



## **Short title: Cardiac ultrasound**

### **1. Introduction**

Ultrasound imaging of the heart is a means of providing enhanced diagnostic and monitoring information that enhances the safe and appropriate conduct of surgery and anaesthesia. It can be performed using a transoesophageal or transthoracic route. While transoesophageal echocardiography (TOE) is largely confined to intraoperative use, transthoracic echocardiography (TTE) is useful in many aspects of perioperative medicine.

There are risks associated with the technique, interpretation and reporting of findings, so this document has been developed to provide guidance for ANZCA Fellows and trainees who wish to train and practise in cardiac ultrasound.

Cardiac ultrasound studies vary from limited goal-directed (focused) studies to comprehensive investigations. Goal-directed studies include monitoring of ventricular filling and functional cardiac status or assessment of valvular function. Studies may also be restricted to directing procedural work performed by either an anaesthetist or another clinician. Comprehensive (diagnostic) cardiac ultrasound involves a documented formal cardiac investigation. This is typically the situation where TOE is performed intraoperatively during cardiac surgery.

### **2. Scope**

This document applies to specialist anaesthetists and trainees providing perioperative cardiac ultrasound services to adult patients, or undertaking training and/or supervision of such procedures, and takes effect from the date of its promulgation. Fulfilment of the requirements outlined in this document does not bestow formal credentialing or certification but should be used to guide credentialing/accreditation for scope of practice in individual institutions.

### **3. Cardiac ultrasound studies**

Only practitioners who have completed or are undertaking supervised training in accordance with this document should undertake cardiac ultrasound. Practitioners undertaking supervised training should be cautious about the interpretation and application of information they obtain from cardiac ultrasound. Only practitioners who have completed training requirements in this guideline should issue formal written reports without supervision.

Although no governing bodies have published specific indications for echocardiography for use by anaesthetists, indications for echocardiography for cardiology practice have been published.<sup>1</sup> Specific practice guidelines for intraoperative TOE have also been published.<sup>2</sup>

#### **3.1 Goal-directed studies**

The following are features of goal-directed studies:

- 3.1.1 They are conducted at the point of care, by the clinician. The results can be directly and immediately integrated with other clinical information at the time of the study. As such,

they are used to supplement information relating to the clinical status of the patient and are most useful when combined with that.

- 3.1.2 They are generally qualitative and may assist in evaluating specific clinical issues including one or more of the following:
  - 3.1.2.1 Ventricular assessment for systolic function, filling volumes and pressures.
  - 3.1.2.2 Valvular assessment for clinically significant stenosis or regurgitation.
  - 3.1.2.3 Assessment of other potentially significant disorders such as pericardial and pleural effusions.
- 3.1.3 They may be more limited than comprehensive examinations with regard to the training and experience of the proceduralist, and the time, views obtained and equipment used.
- 3.1.4 An electronic record should be stored, unless the clinical situation prohibits this. This record should be in a digital format, include patient identification, date and time of cardiac ultrasound examination and archived to allow a full review for both clinical and audit purposes.
- 3.1.5 The proceduralist should generate a written report noting the time and date, major findings, operator performing the study and recommended follow-up. This should be entered in the clinical record. Recommendations may include performing a comprehensive study where appropriate.

## **3.2 Comprehensive echocardiography studies**

The following are requirements of comprehensive echocardiography studies:

- 3.2.1 The same comprehensive study is performed irrespective of the initial clinical indication.
- 3.2.2 Clinical circumstances may limit the study initially to a goal-focused study (for example, during patient resuscitation) with completion of the comprehensive examination when possible.
- 3.2.3 They should use two-dimensional (and optionally M mode) imaging through at least two echocardiography windows and includes quantitative measurements with spectral and colour Doppler analysis.
- 3.2.4 Comprehensive TOE examinations should follow the guidelines published by the American Society of Echocardiography.<sup>3</sup>
- 3.2.5 Comprehensive TTE examinations should follow the guidelines published by the Intersocietal Commission for the Accreditation of Echocardiography Laboratories.<sup>4</sup>
- 3.2.6 They involve the performance of both pre- and post-procedure examinations especially when performed in the setting of cardiac surgery.
- 3.2.7 Images should be stored, preferably in digital format with an archived copy, to allow a full review for both clinical and audit purposes. Image acquisition should include electrocardiographic gating. Stored images should include patient identification, date and time of cardiac ultrasound.

- 3.2.8 A formal report should be produced that includes:
  - 3.2.8.1 The date and time of the examination.
  - 3.2.8.2 Patient identification.
  - 3.2.8.3 Indications for the study.
  - 3.2.8.4 The name(s) and signature of those conducting and reporting the examination and findings.
  - 3.2.8.5 Detailed findings.
- 3.2.9 The formal report should be available:
  - 3.2.9.1 In the patient records.
  - 3.2.9.2 For archival review.

### **3.3 Safety**

- 3.3.1 TOE is a semi-invasive procedure with rare but potentially lethal complications.<sup>5</sup> Recommended indications<sup>2</sup>, contra-indications and safe placement and manipulation of TOE should be followed<sup>3</sup> to reduce the risk of injury to the patient or damage to the probe.
- 3.3.2 If the patient's anaesthetist performs intraoperative TOE, an experienced assistant may be required to assist in monitoring the patient's clinical condition. This is particularly the case when there is the combination of a very unstable clinical situation and particularly complex TOE interpretation issues.
- 3.3.3 There must always be adequate facilities and staff to decontaminate and clean the cardiac ultrasound probe and machine surface after use. For TOE probes there must be a documented protocol for cleaning the probe and a log to record compliance.

## **4. Training**

### **4.1 Training should consist of a formal program that provides for:**

- 4.1.1 Development of sonographic and interpretive skills.
- 4.1.2 Attainment of a sound knowledge of cardiac anatomy and pathophysiology.
- 4.1.3 Demonstration of the knowledge base by examination or other means.
- 4.1.4 Experience conducting and reporting studies.

### **4.2 Development of skills**

#### **4.2.1 Goal directed studies**

During the training period for goal-directed cardiac ultrasound the trainee should perform:

- 4.2.1.1 At least 20 supervised complete goal-directed studies.
- 4.2.1.2 At least 20 additional unsupervised studies, with full review by a supervisor.

4.2.1.3 At least 50 additional goal-directed studies performed by the trainee, with review by a supervisor as required.

4.2.1.4 Practical training/workshops.

#### 4.2.2 Comprehensive studies

Training for comprehensive studies can be in a single modality (TOE or TTE), or for both combined. During this period the trainee should perform:

4.2.2.1 Initially under full supervision at least:

4.2.2.1.1 50 comprehensive TTE, or

4.2.2.1.2 50 comprehensive TOE, or

4.2.2.1.3 60 comprehensive studies (30 TOE and 30 TTE).

4.2.2.2 At least 50 additional unsupervised studies with full review by a supervisor.

4.2.2.3 At least 100 additional comprehensive studies.

4.2.2.4 For training in TOE for cardiac anaesthesia at least 50 TOE studies should be undertaken in the operating theatre during cardiac procedures.

### 4.3 Knowledge base

#### 4.3.1 Goal-directed studies

4.3.1.1 It is recommended that during the training period, trainees obtain either:

4.3.1.1.1 A university certificate level qualification in goal-directed cardiac ultrasound, or

4.3.1.1.2 A fellowship in cardiac ultrasound/echocardiography of at least 6 months, or

4.3.1.1.3 A formal qualification equivalent to the above.

4.3.1.2 The formal training program should include:

4.3.1.2.1 An understanding of physics of ultrasound, and its application to sonography.

4.3.1.2.2 An understanding of relevant sonographic anatomy.

4.3.1.2.3 Ventricular filling and functional assessment.

4.3.1.2.4 Limited valve assessment for clinically relevant disease.

4.3.1.2.5 Assessment of other clinically severe disease states including cardiac tamponade and pleural effusion.

#### 4.3.2 Comprehensive study

- 4.3.2.1 It is recommended that during the training period, trainees obtain either:
- 4.3.2.1.1 An Australian or New Zealand university qualification in echocardiography at diploma level, or equivalent, or
  - 4.3.2.1.2 A pass in a board examination in echocardiography from the US National Board of Echocardiography (Examination of Special Competence in Adult Echocardiography, Examination of Special Competence in Advanced Perioperative Transesophageal Echocardiography), or equivalent, or
  - 4.3.2.1.3 A pass in an examination in echocardiography from the British Society of Echocardiography and Association of Cardiothoracic Anaesthetists or from the European Association of Echocardiography and European Association of Cardiothoracic Anaesthesiologists, or equivalent, or
  - 4.3.2.1.4 A diploma in diagnostic ultrasound focused on echocardiography from the Australasian Society for Ultrasound in Medicine, or equivalent, or
  - 4.3.2.1.5 A fellowship in echocardiography of at least 12 months duration.
- 4.3.2.2 Fellows and trainees undertaking fellowship training programs should be encouraged to obtain one of these qualifications.

The formal training program should include, but not be limited to:

- 4.3.2.2.1 An understanding of physics of ultrasound, and its application to sonography.
- 4.3.2.2.2 A comprehensive understanding of cardiac sonographic anatomy.
- 4.3.2.2.3 A wide exposure to normal and pathological conditions.
- 4.3.2.2.4 Training in effective interpretation, communication and documentation of findings.

#### **4.4 Documentation and assessment**

##### **4.4.1 Documentation**

A logbook or equivalent database should be maintained during the training period to record:

- 4.4.1.1 The number and case mix of the examinations performed and/or reviewed.
- 4.4.1.2 The trainee's level of involvement with each study (for example, observer, part participant, primary operator, producer of the report, case audit).
- 4.4.1.3 Case review/audit sessions attended.
- 4.4.1.4 Training courses attended.

The logbook should be available for the supervisor both during and on completion of training.

#### 4.4.2 Assessment

The form of assessment for the development of competency in cardiac ultrasonography will depend on the pathway undertaken by the trainee. This may be external credentialing or a formative assessment made by the supervisor(s) of the (cardiac ultrasound) training program. The College does not take responsibility for credentialing beyond recommending compliance with the parameters outlined in this document.

### 5. Recognition of prior experience

It is acknowledged that as a result of training and cumulative experience achieved prior to the ratification of the ANZCA guidelines for the relevant modality and scope, many experienced practitioners will exist for whom it is unnecessary to require the training process outlined here.

### 6. Supervision

Supervision of training should be provided by experienced practitioners who have met the requirements in sections 4 or 5 of this document for the modality and scope being supervised.

Prior to the completion of training, unsupervised diagnostic information should be used only with extreme caution and only when the trainee's supervisor considers the reporting of such information to third parties to be within the trainee's scope of practice.

### 7. Continuing professional development

Fellows who are practising cardiac ultrasound are required to maintain relevant continuing professional development, consistent with ANZCA's continuing professional development mandatory compliance policy and standards, as in all other aspects of their practice. For practitioners who hold independent certification in comprehensive (diagnostic) echocardiography, additional requirements as deemed necessary by their certifying body should be fulfilled.

For practitioners wishing for further guidance, the following is the recommended minimum:

- 7.1 Participation in audit and peer review of cardiac ultrasound studies.
- 7.2 Performance and/or review of at least 50 studies annually.
- 7.3 Participation in continuing medical education dedicated to echocardiography.

**This document is accompanied by a background paper (PG46(POM)BP) which provides more detailed information regarding the rationale and interpretation of the Guideline.**

#### Related ANZCA documents

ANZCA Continuing professional development standards

ANZCA Continuing professional development mandatory compliance policy

## References

1. Douglas PS, Garcia MJ, Haines DE, Lai WW, Manning WJ, Patel AR, et al. ACCF/AHA/ASA/ASNC/HFSA/HRS/SCAI/SCCM/SCCT/SCMR 2011 Appropriate use criteria for echocardiography. A report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, American Society of Echocardiography, American Heart Association, American Society of Nuclear Cardiology, Heart Failure Society of America, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Critical Care Medicine, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance American College of Chest Physicians. *J Am Soc Echocardiogr*. 2011 Mar;24(3):229-267.
2. Cheitlin MD, Armstrong WF, Aurigemma GP, Beller GA, Bierman FZ, Davis JL, et al. ACC/AHA/ASE 2003 Guideline update for the clinical application of echocardiography: Summary article: A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/Case Committee to update the 1997 guidelines for the clinical application of echocardiography). *Circulation*. 2003 Sep 2;108(9):1146-1162.
3. Shanewise JS, Cheung AT, Aronson S, Stewart WJ, Weiss RL, Mark JB, et al. ASE/SCA Guidelines for performing a comprehensive intraoperative multiplane transesophageal echocardiography examination: Recommendations of the American Society of Echocardiography Council for Intraoperative Echocardiography and the Society of Cardiovascular Anesthesiologists Task Force for Certification in Perioperative Transesophageal Echocardiography. *Anesth Analg*. 1999 Oct;89(4):870-884.
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