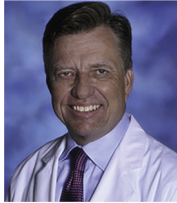




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## EDITOR'S PAGE



# COVID-19 Fatigue

## Not So Fast

Christopher M. O'Connor, MD, *Editor-in-Chief, JACC: Heart Failure*



With over 5 million cases of coronavirus disease-2019 (COVID-19) infection since the outbreak in Wuhan, China, in late 2019, we have been focused as health care providers in leadership on the acute manifestations of the illness, and preparing our health systems for a rapid increase in moderate-severe cases requiring hospitalization.

Over the past several months, my days have been full of change in the governance and culture of the health system. These changes included some of the following:

1. Setting up a broad-based governance structure that goes well beyond our employed faculty physicians with community physicians represented on our leadership team.
2. Supporting our leadership to prepare for this pandemic by converting intensive care unit beds and other units with reverse airflow capabilities to minimize risk.
3. Developing supply chain mechanisms to support personal protective equipment materials in large quantities.
4. Developing algorithms for treatment along a category of mild, moderate, and severe that included the use of extracorporeal membrane oxygenation (ECMO) in the most severe cases.

We had unique collaboration across the multiple hospitals in our system to support sharing of health care providers, ventilators, and patients requiring intensive care unit capabilities. Seven days a week, we were conversing on best practices and sharing information, so that we could quickly adapt our care models. These included the following:

1. Temporarily allowing our cardiovascular fellows to work as hospitalists in COVID-19 units.

2. Removing hospitalists from our heart failure service to free them up for other areas in the health system.
3. Allowing heart failure doctors to become primary care physicians on their respective services.
4. Expanding our ECMO program to support Venovenous ECMO across the health system in the medical intensive care units to a greater degree.
5. Training cardiovascular specialists in advanced respiratory failure management.
6. Converting a number of cardiovascular units to COVID-19 units with specialization in use of prone ventilation and high-flow oxygen therapy.
7. Committing our research infrastructure to support clinical trials of COVID-19 therapy interventions.

Our days have been consumed with COVID-19 management, while ensuring our cardiovascular patients receive safe and effective care. To our surprise, having a reduction in the number of patients with heart failure, ST-segment elevation myocardial infarction, stroke, and aortic dissection coming to the hospital, reinforced the indirect consequences on cardiovascular morbidity and mortality. As we continued to improve our algorithms of care and stabilize our efforts, we began reopening to a new normal of cardiovascular care for patients who had delayed procedures. In this capacity, using universal testing, broad-based personal protective equipment, screening, mitigation, and isolation, we began to serve our cardiovascular patient population. All of this occurred over a 12-week period, and has left many of our providers fatigued, tired, burned out, and questioning the future.

Yet, while the acute phase is beginning to stabilize and we are getting a handle on the new normal, the chronic phase of COVID-19 will continue for years to come, with potentially one-half of the 5 billion people

in the world becoming infected with COVID-19. In addition, many who survive may have persistent symptoms. What are these symptoms? Some include fatigue, dyspnea, and lack of energy. How does this translate into clinical diagnosis? In a case that I was involved with, a 40-year-old triathlete who developed COVID-19 to a moderate degree stayed at home with symptoms not requiring hospitalization, had residual fatigue 6 weeks post-illness. The patient had an N-terminal pro-B-type natriuretic peptide level that was significantly elevated and echocardiographic evidence of recovered myocarditis with impairment of the myocardium.

Will this be the future, that there will be a significant increase in cardiopulmonary compromise of patients who have experienced COVID-19? There are many other aspects to this condition. The pulmonary conditions can include pulmonary fibrosis, restrictive lung disease, pulmonary hypertension, and chronic pulmonary thromboembolic disease. All of these conditions will cause impaired exercise tolerance, dyspnea on exertion, fatigue, and reduced capacity. Up to 10% of intensive care unit patients may develop acute myocarditis by evidence of increased troponin and natriuretic peptic levels (1). Residual elevation of markers may persist for many weeks. The patients may exhibit evidence of recovered myocarditis with diastolic dysfunction or persistent reduced ejection fraction with systolic dysfunction. Cardiac arrhythmias have been noted to be common during hospitalization and may continue post hospitalization (2).

Additional organ systems that may be affected include the brain, liver, and kidneys to name a few. Myalgic encephalomyelitis/chronic fatigue syndrome has found to be common in post-viral illnesses and COVID-19 (3). This condition of chronic fatigue and depressive symptoms may continue for the long term. Depression, anxiety, and post-traumatic stress syndrome are all potential long-term sequelae of COVID-19. Chronic liver disease has been described in these patients as well as chronic kidney disease. It is believed that COVID-19 patients may contribute up to a 5% to 10% increase in chronic kidney disease over the next several years.

Thus, our fatigue for the care of the acute COVID-19 patients is understandable. Our contributions have been remarkable, but we must be prepared for the long-term. COVID-19 survivors will continue to have

important symptoms and impairment of functional status that will require us to be diligent in our understanding and care.

I propose that we begin to establish cardiopulmonary COVID-19 clinics. This would be a multidisciplinary clinic with pulmonologists, cardiologists, and the multidisciplinary team evaluating recovered COVID-19 patients who continue to have symptoms. In this capacity, they could be evaluated and their information could be categorized in a database beyond signs and symptoms. Moreover, a comprehensive biomarker analysis could be performed along multiple pathways including inflammatory, hemodynamic, myocardial injury, and other biomarkers to better understand and follow this condition. From the standpoint of imaging, comprehensive transthoracic echocardiography with a particular emphasis on measurement of diastolic dysfunction and RV function could be made. Pulmonary CT scans could be conducted to look for early evidence of pulmonary fibrosis, thromboembolic disease, and secondary evidence of pulmonary hypertension.

Finally, cardiopulmonary exercise studies could be performed to serve as a benchmark for cardiovascular impairment and to serially follow these patients if indicated. It is postulated that these patients may be excellent candidates for exercise intervention, as was done with the HF-ACTION (Heart Failure: A Controlled Trial Investigating Outcomes of Exercise Training) and with the recently completed REHAB-HF (Trial of Rehabilitation Therapy in Older Acute Heart Failure Patients), to improve functional status and quality of life (4,5).

COVID-19 is not a short-term acute health care problem that will go away and not return. COVID-19 is here today, and has caused enormous fatigue on our patients and health care providers in this 3-month acute phase. The chronic phase will consist of an everlasting number of patients with impaired functional status and quality of life that we should address as heart failure physicians with our multidisciplinary teams.

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**ADDRESS FOR CORRESPONDENCE:** Dr. Christopher M. O'Connor, Editor-in-Chief, *JACC: Heart Failure*, American College of Cardiology, Heart House, 2400 N Street NW, Washington, DC 20037. E-mail: [jacchf@acc.org](mailto:jacchf@acc.org).

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