



Student's Starting Pack

Ver. 1.2 | *P. Janin*
February 2016 | *W. Stedman*
L. Morris
S. Kay
L. Macken





Content

Overview.....	3
Training Program Presentation.....	4
Training Levels.....	9
Logbook Template.....	12
CICM Reference Guide.....	13
CCPU Training Objectives.....	15
Reference Material.....	17
2016 Timetable.....	18
Registration Form.....	20



Overview

Welcome to the Bedside Cardiac Ultrasound (BCU) teaching program at Royal North Shore ICU. This starting pack will provide you with the documents and information useful for your training.

You will find:

- A description of the program
- The training goals and requirements
- Practical information on each aspects of the program
- Templates and other documents
- Reference guides

By enrolling into this program, you will have the opportunity to learn how to perform, interpret and report BCU. This will require time and effort. It can dramatically enhance your problem interpretation and diagnostic capabilities in your clinical practice and it can become a highly rewarding skill. It can open a new area of discussion and interaction with other practitioners.

This learning program can only be successful if you take responsibility for developing your theoretical knowledge as well as practising your scanning abilities. This also comes with an active investment and participation into our developing echocardiography service and activity.



Training Program Presentation

What is it for?

The ICU echo training program is a basic level training. It is primarily aimed at fulfilling the **CICM requirements** for the Specialist training in Intensive Care Medicine. You will receive a certificate after successful completion of the program.

It also offers the possibility to obtain the widely recognised certificates from ASUM (Australasian Society for Ultrasound Medicine): the BELS (Basic Echo in Life Support) and RCE (Rapid Cardiac Echo) CCPUs (Certificate in Clinician Performed Ultrasound). You will need to register with ASUM if you intend to complete their educational programs. These have additional specific requirements such as completion of an online Physics tutorial and completion of formal assessments, and ask for a significant fee.

See: www.asum.com.au/newsite/Education.php?p=CCPU

The detailed requirements for each level of training is presented separately in this document.

The training framework for ICU doctors performing BCU studies at RNS is **not a formalised credentialing process**. By following this training outline, the ICU doctor is **not ‘accredited’ in echocardiography**, but rather has achieved **competency** in performing adequate BCU examinations **specifically targeted to the ICU patient population**, with clear knowledge of his/her limitations, as well as his/her exam’s limitations, and requirement for referral where abnormalities are found or images are inadequate.

Who is it for?

The program is offered to trainees with **limited or no prior echo experience**. In order to achieve a minimum level of training, this program privileges trainees who will stay at RNSH ICU for **12 months or more**.

The training requires time and dedication to achieve the goals. It is not recommended to (but opened to) trainees who already have demanding projects such as exam preparation or a busy formal research project. Completion of the ASUM CCPU BELS typically takes a full year.

How to enrol?

The program is coordinated by Dr Pierre Janin, Dr Wade Stedman, A/Pr Sharon Kay, and Louise Morris. They are the persons to contact to get more information and start your training.

- **A/Pr Sharon Kay:** she is a very experienced cardiac technician and Associate Professor in Echocardiography and Cardiovascular Imaging. She is involved with the design of the course, the introductory lectures, research, as well as the assessments during your training. sharonmkay@gmail.com
- **Louise Morris:** she is an experienced cardiac sonographer, who comes to the ICU on a weekly basis. She will be your one-on-one teacher while you learn all the basics of scanning. morris3@hotmail.net.au
- **Dr Pierre Janin & Dr Wade Stedman:** Intensivists at RNSH ICU, they are present on site most of the time. You will have at least two hands-on sessions with one of them, and meet regularly for the weekly review sessions. pjanin@skmx.net
wadestedman@hotmail.com

If you aim at obtaining one of the **ASUM CCPU certificate**, you have to apply directly on the ASUM website. ASUM charges a significant fee. Enrolling with ASUM is optional; it is **NOT necessary to satisfy the CICM's requirements**. The echo training program that you will receive at RNSH ICU will remain the same, regardless of whether you are also enrolled with ASUM or not.

What facilities, machines and resources do we have?

The ICU currently owns 4 ultrasound machines that can do BCU and cardiac echos:

- **2 Sonosite M-Turbo:** these are solid and very mobile machines. They are specifically designed for point-of-care ultrasound; they are the best machines to start with and the one you will use at the beginning.
- **1 Philips Sparq:** this is the step above the Sonosite, and is a more fragile and much more expensive machine. You will be allowed to use the Sparq after you have reached a first step

in your training, and you have demonstrated familiarity with echo machine functions, and most importantly understanding of your responsibility in maintenance and care.

- 1 **GE Vivid7**: a complex cardiology machine, but much older and bulkier. It will not bring you any benefit over the Sonosite and Sparq, and you should never have to use it.

All machines can be connected to an **archiving computer**, where all ICU studies are stored. You will be shown how to archive your studies. The archiving computer also works as a **reviewing station** using the reviewing and measurement software “Showcase”, and a **reporting station** using the ICU Echo Reporting System (MS Access based application). You will learn how to use the reporting system, so your reports can be stored, validated, and counted in your logbook.

The archiving station is located in the small meeting room between 6E and 6G (similar to the X-Ray room, on the other side of the unit). This same room is also used for simulation activities, and sometimes family conferences.

The archiving computer will be gradually loaded with tutorials and resources that you can refer to when reporting your studies or learning about a particular aspect of BCU.

What does it consist of, and what am I expected to do?

A number of requirements must be fulfilled depending on the level of training and certificate you want to obtain.

- **Introductory course**: a series of lectures will be arranged to give you the basic theoretical and practical knowledge needed to start using ultrasound machines. It is complemented by pre-reading material and practical stations. It covers for the physics and technical aspects, as well as the basic principles of ultrasound imaging in critical care (cardiac and lung ultrasound essentially). Most theory lectures will be transferred online, hosted by a system that can be accessed individually from home and can certify each participant’s attendance. A second series focuses on pathology and interpretation; this will be arranged later during the year. Lectures are **mandatory** for all the trainees.
- **Hands-on sessions**: you will be rostered to have 1-2h sessions at the bedside, to improve on your scanning technique. Sessions are arranged in small groups (2-4 persons). You are requested to find and get consent from suitable patients in the unit shortly prior to starting the hands-on session, as well as obtaining consent from the patient’s nurse to avoid disruption of the clinical care. For continuity and consistency purpose, Louise Morris will be your teacher until you have acquired the basic scanning skills. You should then aim at spending sessions with Intensivists (P. Janin / W. Stedman) to learn about clinical interpretation of your echo studies. The sessions can be booked during your **non-clinical weeks**, and they will be chosen after direct discussion and arrangement with Louise. Ideally you should attend one session every ~3-4 weeks.

- **Formative assessments:** these are privileged one-on-one bedside sessions where you will review the skills you have acquired, and the area you need to improve on. It is an important discussion time, to learn how to better structure the analysis and presentation of your echo exam. It also integrates the critical appraisal of the various echo parameters you acquire.
- **Self-learning:** you are expected to perform **studies on your own** between the hands-on sessions. Those studies must be stored and recorded so they can be reviewed by your supervisor. Ideally at least ~10 studies must be performed between each hands-on session. This must not result in waking up non-sedated patients after 10pm.
- **Log-book:** you will be shown how to save and archive all your studies properly, from the echo machine onto the archiving computer. This is essential to keep record of you work and progress; the studies can then be reviewed and signed by a supervisor if satisfactory. **All studies must be reported** using the electronic reporting system that currently runs on the same computer as the archiving system. After completion of a training stage, you can move to the next stage if you wish.
- **Regular meetings:** RNSH ICU is participating in a joined initiative with St Vincent's Hospital and St George Hospital to develop echo training and practice in ICU. The group is expanding and multiple Hospitals will likely join in the near future. **Inter-hospital meetings** are organised regularly; you should aim at joining the meetings in person whenever possible, or via a videoconferencing system when this can be available. It is an informal group discussion aimed primarily at reviewing interesting ICU echo cases and sharing on selected topics, targeting more advanced echo theory questions and clinical applications. As your skills develop, it'll become strongly recommended that you attend the meetings. This meeting is the opportunity to familiarize with concepts essential for a solid interpretation skill, as well as to create contacts with the ICU echo community and units that propose ICU echo fellow years.
- **Weekly review sessions:** all echo trainees are encouraged to attend when rostered on a clinical day and if clinical workload permits. Review sessions are organized every Wednesday at 4pm in the echo room; recently done studies will be browsed and discussed. You should select and propose studies that you have performed yourself, or that have been recorded on patients with an interesting clinical context. This is a critical learning time for interpretation and reporting, as well as interactive discussion and questions on a broad range of topics.
- **"Pathology day":** a one day exam session, where you will be asked to look at and report echo cases. This is mandatory for all trainees.

- 1 • **"Day1": Online Modules & Pre-reading.** Attend and complete online introductory lectures and review the pre-reading resources. This is mandatory at the beginning of your training.
- 2 • **"Day 2": Introductory echo course.** Introduction to hands-on and reporting; set of questions related to Day1 pre-reading material. Attendance is mandatory.
- 3 • Perform **10-50 introductory exams:** images stored and reviewed by supervisor, reporting forms completed (BELS reports). Get to the level of obtaining studies suitable for a log-book.
- 4 • Start the **log-book.** Perform **studies** that will be reviewed by the supervisor. Images stored and archived properly. Reporting forms completed (CICM reports & optional RCE).
- 5 • **"Day3": Online interpretation Lectures & Questions.** Introduction to diagnosis using bedside echo, pathology and normal variants, as well as selected procedures. Mandatory.
- 6 • Completion of **2 Formative cases** with a supervisor (S. Kay / P. Janin / W. Stedman).
- 7 • **"Day4": Pathology Day.** One session will be arranged during the year, usually near the end of the training. Series of pathological echo cases. Attendance is mandatory.
- 7 • Perform **30 complete exams.** Studies archived and reported (CICM form and optional RCE form), then reviewed and signed by supervisor. Record into the **CICM / RCE log-book.**
- 8 • This completes the Basic / CICM level. ASUM registration and specific Physics online tutorial is required to submit training for CCPU recognition.
- 9 • If desired, submit 2 interesting cases (with 5 relevant questions related to the pathology) to ASUM student cases.
- 10 • Completion of **2 Summative cases** with an external supervisor. Complete **CCPU RCE (ASUM)** if desired.
- 11 • To **maintain competency,** complete 3h of echo training / year, and perform and report and save 25 studies / year.
- 12 • Progression to next Levels should be discussed with the ICU echo supervisor.



Training Levels

The RNSH ICU echo program is designed essentially to comply with CICM requirements. For UK students, this level of training is matching the level of the FICE program or above.

The program is compatible with ASUM’s CCPU program: the first level (“BELS”) is very basic and has limited value beside the CICM path; the next level (“RCE”) is similar to the CICM level with some added requirements and features. None of the ASUM degree are required from the CICM perspective.

Attendance to the theoretical lectures, introduction to hands-on scanning, and review and completion of online modules and material at the start of the training is mandatory for all students.

CICM / BASIC	
Description	<p>Focused rapid cardiac assessment to answer immediate clinical questions (similar to trauma FAST scan). This is equivalent to the standard mandated from 2014 by the CICM Core Training curriculum in basic echocardiography.</p> <ul style="list-style-type: none"> - Global cardiac systolic function - Identification of marked LV and RV enlargement. LV diameter in PLA. - Intravascular volume assessment, IVC size - Presence of pericardial effusion - No Doppler colour studies required
Views	<ul style="list-style-type: none"> - Parasternal Long (PLAX) - Parasternal Short (PSAX) – PV / TV Level - Parasternal Short (PSAX) – Mitral Level: <i>fish mouth</i> - Parasternal Short (PSAX) – Papillary Level - Parasternal Short (PSAX) – Apex - Apical 4 Chamber (AP4): <i>AV not seen, not foreshortened, atria visible</i> - Subxiphoid Long (SCX): <i>4 chambers</i> - Subxiphoid IVC (SCX-IVC) - Subxiphoid Short LV (SCX sax) - Subxiphoid Short AV / Pulmonary Tree

Requirements	<ul style="list-style-type: none"> - 10-50 initial adequate introductory exams (images stored and reviewed by the ICU echo supervisor): "BELS reporting form". - 1 informal exam with the ICU echo supervisor: on demonstration of attaining satisfactory images, the trainee can progress to completion of BASIC (see below) - 30 further studies stored and reported. Completion of a log-book: "CICM reporting form". RCE reporting form should also be completed if aim is to enrol with ASUM's program.
	CICM level is completed after attendance to Day 3 & 4, as well as completion of the formative cases.

	RCE / LEVEL 1
Description	<p>Includes:</p> <ul style="list-style-type: none"> - Measurements: TAPSE, LV dimensions, Aorta - Goss valve competence (gross competence or gross impairment of leaflet motion) - Introduction to the use of colour Doppler
Views	<ul style="list-style-type: none"> - Parasternal Long (PLAX) – LV diameter (+ colour) - Parasternal Short (PSAX) – PV / TV Level (+ colour TV) - Parasternal Short (PSAX) – Mitral Level: <i>fish mouth</i> - Parasternal Short (PSAX) – Papillary Level - Parasternal Short (PSAX) – Apex - Apical 4 Chamber (AP4): <i>AV not seen, not foreshortened (+ colour MV and TV)</i> - Apical 5 Chamber (AP5): AV visible (+ colour AV) - Apical 2 Chamber (AP2) - Subxiphoid Long (SCX): <i>4 chambers</i> - Subxiphoid IVC (SCX-IVC) - Subxiphoid Short LV (SCX sax) - Subxiphoid Short AV / Pulmonary Tree
Requirements	<ul style="list-style-type: none"> - 40 further studies stored and reported, including Mitral, Aortic and Tricuspid valve examination. Completion of a log-book: "RCE reporting form". - Satisfactory completion of competency assessment with ICU echo supervisor.
	Completion of ASUM Rapid Cardiac Assessment CCPU would then be possible, if desired.

LEVEL 2	
<i>Description</i>	<p>Includes:</p> <ul style="list-style-type: none"> - Colour Doppler - RVSP calculations - Haemodynamic effects of pericardial effusions - Grading of abnormalities detected - Advanced Doppler examinations
<i>Requirements</i>	<ul style="list-style-type: none"> - 100 further studies stored and reported. Completion of a log-book. - Satisfactory completion of competency assessment with ICU echo supervisor. - Usually requires completion of post-graduate certificate / diploma or fellowship.
	<p>Aim to complete ASUM DDU from here.</p>

Criteria for satisfactory view focus on:

- Proper axis of the 2D image in each view
- Holding the view through respiration
- Capacity to adapt technique in difficult or non-standard situations (obese, COPD, pectum excavatum, post cardiac surgery, ...)

The subsequent section provides a template for the logbook. A printable .pdf version of the logbook will be created automatically by the reporting system when reports are entered and reviewed.



N	Date	Initial / MRN	<u>Clinical Story:</u>
			<u>Findings:</u>
	<i>Reviewer</i>	<i>Adequate & CI</i>	<u>Comment:</u>

N	Date	Initial / MRN	<u>Clinical Story:</u>
			<u>Findings:</u>
	<i>Reviewer</i>	<i>Adequate & CI</i>	<u>Comment:</u>

N	Date	Initial / MRN	<u>Clinical Story:</u>
			<u>Findings:</u>
	<i>Reviewer</i>	<i>Adequate & CI</i>	<u>Comment:</u>

N	Date	Initial / MRN	<u>Clinical Story:</u>
			<u>Findings:</u>
	<i>Reviewer</i>	<i>Adequate & CI</i>	<u>Comment:</u>

N	Date	Initial / MRN	<u>Clinical Story:</u>
			<u>Findings:</u>
	<i>Reviewer</i>	<i>Adequate & CI</i>	<u>Comment:</u>



CICM Reference Guide

A - Physics and imaging basics

1. Indications for critical care ultrasound in assessment of the critically ill patient
2. Basic 2D ultrasound physics & instrumentation
 - Properties of sound waves
 - Beam and image formation
 - Image resolution: Lateral, Axial, Temporal
3. Transducers and Knobology
 - Types of basic transducer
 - Image optimisation
 - Frequency
 - Overall gain and time-gain compensation
 - Depth
4. Basic artefacts
 - Artefacts based on assumptions made by ultrasound imaging
 - Beam characteristic artefacts: Beam-width and Slice-thickness artefacts
 - Multiple reflection artefacts: Reverberation, comet tail, ring-down artefacts. Mirror image.
 - Refraction artefacts
 - Attenuation and enhancement artefacts

B - Echocardiography

1. Image acquisition
 - Systematic approach: Pre-examination preparation, Image optimisation, Image acquisition.
 - Standard echocardiography views: PLA, PSA, A4C, A2C, SC
2. Left heart assessment
 - Left ventricular chamber size and wall thickness, left atrial area
 - Simple assessment of systolic function
 - Simple assessment of mitral and aortic valve opening
3. Right heart assessment
 - Right ventricular size and wall thickness, right atrial area

- Assessment of systolic function (TAPSE)
- Right ventricular dysfunction and failure
- Simple assessment of tricuspid valve function

4. Pericardial assessment

- Presence of pericardial effusion
- Recognition of tamponade physiology
- Differentiation between pericardial and pleural fluid collection

5. Fluid responsiveness and haemodynamics

- IVC size and collapsibility / distensibility assessment
- Limitations of basic ultrasound assessment of fluid responsiveness
- Integration of basic echocardiography into haemodynamic assessment

NB: Colour or spectral doppler assessment is not considered part of basic critical care ultrasound.



CCPU RCE Training Objectives

Preparation & Acquisition	
Patient	Position Consent / Explanation
Environment	Lights & Curtains
Machine	Probe selection Preset selection
Image optimisation	Data entry (study details) Depth / Width Gain / TGC Frequency Focus
Parasternal Long Axis (PLAX)	
Technique / Alignment	
Identifies	Chambers & Walls (LA, LV, RV, Septum, Ao, Pericard.) Valves (Ao, Mitral leaflets, Chordae, Papillary muscles) Moderator Band
Measures (2D)	Lung & Descending Aorta LA diameter LVIDd, LVIDs IVS Aortic Root
Parasternal Short Axis (PSAX)	
Technique / Alignment	
Identifies	Chambers & Walls (LA, RA, IAS, RV, LV, PA) Valves (TV, AV, PV, Mitral leaflets, Papillary muscles)
Apical Views (A4C, A5C)	
Technique / Alignment	Adjust from A4C to A5C
Identifies	Chambers & Walls (LA, RA, LV, RV, IAS, IVS +/- Ao) Valves (TV, AV, Mitral leaflets, Papillary muscles)
Sub-Costal View (SC)	
Technique / Alignment	Optimise view (long and short axis)
Identifies	Chambers & Walls Valves Liver & Stomach
Inferior Vena Cava (IVC)	
Technique / Alignment	Longitudinal view Transverse view
Measures correctly	
Normal Physiology & Pathology	
Left Ventricle	Chamber & Wall measurement. Normal values. Function assessment
Right Ventricle	LV systolic failure Chamber size & shape

	Contractility & TAPSE Interventricular septum RV systolic failure Normal value Grossly dilated aortic root
Aortic Root	
Inferior Vena Cava	Normal size and appearance Respiratory variations
Pericardium	Differentiate pleural / pericardial effusion Appearance of effusion Tamponade physiology Tamponade signs (RA, RV, IVC)
Valves	Normal appearance Grossly abnormal function
Limitations	
NOT designed for	Valvular Assessment Regional motion abnormality Assessment of diastolic function Pressure measurements Exclusion of PE Exclusion of aortic dissection Exclusion of vegetation
Record Keeping	
	Storing appropriate loops Archiving the study Writing a report
Maintenance	
	Cleaning the equipment Replenish consumables Storing the machine



Reference Material

You will receive a pdf copy of the excellent reference guide published by Philips when you enrol into the training program.

You can view or download relevant material directly from the Philips website:

<http://www.usa.philips.com/healthcare-education-resources/education-training/ultrasound-education-critical-care>

The archiving computer in the echo room will also be loaded with relevant reference material that you can consult to learn on specific topics and to assist you when reporting your studies.



2016 Timetable

- Lectures and Course Days

Day1 - Online Material

~10h

Online pre-reading material & modules.

To be read and completed from home at your convenience, at the beginning of the training and before Day 2.

Day 2 - Introductory Course

2h

Tue 1st March (14-16h)
Tue 8th March (14-16h)

Mandatory for all.
Attend on the date that is on a non-clinical week.

Day 3 - Interpretation Course

~4h

Online interpretation lectures & questions

Mandatory for all.
Usually ~3months after the start of the training.

Day 4 - Pathology Day

4h

Date TBA

Mandatory for all.
Usually near the end of the training.

- Weekly Sessions

Hands-on Sessions (2h)

Tuesdays.

Roster by direct arrangement with L. Morris.
Aim ~1 session per month.

Review Sessions (1h)

Wednesdays 4-5pm (echo room).

Attend when rostered on a clinical day week.

- Other

Inter-hospital meetings: usually during a weekday, from 6pm to 8pm. Exact dates and location is communicated when programmed.

Current aim is to schedule a weekly meeting, alternating lectures on topics and case review sessions.