The Cardiac Society of Australia and New Zealand

Position Statement for Training and Performance in Adult Echocardiography

This document was originally prepared by members of the Echo Working Group and co-ordinated by Prof Michael Feneley.

Revision of this document was co-ordinated by A/Prof David Prior in consultation with members of the Cardiac Imaging Council Executive. The Position Statement was ratified at the CSANZ Board meeting held on Friday, 27th February 2015.

Echocardiography has become an indispensable diagnostic and prognostic tool in modern cardiology. The growth of this non-invasive modality has been driven by a combination of engineering developments related to advances in computing, as well as the development of an evidence base for its clinical use by cardiologists expert in this field. There are two important consequences of this growth; first, the ability to obtain accurate information is dependent on expert acquisition and interpretation, and second, the growth of the technique has become a significant and recognized component of the health budget which is attracting increasing legislative attention.

The consequence of these considerations has been the development and revision of guidelines for clinical competence and accreditation by professional bodies in the United States, Europe and United Kingdom. The importance of these guidelines will increase with the inevitable migration of echocardiography from the province of cardiology to radiology, emergency medicine, intensive care and anaesthesia.

The following document refers to the criteria for training, clinical competence and maintenance of competence in echocardiography for cardiologists in Australia and New Zealand. It also sets out basic standards for performance of diagnostic echocardiography. Two other aspects of the quality control and assurance process relate to sonographers and echo laboratories. These have previously been addressed by the Federal Government in relation to sonographer accreditation and laboratory registration, and will not be discussed further (http://www.health.gov.au/internet/main/publishing.nsf/Content/diagnosticimaging-accred-2-stand).

At the present time it is the recommendation of the Cardiac Society of Australia and New Zealand that all Cardiology trainees should acquire sufficient knowledge of transthoracic echocardiography so that on completion of the three year training program they are competent in performing and interpreting common transthoracic echocardiographic studies. The Society also notes that in addition to a basic level of training expected of all cardiologists, some cardiologists have acquired additional skills in complex transthoracic echocardiography and advanced echocardiographic

techniques such as stress echocardiography and transoesophageal echocardiography. The Society is cognisant of the fact that three levels of training are recommended in the US, but not in Europe or the UK.

In Australia and New Zealand, 2 levels of training expertise in echocardiography are recognized, those with basic skills in transthoracic echocardiography (level 1) and those with additional training and advanced echocardiography skills (level 2). The following position statement sets out recommendations on the minimum number of procedures that should be performed and interpreted during the Cardiology training program to achieve level 1 proficiency. Those practitioners with level 1 training are not considered competent in advanced echocardiography techniques such as transoesophageal and stress echocardiography as this requires level 2 training. It also sets out recommendations regarding the amount of training required to achieve level 2 proficiency in each of the echocardiographic techniques. It is recommended that training program directors do not have training positions in excess of the number of positions that can be accommodated by the volume of transthoracic echocardiograms performed in the training laboratory. Cardiologists responsible for supervising training in echocardiography should have level 2 training in the area in which they are conducting training. During the training program it is recommended that trainees will be exposed to transoesophageal echocardiography and stress echocardiography, however in order to gain expertise in these areas and achieve level 2 proficiency, additional dedicated training should be obtained. It is recognized that some practitioners will have level 2 skills in a modality such as transoesophageal echocardiography, but may not have level 2 training in stress echocardiography.

ELEMENTS OF A SATISFACTORY TRANSTHORACIC ECHOCARDIOGRAM

In almost all cases, a complete study, including M-mode, 2-dimensional, colourflow mapping and spectral Doppler imaging should be performed. Imaging should be performed using at least 2 acoustic windows. The following elements should be included in all echocardiographic studies where technically possible:

1. Examination of left ventricular structure and function including quantification of systolic function using M-mode, 2-dimensional or 3-dimensional imaging. Left ventricular diastolic function should also be measured.
2. Examination of right ventricular structure and function with quantitative assessment where appropriate.
3. Examination of left and right atrial structure including quantification of atrial sizes.
4. Examination of the vascular connections of the heart including the great vessels and venous structures.
5. Examination of the pericardium and quantitation of any haemodynamic consequences of pericardial abnormalities.
6. Examination of the aortic valve including structural assessment and quantitation of aortic stenosis or regurgitation where appropriate.
7. Examination of the mitral valve including assessment of structure and function and quantitation of mitral stenosis or regurgitation where appropriate.
8. Examination of the pulmonary valve including assessment and quantitation of pulmonary stenosis and regurgitation where appropriate.
9. Examination of the tricuspid valve including assessment of structure and

quantitation of tricuspid stenosis or regurgitation where appropriate.
10. Assessment of additional haemodynamic parameters including the assessment of pulmonary pressures.
11. Images should be archived to digital medium or videotape for storage and a detailed written report should be issued for each study performed.

I. TRANSTHORACIC ECHOCARDIOGRAPHY

The interpretation of transthoracic echocardiography is dependent on a combination of cognitive and practical skills relating to ultrasound physics, technical aspects of machine and transducer manipulation, and understanding of anatomy, physiology and pathophysiology (Table 1). These have a number of implications. First, satisfactory interpretation of a transthoracic examination requires a high degree of familiarity with imaging equipment, as only this can lead to an understanding of potential pitfalls in the study as well as guidance to sonographers. The corollary of this observation is that adequate training is based on hands on acquisition of studies. Second, familiarity with cardiac anatomy, physiology and pathophysiology, such as are obtained during cardiology training, need to be duplicated by non-cardiologists seeking to interpret transthoracic echocardiograms.

LEVEL 1 COMPETENCY

Training requirements have been designed in order to address these different components of the knowledge required to perform an echocardiographic study.

The minimum training required for autonomous interpretation of transthoracic echocardiographic studies is summarised in Table 2. Exposure to transoesophageal and stress echocardiography is recommended. Of the 600 transthoracic echocardiograms with which the trainee is involved (300 performed and interpreted, 300 interpreted only), at least 50 studies should involve the interpretation of transoesophageal echocardiograms and at least 25 studies should involve the interpretation of stress echocardiograms. The possibility of a voluntary evaluation of individuals for competency in echocardiography at the end of training is being discussed by the Cardiac Imaging Council and the Cardiac Society, with appropriate material being currently developed.

It is essential that all activities in the above training for transthoracic echocardiography be thoroughly documented and supervised by an appropriate cardiologist with recognized expertise in echocardiography (level 2). All transthoracic echocardiograms performed/interpreted should be documented in an appropriate log book and the log book should be signed as an accurate and complete record, by the nominated supervisor.

MAINTENANCE OF LEVEL 1 COMPETENCY

The criteria for maintenance competency in transthoracic echocardiography include a minimum annual number of 200 studies/year (Table 3). Ongoing participation in echocardiographic specific continuing education is required.

LEVEL 2 COMPETENCY
TRANSTHORACIC ECHOCARDIOGRAPHY

Having achieved level 1 training, additional training is required to achieve level 2 competency. Ideally this is carried out within a dedicated echocardiography fellowship of at least 6 months duration. Minimum requirements are summarised in table 3. An additional 400 transthoracic echocardiograms should be interpreted under supervision. This should include exposure to all common cardiac pathologies and adult congenital heart disease.

II. TRANSOESOPHAGEAL ECHOCARDIOGRAPHY

The cognitive and procedural skills (incremental to those required for transthoracic echocardiography) required for proficiency in transoesophageal echocardiography, are listed in Table 5 and are considered level 2 skills. Transoesophageal echocardiography is obviously an extremely valuable technique for identification of various cardiovascular emergencies including aortic dissection, complications of myocardial infarction, endocarditis and cardiac trauma. While there is a balance of not wishing to excessively limit the number of clinicians able to perform this valuable examination, it must be recognized that inadequate training may lead to failure to recognize serious pathology, or maybe even inappropriate reporting of pathology in a normal patient, with extremely serious consequences including unnecessary surgery.

It is recommended that advanced transoesophageal echocardiographic training should be undertaken post basic Cardiology training. The recommended number is 100 performed and interpreted. Ongoing competence in transoesophageal echocardiography is considered to require 25 studies per year.

III. STRESS ECHOCARDIOGRAPHY

The consensus regarding stress echocardiography is that 200 supervised studies are required for a practitioner who has completed transthoracic echocardiographic training and wishes to develop expertise in this area. This training should include both exercise and pharmacological stress. An ongoing volume of 100 studies per year is required for competence.

It should be noted that this document defines the minimum training requirements for level 1 and level 2 echocardiography. However if an individual intends to devote a major portion of their professional effort to echocardiography, then further experience in echocardiography beyond the minimal requirements is strongly recommended and level 2 practitioners are encouraged to perform more than the minimum numbers both in training and in maintenance of skills.

Table 1. Cognitive and procedural skills required for proficiency in transthoracic echocardiography (derived from ACC/AHA Taskforce[1])

Category	Specifics	Reason
Physics	Principles of image formation and flow velocity measures	Recognition of artifacts Obtaining optimal data
Technical aspects	Transducer manipulation Transducer selection Instrument settings	Obtaining optimal data Recognition of artifacts Distinction of adequate from inadequate data
Cardiology	Anatomy Physiology Pathophysiology Appropriate indications	Recognition and interpretation Correlation with clinical signs Alternative technologies

Table 2. Activities mandated for level 1 competency in transthoracic echocardiography

Transthoracic	300 examinations performed and interpreted and an additional 300 interpreted
Transoesophageal	50 observed and interpreted
Stress Echocardiography	25 observed and interpreted

Table 3. Additional activities mandated for level 2 competency in advanced echocardiography

Transthoracic	400 additional interpreted under supervision
Transoesophageal	100 performed and interpreted
Stress Echocardiography	200 supervised and interpreted

Or completion of a full-time advanced echocardiography fellowship of at least 6 months duration

Table 4. Maintenance of competency for various types of echocardiography

Level 1	Transthoracic	200 additional studies interpreted / year

Level 2	Transthoracic	400 additional studies interpreted / year
	Transoesophageal	25 studies performed / year
	Stress echocardiography	100 studies interpreted / year

Table 5. Cognitive and procedural skills required for proficiency in transoesophageal echocardiography (derived from ACC/AHA Taskforce[1])

Category	Specifics	Reason
Technical aspects	Infection control Electrical safety Oesophageal intubation	Safety
Conscious sedation	Actions, side-effects and risks of sedative and local anesthetic	Safety
Cardiology	Appropriate indications, contraindications and risks	Alternative technologies Informed consent

1. Quinones, M.A. et al, American College of Cardiology / American Heart Association Clinical Competence Statement on Echocardiography 2012 *Circulation* **107:**1068 – 1089.