

Accreditation in Stress Echocardiography

This pack is for the use of all candidates undergoing the accreditation process and becomes effective as of November 2016.

This document supersedes all previous versions.

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Welcome message from the Accreditation Chair

Dear Candidate,

Welcome to the British Society of Echocardiography. The Stress Echo Accreditation process has been set up to assist all those in training in Stress echo and is designed to accommodate the requirements of multiple disciplines including Cardiologists, Physiologists and Healthcare Scientists. It is important that you read all the information carefully before commencing your specific speciality logbook.

The written section of the Stress Echo Assessment will be held each year in various venues around the UK and Republic of Ireland. The Practical assessment will also be held in a variety of locations. Full details and registration forms will be published on the website www.bsecho.org.

We would like every BSE member to undertake the relevant Accreditation process, which has, as its ultimate aim, the achievement and maintenance of high standards of clinical echocardiography for the benefit of our patients.

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

Please let us know if we can assist you in this process in any specific way, or if you have constructive feedback to offer the accreditation committee, then please get in touch.

Good luck with your accreditation process.

Best wishes,



Dr Claire L Colebourn
Chair, BSE Accreditation Committee

Introduction and Aims

- Accreditation is run as a service for members of the British Society of Echocardiography and is not a compulsory or regulatory certificate of competence or excellence.
- Accredited members are expected to be able to perform and report stress echocardiographic studies unsupervised.
- Accreditation is a minimum requirement and cannot be regarded as a guarantee of competence.
- The Accreditation process comprises a written exam, (theory and case reporting sections) and a practical assessment comprising acquisition of defined stress echo views in an exam setting, review of the required log-book and a review of selected Viva echo cases performed to a high standard.
- Echo skills can only be maintained by continued education and practical involvement in echocardiography. The importance of this is underlined by limiting Accreditation to 5 years after which reaccreditation must be sought.

Summary of process requirements

- You must be a [member](#) of the British Society of Echocardiography
- You must hold current BSE or EACVI Adult Transthoracic Accreditation
- You should address all queries regarding accreditation to:

BSE Accreditation Administrator, address details are available on www.bsecho.org. Tel: 020 7345 5185 (lines open 10am-4pm Mon-Fri), Fax: 020 7345 5186, Email: accreditation@bsecho.org.
- You should register for the [written](#) and [practical](#) assessments by visiting the [accreditation](#) section of www.bsecho.org. This will advise the dates and location of the next examinations.
- You must pass the written assessment before attending the practical assessment.
- The practical assessment cases should be collected over a period of no more than 24 months from the written examination with the practical assessment being taken no later than two months after the end of the collection period.

You must submit:

- Five full digital Viva cases accompanied by reports signed by yourself
- A logbook containing 200 reports of a specific case mix (maximum 140 cases with no significant pathology, at least 40 cases demonstrating ischaemia and at least 20 cases demonstrating the assessment of structural heart disease (e.g. cardiomyopathy or mitral regurgitation))
- The full mentor sheet – [Appendix 9](#).

- Extensions to the 24-month deadline may be granted only following periods of parental or extended sick leave or in exceptional circumstances. Extension request forms must be submitted **before the case COLLECTION deadline**. Extension request forms can be obtained by visiting [FAQ section](#) of accreditation of www.bsecho.org. Requests received after the case deadline may not be reviewed. We strongly advise that requests are supported by documents such as doctors letter or letter from employer confirming the reasons for an extension.
- **Extensions are not guaranteed**. A non-refundable charge of £100 will be made for each extension request regardless of the outcome.
- A fee of £250 is charged for the complete Accreditation process. This fee is payable, in advance upon registration for the written section of the examination and will also cover the Practical assessment.
- Candidates who are unsuccessful in the written section of the examination will be charged a reduced fee of £125 to re-sit this section. This reduced fee only applies to candidates who re-sit the examination within two sittings of the unsuccessful attempt. A re-attempt at the Practical assessment is also subject to a fee of £125.
- Candidates are entitled to one re-attempt at the practical assessment, after which the entire process.
- The full training syllabus is available in [appendix 2](#).
- Appeals - Please see the [Appeal document](#) available on FAQs section of www.bsecho.org.

Details of [written assessment](#) and [practical assessments](#)

Written section

- The written assessment is held on two occasions each year. The Spring and Autumn examinations are held at various Pearson VUE centres (online) in the UK, Republic of Ireland and South Africa.
- Please follow instruction on [written examination dates](#) section of www.bsecho.org or see [appendix 5](#) for further information on registrations for the written exams.
- The written assessment is conducted under formal examination conditions. It is comprised of two parts: The Theory section and the Reporting section. The suggested reading list is available in [appendix 1](#).
- Both parts of the examination will be computer marked - guidelines in Appendix 5. In the written assessment it is necessary to pass both the multiple choice and imaging questions at the same exam sitting. The approximate pass mark for the Theory Section is 70/100 marks (70%) and for the Reporting Section 9/15 (60%). These may vary slightly at the discretion of the Chief Examiner following moderation.

- There is no bar to re-sitting the written assessment.
- Accreditation will only be awarded once a candidate has also successfully completed the practical assessment (logbook and cases). Satisfactory performance at the written assessment alone does not allow 'partial accreditation.'

Theory Section

- This consists of **20** questions which must be answered within 60 minutes. The questions test knowledge of echocardiographic findings related to stress echo including questions based on guidelines, indications and complications.
- Each question comprises a brief statement followed by 5 questions relating to the statement. Candidates are required to say whether each question is 'true' or 'false' a blank response is used for 'don't know.' Some example questions are provided in Appendix 3.
- The subject matter reflects the spectrum of clinical practice according to both frequency and technical complexity. Thus ischaemic disease is more frequently represented than valve disease since it forms the majority of Stress echo procedures. This part of the examination will be marked +1 for correct answers, 0 for incorrect or unanswered questions (no negative marking).
- There are no 'trick' questions.
- There are no fixed number of correct answers, i.e. for each question it is possible for every answer to be false or every answer to be true or any combination of true or false.
- The maximum possible mark is 100.

Reporting (imaging)

- This will consist of 15 stem questions relating to 15 case studies. Each question will have 5 possible answers and candidates will be asked to select the best answer. These reflect the range of clinical material seen in routine stress echocardiographic practice. Normal or near-normal studies may be presented.
- For each question, a number of still and moving images will be shown. The clips and stills will last 20 seconds per clip and will contain sufficient information to answer the questions. 1 minute reading time will be provided before the first case is shown. Each case is replayed once following a 1-minute pause to allow the candidate to answer and read the questions again.
- An example question is provided in [Appendix 4](#). Each case is worth 1 mark giving a total of 15.

Practical assessment

All candidates will be required to attend a Practical assessment within 2 months of their case collection deadline. The Written examination must have been passed before attending. Dates and locations will be published on the BSE website. Candidates will be

given an appointment time and should arrive at the venue up to 30 minutes prior to this. Latecomers will only be admitted in exceptional circumstances.

- **Logbooks and cases must be fully anonymised – please read the BSE Policy on the Non-Anonymisation of Patient data in appendix 14. A major breach of this policy will result in a fail.**
- An experienced echocardiographer should check logbook and video submissions before attendance at the Practical Assessment.
- The assessment will consist of 3 stations. The first station will be the logbook
- station. Logbook submission: The Logbook should be submitted in **one ring binder/file folder with the different categories separated by dividers or submitted via the online logbook portal**. Any Logbooks **not** submitted in this format may fail. Further details regarding the logbook submission can be found on page 7.
- If the candidate is successful at this station, they will progress to Station 2.
- Station 2 will consist of a Practical assessment. The Practical assessment is designed to demonstrate the candidate's ability to carry out an Exercise Stress Echo study on a normal volunteer. The candidate will be required to give notice of the preferred stressor (either treadmill or a supine bicycle) so that the correct apparatus can be made available. Only the BSE recommended protocols for both apparatus will be used. (ie. WHO 25 protocol for the bicycle and BRUCE protocol for the treadmill, please refer to the June 2016 issue of Echo, http://bsecho.azurewebsites.net/media/185477/echo_no94_web.pdf)
- An assistant will be present to help with the treadmill/bicycle controls on the instructions of the candidate, but the candidate will be expected to acquire the images. The Assessor(s) present in the room may help adjust the echo machine controls as directed by the candidate if the system is unfamiliar. The candidate will be informed which views will be required prior to the assessment, and this needs to be reciprocated for each stage of the protocol. The study may be stopped before completion of the protocol at the assessor's discretion. There may be discussions around image acquisition (e.g. optimisation) during the assessment. If the views are obtained to the expected standard, the candidate will progress to Station 3.
- Station 3 will be a Viva assessing the video cases. All aspects of stress echo may be discussed during this station while assessing the cases. Further details can be found on page 8. If the candidate is successful at station 3, they will be deemed to have passed the Accreditation process.

Logbook

- The Logbook should comprise details of **200 stress echo** cases personally **performed and reported** by the candidate during the specified period of 24 months. It is not acceptable to include cases performed or reported by someone else.
- The format for the Logbook is a set of copies of actual clinical reports enclosed in a folder or binder, or submitted via the BSE online logbook portal. The reports should ensure:

- All patient data has been removed including the full date of birth, name or address. See [appendix 10](#)
- All cases have been collected in accordance with local requirements for data protection, i.e. your trust policy.
- Inclusion of cavity and Doppler measurements, objective observations and a comment - [appendix 7](#).
- The signature and full name of the candidate is included. At least 180 cases should be reported primarily by the candidate alone although another operator may check them. It may be necessary for the

Candidate to attend another department to gain experience in certain conditions, and it is acceptable to include up to 20 reports that are overseen by experienced operators in this way. In some cases, Trust Policy dictates that Accredited Echocardiographers or medical staff only sign reports. In these cases, reports may be included in the logbook but should be countersigned by both the candidate and the supervising echocardiographer/medical personnel to confirm that the trainee has produced the report.

- The studies should reflect the normal stress echo case-load of a general adult department with the following constraints
 - Up to 140 cases may be normal
 - At least 40 cases should demonstrate ischaemia
 - At least 20 cases should demonstrate the assessment of structural heart disease (e.g. valve disease and HCM)
- Cases should be a mixture of exercise and pharmacological stress. Depending on the case mix in your base department, you may have a predominance of experience in one type of stressor. At least 25 studies need to demonstrate that you can use another type. So for example, if you have trained in a department that predominantly uses Dobutamine Stress echo (DSE), you can submit 175 DSEs and 25 Exercise stress echoes (ESE). However, please note the Practical Assessment will be with exercise so if you are not confident with either the treadmill or bicycle protocols you will be at a disadvantage. We would advise you to discuss this with your mentor to fill the training gap.
- At least 50 studies need to show the use of transpulmonary contrast. Again, please discuss with your mentor if you foresee a training gap.
- To reflect “real life” practice, up to 140 studies could demonstrate a normal response to stress.
- At least 40 studies will need to demonstrate an ischaemic response/viability.
- At least 20 studies will need to demonstrate the use of stress echo in the context of structural heart disease Eg assessment of valves or HCM.
- The different categories of echoes should be separated by dividers.
 - A tally of the primary diagnosis assigned to each case must be entered on the appropriate enclosed summary sheet - appendix 9.
 - If you have problems finding enough specific cases, discuss this with your mentor who may consider arranging for you to attend a larger centre.

Viva Case Submission

- Five Full studies with reports must be brought to the Practical Assessment. The cases **must** be anonymised. This is the section that is often done least well and is where many candidates fail. It is worth spending extra time doing this to make sure the submission is as good as it can be. Remember that it is assumed you will submit your best cases, so we will expect the studies to be complete and of a high standard. Also, remember we are assessing your echo skills, not the pathology you are sending in. A full echo evaluation using the BSE minimum dataset for TTE to rule out significant resting outflow obstruction or valve disease will need to be acquired before each case to demonstrate knowledge about the safety of stress echo. This dataset will only be scrutinised in detail by the examiner for case no 5. The following minimum criteria for stress echo image acquisition are required for the video cases. These and your reports will be scrutinised:
 - Case 1: A normal Dobutamine stress study using trans-pulmonary contrast. The Parasternal or apical long axis, parasternal short axis, Apical 4-chamber and apical 2-chamber views have to be acquired. 4 stages (baseline, low dose, intermediate dose and peak dose) have to be displayed in a quad-screen and synchronised format.
 - Case 2: A normal exercise stress study on the treadmill or bicycle with/without contrast. At least 4 views have to be acquired as above but can be baseline and post-peak if using a treadmill or as per case 1 if using a bike.
 - Case 3: A reversible ischaemic response with Dobutamine or exercise using the appropriate displays as above.
 - Case 4: A Dobutamine study either showing non-viable or viable myocardium using at least the low and intermediate doses of Dobutamine using the same views and displays as above. Peak dose imaging is not required but can be done if reversible ischaemia is also being demonstrated in the case.
 - Case 5: A stress study to evaluate structural heart disease. This could be a viability study for aortic stenosis with left ventricular impairment. Another example would be a study to evaluate exercise-induced pulmonary hypertension in the context of mitral regurgitation. Perhaps a study to assess LVOT gradient on exercise could be your best example.

In order to ensure that your cases play properly and remain anonymised at the assessment, it is recommended that you bring your own laptop to the centre having checked that the cases play on this.

- **All** cases must have patient data removed. Some machinery cannot do this post-examination so please ensure due care is taken to put 'case 1' instead of patient's name or patient's personal details.
- Alternatively, you may wish to use descriptions of pathology such as "aortic stenosis". It does not matter so long as it is very clear to the marker.
- Please ensure that each case and accompanying report is clearly labelled in the same

manner so that the marker can easily match the case with the report.

- Reports should include quantitative measurements, observations and a conclusion or summary.
- The cases must be submitted as digital loops and stills within a PowerPoint presentation.
- Cases that are of high quality may be copied to be used in subsequent BSE written exams.

Outcomes and process for re-attempts

If you are successful at all 3 stations, you will be deemed to have passed the Accreditation process and will receive your certificate before leaving the assessment.

- If you are unsuccessful at any station, you will be deemed to have been unsuccessful at this sitting of the practical assessment. You will be provided with constructive feedback to facilitate a re-attempt, and offered the opportunity to continue to experience the next station. This will be a formative assessment only – once a station has been failed it is not possible to pass further stations at the same sitting. However, constructive feedback will be given to help you to understand the requirements of the station and facilitate a subsequent re-attempt. Please note this feedback is for guidance only and does not necessarily represent the opinion of the deciding assessor at your next attempt. To re-attempt, you will need to attend another practical assessment and begin at the station at which you were unsuccessful and complete all remaining stations successfully. The timescale allowed for re-attempts will depend on which stations were not passed and the number of Viva cases required to be resubmitted. This will be discussed with you at the assessment.

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

Appendix 1: Suggested Reading List

The syllabus is set by the Accreditation Committee of the British Society of Echocardiography and is presented as a guide to candidates.

The reading list is provided by the Accreditation Committee of the British Society of Echocardiography.

- ASE guidelines on performance, interpretation and application of stress echo; Pellikka et al. Journal of the American Society, September 2007.
- Contrast echocardiography: evidence-based recommendations by European Association of Echocardiography; Roxy Senior et al. European Heart Journal Cardiovascular Imaging; Volume 10: p194 – 212.
- Stress echocardiography expert consensus statement- EAE guidelines; Sicari et al; Circulation. 2010;121: p1756-1767.
- EACVI toolbox on contrast echo- Lead authors Roxy Senior and Benoy Shah. <https://www.escardio.org/Guidelines-&Education/Practice-tools/EACVI-toolboxes/Contrast-Echo/Contrast-Echocardiography-Box>
- Chest pain of recent onset: Assessment and diagnosis of recent onset chest pain or discomfort of suspected cardiac origin. NICE guidelines 95. March 2010. www.nice.org.uk
- ESC guidelines on the management of stable coronary artery disease: the Task Force on the management of stable coronary artery disease of the European Society of Cardiology. Task Force Members. Eur Heart J 2013;34(38):2949-3003
- Guidelines on the management of valvular heart disease (version 2012): the Joint Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS). Eur Heart J 2012;33:2451-96
- 2014 ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management: The Joint Task Force on non-cardiac surgery: cardiovascular assessment and management of the European Society of Cardiology (ESC) and the European Society of Anaesthesiology (ESA). Eur Heart J. 2014 Sep 14;35(35):2383-431
- Bierig S, Ehler D, Knoll M, Waggoner A. American Society of Echocardiography minimum standards for the cardiac sonographer: a position paper. J Am Soc Echocardiogr 2006;19:471-4
- Incidence, Pathophysiology, and Treatment of Complications During Dobutamine-Atropine Stress Echocardiography, Marcel L. Geleijnse et al.; Circulation. 2010;121:1756-1767
- Bracco revised warnings for Sonovue, October 2014 www.mhra.gov.uk/home/groups/comms-ic/.../con475311.pdf
- Picano, Eugene. Stress Echocardiography, Sixth edition, Springer 2015

Appendix 2: Training syllabus for BSE Stress echo accreditation

Topics that may be included in the multiple choice examination

1. Underlying Principles

- a. Ischaemic cascade
- b. The difference between wall motion imaging and perfusion imaging
- c. The relationship between coronary arteries and LV segments
- d. Working knowledge of chest pain guidance form NICE (ref 1) and ESC guideline on stable coronary disease (ref 2)
- e. Role of stress echo in the assessment of structural heart disease (ref 3)

2. Indications

- a. Diagnosis of ischaemia
- b. Functional significance of known CAD
- c. Risk stratification post-myocardial infarction
- d. Post revascularisation (thrombolysis, PTCA, CABG) prognosis
- e. Pre-op evaluation prior to non-cardiac surgery ESC/ESA guidelines (ref 4)
- f. Assessment of transplant CAD
- g. Myocardial Viability
 - i. Myocardial stunning
 - ii. Hibernating myocardium
 - iii. Myocardial scar or non-viable myocardium
- h. Assessment of contractile reserve in DCM
- i. Stress Echo for Haemodynamics
 - i. Valvular stenosis
 - ii. Valvular regurgitation
 - iii. Prosthetic valves
 - iv. Pulmonary hypertension
 - v. Hypertrophic cardiomyopathy

3. Relative or true contraindications

- i. Unstable angina
- ii. Acute MI within 48hrs
- iii. Haemodynamic instability, eg hypotension, severe hypoxia
- iv. Hypertension- BP>200/110 at baseline
- v. Serious, uncontrolled arrhythmias

- vi. Mobile LV thrombus
- vii. Symptomatic severe aortic stenosis
- viii. Decompensated heart failure
- ix. Acute myo/pericarditis
- x. AV block and asthma (Adenosine)

4. Technical Aspects

- a. Types of tests (pros and cons)
 - i. Treadmill
 - ii. Bicycle
 - iii. Pharmacological- Dobutamine/Dipyridamole/Adenosine
 - iv. Adjunctive use of Atropine
 - v. Role of pacing
 - vi. Role of handgrip
- b. Consent
 - i. Verbal vs written
 - ii. Patient information
- c. Staffing requirements
 - i. Role of the physician, nurse, physiologist
 - ii. Training in TTE and stress echo
 - iii. Training in ALS/ILS
 - iv. Competency maintenance 100/operator/year (ref 5)
- d. Protocols
 - i. Protocols for exercise- both treadmill and bicycle Protocols for Dobutamine/Dipyridamole/Adenosine
 - ii. Basic knowledge of the stressor pharmacokinetics
 - iii. Protocols for viability
 - iv. Use of beta-blockade
 - v. Use of Atropine/hand grip
- e. End-points
 - i. Completion of protocol
 - ii. Target heart rate/workload
 - iii. Hypotension (BP <90)
 - iv. Hypertension (BP ≥ 220/120 mmHg)
 - v. Sustained arrhythmia
 - vi. Significant ischaemia including cavity dilation
 - vii. ST elevation on ECG if monitored
 - viii. Significant symptoms
- f. Side effects and complications
 - i. Vasovagal reactions
 - ii. The occurrence of major complications (ref 6)
- g. Set-up/equipment/drugs
 - i. Digital echocardiography machine with offline analysis package specific for SE
 - ii. Automated blood pressure machine with manual back up if needed.

- iii. Continuous ECG monitoring
- iv. Fully equipped resuscitation trolley with defibrillator
- v. Oxygen supply and suction.
- vi. Availability of transpulmonary contrast when echo window is suboptimal
- vii. Drugs to manage severe allergic reactions and anaphylactic shock. To include – IV adrenaline 1:1000, IV chlorpheniramine, IV hydrocortisone, salbutamol nebuliser – in dose and preparation to meet current Resuscitation UK guidelines
- viii. Cannulation equipment
 - ix. Exercise treadmill and/or semi-supine bike with protocol options
 - x. Dobutamine infusion and administration pump.
 - xi. IV Atropine - up to 1.2mg.
 - xii. IV beta-blockers, e.g. metoprolol
 - xiii. Aminophylline
- h. Image acquisition
 - i. Baseline minimum dataset
 - ii. Commence with apical views- Ap4c, Ap2c +/- Ap 3C
 - iii. PLAX and SAX
 - iv. Peak/post-peak imaging for exercise (suggested timing of post-peak images within 60 secs)
 - v. 85% target vs 100% target HR
 - vi. Role of recovery imaging
 - vii. Imaging during symptoms

5. Interpretation

- a. Quad screen display
- b. Assessment of wall thickness vs WMAs
- c. Patterns for ischaemia, hibernation, stunning and non-viability/scar
- d. Wall motion score index
- e. Nomenclature of 17 segment model
- f. Inter-observer variability and reproducibility
- g. Causes of false positive tests
 - i. Non-ischaemic cardiomyopathy- mismatch without CAD
 - ii. Septal motion abnormalities (LBBB, post-CABG)- overcome by assessing wall thickness
 - iii. Basal inferior wall artefact
 - iv. Hypertensive response- usually preserved wall thickness
 - v. Poor image quality
 - vi. Interpreter bias
- h. Causes of false negative tests
 - i. Single vessel disease
 - ii. “Mild” coronary stenosis

- iii. Left circumflex artery disease
- iv. Inadequate stress
- v. Rapid recovery
- vi. Poor image quality
- vii. Severe LVH
- i. Accuracy
 - i. Sensitivity and specificity
 - 1. Overall and in different coronary territories
 - 2. In single vs multivessel disease
 - 3. In the context of LVH and LBBB
 - 4. In viability assessment
 - ii. Comparisons with
 - 1. exercise ECG
 - 2. other functional imaging modalities
 - iii. Comparisons between
 - 1. Treadmill vs bicycle
 - 2. Exercise vs pharmacologic
 - 3. Comparison of various pharmacologic agents
 - 4. Contrast vs no contrast
 - 5. Perfusion vs WMA assessment
- j. Prognostic value of a negative vs positive test

6. Contrast Echocardiography & Tissue Harmonic Imaging

- a. Bubble characteristics
 - i. composition
 - ii. size
 - iii. Stability
 - iv. Administration (bolus vs continuous)
 - v. Safety
 - vi. Available agents in the UK
- b. Instrumentation for Contrast Agents
 - i. Mechanical Index
 - ii. Fundamental vs Harmonic imaging
 - iii. High (power Doppler) vs low power (Pulse inversion, power modulation) imaging
 - iv. Contrast destruction/refill analysis (qualitative and quantitative)
 - v. Signal to noise ratio improvement techniques (background subtraction, filtering)
 - vi. Capture mode
- c. Capture mode
 - i. Continuous
 - ii. Triggered (intermittent; gated)
 - iii. Destruction/fill imaging
 - iv. Sequential pulse imaging
- d. Clinical Applications

- i. Endocardial border enhancement
- ii. Global and regional wall motion evaluation
- iii. Doppler signal enhancement
- iv. Myocardial perfusion
- e. Contraindications and warnings for contrast (guidance is for Sonovue, which is the main agent used in the UK- please see revised Bracco guidelines from October 2014, ref 7)
 - i. Contra-indicated in known hypersensitivity
 - ii. Contraindicated in large right-left shunts
 - iii. Contraindicated in severe pulmonary hypertension >90mmHg
 - iv. Caution advised within 7 days of any cardiac decompensation
 - v. “Not suitable” in ventilated patients
 - vi. “Not suitable” in patients with unstable neurological disease
 - vii. “Should not be administered” in pregnancy and lactation

7. Basic knowledge of new technologies applied to stress echo

- i. Real-time 3D echo
- ii. TDI and derivatives
- iii. Coronary flow reserve

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

Appendix 3: Proficiency Examination: Example Theory Questions

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

Q1	The following are all acceptable indications for stress echocardiography	
a)	Assessment of the functional significance of a 60% lesion on CT angiography	T
b)	Determination of viability following inferior myocardial infarction with known right coronary occlusion	T
c)	Diagnosis of crescendo angina in a 67 year old male with a typical history and pre-test probability of 93%	F
d)	Determination of prognosis following anterior myocardial infarction	T
e)	Risk stratification prior to abdominal aortic aneurysm repair in a patient unable to exercise due to claudication	T

Appendix 4: Proficiency Examination: Example Reporting Questions

Clips and stills will be shown lasting 1-3 mins and below is an example of a question with all relevant information provided.

SELECT THE SINGLE BEST ANSWER There is no negative marking. One mark added for a correct answer, no mark deducted for an incorrect answer.

Case 1

The case shown in the accompanying images demonstrates

- a. Ischaemia in the right coronary artery (RCA) territory
- b. An infarction in the left anterior descending territory
- c. An infarction in the RCA territory
- d. Ischaemia in the circumflex territory
- e. Ischaemia in all three territories

Single best answer is (a).

Appendix 5: Pearson VUE guidance notes

BSE written exams are delivered in partnership with Pearson VUE. Candidates will be able to sit the exam at local centres throughout the UK, Republic of Ireland and in South Africa. Each candidate will have their own monitor and will be able to replay videos during the examination. Full instructions will be provided on the day of the exam.

Pre-Registration

- Candidate must register their interest to sit the [written exam](#) by completing an online pre-registration form via accreditation section of www.bsecho.org. BSE will transfer your data and requirements to Pearson VUE who will contact all pre-registered candidates with further information on confirming placements for the exam.
- Pearson VUE will manage all registration and payments after the stage of pre-registration.
- Candidates with special requirements or conditions should notify the BSE during the pre-registration stage.

On the day of the exam

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

Part 1 Theory Section

A. Time

The theory section will last 60 minutes.

B. Format

The theory section will consist of multiple choice questions.

Part 2 Digital Reporting Section

A. Time

The reporting section will last up to 90 minutes

B. Format

The section will consist of 15 cases, each with 1 single best answer questions relating to it

There will be NO negative marking for this paper – each correct answer will receive a score of 1. Incorrect or unanswered questions/stems will receive a score of 0.

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

D. Additional Information

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

Appendix 6: Curriculum-Based Competency Assessment Tool. This will also be available in digital form via the online logbook portal.

MENTOR TO COMPLETE DURING CANDIDATE'S TRAINING PERIOD

How to use this document:

You should keep it with you throughout your training period

At each hospital, you must have a mentor who should be a senior and experienced echocardiographer. Someone holding BSE Accreditation is encouraged but not mandatory.

Your mentor should initial and date each entry once he or she is satisfied that you are competent to perform and report it unsupervised. This competency checklist should be submitted with your logbook.

Knowledge of standard transthoracic echocardiography will be assumed by virtue of the entrance criteria (i.e. BSE or EACVI accreditation in TTE). The theory component will be self-taught. Your department may have suitable text-books

Knowledgebase (please also see full curriculum)

Ischaemic cascade and the differences between wall motion and perfusion imaging.
Differences between viability and ischaemia assessment
Coronary arteries and LV territories
Indications for different types of stress echo including exercise and pharmacological stress
Assessment of structural heart disease by stress echo, eg MR, HOCM, AS
Physics of transpulmonary contrast
Contra-indications and cautions for stressors and contrast
Side effects and complications
End-points for test completion
Treatment of complications including contrast reactions
Treatment of arrhythmias, eg beta blocker but also as per ILS/ALS guidelines
Knowledge of relevant guidelines, eg for chest pain or valvular heart disease testing
Knowledge of strengths and limitations of stress echo
Working knowledge of other functional imaging modalities as compared with stress echo

Practical Competencies

Interacts appropriately with patients and stress echo team
Able to obtain informed consent
Able to tease out relevant contra-indications from patient history

Recognises cautions and contra-indications from baseline study, eg thrombus, critical AS
Understands basic instrumentation

Cares for machine appropriately
Can obtain standard views at baseline and reproduce views during stress
Can carry out stress protocols according to guidelines (at least dobutamine and bike/treadmill)
Able to use Atropine and handgrip at the appropriate time

Can optimise gain settings, sector width, depth, focus, Doppler settings or colour gain as appropriate

Can handle contrast and optimise machinery for contrast settings

Can recognise and correct for artefacts, eg lateral lung shadow, apical foreshortening, LVOT vs MR

Can use all appropriate tools for valve/LVOT/PA pressure assessments

Able to recognise signs and treat contrast allergy, vasovagal response, arrhythmias, prolonged ischaemia

Interpretation competencies

Able to recognise different responses – normal, ischaemic, biphasic etc

Able to report ischaemic burden in 16 or 17 segment models of LV

Able to recognise LV dilatation

Able to recognise artefacts, eg basal inferior wall

Able to assess contractile reserve in aortic stenosis

Able to assess the severity of valve disease, eg pseudo-severe AS

Initials and date

Mentor

Name _____

Signature _____

Appendix 7: Suggested format for a report

A comprehensive report should include-

1. The indication for the study
2. Details of stress technique used including the haemodynamic parameters during the test
3. Use of contrast
4. Symptoms occurring during the test, eg whether the patient had their typical symptoms during stress
5. Assessment of the 12 lead ECG findings if used.
6. Image quality: good/moderate/poor
7. LV size and function at rest and peak
8. Wall motion assessment/scoring at each stage – example pictured below. Most modern echo systems have a template for reporting based on a 16 segment model. The 17 segment model which includes the LV apex is less common due to the fact that in the true apical imaging plane the apex is stationary and therefore wall motion is less applicable.
9. Interpretation and diagnosis including a conclusion regarding the risk stratification.

Appendix 8: Stress Echo Accreditation: Summary Sheet

Complete this sheet and place it at the front of your Logbook

Name:..... Membership No.....

BSE/EACVI Accreditation valid until.....

Date of Passing Stress Echo Written Examination.....

Case collection period

Only one diagnosis can be assigned to each study.

Summarise the primary diagnosis assigned to each case in your Logbook. (Note the target guidelines for case mix)

Primary Diagnosis	Number of cases
Normal response (max 140)	
Ischaemic response (min 40 cases)	
Assessment of structural heart disease (min 20 cases)	
Total Cases by primary diagnosis (200)	
Use of exercise (Min 25 cases)	
Use of dobutamine (min 25 cases)	
Use of transpulmonary contrast (Min 50 cases)	

Appendix 9: Mentor statement to accompany the Practical Assessment

Candidate's name _____

	Initial
I certify that the candidate has undergone a programme of training in stress echocardiography	
I certify I have observed the candidate scanning and I am satisfied that he/she is competent at completing a full stress echo study.	
I certify that the candidate has reached a standard of training to be able to independently perform and report a stress echocardiographic study. He/she has reached all of the mandated competencies. I have signed off the candidate's competency sheet.	
I certify that the candidate above has performed and reported the cases included in the accompanying Log Book within a 24-month period.	
I certify that all cases are fully anonymised (no patient's personal details such as names, full date of births or addresses) as per Appendix 13	
I certify that all cases are signed with name printed of the candidate	
I certify that these cases are being handed in as per Trust Policy Guidelines	

Mentor's name: _____

Signature: _____ Date: _____

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

Medical/Technical Head of Echocardiography's name: _____

Signature: _____ Date: _____

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

Appendix 10: BSE Policy on the Non-Anonymisation of Patient Data

Introduction

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

Guidance is provided to NHS staff in the 'NHS Code of Practice on Confidentiality' (November 2003).
http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4069254.pdf

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

Key identifiable information includes:

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

Anonymisation requires the removal of such information from all reports and images.

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

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

Guidance to candidates submitting Logbooks and Cases for Accreditation

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

In order for evidence to be considered to have been anonymised, BSE Administrators and BSE Assessors must not be able to see any of the identifiers listed above. As age is relevant to the assessment either the age or year of birth must be provided however a full date of birth must not be shown.

Reports

Please note that correction fluid may still allow data to be visible if you look at the back of the page, as does placing a sticker over the patient data. Marker pen often fades so that data may

be correctly disguised at the point of anonymisation but not when brought to a Practical Assessment session

We therefore advise:

Submitting via the logbook portal with all patient details except age and gender removed

Or: cutting out the patient data

Or: Deleting data electronically before printing

Or: Using corrective fluid or marker pen, then photocopying the sheet

Cases

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

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

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

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

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

Breach of NHS Code of Practice on Confidentiality

Major breach:

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

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

Minor breach:

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

In the event of a major breach:

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

In the event of a minor breach:

The candidate will be informed of the breach and notified of the reason for it. This will be taken into account in the marking scheme.

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

Appendix 11- Examples of Practical Assessment Marksheets for Station 1

	Candidate Initials	Assessor Initials	Comments
Logbook submitted in one ring binder/file or via logbook portal			
All cases collected within 24 month period unless Proof of Extension granted (attach email)			
200 Stress Echo reports performed and reported by the candidate. All reports with full name and signature			
All cases fully anonymised			
Correct case mix			
Curriculum-based assessment tool (Appendix 6)			
Summary Sheet present (Appendix 9)			
Mentor statement present			
Final checklist present			

	1	2	3	4	5	6
Indication given for stress echo						
Rhythm during test						
Comment on resting LV global and segmental function						
Type of stressor clear on the report						
For exercise: Duration/workload on the treadmill/bike and reason for stopping exercise						
For DSE: Peak dobutamine and Atropine dose (if used)						
The comment about LV global and segmental function at peak stress						
For structural- clear description of the relevant pathology						
Conclusion						
Pass or fail						

Appendix 12- Examples of Marksheets Station 2

<p>Acquisition should be of best quality Assessors will encourage candidates to move on once images obtained</p>	<p>You will have to declare beforehand whether you want to stress on a bike or treadmill so the correct set-up can be arranged for you. A volunteer will role play as a patient having an exercise stress echo for ischaemia testing. Please interact with him/her as you would a patient attending your stress list.</p>
<p>1</p>	<p>Check identity before starting</p>
<p>2</p>	<p>Assess safety to proceed – e.g. ask about allergies, check for unstable symptoms, check for severe aortic valve stenosis, serious arrhythmia or hypertension</p>
<p>3</p>	<p>Explain the test and consent the volunteer (verbal)</p>
<p>4</p>	<p>Identify if contrast is required- you should be able to discuss your decision-making processes.</p>
<p>5</p>	<p>Acquire Baseline images after adequate optimisation</p>
<p>6</p>	<p>Instruct your assistant (maybe the examiner or a designated physiologist from the host dept) regarding the protocol you want to use</p>
<p>7</p>	<p>Instruct the volunteer how you want them to proceed</p>
<p>8</p>	<p>Acquire low/intermediate/peak images (if bike) or post-peak images (if treadmill). The examiner will normally stop you when they have observed for long enough</p>

Mark scheme for Station 2: demonstration of performing a stress echo

Performance Competency	Criteria	F	BF	BP	P	Weighting	Guidance	Max Score
Checks patient identity	Checks patient identity using 3 unique identifiers	0	1	2	3	3	Checks the correct patient identity. Award P if 3 unique identifiers are checked, BP if 2 unique identifiers are checked, BF if 1 unique identifier is checked and F if no checks are made.	
Baseline Requirements	Pays attention to detail and is able to record baseline parameters including assessment of AV at rest	0	1	2	3	5	Ensures resting BP is normal and No evidence of AS with acquisition of good quality 2D image and CW Doppler of the AV. Award P if high quality optimised image. BP if clinically satisfactory image with limited optimisation. BF if unable to accurately acquire image although is able to identify remedial measures. F if unable to reproduce image which reflects the PLAX in the specific model.	
Contrast Requirement and Associated risks of using contrast	Pays attention to detail and is able to recognise/acquire a good image	0	1	2	3	5	Operator must identify if the patient would require contrast administration. Award P if clear communication of this is demonstrated. BP is able to identify if contrast required or not although limited knowledge of potential issues with contrast and why the decision has been made. BF if able to identify if contrast is required and demonstrates many shortcomings in knowledge of why contrast could/should be used F if unable to identify why contrast could be used and is not able to outline the potential risks of contrast.	
Acquisition of baseline Apical Images	Pays attention to detail and is able to recognise/acquire a good image	0	1	2	3	3	Acquisition of good quality 2D Apical Images in required timeframe. Award P if high quality optimised image. BP if clinically satisfactory image with limited optimisation. BF if unable to accurately acquire image although is able to identify remedial measures. F if unable to reproduce image which reflects the Assessor's image acquisition in the model.	

Appendix 13- Examples of Mark sheets- Station 3

Video Case 1: Normal Dobutamine Stress Echo using transpulmonary contrast

Competency		Satisfactory	Unsatisfactory	Comments
1	ECG			
2	Pre-stress safety checks, eg severe aortic stenosis			
3	Contrast optimisation			
4	Baseline- All views present			
5	Low- all views present			
6	Intermediate- all views present			
7	Peak- all views present			
8	Recovery (optional) views			
9	Synchronised Quad-screen display			
10	Report - accurate			

Adult Stress Echo Accreditation			
Practice must be satisfactory in all areas to pass			
Evidence of satisfactory practice	Tick	Evidence of unsatisfactory practice	Tick
ECG: present throughout with good synchronisation		ECG: Unstable or absent	
Optimisation: demonstrates good endocardial border definition with MI, gain, TGC controls		Optimisation: Frequent, repetitive optimisation errors which detract from the case conclusion	
Complete study: Images are complete enough to allow assessment of ischaemia		Incomplete study: Images are missing which are relevant to the assessment	
Report is complete and accurate		Report is incomplete or inaccurate	
<ol style="list-style-type: none"> Comprehensive and accurate description of all LV segments Correct interpretation of findings in the clinical context 		<ol style="list-style-type: none"> Partial and inaccurate description of parts of the heart Incorrect categorisation of chosen pathology Incorrect interpretation of findings in the clinical context 	

Video Case 2: Normal Exercise Stress Study

Competency		Satisfactory	Unsatisfactory	Comments
1	ECG			
2	Pre-stress safety checks, eg severe AS			
3	Contrast optimisation (optional)			
4	Baseline- All views present			
5	Low- all views present (optional)			
6	Intermediate (optional) all views present			
7	Peak/post-peak- all views present			
8	Recovery (optional) views			
9	Synchronised multi-screen display			
10	Report - accurate			

Adult Stress Echo Accreditation			
Practice must be satisfactory in all areas to pass			
Evidence of satisfactory practice	Tick	Evidence of unsatisfactory practice	Tick
ECG: present throughout with good synchronisation		ECG: Unstable or absent	
Optimisation: demonstrates good endocardial border definition with MI, gain, TGC controls		Optimisation: Frequent, repetitive optimisation errors which detract from the case conclusion	
Complete study: Images are complete enough to allow assessment of ischaemia		Incomplete study: Images are missing which are relevant to the assessment	
Report is complete and accurate 3. Comprehensive and accurate description of all LV segments 4. Correct interpretation of findings in the clinical context		Report is incomplete or inaccurate 4. Partial and inaccurate description of parts of the heart 5. Incorrect categorisation of chosen pathology 6. Incorrect interpretation of findings in the clinical context	

Video Case 3: Ischaemic stress study

Competency		Satisfactory	Unsatisfactory	Comments
1	ECG			
2	Pre-stress safety checks, eg severe AS			
3	Contrast optimisation (optional)			
4	Baseline- All views present			
5	Low- all views present (optional)			
6	Intermediate (optional) all views present			
7	Peak/post-peak- all views present			
8	Recovery (optional) views			
9	Synchronised multi-screen display			
10	Report - accurate			

Adult Stress Echo Accreditation			
Practice must be satisfactory in all areas to pass			
Evidence of satisfactory practice	Tick	Evidence of unsatisfactory practice	Tick
ECG: present throughout with good synchronisation		ECG: Unstable or absent	
Optimisation: demonstrates good endocardial border definition with MI, gain, TGC controls		Optimisation: Frequent, repetitive optimisation errors which detract from the case conclusion	
Complete study: Images are complete enough to allow assessment of ischaemia		Incomplete study: Images are missing which are relevant to the assessment	
Report is complete and accurate		Report is incomplete or inaccurate	
5. Comprehensive and accurate description of all LV segments 6. Correct segmental analysis 7. Correct correlation to coronary circulation		7. Partial and inaccurate description of LV segments 8. Incorrect segmental analysis 9. Incorrect correlation to coronary circulation	

Video Case 4: Viability study

Competency		Satisfactory	Unsatisfactory	Comments
1	ECG			
2	Pre-stress safety checks eg severe AS			
3	Contrast optimisation (optional)			
4	Baseline- All views present			
5	Low- all views present			
6	Intermediate- all views present			
7	Peak (if hybrid study) - all views present			
8	Recovery (optional) views			
9	Synchronised multi-screen display			
10	Report - accurate			

Adult Stress Echo Accreditation			
Practice must be satisfactory in all areas to pass			
Evidence of satisfactory practice	Tick	Evidence of unsatisfactory practice	Tick
ECG: present throughout with good synchronisation		ECG: Unstable or absent	
Optimisation: demonstrates good endocardial border definition with MI, gain, TGC controls		Optimisation: Frequent, repetitive optimisation errors which detract from the case conclusion	
Complete study: Images are complete enough to allow assessment of viability		Incomplete study: Images are missing which are relevant to the assessment	
Report is complete and accurate		Report is incomplete or inaccurate	
<ul style="list-style-type: none"> 8. Comprehensive and accurate description of all LV segments 9. Correct segmental analysis 10. Correct correlation to coronary circulation 		<ul style="list-style-type: none"> 10. Partial and inaccurate description of LV segments 11. Incorrect segmental analysis 12. Incorrect correlation to coronary circulation 	

Video Case 5: Structural study

Competency		Satisfactory	Unsatisfactory	Comments
1	ECG			
2	Pre-stress study to show all TTE images relevant to pathology			
3	Image optimisation			
4	Baseline- All views present			
5	Low- all views present (if relevant to pathology)			
6	Intermediate- all views present (if relevant to pathology)			
7	Peak - all views present (if relevant to pathology)			
8	Recovery views (if relevant to pathology)			
9	Synchronised multi-screen display			
10	Report - accurate			

Adult Stress Echo Accreditation			
Practice must be satisfactory in all areas to pass			
Evidence of satisfactory practice	Tick	Evidence of unsatisfactory practice	Tick
ECG: present throughout with good synchronisation		ECG: Unstable or absent	
Optimisation: demonstrates optimisation of relevant pathology		Optimisation: Frequent, repetitive optimisation errors which detract from the case conclusion	
Complete study: Images are complete enough to allow assessment of pathology		Incomplete study: Images are missing which are relevant to the assessment	