



## **ASE Statement on the Reintroduction of Echocardiography Services During the COVID-19 Pandemic**

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## **Introduction**

The COVID-19 pandemic has changed the manner in which echocardiography services are provided in all healthcare settings. As the pandemic unfolded, many non-urgent echo studies were deferred in an attempt to reduce coronavirus transmission among patients and healthcare workers, conserve personal protective equipment (PPE), and prepare for a potential surge of COVID-19 patients. Although COVID-19 disease prevalence and new case trends continue to differ substantially by region, many facilities are now planning resumption of non-urgent and elective medical services.[1] Safe and efficient reintroduction of outpatient echocardiography services will require consideration of appropriate timing of reopening based on projected COVID-19 case trends, prioritizing procedure scheduling based on current or change in disease acuity, applying exam protocols to address the clinical question while enhancing lab throughput, implementing appropriate PPE and sanitization protocols, and performing pre-procedural COVID-19 testing in certain patient cohorts.

## **When to reopen**

The timing of reintroduction of non-urgent and elective echo procedures should be aligned with institutional policies and follow recommendations of regional public health authorities. Important considerations include local COVID-19 disease prevalence and new case trends, as well as available institutional resources including facilities, staffing, and equipment (including adequate supply of appropriate PPE). Resumption of echo services should be aligned with the gradual introduction of a phasic reopening plan, which will vary by institution and region. A summary of operational considerations is provided in **Table 1**.

## **Scheduling of deferred cases**

Scheduling prioritization should be developed based on time in queue, patient symptom status, and exam indication urgency. For instance, higher priority exams would include patients with acute cardiovascular symptoms, or when echo is needed to guide further management (e.g., chemotherapy, preoperative evaluation). Routine indications for echo (e.g. annual echo evaluation for chronic valve disease) may be deferred until more urgent cases have been scheduled. In cases where the urgency is unclear, consultation with the referring physician is critical. A suggested prioritization schedule is provided in **Table 2**.

Laboratory efficiency will be necessarily impacted due to the institution of social distancing protocols in patient registration areas and waiting rooms. Potential solutions include staggered scheduling, with additional appointments in the early morning, evening, and potentially during weekends. Patients may be requested to wait in their cars in facility parking areas until contacted by phone or text just prior to their scheduled appointment. Protocols should be based on institution and human resource-specific policies while respecting regional guidelines for social distancing. Labs may consider, at least during the initial response levels, lengthening the duration between echo appointments (compared to pre-COVID), or to have open appointment

times built into the day. This will allow flexibility for unanticipated delays that invariably occur as we restart in a new environment and with new protocols. For example, new entrance procedures at hospital or clinic facilities, new sanitization protocols and use of PPE may result in additional time required for the echocardiogram appointment. For reception and waiting areas, floor markings and signs should guide arriving patients so they may queue at appropriate distances apart from others. If possible, plexiglass or other physical barriers can be placed between front desk staff and patients. Intake staff may also need to wear face shields for added protection.

The physical layout of the reception area should also be re-evaluated and altered to provide sufficient spacing between seated patients. Patients should also arrive without escorts unless absolutely necessary for their appointment, and should leave the facility immediately following the examination. Institutional and regional guidelines for universal masking will need to be followed during the initial phase of reintroduction of services.

### ***Considerations for scheduling of transesophageal echocardiograms***

Scheduling prioritization for transesophageal echocardiography (TEE) is similar for transthoracic echocardiograms (TTE). However, personal protective equipment (PPE) requirements for TEE are more advanced than those required for TTE, as TEE is considered an aerosol generating procedure due to the potential to induce coughing in the un-intubated patient and the need for the operator to be in close proximity to the patient. In addition to appropriate room cleaning protocols, it is also important to schedule sufficient time between TEE studies to allow adequate air flow exchanges within the TEE procedure room. This time is typically institution and exam room specific, and guided by infection control policies. This time is generally 1 hour if HEPA filters or other airflow management systems are not in place. Protocols will vary among institutions depending on the phase of the reintroduction of services. Special rooms may be designated for TEE procedures in COVID-19 positive or suspect cases.

### ***Other considerations***

As echo laboratories manage the backlog of deferred cases, the impact of schedule changes and increase in workload on stress and fatigue among lab staff should also be considered. It is important to recognize that staff have been under stress since the inception of the pandemic. As social distancing is impractical for the performance of TTE, this adds additional stress to team members. Effective communication of and strict adherence to safety protocols can help reduce staff anxiety about returning to the work environment. Attention should be paid to the daily or weekly staffing schedule to ensure appropriate assignment of workload and rest between cases for all laboratory staff. Strategies to assist staff in coping with stress and enhancing resilience should be incorporated. The ASE Wellness Center is an example of a website with helpful resources for echocardiography providers.[2]

Continued inclusion of learners will be important as echocardiography services resume. While education remains a vital consideration in academic institutions, student learners may still need to be excluded from high-risk examinations (e.g., TEE in COVID-19 cases), while trainees in an advanced educational program should be incorporated in the daily schedule while minimizing exposure risk. Opportunities for remote education using video conferencing should continue to be used during the initial phases of reintroduction of services to minimize exposure. Institutions will also need to plan for ensuring adequate PPE supplies and continued training in PPE use.

### **Protocol changes**

In general, ASE recommends a comprehensive 2D echo for the evaluation of patient conditions, particularly if there has been no prior echocardiographic evaluation, if there has been a long interval since the prior study, or if there are new symptoms or signs. However, focused protocols for select indications and limited exams for follow-up studies may still be considered, particularly in patients with higher risk for COVID-19 illness. Focused or limited protocols allow necessary imaging acquisition while limiting contact between sonographer and patient, and promoting general safety. This balance between the completeness of data, and provider safety should be considered for every protocol. A comprehensive discussion of the limited echocardiographic examination has been published in a previous ASE guideline.[3] Point-of-care protocols in the COVID-19 setting have also been discussed in a recent guideline.[4]

### ***Sanitization protocols***

Common areas such as waiting rooms and door handles should be regularly sanitized by cleaning staff. If possible, non-cloth based seating material is preferred to facilitate sanitization.

### **Personal protective equipment**

As healthcare providers, we have a duty to care for patients, but we must also continuously consider the risk of occupational coronavirus transmission. Strategies to minimize risk to sonographers, advanced practice providers, and physicians should balance this risk with the judicious stewardship of PPE. Close cooperation and communication between echocardiography lab leaders, cardiovascular service line leaders, institutional supply-chain directors, and regional health authorities is essential to ensure appropriate protection of patients, sonographers, and echocardiographers. There should be a plan in place to intensify or relax PPE protocols depending on a variety of factors, including local COVID-19 prevalence and new case trends.

The levels of PPE used for echo examinations should broadly follow the recommendations of the initial ASE COVID-19 statement.[5] Briefly, the levels or categories of PPE can be grouped as follows:

- Standard precautions: Handwashing or hand sanitization, gloves, and surgical face mask.
- Droplet precautions: Surgical/isolation gown, double gloves, headcover (depending on location), surgical facemask or N-95 level respirator and eye/face 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 levels of PPE used will depend on the phase of the response, local institutional policies, and COVID-19 testing status. The proposed levels of response for reintroduction of services was recently published by North American cardiovascular societies.[6] Briefly, Level 2 is the initial phase of response with the reintroduction of select services. Level 1 reintroduces most services with appropriate precautions and safeguards in place. Level 0 includes provision of all routine services with ongoing COVID-19 testing and surveillance with monitoring of PPE supplies.[6]

Appropriate hand hygiene and equipment cleansing remains critical at all times. During the initial phase of declining COVID-19 case admissions and partial reopening of services (response level 2), standard precautions should be followed for outpatient TTE exams and require a surgical mask for both the patient and provider(s).[7] This requirement for wearing surgical facemasks may be adjusted in subsequent response levels as the pandemic abates from ‘mandatory’ to ‘recommended’ or ‘optional’. Meticulous disinfection of equipment and exam areas including laboratory office spaces with viricidal agents should remain unchanged through different response levels and is likely to become a permanent change induced by the pandemic. Inpatient TTE exams should follow standard precautions for known COVID-19 negative cases, and escalated to droplet precautions for ICU cases. During response levels 1 and 0, given lower COVID-19 prevalence in the community, standard precautions may be considered appropriate in ICU and other inpatient cases for TTE exams.

*Transesophageal echocardiography:* The level of PPE for TEE examinations deserves special mention. TEE is considered an aerosol generating procedure, and airborne precautions are recommended for COVID-19 positive or suspected, symptomatic cases when the TEE exam cannot wait until test results are known. Droplet precautions should be followed for all other TEEs performed during response level 2 including TEE exams performed in the surgical operating room and hybrid operating rooms for structural heart interventions. The requirement for a face shield is optional in known negative cases and should be judiciously considered in context of local institutional resources and policies. Standard precautions may be considered appropriate for TEEs performed during lower response levels when routine services have resumed across the institution. Conservation of PPE is an important consideration in all approaches to maintain preparedness for a surge in cases, while minimizing risk to providers with reasonable certainty.

*Exercise echocardiography:* Exercise stress echocardiography can be considered a potentially aerosol generating procedure, due to the frequent and heavy respiration generated during exercise; this is in contrast to dobutamine stress echocardiography, which is not considered aerosol-generating. Due to this potential for enhanced aerosol generation, all patients and

providers should consider wearing a surgical facemask at a minimum. In certain instances, N-95 masks may be warranted (coughing patient) at discretion of exercise echo operators. Pharmacologic testing is preferred and alternate imaging modalities may be advisable for symptomatic patients.

### **COVID-19 Screening and Testing**

Facilities should establish COVID-19 symptom screening for all patients. This should be done at multiple time points, including when the appointment is scheduled, during registration, and upon arrival. Ongoing COVID-19 screening (e.g., symptom questionnaire, temperature testing) of all patients is recommended prior to any echocardiographic examination, regardless of level of response. Appropriate triage should be established for patients with symptoms consistent with COVID-19. Subsequent COVID-19 testing may be reserved for symptomatic patients or those who have failed the initial screening. Testing affords the opportunity to defer exams in patients who are COVID positive, particularly when echo results are unlikely to alter immediate management.

The sensitivity of different types of tests remains variable. At the time of writing this statement, there were more than 65 different kinds of COVID-19 molecular or serologic tests available in the United States tests that received emergency use authorizations by the US Food and Drug Administration.[8] Since this is a new virus, past experience and recommendations for standardized testing do not exist, leading to variability in sensitivity and specificity of each test type.[9] The principal concern is false negative test results in asymptomatic individuals presenting for an echocardiogram who could pose a transmission risk that could be amplified in a healthcare setting. It is likely that as the pandemic abates, testing protocols will vary among institutions to minimize the risk to both patients and providers. Rapid point-of-care tests that are based on lateral flow technique to detect specific antibodies may be used for emergent inpatient echocardiograms, while antigen-based tests with a longer turnaround time are recommended for surveillance testing for electively scheduled cases. Testing and re-testing for SARS-CoV-2, and procedures for patients to self-quarantine, if required, should follow institutional protocols guided by local and regional health authorities.

### ***Echocardiograms on COVID-19 positive patients***

Echocardiograms should be deferred on COVID-19 positive patients, or patients under investigation for COVID-19, when possible. Recommendations on echo exam timing in the COVID-19 recuperative phase should be guided by infection control experts at the local institution and focused on minimizing staff exposure, and ensuring the appropriate use of PPE. However, patients post-COVID-19 recovery will require serial temporally negative COVID-19 tests, and resolution of respiratory symptoms (cough and shortness of breath) for a pre-specified time interval. There may be instances when echocardiograms are required in acutely ill COVID-19 patients. The indications will be similar to the prioritization schedule noted above.

Development of special pathways for echo exams in COVID-19 patients should be considered for infection control. Examples include dedicated clinic and testing areas for these patients, with portable exams preferred including the use of focused protocols.[10] If dedicated areas are not feasible, COVID-19 patients expected to arrive to the testing facility should be identified and escorted directly into the echo exam room, bypassing the waiting area. A facemask should be mandatory throughout the stay in the facility. Dedicated exam rooms and machines, including portable systems for point of care exams for COVID-19 positive patients are recommended. Additionally, procedure rooms and bathroom facilities require sanitization immediately after each use which will require coordination with institutional hygiene/environmental services. Consultation with local infection control experts will be helpful to confirm the adequacy of proposed workflows for COVID-19 patients.

### **Special considerations for pediatric echocardiography laboratories**

Guidelines for pediatric echocardiography, including fetal and transesophageal imaging during the COVID-19 pandemic have recently been published.[11] As the medical community considers reintroduction of services, there are several unique considerations for pediatric echocardiography laboratories.

#### ***Workflow considerations***

Children undergoing echocardiography are often uncooperative, particularly when under the age of 3 years or when developmentally delayed. In addition, children typically have a caretaker in the room when the echocardiogram is being completed. Furthermore, a complete pediatric echocardiogram requires approximately 45-60 minutes to complete because of additional pediatric views, complexity of disease and long sweeps.[12] These aspects of pediatric echocardiography pose a higher risk of exposure to sonographers and physicians in the typical inpatient and outpatient setting. Potential strategies to address these issues include the following:

- Communication between sonographer, echocardiography attending physician and referring physician is vital, particularly if the echocardiography request/question to be answered is unclear or to agree upon when to discontinue the study if the patient is persistently uncooperative.
- Use of focused echocardiography protocols when possible (i.e. follow-up studies, answer of a focused question) to limit exposure time.
- Routine use of higher level PPE for all pediatric echocardiograms including gloves, surgical facemask and eye protection with a shield or goggles. The use of specific PPE would need to be aligned with institutional policies. N-95 respirators may be considered in high-risk cases.
- Permitting only one caretaker wearing a facemask at all times to accompany the patient in the echocardiography examination room. Attempts should also be made to have the patient wear a facemask when possible.

- Patients and families should spend as little time in a waiting area as possible, so consideration should be made to stagger appointment times and to room patients immediately in the echocardiography examination room to limit exposure for the family and health care providers.

### ***Sedation***

Many laboratories have sedation protocols which are utilized typically for children aged 3 weeks to 3 years. These may include oral or intranasal medications or even inhaled anesthetics.[13] Sedated echocardiograms are typically performed prior to a surgical or catheter-directed intervention in order to assure that all pertinent information regarding structural abnormalities and ventricular performance are obtained. Conscious sedation may be considered an aerosol generating procedure in many institutions. Therefore, for the reintroduction of sedated echocardiography services, SARS-CoV-2 PCR testing within 24 hours of the procedure should be strongly considered. Many institutions now have turnaround time for PCR testing of 1-3 hours. Thus, testing could be performed on the day of the sedated echocardiogram. If PCR testing is positive, consideration should be made to defer the sedated echocardiogram. For conscious sedation in PCR negative patients, standard or droplet precautions may be used as appropriate for the sonographer, sedation provider, and other health care providers in the room. A mask could be placed on the patient as long as he/she is monitored by a front-line provider with expertise in monitoring patients undergoing conscious sedation. Centers using inhaled anesthetics and intubation for sedated echocardiograms should consider conscious sedation protocols to avoid more significant aerosolized procedures.

Finally, it has been noted that the majority of children who acquire COVID-19 are asymptomatic or only suffer from mild symptoms. However, a new and troubling pediatric presentation of COVID-19 has appeared, particularly in Europe and the United States. This “Pediatric Multi-System Inflammatory Syndrome” includes fever, elevated inflammatory markers, abdominal pain (sometimes mimicking appendicitis), vomiting, diarrhea and, in extreme cases, multi-organ failure. SARS-CoV-2 PCR testing can be positive or negative but IgG antibodies are often positive. The presentation can look similar to Kawasaki disease or toxic-shock syndrome with some reports of myocarditis, ventricular dysfunction, arrhythmias and coronary artery aneurysms. [14, 15] Elevated B-natriuretic peptide, troponin, WBC, CRP, and ferritins have been reported. Pediatric echocardiographers need to be aware of this illness and its echocardiographic findings. Serial echocardiograms, even daily for those in the critical care setting, may be required given the rapid evolution and changes in function. Importantly, children who present with these symptoms should be treated as if they are COVID-19 positive even if testing is negative. Thus, higher level PPE with N-95 masks or airborne precautions should be used to image the patients when an echocardiogram is needed. Moreover, a focused echocardiogram should be performed when possible to limit exposure time and the echocardiography machine should be decontaminated after the study is completed.

**Conclusion**

As the COVID-19 pandemic recedes from its initial surge, cardiovascular diagnostic services must be safely reintroduced. There will be a continued need to ensure that coronavirus transmission risk is minimized. PPE considerations include the balance between current local coronavirus transmission risk with the adequacy of current PPE stores, and supply chain capabilities. Monitoring of patients and providers for COVID-19 resurgence will be key in determining the response level of the institution and protocols for diagnostic echocardiograms.

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**Table 1:** Operational considerations for reintroduction of echocardiography services

Operational area	Workflow Considerations
<b>Scheduling</b>	<ul style="list-style-type: none"> <li>• Create priority tiers (see <b>Table 2</b>).</li> <li>• Contact patients using digital communication (e.g., EMR portal, phone, email).</li> <li>• Screen patients for COVID-19 symptoms at multiple time points – initial call/contact, pre-appointment phone call, and at front desk on arrival. Include temperature screening in initial phase.</li> <li>• Consider COVID-19 testing of symptomatic patients prior to appointment.* Consider testing prior to all potentially aerosol generating procedures regardless of symptoms.</li> <li>• Limit patient escorts/visitors to only essential/required.</li> <li>• Adequate spacing between exams to allow time for sanitization protocols and minimal in-facility wait time for patients.</li> </ul>
<b>Environmental</b>	<ul style="list-style-type: none"> <li>• Disinfection of bathroom facilities after each use.</li> <li>• Disinfection of examination room and equipment between exams.</li> <li>• Designated special exam rooms with reserved equipment for COVID-19 patients.</li> <li>• Airborne isolation rooms for TEEs in COVID-19 positive cases. Ensure adequate air exchange time between cases for complete clearance of airborne particles.</li> <li>• Sanitization of reading rooms and common staff areas.</li> </ul>
<b>Waiting area</b>	<ul style="list-style-type: none"> <li>• Communication with patients about readiness for exam prior to arrival in reception/waiting area (e.g., text messaging, phone call). Minimize use of paper-based communication (e.g., forms, financial transactions) by using digital methods (e.g. online form completion or payment systems).</li> <li>• Ensure appropriate social distancing norms between patients and reception staff (e.g., plexiglass barriers) and between patients themselves (e.g., floor markings in front of reception, distance between waiting area chairs).</li> <li>• Disinfection material (e.g., sanitation wipes/hand sanitizers) available for general use.</li> <li>• Facemasks available for patient/escort and all staff members.</li> </ul>
<b>Staffing</b>	<ul style="list-style-type: none"> <li>• COVID-19 screening of staff per institutional policies.</li> <li>• Adequate staffing for covering backlog of cases (extended hours/weekends).</li> <li>• Strategies to cope with stress and enhance resilience during periods of increased workload.</li> <li>• Monitoring of PPE supplies to ensure uninterrupted operations in all work areas (adult, stress, pediatric, intraoperative).</li> <li>• Appropriate social distancing and sanitization in reading rooms, break areas and staff lounges.</li> </ul>

**Footnotes:**

*Abbreviations:* EMR = electronic medical record; TEE = Transesophageal echocardiography  
*\* = Screening and COVID-19 testing of patients should follow local institutional policies and recommendations from regional health authorities*

**Table 2:** Suggested prioritization tiers for rescheduling echocardiography exams

**Footnote**

<b>Priority Tiers</b>	<b>Basis for Priority Rating</b>	<b>Examples</b>
<b>Tier 1 (High Priority)</b>	<ul style="list-style-type: none"> <li>Active or recent change in cardiovascular symptoms</li> </ul>	Dyspnea, chest pain, syncope, TIA, new arrhythmia, child with new cardiovascular symptoms and/or cyanosis.
	<ul style="list-style-type: none"> <li>Recent procedure requiring urgent follow-up</li> </ul>	Post-device implantation arrhythmias or pericardial effusion. Post-cardiac surgery assessment, including VAD complications.
	<ul style="list-style-type: none"> <li>Safety monitoring for therapy (even if asymptomatic)</li> </ul>	Chemotherapy, clinical trial safety endpoint.
	<ul style="list-style-type: none"> <li>Echo required prior to therapy (preoperative-urgent)</li> </ul>	Preoperative workup for surgery that is required for significant functional limitation; LVEF assessment prior to CIED procedure for primary prevention. Baseline assessment prior to initiation of chemotherapy.
<b>Tier 2 (Medium Priority)</b>	<ul style="list-style-type: none"> <li>Asymptomatic but with chronic cardiac disease that requires monitoring for progression</li> </ul>	Cardiomyopathy; severe valve disease (AS, MR, AR); pulmonary hypertension; arrhythmias; pericardial effusion. Progression of disease after intervention (recurrent coarctation, conduit stenosis)
	<ul style="list-style-type: none"> <li>Therapy that requires ongoing monitoring</li> </ul>	Pulmonary artery systolic pressure estimation in patients receiving parenteral therapy for pulmonary hypertension. Anti-rejection therapy after cardiac transplant. Treatment for Kawasaki disease. Follow-up assessment of VAD function in stable patients.
	<ul style="list-style-type: none"> <li>Echo required prior to therapy (preoperative but non-urgent)</li> </ul>	Preoperative workup for non-urgent surgery
<b>Tier 3 (Low Priority)</b>	<ul style="list-style-type: none"> <li>Routine follow up for chronic disease</li> </ul>	Hypertension, coronary artery disease; annual evaluation for aortic disease or prosthetic valve function (normal function on prior exam and no new symptoms)

Additional issues that are not explicitly listed may also impact the prioritization, including duration of test deferral, and whether echo test is needed prior to further non-urgent therapy. Integration of these factors should also be considered when rescheduling patients. Consultation with referring provider is encouraged if priority of echo study is unclear.

*Abbreviations: CIED = cardiac implantable electrical device; LVEF = left ventricular ejection fraction; VAD = ventricular assist device.*