NHS
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Bristol and Weston
NHS Foundation Trust

Training Pathway in ACHD Echocardiography

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1. Introduction

Outlining a structured training program is essential when developing an ACHD Echocardiography department trainee position.

Furthermore, after obtaining the accreditation, the accredited professional is expected to maintain continuous professional development and abide by the re-accreditation processes, as presented in the table 1 below:

Table 1 – Progression, Planning, Timing and Financial Expectations for Professionals seeking CHD Accreditation

Professional Progress	Planning					£ expected[1]
Accredited Echocardiographer in ACHD	Year 1	Attend conferences with CHD echo content EACVI (€270 ≈ £230 x 2) 50 CPD/CME needed, where 25 are specific to CHD Echo €75 ≈ £65 fee for EACVI Silver Members Copy of current EACVI certificate Complete checklist Formal letter attesting to the number of studies performed 125 CHD Logbook Cases			Year 5 Re-accreditation	£525 + annual fee
Trainee Echocardiographer in ACHD	Attend the monthly SWSW ACHD webinars (£0)	Register for the CHD EACVI exam (€432 ≈ £365) Pass the CHD theory exam	Year 1	250 Logbook Cases DOPS summary sheet 10 DOPS Pass the CHD practical	Year 2	£365
Prospective trainee Echocardiographer in ACHD	Attend a morphology course e.g. Hands-on cardiac morphology, by RBH (£670) or Interactive Morphology and Echo Course, by BCH (£630)	Advise to register with EACVI Silver Member (€78 ≈ £65)	Year 1	Bristol ACHD Echo Course November (£475) or equivalent	Year 2	£1200
Adult Accredited Echocardiographer	Year 1	Attend conferences. Attend the monthly SWSW ACHD webinars (£0) BSEcho (£300 x 2) 20 credits for CPD/CME needed £115 fee for re-accreditation for BSE Declaration of Head of Echo with headed letter			Year 5 Re-accreditation	£750 + annual fee

[1] fees correct for 2023/24

This pathway applies to all professionals wishing to undergo the CHD Echocardiography training program within the Echo Department of the Bristol Heart Institute. It describes a detailed plan

for developing the skill set required for CHD echocardiography, from basic practice skills to specialised imaging techniques and reporting.

The primary objectives of the training program are to equip trainees with the skills and knowledge necessary to perform CHD echocardiography proficiently. These objectives include understanding ACHD imaging techniques, developing effective reporting and documentation practices, and refining patient interaction and communication skills that are specific for patients with CHD (such as those with learning disabilities and children).

The twelve-month training program provides a structured timeline for achieving specific objectives. Trainees will progress through various rotations and phases of skill development, gradually transitioning from supervised to independent practice (APPENDIX 1).

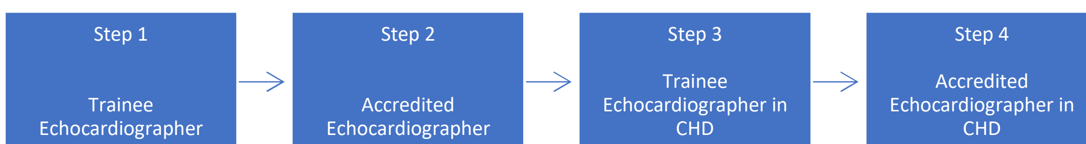
In addition to the practical aspect of the training, the trainee should self-commit to theory-based learning with the guidance of the department's CHD Echo Theory Guide, attend courses within the congenital heart disease field, and aim to successfully achieve the department's competency check (APPENDIX 2).

2. Trainee Overview

Trainees starting the ACHD Echocardiography training pathway should have a background in echocardiography and have successfully achieved adult accreditation by the British Society of Echocardiography or an equivalent accreditation.

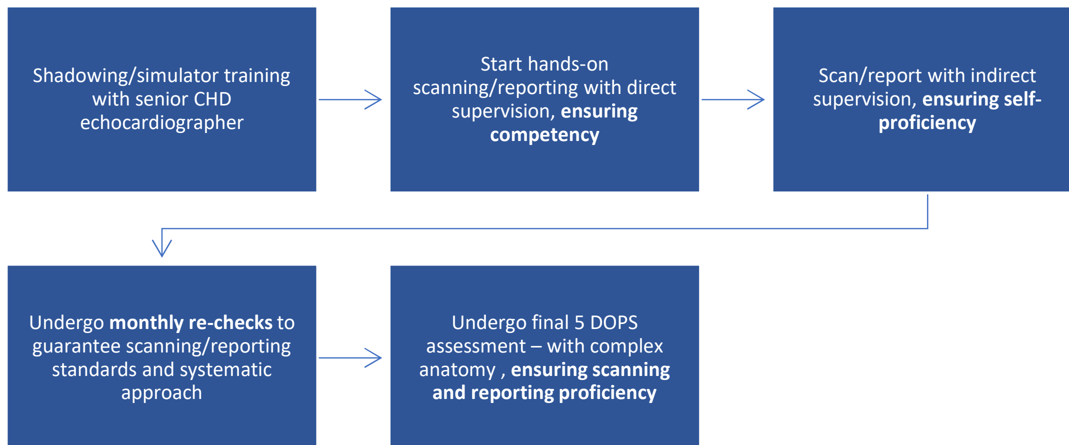
It is expected that the trainee develops their skills according to the following steps:

Figure 1 – Skill Development Steps



Whilst on step 3, trainees following all the competency criteria should gradually progress through the following targets:

Figure 2 – Trainee Progression Steps



Trainees are expected to actively engage in the learning process, participate in all assigned rotations, and adhere to the department's policies and procedures. The department emphasises professionalism, teamwork, and a commitment to continuous improvement.

Trainees should expect a dynamic learning environment that includes hands-on experience, observation of experienced accredited echocardiographers, participation in case reviews, commitment to self-directed theory learning, and cooperation with other departments. This highlights the need for active participation, a willingness to learn, and the ability to adapt to various clinical scenarios, including paediatric and adult environments, depending on availability.

Trainees' performance will be regularly assessed, based on predefined criteria outlining the evaluation process, including regular assessments, feedback sessions, and performance reviews.

The appraisal criteria, emphasising practical (APPENDIX 1) and theoretical skills (APPENDIX 2) will be explained to trainees.

3. Training Schedule

The twelve-month training program is divided into comprehensive rotations designed to cover various aspects of echocardiography skills.

The training program may provide distinct rotations, each focusing on specific skill sets. This section outlines the details of each rotation provided at both hospitals with specialities: the BRHC and the adult hospital, the BHI.

Rotations will provide exposure to basic echocardiography skills and specialised imaging techniques for paediatric and adult patients.

Table 2 – Rota opportunities within the BHI and BRHC

Sessions	Monday	Tuesday	Wednesday	Thursday	Friday
AM (BRHC / BHI)	CHD Inpatient	CHD Teaching Dr C Armstrong (ICC)	CHD Teaching Dr E Kaprevelou (CHD) Dr C Snook (CHD)	CHD Inpatients CHD Pre Admission	CHD JCC presentation Dr C Armstrong (CHD)
	ACHD MDT PHT 1x month Dr E Sammut (ICC)	ACHD Journal Club ACHD CS-Led Clinic Dr G Szantho (ACHD)	ACHD Hot Clinic Dr S Curtis (ACHD)	Dr E Sammut (Adult ICC) Dr V North (ACHD)	Adult Echo Meeting STMHosp ANC ACHD CS-led Echo clinic
PM (BRHC / BHI)	CHD Pre Admission CHD JCC	Dr I Grande (CHD) Dr J Shortland (CHD)	Dr S Narayan (CHD) Dr. D Taliotis (CHD)	Dr A Salam (CHD) Dr I Grange (CHD)	Dr AJ Tometzki (CHD) Dr A Hayes (CHD)
	Mavacamten (HCM) Dr R Bedair (ACHD)	Dr S Curtis (ACHD)	Dr G Stuart (ICC)	ACHD DOSA Dr M Turner (Devices) Bubble clinic	Dr D Taliotis (Transition)

Trainees will progress through a structured timeline, each phase building upon the skills acquired. This section provides a detailed timeline for achieving each training objective described in the practical plan (APPENDIX 1). It includes milestones for limited guidance checks, where trainees demonstrate competence under supervision, and independent performance check, indicating both competency and proficiency in the respective skill.

Table 3 – Timeline objectives

Timeline	Objectives
Introduction	Paperwork
1st week	Introduction to sequential imaging and reporting, shadowing clinics
3rd month	Objectives 1 to 9 proficiency sign-off
6th month	Objectives 10 to 15 proficiency sign-off
11th month	Objectives 16 to 18 proficiency sign-off
12th month	Acquisition of DOPS
Sign-off and Feedback	Paperwork, Competencies check

Regular progress review meetings will assess trainees' development, address challenges, and provide constructive feedback. The frequency and format of these meetings will resume at the end of each period presented on the above timeline, emphasising their importance in tracking progress, addressing concerns, and ensuring a supportive learning environment.

4. Objectives and Skill Development

Trainees will receive comprehensive instruction on basic echocardiography, principles and techniques in congenital heart disease. This includes understanding image acquisition in sequential imaging and the principle of reporting a transthoracic echocardiogram of a patient with congenital heart disease.

Trainees will have opportunities for hands-on experience under the guidance of their mentors/assessors. They will observe initially in the first week, clarify any initial questions, and consequently perform echocardiographic exams, focusing on image acquisition and optimising image quality.

Trainees will demonstrate proficiency in basic echocardiography skills through independent performance. This sign-off signifies the ability to acquire standard views of a complete CHD scan accurately and efficiently without supervision.

Trainees may be presented with challenging cases requiring them to adapt the protocol. However, the dataset should always aim to follow a similar sequence.

Trainees will learn to interpret echocardiographic findings in ACHD patients and analyse complex cardiac anatomy and pathology. They will develop skills in recognising common CHD lesions and assessing hemodynamic significance.

Each objective of the practical plan is broken down into stages, from introduction and hands-on training to limited guidance and independent performance. Clear competency assessment criteria ensure that trainees progress steadily towards proficiency in essential echocardiography skills.

5. Quality Assurance and Continuous Improvement

Regular performance reviews will be conducted to assess trainees' progress and provide constructive feedback. These reviews will include evaluations of technical skills and adherence to departmental protocols. Feedback sessions will discuss strengths, areas for improvement, and strategies for ongoing development.

In cases where trainees demonstrate deficiencies in certain skills or areas, corrective actions and remediation plans will be implemented. These plans may include additional training sessions, targeted skill development exercises, or mentorship opportunities. Trainees will be closely monitored to meet the required competency standards within the designated timeframe.

Trainees will be encouraged to participate in continuous learning activities to enhance their knowledge and skills in CHD echocardiography. This may include attending relevant conferences, workshops, and seminars and engaging in self-directed study and research with the help of the department’s theory guide. The department will provide resources and support to facilitate ongoing professional development.

The training program will undergo regular evaluation to assess its effectiveness and identify areas for improvement, so that the department can ensure that trainees receive the highest level of training and support possible.

Feedback from trainees, supervisors, and other stakeholders will be solicited and used to inform program enhancements, continuous refinement of the training pathway and methodologies will ensure that the program remains aligned with evolving best practices and standards.

6. Conclusion

Trainees will be eligible to complete the ACHD Echocardiography training program upon successfully completing all training objectives and attaining the required competency standards.

This training pathway and competency checks serve as the departmental recognition of their proficiency in CHD echocardiography and their readiness to practice independently in this specialised field.

Successful trainees will be encouraged to continue their professional development by pursuing advanced certifications, participating in continuing education activities, and actively engaging in research and publication pursuits. The department will provide ongoing support and mentorship to facilitate their continued growth and success in CHD echocardiography.

The training pathway process ensures that trainees understand their pathway to success upon completing the training program by providing clear written guidance on the theory and practical competency criteria. It reinforces the department's commitment to supporting trainees throughout their career journey and encourages a lifelong pursuit of excellence in CHD echocardiography.

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Appendix 1 – CHD Practical Competency Checklist

Name of Trainee: - Insert Name here -
Job title: - insert job title here -
Trust / Hospital: - write Trust / Hospital here -

Date of training program agreement: - dd/mm/yyyy -

Echocardiographer Training Objectives
The objectives aim to ensure the trainee knows and understands expectations.
All checks of each objective chart will be dated and signed by the Lead Echocardiographer in CHD.
In the first step, the trainee should spend their time shadowing/simulator training with the most Senior Echocardiographer accredited in CHD.
The aim of the second step is to start hands-on scanning with direct supervision; The supervisor reviews the first competency chart of the trainee by ensuring that they can scan with some guidance and that they are competent in the skills required for that objective.
For the third step, the trainee is expected to perform the scan independently, with limited guidance, ensuring self-proficiency.
Within the self-proficiency period, steps are reassessed at the end of each month, where the competency chart is signed and dated by the supervisor.
Case review assessments are followed, to check for sequential imaging, data collection, interpretation and reporting of the cases, which is used for proficiency markers.
A trainee with adult echocardiography accreditation is expected to be competent in some of the described objectives, especially those related to the patient preparation for the scan, instrumentation and basic echocardiographic views acquisition. Therefore, a step up of proficiency in these objectives can be considered.
For the final step, the trainee should demonstrate proficiency by scanning and reporting 5 DOPS with different moderate or severe main lesions, as described by the 2020 Guidelines for the management of ACHD by the European Society of Cardiology.

Date of initial theory competency check: - dd/mm/yyyy -

Practical day for sequential imaging protocol and normal report template: - dd/mm/yyyy -
Location: - insert location here -
Echocardiogapher responsible for the session: - insert echocardiographers' name here -

Practical week start, shadowing CHD clinics: - dd/mm/yyyy -
Location: - insert location here -
Echocardiogapher responsible for the session: - insert echocardiographers' name here -

CHD ECHO (Week 2 – Month 3)

OBJECTIVE #1 SCAN PREPARATION AND PATIENT CARE

Prepares the patient and equipment for the exam; follows patient safety, infection control and chaperone regulations.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. **Review previous echocardiogram reports or images.**					
b. **Identifies the correct patient and procedure.**					
c. **Obtains and evaluates the patient's history, including signs, symptoms, risk factors, diagnostic tests, and lab results related to cardiovascular pathology.**					
d. **Ensures height, weight, blood pressure and SatO2 are obtained for the patient or that a recent one is available. Understand the need for Z scores in the paediatric population.**					
e. **Introduces oneself to patient/patient family; provides appropriate communication and explanation to the patient/patient family regarding the procedure and the approximate amount of time it will take. Offers chaperone.**					
f. **Demonstrates ability to assess the patient's age/potential cooperation level. In a paediatric environment, checks if distraction tools (television/toys) are available. If a focused study is required, demonstrates sound judgement of what is essential to obtain as per the ordering indication/diagnosis.**					
g. **Ensures the patient is comfortable with ECG leads, that they are well placed, and that the signal is optimised.**					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	1st month	2nd month	3rd month

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CHD ECHO (Week 2 – Month 3)

OBJECTIVE #2 SUBCOSTAL IMAGING

Identifies, demonstrates, and evaluates 2D, colour Doppler images in the subcostal window.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. **Obtains and determines cardiac and visceral situs (is able to visualise and identify stomach on the left, liver on the right, abdominal Ao left of IVC, leftward cardiac position and apex).**					
b. **Demonstrates ability to evaluate pleural/pericardial effusions adequately.**					
c. **Adequately visualises IVC and hepatic veins. Demonstrates a patent IVC connecting to the right atrium with both 2D and colour Doppler.**					
d. **Adequately assesses IVC for dilation, inspiratory collapse, and any evidence of significant flow reversal. Obtains adequate PW Doppler approx. 2 cm into the hepatic vein at an appropriate angle.**					
e. **Adequately assesses abdominal Ao. Able to obtain appropriate angle for PW Doppler interrogation. Knowledge of normal abdominal Ao Doppler and what abnormal features to look for (dampened systolic velocities, diastolic tail, diastolic flow reversal).**					
f. **Knowledge and ability to invert subcostal images and obtain adequate subcostal long-axis views (subcostal 4 chambers).**					
g. **Demonstrates the ability to adequately assess/interrogate the atrial septum from the long axis view, sweeping posterior (coronary sinus) to anterior (Ao) and assessing for any atrial septal defect. Knowledge of PFO (mailbox flap-like) vs. ASD septal defect.**					
h. **Demonstrates ability to obtain subcostal bi-atrial and bicaval view of the atrial septum, assessing for sinus venosus ASD (or evaluating superior and inferior rims of ASD if present)**					
i. **Demonstrates the ability to adequately assess/interrogate the ventricular septum for VSDs from the long-axis 4-chamber and short-axis views.**					
j. **Demonstrates good judgement and critical thinking, obtaining the best diagnostic images. Demonstrates ability to obtain modified views (with emphasis on the right heart 3 chamber infundibular view).**					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	1st month	2nd month	3rd month

CHD ECHO (Week 2 – Month 3)

OBJECTIVE #3 APICAL IMAGING

Identifies, demonstrates, and evaluates 2D and Colour Doppler images in the apical window.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. **Demonstrates the ability to obtain an apical 4-chamber view with correct image orientation and without foreshortening the heart.**					
b. **Demonstrates ability to assess/sweep, interrogating the ventricular septum for VSDs adequately; in particular, assessing for apical VSDs, which are best seen in this view (with attention to colour doppler scale optimisation)**					
c. **Demonstrates adequate colour Doppler interrogation for pulmonary veins, MV, LVOT, AoV, TV, and PV (if possible), paying attention to colour box size and frame rate.**					
d. **Appropriately interrogates all cardiac valves with PW/CW Doppler.**					
e. **Knowledge and ability to obtain an accurate TR Doppler, if possible. Ability/knowledge to slide medially towards the lower left sternal border to optimise the best angle of interrogation.**					
f. **Demonstrates ability to obtain and measure accurate tissue Doppler images/velocities, taking care of Doppler at an appropriate angle.**					
g. **Knowledge of how to obtain and where to measure TAPSE to assess RV function.**					
h. **Demonstrates the ability to adequately image the entirety of the RV (when possible) and calculate RV FAC and RV Strain when a more detailed RV function assessment is needed.**					
i. **Demonstrates ability to obtain an on-axis apical 2 chamber LV with appropriate (clockwise) rotation.**					
j. **Demonstrates ability to obtain an on-axis apical 3 chamber image with appropriate (further clockwise) rotation.**					
k. **Demonstrates good judgement and critical thinking in obtaining the best diagnostic images.**					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	1st month	2nd month	3rd month

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CHD ECHO (Week 2 – Month 3)

OBJECTIVE #4 PARASTERNAL LONG AXIS IMAGING

Identifies, demonstrates, and evaluates 2-D and Colour Doppler images in the parasternal long-axis window.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. Demonstrates ability to obtain an adequate parasternal long-axis image with the septum as perpendicular as possible.					
b. Assesses for pericardial effusion and obtains further imaging if an effusion has been seen in any other views thus far.					
c. Demonstrates ability to perform long-axis sweeps with and without colour Doppler, interrogating the ventricular septum to assess for VSD.					
d. Adequately assesses/visualises the MV and MV apparatus. Knows how and where to look for SAM. Appropriately places the colour box over the MV to assess for MS/MR.					
e. Knowledge of where the CS is visualised, size of a normal CS size, and what to look for when the CS is dilated.					
f. Adequately assesses/visualises the AoV and aortic root. Appropriately examines the AoV with colour Doppler. Obtains accurate measurements of the aortic root as per departmental protocols.					
g. Demonstrates the ability and knowledge to slide up a rib space or two to visualise the tubular distal Asc Ao best and obtain an accurate measure (at the level of the RPA).					
h. Demonstrates ability to obtain appropriate inflow (RV inflow) and outflow (RV outflow) views. Assessing the inflow (TV) and outflow (RVOT/PV) with colour Doppler.					
i. Demonstrates good judgment and critical thinking in obtaining the best diagnostic images.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	1st month	2nd month	3rd month

CHD ECHO (Week 2 – Month 3)

OBJECTIVE #5 PARASTERNAL SHORT AXIS IMAGING

Identifies, demonstrates, and evaluates 2-D and Colour Doppler images in the parasternal short-axis window.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. **Obtains an adequate parasternal short-axis image, beginning at the base of the heart with the TV/AoV/PV in view.**					
b. **Adequately visualises the AoV and is able to determine the AoV anatomy and assess for any AR/AS with colour Doppler.**					
c. **Demonstrates the ability to adequately visualise the right coronary artery using 2D imaging and colour Doppler (if possible, rotating anti-clockwise), decreasing the colour Doppler scale, and focusing the colour box on the area of interest only.**					
d. **Demonstrates ability to adequately visualise the left main coronary artery branching into the LAD and circumflex coronaries (rotating clockwise). Adequately visualises colour Doppler in the left main coronary artery and LAD.**					
e. **Adequately visualises the TV and obtain accurate TR Doppler if possible.**					
f. **Adequately visualises the RV infundibulum/PV/MPA. Assessing for any degree of obstruction or PS/PR. Obtaining accurate Doppler for PV velocity and PR end-diastolic velocity.**					
g. **Adequately visualises the main PA branches, assessing for any stenosis, size discrepancy, or dilation and evaluating for any evidence of PDA.**					
h. **Able to sweep down to the apex of the heart adequately imaging the MV (with and without colour Doppler), papillary muscle level, and apex of the heart.**					
i. **Demonstrates good judgment and critical thinking in obtaining the best diagnostic images.**					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	1st month	2nd month	3rd month

CHD ECHO (Week 2 – Month 3)

OBJECTIVE #6 SUPRASTERNAL NOTCH IMAGING

Identifies, demonstrates, and evaluates 2-D and Colour Doppler images in the suprasternal notch window.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. Able to obtain an adequate long-axis image of the aortic arch, demonstrating the Asc transverse, Desc Ao and the three head and neck vessels.					
b. Appropriately assesses and Dopplers the Desc Ao, looking for normal pulsatile flow. Demonstrates awareness of abnormal Desc aortic Doppler.					
c. Demonstrates the ability to determine arch-sidedness from the short-axis view of the aortic arch angling anterior and following the bifurcation of the first brachiocephalic artery to the right common carotid and right subclavian artery.					
d. Adequately visualises the left innominate vein connecting to the right SVC.					
e. Demonstrates ability to scan the leftward extent of the left innominate vein to exclude a left SVC, anomalous pulmonary venous connection, or other accessory vertical vein connection.					
f. Adequately visualises the pulmonary veins in the 'crab view'. If all four cannot be visualised in this view, demonstrates the knowledge and ability to assess pulmonary veins from other imaging planes.					
g. Demonstrates ability to obtain a ductal view (sliding down to a high left parasternal view) to assess for the presence of a patent ductus arteriosus. Is aware of the pitfalls of imaging a right-to-left PDA.					
h. Able to visualise RPA in the short-axis imaging of the SSN when necessary. Knowledge of how to image the LPA in the long-axis imaging of the SSN when needed (angling leftward from the Desc Ao).					
i. Demonstrates good judgment and critical thinking in obtaining the best diagnostic images.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	1st month	2nd month	3rd month

CHD ECHO (Week 2 – Month 3)

OBJECTIVE #7 ECHO INSTRUMENTATION

Selects, maintains, and adjusts equipment to provide an optimal echocardiography evaluation.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. Selects appropriate transducer frequency to achieve adequate visualisation of cardiac structures. Changes transducer when appropriate for optimal visualisation.					
b. Demonstrates, identifies, evaluates and maintains adequate frame rate/pulse repetition frequency (in both 2D and Colour Doppler imaging - frame rate ≥12 fps).					
c. Optimizes images (harmonics, window size, field of view, gain, TGCs, focus position, depth, and zoom when appropriate).					
d. Utilizes, identifies, and evaluates advanced imaging processing features (pre- and post-processing, dynamic range, compression).					
e. Utilizes correct measurement controls and analysis software (measuring chamber size and function by M-mode and Simpson's, measuring all valve Dopplers, aortic root dimensions, TAPSE and TDI).					
f. Demonstrates awareness of proper ECG capture (ensures a full cardiac cycle is captured in each image or more in the case of some arrhythmias). Demonstrates ability to manipulate size and position of ECG as and when needed.					
g. Optimises M-mode imaging (proper cursor placement, sweep speed, gain).					
h. Utilizes proper Doppler gains and wall filters. Appropriately adjusts the scales to optimise the visualisation of the Doppler signal.					
i. Utilizes proper sample volume placement and size in PW Doppler.					
j. Selects the appropriate velocity range for Colour Doppler.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	1st month	2nd month	3rd month

CHD ECHO (Week 2 – Month 3)

OBJECTIVE #8 SPECTRAL DOPPLER MEASURES

Identifies, demonstrates and evaluates spectral Doppler measurements and performs spectral Doppler calculations.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. Able to appropriately Doppler all cardiac valves with PW/CW when appropriate. (Taking care to place sample size for PW at the leaflet tips of the MV/TV).					
b. Adequately assesses the LVOT/RVOT, aware of the appropriate use of PW to assess for the specific level of obstruction.					
c. Able to obtain accurate CW Doppler of TR velocity and calculate RVSP from TR.					
d. Able to obtain accurate CW Doppler of pulmonary regurgitation to measure PR end-diastolic velocity.					
e. Able to accurately Doppler RPA and LPA and determine if there is any degree of stenosis.					
f. PW Doppler of any ambiguous colour Doppler findings.					
g. Demonstrates good judgment and critical thinking when obtaining diagnostic images.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	1st month	2nd month	3rd month

CHD ECHO (Week 2 – Month 3)

OBJECTIVE #9 PERFORMING A COMPLETE ECHOCARDIOGRAM

Prepare the patient and equipment for the exam, obtain a complete echocardiogram with all necessary views, and provide a comprehensive echo report.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. Completes patient setting, as described in Objective #1.					
b. Demonstrates, evaluates, and utilises different patient positions to visualise cardiac structures adequately.					
c. Demonstrates, identifies, and evaluates normal and abnormal findings. Acquires additional images as necessary to characterise structures.					
d. Correlates all images obtained with patient clinical history.					
e. Ensures the echo report is comprehensive, including all pertinent findings in the summary. Ensuring the body matches up with the summary. Ensuring the HT/WT, BP and SatO2 are entered, and where appropriate, measurements are indexed and Z scores are included in the report.					
f. Apply knowledge of paediatric cardiac anatomy and pathology in correlation with clinical and echocardiographic findings to arrive at a preliminary conclusion.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	1st month	2nd month	3rd month

CHD ECHO (Month 3 – Month 6, as applicable)

OBJECTIVE #10 CARDIAC MALPOSITION

Determines axis and position of the heart in the paediatric patient.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. Appropriately determines cardiac axis and position.					
b. Knowledge of situs solitus vs situs inversus and situs ambiguous.					
c. Awareness of dextrocardia vs dextroposition.					
d. Demonstrates ability to modify scanning windows/imaging planes to adequately image a patient with dextroposition or mesocardia.					
e. Knowledge of how to properly image a patient with mirror image dextrocardia, obtaining apicals with the indicator at 3 o-clock, and making parasternals look as normal orientation. (Sometimes helpful to annotate transducer position on the screen).					
f. Demonstrates ability to obtain arch sidedness and awareness of proper orientation for imaging a right aortic arch.					
g. Demonstrates good judgement and critical thinking in obtaining diagnostic images, including non-standard windows.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	4th month	5th month	6th month

CHD ECHO (Month 3 – Month 6, as applicable)

OBJECTIVE #11 EFFUSIONS

Able to adequately evaluate for and assess an effusion for any evidence of haemodynamic compromise and or tamponade physiology.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. **Demonstrates the ability to assess for a pericardial effusion from multiple imaging planes.**					
b. **Demonstrates knowledge and understanding that a trivial rim of pericardial fluid is normally present and knowledge of what a normal finding vs. pathological pericardial effusion is that needs to be reported.**					
c. **Demonstrates the ability to accurately quantify the size and location of the effusion and determine if it is loculated vs circumferential. Determines if the effusion can be confirmed in other views (measuring any pockets of fluid at end-diastole).**					
d. **Demonstrates awareness of differences in fluid appearance (normal echo-free signal vs hemopericardium with the presence of fibrin strands or clots)**					
e. **Demonstrates the ability to analyse for any echocardiographic evidence of haemodynamic compromise (right atrial collapse in systole - collapse for longer than one-third of the cardiac cycle or right ventricular collapse in diastole - the longer the indentation on the RV free wall, the more severe the tamponade)**					
f. **Demonstrates the ability to assess for inspiratory variation in inflow Dopplers appropriately and determine if the variation is significant (≥25% in MV inflow variation and ≥40% in TV inflow variation)**					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	4th month	5th month	6th month

CHD ECHO (Month 3 – Month 6, as applicable)

OBJECTIVE #12 AORTOPATHY

Able to adequately perform a complete and follow-up assessment for patients in Aortopathy clinics with Marfan syndrome or other connective tissue disorders.

PERFORMANCE OBJECTIVES:		Competent	Competent	Proficient	Proficient	Proficient
a.	**Assesses pertinent history, previous echo findings, taking care to note previous aortic measurements.**					
b.	**Able to adequately image the aortic root sometimes sliding from the standard PLAX window to a modified parasternal to best image the root (including aortic annulus, sinus of Valsalva, and sinotubular junction).**					
c.	**Performs accurate measurements of the aortic root, according to departmental protocols.**					
d.	**Takes care to adequately visualise the Asc Ao by sliding up a rib space to obtain best image. Measures Asc Ao at the level of the RPA in cross section.**					
e.	**Evaluates for aortic regurgitation.**					
f.	**Assesses for any evidence of MV prolapse and or MR. Describes if one or both MV leaflets traverses the plane of the MV annulus in a non-symmetric manner which may demonstrate myxomatous degeneration of the MV.**					
g.	**Visually assesses the diameter of the abdominal Ao (at or above the level of the SMA)**					
h.	**Assesses the diameter of the aortic arch (distal Asc Ao/transverse/Desc Ao) for any evidence of dilation, performs appropriate measures as and when needed.**					
i.	**Assesses the diameter of the main pulmonary artery, which can also be dilated in connective tissue disorders. Measures MPA diameter.**					
j.	**Assess for any evidence of impaired diastolic function or reduced systolic function obtaining TDIs).**					
OTHER COMMENTS:	**Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	4th month	5th month	6th month

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CHD ECHO (Month 3 – Month 6, as applicable)

OBJECTIVE #13 HYPERTROPHIC CARDIOMYOPATHY

Able to perform complete and follow-up studies for patients being followed for HCM (both with and without LVH/LVOTO)

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. Assesses pertinent patient history, previous echo findings, taking care to note previous LV wall thickness measurements and if there has ever been any degree of outflow tract obstruction.					
b. Able to obtain accurate on-axis/non-foreshortened apical 4, 2 and 3 chamber views to assess degree of LVH/RVH. (Foreshortening can sometimes lead the echo reviewer to believe the LV/RV is thicker than it truly is)					
c. Able to adequately visualise the LVOT. Sometimes foreshortening the normal apical 4 chamber image leads to better visualisation of the LVOT.					
d. Carefully assesses the LVOT for any degree of obstruction, using PW Doppler to determine level of obstruction and CW Doppler to determine maximum degree of obstruction, paying close attention to the shape of the Doppler signal.					
e. Assesses systolic and diastolic function.					
f. Assesses the MV (as HCM patients may have MV abnormalities including prolapse, excessive leaflet tissue, chordal elongation, elongation of the mitral leaflets which coapt at the leaflet body rather than the tip, anterior displacement of the mitral apparatus, and insertion of the papillary muscle directly into the anterior MV leaflet).					
g. Obtains an accurate parasternal long axis image (with septum as perpendicular as possible), assessing the degree of LVH/RVH and for any asymmetrical septal hypertrophy.					
h. Assesses for any degree of SAM (by 2D and M-mode). If there is LVOTO determines the mechanism of obstruction (narrowing of the LVOT by septal hypertrophy vs anterior displacement of the mitral apparatus vs SAM)					
i. Obtains accurate parasternal short axis imaging of the LV at the level of the MV (at leaflet tips), papillary muscle, and apex. Obtains accurate M-mode of LV. Accurately measures and reports all necessary wall segments (taking care to not measure RV in IVS measurement).					
j. Adequately assesses the RVOT (from all views but specifically PSAX) for any degree of RVOTO.					
k. Accurately reports wall thickness measures, noting the maximal wall thickness and taking care to compare to previous, ensuring the measurements are accurate. Accurately describes the hypertrophy seen (if any) i.e. concentric vs eccentric vs apical in distribution.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	4th month	5th month	6th month

CHD ECHO (Month 3 – Month 6, as applicable)

OBJECTIVE #14 PULMONARY HYPERTENSION

Able to perform both complete and follow-up assessments for patients with pulmonary hypertension.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. Assesses pertinent patient history, previous echo findings, taking care to note previous right ventricular systolic pressures.					
b. Obtains adequate imaging of the IVC evaluating for dilatation and degree of inspiratory collapse.					
c. Obtains adequate apical imaging with good visualisation of the RA and RV (including measures of RV area, TAPSE, RV TDI). Able to calculate RV FAC and RV Strain if and when needed.					
d. Obtains best/accurate TR Doppler utilizing multiple imaging planes, taking care to align TR signal with beam of interrogation and not over-measuring the Doppler signal. Is able to calculate RVSP from TR (as well as VSD/PDA velocity as and when appropriate).					
e. Obtains accurate parasternal short axis image at the level of the papillary muscles to assess degree of septal flattening/septal shift. Able to accurately measure eccentricity index (abnormal when the ratio is >1.0).					
f. Obtains accurate Doppler velocities across the PV, including assessing for any signs of PHTN in the antegrade flow across the PV (assessing for mid-systolic flow-notching) and obtaining best measure of PR end diastolic velocity.					
g. Accurately and routinely reports on the RV pressures measured in the echo, RA size, RV size and systolic function, degree of septal flattening.					
h. Follows the PHTN protocol and demonstrates good judgement and critical thinking in obtaining best diagnostic images.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	4th month	5th month	6th month

CHD ECHO (Month 3 – Month 6, as applicable)

OBJECTIVE #15 HEART TRANSPLANT

Able to perform routine clinic and annual review echo for patients who had heart transplants.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. Assesses pertinent patient history, including their anatomy prior to transplant, what type of transplant they had, and when they were transplanted. Reviews any key findings in the previous study and takes care to note any special trends in measurements on the previous studies.					
b. Able to determine the need for an annual review transplant echo vs a more focused routine clinic transplant echo (listed on echo order) and follows appropriate imaging protocol.					
c. Obtains adequate subcostal imaging, paying close attention to any anastomosis sites that can be visualised from subcostals (IVC/SVC, sometimes Asc Ao/PA). Assesses for effusion.					
d. Obtains adequate apical imaging to assess atrial size and anastomosis sites. Assesses flow across all of the valves and obtains all necessary measures.					
e. Performs a thorough assessment of diastolic and systolic function, with detailed measurements such as biplane EF, LV and RV strain, and RV FAC.					
f. Performs adequate parasternal imaging, obtaining the most on-axis images possible while maintaining optimal visualisation. Obtains accurate M-mode for LV dimensions and functional assessment.					
g. Further assesses anastomosis sites from all possible views (aortic root/Asc Ao/Desc Ao, distal PA demonstrating flow to branch PAs, atrial anastomosis (evaluate pulmonary venous inflow).					
h. Accurately reports on pertinent findings. Comments on diastolic and systolic function, any significant valve regurgitation, or stenosis at anastomosis sites, presence or absence of effusion.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	2nd step	3rd step	4th month	5th month	6th month

CHD ECHO (Month 6 – Month 12, as applicable)

OBJECTIVE #16 PATENT DUCTUS ARTERIOSUS

Analyses 2D and Doppler findings to identify and evaluate a patent ductus arteriosus.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. Able to adequately visualise the PDA, confirming its presence or absence in multiple views.					
b. Adequately demonstrates PDA flow from the ductal view (high parasternal with the indicator at 12 o'clock) sweeping between the PA and Desc Ao.					
c. If possible, determines PDA size by measuring the duct at its narrowest point before its entry into the main pulmonary artery. Knowledge of other PDA measures if needed (PDA length and the width at each ampulla [PA and aortic]).					
d. Able to determine shunt direction and whether or not the PDA is restrictive by colour Doppler/CW (left to right vs. right to left vs. bidirectional shunt).					
e. Performs measures and the proper imaging to assess if the PDA is haemodynamically significant (assessing LA/LV size, absent or retrograde diastolic flow in the abdominal/Desc Ao, evidence of PHTN).					
f. Is able to calculate pulmonary pressures from an accurate max velocity across the PDA. SBP - 4(PDA Vmax)^2 = RVSP.					
g. Accurately reports on the findings related to the patent ductus arteriosus.					
h. Demonstrates good judgement and critical thinking in obtaining best diagnostic images.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	7th month	8th month	9th month	10th month	11th month

CHD ECHO (Month 6 – Month 12, as applicable)

OBJECTIVE #17 ATRIAL SEPTAL DEFECTS

Analyses 2D and Doppler findings to identify and evaluate atrial septal defects.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. Demonstrates knowledge of the 4 different types of atrial septal defects and where they are located (secundum, primum, sinus venosus, and CS). Aware of the concept that primum ASD is part of the complex defect of AVSD and more appropriately termed 'the atrial component of an AVSD'.					
b. Able to obtain adequate subcostal coronal views with 2D and colour Doppler to assess the atrial septum. Measures the size of the defect and the appropriate rims. Determines the direction of flow across the shunt and the presence or absence of fenestrations.					
c. Able to obtain adequate subcostal sagittal views with 2D and colour Doppler to assess the atrial septum. Visualises SVC and IVC rims. Visualises the RUPV (assessing for PAPVR). Confirms the direction of flow across the ASD.					
d. Assesses for prominent Eustachian valve or Chiari network in the RA as this is helpful for the surgeons to know before ASD repair (often well seen from subcostal sagittal views or initially when assessing the IVC).					
e. Adequately assesses right heart size in apical and parasternal views, evaluating the degree of right heart enlargement.					
f. Assess for PHTN. Obtains an accurate TR jet, if possible. Assesses septal flattening in PSAX views (flattened in diastole = volume overload; if there is systolic flattening as well, this is indicative of PHTN).					
g. Assess aortic and posterior wall rims in PSAX view.					
h. Assess for any abnormalities commonly associated with ASDs, (in the case of secundum and in particular sinus venosus ASDs - partial anomalous pulmonary veins, and all of the features of AVSD in the case of 'primum' ASD.					
i. Can calculate a Qp/Qs ratio to determine degree of shunting. Is aware of the limitations of this. [(PA diameter)^2 × PA VTI] / [(LVOT diameter)^2 × LVOT VTI]					
j. Demonstrates good judgement and critical thinking in obtaining best diagnostic images.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	7th month	8th month	9th month	10th month	11th month

CHD ECHO (Month 6 – Month 12, as applicable)

OBJECTIVE #18 VENTRICULAR SEPTAL DEFECT

Analyses 2D and Doppler findings to identify and evaluate ventricular septal defects.

PERFORMANCE OBJECTIVES:	Competent	Competent	Proficient	Proficient	Proficient
a. Knowledge of the different types of VSDs (perimembranous, muscular, apical muscular, outlet/doubly committed/juxta-arterial VSD).					
b. Adequate assessment of muscular and perimembranous septum in subcostal coronal and sagittal views visualising defect size and shunt direction with colour Doppler.					
c. Adequate assessment of the apical muscular septum with 2D and colour Doppler in the apical 4-chamber view, as this region is best seen and sometimes only seen well in this view.					
d. Adequate assessment of ventricular septum from parasternal long-axis imaging. Sweeping through the entirety of the septum.					
e. Demonstrates knowledge of associated findings with perimembranous VSDs. i.e. assesses for AoV prolapse as well as any TV/chordae involvement in partially occluding the VSD.					
f. Demonstrates ability to thoroughly assess the entirety of the ventricular septum through the multiple views as there can often be multiple VSDs or other additional small VSDs.					
g. Appropriately evaluates LA and LV size evaluating for any evidence of left heart enlargement.					
h. Adequately describes the VSD size/location/shunt direction/velocity in the echo report.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**	7th month	8th month	9th month	10th month	11th month

CHD ECHO (Month 12, as applicable)

OBJECTIVE #19 COMPLEX HEART ANATOMY: DIRECT OBSERVATION OF PROCEDURAL SKILLS (DOPS)

An understanding of all objectives previously described and evaluation of the heart anatomy and function.

Enter your a scale of 1 to 9 or N/O or N/A.

Guide to Scoring 1-3 is considered unsatisfactory, 4-6 satisfactory, and 7-9 above that expected for the stage of training and level of experience. If you score 1, 2, or 3, a brief example will be written in the comments box. Other relevant comments will be added about the echocardiographer's strengths and weaknesses.

PERFORMANCE OBJECTIVES:	DOPS 1	DOPS 2	DOPS 3	DOPS 4	DOPS 5
Description of the main lesion for the case	Lesion	Lesion	Lesion	Lesion	Lesion
1. Puts patient and parents at ease, explains the procedure and behaves in a considerate manner throughout the scan.					
2. Obtains all relevant demographic data, details of referring doctor, relevant previous treatment and reasons for the scan.					
3. Uses appropriate transducers, machine settings and ultrasound modalities throughout the scan.					
4. Identifies visceroatrial situs and position of the heart.					
5. Identifies venous, atrioventricular and ventriculoarterial connections.					
6. Identifies abnormalities, distinguishing between normal variants and pathological findings.					
7. Knows the differential diagnosis when there are indirect signs of anomalies (e.g. dilated right heart).					
8. Interprets echo measurements appropriately, demonstrating knowledge of limitations of calculations.					
9. Uses colour flow, pulsed wave and continuous wave Doppler when relevant.					
10. Interprets Doppler findings correctly (eg appropriate use of Bernoulli equation and formulae for calculations such as valve area).					
11. Records clear, relevant images with appropriate brevity.					
12. Attends to infection control appropriately.					
13. Documents the echo fully, writing a concise and appropriate report.					
OTHER COMMENTS: **Date and initials of the Lead Echocardiographer in CHD**					

Appendix 2 – CHD Theory Competency Checklist

This document provides a record of the competencies required for echocardiographers to undertake safe and effective assessment of patients with congenital heart disease referred for transthoracic echocardiography, and when they have been achieved.

These competencies have been identified to ensure the Agenda for Change for echocardiographers at a Band7 and over.

Echocardiographers, speciality doctors, and fellows interested in congenital heart disease who have achieved these competencies will have the theoretical knowledge and experience to perform an echocardiogram unsupervised in adult and paediatric patients with congenital heart disease.

The trainee should mention how confident they are with each topic based on the following table:

Level	Description
1	Not confident at all
2	Somewhat not confident
3	Neutral
4	Somewhat confident
5	Very confident

The Mentor/Assessor must complete the assessment table based on the following levels of competence:

Level	Description
1	Trainee is able to observe
2	Trainee is able to perform the activity under direct supervision Proactive, close supervision, supervisor in the room
3	Trainee is able to perform the activity under indirect supervision Reactive, on-demand supervision, trainee has to ask for help, supervisor readily available, within minutes
4	Trainee is able to perform the activity under distant supervision Reactive supervision available remotely, e.g. within 20 – 30min, on the phone or post hoc
5	Trainee is able to supervise others in performing the activity

Evidence of competence should be indicated in the comments section, where applicable:

Evidence Used to support claim	Observe	Q & A	Reflection	Written Records	Witness Statement	Certificate of training	Online Training	Self-Assessment	Other
please indicate in the comments section	O	Q&A	R	WR	WS	CT	OT	SA	Other

Important References

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Trainee

I confirm that I will comply with the following responsibilities:

- Ensuring practice within my own level of knowledge and competencies
- Familiarise myself with relevant Trust and Department protocols and policies;
- Understand legal and ethical implications of role development;
- Work within my own Code of Professional Practice;
- Utilise all resources which are made available for learning and professional development;
- Understand the demands and needs of the service;
- Be able to receive constructive feedback;
- Ensure that agreed timeframes are set and met.

Name of staff learning the competence: - insert name here -
Role: - insert location here -
Date: - dd/mm/yyyy -

Mentor/Assessor

I confirm that I will comply with the following responsibilities:

- Provide time and support for the learner;
- Signpost the learner to relevant research and information to support evidence-based practice;
- Facilitate learning and practice;
- Provide constructive feedback;
- Ensure the learner is safe to practice independently;
- Ensure the learner is current with all mandatory training for this skill as documented.

Name of mentor/assessor: - insert name here -
Role: - insert location here -
Date: - dd/mm/yyyy -

Manager

I confirm that I will comply with the following responsibilities:

- Ensure the competence is appropriate and required for the department/speciality;
- Ensure the learner has the appropriate starting requirements;
- Ensure the mentor has the appropriate accreditation;
- Ensure time is allocated to learners' training.

Name of mentor/assessor: - insert name here -
Role: - insert location here -
Date: - dd/mm/yyyy -

Standards – The trainee will be expected to understand/be competent in…	Trainee self-assessment	Date and signature (dd/mm/yyyy)	Level achieved (1-5)	Evidence used

BASIC TECHNIQUES				
Normal heart structure, usual findings, surface anatomy, and position: Identifying normal cardiac structures in echocardiography Surface anatomy and positional relationships of the heart The concept of Z-scores in children				
Sequential segmental analysis on echocardiogram: The sequential segmental approach in congenital echocardiography Identifying cardiac chambers and connections Ability to interpret abnormalities in sequential segmental analysis Awareness of the concept that congenital lesions often co-exist and the common associations				
Foetal circulation and neo-natal: Foetal circulation anatomy and adaptations Neo-natal circulation and expected normal findings on echocardiography				
Evaluation of shunts, left to right and right to left: Different types of shunts and their hemodynamic significance (including ASD,AVSD, PDA, TAPVD/PAPVD and VSD) Detecting and characterising shunts on echocardiography				
Isomerism of the atrial appendages: Isomerism of the atrial appendages and its significance Different atrial arrangements and variations Identifying features of atrial appendage isomerism on echocardiography				

EVALUATIONS OF LESIONS PRE AND POST REPAIR				
SHUNTS				
Atrial septal defects: Identifying and classifying ASDs using echocardiography Hemodynamic consequences and clinical implications of ASDs				
Ventricular septal defects: Detecting and characterising VSDs on echocardiography Different types of VSDs and their associated features				
Patent Ductus Arteriosus: Diagnosing PDA using echocardiography Significance of PDA and its management				
Aortopulmonary window: Detecting an AP window on echocardiography The potential complications and management strategies for AP window				
Anomalies of Venous Connections: The anomalies of venous connections on echocardiography (TAPVD – supracardiac, cardiac, infracardiac, mixed; PAPVD; Scimitar syndrome) The implications and management of anomalies of venous connections				
Muller Procedure (Pulmonary Artery Banding): Rationale for performing PA banding Assessing PAP, ventricular function, and adequacy of pulmonary blood flow post-Muller procedure using echocardiography				
LEFT-SIDED LESIONS				
Aortic Sub-valvular, Valvular, and Supravalvular Obstructions: Identifying Ao obstructions at different levels using echocardiography, including the				

associated lesions The hemodynamic consequences and management of Ao obstructions				
Ross and Ross-Konno Procedure: The Ross (AV) and Ross-Konno (AV&LVOT) procedures for Ao valve replacement Evaluating the Ao valve function and ventricular outflow tract morphology post-Ross procedure using echocardiography				
Double Aortic Arch, Aortic Coarctation, Aortic Interruption, and Vascular Ring: Recognise anomalies of the Ao arch on echocardiography The clinical implications and management of these anomalies				
Sinus of Valsalva aneurysm: Detecting an Sinus of Valsalva aneurysm on echocardiography				
Congenital Mitral Valve: Anatomical features, hemodynamic consequences, and management approaches for congenital MV abnormalities (supravalvular – fibrous ring, Shone's syndrome; valvular – fusion of commissure, double orifice, excessive tissue, leaflet hypoplasia, annular hypoplasia, cleft, prolapse; subvalvular – parachute valve, large or numerous papillary muscle hammock valve, absent papillary muscle); Diagnosing MV congenital abnormalities using echocardiography				
RIGHT-SIDED LESIONS				
Tetralogy of Fallot: The anatomical components and hemodynamic abnormalities in TOF The hyper-cyanotic "Tet" Spells The complications post repair and how to assess these				
Pulmonary Sub-valvular, Valvular, and Supravalvular Obstructions: Identifying PA obstructions at different levels using echocardiography, including the associated lesions The hemodynamic consequences and management of pulmonary obstructions				
Pulmonary Atresia: Identifying pulmonary atresia on echocardiography. The associated cardiac anomalies and management strategies for pulmonary atresia with/without intact ventricular septum.				
Blalock-Taussig Shunts: The indications for BT shunt placement. The surgical technique and expected postoperative echocardiographic findings				
RV to PA conduit: The concept of the surgical RV to PA conduit How to assess the RV to PA conduit on echocardiography				
Ebstein Anomaly: Identifying Ebstein anomaly on echocardiography. The anatomical features, clinical implications, and management of Ebstein anomaly				
Cone Procedure: The Cone procedure for Ebstein's TV abnormality Evaluating valve function post-Cone procedure using echocardiography				
CONGENITAL CORONARY AND GREAT ARTERY ANOMALIES				
Transposition of the Great Arteries: How to diagnose both d-TGA and L-TGA (ccTGA) using echocardiography. The anatomical features, hemodynamic consequences, and management approaches for TGA				
Mustard/Senning Procedure: The Mustard/Senning procedure for TGA and the concept of the systemic right ventricle Identifying anatomical features and assessing postoperative complications on echocardiography post Mustard or Senning				
Arterial Switch: Recognising anatomical changes following arterial switch operation Assessing coronary artery patterns and ventricular function post-arterial switch using				

echocardiography Recognising long term complications post arterial switch				
Rastelli Procedure: The Rastelli procedure for complex congenital heart defects Evaluating VSDs, conduit function, and valve function post-Rastelli procedure using echocardiography				
Truncus Arteriosus (Types 1, 2, 3, and 4): Diagnosing truncus arteriosus and its subtypes using echocardiography Anatomical variations, clinical implications, and surgical management options for truncus arteriosus				
Coronary Artery Anomalies: Detecting and classifying coronary artery anomalies on echocardiography The potential complications and management strategies for coronary artery anomalies				
SINGLE VENTRICLES AND DEXTROCARDIA				
Double Outlet Right Ventricle, Double Outlet Left Ventricle, Double Inlets: Diagnosing double outlet ventricles and double inlet ventricles using echocardiography. The anatomical variations, hemodynamic consequences, and management approaches for these anomalies				
Single Heart Syndromes: Identifying hypoplastic left heart syndrome, tricuspid atresia, mitral atresia on echocardiography. The anatomical features, clinical presentation, and staged surgical management of a single heart.				
Bi-directional Glenn: The indications and surgical technique of the bi-directional Glenn procedure Expected echocardiographic findings and postoperative management considerations				
Fontan and Total Cavopulmonary Connection Procedure: The concept of the Fontan/TCPC circulation and the different types of repair Assessing hemodynamics, pulmonary blood flow, valves and ventricular function post-Fontan using echocardiography				
Damus-Kaye-Stansel / Norwood: The DKS and Norwood procedures and their indications and differences Assessing ventricular-arterial connections and PA morphology post-DKS or Norwood using echocardiography				
Dextrocardia: Identifying dextrocardia using echocardiography. The clinical significance and management considerations of dextrocardia.				
ACQUIRED, INHERITED ANOMALIES AND TRANSPLANT				
Marfan Syndrome: Recognising cardiovascular manifestations of Marfan syndrome on echocardiography The surveillance recommendations for Marfan syndrome.				
Dilated, Hypertrophic and Arrhythmogenic Cardiomyopathy: The echocardiographic features and surveillance for these cardiomyopathies The main findings of each cardiomyopathy to obtain using echocardiography				
Kawasaki Disease: The echocardiographic features of Kawasaki disease The diagnostic criteria and management principles for Kawasaki disease				
Heart Transplantation and Echocardiography: Echocardiographic features in patients post-heart transplantation The role of echocardiography in monitoring graft function and detecting complications post-heart transplantation				

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Summative Sign-off Sheet

Name of staff achieving the competence	Role	Signature	Date (dd/mm/yyyy)

Name of Mentor/Assessor	Role	Signature	Date (dd/mm/yyyy)

Name of Manager	Role	Signature	Date (dd/mm/yyyy)

We hereby confirm that ……………………………………………… has achieved the above competence.

ABBREVIATIONS

ACHD – Adult congenital heart disease
ANC – Antenatal clinic
Ao – Aorta
AoV – Aortic valve
AP – Aortopulmonary
AR – Aortic regurgitation
AS – Aortic stenosis
Asc – Ascending
ASD – Atrial septal defect
AV – Aortic valve
AVSD – Atrioventricular septal defect
BCH – Birmingham Children's Hospital
BHI – Bristol Heart Institute
BRHC – Bristol Royal Hospital for Children
BT – Blalock-Taussig
ccTGA – Congenitally corrected transposition of the great arteries
CHD – Congenital heart disease
CME – Continuing Medical Education
CPD – Continuing professional development
CS – Coronary sinus
CS-led – Clinical Scientist-led
CW – Continuous wave
Desc – Descending
DKS – Damus-Kaye-Stansel
DOPS – Direct observation of practical skills
EACVI – European Association of Cardiovascular Imaging
ECG – Electrocardiogram
FAC – Fractional area change
fps – frame per second
HCM – Hypertrophic cardiomyopathy
HT – Height
ICC – Inherited Cardiac Conditions
IVC – Inferior vena cava
JCC – Joint Cardiac Conference
LAD – Left anterior descending artery
LPA – Left pulmonary artery
LV – Left ventricle
LVH – Left ventricle hypertrophy
LVOT – Left ventricular outflow tract
LVOTO – Left ventricular outflow tract obstruction
MDT – Multi-disciplinary meeting

MPA – Main pulmonary artery
MR – Mitral regurgitation
MS – Mitral stenosis
MV – Mitral valve
N/A – Not applicable
N/O – Not observed
PA – Pulmonary artery
PAP – Pulmonary artery pressures
PAPVD – Partial anomalous pulmonary venous drainage
PAPVR – Partial Anomalous Pulmonary Venous Return
PDA – Patent ductus arteriosus
PHTN – Pulmonary hypertension
PLAx – Parasternal long axis view
PR – Pulmonary regurgitation
PS – Pulmonary stenosis
PSAx – Parasternal short axis view
PV – Pulmonary valve
PW – Pulse wave
RA – Right atrium
RBH – Royal Brompton Hospital
RPA – Right pulmonary artery
RUPV – Right upper pulmonary veins
RV – Right ventricle
RVOT – Right ventricular outflow tract
RVOTO – Right ventricular outflow tract obstruction
SAM – Systolic anterior motion
SatO2 – Saturation of Oxygen
SMA – Superior mesenteric artery
SSN – Suprasternal notch
STMHosp – St Michael's Hospital Bristol
SVC – Superior vena cava
SWSW – South Wales and South West
TAPSE – tricuspid annular plane systolic excursion
TAPVD – Total anomalous pulmonary venous drainage
TCPC - Total Cavopulmonary Connection Procedure
TDI – Tissue doppler imaging
TGA – Transposition of the great arteries
TGC – Time gain compensation
TOF – Tetralogy of Fallot
TR – Tricuspid regurgitation
TV – Tricuspid valve
VSD – Ventricular septal defect
VTI – Velocity time integral
WT – Weight