

Introduction

Using these guidelines:

- These guidelines are based on expert clinical opinion and evidence where appropriate literature exists.
- Individual patient scenarios and local practice pathways remain an equally significant factor in triage.
- This document refers to transthoracic echo (TTE) only.

Triage of emergency, inpatient and critical care echo requests should be facilitated by the referrer using the system in operation locally to make direct contact with the service member who will perform the study; the precise timeframe for performing the study will be decided between the referring clinician and the operator.

National guidelines recommend the following target timeframes:

- Not indicated as an inpatient
- ▶ Indicated as an inpatient but not urgent: variable timeframe depending upon clinical need
- ▶ Urgent: within 24 hours of initiating the referral
- ▶▶ Emergency echo: within 60 minutes of initiating the referral

Service design and capabilities will vary between centres. These timeframes are given as optimum targets¹.

Indications for emergency TTE (Level I or II operator):

Where a clinician of sufficient seniority suspects:

- Acute circulatory failure due to life-threatening hypovolaemia
- Acute systolic or diastolic heart failure
- Acute or severe valve pathology: e.g. critical AS or MV dysfunction
- Acute right heart failure due to pulmonary embolus
- Cardiac tamponade.

Loop closure:

Optimal performance of emergency and urgent TTE relies upon²:

- Clear guidelines for clinicians on the appropriate use of emergency and urgent TTE
- Clear mechanisms for the referrer to communicate with the echo team
- Shared decision making between the referrer and the echo team on the optimal timeframe for each study
- Clear lines of communication for the echo team member to feedback echo findings in useful clinical language
- Established pathways for storage and documentation of studies.

Ref: ¹ S Clarke et al. British Cardiovascular Society working group report: out of hours cardiovascular care: management of cardiac emergencies and hospital in-patients. BCS documents. September 2016. Seven Day services clinical standards. HS documents. February 2016. Indications for emergency TTE (Level I or II operator) <https://www.bsecho.org/Public/Accreditation/Personal-accreditation/Level-1/Public/Accreditation/Accreditation-subpages/Personal-accreditation-subpages/Level-1-accreditation>

WARD BASED AND HIGH DEPENDENCY INPATIENT ECHO REQUESTS

CHEST PAIN

- Evaluation of cardiac chest pain with a normal ECG, no murmur and negative cardiac biomarkers
- ▶ Following confirmed AMI to assess infarct size, LV function and complications
- ▶ Murmur following a recent myocardial infarction
- ▶▶ Chest pain with haemodynamic instability
- ▶▶ Assessment of suspected type I aortic dissection often in conjunction with cross-sectional imaging

SUSPECTED HEART FAILURE

- ▶ Patients admitted for suspected heart failure commenced on inpatient treatment
- ▶▶ Cardiogenic shock as judged by an appropriately senior clinician
- ▶▶ Return of circulation following cardiac arrest

SYNCOPE

- No murmur detected or documented malignant arrhythmias
- Vaso-vagal or situational syncope
- ▶ Murmur detected clinically
- ▶ Arrhythmia-associated syncope
- ▶ Significantly abnormal ECG e.g. LBBB, RBBB or LVH

ARRHYTHMIAS

- Fast AF without hypotension or suspicion of structural heart disease
- Symptomatic ectopics (defer to outpatient following Holter monitoring)
- ▶ Arrhythmia associated with hypotension
- ▶ VT or VF

SUSPECTED OR ESTABLISHED PULMONARY EMBOLISM

- Asymptomatic or minimally symptomatic patient post therapy for CTPA confirmed Pulmonary Embolism
- Pre-discharge to evaluate for features of persisting right ventricular overload in clinically stable patients (defer to 3 months)
- ▶ Re-evaluation where cardiovascular compromise or symptoms persist following initial therapy
- ▶▶ To establish right heart function in clinically unstable patients to facilitate therapy decisions

PA Bergl, A Umpierrez de Reguero, JJ Patel. Things We Do for No Reason: Routine Echocardiography in Hemodynamically Stable Patients with Acute Pulmonary Embolism. *J. Hosp. Med.* 2019 April;14(4):242-245

EMERGENCY NON-CARDIAC SURGERY

- Known ventricular or valvular dysfunction established within prior 12 months without a change in symptoms
- AF without signs of congestive cardiac failure or murmur
- Referral based on age or frailty only
- ▶ Clinical suspicion of undiagnosed valvular or ventricular pathology which will alter the anaesthetic approach: this may include LBBB, RBBB or significant LVH

INFECTIVE ENDOCARDITIS

- Fever with no other positive Duke's criteria
- Repeat assessment in a clinically stable patient with known vegetations
- ▶ To characterise valve lesions and haemodynamic consequences where Duke's criteria are positive
- ▶ One week following a negative TTE study in cases of high clinical suspicion where a Trasoophageal Echo is not possible
- ▶ Detection of high-risk complications when suspected (e.g. fistula, abscess, mass lesions)
- ▶ Persistent bacteraemia of unknown source, particularly in staphylococcal aureus infection
- ▶ Baseline re-assessment prior to discharge following completion of treatment for endocarditis
- ▶▶ Clinical suspicion of infective endocarditis with evidence of acute cardiac failure, valve decompensation, or root abscess

POST CARDIAC OPERATION OR PROCEDURE

- Following routine elective coronary revascularisation in stable patients
- Routine pre-discharge echo following valve replacement in asymptomatic patients. Obtain baseline haemodynamic data at 4-6 weeks post operation
- ▶ Routinely following AF ablation
- ▶ Routinely following structural heart disease intervention e.g. PFO closure
- ▶▶ Concern regarding cardiac tamponade following any cardiac or thoracic cavity procedure
- ▶▶ Concern regarding cardiac tamponade following structural heart disease procedure, coronary intervention or permanent/temporary pace-maker insertion or lead extraction

ACUTE STROKE

- Patient not in AF with no murmurs or suspicion of Regional Wall Motion Abnormality (scan to be performed as an outpatient)
- ▶ Patient in AF
- ▶ Audible murmurs
- ▶ Suspected RWMA from clinical assessment or ECG

SPECIFIC INDICATIONS FOR TTE

Shock: transthoracic echocardiography is recommended as the primary assessment tool for the shock state following senior clinical assessment

- Prior to clinical assessment and initial management
- ▶ Where initial clinical assessment and management has failed to provide reasonable clinical improvement

Ref: Surviving sepsis campaign: International guidelines for the management of sepsis and septic shock: 2016. A Rhodes et al. *Critical Care Medicine.* March 2017, Volume 45 (3): 486-552.

ASSESSMENT OF RIGHT HEART FUNCTION (SEE PRIOR SECTION FOR PULMONARY EMBOLI)

- ▶ Where acute right heart dysfunction is clinically suspected for example due to the use of a high Positive End Expiratory Pressure ventilation strategy or where ECG changes suggest right ventricular infarction

ASSESSMENT OF LEFT VENTRICULAR FUNCTION

- Where clinical information is otherwise adequate to answer the clinical question
- ▶ Following cardiac arrest and return of circulation
- ▶ In cases of severe malnutrition
- ▶ Where underlying cardiomyopathy is suspected
- ▶▶ Where there is difficulty in maintaining end organ perfusion despite senior assessment and therapy
- ▶▶ Where a direct effect of pathology on ventricular function is suspected e.g. septic cardiomyopathy

ASSESSMENT OF COMPLEX FLUID BALANCE

- Prior to clinical assessment and initial management
- ▶ To determine filling status in anuric state
- ▶ To guide renal replacement therapy and fluid therapy planning
- ▶▶ Where despite evidence to the contrary hypovolaemia may be the cause of hypotension/perfusion e.g. following large volume resuscitation or where peripheral oedema is present

DIFFERENTIATION BETWEEN ARDS AND PULMONARY OEDEMA

- Where the cause of interstitial fluid appearance on chest radiology is known for example in acute pneumonitis diagnosed on CT imaging
- ▶▶ Where there is reasonable clinical suspicion that the cause of interstitial fluid seen on chest radiography or lung ultrasound is due to raised LVEDP

SUSPICION OF ACUTE MECHANICAL VALVULAR PATHOLOGY

- Where history examination and current illness are not supportive of a diagnosis of valve dysfunction as a cause for haemodynamic compromise
- ▶ Where the history and examination findings suggest that the clinical picture and/or organ failure may be due to critical or acute valve dysfunction, e.g. flail mitral valve

ASSESSMENT OF THE PERICARDIAL SPACE

- Small volume pericardial effusion is noted on CT in the context of critical illness without haemodynamic effects
- ▶ Where there is clinical suspicion of pyopericardium from clinical, microbiological and radiological information
- ▶▶ Where clinical findings suggest that known or suspected pericardial fluid is either contributing to haemodynamic compromise or causing acute cardiac tamponade

SPECIAL CIRCUMSTANCES

Due to the variety of pathology seen in critical care requests for TTE where the literature is scarce, should be triaged on a case by case basis between the clinical and echo teams.

- ▶ Assessment of cardiac function to facilitate organ donation
- ▶ Guidance for positioning of extracorporeal support cannulae
- ▶ Search for penetrating objects or assessment of cardiac structure following trauma to the thorax

CL Colebourn, J Newton. *Acute and Critical Care Echocardiography.* October 2017. Oxford University Press.