RECOMMENDED GUIDANCE FOR THE PROVISION AND THE STAGED REINTRODUCTION OF ECHOCARDIOGRAPHY SERVICES DURING THE COVID 19 PANDEMIC

A Consensus statement from the Cardiac Services Development Team at the Ministry of Health of Saudi Arabia

Abbreviations

ACS = Acute Coronary Syndrome
AMI = Acute Myocardial Infarction
AUC = Appropriate Use Criteria
TTE = Trans-Thoracic Echo
TEE = Trans-esophageal Echo
AGMP = Aerosol Generating Medical Procedure
ICP = Infection Control Procedures
STEMI = ST Segment Elevation MI
NSTEMI = Non-ST Segment Elevation MI
CDC= Centers of Disease Control
PPE= Personal Protective Equipment
ICU= Intensive Care Unit
ER= Emergency Room
ICP= Infection Control Program
POCUS=Point of Care Ultrasound
ECMO= Extracorporeal Membrane Oxygenation

Disclosures and Funding

No disclosures
No funding was needed to produce this document

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1.0 INTRODUCTION

1.1 BACKGROUND

In response to the COVID 19 Global Pandemic, cardiac services as other different medical specialties had to alter their business as usual to accommodate the preparedness and surge capacity plans. The exponential growth in the number of infected cases that overwhelmed the healthcare systems worldwide requiring urgent and emergent care for critically ill COVID 19 patients lead to limited access for non-COVID patients. The fast and easy transmissibility of this disease puts both the cardiac patients and the healthcare workers at higher risk of acquiring an infection. Echo staff are at even higher risk due to the close contact involved in the performance of echocardiographic studies.[1]

The most vulnerable (the elderly, patients with chronic diseases, and the immunocompromised) are at higher risk of being infected and may suffer significant morbidity and mortality. Cardiac patients fall in this high-risk population.

1.2 PURPOSE

Echocardiography is an essential modality in diagnosing and following up cardiac patients. The provision of this service during the COVID 19 pandemic puts us at crossroads between the need to provide high quality, evidence-based medical care for patients and the protection of our staff at the same time. It also poses a clinical dilemma since first COVID 19 could present with similar symptoms as Acute Coronary Syndrome (ACS) for example or Decompensated Heart Failure (e.g., chest pain, dyspnea)[2]; secondly, the disease itself could cause major cardiovascular complications, It has been reported to cause direct myocardial injury leading to myocarditis and cardiomyopathy. It was also noticed that it creates a hypercoagulable state leading to pulmonary emboli, AMIs, and peripheral vascular ischemia. And lastly, it could infect patients with established cardiac disease leading to new AMIs or exacerbations of heart failure[3].

1.3 EVIDENCE

Evidence suggests that following the guidance of international Appropriate Use Criteria (AUC) tailored to fit the COVID 19 exceptional circumstances and following recommended infection control precautions published by the Saudi CDC during the management of patients with highly suspected/confirmed COVID 19 patients will assure the provision of a safe echocardiography service. Ward and colleagues[1], published their experience of performing 3642 TTEs in 2.5 months during the ongoing COVID 19 pandemic, they found that by following a designated. AUC 94% of echo studies conducted were "appropriate use," and 6% were "rarely appropriate." In their study, they also found that with strict infection control precautions and proper use of PPE, None of the Echo staff got infected

1.4 AIM, SCOPE AND TARGETED END USERS

The following Guidance reflects input from the Cardiac Services Development Team at the Ministry of Health of Saudi Arabia. it is intended to be used to assist clinicians working at the MOH hospitals on the proper use of Echocardiography during the COVID 19 pandemic.

1.5 UPDATING THE GUIDANCE:

The team recognizes that the situation is in continuous evolution. Surge capacity plans changed over time and our understanding of the disease through accumulated clinical experience and published evidence changes, which reflects on our clinical practice; for this reason, this document is dynamic and will be reviewed periodically and adjusted as need

1.6 CONFLICT OF INTEREST: No disclosures.

1.7 FUNDING: No funding was needed to produce this document.

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2.0 GENERAL RECOMMENDATIONS

2.1 GUIDANCE 1 — INFECTION CONTROL PROCEDURES WHILE PERFORMING AN ECHOCARDIOGRAM

2.1.1 An experienced Cardiologist/Echocardiographer should triage all echo requests.

2.1.2All patients requested to have an echocardiogram admitted to the Intensive Care Unit or isolation wards or still triaged in the Emergency Department should be treated as COVID 19 positive until proven otherwise through a sound clinical assessment or testing.

2.1.3. All non-intubated patients with suspected or confirmed COVID 19 should be wearing a surgical mask during the procedure.

2.1.4. The procedure should be performed in a negative pressure isolation room. If a negative pressure room not available, then a HEPA filter should be used and situated near the patient's head.

2.1.5. During all echocardiogram procedures, strict hand hygiene should be followed, PPE such as gowns gloves face masks eye protection, and aerosolization protection (FF2 FF3 N95) should be available and adequately used by the Echo staff performing the study.

2.1.6. TEE is considered an Aerosol Generating Medical Procedure (AGMP). It should be delayed or replaced by another imaging modality unless a robust clinical indication arises, and the TEE would have a significant impact on the outcome of the patient.

2.1.7. Echo protocols and images should be minimized, so it directly addresses the study indication, and measurements should be performed off-line to shorten the exposure time for the echo staff. *(https://www.asecho.org/wp-content/uploads/2018/10/Guidelines-for-Performing-a-Comprehensive-Transthoracic-Echocardiographic-Examination-in-Adults.pdf)*

2.1.8. The ICU, ER, and the isolation ward should have a dedicated echo machine to be used on the suspected and confirmed COVID 19 patients. The machine should also be adequately disinfected after each study following the ICP of the hospital.

2.1.9. Echo staff who are considered more vulnerable should be excluded from the rotation covering highly suspicious/confirmed COVID 19 patients.

2.2 GUIDANCE 2 — CLINICAL INDICATIONS TO PERFORM ECHO IN COVID 19 HIGHLY SUSPICIOUS OR CONFIRMED CASES

2.2.1. An experienced Consultant Cardiologist/Echocardiographer should triage all echo requests.

2.2.2 TTE should be done for COVID 19 confirmed /highly suspected cases who develop an AMI (STEMI/NSTEMI) associated with clinical evidence of mechanical complications that might require an urgent surgical intervention.

2.2.3. TTE should be done in COVID 19 confirmed/highly suspected patients who develop cardiogenic shock to assess myocardial function as there is an association between COVID 19 and to develop acute myocarditis, cardiomyopathy, cardiac tamponade or acute severe heart failure due to ischemic heart disease.

2.2.4. Patients with persistent hypoxemia or hypercapnia or both requiring ECMO as there is a need to assess the right and left cardiac function which would help in decision making on ECMO modality (Veno-Venous vs. Veno-Arterial vs. Veno-Arterial-Venous).

2.2.5. TEE may be required to rule out a Left Atrial Appendage clot before cardioversion for hemodynamically unstable patients with acute onset Atrial Fibrillation.

2.2.6. TTE +/- TEE may be needed to rule out infective endocarditis.

2.2.7. TTE+/- TEE may be needed for patients post Cardiac Transplant in case acute rejection is suspected.

2.2.8. Stress echo should be delayed until patient recovers and confirmed negative.

2.2.9. Utilization of POCUS done either by Emergency Department or Intensive Care Unit physician is highly recommended, and images could be reviewed off-line with the cardiologist before deciding on complete echo study.

2.3 GUIDANCE 3 — CLINICAL INDICATIONS TO PERFORM AN ECHO FOR NON-COVID 19 (NEGATIVE OR LOW SUSPICION)

2.3.1. An experienced Consultant Cardiologist/Echocardiographer should triage all echo requests.

2.3.2. TTE may be needed for admitted cardiac patients who need an echo to facilitate safe discharge

2.3.3. TTE may be needed for Oncology patients to assess myocardial function and help guide or initiate chemotherapy.

2.3.4. TTE +/- TEE may be indicated in newly diagnosed valvular heart disease or heart failure cases to guide an urgent intervention or decide on management plan.

2.3.5. TTE may be indicated in Patients with clinical suspicion of new Aortic stenosis.

2.3.6. TTE may be indicated for Ischemic heart disease patients with NYHA III-IV heart failure symptoms.

2.3.7. Stress echo should be delayed unless it will affect the direct short-term management of the patient.

3.0 SAFE, STAGED REINTRODUCTION OF ECHOCARDIOGRAPHY SERVICES DURING THE ONGOING COVID 19 PANDEMIC

Cardiac patients with untreated disease are at risk for major adverse outcome[7]. Similarly the very restricted access to cardiology clinics and cardiac diagnostic tools is leading to a huge number of undiagnosed cardiac patients that if not caught at the appropriate time will either present acutely to our emergency departments, present at a later stage with advanced non-treatable disease or sustain a sudden cardiac arrest outside our medical facilities.

For that reason, we suggest starting reintroducing outpatient and diagnostic cardiac services as well as inpatient procedures and admissions in a safe and staged fashion that would allow for proper measures to protect our patients from contracting a hospital acquired COVID 19 infection and protect our healthcare workers at the same time.

3.1 GENERAL GUIDANCE

3.1.1. All patients presenting with AMI and/or decompensated heart failure should be treated as COVID 19 positive/highly suspected until proven otherwise through a sound clinical judgment or test result. Echocardiograms for this category of patients should be done in designated areas.

3.1.2. All patients should be wearing a facemask during the procedure .

3.1.3. All echo staff involved in patient management in negative or low risk patients for COVID 19 should be wearing a surgical mask during the patient encounter.

3.1.4. Staff involved in management of negative or low risk for COVID 19 patients should not be part of the COVID 19 team in the hospital. It is advised to have different coverage and call schedule for the COVID 19 and non-COVID 19 cardiac services.

3.1.5. Patients who present to areas where the surge capacity is high should be referred to another hospital/city/region where the surge capacity level is low instead of delaying management.

3.1.6. Continuous collaboration and communication with both the public health and referral service (IHALATY) is of extreme significance as to planning on safe reintroduction and ramping up the service. In case COVID 19 cases on the rise and surge capacity level is higher than immediate transfer of cardiac patients to other hospitals/cities/regions that have not experienced a significant surge in cases and could provide the care needed for cardiac patients.

3.2 PHASED REINTRODUCTION OF ECHOCARDIOGRAM SERVICES

3.2.1. TTE

Phase 1 (Current Phase Level 3-5) – All inpatients that TTE yielded information will affect or determine the patients short term management. All outpatient cases that the information yielded from TTE would alter or determine the short-term management.

Phase 2 (Low Surge Capacity Level 1 &2) – All in patients who have a reasonable indication for TTE. Start of elective echo for – patients who are waiting for intervention or surgery if no baseline echo available, chronic cardiac patients with new onset symptoms, new patients referred with cardiac symptoms needing to establish a diagnosis.

Phase 3 (Normal Circumstances with Ongoing Surveillance and Testing) – Business-as-usual services.

3.2.2. TEE

Phase 1 (Current State Level 3-5) – All inpatients with a proper indication for TEE, the study should be done only if the information yield will directly affect major decisions in short term treatment options. The patient should be currently occupying or could be transferred to an isolation negative pressure room or a HEPA filter is available. All outpatient TEE requests should be delayed.

Phase 2 (Low Surge Capacity Level 1&2) -- All inpatients with a proper indication for TEE, the study should be done only if the information yield will give clarity for the patient's clinical status and would help guide therapy. The patient should be currently occupying or could be transferred to a isolation negative pressure room or a HEPA filter is available.

Phase 3 (Normal Circumstances with Ongoing Surveillance and Testing) – Business-as-usual services.

3.2.3. STRESS ECHO

Phase 1 (Current State Level 3-5) – All inpatients requests should be delayed unless directly affecting short term decision making on treatment options. All outpatients should be deferred to a later date.

Phase 2 (Low Surge Capacity Level 1& 2) – All inpatient requests should be delayed unless directly affecting short term decision making on treatment options. Outpatient studies for patients who need decision making on invasive procedures or open-heart surgery could be considered.

Phase 3 (Normal Circumstances with Ongoing Surveillance and Testing) – Business-as-usual.

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3.3 Table 1 . PHASED INTRODUCTION TO ECHOCARDIOGRAPHY SERVICES

ONGOING SURVEILLANCE AND TESTING OF COVID 19			
PROCEDURE	**PHASE 1** **High Surge Capacity** **Level 3-5**	**PHASE 2** **Low Surge Capacity** **Level 1&2**	**PHASE 3** **Normal** **Circumstances**
TTE	• All inpatients require TTE to determine the patient's short-term management. • All outpatient cases that the information yielded from TTE would alter or determine the short-term management.	• All inpatients who have a reasonable indication for a TTE. • Start of elective TTE for patients who are waiting for intervention or surgery if no baseline TTE available • Chronic cardiac patients with new onset symptoms • New patients referred with cardiac symptoms needing to establish a diagnosis.	**Business-as-usual services**
TEE	• All inpatients with a proper indication for TEE, the study should be done only if the information yield will directly affect major decisions in short term treatment options. • The patient should be currently occupying or could be transferred to an isolation negative pressure room or a HEPA filter is available. • All outpatient TEE requests should be delayed.	• All inpatients with a proper indication for TEE, the study should be done only if the information yield will give clarity for the patient's clinical status and would help guide therapy. • The patient should be currently occupying or could be transferred to an isolation negative pressure room or a HEPA filter is available.	
Stress Echo	• All inpatients requests should be delayed unless directly affecting short term decision making on treatment options. • All outpatients should be deferred to a later date	• All inpatient requests should be delayed unless directly affecting short term decision making on treatment options. • Outpatient studies for patients who need decision making on invasive procedures or open-heart surgery could be considered.	

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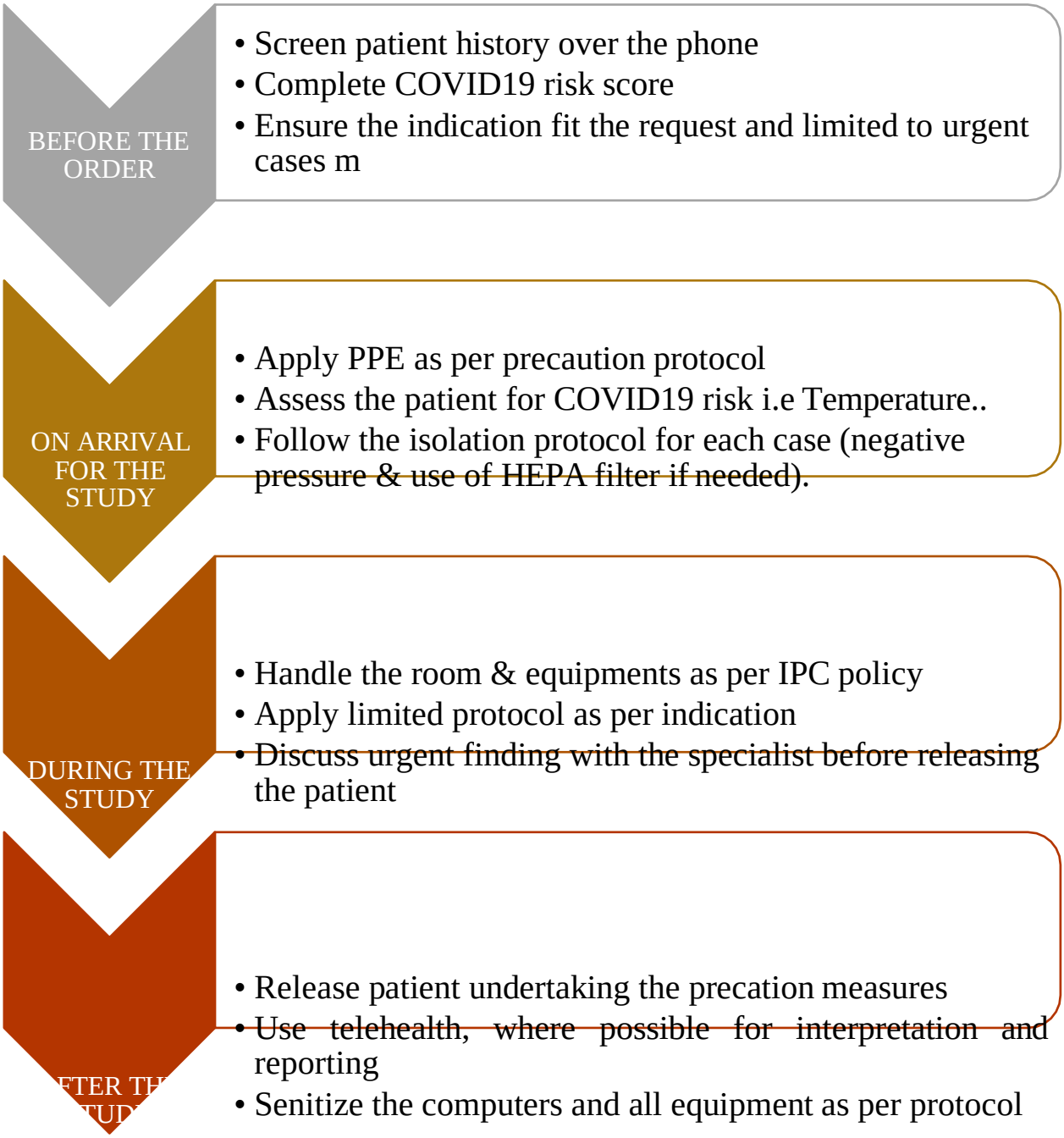
3.4 Figure 1. PROCEDURE FOR PERFORMING ECHOCARGRAM DURING COVID 19 PANDEMIC



3.5 PHASE ALERT LEVELS REFERENCE OF SERVICES

Surge Capacity Activation Levels

	Level (1)	Level (2)	Level (3)	Level (4)	Level (5) A	Level (5) B
+ve	33000	66000	99000	132000	165000	210000
Quarantine 70%	23100	46200	69300	92400	115500	147000
Ward 25%	8250	16500	24750	33000	41250	52500
ICU 5%	1650	3300	4950	6600	8250	10500
Triggers						
	Average* COVID-19 hospital admissions by day: <332 OR Average** daily COVID-19 deaths: <15	Average* COVID-19 hospital admissions by day: 332-646 OR Average** daily COVID-19 deaths: 15-27	Average* COVID-19 hospital admissions by day: 646-996 OR Average** daily COVID-19 deaths: 26-46	Average* COVID-19 hospital admissions by day: 996-1494 OR Average** daily COVID-19 deaths: 46-70	Average* COVID-19 hospital admissions by day: >1494 OR Average** daily COVID-19 deaths: >70	
Resources Actions						
	Decrease MOH Hospitals occupancy for Non-COVID-19 Patients to **<50%**	- Decrease MOH Hospitals Occupancy for Non-COVID-19 Patients to **<25%** - Repurposing Beds	Maximum utilization of other (Private – Gov. – MoH non active)	Trans HD Support	Field hospitals	
Man power Options						
	• Utilize non functional departments staff • Training and Cross Skills • Part-time / Locum /overtime • Consider 12 hours shift • Adjust patient ratio	• Maximize utilizing other healthcare services - PHC (Primary Health Care) - SC (Specialized Centers) - Private sector (Clinics, others	• DMAT • Volunteers			

4.0 REFERENCES

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4.7 David A. Wood et al, "Safe Reintroduction of Cardiovascular Services During the COVID-19 Pandemic: Guidance from North American Society Leadership.