Accreditation in Adult Transoesophageal (TOE) Echocardiography Information Pack

This pack is for the use of all candidates undergoing the accreditation process and becomes effective as of March 2020

This document supersedes all previous versions

This document is a guide to completing BSE accreditation Marksheets and the submission criteria are included

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Welcome message from Accreditation Chair

Dear Candidate,

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

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. It is important that you read all the information carefully before commencing your specific speciality logbook.

The written section of the Assessment is held up to twice each year in various venues around the UK and Republic of Ireland. The practical assessment will be held approximately four times per year in a variety of locations- depending on candidate demand. Full details and registration forms are on the website www.bsecho.org.
We would like every BSE member to undertake the relevant Accreditation process, which has, as its ultimate aim, the achievement and maintenance of high standards of clinical echocardiography for the benefit of our patients.

A list of accredited members is maintained on the BSE website. The accreditation process is regulated. The standard of proficiency required for each specific accreditation is set at a high enough level to command the respect of our professional colleagues across the globe. We aim 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 in any specific way, or if you have constructive feedback to offer the accreditation committee then please just get in touch.

Good luck with your accreditation process.

Best wishes,

Dr Rakhee Hindocha & Sadie Bennett

Co-Chairs, BSE Accreditation Committee

Introduction and Aims

Accreditation is run as a service for members of the British Society of Echocardiography and is not a compulsory or regulatory certificate of competence or excellence. Accredited echocardiographers are expected to be able to perform and report echocardiographic studies unsupervised.

The Accreditation process is involved predominantly with transoesophageal echocardiography. However, an understanding of transthoracic echocardiography is also necessary because the two approaches are complementary. Accreditation is a minimum requirement and cannot be regarded as a guarantee of competence.

The Accreditation process comprises a written exam, (theory and case reporting sections) and a practical assessment comprising a live observed practical assessment on a simulator, review of the required logbook and a review of selected Viva echo cases performed to a high standard.

Echo skills can only be maintained by continued education and practical involvement in echocardiography. The importance of this is underlined by limiting Accreditation to 5 years after which re accreditation must be sought. Ongoing BSE membership is a requirement for maintaining accreditation.

Summary of process requirements

- ➢ You must be a member of the British Society of Echocardiography
- ➢ You should address all queries regarding accreditation to: BSE Accreditation Department, address details and online registrations are available via www.bsecho.org. Tel: 0208 065 5794 (lines open from 09:00-17:00 Mon-Fri- *excluding UK public holidays*), Email: accreditation@bsecho.org.
- ➢ You must pass the written assessment before attending the practical assessment.
- ➢ The practical assessment cases and logbook should be collected over a period of no more than 24 months from the written examination with the practical assessment being taken two months after the collection end date or the next available exam date. Therefore, cases can be collected before the written exam, but the total time for cases to be collected remains 24 months.
- ➢ Each candidate for accreditation must contact a suitably qualified supervisor who undertakes to train and supervise and to arrange visits to other centers if there are difficulties obtaining an adequate case-mix locally.
- ➢ One or two supervisors at each center 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. Mentors can be approached through the BSE, please contact the accreditation department for more information.
- ➢ There is no general (or 'grandfather') exemption from BSE TOE accreditation.

At the practical assessment, you should submit:

➢ Five full cases accompanied by reports signed by yourself
➢ A logbook containing the 125 reports of a specific case-mix or 75 cases if you hold BSE TTE, Critical Care or EACVI Accreditation.
➢ Reports to be uploaded and submitted via the logbook portal. Mentor, summary and statements are to be completed via the portal.

➢ Fully subscribed BSE members can request access to the portal before sitting the written examination by emailing accreditation@bsecho.org.

Extensions and Exam fees

➢ Extensions to the 24-month deadline may be granted in accordance with the extensions policy. Extension requests forms must be submitted **before the submission deadline.** Extension request forms (along with all other BSE applications forms) can be found www.bsecho.org. Requests received after the case deadline may not be granted.
➢ **Extensions are not guaranteed**. A non-refundable charge of £100 will be made for each extension request regardless of the outcome.

➢ A fee of £250 is charged for the complete accreditation process. This fee is payable, in advance upon registration for the written section of the examination and will also cover the practical assessment. There is a non-refundable booking fee of £20 to pay upon registering for a secured placement at the practical assessment. All registrations are online.

➢ Candidates who are unsuccessful in the written section of the examination will be charged a reduced fee of £125 to re-sit this section. This reduced fee only applies to candidates who re-sit the examination within two sittings of the unsuccessful attempt (in 12 months). A re-attempt at the practical assessment is also subject to a fee of £125.
➢ Candidates are entitled to one re-attempt at the practical assessment.
➢ The full training syllabus is available in Appendix 2.
➢ Appeals process can be accessed via www.bsecho.org. Candidates can appeal the decision on a practical assessment result and a reaccreditation result. There is no appeals process for the written section of the examination.

Details of written assessment and practical assessments

Written assessment

The written assessment is held up to two occasions each year (depending on demand). The examinations are held at various Pearson VUE centres (online) in the UK, Republic of Ireland, South Africa and Hong Kong.

Please follow instructions on written examination dates section of www.bsecho.org or see Appendix 5 for further information on registrations for the written exams.

The written assessment is conducted under formal examination conditions. It is comprised of two parts: the Theory section and the Reporting section. The suggested reading list is available in Appendix 1.

This consists of 100 Single Best Answer Questions covering the syllabus in Appendix 2.
The questions test knowledge of echocardiographic findings with some additional questions on basic cardiology and physics.

The first 50 Multiple Choice Questions (MCQ) will be based on video clips and the next 50 MCQs will be based on theory.
Each MCQ comprises of a main stem followed by 5 options relating to the stem. The single best answer should be chosen. Some example questions are provided in Appendix 3.
The subject matter reflects the spectrum of clinical practice according to both frequency and technical complexity. Thus valve disease is more frequently represented than ischaemic disease since, though seen less commonly in clinical practice, it presents a greater challenge to the echocardiographer.
Both parts of the examination will be computer marked - guidelines in Appendix 5.

In the written assessment it is necessary to pass both the multiple choice and imaging questions at the same exam sitting. The approximate pass mark for the Theory Section is approximately 70% and 80% for the Reporting Section. These may vary at the discretion of the Chief Examiner following moderation.
There is no bar to re-sitting the written assessment **any number of times**.
Accreditation will only be awarded once a candidate has also successfully completed the practical assessment (logbook and cases). A satisfactory performance at the written assessment alone does not allow 'partial accreditation'.

Theory Section

This consists of 50 Single Best Answer MCQs covering the syllabus in **Appendix 2**.
The theory section will last **60 minutes.**
Each MCQ comprises of a main stem followed by 5 options related to the stem. The single best answer should be chosen. Some example questions are provided in **Appendix 3**.
The Theory examination will be marked +1 for correct answers, 0 for incorrect or unanswered questions (no negative marking).

There are no 'trick' questions.

Echo Reporting section

This will consist of 50 Single Best Answer MCQs based on an echo image. They reflect the range of clinical material seen in routine echocardiographic practice.
The Echo Reporting section will last **90 minutes**.

Each MCQ comprises of a main stem followed by 5 options relating to the stem. The single best answer should be chosen. Some example questions are provided in Appendix 4.

There are no 'trick' questions.

Practical assessment

All candidates will be required to attend a practical assessment within 26 months of beginning to collect their cases (i.e. within two months of their case collection deadline). **The written examination must have been passed at anytime during the collection period, before attending.**

The Practical assessment will be held up to five times per year- **depending on candidate demand**.

Dates and locations will be announced on the Practical Registrations section of **www.bsecho.org**. Candidates will need to select an available date and register online. Registrations will open at least three months before the assessment date. Upon a confirmed placement, candidates will be given an assessment time.

The assessment will consist of 3 Stations. **Station 1** will assess the **Logbook.**
On attendance at the exam, your logbook portal reference will be activated for the examiners who will review your logbook whilst you attend Station 2.

Feedback for Station 1 will be given after you have completed Stations 2 & 3.
Logbooks and cases must be fully anonymised – please read the BSE Policy on the Non-Anonymisation of Patient data in Appendix 14 breach of this policy will result in an automatic fail.
Logbook submission are via portal unless agreed otherwise by the chief examiner.

Logbook

The Logbook should comprise details of 125 Transoesophageal echocardiography cases personally **performed and reported** by you during the specified period of 24 months (or 75 cases if you hold BSE or **EACVI** TTE/TOE Accreditation). It is not acceptable to include cases reported by you that have been performed by someone else.
Certificate evidence of EACVI TTE/TOE accreditation, if held, must be brought with you to the examination.

The format for the Logbook is a set of copies of actual clinical reports submitted via the BSE online logbook portal.

The reports should ensure:

All patient data has been removed including full date of birth, name or address. See **Appendix 14.**
All cases have been collected in accordance with local requirements for data protection, i.e. your trust policy.
The inclusion of cavity and Doppler measurements, objective observations and a comment - **Appendices 7** and **8**.
The **signature (or e-signature)** and the full name of the candidate are included. At least the final 50 cases should be reported primarily by the candidate alone although they may be checked by another operator.
In some cases, Trust Policy dictates that reports are signed by Accredited Echocardiographers only. In this case, reports signed by the supervising echocardiographer may be included in the logbook but should be countersigned by both the candidate and the supervising echocardiographer to confirm that the trainee has produced the report. An advisory letter from the head of department or supervisor should also be included in the submission.

➤ The studies should reflect the normal case-load of a general adult department and should include **at least one example** of the following case mix:

- Mitral repair
- Severe mitral valve regurgitation
- Endocarditis
- Basic adult congenital heart disease (e.g. ASD, VSD or pulmonary stenosis)
- 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

A tally of the primary diagnosis assigned to each case must be entered on the appropriate enclosed summary sheet - Appendix 9.
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 occasions counts as a separate study.
More than one candidate from the same institution is permitted to study the same patient if the diagnosis is unusual but each candidate must independently scan and write their own report.
If you have problems finding enough specific cases, discuss this with your mentor who may consider arranging for you to attend a specialised centre.

A letter from the supervisor must be submitted with the completed log-book certifying that the studies have been recorded by the candidate. The Curriculum Based Competency Assessment Tool should also be submitted with the logbook. (Appendix 6 & 13).

Station 2 will assess the Viva case submission.

This will consist of a viva pertaining to the digital echo cases. The digital studies must be accompanied by their reports. Each study must be submitted as digital loops and still images within a PowerPoint presentation. The dataset for a complete study are listed in Appendix 1.

Image acquisition, optimisation, measurements and interpretation will be assessed. Studies must include one normal study, one case of aortic stenosis (moderate or severe) and three other examples listed in Appendix 11. The candidate must demonstrate the appropriate use of standard Doppler equations.

If the candidate is successful at this Station they will progress to Station 3. If unsuccessful at station 2, the candidate can still proceed to the following station for the purpose of summative examination. The chief examiner will discuss this with the candidate.

Viva Case Submission
Five full studies with reports must be brought to the Practical Assessment. The cases **must** be anonymised. This is the section that is often done least well and is where many candidates fail.

Remember that it is assumed you will submit your best cases, so it is worth spending extra time to ensure the submission is as good as it can be. Do not choose incomplete studies or patients who are poorly echogenic. Each case should be a full study performed to the BSE minimum dataset and not a focused study.

Please optimise the 2D and Doppler images. Make sure you have optimised the gain setting, sector width, depth, harmonics, focus, sweep speed, Doppler baseline, scale and colour gain. Ensure that the cursors are correctly aligned. Candidates may be failed on just this aspect. Each case should be accompanied by a full and comprehensive report. This should include a summary that can be understood by any non-echocardiographer. If these points are not done well in your submission it may be assumed that you will have poor quality images on your routine cases.

Read the assessment sheet that the assessors will be using for the practical examination.
Only include loops and stills that you wish to be assessed. Ensure that loops and stills with measurements shown match the parameters quoted in the report.
Each case should be accompanied by a full and comprehensive report including quantitative measurements, observations and a conclusion or summary.

The following diagnoses and minimum criteria are required:

A normal study demonstrating appropriate use of machine settings for optimal imaging and correct use of standard 2-D views as per BSE minimum dataset (mid- oesophageal, transgastric and upper oesophageal), M Mode, CW, PW and Colour Doppler to assess chambers and valves. It is essential to demonstrate accurate measurement of the LV dimensions in at least one case. This would normally be in this case but if this is not possible, it is acceptable to provide this in at least one of the other cases.

Moderate or severe aortic stenosis (Please include a good demonstration of the use of the CW Doppler probe in the deep transgastric view/transgastric long axis view). You should also calculate the valve area using the continuity equation and show all measurements used in the calculation.

Moderate or severe mitral or aortic regurgitation which demonstrates quantification of the degree of regurgitation as per BSE guidelines.

It is essential to demonstrate accurate measurement of the LV dimensions in at least one case. These measurements must be made in diastole and systole in both midoesophageal 4 chamber and 2 chamber views. Ejection fraction and regional wall motion abnormalities must be described as well.

The remaining cases should include an example of one of the following:

a)   Prosthetic valve with size and type noted and reference to normal values for that specific valve
b)   Mitral repair
c)   Endocarditis
d)   Intracardiac mass including thrombus with differential diagnoses
e)   Basic adult congenital heart disease (e.g. ASD, VSD or pulmonary stenosis)
f)   Aortic pathology (e.g. dissection, aneurysm, intramural haematoma)
g)   Hypovolaemia/septic shock assessment
h)   Pericardial effusion
i)   Pulmonary embolism assessment/right heart dilatation

In order to ensure that your cases play properly at the assessment you must bring your own laptop to the centre having checked that the cases play on this.

The studies must demonstrate all appropriate echocardiographic views and must show the methods of measuring all dimensions on M-mode or 2D and all parameters on Doppler echocardiography.

No case should have any patient-identifiable data. Erasing patient data may not always be possible after the examination so please ensure due care is taken to put 'case 1' instead of patient's name or patient's personal details. Alternatively, you may wish to use descriptions of pathology such as "aortic stenosis". You must be able to use the common Doppler equations e.g. continuity equation, calculation of a shunt, estimation of pulmonary artery systolic pressure.

Cases that are of high quality may be copied to be used in subsequent BSE written exams.

Station 3 will assess the **Image acquisition skills**. ([Appendix 12](#))

This will include testing the haptic knowledge and image acquisition skills of the candidate on an echo simulator. Any shortcomings identified in the previous stations will be probed.

The simulator can be loaded with different pathologies.

The candidate will be asked to acquire a good quality image of a particular view. Not all views may be possible in the available time.

If there are concerns with any of the images assessors should question the candidate - if they can demonstrate appropriate knowledge/competence when questioned this may be sufficient.

If the candidate is successful in obtaining the required views to the required standard, they will be deemed to have passed this section.

Outcomes and process for re-attempts

If you are successful at all three stations, you will be deemed to have passed the accreditation process and will receive your certificate prior to leaving the assessment.

➤ If you are unsuccessful at any station, you will be deemed to have been unsuccessful at this sitting of the practical assessment. You will be provided with constructive feedback to facilitate a re-attempt and offered the opportunity to continue on to the next station.

➤ **Any parts of the exam passed** at that sitting **do not** need to be re-attempted at the next attempt. This only applies to two attempts at the practical within a reasonable time-frame.

➤ To re-attempt, you will need to attend another practical assessment and begin at the station at which you were unsuccessful and complete all outstanding stations successfully.

➤ The timescale allowed for re-attempts will depend on which stations were not passed and the number of Viva cases required to be resubmitted. This will be discussed with you in the assessment.

A second attempt at the practical assessment is subject to a fee of £125. Candidates are entitled to one re-attempt at the practical assessment, after which the written examination must be undertaken again.

All re-attempts at the practical assessment including single case and logbook re-submissions, require attendance by the candidate in person in order to facilitate adequate and useful face to face feedback. Our feedback consistently demonstrates that non-face to face feedback does not adequately equip a candidate to pass at the next sitting.

Appendix 1 -Suggested Reading List

The syllabus is set by the Accreditation Committee of the British Society of Echocardiography and is presented as a guide to candidates.
The reading list is provided by the Accreditation Committee of the British Society of Echocardiography. There are many excellent books on echocardiography and some examples are listed below. In addition to those listed there are many small basic texts which are a useful introduction to the subject.

Authoritative textbooks (starting with the simpler texts a suggestion)

Practical Perioperative Transesophageal Echocardiography: With Critical Care Echocardiography by David Sidebotham, Alan Merry, Malcolm E. Legget · Elsevier/Saunders ISBN 0702034274.
A Practical Approach to Transesophageal Echocardiography by Albert C. Perrino, Scott T. Reeves ISBN 1451175604
Perioperative Two-Dimensional Transesophageal Echocardiography: A Practical Handbook by Annette Vegas. 1441999523
Clinical Manual and Review of Transesophageal Echocardiography, Second Edition by Joseph Mathew, Madhav Swaminathan, Chakib Ayoub · Mcgraw-Hill. ISBN 0071638075
Echocardiography: Guidelines for reporting – a practical handbook Helen Rimington and John Chambers Taylor & Francis 1998 ISBN 1850700117
Feigenbaum's Echocardiography William F. Armstrong, Thomas Ryan, Harvey Feigenbaum – 2010. ISBN 0781795575

Useful review articles:

A minimum dataset for a standard transoesophageal echocardiogram: a guideline protocol from the British Society of Echocardiography. Richard Wheeler, Richard Steeds, Bushra Rana et al. Echo Res Pract. 2015 Dec 1; 2(4): G29–G45.

ASE/SCA guidelines for performing a comprehensive intraoperative multiplane transesophageal echocardiography examination: recommendations of the ASECouncil for Intraoperative Echocardiography and the SCA Task Force for Certification in Perioperative Transesophageal Echocardiography. Shanewise JS, Cheung AT, Aronson S et al. Anesth Analg. 1999 Oct;89(4):870-84.

Guidelines for performing a comprehensive transesophageal echocardiographic examination: recommendations from the ASE and SCA. Hahn RT, Abraham T, Adams MS et al. Anesth Analg. 2014 Jan;118(1):21-68.

Protocols and guidelines are available under the Education tab of www.bsecho.org.

Please note that only fully subscribed BSE members are granted with full access to all education and exam content.

Echocardiographic assessment of valve stenosis: EAE/ASE recommendations for clinical practice. Baumgartner H, Hung J, Bermejo J et al. Eur J Echocardiogr. 2009 Jan;10(1):1-25.
Recommendations on the Echocardiographic Assessment of Aortic Valve Stenosis: A Focused Update from the European Association of Cardiovascular Imaging and the American Society of Echocardiography. Baumgartner H, Hung J, Bermejo J et al. J Am Soc Echocardiogr. 2017 Apr;30(4):372-392.

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European Association of Echocardiography recommendations for the assessment of valvular regurgitation. Part 2: mitral and tricuspid regurgitation (native valve disease). Lancellotti P, Moura L, Pierard LA et al. Eur J Echocardiogr. 2010 May;11(4):307-32.

European Association of Echocardiography recommendations for the assessment of valvular regurgitation. Part 1: aortic and pulmonary regurgitation (native valve disease). Lancellotti P, Tribouilloy C, Hagendorff A et al. Eur J Echocardiogr. 2010 Apr;11(3):223-44.

Recommendations for Noninvasive Evaluation of Native Valvular Regurgitation: A Report from the American Society of Echocardiography Developed in Collaboration with the Society for Cardiovascular Magnetic Resonance. Zoghbi WA, Adams D, Bonow RO. J Am Soc Echocardiogr. 2017 Apr;30(4):303-371Recommendations for cardiac chamber quantification by echocardiography in adults: an update from the ASE and the EACVI Lang RM, Badano LP, Mor-Avi V et al. J Am Soc Echocardiogr. 2015 Jan;28(1):1-39.

Recommendations for quantification of Doppler echocardiography: a report from the Doppler Quantification Task Force of the Nomenclature and Standards Committee of the American Society of Echocardiography. Quiñones MA, Otto CM, Stoddard M et al. J Am Soc Echocardiogr. 2002 Feb;15(2):167-84.

Guidelines for the echocardiographic assessment of the right heart in adults: a report from the ASE endorsed by the EAE, a registered branch of the ESC, and the CSE. Rudski LG, Lai WW, Afilalo J et al. J Am Soc Echocardiogr. 2010 Jul;23(7):685-713

Safe sedation during TOE. http://www.bsecho.org/recommendations-for-safe-practice-in- sedation/ EAE/ASE Recommendations for the evaluation of left ventricular diastolic function by echocardiography. Nagueh SF, Appleton CP, Gillebert TC et al. J Am Soc Echocardiogr. 2009 Feb;22(2):107-33.

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Appendix 2 -Training syllabus for BSE accreditation

Topics that maybe included in the multiple choice examination **General Concepts**

1. The place of echocardiography
Clinical role of echocardiography and Doppler
Information that echocardiography can and cannot provide
'Ruling out' pathology (sensitivity, specificity & Bayes theorem)
Likelihood of findings influencing patient management
Undesirable outcomes: inaction while waiting for results, clinical 'red herrings'
Indications for echocardiography
Competing and complementary technology
Cardiac catheterisation (ventriculography and coronary angiography)
CT imaging
Magnetic resonance imaging
Nuclear Cardiology

1.1 Service Provision
Provision and indication for specialised techniques, e.g. TOE, Contrast Echo.
Availability and access
Controlling workload
Training & motivation of staff
Audit, Quality Control & Clinical Governance
Infection control

1.2 Relationship with patients
Explaining the procedure in terms relevant to the particular patient
Respect for patient's dignity and cultural backgrounds
Relationships with colleagues
Handling requests for information about the study findings

1.3 Reporting and Documentation
Standard methods & terminology
Distinction between Technical and Clinical reports
Responsibility for reporting - Medico-legal considerations (Data Protection Act)

2. Imaging Physics & Instrumentation
2.1 Concepts and Terminology
Concept of compression waves
Definitions: frequency, wavelength, propagation velocity
Units of measurement: Hz and MHz
Decibel Comparison of Ultrasound with audible sound.

2.2 Propagation of ultrasound through tissues
Speed of sound in different body tissues.
Frequency range used for diagnostic imaging
Distinction between specular reflection and backscatter
Principles of attenuation and scattering

2.3 Ultrasound Transducers
Piezo-electric effect
General concepts of 2D and 3D transducer construction
Characteristics of the ultrasound beam: Far (Fraunhofer) & Near (Fresnel) zones, side lobes
Beam steering methods: mechanical & electronic
Focusing methods, including dynamic receive focusing
Focus position
The role of intracardiac echocardiography

2.4 Imaging physics
Factors affecting choice of imaging frequency: typical practical values for adults & children
Broad-band imaging
Harmonic imaging
M Mode imaging.
Scanning speed limitations, relationships between pulse repetition frequency, frame rate, lines per frame, field of view, depth to be imaged.
Temporal resolution.
Grey scale and dynamic range
Measurement and optimisation of Resolution: axial, lateral, azimuthal and temporal
Side lobe and grating artefacts
Reverberation artefacts
Limiting factors for detecting small targets

2.5 Echo Instrumentation
Function of machine controls:
Transmit power, overall gain, time gain compensation, lateral gain compensation, reject, compression, signal processing, dynamic range, pre-processing; post processing.
Optimisation of imaging parameters, including transducer frequency, scan angle, spatial and temporal smoothing.
Optimisation of 3D volume acquisitions including cropping and manipulation of viewing plane.
The advantages of 3D echocardiography over 2D echocardiography e.g. appreciation of mitral valve pathology, elimination of geometric assumptions in cardiac chamber volume estimations

2.6 Optimising Images
Use of gel (infection risk from transducer, operator)
Standard views: midoesophageal (4C, 5C, 30°, 60°, 90° & 120° views), bicaval, RV inflow-outflow, upper oesophageal and transgastric views
Use of non-standard views

2.7 Storage and Display of Images
Basic concept of digital acquisition and storage systems.
Scan converters and digital memories.
Display devices and controls, recording techniques

3. Doppler physics & fluid dynamics
3.1 Basic Fluid Dynamics
Fluid flow: significance of peak & mean velocities   Determination of volumetric flow by Continuity equation
Laminar & turbulent flow: Reynolds' equation (qualitative)
Transition from Laminar to turbulent flow: inlet jet Bernoulli equation

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3.2 Principles of Doppler
Interaction of ultrasound waves with moving blood: the Doppler effect
The Doppler equation: factors influencing magnitude of Doppler shift
Spectral analysis: fast Fourier transform (qualitative)
The spectral Doppler display: determination of mean, modal and peak velocities
Limitation of CW Doppler caused by lack of depth discrimination
Audible range of Doppler shift frequencies
The effect of beam angle errors on Doppler velocities
Aliasing: how it is caused and how it manifests in practice: the Nyquist limit
Influence on aliasing of: transducer frequency; sample depth (range x velocity product); and beam angle
High pulse repetition frequency (extended range) PW Doppler and the phenomenon of range ambiguity
Relative advantages and disadvantages of CW, PW and HPRF modes
Concept of colour flow imaging as multi-sampled PW
Velocity estimation, by moving target indication and autocorrelation (qualitative)
Limitations of mean velocity: use of velocity variance to show high velocities/turbulence
Aliasing in colour Doppler
The principles of pulse wave tissue Doppler
Packet size, colour mode and sector size and their effect on frame rate and aliasing

4. Deformation Analysis
4.1 Principles of Myocardial Deformation
The definition of displacement, velocity, strain and strain rate
The cardiac ultrasound co-ordinate system for describing motion and deformation: longitudinal, radial, circumferential and rotational axes
Quantifying myocardial deformation as opposed to velocity or displacement
Concept of shear deformation; rotation of the base and apex of the left ventricle, and the resultant twisting deformation or torsion

4.2 Quantifying myocardial strain and strain rate by tissue Doppler
The concept of the myocardial velocity gradient
The concept of strain and strain rate to define deformation
Tissue Doppler imaging for deriving strain and strain rate: practical parameters in measuring strain and strain rate (e.g. sample size and shape, offset distance, drift compensation, spatial and temporal averaging, tracking of sample volume)
Reproducibility issues

4.3 Speckle Tracking Echocardiography/2D strain
Familiarity with the concept of speckles and speckle tracking in greyscale 2D loops
Speckle tracking for angle-independent derivation of velocities, displacement, strain and strain rate, in 2 dimensions
The impact of frame rates on the quality of speckle tracking
Speckle tracking vs. tissue Doppler techniques for assessing myocardial motion and deformation
Speckle tracking for measuring left ventricular rotation and torsion
Kindred technologies
Methods of measuring diastolic dysfunction: E/A ratio, deceleration time, pulmonary venous flow patterns, the ratio of the peak early diastolic transmitral velocity and the peak early diastolic tissue velocity of the mitral valve annulus (the E/E' or E/Ea) ratio for estimating LV filling pressures, the mitral valve Flow propagation velocity

Peak and Mean pressure gradient measurements by Doppler and their relationship to catheterisation data
Measurement of pulmonary pressures from tricuspid and pulmonary regurgitant flow velocities and assessment of inferior vena cava contraction during inspiration

5. Doppler instrumentation
5.1 Spectral Doppler Instrumentation
Features of the spectral display: positive & negative velocities; scale & baseline controls.
Effect of high-and low-pass filter and intensity threshold ('reject') settings
Pulsed Doppler sample volume: influence of gate length and distance (beam width)
Representation of signal strength by image intensity
How aliasing manifests on the spectral display

5.2 Colour Flow Instrumentation
The colour display: BART convention
Colour maps to show velocity scales
Image domination and additive colour modes
Difference between velocity and power (signal amplitude) displays
Basic principles of Tissue Doppler Imaging (TDI), including optimisation of filters for detecting tissue versus blood velocities, sample volume and size, impact of interrogation angle on measured velocities, minimising aliasing, and maximising frame rates to detect short duration myocardial motion
Differences between colour Doppler TDI and pulsed wave TDI.
Minimisation of myocardial translational movements during acquisition.
The concept of tracking on colour Doppler TDI to ensure that sample volume remains in the region of interest
Parametric (curved M-mode) display of tissue Doppler images
The relevance of importing cardiac cycle time points, such as aortic valve closure, into tissue Doppler traces

5.3 TOE Instrumentation
Transducer types: single plane, biplane, omniplane
Optimising machine settings for TOE Patient monitoring for TOE and general safety considerations
Control of infection

5.4 Safety of ultrasound
Potential hazardous biological effects: heating, resonance and cavitation effects
Measurement of beam intensity (SPTA)
Practical precautions: power levels, use of colour and CW Doppler
Thermal Index, Mechanical Index

5.5 Recording methods
Advantages/disadvantages of recording on videotape and digitally
Basic understanding of digital image processing and recording methods: pixel density, volume of data, the DICOM standard, concept of data compression (JPEG, AVI, etc.), archiving of echocardiographic studies on magneto-optical discs, CD/DVD, portable solid-state memories, ECG-gated acquisitions vs. continuous recording, facility to review acquired loop prior to
storage, facility to choose the number and type of cardiac cycles to be recorded, facility for offline image properties adjustment and further quantitative analysis.

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6. Cardiac Anatomy and Physiology

6.1 Anatomy of the thorax
Anatomy of oesophagus
Anatomy of the oesophagus with respect to the heart.
Anatomy of Lungs & pleura
Anatomy of heart, pericardium and mediastinum

6.2 Gross anatomy of the heart
Basic cardiac embryology
Nomenclature of chambers and valves
Major relationships of chambers, valves and blood vessels
Distinguishing features of valves and chambers as related to echocardiography
The pericardial sac

6.3 Cardiac anatomy and physiology as demonstrated by echocardiography
Detailed structural anatomy of the heart, great vessels and pericardium
Visualisation of normal cardiac anatomy and normal variants in standard echocardiographic planes
Normal valve function, normal Doppler parameters and normal variants
The phases of atrial function: reservoir, conduit and contractile phases
The LV remodelling process in response to disease: eccentric (chronically elevated preload) vs. concentric hypertrophy (chronically elevated afterload)

6.4 The Cardiac Cycle
Temporal relationships of the ECG, chamber pressures and valve movements
Typical values for intracardiac pressures
Relationship of valve movements to heart sounds
Identification of valve opening and closure signals on Doppler recordings
The timing of aortic valve closure as a marker of end-ejection, as derived from M-mode, blood flow Doppler or tissue Doppler

7. Cardiac functional parameters

7.1 Measurements and calculations
On-screen measurement of length, slope, area, volume and time interval, and their significance for 2-D, 3D images, M-mode and spectral Doppler displays
Standard M-mode measurements and calculations, both using machine software and manual methods
Derivation of Stroke Volume, Ejection Fraction and LV Mass
Methods of measuring LV volume, including biplane area, area-length, Simpson's rule methods and 3D.
Limitations of single plane estimations of LV ejection fraction e.g. Teicholtz formula method
Limitations of single plane measurements of LA size
Geometric assumptions used in estimation of cardiac chamber volumes with M mode and 2D imaging
The advantages of deriving volumes and ejection fraction by 3D echocardiography
Limitations of measurement and/or calculation validity in presence of poor quality and/or off- axis images

Contents

7.2 Doppler determination of cardiac output, ejection time and velocity acceleration

Methods of measuring diastolic dysfunction: E/A ratio, deceleration time, pulmonary venous flow patterns, the ratio of the peak early diastolic transmitral velocity and the peak early diastolic tissue velocity of the mitral valve annulus (the E/E' or E/Ea) ratio for estimating LV filling pressures, the mitral valve Flow propagation velocity

Peak and Mean pressure gradient measurements by Doppler and their relationship to catheterisation data

Measurement of pulmonary pressures from tricuspid and pulmonary regurgitant flow velocities and assessment of inferior vena cava contraction during inspiration

8. Contrast Studies

Significance of spontaneous echo contrast

Optimisation of machine control settings for detecting contrast

Main indications for a bubble contrast study: diagnosis of intracardiac shunts and PFO, diagnosis of left sided SVC

Manoeuvres to provoke right –to-left passage of bubbles during assessment for PFO

Relevance of injecting bubble contrast through upper arm vein vs. femoral vein for detecting PFO

Technique for performing a hand-agitated contrast study

Clinical precautions

8.1 Awareness of encapsulated contrast agents and techniques

Interaction of ultrasound with encapsulated agents

Generation of harmonic energy by bubble distortion and fracture

Doppler signals generated by bubbles (Power Mode)

Main indications for LV and RV opacification: enhancing endocardial definition for assessment of regional contractility and accurate cardiac volume estimations, detection of intracardiac masses, distinguishing thrombus from a vascular tumour, diagnosis of cardiomyopathies e.g. non- compaction, arrhythmogenic right ventricular dysplasia, Doppler enhancement

Use of contrast in stress echocardiography for improving detection of wall motion abnormalities and for assessment of myocardial perfusion

9. Pathology

9.1 Mitral Valve Disease, 2D, 3D, M-mode and Doppler features of the normal mitral valve

9.2 Mitral Stenosis

Mitral Stenosis

Recognition of rheumatic mitral stenosis

Qualitative description of valve and sub-valve calcification and fibrosis

Measurement of orifice area by planimetry

Factors favouring successful balloon valvuloplasty

Doppler assessment of mean and end-diastolic gradient

Doppler assessment of area by 'pressure half-time': technique and limitations

Role of exercise echocardiography in assessing the change in transmitral gradient and pulmonary systolic pressures with exercise, as decision aid in the timing of surgery/balloon valvuloplasty

9.3 Mitral regurgitation

Aetiologies and typical echocardiographic features of

Rheumatic

Mitral annular calcification

Floppy /myxomatous mitral valve

Ischaemic

Functional

Infective endocarditis

Assessment of severity by

Chamber sizes and volume overload

CW Doppler – shape and density of contour of Doppler signal

Vena contracta, PISA and effective regurgitant orifice area

Size of colour jet relative to atrial size by colour flow Doppler, Regurgitant fraction, regurgitant volume

Pulmonary vein flow patterns

Indirect effects on LV and LA

Role of echocardiography in determining timing of surgery for primary mitral valve disease: ejection fraction, end-systolic LV diameter, EROA

Role of TOE in assessing mitral valve pathology and in determining likelihood of repair as opposed to replacement

10. Aortic Valve Disease

10.1 2D, 3D, M-mode and Doppler features of the normal aortic valve

10.2 Aortic Stenosis

Aetiologies and echocardiographic features:

Rheumatic

Bicuspid

Senile degenerative

Sub-and supra-valve obstruction

Assessment by CW Doppler

Peak and Mean gradients

Apical, right parasternal and suprasternal positions

Continuity equation

Assessment of left ventricular hypertrophy and use of stress echocardiography for distinguishing fixed anatomical stenosis from pseudostenosis in low flow aortic stenosis and for assessing LV contractile reserve

Difference between transaortic pressure gradients derived from echocardiography and from cardiac cathetherisation

10.3 Aortic Regurgitation

Aetiologies and typical echocardiographic features of:

Rheumatic

Bicuspid valve

Aortic root disease

Infective endocarditis (including root abscesses)

Contents

Assessment of severity by:
Chamber sizes/volume overload (regurgitant volume, regurgitant fraction)

CW Doppler – shape and density of contour of Doppler signal, pressure half time
Colour Doppler – size of jet relative to left ventricular outflow tract diameter
Vena Contracta
Effective regurgitant orifice area
Diastolic flow reversal in descending aorta
Indirect effects on LV
Role of echo in determining timing of surgery
Role of TOE in assessing aetiology and severity

11. Tricuspid Valve Disease

11.1   2D, M-mode and Doppler features of the normal tricuspid valve

11.2   Tricuspid valve stenosis
Echocardiographic features
Assessment of severity by imaging and Doppler

11.3 Tricuspid Regurgitation
Aetiologies and echocardiographic features of:
Rheumatic
Prolapse
Congenital
Endocarditis
Carcinoid
Functional
Assessment of severity by:
2D imaging and M-mode
CW Doppler – shape and density of contour of Doppler signal
Colour Doppler
Hepatic vein flow pattern
Indirect effects on RV and RA

12. Pulmonary Valve Disease

12.1   2D, M-mode and Doppler features of the normal pulmonary valve

12.2   Pulmonary Valve Stenosis
Echocardiographic feature
Assessment of severity by:
Spectral Doppler
Detection of infundibular obstruction by spectral Doppler

12.3   Pulmonary Regurgitation
Aetiologies and echocardiographic features
Assessment of severity by

13. Infective Endocarditis – Risk factors for I.E

Typical echocardiographic appearance of vegetations in bacterial and fungal endocarditis
Preferred locations for vegetations

'Jet', 'kissing' lesions
Endocarditis associated with congenital disease and HCM
Complications: abscess, fistula, perforation, valve regurgitation
Role of TOE in suspected endocarditis
Monitoring of IE

14.   Prosthetic valves

14.1 2D, M-Mode and Doppler features of the main types of replacement valves
Tilting Disc
Bi-leaflet
Ball & cage
Bioprostheses (stented and stentless)
Age-related deterioration of bioprostheses
Role of TOE in examining normal and malfunctioning prosthetic valves

14.2 Prosthetic valve stenosis
Assessment by 2D, M-mode and Doppler
Normal ranges
Use of Continuity Equation for aortic prostheses
The phenomenon of pressure recovery
The diagnosis of patient-prosthesis mismatch

14.3 Prosthetic valve regurgitation
Trans-versus para-valvular regurgitation
Normal versus abnormal regurgitation
Assessment by CW, PW and Colour
Doppler Colour artefacts from mechanical prostheses

15. Cardiomyopathies

15.1   Dilated Cardiomyopathy
2D, M-mode and Doppler features of dilated cardiomyopathy
Detection and assessment of associated lesions
Functional valve regurgitation
Thrombus in cardiac chambers
Pericardial effusions
Role of echocardiography in assessment and follow-up

15.2 Hypertrophic Cardiomyopathy
2D, M-mode and Doppler features of Hypertrophic Cardiomyopathy
Differentiation from other causes of hypertrophy, e.g. hypertension, athletic heart', amyloidosis, Fabry's disease, Friedreich's ataxia cardiomyopathy
Techniques for measurement of left ventricular wall thickness, detection of left ventricular outflow tract obstruction and intracavity gradient
Assessment of right ventricular involvement
Associated abnormalities, e.g. systolic anterior motion mitral valve

15. 3 Restrictive Cardiomyopathy
Causes e.g. primary amyloidosis, sarcoidosis, idiopathic, endomyocardial fibrosis
2D, Doppler & TDI features of impaired ventricular filling – increased ventricular wall thickness, dilated atria, increased E/A ratio, reduced deceleration time, increased E/E' ratio, reduced S' wave.

15.4 Main features of LV non-compaction

15.5 Intracardiac Masses
Typical locations for formation of intracardiac thrombus
Echocardiographic features of typical LA myxoma
Differentiation of myxoma from other cardiac tumours
Features suggestive of malignancy
Role of TOE in assessment of intracardiac masses
Role of contrast in the assessment of intracardiac masses

16. Pericardial Disease

16.1 Anatomy of the normal pericardium
Relationships of serous pericardium to heart and great vessels
Transverse and oblique sinuses of the pericardium

16.2 Echocardiographic features of pericardial fluid
Location of fluid in relation to patient position and fluid volume
Differentiation from pleural effusion
Assessment of volume of pericardial fluid
Role of echocardiography in pericardiocentesis

16.3 Features of tamponade
Collapse of RA and/or RV walls
Effect on IVC and hepatic vein flow pattern
Effect on A-V valve flow velocities during respiratory cycle

16.4 Features of pericardial constriction
Pericardial thickening/appearance
Effect on A-V valve flow velocities
Effect of respiration
SVC/hepatic vein flow
Differentiation from restrictive cardiomyopathy including use of tissue Doppler

17. Coronary Artery Disease and Systolic LV function

17.1 Anatomy of the normal coronary arteries

Anatomy & nomenclature of the major branches of the coronary arteries
Relationship of coronary anatomy to standard echocardiographic imaging planes
Nomenclature for describing myocardial segments (16 & 17 segment model)

17.2 Analysis of segmental systolic myocardial function
Use of stress echo to assess for myocardial ischaemia
Diastolic dysfunction in coronary artery disease

17.3 Global measures of LV function:
Ejection Fraction
Stroke Distance
Stroke Volume and Cardiac output
Use of tissue Doppler and speckle tracking echocardiography for assessment of regional myocardial velocities and deformation in ischaemic heart disease, at rest and with stress
Longitudinal function of the left ventricle, as assessed by M-mode (MAPSE) and tissue Doppler of the mitral valve annulus
The concept of post-systolic contraction
The concept of isovolumic acceleration by tissue Doppler
Left ventricular torsion and its implications for systolic function of the LV

18. Diastolic function of the LV

18.1 Normal Diastology
The 4 stages of diastolic dysfunction as assessed by transmitral flow Doppler (including DT); impaired filling pattern and restrictive flow pattern
The limitations of transmitral flow

18.2 Doppler for assessing diastolic dysfunction:
Effect of LA pressures and pseudonormalisation
Effect of mitral regurgitation
The use of Valsalva manoeuvre in reducing LA pressures to differentiate normal from pseudonormalisation
Flow Doppler patterns
The use of left atrial size, IVRT, tissue Doppler (diastolic longitudinal velocities of the mitral valve annulus, the E/E' ratio), pulmonary vein flow pattern and mitral propagation velocity for assessing diastolic function
The importance of untwisting in left ventricular filling

19. LV dyssynchrony and assessment by echocardiography
Techniques for measuring interventricular and intraventricular dyssynchrony for predicting response to cardiac resynchronisation treatment
Tissue Doppler quantitation of intraventricular dyssynchrony and their limitations
Techniques for optimising settings of the cardiac resynchronisation device after implantation

20. Stress Echocardiography
Indications and basic knowledge of techniques for exercise, Dobutamine or vasodilator stress echocardiography

Contents

Exercise or pharmacological stress echocardiography for diagnosis of ischaemic heart disease and myocardial viability

The concept of viable and hibernating myocardium, and the relevance of the various responses of the myocardium to stress

The concept of contractile reserve
The American Society of Echocardiography regional wall motion scoring system
Dobutamine stress echo in 'low flow' aortic stenosis
Exercise stress echo in valvular heart disease and pulmonary hypertension

21. Myocardial Infarction and its sequelae
2D, 3D, M-mode and Doppler features of: post-infarction VSD
Mitral papillary muscle rupture
Cardiac tamponade
Mural thrombus
Myocardial scarring
Dressler's syndrome
Left ventricular aneurysm – true aneurysm vs. pseudoaneurysm
Main features of stress-induced (Takotsubo) cardiomyopathy as differential diagnosis of acute myocardial infarction

22. Pulmonary Hypertension (PH) and functional assessment of RV
2-D, M-mode and Doppler features of pulmonary hypertension
Aetiologies:
primary pulmonary hypertension
post pulmonary embolism
secondary to left-sided lesions
lung disease
Assessment of global systolic function of the RV: Tricuspid annular peak systolic excursion by M- mode (TAPSE), fractional area change of the RV, tissue Doppler of the RV
Right ventricular dysfunction in pulmonary embolism, chronic pulmonary diseases, cardiomyopathy, Eisenmenger's syndrome, and systemic right ventricle

23. Diseases of the Aorta
Technique for examining the ascending and descending thoracic aorta
Echocardiographic features of the normal aortic root, sinuses of Valsalva,   ascending aorta and aortic arch
2-D, M-mode and Doppler features of:
Marfan syndrome
sinus of Valsalva aneurysm
thoracic aortic aneurysm
aortic dissection
additional features related to aortic dissection:
aortic cusp prolapse
aortic regurgitation
fluid in pericardium
Role of transoesophageal echocardiography in the diagnosis of aortic dissection
Assessment of aortic root for patients undergoing transcutaneous aortic valve replacement

24. Adult Congenital Heart Disease

Contents

Anatomy, pathophysiology and natural history of common congenital lesions present in adults
2-D, M-mode and Doppler features of the following, pre-operatively and post-operatively, as seen in the older child or adult.
Ostium Secundum Atrial septal defects
Perimembranous and muscular ventricular septal defects
Partial and complete atrio-ventricular septal defect
Persistent ductus arteriosus
Bicuspid aortic valve and associated aortopathy
Sub-and supra-valve aortic stenosis
Aortic coarctation
Pulmonary stenosis
Ebstein's anomaly
Tetralogy of Fallot
D-typeTransposition of the great arteries and congenitally corrected transposition
Role of contrast echocardiography in evaluating shunts in adults
Calculation of shunts
Role of TOE in adult congenital heart disease intervention

25. Likely echocardiographic findings for common clinical presentations:
Heart failure or breathlessness
Arrhythmia
Ejection systolic murmur
Hypertension
Collagen abnormalities (including systemic sclerosis)
Renal failure
Stroke

26. Emergency and ICU TOE

25.1 General
Constrained environment (multiple arterial/venous lines, ventilator, lighting issues etc.)

25.2 The hypotensive/shocked patient and post cardiac arrest
Role of focused peri-arrest study and appreciation of limited echo windows
Evaluation of LV (systolic and diastolic) and RV function.
Exclusion of severe valve disease (e.g. severe AS, endocarditis) and acute aortic dissection
Assessment for pericardial effusion and cardiac tamponade, hypovolaemia and underfilling, and high output cardiac failure
Septic shock – assess for LV systolic/diastolic dysfunction
Value of repeated echo studies to assess any deterioration/improvement in underlying state

25.3 Suspected acute pulmonary embolus
Echocardiographic evaluation of RV size and function, tricuspid regurgitation and pulmonary artery systolic pressure assessment, IVC size and respiratory variation, thrombus presence in IVC/RA

25.4 Blunt and penetrating cardiac trauma
Typical echocardiographic features including pericardial effusion, right and left ventricular contusion, acute valve lesions, aortic dilation and dissection/transection, VSD, pleural effusion

25.5 TOE in the ventilated patient

Awareness of echocardiographic findings in the presence of mechanical ventilation.
Value of echo in difficult to wean patients
Role in differentiating hydrostatic and inflammatory causes of pulmonary oedema

Assessment in persistent hypoxaemia despite pulmonary recruitment strategies (e.g. exclude PFO, proximal pulmonary embolus)
Acute arrhythmias such as fast AF (assessment for chamber abnormalities, valve disease, LV impairment, pericardial effusion)
Cardiac source of embolus – CVA/peripheral embolic event in ventilated patients thrombus, endocarditis, myxoma)
Value of TOE in ventilated patients (if poor transthoracic echo window)

25.6 Post surgery patient

Appreciation of effects of general anaesthesia and cardio-pulmonary bypass on LV function
Assessment of post-surgical haemodynamic compromise/ acute deterioration e.g. cardiac surgery (tamponade, wall motion abnormalities, valvular dysfunction), general surgery (air/fat embolism, venous thromboembolism, acute MI, volume overload)

25.7 Assessment of filling status

Awareness of the role of TOE in assessing filling using left and right ventricular systolic and diastolic function, IVC, limitations of SVC and hepatic vein size and reactivity, atrial septal motion, chamber sizes and variation in Doppler velocities.
Role of repeated echo studies in assessing effects of fluid challenge and inotropes

26. Additional topics

The level of knowledge expected is that of a competent echocardiographer performing transesophageal echocardiographic studies and sustaining knowledge through the BSE and other educational resources, including issues relevant to clinical scanning and practice raised in the BSE Newsletter.

Appendix 3 Written Examination: Example Theory Questions

There will be 50 Single Best Answer MCQs covering the syllabus.
Each MCQ comprises of a main stem followed by 5 options relating to the stem. The single best answer should be chosen.
The Theory examination will be marked +1 for correct answers, 0 for incorrect or unanswered questions (no negative marking)

	Question	Answer
1	**When considering possible mitral valve repair there is no need to assess**	
a.	the mechanism of the mitral regurgitation	
b.	left atrial size	
c.	mitral to tricuspid annular ratio	T
d.	anterior mitral valve leaflet length	
e.	the presence of annular calcification	
2	**Doppler methods to quantify flow in clinical practice assume that**	
a.	cross-sectional flow profiles are parabolic	
b.	turbulent flow profiles are being sampled	
c.	the intercept angle with flow is 15°	
d.	transmit power is kept constant	
e.	flow velocity and cross-sectional area are measured at the same point	T
3	**Left ventricular regional wall motion abnormalities resulting from occlusion of the circumflex coronary artery may commonly be seen in the following left ventricular segments**	
a.	mid anteroseptal	
b.	basal inferolateral	T
c.	apical inferior	
d.	basal inferoseptal	
e.	apical anterior	

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Appendix 4 - Written Examination: Example Echo Reporting section

This will consist of 50 Single Best Answer MCQs based on the video/still image. They reflect the range of clinical material seen in routine echocardiographic practice.
Each MCQ comprises of a main stem followed by 5 options relating to the stem. The single best answer should be chosen.

The Echo Reporting examination will be marked +1 for correct answers, 0 for incorrect or unanswered questions (no negative marking).

	Question	A
1	**The arrow indicates**	
a.	**Anterior mitral valve leaflet**	
b.	**Posterior mitral valve leaflet**	T
c.	**Coronary sinus**	
d.	**Mitral valve annulus**	
e.	**Zone of coaptation**	

Appendix 5: PearsonVUE – Guidance Notes

BSE written exams are delivered in partnership with Pearson VUE. Candidates will be able to sit the exam at local centres throughout the UK, Republic of Ireland and in South Africa.

Pre-Registration (through BSE website)

- Candidates must register their interest to sit the written exam by completing an online pre-registration form via accreditation section of www.bsecho.org. The pre-registration window is open for up to four weeks.
- Candidates registered names should appear the same as per their photo identification. Pearson Vue follow a strict admission policy.
- BSE will transfer your data and requirements to Pearson VUE who will contact all pre-registered candidates with further information on confirming placements for the exam.

Special accommodations

- Pearson Vue can provide special accommodations to candidates who have official requirements, such as extra time, a reader, or the need of medication during the examination.
- Further information on accommodations is available on the website.
- All requests must be put in writing with supporting documents to support claims for special accommodations. Requests will be approved at the discretion of the BSE. Forward such requests to accreditation@bsecho.org.

Registration (through Pearson Vue)

- All registration and payments will be managed by Pearson VUE after the stage of pre-registration.
- Candidates with special requirements or conditions should notify the BSE during the pre-registration stage.
- Cancellations made less than 7 days do not qualify for a refund. All cancellations must be processed through Pearson Vue.

On the day of the exam

- Instructions will be given on the day of the exam via a video tutorial at the test centre. Candidates will complete the exam on a computer at the test centre.
- A basic calculator is already built into the online exam. An erasable sheet will be given to candidates by the examining centre.
- Candidates are required to bring a photo ID that reflects on the registration as booked.
- Candidates are not required to bring any stationery to the exam.
- Any last-minute requests of special accommodations will not be facilitated by the test centre.

Contents

Results

- Results are released 5-6 weeks after sitting the exam. Scores will be uploaded to BSE personal profiles. Both sections must be passed in order to achieve a complete pass grade.
- **Pass:** candidates will be issued with login details to the portal to begin uploading cases. The submission deadline will appear at the 'Practical submission deadline' in member profile.
- **Fail:** candidates can register interest to sit the next sitting of the exam.
- Reduced fee only applies to candidates who physically sat the exam and were unsuccessful, the next attempt must be taken at the next sitting (within 12 months).
- Results cannot be appealed or 'remarked' as the tests are computer based.

Part 1 Echo Reporting section

Time: The Echo Reporting section section will last **90 minutes.**
Format: The section will consist of 50 Single Best Answer MCQs each with 5 stems relating to it.
Maximum marks 50
Marking: There will be NO negative marking for this paper – each correct answer will receive a score of 1.
Incorrect or unanswered questions/stems will receive a score of 0.

Part 2 Theory section

Time: The theory section will last **60 minutes.**
Format: The section will consist of 50 Single Best Answer MCQs each with 5 stems relating to it.
Maximum marks 50
Marking: There will be NO negative marking for this paper – each correct answer will receive a score of 1.
Incorrect or unanswered questions/stems will receive a score of 0.

Please watch the demo available via Pearson VUE; http://www.pearsonvue.com/demo/

Appendix 6 - Curriculum Based Competency Assessment Tool

MENTOR TO COMPLETE DURING THE TRAINING PERIOD VIA THE ONLINE LOGBOOK PORTAL

How to use this document:

- You should keep it with you throughout your training period
- At each hospital, you must have a mentor who should be a senior and experienced echocardiographer.
- Your mentor should initial and date each entry once he or she is satisfied that you are competent to
- perform and report it unsupervised. This competency checklist should be submitted with your logbook.
- The theory component will be self-taught.
- Your department should have suitable text-books.

1. BASIC ECHOCARDIOGRAPHY
Knowledge
Basic principles of ultrasound
Basic principles of spectral Doppler
Basic principles of colour flow Doppler
Basic instrumentation
Ethics and sensitivities of patient care
Basic anatomy of the heart
Basic echocardiographic scan planes: midoesophageal, upper oesophageal and transgastric views
Indications for transthoracic and transoesophageal echocardiography
Normal variants and artefacts
Practical competencies Initials, name and date
Interacts appropriately with patients
Understands basic instrumentation
Cares for machine appropriately
Can obtain standard views
Can optimise gain setting, sector width, depth, harmonics, focus,
sweep speed, Doppler baseline and scale, colour gain
Can obtain standard measurements using 2D or M-mode
Can recognise normal variants: Eustachian valve, Chiari network etc
Can use Colour Flow Doppler for all valves optimising gain and box-size
Can obtain pulsed wave Doppler at;
left ventricular inflow (mitral valve)
left ventricular outflow tract (LVOT)
right ventricular inflow (tricuspid valve)

right ventricular outflow tract, pulmonary valve & main pulmonary artery

2. LEFT VENTRICLE
Knowledge
Coronary anatomy and correlation with 2D views of left ventricle.
Segmentation of the left ventricle (16 and 17 segment models)
Wall motion
Measurements of global systolic function. (LVOT VTI, stroke volume, fractional shortening, ejection fraction using Simpson's rule)
Doppler mitral valve filling patterns & normal range
Appearance of complications after myocardial infarction
Ventricular septal and papillary muscle rupture
Ischaemic mitral regurgitation
Features of dilated and hypertrophic cardiomyopathy
Common differential diagnosis
Athletic heart, hypertensive disease
Practical competencies   Initials, name and date
Can differentiate normal from abnormal LV systolic function
Can recognise large wall motion abnormalities
Can describe wall motion abnormalities and myocardial segments
Can obtain basic measures of systolic function VTI, FS, LVEF
Understands & can differentiate diastolic filling patterns
Can detect and recognise complications after myocardial infarction
Understands causes of a hypokinetic left ventricle
Can recognise features associated with hypertrophic cardiomyopathy
Can recognise hypertensive heart disease

3. MITRAL VALVE DISEASE
Knowledge
Normal anatomy of the mitral valve, and the subvalvar apparatus and their relationship with LV function
Causes of mitral stenosis and regurgitation
Ischaemic, functional, prolapse, rheumatic, endocarditis
Practical competencies Initials, name and date
Can recognise rheumatic disease
Can recognise mitral prolapse
Can recognise functional mitral regurgitation
Can assess mitral stenosis
2D planimetry, pressure half-time, gradient
Can assess severity of regurgitation, chamber size, signal density, proximal flow acceleration & vena contracta

4. AORTIC VALVE DISEASE and AORTA
Knowledge
Causes of aortic valve disease

Causes of aortic disease
Methods of assessment of aortic stenosis and regurgitation
Basic criteria for surgery to understand reasons for making measurements

Practical competencies	Initials, name and date
Can recognise bicuspid, rheumatic, and degenerative disease	

Can recognise a significantly stenotic aortic valve
Can derive peak & mean gradients using continuous wave Doppler
Can measure valve area using the continuity equation
Can recognise severe aortic regurgitation
Can recognise dilatation of the ascending aorta
Knows the echocardiographic signs of dissection

5. RIGHT HEART
Knowledge
Causes of tricuspid and pulmonary valve disease
Causes of right ventricular dysfunction
Causes of pulmonary hypertension
The imaging features of pulmonary hypertension
The estimation of pulmonary pressures
Practical competencies Initials, name and date
Recognises right ventricular dilatation
Can estimate PA systolic pressure
Can estimate right atrial pressure from the appearance of the IVC

6. REPLACEMENT HEART VALVES Knowledge
Types of valve replacement
Criteria of normality
Signs of failure

Practical competencies	Initials, name and date
Can recognise broad types of replacement valve	

Can recognise paraprosthetic regurgitation
Can recognise prosthetic obstruction

7. INFECTIVE ENDOCARDITIS Knowledge
Duke criteria for diagnosing endocarditis Echocardiographic features of endocarditis Criteria for TOE

Practical competencies	Initials, name and date
Can recognise typical vegetations	

Can recognise an abscess
Can recognise complications just on valve regurgitation

8. INTRACARDIAC MASSES Knowledge
Types of mass found in the heart Features of a mxyoma Differentiation of atrial mass Normal variants and artifacts

Practical competencies	Initials, name and date

Can recognise a LA myxoma
Can differentiate LV thrombus and trabeculation

9. PERICARDIAL DISEASE Knowledge

Features of tamponade
RV collapse, effect on IVC, A-V valve flow velocities and respiratory variation. Features of pericardial constriction
Differentiation of pericardial constriction from restrictive myopathy

Practical competencies	Initials, name and date

Can differentiate a pleural and pericardial effusion
Can recognise the features of tamponade Can judge the route for pericardiocentesis Can recognise restrictive physiology

10. ADULT CONGENITAL HEART DISEASE Knowledge

Anatomy and echo features of basic congenital disease:

ASD, VSD, partial & complete atrio-ventricular defects
Patent ductus arteriosus
Sub and supravalvar aortic stenosis
Sub valvar, valvar and supra-valvar pulmonary stenosis
Ebstein's anomaly Fallot's tetralogy Role of contrast Shunt calculation
Estimation of pulmonary artery pressure

Practical competencies	Initials, name and date

Can recognise a secundum ASD and identify pulmonary veins
Can calculate a shunt

Mentor

Name _

Signature_____

Date: -

Appendix 7 -Suggested format for a report

This is a basic framework for a report; Appendix 1 includes further details for candidates to look through. Guidelines are also available on the BSE website. Please see "A minimum dataset for a standard transoesophageal echocardiogram: a guideline protocol from the British Society of Echocardiography" at www.bsecho.org.

A report should have a section for objective M-mode or 2D dimensions and Doppler measurements. There should be a section for describing observations and a short conclusion.

Measurements - Measurements of intracardiac dimensions can be useful in monitoring disease progression. These can be made using M-mode or 2D and must be interpreted in the light of the size and sex of the patient. Many pragmatic normal ranges are outdated and modern data based on large populations include upper dimensions previously regarded as abnormal. Doppler measurements should be listed (see normal valves chart on BSE Website).

Text - This should include a description of observations made in a logical order. The order will vary for the operator and the study. The most important feature might be described first. Alternatively each anatomical region might be discussed in turn. Interpretation should not be a part of this section and even minor abnormalities are best described. These can be put into context in the conclusion. It is usually not advisable to describe each modality in turn or to describe findings at each window as is sometimes done. This is confusing since small differences can emerge between different windows or repetitions occur. It is better to integrate all windows and all modalities. Normal findings should also be stated and if a region could not be imaged this should also be admitted. This gives the reader the confidence that a systematic study has been undertaken rather than a study focused on only a region of interest.

Conclusion - This should summarize the whole study and be easily understood by a non-echocardiographer. It should identify any abnormality, its cause and any secondary effect. No interpretation should be offered that is not derived from the recorded study, and no medical advice should normally be given.

Appendix 8 – Report Format

THIS IS A SUGGESTED FORMAT FOR A REPORT WITHIN THE WORKPLACE. PLEASE NOTE – ALL REPORTS SUBMITTED IN THE LOGBOOK AND ACCOMPANYING THE CASES <u>MUST</u> BE ANONYMISED AS PER <u>APPENDIX 14</u>

The report should comprise the following sections:

Demographic and other Identifying Information
Obligatory information
Patient's name
Medical record number, NHS number or other unique identifier
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 Medications
Videotape or disk number/identifier

Echocardiographic study
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) – recommended measurements and calculations are included in Appendix 2 of this document (also, please refer to BSE Minimum Dataset)
Diagnostic statements: phrases that add echocardiographic interpretation to descriptive terms (e.g. appearance of rheumatic mitral valve disease, suitable for commissurotomy)

Summary
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.

Appendix 9 –Transesophageal echocardiographic Proficiency: Summary Sheet

- Use this for reference, the digital version is on the logbook portal.
- Only one diagnosis can be assigned to each study.
- Summarise the primary diagnosis assigned to each case in your Logbook. (Note the target guidelines for case mix)

Total cases needed 125 cases
75 with TTE exam   193-222-190

At least one example of:	No of cases
Mitral valve repair	
Mitral valve regurgitation (severe)	
Endocarditis	
Basic adult congenital heart disease (e.g. ASD, VSD, pulmonary stenosis)	
Aortic pathology (e.g. dissection, aneurysm, intramural haematoma)	
Abnormal aortic valve	
Hypovolaemic / 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	
Total	

Appendix 10 – Example of Station 1 Assessment forms to be used at the Practical Assessment

STATION 1: Written Logbook (1/2 hour)

Date	
Candidate ID	
Assessor ID	
Assessor ID	

Number of Cases: 75 with TTE, otherwise 125 cases	
Proof of TTE accreditation	
At least one example of:	
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	
Hypovolaemic / 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	

Checklist	Yes	No	Comments
Logbook submitted via online logbook portal			Major breach
All cases collected within 24 month period including written exam			Automatic fail without extension being given (Proof of extension available)
75 or 125 cases performed and reported by the candidate			Automatic fail if less than required number
All cases anonymised fully			Automatic fail/minor breach (Automatic fail if > 5 cases. Minor breach if < 5 cases)
Correct case mix (see above)			Automatic fail if missing common conditions, minor fail for rarities
All reports with full name and e-signature			Automatic fail if no name or signature on majority. Minor if no signature.
Summary sheet present			Minor breach
Supervisor / mentor statement present			Automatic fail
Final check list present			Minor breach

Comments

STATION 1: Written Logbook (1/2 hour) Logbook cases assessment

Comments
- No conclusion = automatic fail.
- More than two No's = fail for that case.
- 2/6 (30%) Percent of cases failed = Fail of logbook
- Complete as many as possible in time allowed
- Fill in log sheet using pass/fail criteria.

Parameters	1	2	3	4	5	6
Indication for echo (Y/N)						
2D /M-Mode measurements present (Y/N)						
Appropriate Doppler measurements/ calculations present (Y/N)						
Do measurements / Doppler Calculations match descriptions? (Y/N)						
All parts of heart described (Y/N)						
Descriptions complete (Y/N)						
Appropriate to request (Y/N)						
Conclusion (Y/N) No conclusion = automatic fail						
Pass or fail (P/F)						

Comments

Unsuccessful candidates will be informed by Assessor after discussion with Senior Assessor

Appendix 11 – Example of Station 2 Assessment forms to be used at the Practical Assessment

STATION 2: Viva echo cases (1/2 hour)

Date	
Candidate ID	
Assessor ID	
Assessor ID	

Comments
- Candidates will bring their video cases and hopefully their own PC into the room.
- Assess at least 2 cases (if possible 3)
- Assess aortic and mitral pathology.
- Mark the video case according to the mark sheet.
- Ask the candidate questions, if need be, to clarify any issues.
- It is permissible to pass the competencies if the candidate can convince you they understand and generally perform appropriate views and measurements.
- Assess each section and tick the boxes on sheet.
- Add feedback comments if necessary.
- If both cases satisfactory, candidate will pass the station.
- If borderline, assess a third case

5 cases (1 normal, 1 aortic stenosis) to be present	Y/N
Normal – Has to be present	
Stenosis – Has to be present	
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	
Hypovolaemic / septic shock assessment	
Abnormal prosthetic valve	
Intracardiac mass including thrombus	
Pericardial effusion	
Left ventricular wall motion abnormality	
Pulmonary embolism assessment / right heart dilatation	
Total 5?	Y/N

Comments

Unsuccessful candidates will be informed by Assessor after discussion with Senior Assessor

STATION 2 : Viva echo cases (1/2 hour total) **Case 1: Aortic valve/stenosis pathology**

Practice must be satisfactory in all areas to pass			
Evidence of satisfactory practice	Tick	Evidence of unsatisfactory practice	Tick
ECG Largely present throughout without 2D image interference		ECG Unstable or frequently absent making timings inaccurate	
Optimisation Infrequent, non-repetitive optimisation errors which do not detract from the case conclusion		Optimisation Frequent, repetitive optimisation errors which detract from the case conclusion	
Complete study Images are complete enough to allow full assessment of the selected pathology, including Doppler study and measurements.		Incomplete study Images are missing which are relevant to the accurate assessment of the selected pathology, including inadequate Doppler study or relevant measurements quoted in report but not demonstrated.	
2D measurements/M-mode Accurate throughout with minor errors only		2D measurements/M-mode Frequent inaccuracies or isolated inaccuracies that change the categorisation of the chosen pathology	
Colour Doppler Accurate box size, gain, scale and baseline settings demonstrating anatomy clearly		Colour Doppler Frequent inaccuracies of box size, gain, scale and baseline settings which prevent clear demonstration of the anatomy	
Spectral Doppler Accurate use with good cursor alignment and optimised waveforms		Spectral Doppler Inaccurate use with poor cursor alignment or waveform optimisation altering pathology assessment	
Pathology assessment Good quality CWD. No images missing which are key to pathology assessment No measurements significantly inaccurate that are key to pathology assessment (LVOT diameter, LVOT $_{VTI}$ and AV $_{VTI}$)		Pathology assessment Missing, poor quality CWD signal. Images missing which are key to pathology assessment. Measurements key to pathology assessment significantly inaccurate and change the categorisation of the pathology (LVOT diameter, LVOT $_{VTI}$ and AV $_{VTI}$)	
Report is complete and accurate Comprehensive and accurate description of all parts of the heart. Correct categorisation of chosen pathology (NB trivial abnormalities may be included in this case) Correct interpretation of findings in the clinical context.		Report is incomplete or inaccurate Partial and inaccurate description of parts of the heart Incorrect categorisation of chosen pathology Incorrect interpretation of findings in the clinical context	
Comments			

STATION 2 : Viva echo cases (1/2 hour total) **CASE 2: Regurgitant pathology**

Practice must be satisfactory in all areas to pass			
Evidence of satisfactory practice	Tick	Evidence of unsatisfactory practice	Tick
ECG Largely present throughout without 2D image interference		ECG Unstable or frequently absent making timings inaccurate	
Optimisation Infrequent, non-repetitive optimisation errors which do not detract from the case conclusion		Optimisation Frequent, repetitive optimisation errors which detract from the case conclusion	
Complete study Images are complete enough to allow full assessment of the selected pathology, including Doppler study and measurements.		Incomplete study Images are missing which are relevant to the accurate assessment of the selected pathology, including inadequate Doppler study or relevant measurements quoted	
2D measurements/M-mode Accurate throughout with minor errors only		2D measurements/M-mode Frequent inaccuracies or isolated inaccuracies that change the categorisation of the chosen pathology	
Colour Doppler Accurate box size, gain, scale and baseline settings demonstrating anatomy clearly		Colour Doppler Frequent inaccuracies of box size, gain, scale and baseline settings which prevent clear demonstration of the anatomy	
Spectral Doppler Accurate use with good cursor alignment and optimised waveforms		Spectral Doppler Inaccurate use with poor cursor alignment or waveform optimisation altering pathology assessment	
Pathology assessment Good assessment of regurgitation. Understanding of the methods available to assess severity and accurate demonstration if appropriate (eg PISA/Vena contracta/PV flow). No images missing which are crucial to pathology assessment. No measurements significantly inaccurate that are crucial to pathology assessment.		Pathology assessment Poor or inadequate assessment of severity. Failure to return Doppler baseline to normal after PISA assessment. Images missing which are crucial to pathology assessment. Measurements key to pathology assessment significantly inaccurate and change the categorisation of the pathology.	
Report is complete and accurate Comprehensive and accurate description of all parts of the heart. Correct categorisation of chosen pathology (NB trivial abnormalities may be included in this case) Correct interpretation of findings in the clinical context.		Report is incomplete or inaccurate Partial and inaccurate description of parts of the heart Incorrect categorisation of chosen pathology Incorrect interpretation of findings in the clinical context	
Comments			

STATION 2 : Viva echo cases (1/2 hour total) **CASE 3: RWMA Pathology**

Practice must be satisfactory in all areas to pass			
Evidence of satisfactory practice	Tick	Evidence of unsatisfactory practice	Tick
ECG Largely present throughout without 2D image interference		ECG Unstable or frequently absent making timings inaccurate	
Optimisation Infrequent, non-repetitive optimisation errors which do not detract from the case conclusion		Optimisation Frequent, repetitive optimisation errors which detract from the case conclusion	
Complete study Images are complete enough to allow full assessment of the selected pathology, including Doppler study and measurements.		Incomplete study Images are missing which are relevant to the accurate assessment of the selected pathology, including inadequate Doppler study or relevant measurements quoted in report but not	
2D measurements/M-mode Accurate throughout with minor errors only		2D measurements/M-mode Frequent inaccuracies or isolated inaccuracies that change the categorisation of the chosen pathology	
Colour Doppler Accurate box size, gain, scale and baseline settings demonstrating anatomy clearly		Colour Doppler Frequent inaccuracies of box size, gain, scale and baseline settings which prevent clear demonstration of the anatomy	
Spectral Doppler Accurate use with good cursor alignment and optimised waveforms		Spectral Doppler Inaccurate use with poor cursor alignment or waveform optimisation altering pathology assessment	
Pathology assessment Appropriate measurement of Simpson's method, M-mode showing systolic and diastolic measurements in both 4C & 2C view. Correlates with visual impression and other methods. No images missing which are crucial to pathology assessment. No measurements significantly inaccurate which are crucial to pathology assessment.		Pathology assessment Incomplete assessment of Simpson's/M- mode or measured inaccurately and changes the categorisation of the reported EF. Images missing which are crucial to pathology assessment. Measurements crucial to pathology assessment significantly inaccurate and change the categorisation of the pathology.	
Report is complete and accurate Comprehensive and accurate description of all parts of the heart. Correct categorisation of chosen pathology (NB trivial abnormalities may be included in this case) Correct interpretation of findings in the clinical context.		Report is incomplete or inaccurate Partial and inaccurate description of parts of the heart Incorrect categorisation of chosen pathology Incorrect interpretation of findings in the clinical context	
Comments			

STATION 2 : Viva echo cases (1/2 hour total) **CASE 4: Other Pathology**

Practice must be satisfactory in all areas to pass			
Evidence of satisfactory practice	Tick	Evidence of unsatisfactory practice	Tick
ECG Largely present throughout without 2D image interference		ECG Unstable or frequently absent making timings inaccurate	
Optimisation Infrequent, non-repetitive optimisation errors which do not detract from the case conclusion		Optimisation Frequent, repetitive optimisation errors which detract from the case conclusion	
Complete study Images are complete enough to allow full assessment of the selected pathology, including Doppler study and measurements.		Incomplete study Images are missing which are relevant to the accurate assessment of the selected pathology, including inadequate Doppler study or relevant measurements quoted	
2D measurements/M-mode Accurate throughout with minor errors only		2D measurements/M-mode Frequent inaccuracies or isolated inaccuracies that change the categorisation of the chosen pathology	
Colour Doppler Accurate box size, gain, scale and baseline settings demonstrating anatomy clearly		Colour Doppler Frequent inaccuracies of box size, gain, scale and baseline settings which prevent clear demonstration of the anatomy	
Spectral Doppler Accurate use with good cursor alignment and optimised waveforms		Spectral Doppler Inaccurate use with poor cursor alignment or waveform optimisation altering pathology assessment	
Pathology assessment Appropriate measurement of Simpson's method, M-mode showing systolic and diastolic measurements in both 4C & 2C view. Correlates with visual impression and other methods. No images missing which are crucial to pathology assessment. No measurements significantly inaccurate which are crucial to pathology assessment.		Pathology assessment Incomplete assessment of Simpson's/M-mode or measured inaccurately and changes the categorisation of the reported EF. Images missing which are crucial to pathology assessment. Measurements key to pathology assessment significantly inaccurate and change the categorisation of the pathology.	
Report is complete and accurate Comprehensive and accurate description of all parts of the heart. Correct categorisation of chosen pathology (NB trivial abnormalities may be included in this case) Correct interpretation of findings in the clinical context.		Report is incomplete or inaccurate Partial and inaccurate description of parts of the heart Incorrect categorisation of chosen pathology Incorrect interpretation of findings in the clinical context	
Comments			

STATION 2 : Viva echo cases (1/2 hour total) **CASE 5: Normal Pathology**

Practice must be satisfactory in all areas to pass			
Evidence of satisfactory practice	Tick	Evidence of unsatisfactory practice	Tick
ECG Largely present throughout without 2D image interference		ECG Unstable or frequently absent making timings inaccurate	
Optimisation Infrequent, non-repetitive optimisation errors which do not detract from the case conclusion		Optimisation Frequent, repetitive optimisation errors which detract from the case conclusion	
Complete study Images are complete enough to allow full assessment of the selected pathology, including Doppler study and measurements.		Incomplete study Images are missing which are relevant to the accurate assessment of the selected pathology, including inadequate Doppler study or relevant measurements quoted in report but not demonstrated.	
2D measurements/M-mode Accurate throughout with minor errors only		2D measurements/M-mode Frequent inaccuracies or isolated inaccuracies that change the categorisation of the chosen pathology	
Colour Doppler Accurate box size, gain, scale and baseline settings demonstrating anatomy clearly		Colour Doppler Frequent inaccuracies of box size, gain, scale and baseline settings which prevent clear demonstration of the anatomy	
Spectral Doppler Accurate use with good cursor alignment and optimised waveforms		Spectral Doppler Inaccurate use with poor cursor alignment or waveform optimisation altering pathology assessment	
LV assessment Good quality M-mode of the LV and Ao/LA. No crucial images missing. No measurements significantly inaccurate.		LV assessment Poor quality or missing M-mode of the LV and Ao/LA. Images missing which are crucial to assessment. Measurements crucial to assessment significantly inaccurate.	
Report is complete and accurate Comprehensive and accurate description of all parts of the heart. Correct categorisation of chosen pathology (NB trivial abnormalities may be included in this case) Correct interpretation of findings in the clinical context.		Report is incomplete or inaccurate Partial and inaccurate description of parts of the heart Incorrect categorisation of chosen pathology Incorrect interpretation of findings in the clinical context	
Comments			

STATION 3: Image acquisition skills (1/2 hour)

Date	
Candidate ID	
Assessor ID	

This station tests the haptic knowledge and image acquisition skills of the candidate. Any shortcomings identified in the previous stations should be probed.

The simulator can be loaded will different pathologies.

The candidate will be asked to acquire a good quality image of a particular view. NB no blind spot between upper oesophageal and mid oesophageal views. Not all views may be possible in available time. Image acquisition should take no more than 20 mins. (10 images at 2 mins each).

If there are concerns with any of the images assessors should question the candidate - if they can demonstrate appropriate knowledge/competence when questioned this may be sufficient. Candidates should not fail as a result of one poor image.
Pass mark = 80% of acquired images are of good quality.
Constructive feedback can be provided by the senior assessor in a separate room to enable direct comparison of candidate's image acquisition and the expected standards.

Unsuccessful candidates will be informed by the assessor after discussion with the senior assessor has taken place.

Spend 1-2 minutes on each acquisition	Image	Satisfactory	
		Yes	No
1.	2D MO 4 Chamber view		
2.	2D MO 5 Chamber view		
3.	2D MO mitral commissural view		
4.	2D MO 2 Chamber view		
5.	2D MO LAX view		
6.	2D MO AV SAX view		
7.	2D MO AV LAX view		
8.	2D MO LA appendage view		
9.	2D MO R/L Upper/lower pulm. veins		
10.	2D RV inflow/outflow view		
11.	MO Bicaval view		
12.	MO modified bicaval view		
13.	2D TG Basal SAX view		
14.	2D TG Mid Papillary view		
15.	2D TG 2 Chamber view		
16.	2D TG LAX with CWD across aortic valve		
17.	2D TG RV inflow view		
18.	2D Deep TG view		
19.	Desc Aorta SAX view		
20.	Desc Aorta LAX view		
21.	UO Aortic arch LAX view		
22.	UO Aortic arch SAX view		
23.	MO Asc Aorta LAX view		
24.	MO Asc Aorta SAX view		

Assessment Score:
Please circle the most appropriate score:

Body Position					
1 Looks awkward and uncomfortable.	2	3 Occasional awkward movement.	4	5 Appears at ease and moves comfortably.	

Probe Handling					
1 Has difficulty moving the probe using excess force. Jerky.	2	3 Occasional difficulty or forceful use of probe.	4	5 Adjusts and moves the probe with ease. Smooth.	

Recognition of anatomy					
1 Does not seem to be able to recognise obvious structures.	2	3 Some difficulty recognising structures.	4	5 Appears to recognise the anatomy without difficulty	

Recognition of view					
1 Excess thinking time before attempting to find next view.	2	3 Some thinking time between moving on to find next view	4	5 Very little thinking time between each view.	

Economy of movement					
1 Repetitve movements and non-purposeful movements.	2	3 Occasionally repetitions and non-purposeful movement.	4	5 No repetitive moves and purposeful movements.	

Safety of movement					
1 Moves probe in oesophagus while tip in extremes of flexion; locks probe tip	2	3 Maintains some degree of probe tip flexion while moving probe in oesophagus	4	5 Releases all flexion while moving probe in oesophagus	

Overall observed score					
1 Appeared at beginner level.	2	3 Appeared to have had some experience with TOE.	4	5 Appeared a skilled user.	

Appendix 13 – Mentor statement to accompany the Practical Assessment

- Use this for reference only, mentors must complete the online version available on the logbook portal. Head of echo will receive an email to validate candidate logbook.

Candidate's name _____

	Initial
I certify that the candidate has undergone a programme of training in echocardiography	
I certify I have observed the candidate scanning and I am satisfied that he/she is competent at completing a full transthoracic echo study.	
I certify that the candidate has reached a standard of training to be able to independently perform and report a transthoracic echocardiographic study. He/she has reached all of the mandated competencies. I have signed off the candidate's competency sheet.	
I certify that the candidate above has **performed** and **reported** the cases included in the accompanying Log Book within a 24-month period.	
I certify that all cases are fully anonymised (no patient's personal details such as names, full date of births or addresses) as per Appendix 14	
I certify that all cases are signed with name printed of the candidate	
I certify that these cases are being handed in as per Trust Policy Guidelines	

Mentor's name: _____

Signature: _____ Date: _____

Head of Echo Validation: this section will be sent as an email to the Head of Echo when the email address is entered in the portal by the candidate

I am satisfied that the candidate above has performed and reported the cases included in the accompanying Log Book within a 24-month period and five cases are also enclosed.

Medical/Technical Head of Echocardiography's name:

Signature: _____ Date: _____

Notes: The Head of Echocardiography is usually the lead clinician or consultant cardiologist with overall responsibility for echocardiography. This may be a representative from a local Cardiology department who has personally observed the candidate scanning and is satisfied that they have the ability to perform and report echoes independently.

Appendix 14 – BSE Policy on the Non-anonymisation of Patient Data

Introduction

The duty of confidentiality arises out of the common law of confidentiality, professional obligations and also staff employment contracts. Breach of confidence may lead to disciplinary measures, bring into question professional reputation and possibly result in legal proceedings. Guidance is provided to NHS staff in the 'NHS Code of Practice on Confidentiality' (November 2003). http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/d h_4069254.pdf

Patient information that can identify individual patients is confidential and must not be used or disclosed. In contrast, anonymised information is not confidential and may be used.

Key identifiable information includes: Patient's name, address, full post code, date of birth, NHS number and local identifiable codes or anything else that may be used to identify a patient directly or indirectly. For example, rare diseases, drug treatment or statistical analyses which have very small numbers within a small population may allow individuals to be identified.

Anonymisation requires the removal of such patient-identifiable information from all reports and images submitted for the practical part of the Accreditation process.

For accreditation purposes, BSE Administrators and BSE Markers must not be able to identify the patient from see any of the identifiers listed above.

Speakers presenting on behalf of the BSE at meetings and speakers on courses/meetings awarded BSE re-accreditation points must ensure that all presentation material is anonymised.

As age is relevant to the assessment either the age or year of birth must be provided however a full date of birth must not be shown.

Reports
Use the online logbook portal to block out data.

Cases
In order for cases to be classed as anonymous BSE Administrators and BSE Markers must not be able to gain personal information about the patient that is not directly relevant to the echocardiogram. This means that name, address, NHS/Hospital number and full date of birth must not be visible on the report that is enclosed with the images nor on the images themselves. If the age is not given separately the year of birth must be left visible on the report.

Please see the notes above about correctly removing patient ID from the paper report that is enclosed with the cases.

We appreciate that the removal of patient ID from cases may be difficult depending on the machine being used, we therefore advise that the cases are specifically collected for the BSE and the data inputs are made relevant to your cases.

If possible, use the hide ID button on the echo machine to anonymise data.

E.g. Patient Name could be 'BSE Case 1' or 'Aortic Stenosis', Patient Number could be your membership number followed by case number, '1111-1'

Explanatory notes for the inclusion of patient identifiable data in any medium are **NOT** acceptable.

Breach of NHS Code of Practice on Confidentiality
Major breach:

One or more examples of detailed patient demographics (e.g. name and

address) OR

One or more examples of patient data sufficient to allow a patient to be traced in any way

Minor breach:
Examples of patient identifiable information found within the logbook. These might include, for example, name or date of birth but insufficient information to identify the patient.

In the event of a major breach:
The candidate will automatically fail.

The candidate will be informed of the fail and notified of the reason for it.

The Chair of the Accreditation Committee will be notified of all major breaches and will make the decision as to whether the Head of Information Governance at the candidate's place of employment should be notified.

In the event of a minor breach:
The candidate will be informed of the breach and notified of the reason for it. This will be taken into account in the marking scheme.
The final decision will be at the discretion of the Chair of the Accreditation Committee

Appendix 15– Final checklist for logbooks

Appendix 15 – Final checklist for logbooks.	YES	NO	Comments
Logbook populated on the online portal & mentor access has been arranged.			Request portal login for mentor, supply full name and email address.
All cases collected within 24 month period			
125 TOE reports performed and reported by the candidate All reports with full name present with e-signature.			
Existing TTE accreditation (75 cases only)			
All cases fully anonymised			
Correct case mix.			
Curriculum based assessment (Appendix 6) tool signed on portal Summary sheet present and tallied on portal (Appendix 9)			
Mentor statement completed and e-signed on portal (Appendix 14)			