British Society of Echocardiography

Endorsed by: BCIS British Cardiovascular Intervention Society; British Cardiovascular Society; BHRS British Heart Rhythm Society; BIASP British & Irish Association of Stroke Physicians; British Society for Heart Failure; GIRFT Getting It Right First Time; Intensive Care Society

Clinical indications and triage of echocardiography

Emergency, inpatient and critical care level II studies

Introduction

Using these guidelines:

1. These guidelines are based on expert clinical opinion and the evidence base.
2. Individualised care and local pathways remain an equally significant factor in triage.
3. This document refers to transthoracic echo (TTE) only.

Timing of emergency studies should be decided in concert between the operator and the requester. Patient need must be the determining factor. Communication loops must be opened and closed at request and response points. Image quality, documentation, upload and reporting standards should be governed as per departmental studies.

National guidelines recommend the following target time-frames:

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

Service design and capabilities will vary between centres. These time-frames are given as a guide to triagers.[1]

Indications for a Level I study:

Where a clinician of sufficient seniority who has reviewed the patient suspects:

1. Acute circulatory failure
2. Acute systolic or diastolic heart failure
3. Acute or severe valve pathology: e.g. critical AS or MV dysfunction
4. Acute right heart failure due to pulmonary embolus
5. Cardiac tamponade.

Loop closure:

Optimal performance of emergency and urgent TTE relies upon[2]:

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

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
▶	Acute myocardial infarction (echo should not delay PPCI): Following confirmed acute myocardial infarction to assess infarct size, LV function and complications • STEMI: Inpatient • NSTEMI: Inpatient or early outpatient (as decided by clinical team)
▶	• Murmur following a recent myocardial infarction
▶▶	• Chest pain with haemodynamic instability • Assessment of suspected type 1 aortic dissection (should not replace or delay cross sectional imaging)

SUSPECTED HEART FAILURE

An NT-proBNP < 300 ng/L effectively rules out the diagnosis of acute HF regardless of the patient's age and an alternative diagnosis should be sought.[3,4]

▶	• For ruling in acute heart failure, the following age-adjusted cut-points indicate that HF is likely: [5,6]

Age (yrs)	<50	50-75	> 75
Acute Heart Failure likely if NT-proBNP (ng/L) is	≥450	≥900	≥1800

If the NT-proBNP concentration is intermediate (above 300 ng/L but below acute heart failure levels), reconsider the diagnosis. If after full reassessment, including ECG and CXR, HF is likely, request an echocardiogram.

SYNCOPE

■	• No murmur detected • No malignant arrhythmia documented • Vasovagal syncope with clear precipitant and normal ECG / cardiac examination
▶	• Murmur • Arrhythmia-associated syncope • Abnormal ECG e.g. LBBB, RBBB or LVH

ARRHYTHMIAS

■	• Low burden ventricular ectopics with no suspicion of significant heart disease • AF with fast ventricular response without hypotension or suspicion of structural heart disease • Incidental finding of AF
▶	• Arrythmia (including AF with fast ventricular response) associated with hypotension or strong suspicion of structural heart disease or requiring urgent intervention • VT

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

EMERGENCY NON-CARDIAC SURGERY

■	• Known ventricular or valvular dysfunction established within 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

INFECTIVE ENDOCARDITIS

■	• Repeat assessment in a clinically stable patient with known vegetations
▶	• To characterise valve lesions and haemodynamic consequences where Duke's criteria are positive • Persistent bacteraemia of unknown source, particularly in staphylococcus aureus infection • Baseline re-assessment prior to discharge following completion of antibiotic therapy for endocarditis in those who did not undergo heart valve surgery. • One week following a negative TTE study in cases of high clinical suspicion where a transoesophageal echo is not possible
▶▶	• Clinical suspicion of high risk complications of infective endocarditis e.g. fistula; root abscess; acute cardiac failure

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 6-8 weeks post operation. See heart valve disease triage poster.
▶	• Following certain structural heart disease intervention e.g. PFO
▶▶	• Concern regarding cardiac tamponade following any cardiac or thoracic cavity procedure

ACUTE STROKE

■	• AF • Murmur not felt to be related to clinical presentation
▶	• Young stroke (<55 yrs) with suspicion of cardiac structural abnormality • Multifocal stroke confirmed on imaging consistent with cardioembolic aetiology • Clinical suspicion of endocarditis • Suspected regional wall motion abnormality

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

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 felt to be due to cardiac structural disease • In cases of severe malnutrition • Where underlying cardiomyopathy is suspected as a cause for clinical signs and presentation
▶▶	• Where there is difficulty in maintaining end organ perfusion due to suspected structural cardiac disease despite senior assessment and therapy • Where a direct effect of pathology on ventricular function is suspected e.g. septic cardiomyopathy • Cardiogenic shock and/or respiratory failure associated with HF

ASSESSMENT OF COMPLEX FLUID BALANCE

■	• Prior to clinical assessment and initial management
▶	• To determine filling status in anuric state when cardiac structural disease is suspected • To guide renal replacement therapy and fluid therapy planning
▶▶	• Where other clinical markers suggest euvolaemia or even hypervolaemia, but there remains suspicion that hypotension or hypoperfusion may be caused by persistent intravascular hypovolaemia

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 VALVULAR PATHOLOGY

■	• Where history, examination and current illness are not supportive of a diagnosis of valve dysfunction as a cause for haemodynamic compromise
▶	• Clinical / radiological signs or symptoms of heart failure with a significant murmur
▶▶	• Where the history and examination findings suggest that the clinical picture and/or organ failure may be due to 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 clinical findings suggest that known or suspected pericardial fluid is either contributing to haemodynamic compromise or causing cardiac tamponade • Where there is clinical suspicion of pyopericardium from clinical, microbiological and radiological information

SPECIAL CIRCUMSTANCES

Due to the variety of pathology seen in critical care, where the literature is scarce, requests for TTE 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

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) **2.** https://www.bsecho.org/Public/Accreditation/Personal-accreditation/Level-1/Public/Accreditation/Accreditation-subpages/Personal-accreditation-subpages/ Level-1-accreditation **3.** McDonagh, Theresa A., et al. 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. European heart journal 42.36 (2021): 3599-3726. **4.** Bayes-Genis A et al. Practical algorithms for early diagnosis of heart failure and heart stress using NT-proBNP: A clinical consensus statement from the Heart Failure Association of the ESC. European Journal of Heart Failure. 2023 Nov;25(11):1891-8. **5.** Januzzi JL et al. NT-proBNP testing for diagnosis and short-term prognosis in acute destabilized heart failure: An international pooled analysis of 1256 patients: The International Collaborative of NT-proBNP study. Eur Heart J 2006;27:330–337. **6.** Januzzi JL, et al. N-terminal pro–B-type natriuretic peptide in the emergency department: the ICON-RELOADED study. J Am Coll Cardiol.2018;71:1191–1200.