British Society of Echocardiography

Accreditation in Congenital Heart Disease (CHD) Echocardiography Information Pack

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

30 April 2026

This document supersedes all previous versions.

This document is a guide to completing the BSE Congenital Accreditation

Submission and assessment criteria are included

British Society of Echocardiography

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Welcome message from the Chair of Accreditation

Dear Candidate,

Welcome to the British Society of Echocardiography (BSE). The process underlying accreditation is set up to assist the echocardiographer in training with the ultimate aim of achieving and maintaining a high standard of clinical echocardiography for the benefit of our patients.

The accreditation process is regulated to ensure high proficiency and professional standards. We aim to enable as many members as possible to achieve accreditation. A list of accredited members is maintained on the BSE website.

Please remember that we are here to support you throughout this process. If you need any assistance or have constructive feedback to offer the accreditation committee, please don't hesitate to let us know. We are committed to your success.

Good luck with your accreditation process.

Best wishes,

Michâel Purdon

Chair, BSE Accreditation Committee

Introduction & aims

The BSE's congenital heart disease (CHD) accreditation is designed to maintain high standards of clinical echocardiography for the benefit of patients with CHD, whilst providing healthcare professionals undertaking echocardiographic studies with appropriate training to support their practice.

The candidate will be assessed on their knowledge of the echocardiographic assessment of CHD in both children and adults and must understand the aetiology and progression of disease throughout life.

- Accreditation is a service for BSE members 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.
- The Accreditation process consists of a written theory examination and a practical assessment. This pack provides further instructions for both.
- Accreditation is a minimum requirement and cannot be regarded as a guarantee of competence.
- Echocardiography skills can only be maintained by continued education and practical involvement in echocardiography. This is underlined by limiting accreditation to five years, after which re-accreditation must be sought. Further details surrounding re-accreditation are available on the BSE website.
- Accredited members are expected to uphold the BSE code of conduct standards. Where concerns about an accredited member's echocardiography practice arise, they should be dealt with locally in the first instance and only escalated to the Accreditation Chair if improvement in echocardiography practice has not been demonstrated.
- **Return-to-practice pathways** for reaccreditation are available for previously accredited members.
- **International candidates** working outside the United Kingdom must pass the logbook section of the practical examination before booking a place on a practical assessment day. This will help the Society manage capacity, and candidates manage their travel arrangements (including visas, where necessary) for overseas candidates.

Summary of process requirements

There are two routes to obtain BSE CHD accreditation, exam and logbook requirements differ depending on whether a candidate already holds BSE Level 2 Transthoracic (TTE) accreditation or EACVI TTE accreditation.

1. The candidate must be a member of the BSE.
2. Candidates must have a designated mentor to assist them through the accreditation process.

3. Both CHD accreditation routes, have two compulsory elements: a written theory examination and a practical assessment. **You must pass both elements to become an accredited member.**
4. The written theory exam comprises A multiple-choice question (MCQ) theory section and a "best answer" image reporting section.
5. The practical assessment consists of a logbook, a practical scanning assessment, and a viva assessment of five patient case studies.
6. The candidate must pass the written assessment before registering to attend the practical assessment.
7. The logbook should be collected within 36 months of the written examination.

Any queries regarding the accreditation process should be addressed to the BSE Accreditation Department; contact details and registrations are available at www.bsecho.org.

Tel: 0208 065 5794 (lines open from 09:00-17:00 Mon-Fri), email: accreditation@bsecho.org.

Exam fees

A fee of £375 is charged for the complete accreditation process. This fee is payable upon registration for the written section of the examination and covers the practical assessment. There is a non-refundable booking fee of £50 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 £187.50 to re-sit this section. This reduced fee only applies to the second attempt if taken within 12 months of an unsuccessful first attempt.

Candidates are entitled to one re-attempt at the practical assessment. A re-attempt at the practical assessment is subject to an additional fee of £187.50.

Fee increases may occur annually.

Extensions

Extensions to the 36-month deadline may be granted. Extension request forms must be submitted **before the submission deadline**. Requests received after the case deadline may not be granted.

Less-than-full-time extensions are available for up to 36 months for candidates working less than full-time as stipulated by their contracted hours. Further information can be found on the BSE website's extension request page.

Appeals

Candidates can appeal the decision on a practical assessment result. **There is no appeals process for the written section of the examination**. Further information on applying for an appeal can be found on the practical assessment page of the BSE website.

Mentor

A mentor is an experienced echocardiographer who can successfully guide a candidate through the BSE accreditation process. If the echocardiographer is BSE-accredited, this is an advantage but not essential.

The mentor should understand the accreditation process, including the training syllabus (see Appendix 1) and all relevant assessment criteria.

The mentor must assess the candidate's ability to perform a CHD echocardiogram proficiently. Once a proficient level of ability is achieved, the mentor must complete the curriculum-based competency tool and the mentor statements. These must be accessed and completed via the online logbook portal. The curriculum-based competency tool can also be found in Appendix 2.

The accreditation process cannot be completed without the support of a mentor. Ongoing supervision is essential to the accreditation process. **Candidates should only pursue accreditation when they have a designated mentor.** Candidates may have more than one mentor if working between Hospitals.

Written Theory Examination

Appendix 1a contains the whole training syllabus for this accreditation process for those candidates who already hold BSE Level 2/ EACVI TTE Accreditation. Appendix 1b contains the additional elements which those candidates without BSE Level 2/EACVI TTE Accreditation will also be examined on, alongside the syllabus included in Appendix 1a.

Appendix 3 includes a recommended reading list.

The written theory examination is held once a year, usually in the Spring. It is held at various Pearson VUE centres across the UK, the Republic of Ireland, and some overseas locations. Registration dates are announced on the written assessment section of the BSE website. See Appendix 4 for registration guidance.

The written examination has two parts: an MCQ theory section and an Image reporting section. To pass the written examination overall, it is necessary to pass both parts at the same exam sitting.

If the first attempt is unsuccessful, candidates may be eligible to retake the exam at a reduced rate.

Reduced rate: This only applies to a second attempt if it is taken within 12 months of the first attempt. If the second attempt is unsuccessful, the next attempt will be charged at the full fee.

There is no bar to re-sitting the written examination any number of times.

The pass mark for the MCQ is 70%, and the pass mark for the image reporting section is 70%. Following moderation, the Accreditation Chair may decide to vary these slightly.

Accreditation is only awarded once a candidate has successfully completed the practical assessment. Satisfactory performance at the written assessment alone does not allow 'partial accreditation.'

Multiple-choice section

- Consists of up to 25 questions that must be answered within 60 minutes.
  a) 25 questions for those without BSE Level 2/EACVI TTE accreditation
  b) 20 questions for those with BSE Level 2/EACVI TTE accreditation
- Questions are designed to test the knowledge of echocardiographic findings in congenital heart disease, surgical corrections, complications and sequelae of disease (see Appendix 1a).
- Where a candidate does not hold TTE accreditation, a selection of questions will also assess the physics of ultrasound. (See Appendix 1b)
- Each question comprises a brief statement followed by five questions. Candidates are required to answer 'true' or 'false' to each question. Example questions are provided in Appendix 5.
- This part of the examination will be marked +1 for correct answers and 0 for incorrect or unanswered questions (no negative marking).
- There are no 'trick' questions.
- There are no fixed number of correct answers, i.e. for each question, every answer can be false or, every answer to be true or any combination of true or false.
- **The maximum possible mark is 125**.

Image reporting section

- Consists of 50 questions centred around 10 patient case studies that must be answered within 90 minutes.
- The candidate will be presented with 10 patient case studies. Each case study will consist of relevant patient details and various echocardiographic images.
- For each case study, the candidate must answer five questions. Each question will have four possible answers; the candidate must select the best single answer. An example case study and questions are provided in Appendix 6.
- **The maximum possible mark is 50.**

Practical assessment

This is held up to two times per year (subject to candidate demand). Dates, locations and online registration instructions are announced on the practical assessment section of BSE website.

The practical assessment has three parts:

- a 250-case logbook for candidates without BSE Level 2/EACVI TTE Accreditation
  - or a 200-case logbook for candidates with BSE Level 2/EACVI TTE Accreditation
- a practical scanning assessment
- a viva assessment of five patient case studies.

All candidates must attend within 38 months of starting the accreditation process (i.e., within two months of their case collection deadline). A two-month grace period is designed to give the candidate time to review, prepare, and submit the logbook and five viva cases.

Registration should **ONLY** be sought after collecting the logbook and patient case studies.

It is the candidate's responsibility to ensure they enter correct information on registration forms. Incorrect information will lead to a rejected registration.

Logbook submission

The logbook should demonstrate the candidate's ability to meet the competencies, as shown in Appendix 2. The specific case mix of the logbook is shown below.

It should consist of **250 reports** personally **performed and reported** by the candidate during the specified 36-month period.

If the candidates hold BSE or EACVI TTE Accreditation, the logbook is reduced to **200 reports**.

The logbook format is copies of the actual clinical report. The reports are to be uploaded and submitted via the BSE logbook portal.

Non-portal logbooks will not be accepted.

Please see Appendix 7 for full details of what is expected in reports and how the logbook is marked.

Duplicate reports are not acceptable.

If a candidate has problems finding enough specific cases, they should discuss this with their mentor, who may consider arranging for the candidate to attend a nearby centre.

The logbook should reflect the candidate's **best clinical practice**, and as such, targeted scans should not be included unless they show a significant and rare pathology.

Competencies and mentor statements are to be completed via the BSE logbook portal.

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

The logbook case mix should include:

- A maximum of 5 cases should be for sequential segmental analysis where there is no significant cardiac abnormality.
- At least 25 cases should be for unrepaired shunt lesions.
- At least 25 cases should be for repaired shunt lesions.
- At least 5 cases should be for unrepaired cyanotic or complex congenital disease.
- At least 25 cases should be for repaired cyanotic or complex congenital disease.
- At least 25 cases should be for valve disease / outflow obstruction.
- At least 5 cases should be for replacement / repaired valves.
- At least 5 cases should be for suspected coronary artery anomalies.

Additional information for logbook case mix:

- Sequential segmental analysis may include normally connected hearts.
- Unrepaired shunt lesions may include ASD, VSD, AVSD, PDA.
- Repaired shunt lesions may include ASD, VSD, AVSD, PDA.
- Unrepaired cyanotic or complex congenital disease may include TGA, tetralogy of Fallot, pulmonary atresia with VSD, pulmonary atresia with intact septum, DORV, truncus arteriosus, anomalous pulmonary venous drainage, univentricular heart or ccTGA.
- Repaired cyanotic or complex congenital disease may include TGA, tetralogy of Fallot, pulmonary atresia with VSD, pulmonary atresia with intact septum, DORV, truncus arteriosus, anomalous pulmonary venous drainage, univentricular heart or ccTGA.
- Valve disease / outflow obstruction may include subvalvular membrane, supra valve stenosis, bicuspid aortic valve, coarctation, Ebstein's anomaly or pulmonary stenosis.
- Replacement / repaired valves in the setting of CHD may include any replaced/repaired valves.
- Suspected coronary artery anomalies may include normal ostia findings.

Other information regarding the logbook:

- **All** patient-identifiable data needs to be removed. This may require the manual removal of identifiable data. See Appendix 9.
- **At least the final 150** cases should be reported primarily by the candidate, although they may be checked by another operator.
- 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 on the report as the performing and reporting echocardiographer/sonographer. Where local policy deviates from this, a supporting letter and current standard operating procedure from the departments echo lead stating local policy should be included. This should be submitted under the "optional supporting information" section on the BSE logbook portal.
- Final sign-off / validation of the logbook is undertaken by the department's echo lead.

Practical scanning assessment

Consists of a candidate acquiring up to 10 different echocardiographic imaging views within 20 minutes. A real-life model or simulator may be used. Where a simulator is used, the assessor will allow the candidate time to familiarise themself with the "feel" of the probe and simulator.

This part of the assessment is designed to assess a candidates practical scanning ability along with their ability to perform basic image optimisation.

All imaging views used in this assessment are taken from the recommended minimum CHD imaging list as shown on the BSE website. If the views are obtained to an appropriate standard, the candidate will be deemed successful at this part of the assessment process.

The candidate is not expected to be familiar with the equipment. The assessor will alter the equipment setting as directed by the candidate.

For full details of the practical scanning marking criteria, please see Appendix 10.

Patient case study viva assessment

Consists of a viva assessment of five separate patient case studies. See below for the required cases.

The candidate will be expected to discuss their patient cases with the Assessor. All five cases may be reviewed.

For full details of the viva case marking criteria please see Appendix 11.

The cases must represent a complete, high-quality study. They should be accompanied by a printed report that is complete, comprehensive, and reflects the patient case study being presented.

The candidate must ensure that at least one full cardiac cycle is recorded. The cases must play automatically / continuously within a PowerPoint presentation (or equivalent). Cases that do not play appropriately may be classified as an unsuccessful attempt.

Candidates must bring and present their patient case studies on their own laptop. It is the candidate's responsibility to ensure these are anonymised and can be viewed in a manner that allows an assessment of the cases being presented.

The viva case studies should include one of each of the following:

1. A study showing no significant abnormality.
2. A study showing echocardiographic assessment of a simple unrepaired lesion.
3. A study showing echocardiographic assessment of uncorrected complex or cyanotic heart disease.
4. A study showing echocardiographic assessment of a repaired case of complex CHD.
5. A study showing left or right heart obstruction.

****Patient case studies may be used in subsequent BSE written exams, educational and training sessions****

Practical assessment - outcomes and process for re-attempts (resubmissions)

A candidate will have two attempts at passing the practical assessment part of the accreditation process. A second attempt (referred to as resubmission) at the practical assessment is subject to a fee of £187.50.

- **If a candidate is successful** in all three parts of the practical assessment, the candidate will be awarded BSE accreditation and will join the accredited member list.
- **If a candidate is unsuccessful** in any of the three parts of the practical assessment, the candidate will be deemed unsuccessful at this first attempt. The candidate will be given constructive feedback to facilitate a re-attempt. The candidate may be requested to resubmit logbook reports/patient case studies. **These must be new reports / patient case studies**. A candidate is not permitted to resubmit previously assessed work under any circumstance.
- If a candidate fails the second attempt (resubmission), the accreditation process must start over, with the candidate undertaking the written examination again.

In the event of an unsuccessful attempt, the candidate is required to:

Attend another practical assessment and re-attempt **ONLY** the parts of the practical assessment that the candidate was unsuccessful at in the first attempt. The pass marks from the remaining practical assessment elements will be upheld.

The timescale allowed for re-attempts (resubmissions) will depend on which elements were unsuccessful and the candidates' current and future work commitments. This will be discussed with the candidate during the first attempt. Typical timeframes may include 3-9 months and can be up to 12 months following the first attempt.

Our feedback consistently demonstrates that non-face-to-face feedback does not adequately equip a candidate to pass at the next sitting. Therefore, all re-attempts at the practical assessment require the candidate's attendance in person to facilitate adequate and helpful face-to-face feedback*

*** We may authorise virtual or remote submissions, subject to committee approval. If remote submission is approved, the reassessment will occur on or near a practical assessment day or during the logbook marking cycle before a practical assessment (only if submitted by the logbook marking deadline as announced online)**

Appendix 1a: Training syllabus for candidates **with** BSE Level 2/EACVI TTE Accreditation

The following sections form the minimum suggested training syllabus for this accreditation process.

Candidates should use this as a guide to prepare for the written and practical assessments of this accreditation process.

1. General Concepts

1.1 Image optimisation

- Factors affecting choice of imaging frequency: typical practical values for adults & children
- Use of distraction techniques to assist in obtaining images
- Use of non-standard views

1.2 Relationship with patients

- Explaining the procedure in terms relevant to the particular patient
- Respect for patients' dignity and cultural backgrounds
- Relationships with patient, parents, carers and colleagues
- Handling requests for information about the study findings

1.3. Conscious sedation in children

- Explaining the procedure in terms relevant to the patient/parents
- Specific environment for performing studies in children/adults with CHD
- Indications for conscious sedation
- Precautions, dosage, follow-up

1.4 Reporting and Documentation

- Standard methods & terminology used for describing congenital heart disease (segmental sequential analysis)

2. Cardiac Anatomy and Physiology

2.1 Anatomy of the thorax

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

2.2 Cardiac morphology and echo identification for the congenital sonographer

- Cardiac position, levocardia, dextrocardia, mesocardia
- Atrial situs - definition, abdominal aorta and great vein relationship
- Systemic venous return: morphology
- Pulmonary venous return: morphology
- Atrial anatomy
  - difference between right and left atrium, atrial appendages
- Ventricular anatomy
  - Morphology of right and left ventricle
  - Atrioventricular valve arrangement
  - Trabecular pattern
  - Ventricular shape.
  - Inlet and outlet valve relationships
  - Chordal attachments
- Atrioventricular valves:
  - anatomy of mitral and tricuspid valve
- Semilunar valves: anatomy of pulmonary and aortic valve
- Intra-atrial septum
  - Morphology
  - Primum and secundum septum
  - Foramen ovale
  - Sinus venosus
- Interventricular septum
  - Morphology
  - Inlet
  - Outlet
  - Membranous
  - muscular septum
- Pulmonary artery anatomy
- Aortic anatomy
- Coronary artery anatomy: normal anatomy and variants
- The arterial duct: normal anatomy and normal variants
- The pericardium: anatomy
- Visualisation of normal cardiac anatomy and normal variants in standard echocardiography planes
- Normal valve function, normal Doppler parameters and normal variants

2.3 Terminology of congenital heart disease

- Atrial situs and situs abnormalities
  - Situs inversus

  - Right and left isomerism
  - Cortriatriatum

- Atrioventricular connections
  - Concordant
  - Discordant
  - Double inlet
  - Absent connection
  - Straddling valves
  - Criss-cross connections
- 'Univentricular' heart: description of different variants
- Ventriculoarterial connections
  - Concordant
  - Discordant
  - Single outlet
  - Double inlet
- Great artery relationships

2.4 The physiology of congenital heart disease

- The fetal circulation: how it differs from the postnatal circulation
- Circulatory changes at birth: the neonatal circulation
- Adaptations in circulatory physiology during the first weeks of life
- Causes of chamber dilation and hypertrophy
- Ventricular pressure and volume overload
- Physiological effect of shunts at atrial, ventricular and great artery level
- Physiological effect of regurgitation through all four valves
- Physiological effect of stenosis on all four valves

2.5 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)

2.6 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

3. Cardiac functional parameters

3.1 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 TAPSE) 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
- Assessment of cardiac structures in paediatrics referenced to Z scores

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

- 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 TAPSE) 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.
- 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

4. 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

5. Pathology and echocardiographic assessment for the congenital sonographer

5.1 Septation defects

- Atrial communications
    - Anatomical variations :Sinus venosus, secundum, primum defects, unroofed coronary sinus and associated lesions
    - Echo features of atrial communications
    - Assessment of shunt
    - Evaluation of right heart pressures
    - Evaluation of pulmonary veins
    - Surgical and percutaneous closure of defect and echo assessment following closure

- Ventricular septal defects
    - Anatomical variations : perimembranous, muscular, apical, doubly committed
    - Echo features of VSD
    - Assessment of haemodynamic effect of the shunt, restrictive / non restrictive
    - Evaluation of right heart pressures
    - Aortic valve cusp prolapse
    - Subvalvar aortic stenosis
    - Double chambered RV
    - Malalignment of the ventricular septum, anterior / posterior deviation
    - Percutaneous and surgical closure of VSD's and echo assessment following closure

- Atrio-ventrcular septal defect (AVSD)
    - Anatomical variations
    - Echo features of AVSD
    - AV valve function in AVSD
    - Assessment of LVOT obstruction
    - Evaluation of pulmonary hypertension
    - Echo assessment following surgical correction

5.2 Shunt lesions (not caused by septation defects)

- Arterial duct
    - Anatomical variations
    - Echo views to assess arterial ducts

- Haemodynamic effects of an arterial duct
- Ductal flow patterns
- Surgical and percutaneous closure of defect and echo assessment following closure

- Basic anatomy and echo features of other acyanotic lesions
  - AP window
  - Unroofed CS
  - PA from aorta
  - Coronary artery fistula
  - Sinus of Valslva fistula

5.3 Cyanotic Shunts

- Transposition of the Great Arteries (TGA)
  - Anatomy and variations
  - Echo features of TGA in the newborn
  - Associated lesions (VSD, PS)
  - Coronary artery anatomy and variations
  - Surgical treatment in TGA
  - Echo evaluation and assessment following atrial switch
  - Echo evaluation and assessment in arterial switch
  - Echo evaluation and assessment following Rastelli procedure

- Tetralogy of Fallot / Pulmonary atresia with VSD
  - Anatomy and variations
  - Assessment of pulmonary blood flow
  - Echo assessment in uncorrected TOF
  - Assessment of coronary arteries
  - Surgical treatment for TOF
  - Echo assessment and evaluation of the post operative TOF and associated complications.

- Pulmonary atresia intact septum
  - Anatomy and variants
  - Echo assessment of pre operative patient
  - Percutaneous and surgical assessment and the echo evaluation of the treatments

- Double Outlet Right Ventricle (DORV)
  - Anatomy and variations
  - Echo evaluation and assessment of uncorrected DORV
  - Surgical treatments

- Echo evaluation and assessment of the post operative patient

- Truncus arteriosus
  - Anatomy and variations
  - Echo evaluation and assessment of the pre op patient
  - Surgical treatment

- Anomalous pulmonary venous drainage
  - Anatomy and variations, partial and total, supracardiac and infracardiac
  - Assessment of pulmonary veins in partial and total anomalous pulmonary venous drainage.
  - Echo features pre and post surgical correction

5.4 Other complex lesions

- Univentricular heart
  - Anatomy and variations
  - Echo assessment and evaluation
  - Staged surgical and interventional procedures
  - Evaluation of Fontan circulation by echocardiography

- **ccTGA, Double discordance**
  - Anatomy and variations
  - Echo assessment of evaluation of unrepaired ccTGA
  - Surgical treatment options and post-operative assessment, including double switch.

5.5 Congenital valvular disease/Outflow tract obstruction

Mitral valve anomalies

- Echo assessment of the congenitally abnormal mitral valve
  - Anatomy and different variants of mitral valve anomalies
  - Description of the valve and subvalvar apparatus
  - Measurement of orifice area by planimetry

- Doppler assessment of severity of stenosis/regurgitation
  - Mean and end-diastolic gradient
  - Valve area by pressure half-time: technique and limitations

- Mitral valve prolapse: definition and echocardiographic assessment
- Echocardiographic assessment of surgical mitral valve repair

Aortic valve anomalies

- Echo assessment of the congenitally abnormal aortic valve
  - Anatomy and different variants of aortic valve
  - Assessment of the left ventricle: size, hypertrophy, systolic and diastolic function
  - Associated left ventricular outflow tract abnormalities
  - Effect on the aortic root
  - Associated lesions
- Doppler assessment of the aortic stenosis and regurgitation
  - Assessment by CW Doppler, including stand-alone CW probe
  - Peak and mean gradients
  - Apical, right parasternal and suprasternal positions
  - Continuity equation
- Echocardiographic assessment of surgical and percutaneous treatments for congenital aortic valve disease including balloon valvuloplasty, repair, Ross procedure
- Echocardiographic assessment of the aorta in Marfans syndrome, Sinus of Valsalva aneurysm, aortic dissection.

Tricuspid anomalies

- Echo assessment of the tricuspid valve
  - Anatomy and congenital variations of the tricuspid valve including dysplastic TV, Ebsteins anomaly
  - Assessment of the right heart, size and function
  - Doppler assessment of stenosis and regurgitation
  - Echocardiographic assessment of surgical and percutaneous treatment for the tricuspid valve

Pulmonary anomalies

- Echo assessment of the tricuspid valve
  - Anatomy and congenital variations of the pulmonary valve, sub valvar, valvar, supravalvar lesions
  - Imaging and Doppler assessment of the outflow tract, infundibular obstruction
  - Assessment of the right heart, size and function
  - Doppler assessment of obstruction / regurgitation
  - Associated abnormalities
  - Echo assessment of surgical and percutaneous treatment for the pulmonary valve

LV outflow tract obstruction

- Echo assessment of subvalvar aortic stenois
    - Anatomy and congenital variations
    - Imaging and Doppler assessment
    - Surgical procedures and complications
    - Associated lesions

- Echo assessment of supravalvar aortc stenosis
    - Anatomy and congenital variations
    - Imaging and Doppler assessment
    - Surgical procedures
    - Associated lesions

- Coarctation of the aorta
    - Anatomy and variations of the aortic arch
    - Site and type of narrowing
    - Imaging and Doppler assessment including full Bernoulli equation
    - Effect of a patent arterial duct on the assessment of the arch
    - Percutaneous and surgical procedures and the post op echo assessment
    - Associated lesions
    - Complications and re-coarctation

- Interrupted aortic arch
    - Site and type of interruption of the aorta
    - Imaging and Doppler assessment
    - Associated lesions
    - Surgical procedures and post op echo assessment

RV Outflow tract obstruction

- Echo assessment of subvalvar pulmonary stenosis
    - Anatomy and congenital variations
    - Imaging and Doppler assessment
    - Surgical procedures
    - Associated lesions

- Supravalvar stenosis and peripheral branch PS
    - Anatomy and congenital variations
    - Imaging and Doppler assessment
    - Surgical procedures
    - Associated lesions

5.6 Prosthetic Valves

2D, M-Mode and Doppler features of the main types of replacement valves

- Tilting Disc

- Bi-leaflet
- Bioprostheses (stented and stentless)
- Age-related deterioration of bioprostheses
- Role of TOE in examining normal and malfunctioning prosthetic valves

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

Prosthetic valve regurgitation

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

5.7 Congenital coronary anomalies

- Anatomy & nomenclature of the major branches of the coronary arteries
- Imaging of the coronary artery origins
- Relationship of coronary anatomy to standard echocardiographic imaging planes
- Echo identification and assessment of congenital coronary artery anomalies including anomalous origins and transmural coronary course
- Physiological effect of coronary artery abnormalities
- Echo assessment of surgical treatment for coronary artery anomalies
- Echo features and assessment of coronary artery fistulae
- Echo assessment for surgical and percutaneous treatment of coronary artery fistulae
- Use of Z scores in congenital coronary anomalies

5.8 Intracardiac Masses

- Typical locations for formation of intracardiac thrombus
- Intracardiac masses that may present in childhood and their echo features, e.g. rhabdomyoma, fibroma, teratoma, myxcoma
- Features suggestive of malignancy
- Role of TOE in assessment of intracardiac masses
- Role of contrast in the assessment of intracardiac masses

6. Acquired heart disease

6.1 Infective endocarditis

- Use of Z 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

6.2 Pericardial disease

- **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

- **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

6.3 Kawasaki disease

- Echo assessment and follow up of Kawasaki disease
- Assessment of coronary artery ostia
- Use of Z scores to assess coronary artery dimensions

6.4 Duchene Muscular Dystrophy

- Echo assessment and follow up of Duchene muscular dystrophy

6.5 Rheumatic fever

- Echo assessment and follow up of rheumatic fever

6.6 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

7. **Inherited cardiac conditions**
   - Echocardiographic assessment and features of:
     - Arrhythmogenic right ventricle
     - Hypertrophic cardiomyopathy
     - Dilated cardiomyopathy
     - Marfans syndrome
     - Loeys Dietz syndrome

8. **Additional topics**
   - The level of knowledge expected is that of a competent echocardiographer performing CHD 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 1b: Training syllabus for candidates **without** BSE Level 2/EACVI TTE Accreditation

In addition to the elements outlined in appendix 1a, candidates **without** BSE Level 2/EACVI TTE Accreditation will also be assessed on the topics below:

1 Clinical role of echocardiography

1.0 Imaging Physics & Instrumentation

- Concepts and terminology
- Concepts of compression waves
- Definitions: frequency, wavelength, propagation velocity, amplitude
- Units of measurement: Hz and MHz
- Decibel Comparison of Ultrasound with audible sound.

1.1 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

1.2 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

1.3 Imaging physics

- Factors affecting choice of imaging frequency: typical practical values for adults & children
- Broad-band imaging
- Harmonic imaging
- and M Mode methods.
- Curved Anatomical M Mode
- Scanning speed limitations, relationships between pulse repetition frequency, frame rate, scan lines per frame, field of view, and 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.
- Greyscale and dynamic range
- Measurement and optimisation of Resolution: axial, azimuthal and elevation
- Lateral resolution and side-lobe/grating artefacts
- Reverberation artefacts
- Limiting factors for detecting small targets

1.4 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 frame/volume rate, 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

1.5 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 studies, emergency room studies.

2.6 Storage and Display of Images

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

2 Doppler Physics & Fluid Dynamics

2.0 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
- Bernoulli principle for fluid dynamics – relationship of fluid speed and statics pressure/potential energy
- Coanda effect

2.1 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 and the effect of scan frequency on the Nyquist limit
- The principles of pulse wave tissue Doppler
- Packet size, colour mode and sector size and their effect on frame rate and aliasing

3 Deformation Analysis

3.0 Principles of Myocardial Deformation

- The definition of displacement, velocity, strain and strain rate
- The cardiac ultrasound coordinate 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

3.1 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

3.2 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
- 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

4 Doppler instrumentation

4.0 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.

4.1 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

5 TOE Instrumentation

5.0 General concepts

- Transducer types: single plane, biplane, multiplane
- Optimising machine settings for TOE Patient monitoring for TOE and general safety considerations
- Control of infection
- General indications and recognition of the limitations of TTE.

6 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

Appendix 2: Curriculum-based competency tool

The following competency assessment tool should be used to ensure all knowledge and practical experience is covered during the candidates' training period.

The competency tool is now required to be completed by the candidate's mentor via the BSE online logbook portal.

Competency	**Date achieved**
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 Doppler examination in at least two planes for all valves optimising gain and box-size Can obtain pulsed Doppler and continuous wave Doppler adequately	
2. LEFT VENTRICLE Knowledge Coronary anatomy and correlation with 2D views of left ventricle. Segmentation of the left ventricle wall motion Measurements of global systolic function. (LVOT VTI, stroke volume, fractional shortening, ejection fraction using Simpson's biplane method) Doppler mitral valve filling patterns & normal range Appearance and complications post-surgery Appearance of complications after myocardial infarction Aneurysm, pseudoaneurysm, Ventricular septal and papillary muscle rupture Ischaemic mitral regurgitation Features of dilated, and hypertrophic cardiomyopathy and 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 Can detect and recognise complications post-surgery Understands causes of a hypokinetic left ventricle Can recognise features associated with cardiomyopathies Can recognise hypertensive heart disease	
3. MITRAL VALVE DISEASE Knowledge Normal anatomy of the mitral valve, and the subvalvular apparatus and their relationship with LV function Causes of mitral stenosis and regurgitation- Ischaemic, functional, prolapse, rheumatic, endocarditis, cleft, double orifice Practical competencies Can recognise rheumatic mitral valve disease Can recognise mitral valve prolapse Can recognise functional mitral regurgitation Can assess mitral stenosis; 2D planimetry, pressure half-time, mean pressure gradient Can assess severity of mitral regurgitation, chamber size, signal density, PISA & vena contracta Can recognise surgical repair of mitral valve Can recognise and interrogate mitral valve replacement	
4. AORTIC VALVE DISEASE and AORTA Knowledge Causes of aortic valve disease Causes of disease of the aorta Methods of assessment of aortic stenosis and regurgitation Basic criteria for surgery to understand reasons for making measurements Practical competencies Can recognise bicuspid, unicuspid, quadracuspid, rheumatic, and degenerative disease Can recognise a significantly stenotic aortic valve Can recognise sub and supra valvular stenosis Can recognise LVOT obstructions; aortic subvalvular membrane 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 Can recognise variations of the aortic arch Can recognise coarctation of the aorta and aortic arch interruptions Can recognise post-operative appearance Can recognise aortic 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 Can recognise congenital variations of tricuspid valve disease; Ebsteins anomaly, dysplastic pulmonary and tricuspid valves Can recognise pulmonary valve, sub and supra valvular stenosis Can recognise RVOT and infundibular obstruction Can recognise tricuspid valve stenosis including rheumatic involvement Can recognise pulmonary branch stenosis Can recognise aberrant left pulmonary artery (sling)	
6. REPLACEMENT / REPAIRED HEART VALVES Knowledge Types of valve replacement / repair criteria of normality Signs of failure Practical competencies Can recognise broad types of replacement / repair valve Can recognise para-prosthetic regurgitation Can recognise prosthetic obstruction	
7. INFECTIVE ENDOCARDITIS Knowledge 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, AV valve flow velocities and respiratory variation. Features of pericardial constriction Differentiation of pericardial constriction from restrictive cardiomyopathy Practical competencies Can differentiate a pleural and pericardial effusion Can recognise the features of tamponade	

Can recognise restrictive physiology	
10. SEPTATION DEFECTS Knowledge Atrial communications and anatomical variations; Sinus venosus; secundum; primum defects; unroofed coronary sinus and associated lesions Echo features of atrial communications Ventricular septal defects and anatomical variations; perimembranous; muscular; apical; doubly committed Echo features of ventricular septal defect Surgical and percutaneous closure of defect and echo assessment following closure Atrio-ventricular septal defect (AVSD) and anatomical variations Echo features of AVSD Practical competencies Can recognise an atrial communication and direction of shunt Assessment of haemodynamic effect of the shunt, restrictive / non restrictive Evaluation of right heart pressures Can recognise malalignment of the ventricular septum, anterior / posterior deviation Percutaneous and surgical closure of VSD's and echo assessment following closure Can identify AV valve function in AVSD and name the leaflets Can assess LVOT obstruction Echo assessment following surgical correction	
11. PATENT DUCTUS ARTERIOSUS (PDA) Knowledge Anatomical variations and location Haemodynamic effects of PDA; left heart dilatation Practical competencies Can recognise ductal Doppler flow patterns Surgical and percutaneous close of defect and echo assessment Can recognise the difference between a PDA and aorto-pulmonary collateral	
12. TRANSPOSITION OF THE GREAT ARTERIES (TGA) Knowledge Transposition of the Great Arteries (TGA) anatomy and variations Echo features of TGA and associated lesions (VSD, PS) Coronary artery anatomy and variations Surgical repair of TGA (atrial/arterial switch) Practical competencies Echo evaluation and assessment following atrial switch Echo evaluation and assessment in arterial switch Echo evaluation and assessment following Rastelli procedure Echo evaluation and assessment following Le Compte manoeuvre	
13. TETRALOGY OF FALLOT (TOF) Knowledge Anatomy and variations of TOF Assessment of pulmonary blood flow Surgical repair for TOF	

Practical competencies Assessment of coronary arteries Echo assessment in uncorrected TOF Echo assessment and evaluation of the post-operative TOF and associated complications.	
14. DOUBLE OUTLET RIGHT VENTRICLE (DORV) Knowledge Anatomy and variations of DORV Practical competencies Echo evaluation and assessment of uncorrected DORV Surgical repairs with echo evaluation and assessment of the post-operative patient	
15. TRUNCUS ARTERIOSUS Knowledge Anatomy and variations of truncus Surgical treatment with post-op appearance Practical competencies Echo evaluation and assessment of the unoperated lesion Echo evaluation of the truncal valve; regurgitation, number or leaflets	
16. ANOMLAOUS PULMONARY VENOUS DRAINAGE Knowledge Anatomy and variations; partial and total, supra cardiac and infra cardiac Haemodynamic effect on heart Practical competencies Assessment of pulmonary veins in partial and total anomalous pulmonary venous drainage. Echo features pre and post-surgical correction	
17. UNIVENTRICULAR HEART Knowledge Anatomy and variations of a univentricular heart Staged surgical and interventional procedures Practical competencies Echo assessment and evaluation Evaluation of Fontan circulation by echo	
18. CONGENITALLY CORRECTED TRANSPOSITION OF THE GREAT ARTERIES (ccTGA OR DOUBLE DISCORDANCE; AV/VA DISCORDANCE) Knowledge Anatomy and variations of ccTGA Surgical treatment options and post-operative assessment, including double switch. Practical competencies Echo assessment of evaluation of unrepaired ccTGA Echo assessment of evaluation of repaired ccTGA	
19. CORONARY ANOMALIES Knowledge Anatomy of the major branches of the coronary arteries Physiological effect of coronary artery abnormalities Echo features and assessment of coronary artery fistulae	

Use of Z scores in congenital coronary anomalies; Kawasaki Practical competencies Can image the coronary artery origins Relationship of coronary anatomy to standard echocardiographic imaging planes Echo identification and assessment of congenital coronary artery anomalies including anomalous origins and transmural coronary course Echo assessment of surgical treatment for coronary artery anomalies Echo assessment for surgical and percutaneous treatment of coronary artery fistulae	

Appendix 3: Reading list

The reading list is provided by the Accreditation Committee of the British Society of Echocardiography and represents only a handful texts that are available for candidates to learn from

1. **Echocardiography in Adult Congenital Heart Disease**; Wei Li, Michael Henein, Michael Gatzoulis (2007)
2. **Echocardiography in Paediatric and Adult Congenital Heart Disease** by Benjamin W. Eidem, Frank Cetta, and Patrick W. O'Leary (2009)
3. **Echo in Paediatric & Congenital Disease from Foetus to Adult**; Wyman Lai, Luc Mertens, Meryl Cohen & Tal Geva (2009)
4. **The Paediatric Cardiology Handbook**; Myung K. Park (2015)
5. **Adult Congenital Heart Disease**; Sara Thorne & Paul Clift (2017)
6. **2020 ESC Guidelines for the Management of Adult Congenital Heart Disease;** Baumgartner, Helmut, De Backer Julie, Babu-Narayan, Sonya V, et al; European Heart Journal (2020)

   https://academic.oup.com/eurheartj/advance-article/doi/10.1093/eurheartj/ehaa554/5898606?searchresult=1
7. **EDUCATIONAL SERIES IN CONGENITAL HEART DISEASE: Echocardiographic assessment of left to right shunts: atrial septal defect, ventricular septal defect, atrioventricular septal defect, patent arterial duct** Antigoni Deri and Kate English (2018)
8. EDUCATIONAL SERIES IN CONGENITAL HEART DISEASE: Congenital left-sided heart obstruction Michelle Carr, Stephanie Curtis, and Jan Marek (2018)
9. **EDUCATIONAL SERIES IN CONGENITAL HEART DISEASE: Tetralogy of Fallot: diagnosis to long-term follow-up** R Bedair and X Iriart (2019)
10. EDUCATIONAL SERIES IN CONGENITAL HEART DISEASE: Echocardiographic assessment of transposition of the great arteries and congenitally corrected transposition of the great arteries Meryl S Cohen and Luc L Mertens (2019)
11. Lai W et al. Guidelines and standards for performance of a paediatric echocardiogram: A report from the task force of the paediatric council of the American Society of Echocardiography. J Am Society Echocardiography 2006;19:1413-1430
12. Robinson S et al. A practical guideline for performing a comprehensive transthoracic echocardiogram in adults: The British Society of Echocardiography minimum dataset. Echo Research and Practice 2020;7(4):G59-G93.

Appendix 4: Written Examination Registration Guidance

BSE written exams are administered in collaboration with Pearson VUE testing services. Candidates can take the exam at local testing centres across the UK, the Republic of Ireland, and certain overseas locations.

- **Pre-registration (through the BSE website)**
  1. Candidates must have an active BSE membership (fully paid and up to date).
  2. Candidates must register their interest in taking the written exam by completing an **online pre-registration** form via the accreditation section of www.bsecho.org, during the pre-registration window specified online. **Candidates' registered names should match their photo identification. Pearson VUE follows a strict admission policy.**
  3. BSE will transfer your data and requirements to Pearson VUE, who will contact all pre-registered candidates with further information on confirming exam placements.

Delivery methods: Candidates can take the exam in two ways: in a **Test Centre (recommended)** or online proctored exam (OnVUE), which allows them to sit the exam from home (subject to system requirements).

Note: Candidates taking the exam from home accept full responsibility for technical issues like device updates, pop-up blocking, connection errors, and bandwidth. System checks before the exam may not catch all faults, which can still occur during the exam. Understand these risks.

- **Special accommodations**

Pearson VUE can provide special accommodations (reasonable adjustments) to candidates with official requirements, such as extra time, a reader, or medication during the examination.

All requests must be in writing and supported by documents from a healthcare professional/provider detailing the requirements and reason for the request. The BSE will approve requests at its discretion and **must be submitted within the pre-registration window**. To submit such requests, forward them to accreditation@bsecho.org.

- **Registration (through Pearson VUE)**

Pearson VUE will manage all registration and payments after the pre-registration stage. Some automated emails may end up in spam or junk mail. Pearson VUE may notify candidates of any changes to bookings; candidates must ensure that their contact information is accurate.

Cancellations made less than 7 days in advance 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. The instructions can also be accessed through Pearson VUE's online resources before the exam. Candidates will complete the exam on a computer at the test centre.

The exam already includes a basic calculator and a whiteboard application. The examining test centre will give candidates an erasable sheet.

If the candidate chooses to take the exam from home using online proctoring (OnVUE), a basic calculator and whiteboard are built into the exam as an online application for the candidate to use at their convenience. Therefore, **no form of stationery is permitted when taking the exam.**

Candidates are required to bring a government photo ID and another form of identification. Please ensure that the registration details match your photo ID exactly; otherwise, you will be refused entry. If denied entry, candidates should contact BSE immediately.

The test centre will not facilitate any last-minute requests for special accommodations.

- **Results**

Results are released 5-6 weeks after sitting the exam, and scores will be uploaded to BSE profiles. **Both sections must be passed for a complete pass.**

Pass: Candidates can request portal login details to upload logbook reports. The deadline appears under 'Practical submission deadline' after written exam scores in the 'Participation' tab of the BSE profile. This information is also emailed to the candidate (subject to account status).

Fail: candidates can register interest to sit in the next sitting of the exam.

- The reduced fee applies only to first-time, unsuccessful candidates who sit the exam physically. The second attempt must occur within 12 months. **Results cannot be appealed or remarked since tests are computer-based.**

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

- **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-takers/Resources.aspx.

Pearson VUE has a strict admissions policy. Candidates' registered names should be exactly as they appear on their government-issued photographic ID.

Appendix 5: Written exam multiple choice questions example

Answer 'True' (T) or 'False' (F) to each of the following.

There is no negative marking - one mark added for a correct answer, no mark deducted for an incorrect answer.

Q1	**With regard to ventricular septal defects:**	
a)	Doubly committed defects are the most common	F
b)	The Bernoulli equation can be used to assess the pressure difference between the left ventricle and the right ventricle	T
c)	VSDs always communicate between the right and left ventricles	F
d)	A peri-membranous ventricular septal defect rarely causes pulmonary hypertension	F
e)	The parasternal short axis view is ideal for diagnosing the type and location of a ventricular septal defect	T

Q2	**The following statements regarding congenital heart disease are true:**	
a)	Coronary aorto-ventricular fistula may be associated with a dilated coronary sinus and proximal coronary artery	T
b)	A highly pulsatile aortic root and akinetic abdominal aorta are associated with aortic coarctation	T
c)	An ostium primum ASD may be associated with a common AV valve	T
d)	Large, overriding aorta, ASD and tricuspid stenosis are all associated with tetralogy of Fallot	F
e)	Eisenmenger reaction describes a combination of left-to-right shunt with secondary pulmonary hypertension	T

Q3	**The following are echo features of arrhythmogenic right ventricular dysplasia:**	
a)	Global RV dilatation and hypokinesis	T
b)	Localised aneurysms of the right ventricle	T
c)	Severe left ventricular systolic impairment	F
d)	Regional right ventricular hypokinesis	T
e)	Pulmonary stenosis	F

Appendix 6: Written exam image reporting questions example

A number of moving clips and stills will be included in each question. Although these can be viewed and replayed as many times as the candidate wishes, the candidate should be mindful of the time spent on each question.

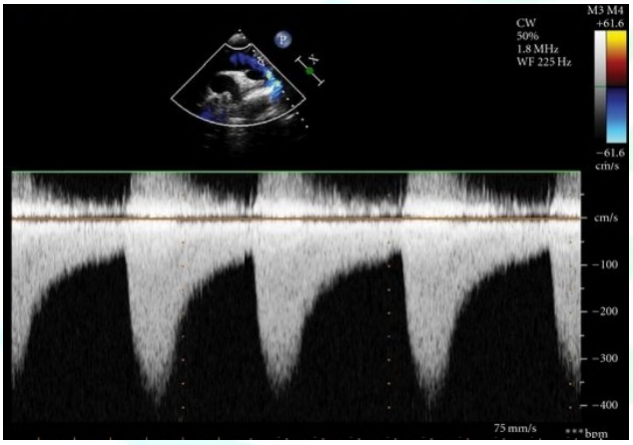
The **SINGLE BEST ANSWER** should be selected**.**

There is no negative marking - one mark added for a correct answer, no mark deducted for an incorrect answer.

Case 1

Request: 43 year old man presented with a systolic murmur, no previous cardiac history.

Data: LVIDd: 5.0cm, proximal ascending aorta: 3.4cm, AV Vmax: 3.8m/s, max PG: 57mmHg, AVA: 1.1cmsq, TAPSE: 2.1cm, descending aorta Vmax: 3.5m/s, AR pressure half time: 560msec.



1.1	**The aortic valve is:**	Answer
a	Not a native valve	
b	Highly likely bicuspid	T
c	Highly likely unicuspid	
d	Highly likely tricuspid	

1.2	**The images and data demonstrate:**	
a	Normal aortic arch	
b	Aortic coarctation with patent ductus arteriosus	
c	Aortic ridge at the level of the isthmus	
d	Significant aortic coarctation	T

Appendix 7: Logbook guidance and marking criteria

In order to meet all competencies of this accreditation process the logbook should represent good/excellent examples of a candidate's daily workload.
Whilst we encourage the use of good/excellent work to be included in the logbook, it is acknowledged that not every report in the logbook will meet this standard. Therefore, when considering whether to include a report, please refer to the following as an absolute minimum.

*****If a report does not meet the below, it should not be included as a logbook report*****

Clinical question: Must be stated.
Age: Must be stated.
BSA: Height and weight to determine BSA should be quoted where possible. For infants, if only weight is available this should be quoted.
BP: Measurement only where appropriate e.g. aortic stenosis.

Paediatric studies
Height and weight, or weight only in infants
Rate and rhythm
Image quality / cooperation of patient

Position, Situs and connections: Describe the position of the heart in the chest and the atrial situs. Describe the atria ventricular and ventriculo arterial connections.
For example, Levocardia, Situs solitus, AV-VA concordance

Systemic venous return: Describe the drainage of the SVC and IVC to the right atrium.

Pulmonary venous return: Describe the drainage of the pulmonary veins

Atrial septum: The septum appears intact with no shunts seen or describe any abnormalities

Right atrium: Normal/abnormal in size

Left atrium: Normal/abnormal in size. Biplane volume measurement where possible.

Tricuspid valve: Describe the observed structure and comment on TR. TR Vmax should be given to assess RV systolic pressure where present.

Mitral valve: Describe the observed structure and comment on MR. Mitral valve Doppler assessment and TDI measurement ideally.

Pulmonary valve: Describe the appearance of the valve, comment on stenosis / regurgitation. Comment on left and right pulmonary arteries, comment of patent ductus arteriosis present.

Aortic valve: Describe the appearance of the valve, comment on stenosis / regurgitation. Comment on coronary artery origins.

Right ventricle: Right ventricular assessment of size and function, TAPSE and RV S'

Left ventricle: LVIDd and LV wall thickness, visual assessment and description of function. Where possible, biplane Simpson's assessment for ventricular function.

Ventricular septum: The septum appears intact with no shunts seen or describe any abnormalities
RVOT / LVOT: Assess for right and left ventricular outflow tract obstruction using colour and PW Doppler modalities.

Aorta: Comment on ascending aorta size, aortic arch, proximal descending aorta and abdominal aorta where possible. Assess Doppler velocities in ascending and descending aorta.

Pericardium: Comment on absence / presence of pericardial fluid

Conclusion / Summary:
Must relate to the clinical question.
Z scores may be used to assess structure size in children in relation to their BSA or weight.

Adult Studies
The report format for an adult CHD study may be presented in the style suggested in the BSE adult TTE accreditation pack, all parts and connections of the heart must be determined.

Logbook marking criteria

When marking a candidate's logbook, the Assessor will review a selection of reports in the candidate's logbook.

The following marking criteria is used when assessing each logbook report

Does the report meet the following criteria?	Yes / No (if no, state reasons why)
Fully Anonymised	
Indication for echo present	
Appropriate 2D measurements present	
Appropriate Doppler calculations present	
Do measurements / Doppler calculations match descriptions	
All parts of heart described	
Descriptions complete	
Appropriate to request	
Conclusion present	

Logbook outcomes include:

Satisfactory log-book for BSE accreditation OR Unsatisfactory at present and a resubmission is required.

If a logbook is unsatisfactory, the candidate will be asked for one of the following resubmissions.

- **25-75 further specified reports:** To address repeated inaccuracies, lack of correct conclusion or lack of sequential systematic comments on all parts of the heart. (e.g. lack of RWMA description + lack of quantitative valve pathology measurements).
- **200 reports:** To address significant errors, inaccurate information, or a lack of systematic comments, the logbook will need to be completely resubmitted for the presence of a Patient ID on any report.

To ensure consistency across logbook marking, all logbooks are discussed with the national logbook leads and chief assessor prior to a resubmission being requested.

Appendix 8: Guidance for the removal of patient identifiable data

The duty of confidentiality arises from the common law of confidentiality, professional obligations and staff employment contracts. Breach of confidence may lead to disciplinary measures, question professional reputation and possibly result in legal proceedings.

Guidance is provided to Healthcare Professionals 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 any part of the submission required for this accreditation process. In contrast, anonymised information is not confidential and may be used.

Key identifiable information includes:

a. **Patient's name**
b. **Address**
c. **Full post code**
d. **Date of birth**
e. **NHS number and local identifiable codes**

Key identifiable information may also include information that can be used to identify a patient directly or indirectly. For example, rare diseases, drug treatment, or statistical analyses involving very small numbers within a small population may allow individuals to be identified.

Guidance to candidates submitting Logbooks and Cases for Accreditation

The NHS Code of Practice on confidentiality means that evidence submitted for this accreditation process must have removed **ALL** patient identifiable information beyond gender and age/year of birth.

Reports – Please use the BSE online portal and electronically delete all patient information except age and gender.

We advocate against using other electronic anonymisation methods as sometimes data is still present. If in doubt, manually remove patient identification information before use.

Video cases—We appreciate that removing patient IDs may be difficult. Therefore, it is advised that the video cases are specifically collected and the data inputs made relevant to your cases (E.g., the Patient Name could be 'BSE Case 1', and the Patient Number could be your membership number followed by the case number, '1111-1').

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

Appendix 9: Practical scanning assessment marking criteria

The marking criteria used for the practical scanning assessment can be seen below.

2 minutes:	• Familiarisation of echo machine / equipment. • Assessor will be on hand if assistance is required.
20 minutes:	• Candidate to have 2 minutes to obtain and acquire each image. • The Assessor will instruct the candidate on the images to acquire. • The Assessor can alter echo machine / equipment setting to optimise images at the direction of the candidate.

The pass mark is set at 102 points. Once this mark is achieved the candidate will be deemed as being successful at this station.

Each image the candidate acquires is scored as per the marking scheme below.

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: optimization of images	able to fully demonstrate high quality image acquisition with appropriate

An example of the imaging list used in this assessment can be seen below.

	Image (Score Weighting)
1	Demonstrate & identify situs (5)
2	2D subcostal view demonstrating the abdominal aorta (3)
3	2D bicaval view with colour flow mapping (5)
4	2D parasternal long axis (3)
5	2D modified parasternal short axis demonstrating main pulmonary artery & branches (5)
6	Pulsed wave Doppler trace of right ventricular outflow tract (3)
7	2D proximal right coronary artery with colour flow mapping (5)
8	2D apical 4 chamber (3)
9	2D apical 4 chamber modified to demonstrate the coronary sinus (3)

Appendix 10: Patient case studies viva marking criteria

The next few pages show the individual marking criteria for each of the patient video case studies. All criteria must be met to a satisfactory standard in order for the patient case study to be passed. A minimum of two patient case studies will be assessed. The British Society of Echocardiography reserves the right to assess all five patient viva cases.

Congenital heart disease accreditation. **Case 1 – Normal study** 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 sequential, segmental assessment of the heart, including Doppler study and measurements.		**Incomplete study** Images are missing which are relevant to the accurate segmental, sequential assessment of the heart, including inadequate Doppler study or relevant measurements quoted in report but not demonstrated.	
2D measurements/M-mode (if appropriate) Accurate throughout with minor errors only		**2D measurements/M-mode (if appropriate)** 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/accurate description of all parts of the heart and connections 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 and connections Incorrect categorisation of chosen pathology Incorrect interpretation of findings in the clinical context	

Congenital heart disease accreditation. **Case 2 – Simple unrepaired lesion** 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 (if appropriate) Accurate throughout with minor errors only		**2D measurements/M-mode (if appropriate)** 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 Full assessment of the unrepaired lesion with necessary measurements No images missing which are key to pathology assessment No measurements significantly inaccurate that are key to pathology assessment		**Pathology assessment** Missing or poor quality images with do not demonstrate the lesion 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	

Congenital heart disease accreditation. **Case 3 – Uncorrected complex or cyanotic heart disease** 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 (if appropriate) Accurate throughout with minor errors only		**2D measurements/M-mode (if appropriate)** 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 Full assessment of the uncorrected complex lesion 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 the uncorrected complex lesion 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	

Congenital heart disease accreditation. **Case 4 – Repaired case of complex congenital heart disease** 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 (if appropriate) Accurate throughout with minor errors only		**2D measurements/M-mode (if appropriate)** 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 Full assessment of the repaired pathology with note to assess post-operative complications (leaks, re-stenosis) No images missing which are key to pathology assessment No measurements significantly inaccurate that are key to pathology assessment.		**Pathology assessment** Incomplete assessment of the repaired pathology 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	

Congenital heart disease accreditation. **Case 5 – Left or right heart obstruction** 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 (e.g. suprasternal view, bifurcation) 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 11: Mentor Statement & Declaration

The candidate must email a completed copy to accreditation@bsecho.org at the point of registration for a practical assessment.

I confirm that I have provided overall supervision and guidance for the following candidate during the period in which they have performed and reported logbook studies and viva cases. ☐

I have reviewed the logbook and viva cases prior to the submission, and I am fully satisfied that the candidate has met the BSE submission criteria. ☐

I believe the candidate is ready to attend the practical assessment to present their work. ☐

Following the assessment, should the BSE wish to contact me for any information, I will be able to answer any questions the BSE may have regarding the candidate's performance.

Full name of mentor	
Mentor job title	
Mentor place of work	
Mentor email address	
Mentor phone number	
Name of candidate	
BSE ID of the candidate	
Candidate's place of work	

By signing this document, I declare that the information provided in this document is true and correct to the best of my knowledge.

Mentor signature:

Date:

Appendix 12: Appeal guideline and application

Appeal application process for all BSE accreditation specialities

The following information is provided by the British Society of Echocardiography (BSE) to assist a candidate who wishes to appeal the decision of their practical assessment for any of the BSE accreditation specialities. There is no appeals process for the written examination.

Please read the following information to ascertain if there are grounds for an appeal. The information below will also provide an overview of the appeal process from start to finish.

1. Reasons for appeal

An appeal for the following reasons is welcomed by the BSE Accreditation Committee:

- A decision to refuse to accredit a person
- A decision to request a resubmission of cases (logbook or/and video-case)
- A decision to impose a condition of accreditation
- A decision to revoke accreditation on retrospective review of submitted works for quality assurance purposes
- Any other decision that is not listed above, for which the candidate feels is relevant

2. The Appeals Panel and role

The appeals panel will consist of two senior assessors who have not been involved with the original assessment and who are not from the same centre as the candidate submitting the appeal.

The appeals panel role is to:

- Look at the information used by the assessor/person who made the initial decision
- Clear up any misunderstanding
- Correct any errors
- Make a final verdict on whether the initial decision should be upheld, varied or changed
- Provided a detailed response to the candidate informing them of the decision along with feedback as to why this decision has been reached.

3. **The appeals process**

Candidates submitting an appeal must complete and return the following to the accreditation operational team within **2 months** of the initial practical assessment.

- Complete appeal form (see below)
- Any relevant documentation (Assessor's mark sheets/comments)
- **Appeal fee £100** to be paid by BACS (see bank details below)-
  Bank Natwest- Account number:73699519, Sort code- 53-70-15, include **A-**followed by your **BSE ID** number as the payment reference.

Please note that if the appeal outcome changes from the original decision, the fee will be reimbursed.

Please send this form via email to **accreditation@bsecho.org**. If you have any supporting documents or case presentations, please request an upload link from the accreditation team.

4. **Appeal outcome**

The appeal panel appointed will review the appeal application. This will usually be at the next practical assessment day to ensure a fair hearing (please be mindful that assessors are volunteers of the BSE who have other work and life commitments and should not be expected to work above what is reasonable).

The panel will provide written feedback on the appeal outcome and any relevant feedback. This will be provided to the candidate who submitted the appeal within 28 days of the appeal being heard.

The review panel's decision is final. There is no appeal against the decision of the appeals panel.

APPEAL FORM

Applicant Details:

Title: ☐ Dr ☐ Mr ☐ Ms ☐ Mrs ☐ Miss ☐ Other (please specify): Click or tap here to enter text.

Membership number: Click or tap here to enter text.

Hospital/Company: Click or tap here to enter text.

Candidate postal address: Click or tap here to enter text.

Telephone: Click or tap here to enter text.

Email: Click or tap here to enter text.

Question 1: What decision are you appealing?

☐ A decision to refuse to accredit a person (go to Question 3).

☐ A decision to request a resubmission of cases (go to Question 3).

☐ A decision to request a resubmission of reports (go to Question 3).

☐ A decision to impose a condition of accreditation (go to Question 3).

☐ A decision to revoke accreditation on retrospective review of submitted works for quality ☐assurance purposes (go to Question 3).

☐ Other (go to Question 2).

Question 2: Please list the details of the condition or conditions, or any other decision, that you are appealing (after filling in the information, go to question 3).

Click or tap here to enter text.

Question 3: When did you receive notice of this decision? (After filling in the information, go to Question 4).

Click or tap here to enter text.

Question 4: What are your reasons for appealing the decision?

You may wish to attach additional documents to this form. Please ensure you detail which exact cases and which sections of marking you are querying. Please provide copies of the original cases and reports submitted if appropriate

Click or tap here to enter text.

By signing below, you confirm that you have read the guidelines and are aware of the timeframe required to provide a complete outcome for this appeal application.

Appeal fee £100 payment date: Click or tap to enter a date.

Signature: Click or tap here to enter text.

Date: Click or tap to enter a date.

End of form

Appendix 13: Terms and Conditions Written Exam

By registering for the written exam, the candidate agrees to the terms and conditions listed below.

1. **To pursue the written (theory) examination for BSE level II accreditation,** a candidate must:
    a. Have an active (paid) BSE membership.
    b. The membership account must be populated with the candidate's full name as it appears on their government photo identification.
    c. The membership account must include a complete postal address, contact telephone number and a current email address.
    d. The candidate is responsible for updating their BSE profile before registering interest to take the written exam.
    e. The candidate must read the relevant accreditation pack before registering for the exam.

2. **Pre-registration** is a **compulsory step** to register interest in taking the exam; this must be completed after becoming a paid BSE member and completing the online pre-registration form. Through pre-registration, the candidate grants the BSE permission to share personal data with Pearson VUE testing services.
    a. Pre-registration must be completed within the advertised registration period.
    b. Requests after registration closing dates will not be accepted.
    c. Payment is not expected at the point of pre-registration.

3. **Special accommodations:** additional time, nursing or relief breaks, could be permitted if the candidate:
    a. Provides documentation from a governing body to confirm the details and reasoning for the special accommodations.
    b. The documentation must be submitted within the pre-registration window to allow time for BSE to approve and for Pearson VUE to accommodate the request.
    c. The candidate must immediately contact the Accreditation department if a diagnosis has been made post-pre-registration.
    d. All queries will be directed to accreditation@bsecho.org, quoting the five-digit BSE ID number.

4. **Registration through Pearson VUE:** upon successfully transferring data to Pearson VUE, the candidate will receive automated messages to create a Pearson VUE account and then book the exam.
    a. Candidates must read the booking instructions and book the exam within the registration booking window.

b. Late registrations will not be accepted.

5. **Fee payment:** the appropriate fee must be paid in full when booking the exam. The reduced rate only applies to candidates who have taken the second attempt after an unsuccessful first attempt (physical).

6. **Cancellations:** cancellations made less than 7 working days before the exam will not be eligible for a refund. Cancellations must be made more than 7 working days before the exam through Pearson VUE.

Appendix 14: Terms and Conditions- Practical assessment

Assessment eligibility:

The BSE Practical Assessment is available to Level II candidates who have successfully passed the written exam with a current membership.

Level 1 candidates with a current membership and a completed logbook are eligible to take the practical assessment.

A mandatory booking fee must be paid when registering for a practical assessment. This fee is non-refundable and cannot be transferred under any circumstances. Places for assessments are allocated on a first-come, first-served basis and depend on the successful submission of the logbook. Once a venue reaches its capacity, candidates' names will be added to the waiting list. Registration will close once the maximum capacity for the practical assessment is reached.

When registering for the waiting list, the candidate acknowledges that a logbook submission deadline is advertised on the registration page and that the candidate intends to submit their logbook by that deadline, even while on the waiting list.

BSE reserves the right to reject registrations that are not eligible for the assessment.

**Booking fee noted online and in the relevant accreditation pack. Fees are subject to annual increases.*

Cancellations:

Cancellations with less than one week's notice (7 calendar days or less) will be classed as a no-show and automatically fail.

Appeals may be considered by the Accreditation Committee in cases of extenuating circumstances.

All cancellations must be made in writing to accreditation@bsecho.org stating name, membership number, date and time of confirmed assessment and reason for cancellation.

Personal Property:

BSE accepts no liability for the loss of belongings at the assessment venue.

Candidates are allowed to bring a bottle of water, any device, and printed reports needed for their assessment. These items can be stored in a simple carrier for easy movement between stations.

Cloakroom facilities differ between venues; we advise candidates to pack their belongings appropriately. Candidates must keep their photographic identification with them at all times.

All items are left in designated areas at the owner's risk. Please do not bring any other valuables.

Logbook and Digital Cases

Logbook reports and digital cases must fulfil the requirements and timelines detailed in the relevant Accreditation pack. The logbook must be submitted by the date advertised on the event's practical registration page.

By registering for the practical assessment, you, as the candidate, have accepted the following:

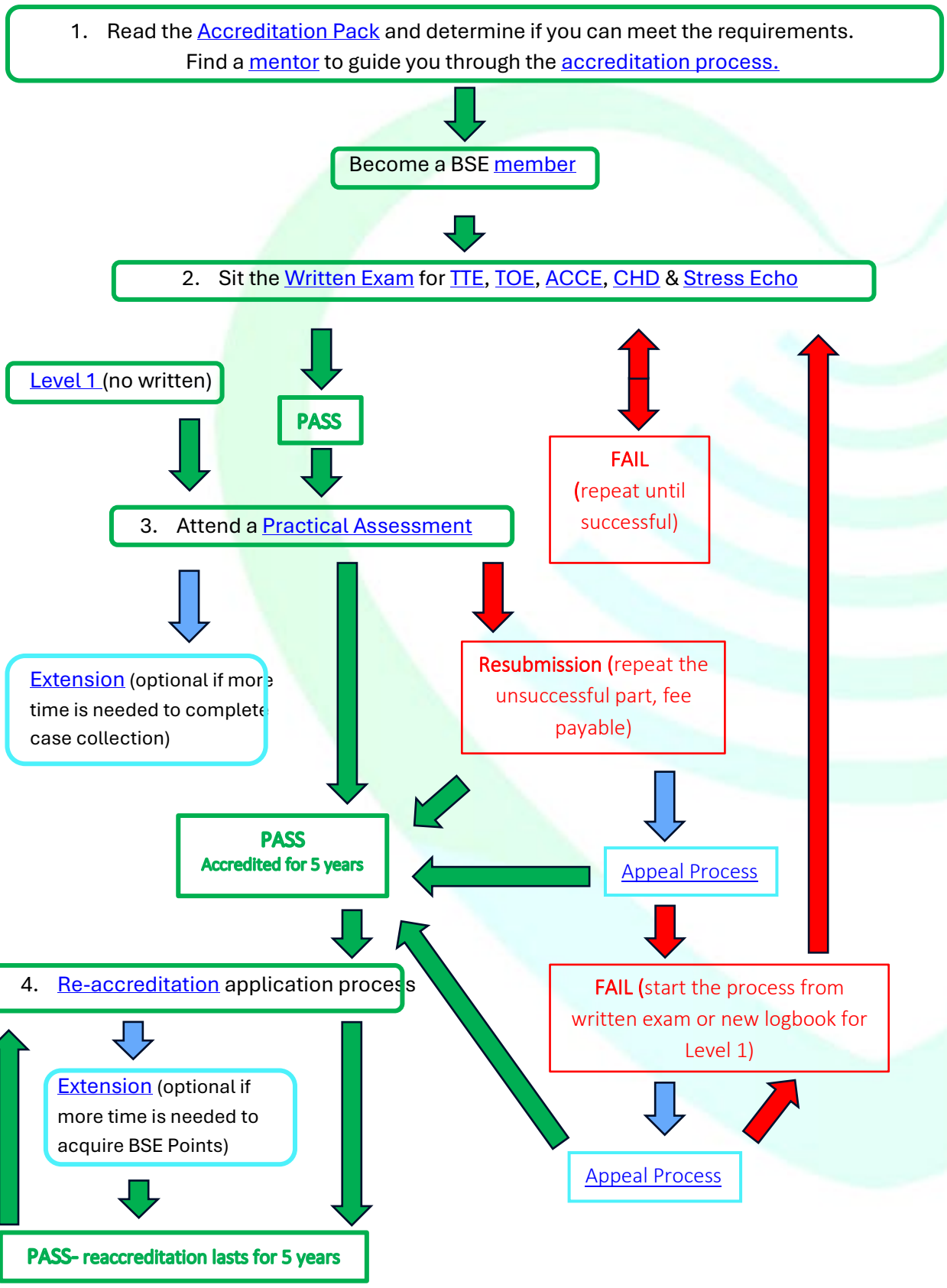
1. You have read the accreditation pack and understand the requirements for achieving BSE accreditation.
2. You have paid the relevant fees and your membership is current.
3. You have passed the written exam, and your work is ready for submission on the date you registered.
4. Your logbook must be submitted by the deadline advertised on the registration page, unless an extension has been authorised by the BSE.
5. Failure to submit the logbook by the agreed deadline will result in the loss of your placement.
6. You understand that the exam and booking fees paid are non-transferable and non-refundable.

Accommodation and Travel:

All participants are responsible for their travel and accommodation if required.

British Society of Echocardiography

Accreditation Process Overview



Useful Links & Contacts

Click the following titles to link to areas of **www.bsecho.org**

- **Accreditation process**
- **Education resources (protocols & guidelines)**
- **Extension requests**
- **Logbook portal**
- **Pearson VUE Testing**
- **Practical assessments**
- **Re-accreditation**
- **Regional representatives map**
- **Written examination dates**

Join the Accreditation Clinics on the first Thursday of each month at 1 pm to ask questions about accreditation. These clinics are hosted by the Accreditation team, with support from a committee member involved in the assessment process.

Sign up for a 👉 Accreditation clinics

Contacts

- **All accreditation** queries (including exam registrations) and requests to access the portal should be made to **accreditation@bsecho.org**
- Membership questions should be sent to membership@bsecho.org
- Events, education and e-learning questions should be sent to events@bsecho.org
- Concerns or complaints should be directed to admin@bsecho.org
- Phone number for all areas: 0208 065 5794 (Mon-Fri 9 am-5 pm, excluding UK public holidays)