Focused Echocardiography in Life Support (FELS)

Purpose of Document

This document describes the process for credentialing Emergency Physicians within Monash Health (MH) to perform Focused Echocardiography in Life Support (FELS).

This document should be read in conjunction with Australian College of Emergency Medicine (ACEM) documents

- Number G25, October 2021, version 9: *Ultrasound Education Programs*
- Number P21, July 2022, version 6: *Policy on the use of Focused Ultrasound in Emergency Medicine*
- Number P733, August 2023, version 6: *Credentialing for emergency medicine ultrasonography*
- Number COR742, August 2023, version 6: *Provision of focused ultrasound training and governance*

Summary

The use of ultrasound has evolved over the last 25 years into a crucial first-line test for the cardiac evaluation of symptomatic patients. The advancements in ultrasound machine technology and the incorporation of updated educational curriculum in residency training programs have streamlined the integration of focused cardiac ultrasound into specialised practices. In the speciality of emergency medicine (ED), FELS has become a fundamental tool to expedite the diagnostic evaluation of the patient at the bedside and to initiate urgent treatment and triage decisions by the ED physicians (1).

The ACEM supports the use of FELS in the ED, ultrasound imaging has shown to enhance the physician's ability to assess and manage patients with a variety of acute illnesses and injuries leading to improving patient outcomes.

FELS program requirements

1. Introductory course
    a. Recognition of Previous Learning (RPL)
2. Skill development
3. Assessment/credentialing
4. Auditing
5. Skill maintenance

Revised February 2024

Introductory course

FELS training and credentialing is only open to Monash Health (MH) employees*
who have attained MH credentialing in eFAST.
*For Victorian Heart Hospital (VHH) trainees please refer to the VHH FELS training and credentialing
document

A one-day introductory course is required prior to commencing the skills development
component of FELS training. Pre-reading and completion of an online physics module will be
necessary before starting this course. Details for these requirements will be provided.

The introductory course will include didactic presentation of machine and ultrasound probe
orientation (knobology), FELS protocol familiarisation, integration of ultrasound image
findings and hands on training on a model and or ultrasound simulator.

Recognition of Previous Learning (RPL)

MH acknowledges introductory courses conducted by external training organisations. If a
physician provides evidence of introductory course completion within the past two years,
they might qualify for RPL. In such cases, they would need to fulfill credentialing
requirements by undertaking 25 scans and completing two summative assessments, as
outlined in Appendix 4.

Similarly, external graduate certificates and diplomas may also be subject to RPL
consideration. Physicians may need to complete five scans alongside a summative
assessment. Regardless of whether it pertains to RPL for introductory courses or the overall
credentialing process, it's crucial that all physicians comply with skill maintenance
stipulations.

Skill development

After completing the introductory course, the development of ultrasound scanning skills are
further developed through bedside one-on-one training sessions with the sonographer
educators or ED faculty[#]. During these sessions a minimum of five scans must be completed.
Additionally, physicians are expected to engage self-directed learning, including viewing FELS
learning tools, studying cases, reading journals and utilising other online resources. Refer to
Appendix 1 for recommendations and targets regarding FELS training timelines.

Please note that if there are three cancellations of one-on-one sessions without reasonable
notice, physicians will need approval from ED governance to re-enter the program.

[#]ED faculty members approved by governance

During the skill development phase, physicians must perform a minimum of 25 examinations,
with at least 5 of these being clinically indicated (e.g., must include at least two cases each of
tamponade, right heart failure or massive PE, hypovolemia or distributive shock and left
ventricular failure). All FELS images should be stored in an image storage system and

reviewed by the sonographer educator (this may be done retrospectively using recorded images or loops). Findings should be compared with clinical data, and accuracy noted.

Documentation of findings for ALL examinations MUST be completed on the patients Electronic Medical Record (EMR) under the adhoc tab (refer to Appendix 4). A scan is only considered valid if the physician is the person performing the scan and multiple entries of the same patient in the same episode of care by that physician are not counted towards the total numbers.

To ensure understanding of normal and abnormal echo appearances, physicians should interpret an additional 25 examinations prepared by the sonographer educator. This interpretation may occur as part of practical supervision or as a separate component, such as online image interpretation.

During this training and skills development stage, physicians will receive support and feedback as needed.

Assessment/credentialling

Following the skills development phase, physicians should demonstrate proficiency in both image acquisition and interpretation (refer to Appendices 2 and 3). Assessments are essential for skill development, offering valuable feedback to both learners and trainers and highlighting areas for improvement. During FELS training, it's advised to undergo at least one formative and two summative assessments.

Successful credentialing in FELS requires completing two in-person, practical summative assessments (refer to Appendix 5), conducted by either a sonographer educator or ED faculty.

There is no limit on the number of attempts for summative assessments.

Upon completion of 25 scans and 2 summative assessments, physicians become credentialed to perform FELS at MH.

Auditing

Auditing is conducted and data maintained by the PoCUS sonographer educator with quarterly audit reports provided to the ED Governance committee. Auditing consists of assessing physician scans using a simple system (see below) evaluating the technical adequacy and diagnostic accuracy of the scan, concerning correlative imaging, surgical or clinical findings where available.

eLOGBOOK QUALITY AUDIT - FEEDBACK	
3	Good scan, minor technical errors at least 3 images of diagnostic quality
2	Moderate technical errors - gains, focal zone and depth but no misdiagnosis 2 or less images of diagnostic quality
A	Extensive technical errors rendering the scan non-diagnostic OR suboptimal imaging due to pt body habitus/status
1	False negative
0	False positive

Audit results and comments for physician feedback will be provided in personal eLogbook's maintained for physicians. A minimum 25 FELS examinations will be audited until a physician achieves MH credentialing in FELS.

Auditing will continue at a reduced capacity during the skills maintenance phase.

Skills Maintenance

After receiving MH credentialing, the physician can perform FELS scans within MH. To maintain MH credentials, they are required to:

1. Perform and log a minimum of 25 FELS scans annually (no required number of positives after credentialed). A random audit of a minimum of 10 scans per annum will be conducted, with feedback provided where required, to ensure the maintenance of skill and quality.
2. Undertake 3 hours of ultrasound education annually. A one-hour session with a sonographer educator to receive ongoing feedback through review of their own logged cases, audit scores and practical scanning is highly recommended.

Cardiac FELS training timeline recommendations/targets

This document is intended to be used as a reference guide only. Learners will vary in training and learning characteristics and timelines should be adapted to individuals as required.

Introductory course

- Book in first 1-on-1 training in the introductory course

Skills development and Assessments

1 month – 1-2 sessions of 1-on-1 training

- Knobology
- Patient positioning
- Protocol review
- Demonstration before scan if needed
- 1-2 scans per session

1-3 months – 3 sessions of 1-on-1 training onwards

- Demonstration usually not required
- Reinforce probe movements
- Encourage independent practise
- 3 scans per session

3 months – ~10-15 scans

- Formative assessment to assess independent scanning
- Schedule "Echo Interpretation" session

3-6 months – ~20-25 scans

- Independent practise
- Focus on clinical application and pathology assessment
- +/- formative assessment

6 months – ~25-30 scans

- Auditing review
- Summative assessment

Eligible VHH ED trainees may elect to proceed to Module 2 post credentialing in FELS

Post credentialing

3 – 6 months

- Remind of maintenance requirements, updated auditing feedback

9-12 months

- Review status of maintenance requirements, updated auditing feedback

Revised February 2024

Appendix 2

Details of FELS Training & Evaluation

A competent FELS physician is expected to adhere to the following steps:

System Set-up
- Turn machine on, enter patient UR, surname & Dr initials
- Select the correct transducer
- Select Cardiac pre-set

Transducer Positioning
- The orientation of transducer and correlation with the image
- Demonstrates the ability to manipulate the transducer to achieve the required images (sliding, fanning, rocking, rotating)

Image optimisation
- Overall gain
- TGC
- Depth
- Frequency

Anatomy and Physiology

- Identification of normal cardiac anatomy
- Assessment of left ventricle (LV) and right ventricle (RV) function
- Assessment of RV size in relation to the LV
- Assessment of RV to aortic root to the left atrial ratio
- Recognition of the presence of fluid in the pericardium
- Differentiation between free fluid, thrombus and epicardial fat pad
- Recognition of any other gross cardiac abnormalities
- Recognition of pleural effusions and ascites

Recognition of artefacts and how to modify image accordingly:
- Increased attenuation of ultrasound beam due to patient habitus
- Patient movement or respiration
- Shadowing from ribs
- Shadowing from air-filled and bowel
- Artefacts from air-filled lung

Parasternal Long Axis (PLAX)
- The transducer in the left parasternal region at 3rd to 5th intercostal space oriented to right shoulder (10 o'clock position) depth should be adjusted as necessary
- Visualise the RV, LV, mitral valve (MV), aortic valve (AV), ascending aorta and left atrium (LA).
- Assess LV and RV size as a ratio to each other (LV 2/3 RV 1/3)
- Assess RV to aortic root to LA size ratio (roughly 1:1:1)
- Assess overall LV function: normal vs abnormal
- Identify pericardial effusion
- Identify fluid in the pleural cavity

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Parasternal Short Axis (PSAX)

- The transducer in the left parasternal region at 3rd to 5th intercostal space oriented to left shoulder (1 o'clock position), depth should be adjusted as necessary
- Aim to have the LV in the middle of the sector looking like a doughnut with the two papillary muscles visible in the LV cavity
- Assess overall ventricular function normal vs abnormal
- Assess the shape of the LV, round vs D shaped
- Assess for pericardial effusion

Apical 4 Chamber

- Patient position left lateral if possible
- Start low and lateral; the heart is "proud" in the chest wall so have a shallow angle on the chest wall
- The marker should be facing the between 2 and 3 o'clock, depth should be adjusted as necessary
- Demonstrate the ventricles, atria and atrioventricular valves
- Assess overall ventricular function normal vs abnormal
- Assess LV and RV size as a ratio to each other
- Identify a pericardial effusion and right heart inversion if present

Subcostal Long Axis

- Patient position preferably supine and no more than 30 degrees erect
- Probe marker pointing towards the patient left side (3 o'clock) place the probe over the liver and point to the heart, depth should be adjusted as necessary
- Obtain a four-chamber view maximising LV length and minimising RV foreshortening
- Observe any free fluid over the right atrium (RA), RV and LV
- Identify any 2D signs of RA and/or RV inversion
- Assess the size of the RV in relation to the LV
- Assess LV and RV function

Subcostal Short Axis at the level of mid LV

- Rotate the transducer 90° (12 o'clock) anti-clockwise keep the heart in the image
- Fan the transducer towards the left shoulder and obtain an LV short-axis image at the level of the papillary muscles
- Assess overall LV function
- Assess the shape of the LV as round versus D shaped

**Inferior Vena Cava (IVC) longitudinal**

- Maintaining the probe marker position (12 o'clock) fan the probe towards the patient's right side. Identify the IVC entering the RA and traversing the liver
- Freeze image and use callipers to measure the diameter of the IVC (>2.1cm dilated)
- On live imaging ask patient to sniff-in forcefully and assess the IVC for collapse

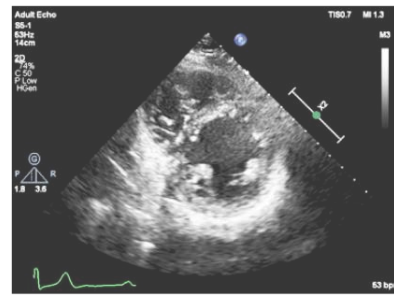**Integration of results to management of the patient**

- Recognise the limitations of a scan.
- Recognise patients requiring formal imaging assessment
- Incorporate ultrasound findings with the rest of the clinical assessment
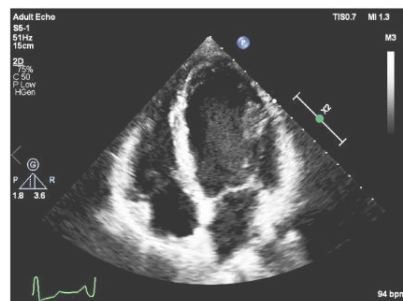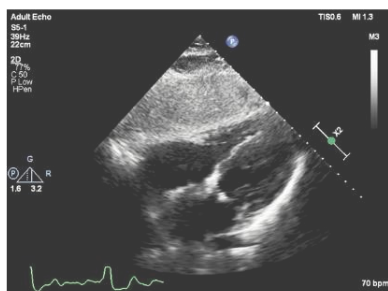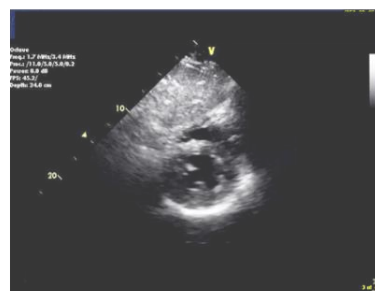
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FELS IMAGE PROTOCOL
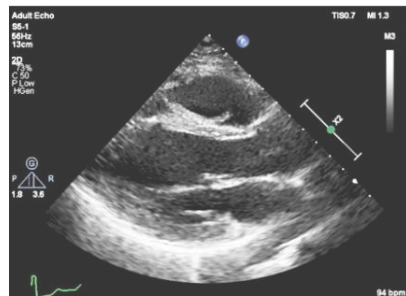
1. PLAX

2. PSAX

3. Apical 4C

4. SubLAX

5. SubSAX

6. Sub IVC

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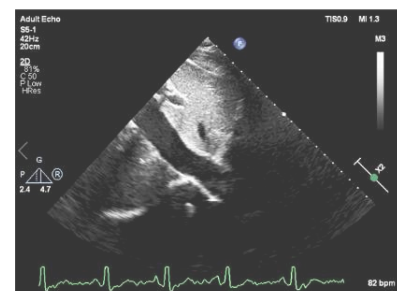
Appendix 4

PoCUS FELS/HEART FAILURE

Examination Date and Time: 18/01/2024 1433   Scan Supervised by:

Clinical Reason for Performing Scan:

Scan Type:
- ○ Monash Health credentialed scan
- ○ Non Monash Health credentialed scan
- ○ Training scan

Left Ventricle

LV Image Quality:
- ○ Good
- ○ Suboptimal
- ○ Non Diagnostic

LV Size:
- ○ Normal
- ○ Dilated
- ○ Unsure

LV Function:
- ○ Normal
- ○ Reduced
- ○ Unsure

Right Ventricle

RV Image Quality:
- ○ Good
- ○ Suboptimal
- ○ Non Diagnostic

RV Size:
- ○ Normal
- ○ Dilated
- ○ Compressed
- ○ Unsure

RV Function:
- ○ Normal
- ○ Reduced
- ○ Unsure

Pericardial effusion, atria and IVC

Pericardial Effusion:
- ○ Nil
- ○ Small
- ○ Moderate
- ○ Large

If present, is there atrial compression
- ○ Yes
- ○ No
- ○ Non-diagnostic/Unsure

If present, is there RV collapse?
- ○ Yes
- ○ No
- ○ Non-diagnostic/Unsure

Could this patient have tamponade
- ○ Yes
- ○ No
- ○ Unsure

IVC - Size (<2.1cm):
- ○ Normal
- ○ Dilated
- ○ Non Diagnostic

IVC - Collapssibility
- ○ >50%
- ○ <50%
- ○ Unsure
- ○ Ventilated

Revised February 2024

Appendix 5

Monash Health Practical Evaluation for FELS Credentialling

- **Name:**

- **Hospital:**

- **Assessor:**

- **Date:**

- **Start/finishing time:**

Evaluation

Completion in ≤ 10 minutes

Satisfactory or Non-satisfactory only

Any score of 0 = Non-satisfactory

Scores 1 or 2 = Satisfactory

2 levels of Pass scores are for feedback and to monitor areas for improvement

	0	1	2
Explain Examination	Incomplete or Misinformation	Explanation Complete but Brief	Full Explanation with Indication and Limitations
Patient and scanning environment setup Positioning patient, removing ECG dots, turning off lights.	Not attempted	Partial attempt of patient and environment setup	Excellent patient and scanning environment setup
Entry of Patient Details, Selection of Transducer and Examination Presets	Unable to complete task completely	Task completed but with hesitancy	Excellent knowledge of machine, accurate data input
Image optimisation (depth, gain, TGC, focus)	Suboptimal image quality	Optimizes image but uncertainty in use of controls	Optimizes image appropriately with familiarity
PLAX – on axis LV and able to see Aortic root prox ascending Ao	Incomplete demonstration	Structures demonstrated but unsystematic approach	Systematic approach in demonstrating all structures
PSAX – on axis doughnut shaped LV	Incomplete demonstration	Structures demonstrated but unsystematic approach	Systematic approach in demonstrating all structures
Apical 4 Chamber	Incomplete demonstration	Structures demonstrated but unsystematic approach	Systematic approach in demonstrating all structures

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	0	**1**	**2**
Subcostal View – Demonstration of heart in the 4 chamber view.	Incomplete demonstration	Structures demonstrated but unsystematic approach	Systematic approach in demonstrating all structures
Subcostal View – Demonstration of heart in the subcostal short axis view.	Incomplete demonstration	Structures demonstrated but unsystematic approach	Systematic approach in demonstrating all structures
Subcostal View – Pericardium including IVC sniff	Incomplete demonstration	Structures demonstrated but unsystematic approach	Systematic approach in demonstrating all structures
Clean of gel, cover patient and turn on room light. Clean machine and probe thoroughly. Leave chords near and tangle free	Not attempted	Incomplete	Complete
Interpretation and Documentation	Absent/inappropriate documentation Incorrect interpretation	Incomplete documentation Some inaccuracies without major errors in interpretation	Systematic approach in documentation and accurate reporting
Comments:			

Result: Competent   /   Incompetent

Assessor/Signature/Date:

References

1. Labovitz AJ, Noble VE, Bierig M, Goldstein SA, Jones R, Kort S, et al. Focused cardiac ultrasound in the emergent setting: a consensus statement of the American Society of Echocardiography and American College of Emergency Physicians. J Am Soc Echocardiogr. 2010;23(12):1225-30.

Revised February 2024