



Credentialling Workbook for Basic Lung Ultrasound

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Introduction

Basic lung ultrasound examination can be used to detect the absence of lung sliding, interstitial fluid syndromes, pleural effusion, and consolidation. The examination involves scanning the lungs in a minimum of four zones.

The basic pathway to competency follows a structure of: theory and introductory phase, supervised practice, experience and exit assessment of competence, the details of which can be found in this booklet.

The credentialing process requires candidates to:

- Complete an appropriate instructional educational program
- Perform and record a requisite number of supervised and logged emergency department ultrasounds
 - A minimum of 25 accurate examinations must be performed
 - At least 50% of these examinations must be clinically indicated
 - At least five should demonstrate significant pathology e.g. pneumothorax, effusion, pneumonia, interstitial syndrome
 - There should be a minimum of two formative assessments completed
- Pass a summative assessment
- Once credentialed, meet ongoing maintenance requirements
 - At least three hours of ultrasound training per year
 - Perform or supervise a minimum of 25 Lung Ultrasound examinations per two-year cycle and maintain a logbook to prove this for audit purpose

Credentialling in Basic Lung Ultrasound

Unit Completion form



1. Personal Details

Family name:

Given names:

Email Address:

2. Educational Program

- ☐ Introduction to ED POCUS course certificate
- ☐ USS physics course certificate
- ☐ Lung Ultrasound theory course certificate
- ☐ Lung Ultrasound practical course component met, and certificate provided

3. Experience phase

- ☐ I have used a logbook and the scans have been reviewed by a credentialled scanner/supervisor
- ☐ My logbook contains: 25 accurate Lung ultrasound scans, including scans used for assessments
- ☐ 50% of these scans are clinically indicated
- ☐ There are at least 5 positive scans for significant pathology e.g. pneumothorax, effusion, pneumonia, interstitial syndrome
- ☐ The above requirements are clearly labelled and identifiable within my logbook.

4. Demonstration of Competence

- ☐ I have completed 2 formative assessments and 1 summative assessment
- ☐ Assessments are not completed on the same date
- ☐ All assessments are signed by both my supervisor and me.

5. Maintenance Requirement

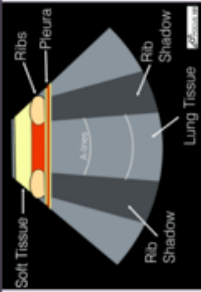
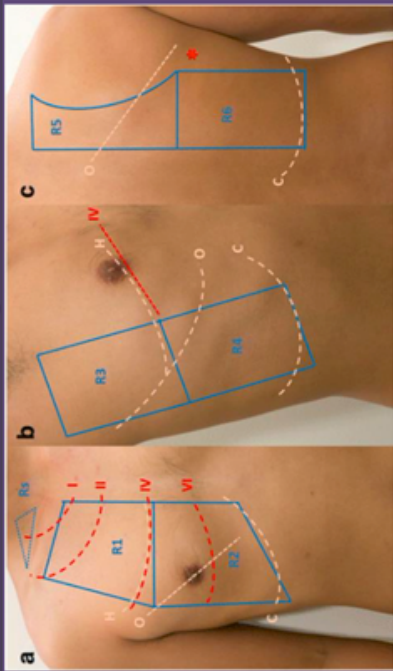
- ☐ I acknowledge that to maintain these credentials I will undertake at least three hours of ultrasound training per year
- ☐ I acknowledge that to maintain these credentials I must perform or supervise a minimum of 25 Lung US examinations per two-year cycle and maintain a logbook to prove this for audit purposes

Instructional Educational Program for Basic Lung Ultrasound

- 1. Basic Ultrasound Knowledge:** A formal course should include education on the Physics of Ultrasound and Instrumentation. Online Ultrasound Courses that provide this basic knowledge include the Australasian College for Emergency Medicine (ACEM) Ultrasound Course modules. Anyone can access these modules by creating an ACEM login. The Introduction to POCUS and Physics course can be found at [Course: Ultrasound \(acem.org.au\)](https://elearning.acem.org.au/course/view.php?id=951) or <https://elearning.acem.org.au/course/view.php?id=951>
 - a. Physics:** Piezoelectric effect; Wave characteristics – cycle, frequency, period, wavelength, amplitude; Echogenicity; Image resolution; Attenuation; Doppler effect; Impedance; Artefacts; Bio-effects
 - b. Instrumentation:** Transducer types and selection; Transducer manipulation; Image labelling; Focus; Gain; Time gain compensation; Orientation; Scan planes; Image measurement; Infection control; Machine care and maintenance

- 2. Lung Ultrasound Theory:** A formal course should instruct on normal anatomy, views obtained, possible findings, clinical algorithms and integration, limitations/pitfalls and reporting. ACEM also provides a Thoracic/Lung learning module [Course: Ultrasound \(acem.org.au\)](https://elearning.acem.org.au/course/view.php?id=951) or <https://elearning.acem.org.au/course/view.php?id=951>
 - a. Anatomy:** Lung surface markings of upper, middle and lower lobes; Lung zones 1-4 or 1-6; diaphragm; ribs; pleural surface; spine; heart; liver; spleen; thymus
 - b. Practical:** Optimise machine preset/settings to scan lungs; Scan lung zones 1-4 (or 1-6); identify diaphragms and lung curtain; identify ribs, intercostal space, pleural line; identify lung sliding; identify lung pulse; identify comet tail and other artefacts
 - c. Findings:** Normal lung; absent lung sliding (and how to differentiate causes); Focal B lines; Diffuse B lines; Consolidation; Pleural effusion
 - d. Integration – clinical cases:** Pneumonia; Interstitial syndrome; Cardiogenic pulmonary oedema; Lung fibrosis; Pneumothorax; Pleural effusion; Bronchiolitis/viral pneumonitis; Integration of lung ultrasound into resuscitation (initial assessment and in monitoring response e.g early evidence of fluid overload)
 - e. Pitfall cases**

- 3. Lung Practical ultrasound sessions.** It is essential that practical ultrasound sessions include:
 - a. Demonstration of correct application protocol for emergency indication.
 - b. Minimum time – two hours
 - c. Maximum student:instructor ratio – 5:1
 - d. Live ultrasound models for scanning sessions, preferably including both normal subjects and patients with demonstrable pathology. Patients or professional-grade simulators are preferable for abnormal anatomy. However, they may not always be readily available. In such cases, ultrasound cineloops showing the same pathology may be substituted.

				Lung		Lung USS is a limited ultrasound that aims to detect: 1. Absence of Lung sliding (possible pneumothorax) 2. A-lines (normal lung artefact) 3. Significant B-lines (fluid or inflammation) 4. Consolidation 5. Pleural effusion		Patient details																																									
Indication for scan		(e.g. Respiratory distress, hypoxaemia)		Pulse		BP		RR		Sats																																							
Examination Findings		Probe Position		Views		Pathology		Findings		Notes																																							
				Normal anatomy - Rib shadows - A-lines – reverberation artefact - Lung sliding – ‘ants marching’ at pleural surface, can also use M-mode looking for seashore sign.		Inferior R4/ Inferior L4 normal view - Diaphragm: double line - Liver (R4), Spleen L4) - Spine should only be seen below diaphragm - May see mirror image of spleen/liver - Lung curtain sweeps down				<table><tr><td rowspan="3">B-lines</td><td>B0</td><td>1-3 B-lines per ICS is normal</td></tr><tr><td>B1</td><td>>3 discrete B-lines per ICS</td></tr><tr><td>B2</td><td>Confluent B-line</td></tr><tr><td rowspan="3">Consolidation</td><td>C0</td><td>No consolidation</td></tr><tr><td>C1</td><td>Subpleural consolidation <1cm height</td></tr><tr><td>C2</td><td>Large consolidation >1cm height</td></tr><tr><td rowspan="3">Pleural effusion</td><td>E0</td><td>None</td></tr><tr><td>E1</td><td>Present</td></tr><tr><td>P0</td><td>Absent</td></tr><tr><td rowspan="3">Pneumothorax</td><td>P1</td><td>Present</td></tr></table>		B-lines	B0	1-3 B-lines per ICS is normal	B1	>3 discrete B-lines per ICS	B2	Confluent B-line	Consolidation	C0	No consolidation	C1	Subpleural consolidation <1cm height	C2	Large consolidation >1cm height	Pleural effusion	E0	None	E1	Present	P0	Absent	Pneumothorax	P1	Present	<table><tr><td>Right zone 1</td><td>Left zone 1</td></tr><tr><td>Right zone 2</td><td>Left zone 2</td></tr><tr><td>Right zone 3</td><td>Left zone 3</td></tr><tr><td>Right zone 4</td><td>Left zone 4</td></tr><tr><td>Right zone 5</td><td>Left zone 5</td></tr><tr><td>Right zone 6</td><td>Left zone 6</td></tr></table>		Right zone 1	Left zone 1	Right zone 2	Left zone 2	Right zone 3	Left zone 3	Right zone 4	Left zone 4	Right zone 5	Left zone 5	Right zone 6	Left zone 6
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Technique - Rock probe to make pleura parallel - Tilt to find A-lines - Scan in mid-clavicular line, mid-axillary line, paraspinal - Scan superiorly to diaphragm		Absent lung sliding - Absence of ‘ants marching’ or barcode sign in M-mode (Seashore is normal) - DDx: PTX, consolidation, apnoea/ RMB, intubation, pleural disease/ pleurodesis, severe hyperinflation, effusion		B-lines - Ray-like vertical lines extending off the bottom of the screen, start at pleura. - Confluent – pneumonia, oedema - Diffuse – viral pneumonitis, oedema		Consolidation - Air bronchograms, subpleural hypoechoic regions, c-lines, “shredding” appearance - >1cm more likely bacterial, viral <0.25cm		Pleural effusion - Usually hypoechoic (acute), best seen in dependent areas (above diaphragm) - Loss of spine sign, A-lines, pleural sliding		Conclusions (Note: USS findings must be consistent with clinical suspicion: integrate history, examination, investigations and USS findings). e.g. B-pattern focal, multifocal or diffuse, size of pleural effusion and echogenicity, size of pneumothorax																																							
Accuracy: High sensitivity and specificity for pneumothorax: pleural effusion (sens. 92%, spec. 93-97%), better than CXR; pneumonia (sens. 96%, spec. 93% - misses central pneumonia 1.5% of cases)		Clinician		Signature		Date		Time		Resource adapted from V. Manivel, POCUS 101																																							

Logbook requirements

Patients must be informed that the ultrasound examination is being performed for credentialing purposes and verbal or written consent obtained.

Ultrasound examinations must be documented in an appropriately secure logbook. The entry should include:

- Clinical details
- Date and type of ultrasound examination performed
- Findings
- Candidate's interpretation of those findings
- The findings and interpretation should subsequently be compared to other clinical data and a notation made as to whether the scan findings were accurate.
- Where the scan was not supervised there should be confirmatory evidence of the accuracy of the examination (via additional studies or clear clinical evidence).
- All logbook scans should be either directly proctored, or the images reviewed at a later date by one of the trainee's supervisors.

We encourage you to perform as many of your logbook scans as possible with a credentialed clinician in order to gain feedback.

A logbook template can be found on the CED Credentialling page under "Credentialling Resources"

Assessments

For each modality, at least two directly supervised formative assessments must be completed prior to a final summative assessment. Assessments forms can be found on the next page or on the CED Ultrasound website.

The final summative assessments and credentialing process must be overseen by a clinician who is themselves credentialed in that modality. They will observe the candidate performing the ultrasound examination and will not give any feedback during this examination. This may be undertaken simultaneously as a Direct Observations of Procedural Skill (DOPS) assessment for FACEM Trainees.

Once the examination requirements are satisfied, the emergency medicine practitioner will be credentialed for the appropriate ultrasound module. The emergency medicine sonologist may then document the results of his/her ultrasound scans in the medical record and incorporate the results into clinical decisions. ACEM has a formal link with the Australasian Society for Ultrasound Medicine. ACEM accepts successful completion of the Certificate in Clinician Performed Ultrasound (CCPU) as appropriate demonstration of competence.

CED POCUS Competence Assessment Form



Lung Ultrasound

Candidate: _____

Assessor: _____

Date: _____

Assessment type: Formative (feedback & teaching given during assessment for education) ☐
 Summative (prompting allowed but teaching not given during assessment) ☐

To pass the summative assessment, the candidate must pass all components listed

Prepare patient

Position
Informed

Competent	Prompted	Fail

Prepare Environment

Lights dimmed if possible

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Probe & Preset Selection

Can change transducer
Understands roles of the different transducers
Selects appropriate preset
Discusses & justifies choice of probe orientation
Understands effect of filters (eg THI & multibeam / crossbeam) on lung imaging

Data Entry

Enter patient details

--	--	--

Image Acquisition

Optimisation (depth, freq, focus, gain)

--	--	--

Images & explains normal structures

Chest wall
Ribs / costal cartilages
Pleural space
Pleural sliding
Able to differentiate lung sliding & cardiac motion on left chest
Able to use M mode & explain its role & limitations
Lung
Diaphragm
Liver and spleen

Heart

--	--	--

Images & explains normal artefacts

Lung (pleural) sliding

Scatter

Lung curtain

A lines

B lines

Lung pulse

Competent

Prompted

Fail

Interprets images of pathology (using library images if necessary)

Pleural thickening

Pleural fluid

B-pattern (including differential)

Consolidated lung (incl differential)

Absent lung sliding

Presence of lung point

Record Keeping

Labels & stores appropriate images

Documents any pathology identified

Completes report

Each view adequate / inadequate

Documents focussed scan only

Describe findings briefly

Integrates ultrasound findings with clinical assessment and explains how the findings might change management

Machine Maintenance

Cleans / disinfects ultrasound probe

Stores machine and probes safely and correctly

For Formative Assessment Only:

Feedback of particularly good areas: _____

Agreed actions for development _____

Examiner Signature: _____ Candidate Signature: _____

Examiner Name: _____ Candidate Name: _____

Date: _____



Credentiailling Certificate in Focused Ultrasound

Has met the requirements for
Credentiailling in Basic Lung as outlined
in the ACEM Policy on Credentiailling for
Emergency Medicine Ultrasound (P733)

Kylie Salt (Clinical Lead in US, CED, Starship
Children's Hospital, Auckland, NZ)

Date

Credentialling Maintenance

To maintain his/her credentials, the emergency medicine sonologist should undertake at least three hours of ultrasound training per year. This may include:

- 1:1 training with a qualified Sonographer Educator in ED (SEED);
- attending or presenting at an ultrasound webinar/workshop or conference;
- teaching on an accredited course;
- participation in ultrasound quality assurance and retrospective image review; and
- reading Ultrasound journals or textbooks.

For the Lung Ultrasound module, the emergency medicine sonologist must perform or supervise a minimum of 25 scans per two-year cycle. It is recommended these are logged in a logbook for audit purposes. An example logbook could contain the following columns:

- Date
- Case for 14 years and under?
- Supervised scan? (Did you supervise this scan, rather than personally perform?)
- Trainee's name (if supervised scan)
- Clinical Indication (indicate the symptoms or condition that substantiates the necessity for further investigation by an ultrasound scan)
- Positive?
- Interpretation and Clinical Findings
- Comparison with further imaging or clinical outcome