

## **Clinical Indications for Echocardiography**

Echocardiography is widely utilised and potential applications are increasing with advances in technology. The aim of this document is two-fold:

- 1) To define clinical indications in which echocardiography provides incremental value to patient management;
- 2) To draw guidelines for the urgency with which a request should be met.

In attempting to define clinical indications for which echocardiography provides incremental value for patient care, the expectation is that this will be used to audit request activity and to promote appropriate resource utilisation. Each indication has been assigned a number (figure) which may be used to order requests. This document is based on literature searching conducted in Medline, EMBASE, Cochrane library for English-language meta-analyses and systematic reviews from 1990-2006.

The document is limited to indications for echocardiography in the adult. It includes recommendations in relation to transthoracic echocardiography (incorporating Doppler analysis, M-mode echocardiography, tissue velocity imaging, 2D and 3D echocardiography, and contrast echocardiography). It does not include recommendations specifically relating to the practice of transoesophageal echocardiography and stress echocardiography, although attention is drawn where utilisation of one or other technique may be preferable. It is recognised that similar information may be drawn from a variety of competing technologies, including nuclear cardiology, cardiovascular magnetic resonance imaging and cardiac CT but no recommendations are made on the relative benefit of such competing technologies. The document does not give indications as to the frequency with which echocardiography should be performed, since this will vary on an individual patient basis and dependent on local service availability.

The recommendations that echocardiography should be performed are based on evidence from clinical studies and/or general agreement from clinical practice that echocardiography will have a clear and positive impact on clinical management. In addition, recommendations are given that echocardiography should not be performed in conditions for which there is no clinical study evidence and no generally accepted role. An echocardiogram is not indicated when the pathology has been clearly defined by other techniques.

Although transthoracic echocardiography is non-invasive, widely available and is not uncomfortable, patients whose management would not be altered by echocardiographic abnormalities should not be studied.

This document is a guideline for indications for echocardiography and will be up-dated in accordance with changes directed by publications or changes in practice. It is expected that separate documents relating to indications for transoesophageal (including intra-operative imaging) and stress echocardiography will be drawn up to run in conjunction with these indications.

## **Indications**

### **1. Heart Murmurs**

#### **1.1 INDICATED.**

- a. Murmur in the presence of cardiac or respiratory symptoms.
- b. Murmur in an asymptomatic individual in whom clinical features or other investigation suggest structural heart disease.

#### **1.2 NOT INDICATED.**

- a. Assessment of an innocent murmur diagnosed by a competent physician.
- b. Unchanged murmur in an asymptomatic individual with previous normal echocardiogram.

### **2 Native Valvular Stenosis**

#### **2.1 INDICATED.**

- a. Initial assessment of aetiology and severity, ventricular size and function
- b. Repeat assessment of known stenosis with change in clinical status.
- c. Periodic repeat assessment of asymptomatic individual with known severe stenosis for ventricular size and function
- d. Repeat assessment of known stenosis in pregnancy
- e. Assessment for pre-procedural decision-making for valvular intervention (eg suitability for balloon valvuloplasty)
- f. Periodic repeat assessment of asymptomatic individual with moderate stenosis for valve severity, ventricular size and function.

#### **2.2 NOT INDICATED.**

- a. Periodic repeat assessment of asymptomatic individual with haemodynamically-insignificant lesions, eg mitral annular calcification.

### **3 Native Valvular Regurgitation**

#### **3.1 INDICATED.**

- a. Initial assessment of aetiology and severity, ventricular size and function
- b. Initial assessment and risk stratification of individual with clinical signs of mitral valve prolapse
- c. Repeat assessment in known regurgitation with change in clinical status.
- d. Periodic repeat assessment of asymptomatic individual with known severe regurgitation for ventricular size and function
- e. Periodic repeat assessment of asymptomatic individual with known mild or moderate regurgitation and ventricular dilatation or dysfunction
- f. Periodic repeat assessment of asymptomatic individual with moderate MR
- g. Repeat assessment of known regurgitation in pregnancy
- h. Assessment for pre-procedural decision-making for valvular intervention (eg suitability for mitral valve repair – consider TOE and RT3D)

#### **3.2 NOT INDICATED**

- a. Periodic repeat assessment of asymptomatic individuals with trivial or mild regurgitation and normal ventricular size and function.

- b. Periodic repeat assessment of asymptomatic individuals with mitral valve prolapse and no or mild MR.

#### 4 Prosthetic Valve Assessment

##### 4.1 INDICATED.

- a. Baseline assessment of newly implanted prosthetic valve.
- b. Late post-intervention re-evaluation for ventricular remodelling.
- c. Repeat assessment of prosthetic valve with change in clinical status.
- d. Repeat assessment of prosthetic valve with clinical findings suggestive of dysfunction
- e. Repeat assessment of prosthetic valve following exposure to clinical risk of valve thrombosis
- f. Periodic repeat assessment of asymptomatic individual with bioprosthetic valve (after 7 years for aortic bioprosthesis; after 5 years for mitral bioprosthesis) if intervention without symptoms would be undertaken.

##### 4.2 NOT INDICATED

- a. Periodic repeat assessment of asymptomatic individual with mechanical prosthesis
- b. Repeat assessment of patients whose clinical status precludes therapeutic intervention

#### 5 Infective Endocarditis

Note: In view of the possibility of both false-negative and false-positive studies, echocardiography should supplement but not replace clinical and microbiological diagnosis.

##### 5.1 INDICATED.

- a. To characterise valvular lesions, haemodynamic consequences and ventricular response in a patient with clinically proven or suspected endocarditis.
- b. Detection of high-risk complications, eg fistula, abscess, mass lesions.
- c. TOE evaluation of patients with a high clinical suspicion following negative or equivocal TTE in native and prosthetic valves.
- d. Persistent bacteraemia of unknown source, particularly in staphylococcal infection (consider TOE).
- e. Baseline assessment of valve, ventricular size and function prior to discharge following completion of treatment for endocarditis.

##### 5.2 NOT INDICATED.

- a. Fever with no other suggestive features.
- b. Periodic repeat assessment in a clinically stable patient with prior echocardiographic evaluation to assess response to therapy.

#### 6 Ischaemic Heart Disease – Known or Suspected

##### 6.1 INDICATED.

- a. Chest pain with haemodynamic instability
- b. Murmur following acute or recent myocardial infarction.
- c. Assessment of infarct size, presence of complications and baseline LV function following MI (consider use of LV contrast echocardiography)
- d. Evaluation of patients with non-diagnostic ECG and indeterminate laboratory markers if performed during or immediately after cardiac chest pain.

- e. Evaluation of LV function to guide further therapy or assess effect of intervention, e.g. drug therapy, ICD implantation, CRT, patients scheduled to undergo coronary artery by-pass surgery.
- g. Stress echocardiography to assess reversible ischaemia, myocardial viability and risk stratification.

#### 6.2 NOT INDICATED.

- a. Evaluation of non-cardiac chest pain

### 7 Cardiomyopathy

#### 7.1 INDICATED.

- a. Clinical cardiomegaly
- b. Clinical or radiographic signs of heart failure
- c. Unexplained shortness of breath in the absence of clinical signs of heart failure if ECG/CXR abnormal
- d. Persistent hypotension of unknown cause
- e. Suspected cardiomyopathy based on abnormal examination, ECG, or family history in first degree relative
- f. Baseline LV function and periodic review when using cardiotoxic drugs, eg herceptin
- g. Repeat assessment in documented cardiomyopathy with change in clinical status
- h. Repeat assessment in documented cardiomyopathy where result may change management or following procedures affecting function, eg cardiac resynchronisation, septal ablation.

#### 7.2 NOT INDICATED.

- a. Minor radiographic cardiomegaly in the absence of symptoms or signs of heart failure.
- b. Routine repeat assessment in clinically stable patients in whom no change in management is contemplated.
- c. Assessment of patients with oedema, normal venous pressure and no evidence of cardiac disease.

### 8 Pericardial Disease

#### 8.1 INDICATED.

- a. Suspected pericarditis, pericardial effusion, tamponade or constriction
- b. Suspected pericardial effusion or bleeding (post-surgery or trauma)
- c. Periodic repeat assessment of moderate or large pericardial effusion
- d. Repeat assessment of small pericardial effusion with change in clinical status
- e. Echo-guided pericardiocentesis

#### 8.2 NOT INDICATED.

- a. Repeat assessment of small pericardial effusion without clinical change.
- b. Pericardial friction rub following uncomplicated MI
- c. Follow-up studies in patients with terminal illness whose management would not be affected by echocardiographic abnormalities

### 9.0 Cardiac Masses

#### 9.1 INDICATED

- a. Embolic peripheral or neurological events suggesting intracardiac mass

- b. Haemodynamic or auscultatory findings suggesting intracardiac mass
- c. Periodic repeat assessment following removal of cardiac mass/tumour, eg myxoma
- d. Known primary malignancies where echocardiographic surveillance for cardiac involvement forms part of the normal staging process, eg renal hypernephroma

9 NOT INDICATED.

- a. Patients with terminal illness whose management would not be affected by echocardiographic abnormalities

## 10 Pulmonary Disease

10.1 INDICATED.

- a. Lung disease with clinical suspicion of cardiac involvement (cor pulmonale)
- b. Suspected or established pulmonary hypertension
- c. Suspected or established pulmonary embolism to inform a decision regarding thrombolysis
- d. Evaluation for surgical procedures for advanced lung disease including transplantation
- e. Repeat assessment of pulmonary artery pressure to evaluate response to treatment for pulmonary hypertension (consider saline contrast enhancement)
- f. To distinguish cardiac from non-cardiac causes of dyspnoea when the results of clinical and other diagnostic testing are ambiguous
- g. Patients with known chronic lung disease and unexplained desaturation (consider saline contrast echocardiography)

10.2 NOT INDICATED.

- a. Lung disease with no clinical suspicion of cardiac involvement

## 11 Neurological Disease

11.1 INDICATED.

- a. Acute interruption of blood flow to major peripheral or visceral artery
- b. Unexplained stroke or TIA without evidence of prior cerebrovascular disease or without significant risk factors for other cause (consider saline contrast echocardiography by TTE or TOE). The importance of a PFO if found when performing contrast studies may depend on the patient's age and may therefore only be appropriate in those under 55.
- c. Patients for whom a therapeutic decision will depend on outcome of echocardiography, eg anticoagulation
- d. Assessment of neuromuscular diseases associated with cardiac manifestations, eg muscular dystrophies, mitochondrial myopathies and periodic paralyses
- e. Hemiplegic migraine (saline contrast study)

11.2 NOT INDICATED.

- a. Patients in whom echocardiography will not affect decision to commence anticoagulation (eg patients in AF with cerebrovascular event and no suspicion of structural heart disease)

## 12 Arrhythmia, Palpitations and Syncope

12.1 INDICATED.

- a. Clinical suspicion of structural heart disease in proven arrhythmia
- b. Assessment of ventricular function for primary prevention of sudden cardiac death (SCD) post-MI

- c. Assessment of ventricular function for secondary prevention of SCD in VT
- d. Evaluation of LV function prior to anti-arrhythmic medication
- e. Syncope in a patient with clinically suspected heart disease
- f. Exertional syncope
- g. Syncope in a patient with high-risk occupation, eg pilot, bus driver
- h. Assessment of patients without clinical suspicion of structural heart disease who have an arrhythmia commonly associated with structural heart disease
- i. Guidance of catheter placement during radiofrequency ablation (consider TOE or intracardiac echo)
- j. Post-operative evaluation of patients following RF ablation and surgical procedures in the absence of complications

#### 12.2 NOT INDICATED

- a. Palpitations without proof of arrhythmia or clinical suspicion of structural heart disease
- b. Isolated premature ventricular contractions in absence of clinical suspicion of structural heart disease.
- c. Classic neurocardiogenic syncope

### 13 Echocardiography Before Cardioversion

#### 13.1 INDICATED

- a. Guidance for decision to attempt cardioversion, eg LV function, MV disease
- b. Patients requiring cardioversion with AF >48hours duration not adequately anticoagulated (TOE)
- c. Repeat assessment of documented appendage thrombus (TOE)
- d. Repeat assessment following embolic event at previous cardioversion (TOE)
- e. Patients with AF less than 48hrs duration and clinical suspicion of structural heart disease not adequately anticoagulated (consider TOE).
- f. Patients undergoing cardioversion for atrial flutter

#### 13.2 NOT INDICATED

- a. Patients requiring emergency cardioversion
- b. Patients on long-term anti-coagulation at therapeutic level with no clinical suspicion of structural heart disease
- c. Patients on long-term anti-coagulation at therapeutic level with structural heart disease but no recent clinical change

### 14 Hypertension

#### 14.1 INDICATED

- a. Suspected LV dysfunction
- b. Evaluation of LVH and LV remodelling where this will alter management
- c. Evaluation of clinically suspected aortic coarctation.

#### 14.2 NOT INDICATED

- a. Routine assessment
- b. Repeat assessment of LV function in asymptomatic patients
- c. Repeat assessment for LV mass regression

## 15 Aortic and Major Arterial Disease

### 15.1 INDICATED

- a. Suspected aortic dissection: diagnosis, location, extent (TOE)
- b. Assessment of aortic aneurysm and aortic dilatation: diagnosis, location, extent (consider TOE)
- c. Suspected aortic rupture and intramural haematoma
- d. Periodic repeat assessment of aortic root and ascending aortic dilatation
- e. Assessment of suspected or proven connective tissue disorder in which aortic pathology may be a feature, eg Marfans
- f. Repeat assessment of prior surgical repair of aorta

### 15.2 NOT INDICATED

*None relevant*

## 16 Pre-Operative Echocardiography for Elective and Semi-urgent Surgery

### 2.1 INDICATED

- a. Documented ischaemic heart disease with reduced functional capacity (<4 METS)
- b. Unexplained shortness of breath in the absence of clinical signs of heart failure if ECG and/or CXR abnormal
- c. Murmur in the presence of cardiac or respiratory symptoms
- d. Murmur in an asymptomatic individual in whom clinical features or other investigation suggest severe structural heart disease.

### 12.2 NOT INDICATED

- a. Repeat assessment of previous echocardiogram with no intervening change in clinical status
- b. Routine pre-operative echocardiography



### **In-Patient Triage**

Appropriate triage categorization is dependent on accurate information being given in the request form. It is recognized that failure to provide adequate information may lead to delay.

The triage categories are:

#### **Category 1 (Emergency)**

Echocardiography to be done immediately

8.1a Likely acute pericardial tamponade (following interventional procedure including intracardiac catheter or pacing manipulation)

10.1c Likely acute (massive) pulmonary embolism to inform a decision regarding thrombolysis

#### **Category 2**

Result likely to change immediate patient management and to be done <24 hours. Priority within that time to be discussed (may be emergency)

5.1b Detection of high-risk complications of infective endocarditis where patient is haemodynamically unstable.

6.1b Murmur following acute or recent myocardial infarction where papillary muscle rupture or ventricular septal rupture suspected.

7.1d Persistent hypotension of unknown cause where patient haemodynamically unstable and not responding to intensive care.

8.1a Suspected pericardial tamponade.

8.1b Suspected pericardial effusion or bleeding (including after serious chest trauma).

15.1a Suspected aortic dissection (including following possible deceleration injury)

#### **Category 3**

Echocardiography indicated but may not change immediate management. Echocardiography should be done as an in-patient if possible. If resources do not allow this, it may be performed as an outpatient but should be discussed with the referring clinicians.

All other indications for echocardiography.