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.

Collaboration during Crisis: A Novel Point-of-Care Ultrasound Alliance among Emergency Medicine, Internal Medicine, and Cardiology in the COVID-19 Era

To the Editor:

The coronavirus disease 2019 (COVID-19) pandemic may be the greatest public health emergency we will experience in our lifetimes. It has both exposed major shortcomings in the American medical system and revealed our capacity for innovation and collaboration. Early in disaster planning at our institution, we identified several issues regarding echocardiography: (1) personal protective equipment shortages, (2) the infection control risk posed by large ultrasound machines, (3) heterogenous knowledge of basic point-of-care ultrasound (POCUS) echocardiography, and (4) a need for cardiac diagnostics beyond the scope of basic POCUS (e.g., regional wall motion abnormalities).[1-5]

Before COVID-19, an enterprise-level multidisciplinary POCUS committee had been organized to address POCUS training, credentialing, and image archival. With multispecialty agreement, including members of this committee, the default method of cardiac ultrasound imaging became POCUS in patients with or suspected of having COVID-19. Echocardiography laboratory sonographers were available to remotely support and direct frontline providers during bedside echocardiographic image acquisition using either in-room intensive care unit cameras when the provider was using a cart-based machine or the teleguidance feature on the handheld ultrasound systems. Echocardiography faculty members, with access to the POCUS image archive, offered remote real-time image interpretation assistance (Figure 1). This initiative minimized the number of providers exposed to patients with COVID-19 and maximized infection control precautions, while appropriately triaging the need for comprehensive echocardiography.

We have identified the following points as instrumental for success: (1) multispecialty collaboration, (2) repurposing of existing technology, (3) acquisition of handheld ultrasound devices with teleguidance capabilities, (4) dedicated informatics support, (5) scalable education through virtual meetings and recorded sessions, and (6) frequent communication. Penn Health Tech, an interdisciplinary center dedicated to innovation, was instrumental in acquiring handheld ultrasound devices. Our chief medical informatics officer deputized an information services project manager, who had frequent communication with providers and industry to understand and build the POCUS image archive. Our handheld ultrasound device vendor provided virtual product training sessions, and recorded sessions were posted on the institutional website. The Division of Cardiovascular Medicine educated staff members about the work flow and took call from 9 AM to 5 PM on business days. The University of Pennsylvania institutional review board reviewed the data collection policy and approved the protocol.

In spring 2020, we averaged a daily census of 60 to 90 patients with COVID-19, with an average of three requests for cardiology support daily. In the 151 cardiac POCUS studies performed among patients with COVID-19, there were 26 echocardiography laboratory overreads, demonstrating a utilization rate of 17%. Of these, 23 (88%) were diagnostic and prevented sonographer exposure to infectious patients. On the first day of deployment, the protocol enabled the detection of occult systolic heart failure in an ill patient with COVID-19, with subsequent diuresis that reversed multisystem organ failure. In another patient suspected to have COVID-19, pericardial tamponade was suspected on emergency department POCUS, with overread by cardiology, and the patient was taken directly to the catheterization laboratory for drainage.

Novel technology and a health care crisis made it possible to break down existing silos and inspired innovation while maintaining the independence of the participating disciplines. This collaboration is generalizable to other institutions, which can adapt this work flow to fit their technological capabilities, and to other patients in need of urgent POCUS.

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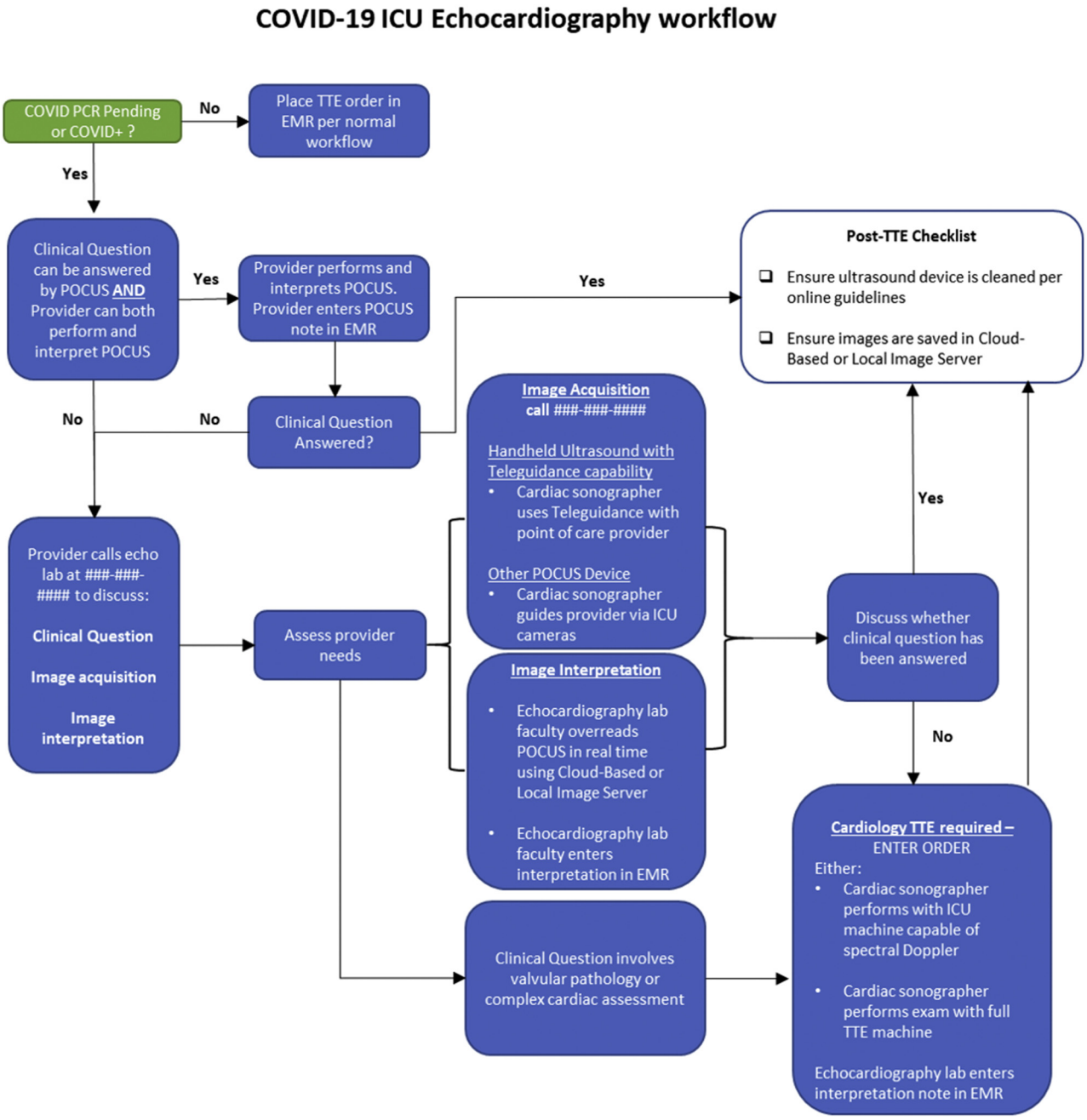

Figure 1 This work flow describes the process for which a frontline provider at our institution could obtain echocardiographic image acquisition and/or image interpretation support for patients with suspected or confirmed COIVD-19. *EMR*, Electronic medical record; *ICU*, intensive care unit; *PCR*, polymerase chain reaction; *TTE*, transthoracic echocardiography.