ASE Statement on Protection of Patients and Echocardiography Service Providers During the 2019 Novel Coronavirus Outbreak

Table of Contents

1. Background

The 2019 novel coronavirus, or severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) that results in coronavirus disease-2019 (COVID-19), has been declared a pandemic and is severely affecting the provision of healthcare services all over the world. Healthcare workers are at higher risk since this virus is very easily spread, particularly through the kind of close contact involved in the performance of echocardiographic studies. The virus carries relatively high mortality and morbidity risk, particularly for certain populations (the elderly, the chronically ill, the immunocompromised and, possibly, pregnant women). Echocardiographic services will be required in the care of some patients with suspected or confirmed COVID-19. Consequently, echo providers will be exposed to SARS-CoV-2.

Sonographers, nurses, advance practice providers and physicians have a duty to care for patients and are at the frontlines in the battle against disease. We are at high risk, particularly when we participate in the care of patients who are suspected or confirmed to have highly contagious diseases. While dedication to patient care is at the heart of our profession, we also have a duty to care for ourselves and our loved ones and to protect all of our patients by preventing the spread of disease. This means reducing our own risk while practicing judicious use of personal protective equipment (PPE).

ASE is committed to the health, safety and wellbeing of our members and the patients we serve. This document is provided to the ASE community as a service to help guide the practice of echocardiography in this challenging time. It represents input from a variety of echocardiography practitioners and institutions who have experience with the COVID-19, or have been actively and thoughtfully preparing for it. The circumstances surrounding the outbreak are, of course, extremely dynamic, and this statement's recommendations are subject to change. We direct echocardiography practitioners to the Centers for Disease Control (CDC) website for the latest updates and recommendations.

This statement addresses triaging and decision pathways for handling echocardiographic requests, as well as indications and recommended procedures to be followed for an echocardiographic assessment of cardiovascular function in suspected or confirmed COVID-19 cases. In addition, we list measures recommended to be used in the echo lab for prevention of disease spread.

2. Whom to Image?

a. Review of Indications

Echocardiograms (TTEs, stress echoes and TEEs) should only be performed if they are expected to provide clinical benefit. ASE and other societies have established Appropriate Use Criteria to guide imaging. Echocardiogram orders are not yet subject to decision support tools as are cardiac MRI and cardiac CT, but the SARS-CoV-2 outbreak highlights the need to avoid performing rarely appropriate exams, at least not while the COVID status of the patient is unclear. Echocardiographic services should not be ordered if they are unlikely to provide clinical benefit, and screening of indications may be indicated, particularly for symptomatic patients whose SARS-CoV-2 status is unknown. In particular, repeat echocardiograms should not be performed unless there has been a clear change in clinical status.

In addition, there are echocardiograms that could be safely postponed until a later date. There are two ways to identify these studies.

- Determine which studies are “elective” and reschedule them, performing all others.
- Identify “non-elective” (urgent/emergent) indications and to defer all others.

These two different ways of looking at indications should both prioritize patients who are at risk for significant morbidity or mortality in the short term if echocardiographic exams are not performed.

Depending on the trajectory of the outbreak, some institutions may face a crisis state with reduced availability of trained staff and/or equipment. In this setting, triage by indication may be necessary—deciding which appropriate and urgent/emergent echocardiograms will be performed and which will not, or deciding which will be performed first. This prioritization of indications will need to be done on a case-by-case basis taking into account many patient-level factors such as current indication, current clinical status, past medical history and the results of other tests. Involving referring physicians in the triage process is therefore essential.

TEEs carry a heightened risk of spread of the SARS-CoV-2 since they can provoke aerosolization of a large amount of virus. TEEs therefore deserve special consideration in determining when and whether they should be performed, and under what precautions (described below). TEEs should be postponed or canceled if the indication is rarely appropriate, if they are unlikely to change clinical care, and/or if an alternative imaging modality (e.g. off axis TTE views, ultrasound enhancing agent with TTE) can provide the necessary information.

3. Where to image?

The portability of echocardiography affords a clear advantage in imaging patients without having to move them and risk virus transmission in the clinic or hospital. All forms of echocardiography (including chemical stress tests) can be performed in emergency departments, hospital wards, intensive care units, operating theaters, recovery areas and structural heart and electrophysiology procedure laboratories, in addition to echocardiography laboratories. Identifying the optimal location for an echocardiographic study requires minimizing the risk of virus transmission but also considering monitoring capabilities and staffing of different locations. For example, patients with suspected or confirmed COVID-19 are placed in isolation rooms, and echocardiography performed in the patient’s room can prevent transit to other areas of the hospital, risking wider exposure. However, it may not be possible to perform a TEE or stress echo in the room due to staffing or insufficient monitoring equipment.

In the outpatient setting, patients should be screened for infection according to local protocols and methods for quarantine. Some institutions have set aside a separate room and separate machine for patients with suspected or confirmed infection.

4. How to image?

a. Protocols

Cardiac imaging is performed by a wide variety of operators using a wide variety of machines and employing a wide variety of protocols. Ultrasound assisted physical examination (UAPE), point of care cardiac ultrasound (POCUS), critical care echocardiography (CCE), limited and comprehensive traditional TTE, TEE and stress echocardiography all can play a role in caring for patient with suspected or confirmed COVID-19. UAPE and POCUS exams performed by the clinicians who are already caring for these patients at bedside presents an attractive option to screen for important cardiovascular findings, elucidate cardiac contributions to symptoms or

signs, triage patients in need of full feature echocardiographic services and even, perhaps, identify early ventricular dysfunction during COVID-19 infection, all without exposing others and utilizing additional resources. Depending on the capabilities of the machines used, images obtained by UAPE, POCUS and CCE practitioners can often be saved to allow remote interpretive assistance from more experienced echocardiographers. Archiving these images for future review should help to focus future imaging studies and provide comparisons of cardiac structure and function over time. Some devices use a camera that allows a sonographer or other imaging expert to remotely guide probe placement.

Along the same lines, echocardiographic studies performed on patients with suspected or confirmed COVID-19 should be as focused as necessary to obtain diagnostic views but should also be comprehensive enough to avoid the need to return for additional images. Each study should be tailored to the indication and planned in advance, after review of images from past exams and other imaging modalities. Complete exams may be necessary in some circumstances. Plans for ultrasound enhancing agent (contrast) utilization should be made in advance in order to prevent a sonographer having to wait for the agent to be delivered or having to use more personal protective equipment to exit the patient's room to obtain the agent. Regardless of the type of study (UAPE, POCUS, CCE or comprehensive echo), prolonged scanning can expose these clinicians to added risk. These studies should not be performed by a sonography student or any other novice/inexperienced practitioner, in order to minimize scanning time while obtaining images of the highest possible quality.

b. Protection

i. Personnel

Imaging should be performed according to local standards for the prevention of virus spread. Meticulous and frequent hand washing is crucial. In some institutions, the level of PPE required may depend on the risk level of the patient with regard to COVID-19 (minimal risk=not suspected, moderate risk=suspected, high risk=confirmed). In some institutions, suspected and confirmed cases are treated similarly. The types of PPE can be divided into levels or categories (see **Table**).

- Standard care involves handwashing or hand sanitization and use of gloves.
- Droplet precautions include gown, gloves, headcover, facemask and eye shield.
- Airborne precautions add special masks (e.g. N-95 or N-99 respirator masks, or powered air purifying respirator - PAPR systems) and shoe covers.

The local application of each component of PPE can vary according to level or type of risk for TTEs and stress echo exams, but airborne precautions are required during a TEE for suspected and confirmed cases, due to the increased risk for aerosolization.

ii. Equipment

Equipment care is critical in the prevention of transmission. Some institutions cover probes and machine consoles with disposable plastic and forego the use of ECG stickers. Some institutions set aside certain machines or probes for use on patients with suspected or confirmed infection. Although SARS-CoV-2 is sensitive to most standard viricidal disinfectant solutions, care must be taken when cleaning. Local standards vary, but echocardiogram machines and probes should be thoroughly cleaned, ideally in the patient's room and again in the hallway. Smaller, laptop-sized portable machines are more easily cleaned, but use of these machines should be balanced

against potential tradeoffs in image quality and functionality. Please consult vendors' disinfecting guidelines available on their websites, as procedures vary and could affect the functionality of machines. TEE probes should undergo cleaning in the room (including the handle and chord), then be transferred in a closed container to be immediately disinfected according to the manufacturer's recommendations. The American Institute for Ultrasound in Medicine (AIUM) has specific guidelines for disinfection of ultrasound equipment.

iii. Role of learners

The performance and interpretation of echocardiographic studies, especially those in suspected or confirmed COVD-19 cases, should be limited to essential personnel. For TEEs, practices may vary, but there should be at most one person to handle the probe and another to operate the machine controls, along with another to administer sedation. Medical education remains important, and echocardiographic practitioners play a crucial role in teaching essential components of cardiovascular medicine, as well as scanning and interpretation skills, to a wide variety of learners. Medical and sonography students, residents, fellows and practicing physicians gain knowledge and experience through rotations on echocardiography services, through observing the performance of studies, hands on scanning and reading with experts. In the current environment, however, elective rotations should be suspended, and restrictions should be placed on trainees who are not essential to clinical care. In many institutions, fellows provide crucial off-hours scanning and interpretation but must follow all applicable procedures to reduce infection transmission. Training and education can be moved "online." The ASE and others provide multiple educational offerings, including webinars and lectures. A variety of simulators are available to teach scanning skills.

In addition to limiting the number of echocardiography practitioners involved in scanning, consideration should be given to limiting the exposure of staff who may be particularly susceptible to severe complications of COVID-19. Staff who are >60 years old, have chronic conditions, are immunocompromised or are pregnant may wish to avoid contact with patients suspected or confirmed to have COVID-19, depending on local procedures.

iv. Other considerations

The risk of transmission also occurs in reading rooms. Keyboards, monitors, mice, chairs, phones, desktops, and door knobs should be frequently cleaned, and ventilation provided wherever possible. In some institutions the echo lab reading room is a place where many clinical services congregate to review images. In the current environment, it may be advisable to ask these services to review images remotely while speaking with the echocardiographer-consultant by phone, or review images together via a webinar.

5. Conclusion

The provision of echocardiographic services remains crucial in this difficult time of the SARS-CoV-2 outbreak. Working together, we can continue to provide high quality care while minimizing risk to ourselves, our patients and the public at large. Carefully considering 'Whom to Image', 'Where to Image' and 'How to Image' has the potential to reduce the risks of transmission.

6. Acknowledgements

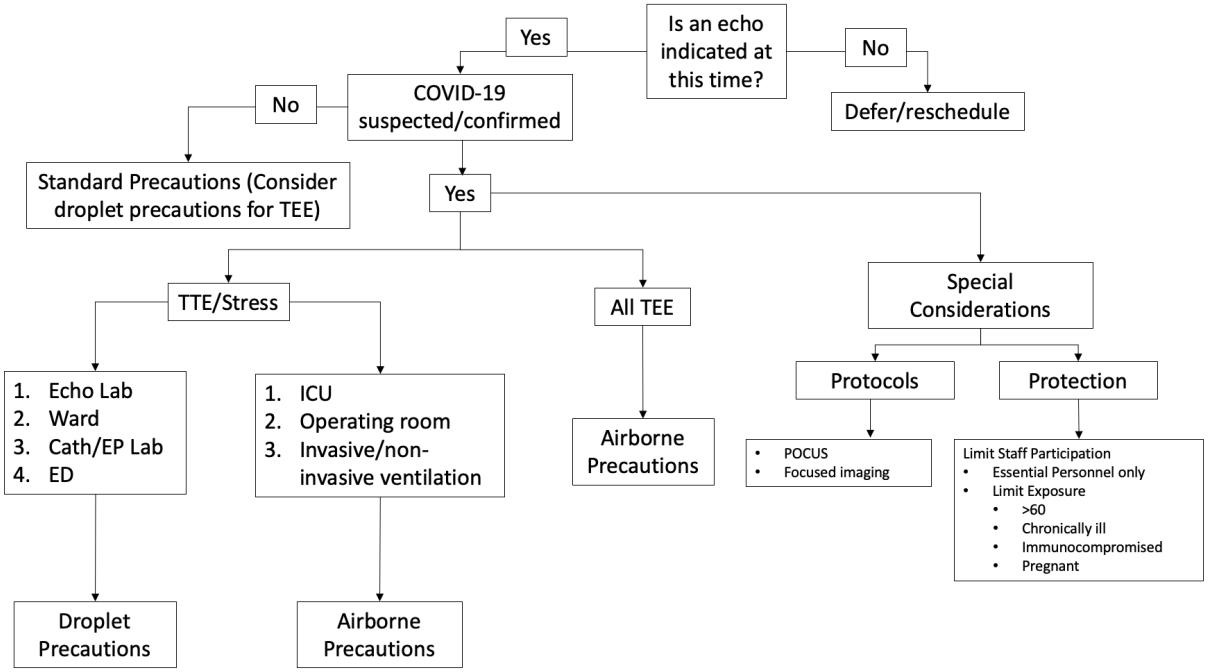
This statement was prepared by James Kirkpatrick, MD, Smadar Kort, MD, Judy Hung, MD, Cynthia Taub, MD, and Madhav Swaminathan, MD, and approved by the American Society of Echocardiography executive committee on March 17, 2020.

Protocols and procedures used in the preparation of this document courtesy of Madhav Swaminathan, Duke University, Durham, NC; Muhammad Saric, New York University Medical Langone Medical Center, New York City, NY; Mingxing Xie, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China; Cynthia Taub, Montefiore Medical Center, Albert Einstein College of Medicine, Bronx, NY; Lissa Sugeng, Yale University, New Haven, CT; Smadar Kort, Stony Brook University, Stony Brook NY; Judy Hung, Massachusetts General Hospital, Boston, MA; Marielle Scherer-Crosbie, University of Pennsylvania, Philadelphia, PA; Ray Stainback, Baylor St. Luke's Medical Center, Houston, TX; James Kirkpatrick, University of Washington, Seattle, WA.

Additional guidance has been provided by The British Society of Echocardiography and The Societa Italiana di Ecocardiograpfia e Cardiovascular Imaging

7. Figure 1

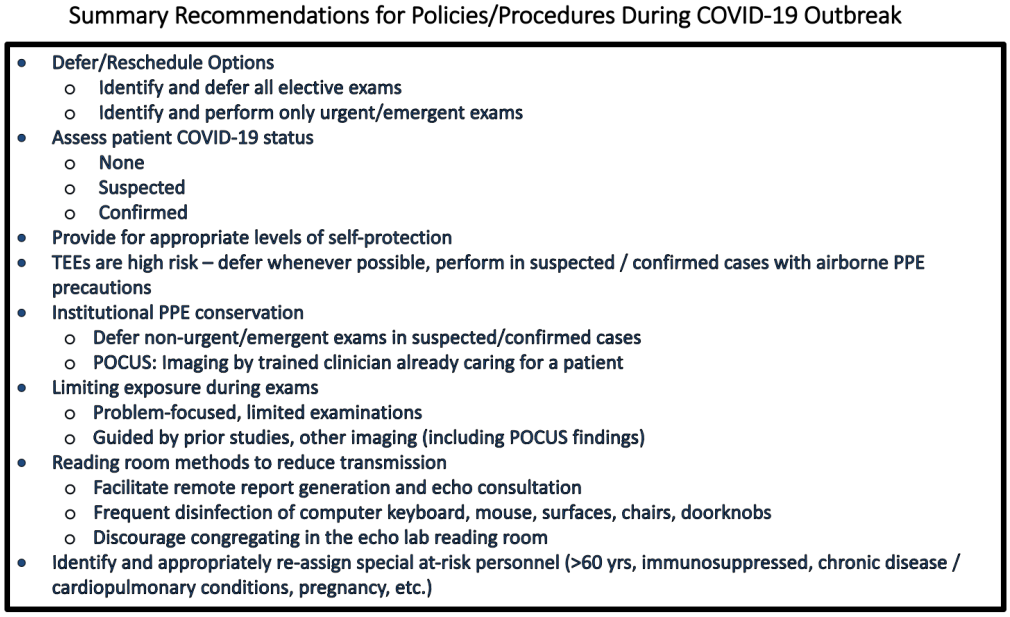
Suggested algorithm for determining indication and level of protection



ED, Emergency Department; EP, electrophysiology; ICU, intensive care unit

8. Figure 2

Summary recommendations



9. Table

Precaution types and PPE

	Hand washing	Gloves/double gloves	Isolation gown	Surgical mask	N-95 or N-99 mask	Face shield	PAPR system	Surgical cap	Shoe cover
Standard	X	X		X					
Special Droplet	X	X	X	X*	X*	X	X	X	X
Airborne**	X	X	X		X	X	X	X	X

*Surgical mask may be used for droplet precautions in order to conserve N-95/N-99 respirators

**Patient location may determine level of protection (e.g. airborne precautions employed for all patients in the ICU setting)

This is a general guide based on current practice/recommendations at the present time and is subject to change and modification to fit local procedures and practice patterns.

10. Resources

1. ASE COVID-19 resource page.
2. Connect@ASE COVID-19 discussion page.
3. American Institute for Ultrasound in Medicine (AIUM) guidelines for equipment disinfection.
4. Centers for Disease Control COVID-19 resource page.
5. Centers for Disease Control recommendations for infection prevention and control.
6. Centers for Disease Control visual guide for using personal protective equipment.