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**AMERICAN SOCIETY OF  
ECHOCARDIOGRAPHY**

*Sound Saves Lives*

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

Endorsed by the American College of Cardiology

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**Notice and Disclaimer:** This statement reflects recommendations based on expert opinion, national guidelines, and available evidence. Our knowledge with regard to COVID-19 continues to evolve, as do our institutional protocols for dealing with invasive and non-invasive procedures and practice of personal protective equipment. Readers are urged to follow national guidelines and their institutional recommendations regarding best practices to protect their patients and themselves. These reports are made available by ASE as a courtesy reference source for its members. The reports contain recommendations only and should not be used as the sole basis to make medical practice decisions or for disciplinary action against any employee. The statements and recommendations contained in these reports are primarily based on the opinions of experts, rather than on scientifically-verified data. ASE makes no express or implied warranties regarding the completeness or accuracy of the information in these reports, including the warranty of merchantability or fitness for a particular purpose. In no event shall ASE be liable to you, your patients, or any other third parties for any decision made or action taken by you or such other parties in reliance on this information. Nor does your use of this information constitute the offering of medical advice by ASE or create any physician-patient relationship between ASE and your patients or anyone else.

## 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.[1] Healthcare workers are at higher risk since this virus is very easily spread, especially 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).[2] Given the risk of cardiovascular complications in the setting of COVID-19, including pre-existing cardiac disease, acute cardiac injury, and drug-related myocardial damage,[3] echocardiographic services will likely be required in the care of 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.[4]

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.

**Whom to image?** *(This section was updated April 1, 2020.)*

### ***Review of Indications***

Transthoracic echocardiograms (TTE), stress echocardiograms and transesophageal echocardiograms (TEE) should only be performed if they are expected to provide clinical benefit. ASE and other societies have established appropriate use criteria (AUC) to guide imaging.[5-8] Echocardiogram orders are not yet subject to decision support tools as are cardiac magnetic resonance imaging and cardiac computed tomography, but the SARS-CoV-2 outbreak highlights the need to avoid performing rarely appropriate exams. Application of the AUC represents the first decision point as to whether an echocardiographic test should be performed. Secondly, there are cases in which the indication for echocardiography is appropriate or may be

appropriate, but the exam is unlikely to yield clinically important information in the short term with the added risk of potential disease transmission. 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.

In cases considered for deferral, there is no significant risk to patients in terms of morbidity or mortality and no expected benefit in terms of avoiding the use of medical resources (such as emergency department visits or hospitalizations). These tests should be postponed.

Next, it is important to determine the clinical benefit of echocardiography for symptomatic patients whose SARS-CoV-2 status is unknown. Knowing the status of a patient allows for the appropriate application of personal protective equipment (PPE) and its conservation when not needed, in addition to reducing the exposure risk to echocardiography personnel.

TEEs carry a heightened risk of spread of the SARS-CoV-2 since they may provoke aerosolization of a large amount of virus due to coughing or gagging that may result during the examination. TEEs therefore deserve special consideration in determining when and whether they should be performed, and under what precautions (described below). A cautious consideration of the benefit of a TEE examination should be weighed against the risk of exposure of healthcare personnel to aerosolization in a patient with suspected or confirmed COVID-19 and the use of PPE. TEEs should be postponed or canceled if an alternative imaging modality (e.g. off axis TTE views, ultrasound enhancing agent with TTE) can provide the necessary information. The use of contrast enhanced computed tomography (CT) and magnetic resonance imaging (MRI) has emerged as an alternative to TEE for exclusion of left atrial appendage thrombus prior to cardioversion.[9] The use of these tests to avoid an aerosolizing procedure should be balanced against the risk of transporting a patient through the hospital to the CT or MRI scanner, the need to disinfect the CT or MRI room, and iodinated contrast and radiation for CT, long scan times for MRI. Some institutions have a dedicated CT scanner reserved for patients with COVID-19.

Similarly, treadmill or bicycle stress echo tests on patients with COVID-19 may lead to exposure due to deep breathing and/or coughing during exercise. These tests should generally be deferred or converted to a pharmacological stress echo.

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, while accounting for 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.

### **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.

## **How to image?**

### ***Protocols***

Cardiac imaging is performed by a wide variety of operators using a wide variety of machines 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 review should help to focus future imaging studies and provide comparisons of cardiac structure and function over time. In some cases, review of these images by a consulting cardiovascular specialist may obviate the need for an echocardiogram (and therefore reduce staff exposure), as pertinent clinical questions will be answered (e.g. etiology of hypotension). In other cases, they will indicate the need for more advanced imaging (e.g. wall motion and quantitative valvular assessment). Therefore, these images should be saved and archived whenever possible. 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 (UEA) 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. While the safety of UEAs specifically in COVID-19 cases has not yet been determined, they have been used and proved

safe in ICU patients. The use of UEAs may therefore be considered in such cases as long as the benefits in terms of diagnostic yield and scan time are favorable.

Regardless of the type of study (UAPE, POCUS, CCE or comprehensive echo), prolonged scanning can expose these clinicians to added risk. An additional consideration when performing a limited transthoracic echo exam is the limitations that may be posed by layers of protective equipment on image quality. Therefore, 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.

Finally, the results of the exam should be rapidly reviewed and key findings recorded immediately on the patient's record and communicated to the primary care team to allow hemodynamic management to be optimized.

The group therefore recommends the following:

- Echocardiographic exams be planned ahead, based on indications, clinical information, laboratory data and other imaging findings to allow for a focused sequence of images that help with management decisions.
- The use of UEAs should be considered prior to the exam to avoid the need to prolong scan time while awaiting preparation of the agent.
- Scan times should be minimized by excluding students or novice practitioners from performing imaging.
- Imaging team should ensure rapid review and reporting of key findings in the patient's record and communicating them with the primary care team.

### ***Protection***

#### 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. The use of a surgical face mask in this setting may also be considered.
- 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. A surgical face mask for patients is recommended for those who are symptomatic, undergoing surface echo examination provided institutional resources allow this strategy for source control.[10]

It is important to reiterate that the type of PPE to be used on specific cases will depend on local institutional policy and resources. The US Centers for Disease Control (CDC) provides updated guidelines for PPE use for healthcare workers.[4]

## 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. It is important to note that the benefit of using protective covers must be balanced against the risk of potential for suboptimal images and prolongation of scan time. 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 exact steps to be followed for disinfection of the TEE probe and equipment will depend on local institutional protocols that usually are guided by infectious disease experts and resource availability. The American Institute for Ultrasound in Medicine (AIUM) has specific guidelines for disinfection of ultrasound equipment.[11]

## Role of learners

The performance and interpretation of echocardiographic studies, especially those in suspected or confirmed COVID-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, advanced trainees (e.g., fellows) provide crucial off-hours scanning and interpretation but must follow all applicable procedures to reduce infection transmission. Training and education can be moved "on-line". The ASE and others provide multiple educational offerings, including webinars and lectures. A variety of simulators are available to teach scanning skills without involving patients.

## Other considerations

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.

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.

## 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.

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Additional guidance has been provided by The [British Society of Echocardiography](#) and [The Societa Italiana di Ecocardiografia e Cardiovascular Imaging](#)

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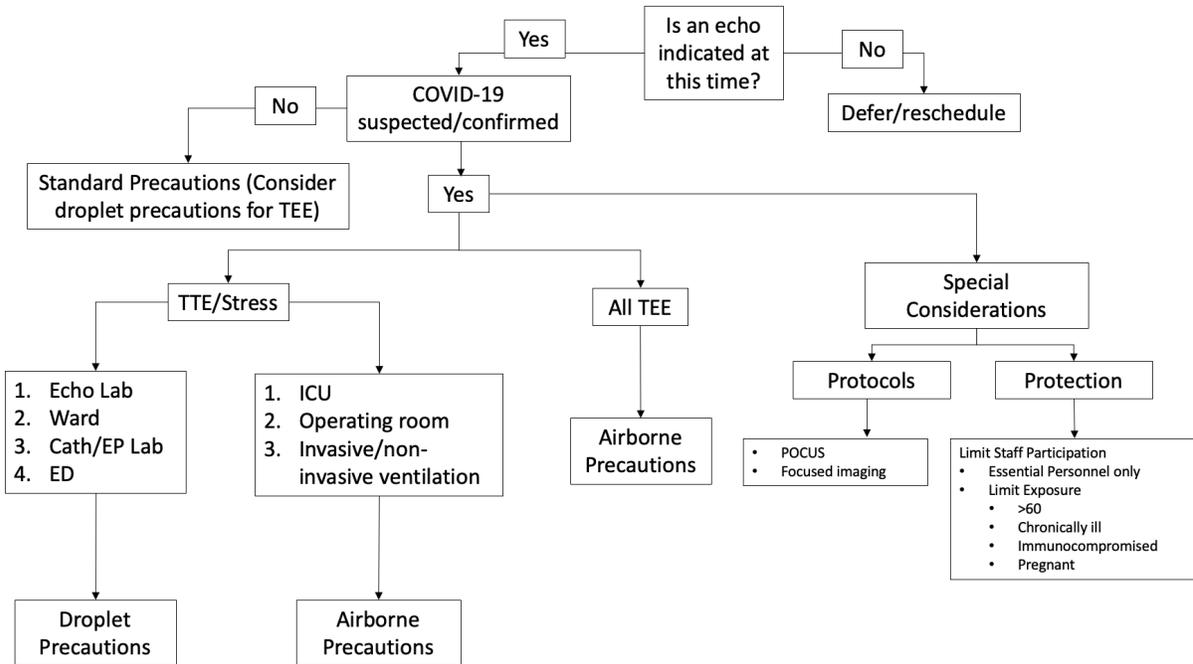
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**Figure 1**

Suggested algorithm for determining indication and level of protection



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

## Figure 2

### Summary recommendations

#### Summary Recommendations for Policies/Procedures During COVID-19 Outbreak

- Defer/Reschedule Options
  - Identify and defer all elective exams
  - Identify and perform only urgent/emergent exams
- Assess patient COVID-19 status
  - None
  - Suspected
  - Confirmed
- Provide for appropriate levels of self-protection
- TEEs are high risk – defer whenever possible, perform in suspected / confirmed cases with airborne PPE precautions
- Institutional PPE conservation
  - Defer non-urgent/emergent exams in suspected/confirmed cases
  - POCUS: Imaging by trained clinician already caring for a patient
- Limiting exposure during exams
  - Problem-focused, limited examinations
  - Guided by prior studies, other imaging (including POCUS findings)
- Reading room methods to reduce transmission
  - Facilitate remote report generation and echo consultation
  - Frequent disinfection of computer keyboard, mouse, surfaces, chairs, doorknobs
  - Discourage congregating in the echo lab reading room
- Identify and appropriately re-assign special at-risk personnel (>60 yrs, immunosuppressed, chronic disease / cardiopulmonary conditions, pregnancy, etc.)

## 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
<b>Standard</b>	X	X		X					
<b>Special Droplet</b>	X	X	X	X*	X*	X	X	X	X
<b>Airborne**</b>	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.

### 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](#).