right ventricle in COVID-19. Pulm Circ 2020;10:2045894020936660.
4. Dandel M. Pathophysiology of COVID-19-associated acute respiratory distress syndrome. Lancet Respir Med 2021;9:e4.
5. Kirkpatrick JN, Mitchell C, Taub C, Kort S, Hung J, Swaminathan M. ASE statement on protection of patients and echocardiography service providers during the 2019 novel coronavirus outbreak: endorsed by the American College of Cardiology. J Am Soc Echocardiogr 2020;33:648-53.
6. Karagodin I, Singulane CC, Descamps T, Woodward GM, Xie M, Tucay ES, et al. Ventricular changes in patients with acute COVID-19 infection: follow-up of the World Alliance Societies of Echocardiography (WASE-COVID) study. J Am Soc Echocardiogr 2021; https://doi.org/10.1016/j.echo.2021.10.015.

https://doi.org/10.1016/j.echo.2022.01.014

Conflicts of Interest: None.

The WASE COVID study has been funded by the American Society of Echocardiography Foundation, University of Chicago, and MedStar Health, with in-kind donations from Ultromics.

Reprint requests: Dr. Federico M. Asch, MD, FASE, MedStar Health Research Institute, Cardiology, 100 Irving Street, NW, Suite EB 5123, Washington, D.C. 20010. (E-mail: *fmasch@gmail.com*).