Certificate in Clinician Performed Ultrasound (CCPU) Syllabus

Neonatal Cardiac Ultrasound

Approved by Board of Examiners 03 March 2025.

Australasian Society for Ultrasound in Medicine
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Neonatal Cardiac Ultrasound Syllabus

Purpose

The candidate demonstrates skill in obtaining valid and efficient ultrasound images/clips and data in the assessment of neonatal cardiac structure and function to answer the specific clinical question. The candidate can recognise when the findings are positive, negative, or equivocal and use this assessment to enhance the clinical management of the patient. Neonatal ultrasound skills should be sufficient to produce a scan that visualises all the main cardiac structures, their functional integrity and relationship with one another. Measurements relevant to the clinical question should be included. The overall standard for CCPU should be to produce a scan that a paediatric cardiologist can interpret.

Prerequisites:

The CCPU in Neonatal Cardiac Ultrasound is open to Neonatologists and Trainees registered with The Royal Australasian College of Physicians, Neonatal and Perinatal Medicine. International graduates filling temporary fellowship positions may apply to the CCPU Board to register for this unit if they can demonstrate appropriate employment and AHPRA registration, such applications are considered on a case-by-case basis.

CCPU candidates engaged in ultrasound assessment of patients should have:

- Enrolled in the CCPU,
- Reviewed ASUM Code of Conduct and Safety Policies,
- Completed the ASUM CCPU online physics tutorial quiz. Candidates can also choose to complete the physics tutorial and quizzes concurrently with obtaining clinical training, however, this must be completed prior to the final summative assessment.
- Complete CCPU online neonatal unit.

Candidates must be affiliated with a recognised institution for training in CCPU Neonatal Cardiac ultrasound. Recognised institutions must:

- Be associated with a neonatal intensive care unit.
- Have a close affiliation with a paediatric cardiology service.
- Have at least one clinician whose qualification is recognised by the ASUM council as a qualification for training.

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- Have access to a level of ultrasound equipment to allow appropriate quality, accuracy, and repeatability of scanning. Equipment should be no older than 10 years.

Course objectives

The candidate can:

- Describe the clinical questions, related to the Neonatal cardiac ultrasound which may typically be addressed using focussed point of care ultrasound scanning, as described in relevant and contemporary peer-reviewed literature, relevant published protocols or standards of practice or in the CCPU Neonatal cardiac style guide.
- Demonstrate the technical (sonographic) ability to acquire a satisfactory ultrasound examination which is suitable to answer the clinical question, including any applicable measurements.
- Describe the diagnostic criteria, as described in relevant and contemporary peer-reviewed literature or relevant published protocols or standards of practice, for ultrasound findings which would support a positive, negative or equivocal diagnosis.
- Describe the limitations of ultrasound in assessing the neonatal cardiovascular system.
- Demonstrate the ability to interpret the ultrasound data to determine if the findings support a positive, negative or equivocal answer to the specific clinical question.
- Demonstrate the ability to determine the appropriate on-going patient management as a result of the ultrasound findings in conjunction with other clinical information.
- Demonstrate the ability to describe and adequately document the ultrasound findings in the patient's clinical record in such a way as to facilitate satisfactory continuity of care of the patient.

On completing this unit, delegates will be able to:

- Understand and appreciate the needs of an infant during scanning.
- Understand and appreciate the infection risks of scanning.
- Understand and appreciate the optimal choice of probes and settings for neonatal scanning.
- Confidently acquire normal images of the heart
- Demonstrate an understanding of the normal anatomical structure of the infant heart as it relates to standard echocardiographic windows.

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- Understands the common conventions of neonatal scanning including image optimisation and competently records a series of images to clearly demonstrate normal anatomy.
- Competently interpret neonatal cardiac ultrasound findings in relation to clinical scenarios
- Demonstrate proficiency in assessing and interpreting normal and abnormal neonatal cardiac haemodynamics.
- Understand limitations to the accuracy of haemodynamic measurements.
- Recognise common patterns of Congenital Heart Disease.

Unit Content and Teachers Methodology

Course Content

The unit will present learners with the following material:

Anatomy:

Normal anatomical structure of the heart as it relates to the standard echocardiographic windows will be presented, including:

- Surface anatomy of the heart and great vessels
- The three-dimensional structure of the heart
- Derivation of the two-dimensional images obtained using heart ultrasound.
- Anatomy of the inflow tracts
- Anatomy of the great vessels (outflow tracts)
- Anatomy of the heart valves
- Anatomy of the cardiac chambers
- Embryology of the heart

Pathology:

- Abnormalities in structure
    - Congenital heart disease recognition
    - Acquired lesions (e.g. pericardial tamponade)
- Abnormalities in function
    - Patent ductus arteriosus and its associated haemodynamic sequelae.
    - Systolic and diastolic dysfunction
    - Low cardiac output state
    - High cardiac output state
    - Pulmonary hypertension

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Skills

Training will teach the following image optimisation skills related to haemodynamic assessment:

- Competently perform 2D imaging of the neonatal heart using the parasternal long axis, parasternal short axis, high parasternal ductal, suprasternal, apical and subcostal windows
- Assessing the size and shunt direction of the patent ductus arteriosus
- Measuring right and left ventricular output.
- Measuring superior vena cava flow
- Assessing myocardial function using M-mode and other means
- Assessing significance and direction of atrial shunting
- Measuring or assessing estimated pulmonary artery pressure using tricuspid incompetence, ductal shunt velocities or pulmonary artery acceleration times
- Recognising common congenital heart disease (CHD) including:
    - When to involve a paediatric cardiologist
    - Recognising indirect markers of CHD. For example, large or small vessels or chambers, and abnormal movement of the myocardium or valves
    - Assessing infants with cyanosis of unknown cause
    - Recognising echocardiographic features of PPHN
    - Recognising common cyanotic CHD that can mimic PPHN (TAPVD, TGA-IVS)
    - Recognising other common cyanotic CHD, including duct dependent pulmonary circulations
    - Recognising common duct dependent systemic circulations
    - Recognising other common CHD (ASD, VSD, valvular stenosis, Tetralogy of Fallot and AV canal defects)
    - Assessing infants with respiratory distress, heart failure and or shock
    - Identifying position of intravascular catheters when present (UAC, UVC, longline)

Recording

Units will teach the learners the common conventions of cardiac scanning and how to competently record a series of images to clearly demonstrate normal cardiac anatomy.

Limitations

During training, all scans should be reviewed by a supervisor, competent scanner or cardiologist. There is a need to recognise when to refer because of an incomplete scan or a possible anatomical or functional abnormality. Important management decisions should never be made alone by a trainee.

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The trainee will develop skills to understand the limitations of haemodynamic measurements.

Holders of the CCPU in Neonatal Ultrasound are expected to consult and request appropriate advice by a paediatric cardiologist under the following circumstances:

- If the primary clinical concern is the possibility of congenital heart disease (CHD)
- If specific treatment is being instituted for CHD based on a clinician performed neonatal cardiac ultrasound
- If transfer to a paediatric cardiology unit is being planned based on a CPU
- If the clinical findings or course are not consistent with the CPU findings
- If the baby is no longer in an NICU setting, for example after discharge.

Interpretation

Units will teach learners the skills needed to competently interpret the cardiac ultrasound findings in relation to the clinical condition.

Documentation

Trainees will be taught the skills of documentation of neonatal cardiac scan results in a structured and organised way. It is recommended that the documentation of neonatal cardiac ultrasound studies specifically mention the scans are “Clinician performed” to distinguish them from studies by a consultative diagnostic imaging specialist.

Teaching Methodologies for the Neonatal Cardiac Ultrasound

Learners will receive reference material outlining the Unit curriculum.

Early in the unit, candidates are required to complete a series of online lectures covering introductory topics to neonatal cardiac ultrasound including artefacts, image optimisation, basic and advanced techniques via the ASUM training portal. This will be followed by a multi choice quiz with a required pass rate.

The lectures presented will cover substantially the same material as the ones printed in this curriculum document.

Throughout the period of logbook acquisition, accredited local supervisors will continue practical bedside teaching, adhering to the Neonatal Cardiac CCPU curriculum. A focus on skill-based competence, rather than the number of hours scanning will be the focus. Documentation of these

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acquired learning goals forms part of the logbook assessment.

Expected standards of practice for Neonatal Cardiac Ultrasound

Key clinical questions to be addressed:

- **Unit specific questions:**
    - Is cardiac anatomy normal?
        - Recognise common lesions such as ASD, VSD, AV canal defects, Tetralogy of Fallot, right outflow tract obstruction (e.g pulmonary stenosis), left outflow tract obstruction (e.g aortic stenosis, coarctation etc), abnormalities of the great arteries (e.g Transposition).
        - Is there a lesion causing duct dependent pulmonary circulation?
        - Is there a lesion causing duct dependent systemic circulation?
        - Is there a lesion causing duct dependent mixing? (e.g TGA)?
        - Is there a lesion mimicking PPHN? (e.g obstructed TAPVD)?
    - Are there any other indirect markers/patterns to suggest the presence of congenital heart disease? For example, large or small vessel or chamber sizes, abnormal movement of myocardium or valves, particular intracardiac shunting patterns.
    - Does a cardiologist need to be involved?
    - Is cardiac function normal or abnormal and how does it relate to the clinical picture?
        - Contractility measurements, right and left cardiac outflow measurements, SVC flow measures.
    - Is there a patent ductus arteriosus (PDA) and is it hemodynamically significant?
    - Is there atrial shunting and what is the significance?
    - Is there any evidence of PPHN, and what is the significance?
    - What is the position of vascular lines (UVC/UAC/longline)?

Minimum expected ultrasound data acquisition/protocols:

Preparation

- Prepare clinical environment.
- Prepare patient, including informed consent where possible (refer to ASUM code of conduct) in line with state and hospital/practice policy.
- Select and prepare ultrasound and ancillary equipment in line with ASUMs safety policies.
- Enter patient data into ultrasound equipment.

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Image acquisition

- Acquire and optimise ultrasound images/data
- Identify relevant anatomical features and landmarks, (See attached style guide)
- Unit specific acquisition components (See attached style guide)
- Identify and respond to ultrasound artefacts, if required, to improve diagnostic quality of images/data.

Minimal recorded images/ultrasound data

See Cardiac Style Guide

The Style guide outlines the required minimal images to be recorded, unless the patient's clinical situation renders this impracticable and/or unsafe (for example, extremely premature neonate requiring minimal handling, handling is interfering with ventilation/stability, acute interventions are needed). In this situation, the practitioner should record whatever images are obtainable, in the time available, to answer the clinical question without allowing the ultrasound examination to interfere with ongoing medical treatment.
If local protocols recommend more recorded images/data for a particular examination, then these should be adhered to.

Sonographic appearances of expected positive, negative and equivocal findings.

- Describe ultrasound appearances using correct sonographic terminology.
- Identify and describe conclusive findings, positive or negative.
- Identify limitations of an examination, including specific examples/situations if appropriate
- Identify the relevance of equivocal findings.

Integration of ultrasound findings with clinical information

- Describe relevance of ultrasound findings correlated to clinical presentation and other data.
- Integrate information with ongoing clinical management of patient.

Post examination.

- Ensure examination and findings adequately recorded in patient clinical record.

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- Clean ultrasound equipment safely and correctly as per ASUM Safety Protocols.
- Store ultrasound equipment safely and correctly.

Primary Supervisor

- Refer to the CCPU Regulations for Primary Supervisor criteria and the Supervisor Handbook which defines the roles and responsibilities of the primary supervisor.
- All assessments (both formative and summative) and logbook verification declaration must be completed by the candidate's approved Primary Supervisor. Logbook supervision requirements are detailed in the CCPU Supervisor Handbook.
- At the discretion of the primary supervisor, associate supervisor/s may assist with the training and learning required for the logbook and may sign off individual logbook entries. Refer to the CCPU Supervisor Handbook for associate supervisor criteria.
- Supervisors will be familiar with the current curriculum to support candidates through the program.
- Supervisors will teach optimal image acquisition, and most importantly clinical integration of this information and how it might influence management in each case.

Assessments

Assessments for clinical units are focussed on the candidate demonstrating the knowledge, skill and ability to perform an accurate, valid, efficient, and clinically relevant ultrasound examination which has the potential to have a positive impact on patient clinical management. All assessments must be completed by the candidate's nominated Primary Supervisor.
Candidates are expected to develop a solid foundation of key ultrasound knowledge and skills and apply these to clinical practice in a guided, supervised, incremental fashion. As their experience builds, candidates may wish to undertake further formal training and education to further develop and enhance their skills.

The successful completion and documentation of the following assessments in Neonatal Cardiac Ultrasound are required:

- Two (2) formative assessments of clinical skills, specifically related to the assessment of the neonatal cardiac ultrasound examination (see Formative Assessment)

- One (1) summative assessment of clinical skills, specifically related to the assessment neonatal cardiac ultrasound examination (see Summative Assessment)

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- Submission of a minimum of 4 neonatal cardiac ultrasound scans. Digital format (DICOM) uploaded to ASUM for review by the examiner. Studies submitted should include examples of PDA, PPHN, flow/output and congenital heart disease.
    - Each submitted cardiac scan should be accompanied by a 1-page document prepared by the candidate. This should include the following.
    - Brief outline of the patient (no identifiers)
    - The clinical reason the scan was performed.
    - Any comments on the technical details of the scan (limited views in unstable patient, lung expansion precluded some views)
    - Interpretation of scan
    - How did the scan inform clinical management?
    - The technical aspects of the scans will be assessed against the published neonatal style guide and their ability to interpret the images against the documented Standards of Practice.
    - If a reviewer deems a candidate not to have met the criteria for awarding CCPU the images will be reviewed by a second examiner.
- Letter of endorsement from their local supervisor after completion of logbooks that they are at a satisfactory level.

***Please note:** Formative assessments will not be accepted if they are completed within one week of each other or on the same day as the summative assessment. For more information, please refer to CCPU Regulations

Logbook Requirements

For neonatal cardiac ultrasound, candidates must demonstrate, in their verified logbook that they have personally performed:

- A minimum of 75 Neonatal Cardiac ultrasound scans, of which at least 50% must have verified positive findings or measurements of cardiac output/function, PDA or PPHN assessment. The scans may include:
    - 25 'basic' scans, where some supervision is required and not all views are taken.
    - At least 50 scans completed independently, including the majority of views dependent on the clinical setting.

- All ultrasound scans should be performed in a clinical environment.

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- The ‘Comparison with Further Imaging or Clinical Outcome’ column should describe the further imaging or the final outcome of the patient, if available.

Resources/suggested learning activities

- Clinical training
- ASUM Standards of practice documents
- Echocardiography for the Neonatologist. Ed Skinner J, Hunter S and Alverson D. Churchill Livingstone, London, 2000
- Evans N, Malcolm G. Practical Echocardiography for the Neonatologist. Functional and Structural Echocardiography. A multimedia CDROM. Royal Prince Alfred Hospital 2000. https://payhip.com/PracticalNeonatalUltrasound
- *The Physics and Technology of Diagnostic Ultrasound: A Practitioner's Guide* https://ultrasoundbook.net/

Recertification

Once full accreditation of a candidate has been obtained in relation to the Neonatal Cardiac Ultrasound CCPU, demonstration of ongoing maintenance of competence will be required every 5-year period by providing evidence that the candidate has met practice requirements and Continuing Professional Development (CPD) requirements.

To achieve recertification the candidate must:

- Continue to fulfil the conditions for Eligibility and Admission to the CCPU.
- Record at least five (5) points of relevant CPD per year for the Neonatal Cardiac Ultrasound.
- The recertification logbook must include the minimum of 25 scans, to be completed in 24 months prior to your recertification deadline.
- All scans must be clinically indicated, and the logbook must be submitted to ASUM with your recertification application.
- Supervised scans can be included in your recertification logbook if the following criteria met:
- You directly supervised the scan; this is clearly indicated in the logbook along with your name of the trainee and both your name and the trainee’s name are logged on the ultrasound machine/report.

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- Recertification will only be given for those specialised units where recertification requirements have been met.
- A CCPU holder who fails to meet the recertification requirements will be removed from the ASUM CCPU certified list and will be required to forgo the use of the post nominals.
- The recertification grace period is 3 years after the original recertification due date.

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