British Society of Echocardiography
Affiliated to the British Cardiac Society

ASSOCIATION CARDIOTHORACIC ANAESTHETISTS

TRANSOESOPHAGEAL ECHOCARDIOGRAPHY ACCREDITATION

The British transoesophageal echocardiography accreditation process represents a joint venture between the British Society of Echocardiography (BSE) and the Association of Cardiothoracic Anaesthetists (ACTA).

The process is primarily offered as a service to the Members of both these specialist societies. It is designed to accommodate the requirements of cardiologists, sonographers, anaesthetists, intensivists and cardiac surgeons.

Full details and registration forms are on the website www.bsecho.org.

We would encourage individuals to undertake the Accreditation process, which has as its ultimate aim the achievement and maintenance of high standards of clinical echocardiography for the benefit of patients.

A list of Accredited members is maintained on the BSE website. The process has to be regulated, and the standard of proficiency required for Accreditation has to be set at a high enough level to command the respect of our professional colleagues. Subject to these constraints, we want to make it possible for as many members as possible to obtain Accreditation, and not to put any unnecessary barriers in their way.

Please let us know if we can assist you in this process.

Mr Keith Pearce
Chair, BSE Accreditation Committee

1. General

1.1 The accreditation process is designed to set standards for and test competence at performing and reporting studies. Probe insertion will not be tested.

1.2 The accreditation process requires that the candidate shall submit a log-book and pass a written examination within a continuous 24 month period.

1.3 The accreditation process is run as a service for practising echo cardiographers. It is not a compulsory or regulatory certificate of competence.

1.4 The accreditation process is involved predominantly with transoesophageal echocardiography. However, an understanding of transthoracic echocardiography is also necessary because the two approaches are complementary.

1.5 Each candidate for accreditation must enrol with a suitably qualified supervisor who undertakes to train and supervise and to arrange visits to other centres if there are difficulties obtaining an adequate case-mix locally.

1.6 One or two supervisors at each centre have been approved by the BSE based on demonstration of competence at echocardiography and evidence of continuing practice. To maintain supervisor status it will be necessary for the supervisor him or herself to pass the BSE accreditation process. The names and contact details of supervisors in a candidate's region are available on request from the BSE administrator.

1.7 There is no general (or 'grandfather') exemption from BSE accreditation. There is no mutual recognition with other accreditation systems.

1.8 Accreditation is a minimum standard and cannot be regarded as a guarantee of continuing competence. Successful candidates will be expected to begin a process of continuing medical education towards re-accreditation.

1.9 The re-accreditation process will include evidence of continuing clinical activity, distance learning and attendance at courses and conferences.

1.10 Ongoing BSE membership is a requirement for maintaining accreditation.

2. Log-book

2.1 The log-book will be collected over a period of up to 24 months with the exam being taken at any point during this period. There are two options

Option (a) for applicants not holding the BSE Accreditation in Transthoracic Echocardiography: 125 TOE reports

Or Option (b) for applicants who hold the BSE Accreditation in Transthoracic Echocardiography: 75 TOE reports.

2.2 Studies performed before and after bypass i.e. during the same operation count as one study. A study performed for the same patient on separate occasion's counts as a separate study.

2.3 The log-book is a set of copies of signed reports enclosed in a folder or binder. The report should have all patient data removed (this means removal of patient information such as name, date of birth, hospital number and address). I f the age is not given separately the year of birth must be left visible. All cases should be collected in accordance with local requirements for data protection i.e. your trust policy.

2.4 All reports submitted must carry the signature of the candidate.

2.5 A letter from the supervisor must be submitted with the completed log-book certifying that the studies have been recorded by the candidate (the enrolment forms include advice on the format for the supervisor's letter).

2.6 The studies should include at least one example of the following:

Mitral valve repair
Mitral valve regurgitation (severe)
Endocarditis
Basic adult congenital heart disease (e.g. ASD)
Aortic pathology (e.g. dissection, aneurysm, intramural haematoma)
Abnormal aortic valve
Hypovolaemia/septic shock assessment
Abnormal prosthetic valve
Intracardiac mass including thrombus
Pericardial effusion
Left ventricular wall motion abnormality
Pulmonary embolism assessment/Right heart dilatation

No more than 20 studies should be predominantly normal

3. Digital studies

3.1 Five reports must be accompanied by complete digitally stored studies.

3.2 Image acquisition, optimization, measurements and interpretation will be assessed.

3.3 Each study must be submitted as digital loops and still images within a PowerPoint presentation or uploaded onto www.bsecho.org when this facility becomes available.

3.4 Please name studies as Case 1, Case 2 etc.

3.5 These cases will be taken into account when the supervisor's letter is written.

3.6 The contents of a full study are listed in Annex 1.

3.7 Studies must include one normal study, one case of aortic stenosis (moderate/severe) and three other examples listed in 2.6

4. Written examination

4.1 This consists of a total of 100 Single Best Answer Questions covering the syllabus in Annex 2.

4.2 The first 50 questions will be based on video clips.

4.3 The second 50 questions will be based on theory.

4.4 Questions may include transthoracic as well as transoesophageal studies.

4.5 The written examination will last approximately three and a half hours including a break between the two sections.

4.6 There will be no negative marking.

4.7 A candidate may sit the examination at any time during the 24 month period of collecting studies for their log-book.

5. Marking the accreditation process

5.1 The logbooks and images will be assessed using an objective grading system (Annex 4). A report will be made to the Chairman of the Accreditation Committee.

5.2 Borderline cases will be discussed by the committee.

5.3 The MCQ paper will be marked electronically.

5.4 The submitted log-book must adhere to the recommendations above.

5.5 In order to achieve accreditation, candidates must satisfy the examiners in both sections of the written examination and the log-book.

5.6 Partial accreditation by passing the written examination alone is not possible.

6. Summary of Requirements

6.1 Candidates should register for the accreditation on the enrolment forms supplied and send these to -
BSE Accreditation Administrator, Docklands Business Centre, 10-16 Tiller Road, London, E14 8PX

6.2 The cost of the accreditation process will be £150. Candidates who are not already members of the BSE will need to pay the membership fee of £60 in addition to the exam cost (total £210). Membership will run until 31st March the following year.

6.3 Candidates should register using the enrolment form (annex 7). Examination dates will be posted on both www.bsecho.org and www.acta.org.uk

6.4 The log-book and written examination must be completed within a period of up to 24 months.

6.5 For the log-book, candidates must submit reports from studies using one of two options described in 2.1. Resubmission of logbook reports/cases is subject to a fee of £75. Candidates are entitled to 1 resubmission in the practical assessment, after which the entire process must be undertaken again.

6.6 A letter from the supervisor must be submitted testifying that the candidate has performed and reported the 125 or 75 studies him or herself and that the candidate is safe to practice.

Annex 1.

A minimum quantitative data set shall be:

Left ventricular diameter in systole and diastole, left ventricular wall thickness and left atrial diameter (in at least 50% of cases). Additional quantitative data should be provided as appropriate for the pathology. It is recognised that all views and measurements may not be possible in every case especially perioperatively.

REPORT FORMAT

A routine clinical based report should comprise the following sections:

(Please note for the purpose of this practical logbook submission the annonymisation policy should be used)

Demographic and other Identifying Information

Obligatory information

Patient name, medical record number, NHS number (all these need to have patient data removed)

Age

Gender

Indications for test

Referring clinician identification

Interpreting echocardiographer identification

Date of study

Additional, optional information

Location of the patient (e.g. outpatient, inpatient, etc.)

Location where study was performed

Study classification (routine, urgent, emergency)

Date on which the study was requested, reported

Height and weight

Blood pressure

<u>Echocardiographic study</u>

This covers the main content of the report. For each cardiac structure, the report is divided as follows:

Descriptive terms: phrases that are used to construct the text content of a report, describing morphology (e.g. mitral leaflet -*thickened tips*) and function (e.g. mitral leaflet –*reduced mobility of the PMVL*) of cardiac structures.

Measurements/analysis: (e.g. peak gradient, mean gradient, MVA)

Diagnostic statements: phrases that add echocardiographic interpretation to descriptive terms (e.g. appearance of *rheumatic mitral valve disease, suitable for commissurotomy*)

<u>Summary</u>

This important section should contain final comments that address the clinical question posed by the TOE request.

This may comprise simple repetition of key descriptive terms from within the main part of the report (e.g. “severe LV dysfunction”).

It may add clinical context to the technical aspects of the report, particularly with respect to abnormal findings.

Where possible, comparison with previous echocardiographic studies or reports should be made and important differences (or similarities) highlighted.

Technical limitations of the study or its interpretation should be included

DIGITAL STUDIES

Five complete digitally stored studies must be submitted. Each study must be prepared as digital loops and still images within a PowerPoint presentation or uploaded onto www.bsecho.org when this facility becomes available. Studies must be named Case 1, Case 2 etc.

It is recognised that not all views may be possible in all patients. In particular there are certain probe positions that may be poorly tolerated in awake patients e.g. deep transgastric, upper oesophageal.

All cases must have all patient data removed. This includes removal of patient name and other unique identifiers such as hospital number or date of birth. Movie files (e.g. AVI, MPEG) files embedded in the Powerpoint presentation must also have all patient data removed.

An ECG should be attached

Where possible the following images and measurements should be included:

2D views

- Midoesophageal four chamber, two chamber and long axis
- Midoesophageal commissural
- Midoesophageal aortic valve short axis
- Midoesophageal bicaval
- Midoesophageal right ventricular inflow outflow
- Transgastric short axis, two chamber and long axis
- Main pulmonary artery
- Ascending aorta, arch and descending aorta

M-mode or 2D measurements

- LV dimensions from long axis or short axis views in systole and diastole
- Septal thickness at end diastole
- Left atrial dimension

Colour Doppler mapping

- For aortic, mitral and tricuspid valves

Quantitative Spectral Doppler

- Pulsed Doppler at the tip of the mitral leaflets. E and A velocities, and E deceleration time
- Pulsed Doppler in the left ventricular outflow tract
- Pulsed Doppler in the pulmonary veins
- Continuous wave Doppler across the aortic valve
- Continuous wave Doppler across the tricuspid valve if tricuspid regurgitation is present

Annex 2.

TRANSOESOPHAGEAL ACCREDITATION SYLLABUS

Basic principles of ultrasound

Ultrasound waves
Reflection
Scattering
Refraction
Attenuation

Transducers

Piezoelectric crystal
Damping
Transducer types
Beam shape and focusing
Resolution

Ultrasound instruments and imaging modalities

M mode
2-D image production
2-D instrument settings
2-D artefacts
Principles of 3D
Doppler equation
Spectral analysis
Continuous wave Doppler
Pulse wave Doppler
Colour flow Doppler
Tissue Doppler
Doppler artefacts
Biological effects of ultrasound

Cardiac anatomy

Cardiac physiology

Imaging planes

As described in Reference 1, Annex 3

Cardiac functional parameters

On-screen measurement of 2-D images and spectral Doppler displays
Derivation of stroke volume, cardiac output and ejection fraction
Methods of measuring left ventricular volume, including biplane area, area-length and Simpson's rule methods

Peak and mean pressure gradient measurements by Doppler
Quantitative Doppler including the continuity principle and proximal
isovelocity surface area method
Limitations of measurement and/or calculation validity in presence of poor
quality and /or off-axis images
Methods of measuring diastolic dysfunction including E/A ratio, deceleration
times, pulmonary venous flow patterns and tissue Doppler (E/E' ratio)
Mitral flow propagation velocity
Cardiac deformation (strain, strain rate, torsion)

Contrast Studies
Optimisation of machine control settings for detecting contrast
Indications for bubble contrast study
Techniques for performing hand-agitated contrast study
Clinical precautions
Awareness of commercially available contrast agents, uses, techniques and precautions

Safe practice
Potential complications and their avoidance
Informed consent
Infection control measure
Electrical hazards
Care and cleaning of the probe
Probe manipulation and oesophageal intubation
Sedation and patient monitoring

Left ventricular function
Anatomy and nomenclature of the major branches of the coronary arteries
Relationship of coronary anatomy to standard echocardiographic imaging
planes as described in Reference 2, Annex 3
Nomenclature for describing myocardial segments (16 and 17 segment model)
Analysis of segmental systolic myocardial function
Measurements of left ventricular internal dimensions
Global measures of left ventricular systolic function and confounding factors
Diastolic function (including use of tissue Doppler)
Complications of myocardial infarction - aneurysm, pseudoaneurysm, VSD & papillary muscle rupture, ischaemic mitral regurgitation
Myocardial perfusion imaging

Peri-operative indications
Assessment of mitral (or aortic) valve repair
Replacement heart valves

Myomectomy

Hypotension evaluation perioperatively including systolic anterior motion of mitral valve

Pulmonary embolus assessment and pulmonary thrombectomy

Pericardial window, effusion and tamponade assessment

Placement of assist devices

Intracavity air

Off pump cardiac surgery

LV filling assessment (fluid status) and monitoring

Effects of inotropes (including assessing for worsening mitral regurgitation and dynamic LV outflow obstruction)

Critical care

Haemodynamic monitoring - filling status, assessment of ejection fraction, effect of sepsis, low SVR, tamponade exclusion, serial haemodynamic monitoring (ie effects of inotropes, fluids, vasoconstrictors, vasodilators eg nitirc oxide)

Persistent hypoxameia/difficult to wean/ARDS - exclusion of PFO/ASD

Cardiac trauma - assessment of RV function, valvular function, presence of pericardial and pleural effusion

Assessment for acute cardioversion for fast AF - exclusion of clot in LA appendage

Valvular disease of the heart

Causes of valvular heart disease: endocarditis, degenerative including prolapse, rheumatic, ischaemic & functional, traumatic, connective tissue disease, carcinoid

Assessment of mitral regurgitation including qualification of scallop/segment affected, annulus measurement, severity of regurgitation (signal density, proximal flow recruitment, vena contracta, pulmonary venous flow, PISA) and suitability for repair

Assessment of mitral stenosis including subvalvar apparatus, quantification of stenosis by planimetry, pressure half time & gradient, suitability for valvuloplasty

Assessment of tricuspid valve disease including leaflet thickening, lack of coaptation, annulus measurement

Assessment of aortic valve disease including appropriate views and derivation of peak & mean gradients using continuous wave Doppler, assess valve area using the continuity equation. Assessment aortic regurgitation using pressure half time, deceleration time

Assessment of pulmonary valve disease

Infective endocarditis

Dukes criteria for diagnosing endocarditis

Role of transoesophageal echo in suspected endocarditis

Typical echocardiographic appearance of vegetation

Leaflet perforation

Root endocarditis (abscess etc)

Fistula

Evidence of pancarditis

Replacement Valves

Types of prosthetic heart valves and annuloplasty rings

2-D and Doppler features

Role of transoesophageal echo for examining normal and malfunctioning prosthetic valves

Echo features of prosthetic valve malfunction (including pannus formation)

Stroke

Causes of stroke

Clinical risk factors

Indications for echocardiography

Sites of thrombus formation

Left atrial appendage flow patterns

Methods of demonstrating a patent foramen ovale

Appearance and significance of spontaneous contrast

Atrial septal aneurysm/PFO/ASD

Intracardiac masses

Types of masses found in the heart

Differential diagnosis of an intracardiac mass (tumours, thrombus, vegetations)

Echo features of a myxoma

Echo features of intracardiac thrombus

Normal variants: Chiari network, Eustachian valve, Pectinate muscle, cor triatum

Artefacts

Pulmonary disease

Appearances of thrombus in pulmonary artery

Infundibular stenosis

Dilated/stenosed pulmonary trunk

Aortic disease

Echo features of the normal aortic root, sinuses of Valsalva, ascending aorta and aortic arch

Condition associated with aortic dilatation: Marfan's syndrome, Ehlers Danlos, Loetz-Dietz syndrome, Sinus of Valsalva aneurysm

Thoracic aortic aneurysm

Echo features of aortic dissection - aortic valve involvement, coronary involvement, pericardial effusion, pleural effusion, entry and exit points, assessment of ascending, arch and descending aorta

Aortic calcification and atherosclerosis

Adult Congenital Heart Disease

Atrial septal defects including evaluation for percutaneous closure

Ventricular septal defects

Pulmonary valve and infundibular stenosis

Left atrial and mitral valve abnormalities
Aortic valve (including bicuspid) and associated abnormalities
Patent ductus arteriosus
Aortic coarctation
Persistent left sided superior vena cava
Tetralogy of Fallot
Transposition of the great arteries
Atrioventricular septal defects
Ebstein's anomaly
Coronary artery anomalies

Pericardial disease and pleural effusions
Site and extent of pleural effusion
Pericardial effusion: site, extent, haemodynamic compromise
Echo features of cardiac tamponade

Cardiomyopathy
Dilated cardiomyopathy
Hypertrophic cardiomyopathy including systolic anterior motion of mitral valve, left ventricular outflow tract obstruction
Restrictive cardiomyopathy

Right Heart
Causes of tricuspid and pulmonary valve disease
Causes of right ventricular dilatation and dysfunction
Assessment of right ventricular systolic function (including TDI & TAPSE)
Causes of pulmonary hypertension
Imaging features of pulmonary hypertension
Estimation of pulmonary pressures

Echocardiography in the shocked patient
Echo findings associated with:
Acute pulmonary embolus
Hypovolaemia
Sepsis
Cardiac tamponade
Dynamic left ventricular out flow tract obstruction

Comparison of transoesophageal echo and other techniques
Transthoracic echocardiography
Magnetic resonance imaging
Angiography
Computerised tomography
Epiaortic imaging

Annex 3.

References

1. Shanewise JS, Cheung AT, Aronson S, 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. J Am Soc Echocardiogr 1999; 12: 884-900
2. Lang RM, Bierig M, Devereux RB, et al. Recommendations for Chamber Quantification: A Report from the American Society of Echocardiography's Guidelines and Standards Committee and the Chamber Quantification Writing Group, Developed in Conjunction with the European Association of Echocardiography, a Branch of the European Society of Cardiology. J Am Soc Echocardiogr 2005; 18: 1440-63
3. Wheeler R, Steeds R et al. A Minimum Dataset for a Standard Transoesphageal Echocardiogram. From the British Society of Echocardiography Education Committee. www.bsecho.org/TOE%20NEW_Amended%202%20LOW.pdf

Annex 4.

Score matrix for stand-alone reports

1 = Poor	Serious and/or potentially dangerous error suggested by the report Very poor report, no conclusions/summary, illegible E.g. large pedunculated mass attached to the tricuspid valve in the report. 'No evidence of endocarditis' in the conclusion!
2 = Below accepted standard	Some errors or omissions Absent data and or minimum datasets E.g. dilated LA on measurements, EF 70%, MR described as mild – which doesn't fit E.g. reports that chamber is dilated without giving dimensions Quantifies valve pathology without Doppler data to back this up
3 = Meets accepted standard	Report seems valid and conclusions consistent with data Contains minimum datasets
4 = Good	Clear well laid out report, conclusions appropriate to data presented and will be comprehensible to cardiologists and other medical practitioners Complete dataset and other relevant dimensions E.g. clear description of pathology with some clinical relevance
5=Excellent	Excellent report in layout, descriptions, language with conclusions closely related to the data and the information on the request that would be comprehensible to all and clinically useful in caring for the patient E.g. detailed description of pathology with clinical/surgical relevance

Pass mark 28 out of 50.

Annex 5

Score matrix for digital cases

	Domain	0 = Poor	1 = Borderline	2 = Good
ECG	1. ECG trace	Absent	Poor gain settings Loops not triggered to ECG Artefact (diathermy)	Good gain settings
2D images	2. Images optimised?	Poor gain setting, sector width, depth, harmonics, focus	Suboptimal gain setting, sector width, depth, harmonics. Focus point remains fixed	Optimal setting, harmonics. Alters focus point, uses zoom and alters frequency for transgastric views
	3. Quality and clarity	Poor	Borderline	Good
	4. Views complete?	Several views absent	Some views absent Unnecessary repetition of views Views in random order	Views complete Logical order
	5. Views relevant?	E.g. AF present but no views of appendage	Pathology e.g. leaflet prolapse or vegetation not shown in multiple views	Views relevant to pathology
M-mode/2D measure-ments	6. Measurements correct?	Absent or inaccurate	Measurements on report but not recorded Incomplete dataset E.g. aortic stenosis but no root dimensions	Complete dataset (LA, LVIDD, LVIDS and other relevant dimensions e.g. aortic root dimensions in the presence of aortic valve disease)
Colour Doppler	7. Quality	Poor or absent	Suboptimal scale, sector size	Appropriate scale, baseline and sector size
	8. Complete and appropriate	Vegetation on leaflet but no colour Doppler	E.g. regurgitant jet shown in only one view	E.g. jet interrogated in multiple views
Spectral Doppler	9. Quality and appropriate?	Absent	Inadequate for pathology e.g. MR - no mitral inflow velocities or pulm venous flow; stenosis - no gradient Poor or inconsistent signals No post-intervention data	Good quality and consistent signals
	10. Measurements correct?	Absent or major errors	Minor errors of measurement or placement of cursor	Measurements correct and comments on alignment

Report	11. Does the report match the images?	Major errors of interpretation or omission	Minor errors of interpretation or omission	Report matches images accurately
	12. Structure and logic	Poorly structured	Limited explanation of findings	Clear and concise Well structured, findings in clinical context
	13. Is there a summary or conclusion?	No summary	Summary is merely repetition of findings Does not answer the question	Good summary with conclusion
	14. Summary accurate?	Absent or inaccurate	Minor inaccuracies	Accurate summary
Overall impression	15. Overall quality of study	Poor	Borderline	Good

Pass mark 21 out of 30. If this is a perioperative study, is there satisfactory post-procedure data (comment on leaks, gradients, changes in ventricular function, satisfactory repair)?

Annex 6

Candidate Membership number: _____ **Case No:** _____

1. Score sheet for digital studies		Score each domain (0-2)				
Case number		1	2	3	4	5
ECG	**1. ECG trace present?**					
2D images	**2. Are the images optimised? (gain, sector width, depth, harmonics, focus)**					
	3. Are the views of good quality?					
	4. Are the views complete?					
	5. Are the views relevant to the pathology?					
Measurements	**6. Are measurements correct?**					
Colour Doppler	**7. Is the colour Doppler of good quality (gain, sector size)?**					
	8. Are the views complete and appropriate for pathology?					
Spectral Doppler	**9. Is the spectral Doppler of good quality and appropriate?**					
	2. 10. Are the Doppler measurements correct?					
Report	**11. Does the report match the recorded images?**					
	12. Is the report well structured and logical?					
	13. Is there a summary or conclusion?					
	14. Is the summary accurate?					
Overall	**15. Overall impression of study**					
Total mark out of 30						

Score system: 0 = Poor, 1 = Borderline, 2 = Good
A pass for any single case is 21 out of 30 possible marks
If a single case scores <15 or 2 cases score <21 the candidate will fail this section.

PASS FAIL

Comments to candidate:

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Assessor number 1 2 3 Date

Annex 7:

FORM FOR ENROLMENT:
TRANSOESOPHAGEAL ECHOCARDIOGRAPHY ACCREDITATION

Name …… Hospital……

Qualifications…… BSE membership no……..

Primary specialty; Anaesthesia / Cardiology / ICM / Cardiac technician / Other
(Please Circle as appropriate)

Grade A4C Band 6 / Band 7 / Band 8 / Cons / SpR / Fellow / Other (specify……)
(Please Circle as appropriate)

Address for correspondence (including postcode)

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……

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Contact telephone Number ……

Name of supervisor ……

I have read and understand the requirements of the Transoesophageal Echocardiography Accreditation

Signed …… Date …….