

Accreditation in Adult TTE 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 Chair of Accreditation

Dear Candidate,

Welcome to the British Society of Echocardiography. The process underlying accreditation is set up to assist the echocardiographer in training, and you must read all the information carefully before commencing your specific speciality logbook.

The written section of the Adult Transthoracic assessment is held twice a year at various Pearson VUE centres around the UK, Republic of Ireland and South Africa. The practical assessment is held up to five times per year in a variety of locations in the UK only.

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-Chair, BSE Accreditation Committee

Introduction & 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 members are expected to be able to perform and report echocardiographic studies unsupervised.
- 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 demonstration of selected echo views on a normal volunteer in an exam setting, review of the required log-book 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 five years after which reaccreditation must be sought.

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 registrations are available on www.bsecho.org. Tel: 0208 065 5794 (lines open from 09:00-17:00 Mon-Fri), 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.

At the practical assessment, you should submit:

- Five full cases accompanied by reports signed by yourself
- A logbook containing the 250 reports of a specific case-mix or 150 cases if you hold BSE or EACVI TOE Accreditation:
 - 250 reports for TTE level II
 - 150 if the candidate holds BSE or EACVI TOE accreditation
 - There is no reduction in numbers for holding EACVI TTE 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.
- 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 and practical assessments

Written section

- The [written assessment](#) is held on up to two occasions each year. The Spring and Autumn examinations are held at various Pearson VUE centres across the UK, Republic of Ireland, South Africa and Hong Kong.
- Please follow instructions on the written examination section of www.bsecho.org or see [Appendix 5](#) for further information on registrations for the written exams.
- 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 83/125 marks (66%) and for the Reporting Section 30/50 (60%). These may vary slightly at the discretion of the Chief Examiner following moderation.
- There is no bar to re-sitting the written examination any number of times.
- Accreditation is awarded once a candidate has also successfully completed the practical assessment. Satisfactory performance at the written assessment alone does not allow 'partial accreditation.'

Theory section

- This consists of 25 questions which must be answered within 60 minutes. The questions test knowledge of echocardiographic findings with some additional questions on basic cardiology and up to five questions on the physics of ultrasound.
- 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.
- This part of the examination will be marked +1 for correct answers, 0 for incorrect or unanswered questions (no negative marking).
- There are no 'trick' questions.
- Each question comprises a brief statement followed by five questions relating to the statement. Candidates are required to say whether each question is 'true' or 'false'. Some example questions are provided in [Appendix 3](#).
- There are no fixed number of correct answers, i.e. for each question it is possible for every answer to be false or every answer to be true or any combination of true or false.
- The maximum possible mark is 125.

Reporting (imaging)

- This section of the exam is answered in 90 minutes.
- This section consists of 50 questions, five questions on each of 10 case studies. Each question will have four possible answers and candidates will be asked to select the best answer. These reflect the range of clinical material seen in routine echocardiographic practice. Normal or near-normal studies may be presented.
- Each case will have five associated MCQ questions asking the candidate to select the best response from four answers (single best answer). The clips and stills can be viewed as the candidate wishes and replayed as required.
- An example question is provided in [Appendix 4](#). Each case is worth a total of five marks giving a total of 50.

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 any time during the collection period. The Practical assessment will be held up to five times per year.
- Dates, locations and online registration instructions are announced on the Practical assessment section of www.bsecho.org.

- **The assessment will consist of three sections:**
 - On attendance at the exam, your logbook portal reference will be activated for the examiners to 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 15](#) : breach of this policy will result in an automatic fail.**
- Logbook submission: **As of January 2020, logbooks must be submitted via the online logbook portal, more details can be found online: [online logbook portal](#). Non-portal logbooks will not be accepted.** Further details regarding the logbook submission can be found on page 8-9.
- Station 2 will consist of a practical assessment. The candidate will be asked to acquire a number of views on a normal volunteer. To ensure an adequate assessment of the candidate's imaging ability, the candidate will be asked to obtain a variety of 2D images, Colour Doppler, continuous/pulse wave Doppler and M-mode images. All images which form part of this assessment are taken from the minimum BSE transthoracic echo dataset. The assessor will be present in the room and may help adjust the echo machine settings as directed by the candidate if the machine is unfamiliar. Echo platform familiarity is not expected or tested. This will be done in a specified timescale. On reaching a trigger score of 93, the candidate will proceed 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.
- Station 3 will be a viva assessing the five video cases. Further details can be found on Page 8.
- **Logbook and viva submissions should be checked by an experienced echocardiographer prior to attendance at the Practical Assessment.**
- Following Station 3, the candidate will receive their logbook feedback. Accreditation is achieved if all three stations are passed. Candidates unsuccessful at Stations 1, 2 or 3, need only re-sit stations at which they were unsuccessful at their next attempt.

Please note that only two attempts to pass the practical are allowed per successful sitting of the written exam.

Logbook submission

- The Logbook should comprise details of 250 cases personally **performed and reported** by you during the specified period of 24 months (or 150 cases if you hold BSE or EACVI TOE Accreditation). It is not acceptable to include cases reported by you that have been performed by someone else.
- 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 patient hospital ID number, full date of birth, name or address. See [Appendix 15](#).
- All cases have been collected in accordance with local requirements for data protection, i.e. your trust policy.
- The inclusion of structural and Doppler measurements, objective observations and a comment - [Appendix 7](#) and [Appendix 8](#).
- We expect reports to reflect departmental practice at your centre, but may question candidates on up-to-date normal ranges as they are published.
- The candidate's name must appear as the performing and reporting sonographer. Should the candidate's name not appear on the reports as the reading or reporting sonographer, an accompanying cover letter from the candidate's line manager explaining local practice should be included.
- The mentor sections must be completed online by the mentor. In case of technical issue, please use the form in [Appendix 14](#). A logbook without a mentor statement can not be submitted.
- At least the final 150 cases should be reported primarily by the candidate alone although they may be checked by another operator.

This is the same as above.

➤ The studies should reflect the normal case-load of a general adult department with the following constraints:

- At least 25 cases should be for left ventricular function assessment.
- At least 50 cases should be for valve disease assessment.
- At least 10 should show replacement valves.
- At least 10 should be for assessment of the right ventricle.
- At least 5 should show pericardial disease/effusion.
- At least 5 should show diseases of the aorta (e.g. aortic root or ascending aorta dilatation, aortic dissection).
- There should be at least 5 cases of suspected endocarditis.
- At least 5 should show left ventricular hypertrophy.
- There should be at least 5 cases of cardiomyopathy including at least two with hypertrophic cardiomyopathy.
- There should be some cases showing mass or thrombus.
- There should be some cases of simple congenital disease (e.g. ASD)
- No more than 20 studies should be specialised studies (e.g. Stress or Bubble Contrast). These studies are not a compulsory inclusion in your logbook; however, if you do include any, there should be no more than 20 in total.
- No more than 25 studies should be completely normal.

➤ The different categories of echoes should be separated. This is done under separate tabs within the [portal](#).

➤ Duplicate reports are not acceptable.

➤ If you have problems finding enough specific cases, discuss this with your mentor who

may consider arranging for you to attend a larger centre.

- The logbook should reflect the candidate's best clinical practice and as such targeted scans, unless showing a significant and rare pathology, should not be included.
- The logbook must demonstrate the candidate's ability in performing appropriate quantification relevant to the pathology. For example, we would expect full quantification and description of any moderate to severe valve lesion. Candidates must include parameters to support the overall severity of the pathology being shown.
- For full details of the log-book marking standard operating procedure (SOP), please see [Appendix 10](#).
- **Ejection fraction:**
 - In the LVE function section, we expect to see >50% of reports containing a Simpsons biplane calculated ejection fraction.
 - Regional wall abnormalities should be fully described in words, not simply on target diagrams, and using the current 17 segment model
 - If visually estimated, ejection fraction should be given in 5-10% ranges.
- Right ventricular function should be assessed using the current recommendations.
- BSA should be quoted in all reports or the reason for its non-inclusion given, for example; patient bed bound.
- Left atrial size is optimally described as a BSA indexed biplane volume. Where this is not possible monoplane volume and length is an acceptable minimum.
- **Diastolic function:** We are aware that some departments do not follow BSE guidelines on reporting of diastolic function. Diastolic function should be described as part of a standard report and summarised in accordance with up-to-date guidelines and within the bounds of your current department practice. We expect an absolute minimum of 10 cases describing full diastolic function in line with current guidelines as they alter, within the LV function section of your logbook.

Viva case submission

Five full studies with reports (paper copies) must be brought to the Practical Assessment. The cases **must** be anonymised. Please remember that it is assumed you will submit your best cases, so we will expect the studies to be complete and of a high standard. Please ensure at least one complete cardiac cycle per image is provided as cropped loops cannot be assessed.

- **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 views as per the latest version of the BSE minimum dataset (parasternal, apical, subcostal, suprasternal), M Mode (minimum Ao/LA, MV, LV) and 2D, CW, PW and Colour Doppler to assess chambers and valves. It is essential to demonstrate accurate measurement of the LV dimensions (minimum IVSd, LVEDd, ILatd and LVEDs) using M-mode 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** (you must include a good demonstration of the use of the stand-alone CW Doppler probe from one **non-apical view**: right parasternal or suprasternal). 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** carefully demonstrating quantification of the degree of regurgitation as per BSE guidelines. Pay close attention to optimal machine settings.
- **Previous or recent myocardial infarction** describing regional wall motion abnormalities and carefully quantifying overall ejection fraction using the Simpson's Biplane method. You must show the measurements taken in diastole and systole in both apical four chamber and two chamber views. All walls must have clearly visible endocardial borders. Please carefully demonstrate any complications arising from the demonstrated regional wall motion abnormality (RWMA). We expect high quality PSax views and apical images in this case.
- **The fifth case** should show an example of one of the following and of pathology **not previously shown** in the other four cases:
 - a) Prosthetic valve with size and type noted and reference to normal values for that specific valve
 - b) Mass or thrombus with differential diagnoses
 - c) Simple congenital heart disease e.g. ASD, VSD, PS or Bicuspid Aortic Valve
 - d) Significant LVH including amyloid, HCM
 - e) Significant pericardial effusion, mitral stenosis, cardiomyopathy or right heart disease.

In order to ensure that your cases play properly and remain anonymised at the assessment, it is recommended that you bring your own laptop to the centre having checked that the cases play on this. **Please ensure that each clip plays automatically or on click and loops continuously within a Power Point presentation format.**

- 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.
- **All** cases must have patient data removed. Some machinery cannot do this post-examination so please ensure due care is taken to put '**case 1**' instead of the patient's name or patient's personal details. Alternatively, you may wish to use descriptions of pathology such as "aortic stenosis". It does not matter so long as it is very clear to the examiner.
- Please ensure that each case and accompanying report is clearly labelled in the same manner so that the examiner can match the case with the report easily.
- Reports should include quantitative measurements, observations and a conclusion or summary.
- The cases must be submitted as digital loops and stills within a PowerPoint presentation. Do not label the views or include text.
- A guide to getting the cases right is available in [Appendix 12](#). Cases that are of high quality may be copied to be used in subsequent BSE written exams.

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.

- Textbook of Clinical Echocardiography (5th edition, June 2013), (6th edition, release date 18 May 2018) - Catherine Otto
- Echocardiography Review Guide: Companion to the Textbook of Clinical Echocardiography (3rd edition) – Catherine Otto et al. (2015)
- Feigenbaum’s Echocardiography (7th edition) - William Armstrong and Thomas Ryan - (2010)
- Echocardiography: A Practical Guide for Reporting and Interpretation (3rd edition) – Helen Rimington and John Chambers (Nov 2015)
- Echocardiography (Oxford Specialist Handbooks in Cardiology (2nd edition) – Paul Leeson et al. (2012)
- Making Sense of Echocardiography: A Hands-on Guide (2nd edition) –Andrew Houghton (2013)

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.

Appendix 2: Training syllabus for BSE accreditation

Topics that may be 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 & Baye's 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)
- C-T imaging
- Magnetic resonance imaging
- Nuclear Cardiology

1.1 Service Provision

- Advantages/disadvantages of Physiologist-led versus physician-led service
- Costs: fixed and variable
- Provision and indication for specialised techniques, e.g. TOE. Stress echo, 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 patients' 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 and use of dual focus
- 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
- B mode and M Mode methods.
- Curved Anatomical M Mode
- Scanning speed limitations, relationships between pulse repetition frequency, frame rate, lines per frame, field of view, depth to be imaged.
- Concept of Parallel Processing and its influence on frame rate and image quality
- Effect on evaluation of rapid motion
- Temporal resolution.
- Grey scale and dynamic range
- Measurement and optimisation of Resolution: axial, azimuthal and elevation
- Lateral resolution 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; reject, logarithmic compression, signal processing, dynamic range, pre-processing; post-processing
- Optimisation of imaging parameters, including transducer frequency, scan angle, gamma correction, 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)
- Positioning of the subject
- Standard views: Parasternal, apical (4, 5 and 2-chamber, long axis), subcostal, suprasternal, right parasternal, long and short axis.
- Use of non-standard views
- Adapting for subjects with difficult echo windows, ventilated patients, ward-based echos, emergency room echos

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, Continuity equation
- Laminar & turbulent flow: Reynolds' equation (qualitative)
- Transition from Laminar to turbulent flow: inlet jet Bernoulli equation

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

5. Doppler instrumentation

5.1 Spectral Doppler Instrumentation

- Duplex Doppler using imaging transducers
- The 'Stand-alone' Doppler probe
- 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, 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 tissue Doppler Imaging and pulsed wave tissue Doppler imaging
- Minimisation of myocardial translational movements during acquisition.
- The concept of tracking on colour Doppler tissue Doppler imaging 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

TOE Instrumentation

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

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

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.

6. Cardiac Anatomy and Physiology

6.1 Anatomy of the thorax

- Thorax contained by rib cage & diaphragm
- Lungs & pleura; heart & pericardium; mediastinum
- Blood vessels within the thorax

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 (including MAPSE) 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 the presence of poor quality and/or off-axis images

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 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

- 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

9.2 Mitral regurgitation

- Aetiologies and typical echocardiographic features of Rheumatic Mitral annular calcification

- 'Floppy MV'/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 catheterisation

10.3 Aortic Regurgitation

Aetiologies and typical echocardiographic features of:

- Rheumatic
- Bicuspid valve
- Aortic root disease
- Infective endocarditis (including root abscesses)

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 Rheumatic 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 features

Assessment of severity by:

- Spectral Doppler
- Detection of infundibular obstruction by spectral Doppler

Pulmonary Regurgitation

- Aetiologies and echocardiographic features

Assessment of severity by

- CW Doppler – deceleration rate, density and contour of Doppler signal
- Colour Doppler
- Indirect effects

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

13. Prosthetic Valves

13.1 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

13.2 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

13.3 Prosthetic valve regurgitation

- Trans-versus para-valvar regurgitation
- Normal versus abnormal regurgitation
- Assessment by CW, PW and Colour
- Doppler Colour artefacts from mechanical prostheses

14. Cardiomyopathies

Dilated Cardiomyopathy

14.1 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

14.2 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

14.3 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'

14.4 Main features of LV non-compaction

14.5 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

15. Pericardial Disease

15.1 Anatomy of the normal pericardium

- Relationships of serous pericardium to heart and great vessels
- Transverse and oblique sinuses of the pericardium

15.2 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

15.3 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

15.4 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

16. Coronary Artery Disease and Systolic LV function

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

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

17. Diastolic function of the LV

- 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

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 pseudonormal transmitral
- 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

18. 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

19. Stress Echocardiography

- Indications and basic knowledge of techniques for exercise, dobutamine or vasodilator stress echocardiography
- 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

20. Myocardial Infarction and its sequelae

- 2D, 3D, M-mode and Doppler features of: post-infarction VSD
- Mitral papillary muscle rupture
- 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

21. Pulmonary Hypertension and functional assessment of RV

- 2-D, M-mode and Doppler features of pulmonary hypertension
- Aetiologies: primary; 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

22. 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 transcatheter aortic valve replacement

23. Adult Congenital Heart Disease

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 defects
- Persistent ductus arteriosus
- Bicuspid aortic valve and associated aortopathy
- Sub-and supra-valve aortic stenosis
- Aortic coarctation
- Pulmonary stenosis
- Ebstein's anomaly
- Fallot's tetralogy
- Transposition and corrected transposition of the great arteries
- Role of contrast echocardiography in evaluating shunts in adults
- Calculation of shunts
- Role of TOE in adult congenital disease

24. Likely echocardiographic findings for common clinical presentations:

- Heart failure or breathlessness
- Arrhythmia
- Ejection systolic murmur
- Hypertension
- Collagen abnormalities (including systemic sclerosis)
- Renal failure
- Stroke

25. Emergency and ICU Echo

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 Echo in the ventilated patient

(e.g. exclude PFO, proximal PE)

- 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 (LV/LA 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-surgery 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 echocardiography in assessing filling using LV and RV systolic and diastolic function, IVC, 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 transthoracic 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: Proficiency examination- example of theory

Answer 'True' (T) or 'False' (F) to each of the following. Each correct answer gains one mark, whilst each incorrect answer. A question left blank does not gain any marks.

Q1	In an ultrasound imaging system:	
a)	Sector width, sector depth and frame rate can all be controlled	F
b)	independently Frame rate falls as sector width increases	T
c)	Using a lower frequency transducer improves the frame	F
d)	rate The frame rate increases as sector depth increases	F
e)	Using Colour Flow Doppler reduces the frame rate	T

Q2	On a Spectral Doppler display:	
a)	The velocity at which aliasing occurs increases at higher ultrasound	F
b)	frequencies The velocity at which aliasing occurs increases at greater depths	F
c)	The velocity at which aliasing occurs increases at greater sector	F
d)	angle At 2 MHz the aliasing velocity at 10 cm is approximately 1.5	T
e)	m/s	T

Q3	In assessing Tricuspid	
a)	Pulmonary systolic pressure (PAP) can be calculated using the formula $PAP = 4 \times (\text{Peak TR Velocity})^2$	F
b)	Presence of proximal flow acceleration indicates at least moderately severe	T
c)	TR Both apical and parasternal views should be used to view the colour jet	T
d)	In very severe ('free') regurgitation, the calculation of pulmonary pressure is	T
e)	invalid	T

Q4	An Atrial Septal Defect (ASD) may be associated with:	
a)	Paradoxical interventricular septal motion	T
b)	No obvious defect of the atrial septum on imaging	T
c)	Right ventricular dilatation	T
d)	Left ventricular dilatation	F
e)	Flow of blood from left atrium to right atrium	T

Appendix 4: Proficiency examination- example of reporting questions

A number of moving clips and stills will be included in each question. These can be viewed and replayed as many times as the candidate wishes.

Please select the SINGLE BEST ANSWER There is no negative marking - one mark added for a correct answer, no mark deducted for an incorrect answer.

Case 1

Male age 46

Request: Systolic murmur

Data: IVS 1cm; LVIDd 4.2cm; PWT 1cm; LVIDs 3cm; LA 3.6cm; Ao valve 2.7cm; PA 2.2cm; Pulmonary FVI 32; LVOT 2.2cm; LVOT FVI 29; LV to RV pressure gradient 118mmHg; BP 150/88

1. Describe the main abnormality

- a. Apical VSD
- b. Endocardial cushion defect
- c. Subaortic VSD X
- d. ASD

2. What is the likely aetiology?

- a. Congenital X
- b. Inferior myocardial infarction
- c. Anterior myocardial infarction
- d. Endocarditis

3. What is the pulmonary to systemic flow ratio

- a. 0.9
- b. 1.0
- c. 1.1 X
- d. 1.3

4. What is the RV systolic pressure?

- a. 20mmHg
- b. 32mmHg X
- c. 38mmHg
- d. 42mmHg

5. Which of these is correct?

- a. RV and LV are normal X
- b. RV is dilated and LV is normal
- c. LV is dilated and RV is normal
- d. LV and RV are both dilated

Appendix 5: Pearson VUE- notes for guidance

[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.

➤ 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: Theory section

- A. Time**
The theory section will last 60 minutes.
- B. Format**
The theory section will consist of multiple choice questions.
- C. Answers**
For one part the answers will be either TRUE or FALSE

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: Digital reporting section

- A. Time**
The reporting section will last 90 minutes
- B. Format**
The section will consist of 10 cases, each with 4 single best answer questions relating to it
- C. Answers**
For each question there is only one correct answer, a choice of A B C or D

There will be NO negative marking for this section – 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/>

D. Additional Information

Candidates are advised to check the security procedures in the “What to expect section” of the Pearson VUE/BSE guide page; <https://home.pearsonvue.com/test-taker/security.aspx>

Appendix 6: Curriculum based competency assessment tool

From January 2020 this is to be completed in digital form on the [online logbook portal](#)

Please use the following assessment tool to ensure all knowledge and practical experience is covered during the candidates training period.

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. Someone holding BSE Accreditation is encouraged but not mandatory.

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
Parasternal long axis standard, RV inflow, RV outflow
Parasternal short axis including aortic valve, mitral valve and papillary muscles
Apical views, 4- and 5-chamber, 2-chamber and long-axis.
Subcostal and suprasternal views
Indications for transthoracic and transoesophageal echocardiography
Normal variants and artefacts

Practical competencies

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 work, LV tendon
Can use colour examination in at least two planes for all valves optimising gain and box-size

Can obtain pulsed Doppler at:

- a. left ventricular inflow (mitral valve)
- b. left ventricular outflow tract (LVOT)
- c. right ventricular inflow (tricuspid valve)
- d. 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
Aneurysm, pseudoaneurysm,
Ventricular septal and papillary muscle rupture
Ischaemic mitral regurgitation
Features of dilated, and hypertrophic cardiomyopathy
Common differential diagnosis
Athletic heart, hypertensive disease

Practical competencies

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

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

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

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

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

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 myxoma
Differentiation of atrial mass
Normal variants and artifacts

Practical competencies

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

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

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 supra-valvar 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

Can recognise a secundum ASD
Can calculate a shunt

Appendix 7: Suggested format for a report

This is a basic framework for a report; [Appendix 8](#) includes further details for candidates to look through. Guidelines are also available on the BSE website:

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. Please see “Minimum Data set for Transthoracic Echocardiography” at www.bsecho.org.

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 MUST BE ANONYMISED AS PER [APPENDIX 15](#)

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

For each cardiac structure, the report should be divided as follows:

- **Descriptive phrases describing morphology & function:**
 - The aortic valve appears trileaflet with thin & mobile cusps.
- **Measurements/analysis: (e.g. peak gradient, mean gradient, MVA):**
 - AV Vmax: 1.2m/s, mean gradient: 6mmHg, AVA via continuity equation: 2.3cmsq overall impression is of no aortic stenosis.
- **Diagnostic statements: phrases that add echocardiographic interpretation to descriptive terms**
 - 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 TTE 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: Transthoracic 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)

Primary Diagnosis	Number of cases
Left Ventricular Function Assessment (≥ 25)	
Valve Disease Assessment (≥ 50)	
Replacement Valves (≥ 10)	
Assessment of the Right Ventricle (≥ 10)	
Pericardial Disease/Effusion (≥ 5)	
Aortic Disease (≥ 5)	
Endocarditis (≥ 5)	
Left Ventricular Hypertrophy (≥ 5)	
Hypertrophic Cardiomyopathy (≥ 2)	
Dilated Cardiomyopathy (≥ 3)	
Mass/Thrombus (some)	
Congenital Heart Disease (some)	
Stress Echo/Contrast Bubble Study (≤ 20) [Not compulsory]	
No Significant Cardiac Abnormality (≤ 25)	
Other Pathology	
Total Cases (250)	

Appendix 10: Station 1 guidance and examples of marksheets

➤ **Guidance to candidates and assessors for quality assessment of log-books:**

We expect cases included in your log-book to represent good/excellent examples of your daily work. We would not expect you to include reports that do not reflect this: for example, difficult imaging subjects without accurate measurements.

We expect reports included in your log-book to reflect the published BSE minimum dataset, however we acknowledge that not every echo in your log-book will meet this bar completely.

When considering whether to include a particular report in your log-book please refer to the following as an absolute minimum bar.

Remember that your log-book should contain mainly reports which MEET the BSE minimum dataset.

Clinical question: must be stated.

BSA: should be given unless it is not possible to weigh the patient: this should be stated (eg. patient in bed)

BP: measurement only where appropriate eg. Aortic stenosis.

LV: LVIDD and LV wall thicknesses, visual assessment of overall function and comment on the regions.

NB: the standard 17-segment model must be used and described in words not just on a diagram.

NB: more than half of your reports in the LV function assessment section should include a Simpson's Biplane measurement, not just a visual assessment.

MV: Describe the observed structure and use CFD to comment on observed MR.

E/A, Dec T, at least one TDi must be measured and documented with a comment of diastolic function.

LA: Monoplane volume and diameter is an absolute minimum.

Please use BSA indexed biplane area measurements in all cases where this is possible unless the patient cannot be weighed, in which case use biplane volume measurements where you are able.

AV: Describe the observed structure and use CFD to comment on AR.

AV VTi and LVOT VTi are essential measurements and should be included in all cases.

Aorta: The root must be at least visually assessed in all cases where a measurement is not possible.

RV: Visual assessment of structure and function represents a minimum standard for each included case.

TAPSE should be given.

RA: Visual assessment of size represents a minimum standard.

TV: Describe the observed structure and use CFD to comment on TR.

TR VMax should be given where there is a TR jet demonstrated.

PV: 'Unable to visualise' is a minimum comment.

Pericardium: A comment of fluid volume is an absolute minimum.

Conc: Must relate to the clinical question and should not re-iterate data given in the body of the report.

Six reports should be reviewed at random.

If all six reports meet the above minimum guidelines the log-book is satisfactory for BSE accreditation. If there are two minor discrepancies or less per report a further two cases should be reviewed and assessed.

If there are more than two discrepancies from the above minimum standard per report further cases are required as shown in the outcome criteria below.

Options for log-book assessment outcomes are:

➤ **Satisfactory log-book for BSE accreditation.**

OR

➤ **Unsatisfactory at present.**

Please provide:

- 5/10/20 further specified cases to be submitted: for example to address persistent inaccuracies in certain measurements or observations.
- 25-50 further consecutive reports: where reports are seen to show repeated minor inaccuracies, lack of conclusion or lack of sequential systematic comments on all parts of the heart.

OR

- 50-75 further consecutive reports: where reports are seen to show repeated significant inaccuracies, lack of correct conclusions or lack of sequential systematic comments on all parts of the heart.

If the station lead feels that a log-book falls so far short of the minimum bar in all domains that a full log-book needs to be repeated this **MUST** be verified with the Chief examiner.

Examples of Station 1 Practical assessment mark sheets

Reports	1	2	3	4	5	6	7	8	9	10	11	12	Comments
Fully Anonymised													
Indication for echo present													
2D /M Mode Measurements present													
Appropriate measurements/Doppler calculations present													
Do measurements/ Doppler Calculations match descriptions													
All parts of heart described													
Descriptions complete													
Appropriate to request													
Conclusion present													
Pass or fail													

Logbook	YES	NO	Comments
All cases collected within 24-month period			
250 TTE reports performed and reported by the candidate			
150 cases reported by the candidate as 1 st operator (can be countersigned)			
All cases fully anonymised			
Correct case mix			
All reports with full name and signature			
Supervisor/Mentor statements complete			

Appendix 11: Station 2 examples of practical assessment sheets

Station 2: Timeframe chart

Each candidate assessment will last approximately 30 minutes.

2 Minutes:	Familiarization of echo machine – Examiner will be on hand if assistance is required.
20 Minutes:	You will have 2 minutes to obtain and acquire each of the 10 images. The examiner will instruct you on the images you should acquire.
5 Minutes:	In certain circumstances the Examiner may offer you an additional 5 minutes at the end to review and retake any images you are not satisfied with.

Station two: Marking framework – There are four imaging list which may be used for the candidates practical assessment, these can be seen below.

Practical Scanning Mark Scheme

F = Fail = 0 points:	unable to demonstrate appropriate skill set
BF = Borderline Fail = 1 point:	unable to demonstrate appropriate skill set, is able to describe reasons how improvement could be achieved
BP = Borderline Pass = 2 points: quality	able to acquire/demonstrate skill set although fails to optimize image acquisition
P = Pass = 3 points:	able to fully demonstrate high quality image acquisition with appropriate optimization of images

Multiply the score achieved by the weighting given for each image/competency – see below:

Competency	Criteria	F	BF	BP	P	Weighting	Guidance	Max Score	Candidate Grade	Total
2D PLAX	Pays attention to detail & is able to recognise / acquire a good quality image within the required timeframe.	0	1	2	3	5	P if image is high quality & optimised. BP if image is clinically satisfactory with limited optimisation. BF if unable to acquire image but can identify remedial measures. F if unable to reproduce image which reflects the PLAX	15	2	10

Image List One

2 minutes per acquisition Encourage candidates to move on if necessary	Image (Score Weighting)
1	2D Parasternal Long Axis (5)
2	2D Parasternal Short Axis Left Ventricle (5)
3	2D modified Short Axis demonstrating Main Pulmonary Artery (3)
4	PW Doppler RVOT (1)
5	2D Apical 4 Chamber (5)
6	PW Doppler Mitral Valve (1)
7	2D Apical 2 Chamber (5)
8	2D A4C modified to show RV, with Colour Doppler, demonstrating TR if present (3)
9	2D Subcostal 4 Chamber (3)
10	Blind CW Doppler Descending Aorta (3)
	Modification of Patient Position to <u>Optimise Image Quality</u> (5)
	Image <u>Optimisation</u> (3)

Image List Two

2 minutes per acquisition Encourage candidates to move on if necessary	Image (Score Weighting)
1	2D Parasternal Long Axis (5)
2	2D Parasternal Long Axis tilt for Tricuspid Valve with <u>Colour Doppler</u> (3)
3	2D Parasternal Short Axis at Mitral Valve (5)
4	Parasternal Short Axis with <u>Colour Doppler</u> on <u>Interatrial Septum</u> (2)
5	2D Apical 5 Chamber (5)
6	PW Doppler Mitral Valve (1)
7	<u>Septal TDI</u> (2)
8	2D Apical 2 Chamber <u>optimised</u> for LV (5)
9	2D Subcostal IVC with sniff (1)
10	Blind CW Doppler Ascending Aorta (3)
	Modification of Patient Position to <u>Optimise Image Quality</u> (5)
	Image <u>Optimisation</u> (3)

Image List Three

2 minutes per acquisition Encourage candidates to move on if necessary	Image (Score Weighting)
1	2D Parasternal Long Axis with <u>Colour Doppler</u> on Aortic Valve (5)
2	M-mode through the Mitral Valve (3)
3	2D Parasternal Short Axis Zoom on Aortic Valve (5)
4	Parasternal Short Axis with <u>Colour Doppler</u> on <u>Interventricular Septum</u> (1)
5	2D Apical 4 Chamber (5)
6	TAPSE (3)
7	Apical 5 Chamber with <u>Colour Doppler</u> on Aortic Valve (3)
8	Subcostal 4 Chamber with <u>Colour Doppler</u> on the <u>Interatrial Septum</u> (3)
9	2D Suprasternal Aortic Arch (3)
10	PW Assessment of <u>Coarctation</u> (3)
	Modification of Patient Position to <u>Optimise Image Quality</u> (5)
	Image <u>Optimisation</u> (3)

Image List Four

2 minutes per acquisition Encourage candidates to move on if necessary	Image (Score Weighting)
1	2D Parasternal Long Axis (5)
2	2D Parasternal Long Axis tilt for Pulmonary Artery (5)
3	CW through Pulmonary Valve (2)
4	Parasternal Short Axis with <u>Colour Doppler</u> on Tricuspid Valve (2)
5	2D Apical 4 Chamber <u>optimised</u> for LV (5)
6	PW Doppler LVOT (3)
7	Apical 3 Chamber with <u>Colour Doppler</u> on Mitral Valve (3)
8	Subcostal Short Axis at Aortic Valve level (3)
9	Subcostal Abdominal Aorta (3)
10	Blind CW Doppler Descending Aorta (3)
	Modification of Patient Position to <u>Optimise Image Quality</u> (5)
	Image <u>Optimisation</u> (3)

Appendix 12: Getting the Viva cases right

This section of the submission will be reviewed in great detail by the assessors.

Candidates are most often failed at this stage of the process.

The 5 cases are assumed to be your best work. Do not choose patients who are poorly echogenic. All images must be recorded on the same patient on the same occasion. Each case should be a full study performed to the BSE minimum dataset and not a focussed study.

Optimise the 2D and Doppler images. Make sure you have optimised the gain setting, sector width, depth, harmonics, focus, sweep speed, Doppler baseline and scale, colour gain. Candidates may be failed on just this aspect. 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 mark sheet that the assessors will be using to assess the study. You need to show all standard views, including the subcostal and suprasternal views.

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. Include images demonstrating all of the measurements quoted in the report.

Ensure that the M-mode is correctly aligned. If it is too difficult take your measurements from the 2D images or the measurements may be very inaccurate. M-mode measurement of the left ventricular dimensions performed accurately is essential in at least one case.

Get the Doppler right. Place the cursor correctly and alter the Doppler scale and sweep speed appropriately. Get the best signal before recording. Optimise the colour Doppler gains before recording. Use the stand alone probe for the aortic stenosis case (and other cases, if appropriate) and demonstrate you are able to obtain a CW Doppler signal from the apical, right parasternal and/or suprasternal windows in your search for the peak gradient.

You must be able to use the common Doppler equations e.g. continuity equation, calculation of a shunt, estimation of pulmonary artery systolic pressure.

Each case should be accompanied by a full and comprehensive report. This should include a summary that can be understood by any non-echocardiographer.

GOOD LUCK

Appendix 13: Station 3- examples of marksheets

Adult Transthoracic Accreditation. Case 1 – No significant 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 M-mode of the LV and Ao/LA No images missing which are key to pathology assessment No measurements significantly inaccurate that are key to pathology assessment		Pathology assessment Poor quality or missing M-mode of the LV and Ao/LA Images missing which are key to pathology assessment Measurements key to pathology assessment significantly inaccurate and change the categorisation of the pathology	
Report is complete and accurate Comprehensive/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/inaccurate description of parts of the heart Incorrect categorisation of chosen pathology Incorrect interpretation of findings in the clinical context	

Adult Transthoracic Accreditation. Case 2 – Aortic Stenosis. Practice must be satisfactory in all areas to pass		
Evidence of satisfactory practice		Evidence of unsatisfactory practice
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 CW from the apex and stand alone CW from at least one other window. No images missing which are key to pathology assessment No measurements significantly inaccurate that are key to pathology assessment (LVOT diameter, LVOT VTi and aortic VTi)		Pathology assessment Missing, poor quality or significantly lower stand alone CW 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 aortic 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

Adult Transthoracic Accreditation. Case 3 – Regurgitation. Practice must be satisfactory in all areas to pass			
Evidence of satisfactory practice		Evidence of unsatisfactory practice	
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 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 key to pathology assessment No measurements significantly inaccurate that are key 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 key 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 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	

Adult Transthoracic Accreditation. Case 4 – RWMA			
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 Appropriate measurement of Simpson's biplane MOD showing systolic and diastolic measurements in both apical 4 chamber and apical 2 chamber And Correlates with visual impression and other methods. No images missing which are key to pathology assessment No measurements significantly inaccurate that are key to pathology assessment.		Pathology assessment Incomplete assessment of Simpson's or measured inaccurately and changes the categorisation of the reported EF. Images missing which are key 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 including RWMAs Correct categorisation of chosen pathology Correct interpretation of findings in the clinical context		Report is incomplete or inaccurate Partial and inaccurate description of parts of the heart including RWMAs Incorrect categorisation of chosen pathology Incorrect interpretation of findings in the clinical context	

Adult Transthoracic Accreditation. Case 5 – 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 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 No images missing which are key to pathology assessment No measurements significantly inaccurate that are key to pathology assessment.		Pathology assessment Images missing which are key 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 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	

Appendix 14: Mentor statement to be completed via the portal

- 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 15: 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/dh_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;

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 information from all reports and images.

For accreditation purposes, BSE Administrators and BSE Assessors must not be able to identify the patient from the detail or combination of details given.

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.

Guidance to candidates submitting Logbooks and Cases for Accreditation

The NHS Code of Practice on confidentiality means that evidence submitted for the practical part of the Accreditation process must have all patient identification removed.

Reports

Use the [online portal](#) and electronically delete all patient information except age and gender.

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.

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 – this is a breach of NHS Code of Practice on Confidentiality

The final decision remains at the discretion of the Chair of the Accreditation Committee.

Appendix 16: Final checklist

Please use the below as a reference, all of the requested forms are to be completed via the logbook portal.

ACTION	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 a 24- month period.			
250 TTE reports performed and reported by the candidate All reports with full name and signature or e-signature.			150 if holding previous TOE BSE/EACVI Accreditation.
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)			
A copy USB playable and ready give to BSE onsite registration			