



# Guideline on training and practice of perioperative cardiac ultrasound in adults

## Background Paper

### 1. Introduction

Ultrasound imaging of the heart is a means of providing enhanced diagnostic and monitoring information that is vital to 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 all phases of perioperative medicine.

PS46 guides ANZCA Fellows and trainees in their training in, practice of, and continuing professional development in cardiac ultrasound. It is not intended for the guidance of Fellows and trainees of other colleges.

#### 1.1 History of cardiac ultrasound in anaesthesia

The use of ultrasound in anaesthesia for both imaging and guiding procedures has increased rapidly in the past decade. This has been driven in part by technological improvements enabling deployment to the point of care and improved image quality. The use of echocardiography in anaesthesia started in the 1990s with TOE in cardiac anaesthesia. This was formalised in 2004, when ANZCA published recommendations on the training and experience requirements for perioperative echocardiography. Since then, the use of cardiac ultrasound by anaesthetists has grown to include use during non-cardiac surgery, TTE imaging intra-operatively and perioperatively. The concept of “goal-directed” cardiac ultrasound has been developed to describe a common practice in which a specific question is answered at the point of care in a changing clinical situation.

Use by other critical care specialties (intensive care medicine and emergency medicine) has developed in a similar manner to that in anaesthesia

### 2. Justification for PS46

Patient safety dictates that standards are required for all areas of practice of all medical practitioners and there is an increasing need for them to be documented. The inaugural document was promulgated in 2004. The 2013 review considered whether there was a clear continued need for the guideline, whether there was sufficient grounds to support such a guideline, and if so, whether the current document needed revision.

## **2.1 Practice of anaesthesia**

ANZCA promulgates advice on clinical aspects of the practice of anaesthesia and perioperative medicine. Cardiac ultrasound is part of the scope of practice of anaesthetists, being practised initially by cardiac anaesthetists, and subsequently also by other anaesthetists involved in the assessment of patients with potentially significant cardiac disturbances. Core training for FANZCA includes familiarity with, but not the practice of, any form of cardiac ultrasound. For that reason, PS46 contains recommendations on the training required for practice of cardiac ultrasound, along with recommendations for continuing professional development.

## **2.2 Benefits**

The use of cardiac ultrasound by anaesthetists provides benefits for their patients. An assessment of haemodynamic state and of any cardiac pathology that might affect haemodynamic state is of vital importance in all critical care. While traditional clinical examination and monitoring continues to be the mainstay, there is increasing recognition that more advanced techniques help resolve dilemmas where different conditions have similar clinical appearances but require very different responses or where accurate assessment and diagnosis has significant management implications. Cardiac ultrasound, goal-directed studies or more comprehensive (diagnostic) echocardiography is an imaging modality that can give vital information not readily discernible by other means.

Development of appropriate standards for the practice of cardiac ultrasound by anaesthetists minimises the risks to patients from incorrectly performed or interpreted studies.

## **2.3 Risks to patient safety**

As there are risks to patient safety associated with either the technique, or reporting and subsequent use of findings, these guidelines have been developed to assist ANZCA Fellows and trainees performing these procedures. The risks inherent in the technique are mainly those of transoesophageal echocardiography (TOE).<sup>1-5</sup> Those risks include but are not confined to: damage to the teeth, pharynx and oesophagus including rupture or burns. The risks inherent in reporting and its subsequent use are those of misinterpretation with subsequent errors in treatment. For these reasons it is important that those practising cardiac ultrasound are appropriately skilled, so that the risk of harm is minimised.

## **2.4 Standards for cardiac ultrasound**

The relevant standards are those of other specialties within Australia and New Zealand, and those of anaesthesia bodies internationally, and cover the training, continuing professional development of practitioners and the performance of cardiac ultrasound, including its documentation.

Within Australia and New Zealand, the Australasian College for Emergency Medicine has produced standards and the College of Intensive Care Medicine of Australia and New Zealand has produced recommendations for their own Fellows undertaking cardiac (and other) ultrasound studies, usually goal-directed examinations at the point of care in a changing clinical situation. The Royal Australasian College of Physicians has produced standards for the practice of cardiac ultrasound for cardiology trainees and Fellows. Each of these standards/recommendations has been developed specifically for the practice of that specialty.

International standards for anaesthetists have been developed by the American Society of Echocardiography/Society of Cardiovascular Anesthesiologists<sup>4, 6, 7</sup>, the Association of Cardiothoracic Anaesthetists/British Society of Echocardiography<sup>8</sup>, and the European Association of Cardiovascular Imaging/European Association of Cardiothoracic Anaesthesiologists<sup>9</sup>, and these standards have been taken into account when developing ANZCA recommendations. Achieving consistency with other anaesthesia organisations was one of the aims of the document.

While all of the above standards are relevant, it was considered appropriate to develop a guideline specifically for Fellows and trainees of ANZCA for use within the practice of anaesthesia in Australia and New Zealand.

### **3. Issues considered**

#### **3.1 Terminology - goal-directed and comprehensive studies**

The distinction was made between comprehensive (diagnostic) and goal-directed (limited) studies. In the 2004 iteration of PS46, the distinction was not made, but by implication it described comprehensive studies. However, this did not always accord with practice, when for a variety of reasons, often in answer to a specific clinical question, more limited studies were performed.

#### **3.2 Goal-directed studies**

There are many terms that have been used to describe more limited examinations. Even what is meant by a “limited” study is wide and may encompass any or all of: limited time, limited windows, limited views, limited modalities, limited training or limited experience of the sonographer or reporter, limited equipment in terms of cost, quality or capabilities, and a limited need for the study to answer one or maybe only a couple of clinical questions. The small size and cost of the equipment often means that “limited” implies point of care and a real time study, often with a physician sonographer who is also the physician responsible in whole or in part for the care of the patient. The “limited” clinical question(s) to be answered lead to terms such as goal-directed or focused. The justification for such studies usually relates most importantly to the immediate need to answer a specific clinical question in order to determine the immediate treatment of a patient. Therefore, of all the possible terms, the “goal-directed” was preferred, giving as it does, primacy to the whole purpose of any such study.

The use of the term “goal-directed echocardiography” does not imply that it is a limited study, and while a full diagnostic study may be goal-directed, some might take “echocardiography” to mean a full diagnostic study. Therefore, to avoid confusion, it was recommended to use of the term “cardiac ultrasound” when referring to both goal-directed and diagnostic studies and to reserve the term “echocardiography” to its more classic concept of being a full comprehensive (diagnostic) study.

#### **3.3 Comprehensive studies**

Only a few terms have been used to define a full and comprehensive examination. These are the examinations typically performed when a patient is referred to a cardiologist for a TTE. While such an examination is usually requested for a specific purpose, it looks at the heart through multiple windows, in multiple views and uses multiple echocardiographic modalities (that is, two-dimensional pulse wave Doppler and continuous wave Doppler, with M mode and/or three-dimensional added as required).

Any comprehensive study and report should attempt to answer the clinical question being asked. However, it is also expected to include any and all other significant findings unrelated to the original referral, and to be a “stand-alone” study documented in a formal report.

### **3.4 Approaches to cardiac ultrasound – inclusion of TTE**

The 2004 iteration of PS46 covered comprehensive TOE studies. In the 2013 review, inclusion of goal-directed TOE and TTE (comprehensive and goal-directed) was discussed. It was readily agreed that goal-directed TOE should be included as an extension of comprehensive TOE.

### **3.5 TTE inclusion**

The merits of a single document for all anaesthetist-operated cardiac ultrasound, compared with separate documents for TOE and TTE was considered.

The initial version of PS46 was drafted when the prime anaesthetist involvement in cardiac ultrasound was that of cardiac anaesthetists performing TOE during cardiac surgery, but anaesthetist involvement has subsequently grown to include TOE during non-cardiac surgery, and peri- and intraoperative TTE.

Separate documents for anaesthetist TOE and TTE were considered, but it was concluded that the similarities between TOE and TTE are far greater than the differences. Both are cardiac ultrasound, with the same principles covering all ultrasound studies, the same cardiac pathologies being examined, and the same knowledge base. The main differences between TOE and TTE are probe position and resultant differences in image acquisition techniques related to probe position. There is limited evidence about the relative quality of cardiologist-performed and anaesthetist-performed cardiac ultrasound; cardiac anaesthetists are agreed that anaesthetist-performed TOE is of positive value for patient care, but a minority believe that TTE should remain cardiologist-performed.

A recommendation that TTE be the preferred modality intra-operatively if it was possible, if there was a good chance that it could answer the clinical question and if continuous monitoring was not required was considered. However, because of the concerns about the relative value of anaesthetist-performed and cardiologist-performed TTE, it was rejected.

### **3.6 Documentation and audit**

Comprehensive studies must be a part of a patient’s record. Images reflecting the comprehensive nature of the study need to be saved, and a full report written and included in the patient’s notes. Goal-directed studies should also be recorded as a part of a patient’s record. However, it is recognised that time or other constraints may preclude keeping a record and it may be more appropriate to incorporate the study findings in the anaesthetic or other patient record along with, but not separate from, all the other clinical information being recorded.

For those reasons, PS46 includes minimum standards for reporting cardiac ultrasound studies.

Studies need to be available for audit and therefore, images and associated reports need to be accessible from image archives rather than through individual patient records. The image archive should be able to be searched by patient, date, sonographer and the reporting Page 5 PS46 BP 2014 physician, if a separate person. Regular audit sessions, as

well as sharing interesting cases, are considered essential whether held within a given hospital, region or other grouping.

The ability to access and, if necessary, forward digital images allows for an anaesthetist with a minimum level of training to acquire, report and/or act on findings and then have them reviewed either contemporaneously or at a later date as appropriate while still in training and not meeting the full requirements of PS46. As an additional support, all anaesthetists even after meeting the minimum training and practice requirements of cardiac ultrasound, should have access to another practitioner with more experience for support for both audit and assistance with more difficult cases.

### **3.7 Training**

The guideline is for the guidance of Fellows and trainees, rather than for certification to practise cardiac ultrasound. However, given the risks of incorrect techniques of TOE and incorrect interpretation of the studies, minimum standards for training were developed. While informed consent will always be required for medical treatment, it is especially important when education is the prime aim of any procedure.

Minimum standards for training include both knowledge and practical skills acquisition. Allowance has been made for the varied methods by which Fellows and trainees achieve these. As noted above, the minimum standards produced by other (international) anaesthesia bodies, along with the expert advice of the group of experts was used to develop the standards within PS46. The list of acceptable qualifications/accreditations is not exhaustive, and other qualifications/accreditations which are equivalent can be used to meet the knowledge requirement.

### **3.8 Continuing professional development**

Continuing professional development is an essential component of the practice of anaesthesia, and so recommendations on this are included. While cognisant of the principle underlying ANZCA Continuing Professional Development Program, namely that each practitioner should undertake continuing professional development appropriate to their practice, recommendations were made for those wanting further guidance. Note was taken of similar recommendations by other anaesthesia bodies.<sup>8</sup> These recommendations should support development of a high quality service by ANZCA Fellows and trainees.

### **3.9 Recognition of prior learning**

This was included, as those who have practised cardiac ultrasound from its entry into anaesthesia practice will have gained their experience and training prior to the 2013 or 2004 version of PS46. The setting in which they acquired this training and experience was different from that of today, which is recognised in the statement in the document.

### **3.10 Potential restraint of trade**

The document development recognised the need for all practitioners of cardiac ultrasound to meet appropriate standards as well as the need to ensure that those practitioners with appropriate skills were not excluded.

### **3.11 Conflicts of interest**

All those who were involved in the document development at the various stages declared conflicts of interest, and any identified conflicts, which included involvement in courses teaching cardiac ultrasound, were managed and mitigated.

### 3.12 Literature search methods/methods of expert consensus development

An expert group met on February 23, 2011 to develop consensus on revision of PS46, which built on the work of an earlier review of PS46. Members circulated relevant papers on international standards for anaesthetists practising cardiac ultrasound prior to the meeting.

#### 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. Intersocietal Commission for the Accreditation of Echocardiography Laboratories. IAC Standards and guidelines for adult echocardiography accreditation; Part B, Section 3B Adult stress testing. Ellicott City: Intersocietal Commission for the Accreditation of Echocardiography Laboratories, 2006. From: <http://intersocietal.org/echo/standards/IACAdultEchocardiographyStandards2013.pdf>. Accessed: 31 May 2013.
4. 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.
5. Kallmeyer IJ, Collard CD, Fox JA, Body SC, Shernan SK. The safety of intraoperative transesophageal echocardiography: A case series of 7200 cardiac surgical patients. *Anesth Analg*. 2001 May;92(5):1126-1130.
6. Cahalan MK, Abel M, Goldman M, Pearlman A, Sears-Rogan P, Russell I, et al. American Society of Echocardiography and Society of Cardiovascular Anesthesiologists Task Force Guidelines for training in perioperative echocardiography. *Anesth Analg*. 2002 Jun;94(6):1384-1388.
7. Mathew JP, Glas K, Troianos CA, Sears-Rogan P, Savage R, Shanewise J, et al. ASE/SCA recommendations and guidelines for continuous quality improvement in perioperative echocardiography. *Anesth Analg*. 2006 Dec;103(6):1416-1425.

8. Skinner H, Morgan-Hughes N, Swanevelder J, More R. Accreditation in transoesophageal echocardiography in the UK: The initial experience. *Br J Anaesth*. 2012 Oct;109(4):487-490.
9. European Association of Cardiovascular Imaging. Adult transesophageal echocardiography (TEE) [Internet]. n.d. From: <http://www.escardio.org/communities/EACVI/accreditation/TEE/Pages/welcome.aspx>. Accessed 31 May 2013.  
NOTE: this web address has changed – at time of publication: <http://www.escardio.org/communities/EACVI/accreditation/echocardiography/TEE/Pages/welcome.aspx>

### **Further reading**

Quinones MA, Douglas PS, Foster E, Gorcsan J, 3rd, Lewis JF, Pearlman AS, et al. ACC/AHA clinical competence statement on echocardiography: A report of the American College of Cardiology/American Heart Association/American College of Physicians-American Society of Internal Medicine Task Force on Clinical Competence. *Journal of the American College of Cardiology*. 2003 Feb 19;41(4):687-708.

Spencer KT, Kimura BJ, Korcarz CE, Pellikka PA, Rahko PS, Siegel RJ. Focused Cardiac Ultrasound: Recommendations from the American Society of Echocardiography. *Journal of the American Society of Echocardiography* 2013;26(6):567-581.

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A revised version of PS46 was promulgated in 2013 for a pilot phase, during which further feedback was sought with a view to producing a definitive version. No significant amendments to the document were considered necessary at the close of the pilot phase in 2014.

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Promulgated: 2013  
Reviewed: 2014  
Date of current document: November 2014

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