



Focused Ultrasound in Intensive Care (FUSIC)

Training Details (December 2019)

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Introduction

Traditionally ultrasound has been the remit of either cardiologists/cardiac physiologists or radiologists/sonographers. When faced with a critically ill patient, this distinction becomes unhelpful because organ systems are interrelated and should not be examined in isolation.

The Intensive Care Society is the largest multi-professional critical care membership organisation in the UK that welcomes medical, nursing and allied healthcare professionals from across the world.

To enable non-traditional users to learn ultrasound, the Intensive Care Society launched FICE in August 2012, followed by CUSIC in 2014. Since then, ultrasound has become a vital tool in the assessment, monitoring and treatment of critically ill patients.

With the continued uptake of ultrasound skills across the Intensive Care workforce, the separation between cardiac and non-cardiac ultrasound has become increasingly artificial. After all, the patients, equipment and operators are all the same. We have also recognised that it is unrealistic to expect anyone to become proficient in ultrasound assessment of every organ system in one go.

Therefore, to break down these barriers and become as accessible as possible, the Intensive Care Society has decided to make our training system completely modular. FUSIC is the natural evolution of our ultrasound accreditation and offers you the freedom to choose the specific modules that are most relevant to your professional development, all in a timeframe that suits you.

This document outlines the FUSIC training pathway to achieving accreditation in the various modules of intensive care ultrasound. While accreditation may be completed in individual modules, Heart, Lung and Vascular access modules are considered core skills for Intensive Care Medicine. We intend to introduce more advanced modules in the near future.

FUSIC Accreditation is available to clinicians (doctors, nurses and allied healthcare professionals) from all specialities that regularly assess and treat critically ill patients.

Outline

Accreditation in each module requires registration with the ICS, attendance at an ICS certified course (for specified modules), completion of theoretical training, mentored and directly supervised practice leading to completion of a log book demonstrating knowledge of an appropriate range of pathology, satisfactory completion of competency assessments and a final triggered assessment within each area of practice (Heart, Lung, Vascular, DVT and Abdomen).

While it should be possible to complete each non-cardiac module within a 6-month training block on an appropriate intensive care unit, FICE may take longer due to its larger logbook requirement. Regardless of module, each logbook *must* be completed within 12 months (i.e.



first scan to last scan). Individual circumstances may mean that more time is required, but extensions will only be granted by advance application to the FUSIC committee. This can be done by emailing fusic@ics.co.uk

Please note that modules are subject to updates and changes.

Administration

Those wishing to complete any module of FUSIC training must first register with the Intensive Care Society, ideally having identified a training Mentor. Failure to do so may delay your accreditation process.

A registration fee will be charged, details of which can be found on the ICS website. This fee covers the administration, training, development and clinical governance costs associated with running the programme. ICS members will be charged a reduced fee as a members benefit.

The ICS maintains a database of approved FUSIC Mentors and Supervisors for each module. You can locate your nearest Mentor using the link on the FUSIC homepage. Once your Mentor and Supervisor have completed and signed off your summary training record, you will need to send this to the ICS, who will then provide you with a certificate of completion of training in the relevant module(s).

All enquiries regarding the training pathway should be addressed to:

Email: fusic@ics.ac.uk

Telephone: 0207 2804350

Writing:

FUSIC Administrator

The Intensive Care Society

Churchill House

35 Red Lion Square,

London WC1R 4SG



Details of Training Pathway

1: Registration with ICS

Please email FUSIC@ics.co.uk to register. A member of the secretariat will contact you to confirm your registration.

2: Identification of Mentor and Supervisor

There are several ways to do this:

- 1) Choose one from the ICS website. A list of local Mentors and Supervisors can be found here.
- 2) Ask someone local to apply. Application is easy using a simple form that can be downloaded from the ICS website. Definitions, roles and responsibilities of a Mentor and Supervisor are all outlined below.
- 3) Remote mentoring. It is important to have a local Mentor to help develop your practical skills and support your clinical practice going forward. However, we recognise that this is not always possible, and remote supervision may be necessary. Cloud-based archiving and review systems, such as that found at www.hocuspocus.org, may facilitate this.

3: Completion of e-Learning

E-learning packages will become available over time and will be hosted on the ICS website.

4: Attendance on an approved course

To complete the Heart (FICE), Lung, and Abdominal modules you must attend an ICS approved FUSIC course that includes these modules. You can complete other modules, such as vascular access and DVT, with local theoretical training as long as it covers all aspects of the respective syllabus. Your training mentor is responsible for confirming satisfactory completion of theoretical training.

The ICS maintains a list of approved courses on its website.

5: Mentored practice and completion of logbook

Supervised cases: Direct supervision is an essential part of the training process. A minimum number of supervised scans are required for each module (details specified below), but we encourage as much direct supervision as possible throughout your logbook collection period.



All ultrasound-guided procedures will be directly supervised until you have demonstrated competence in performing them.

Unsupervised cases: Any scans you undertake without direct supervision should be stored for review by your Mentor. Your training studies must not be stored in the clinical record or used for clinical decision-making until someone suitably trained has verified them.

Timeline: Learning must take place in the real world and we acknowledge that the FICE accreditation the process, for instance, may take up to 24 months from registration to completion. However, we strongly believe that to combat skill fade and ensure adequate uptake of knowledge, skills and attitudes the logbook collection period (from first scan to last scan) should be no more than 12 months. Consequently, these dates will be recorded and monitored closely. Applications to extend this logbook collection period may be considered under exceptional circumstances.

Case-mix: A demonstrable range of pathology is essential. Fundamentally, logbook studies should be from patients with organ dysfunction. It is acceptable to include multiple scans from the same patient if their clinical or radiological picture has changed. No more than 10% of logbook studies should be on healthy volunteers. In previous years, examinations undertaken during an approved course were accepted as directly supervised scans. However, we no longer support this practice. Courses are important; real-life learning opportunities more so.

Reporting: You must use the standard reporting form for all ultrasound examinations where provided. All documents, including the training record, logbook and competency assessments, can be downloaded from the ICS website.

Review: Your Mentor is responsible for reviewing your logbook and signing off that you have undertaken studies and demonstrated competence in an appropriate range of pathology. We encourage you to meet periodically with your Mentor to review your studies. Doing so all at the end limits your learning opportunities and risks losing them altogether, after considerable expense of your time and effort. Over time you should notice increasing agreement in interpretation between you and your Mentor.

Competence: Learners acquire skills at differing rates. The minimum number of scans that are likely to be necessary in order to demonstrate competence, and to have experience of the required range of pathology, are listed below. Your Mentor and Supervisor are responsible for assessing competence and whether you have undertaken an adequate number before your Triggered Assessment.

Heart (FICE)

Minimum supervised - 10

Minimum total - 50

Case mix - no more than 10 normal scans

Lung

Minimum supervised - 10

Minimum total - 30

1 scan = 1 patient (i.e. 2 lungs for each scan)

Case mix - No more than 10 normal scans

Medical practitioners must demonstrate competence in ultrasound-guided pleural aspiration and drainage. This is not required for nurses or allied health professionals unless the procedure is part of their routine practice.

Vascular Access

For practitioners without previous vascular access ultrasound experience the minimum number of procedures recommended to demonstrate competence is:

CVC (jugular +/- femoral) - 5 (3 supervised)

PICC/Mid - 3 (1 supervised) - *if PICC or midlines are not available in your institution these can be substituted with peripheral lines*

Peripheral vascular access - 2 (1 supervised)

Abdominal

Minimum Supervised - 10

Minimum total - 25

Case mix - no more than 15 normal scans

Doctors must demonstrate competence in ultrasound-guided paracentesis.

DVT

Supervised - 5

Minimum total - 10

Case mix - At least 1 must demonstrate a DVT. Trainees are encouraged to attend a DVT ultrasound list if there is difficulty finding a positive scan.



6: Assessment of competence

Once you have performed and logged an appropriate number of examinations/procedures for each module and had your competencies signed off, your Mentor will decide when it is appropriate for you to undertake a triggered assessment.

Completion of training in each module occurs following a satisfactory triggered assessment with your Supervisor.

Once all the above steps have been completed and your summary training record (completed and signed by your Mentor and Supervisor) is forwarded to the ICS Secretariat, you will be awarded your certificate of accreditation in the relevant module.

7: Maintenance of competence after accreditation

Once accredited, you will be responsible for maintaining your knowledge and competence in ultrasound by undertaking regular and relevant continuing medical education (CME/CPD). In order to maintain your practical skills it is important that you regularly undertake ultrasound examinations (and guided procedures) that involve an appropriate range of pathology and practical procedures.

Undertaking regular audit and multidisciplinary review of your studies by advanced practitioners is an excellent way to maintain quality assurance.

For further guidance on ultrasound governance, please read GPICS 2, section 4.7 (p138).

Trainers

Mentor

Your Mentor may be any healthcare professional with suitable experience and regular practice in intensive care ultrasound.

As a minimum, Mentors are expected to have been FUSIC-accredited in the relevant module for at least 12 months, be able to demonstrate support from a local Supervisor, and have been approved by the FUSIC committee. Mentor applications can be found on the FUSIC website.

Mentors have the following responsibilities:

- To identify a local Supervisor for review of difficult cases and ongoing clinical support
- To enable you to access a suitable ultrasound machine and critically ill patients
- To mentor you and review your logbook scans
- To sign-off your competencies and recommend you for a triggered assessment



- To countersign (with Supervisor) your summary training record to confirm that you have satisfactorily completed all the training components.

Supervisor

Each unit delivering intensive care ultrasound training should have a nominated Supervisor for each module. Supervisor definitions differ slightly, depending on the training module (see table). However, the roles are exactly the same.

You do not need to find yourself a Supervisor as your Mentor will have already identified one when they registered themselves with the ICS.

Supervisor definition	
Heart (FICE)	Level 2 TTE accreditation <i>or</i> A Cardiologist with regular sessional commitments to TTE
Lung	Clinician with advanced lung ultrasound practice (approved by FUSIC committee) <i>or</i> Radiologist
Abdomen	Clinician with level 2 or equivalent qualifications eg RCR, RCEM, diploma
Vascular access	Intensive Care or Anaesthetic consultant with relevant experience
Vascular (DVT)	Clinician with advanced ultrasound practice (approved by FUSIC committee) <i>or</i> Qualified Sonographer or Radiologist

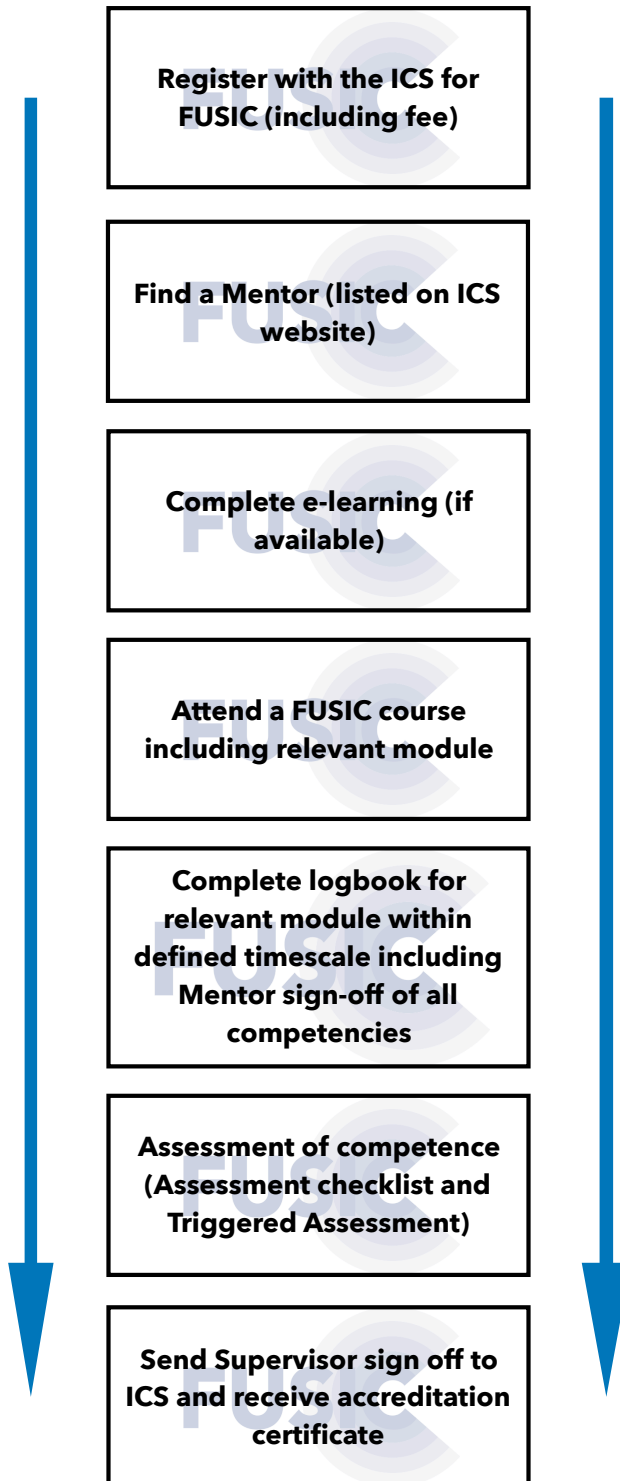
Your training Supervisor has the following responsibilities:

- To conduct your triggered assessment.
- To counter sign (with your Supervisor) summary training record to confirm that you have satisfactorily completed all the training components.
- To provide expert advice and review of scans when needed by you or your Mentor.
- To provide your Mentor with ongoing training, according to their individual needs, and facilitate their path to more advanced level accreditation if appropriate.

Your Supervisor is encouraged to participate in trainee teaching when possible. An ICU consultant with advanced ultrasound accreditation would be expected to take on roles of both Mentor *and* Supervisor.



Each module of the FUSIC programme can be completed via the steps demonstrated below



FUSIC syllabus

Generic knowledge

Physics and instrumentation

- Properties of sound waves: amplitude, frequency, wavelength, propagation velocity
- Ultrasound in the body:
 - Propagation velocity in different media
 - Frequency and attenuation
 - Sound and interfaces - transmission, reflection (specular, scatter), refraction, acoustic impedance
 - Biological effects - heat generation and safety
- Sound generation
 - Piezo-electric effect
 - Basic transducer design
 - Types of transducers
 - B mode and M mode
- Image quality
 - Frame rate, temporal resolution, spatial resolution, axial resolution, lateral resolution and how these relate to frequency, depth and width
 - Gain
 - Focus points
 - Artefacts and their generation
- Doppler
 - Colour, Power, Spectral (PW, CW)
- Ultrasound systems
 - Basic components and controls
 - ECG
- Descriptive terms
 - Hyperechoic, hypoechoic and anechoic and how they relate to structures

- Sonographic appearance of tissues, muscle, blood vessels, nerves, bone, tendons etc

Ultrasound techniques

- Patient information and preparation
- Indications and limitations of focused examinations
- Relevance of other imaging modalities to ultrasound
- Influence of ultrasound results on the need for other imaging
- Selection of appropriate transducer and exam type
- Use of conductive gel
- Correct adjustment of ultrasound controls (depth, gain, width and focus)
- Probe manipulation - pressure, sliding, tilting in long and short axes
- Scanning techniques - 2D, M-mode, and colour Doppler
- Identification of relevant anatomy
- Identification of common artefacts

Needling techniques

- Understanding of terminology of planes of view e.g. transverse, longitudinal
- Understanding of terminology of needle insertion: in plane and out of plane
- Relationship of probe, needle gauge, angle of insertion, depth and needle visibility
- Limitation of out of plane needle insertion with regard to visibility of needle tip
- Limitation of in plane technique: beam width, parallelism
- The use and limitation of needle guides and ultrasound visible needles
- Knowledge of common causes of failure to see the needle during placement

Administration and governance

- Image recording, reporting and storage
- Indications for immediate expert assistance, subsequent comprehensive scan by accredited practitioner or need for alternative investigation



- Medico-legal aspects - outlining the responsibility to practice within specific levels of competence and the requirements for training
- Need to quality assure reports
- Relevance of data protection act to image storage
- Consent
- Understanding sterility, infection control and machine cleaning
- The value and role of departmental protocols
- The resource implications of ultrasound use

Module Specific knowledge

Heart ultrasound (FICE)

Knowledge

- Indications and limitations of focused echo
- Relationship between conduct of peri-arrest echo and the ALS algorithm
- Format of standard echo report

Performance of systematic examination of the heart

- Scanning the heart from the PLAX, PSAX, A4C and subcostal windows

Recognition of normal anatomy

- Pericardium, walls, chambers, valves, great vessels, lung, ribs, sternum

Recognition of pathology including:

- LV dilatation - LVEDD >6cm
- RV dilatation - RV >2/3 the basal width of the LV
- Ventricular dysfunction - reduction in wall thickening and motion, TAPSE, MAPSE
- Regional wall motion abnormalities - regional reduction in wall motion and thickening
- Fluid overload - RV dilatation, D shaped septum, paradoxical septal motion
- Pulmonary hypertension - RV dilatation, D shaped septum, paradoxical septal motion
- Features of low venous return (vasodilatation, hypovolaemia) - small, collapsing IVC, small, hyperdynamic LV and RV, papillary apposition in systole
- Pericardial collection - distinguish from pleural collection
- Pleural collection - distinguish from pericardial collection

Lung ultrasound

Performance of systematic examination of lung and pleura

- Scanning each lung in 3 zones (upper, lower and postero-lateral regions)

Recognition of normal thoracic structures and adjacent organs

- Ribs, subcutaneous tissues, pleura and diaphragm
- Heart, liver, spleen and kidneys

Identification of ultrasound appearances of normal aerated lung including:

- Diaphragmatic movement
- Pleural line and sliding sign (in 2D and M mode)
- Normal aerated lung (including A-line and B line artefacts)

Recognition of pleural fluid

- Ultrasound appearances of pleural fluid and pleural thickening
- Appearances suggesting transudate, exudate and loculation
- Assessment of size of effusion
- Distinguishing between pleural thickening and effusion
- Demonstration of sinusoid sign on M mode
- Distinguishing between pleural and abdominal fluid collection

Recognition of consolidation/atelectasis

- Ultrasound appearances of consolidated/atelectatic lung
- Ultrasound appearances of air and fluid bronchograms

Recognition of interstitial syndrome

- Differentiating between normal and pathological B-lines

Use of ultrasound to exclude pneumothorax

- Recognition of signs of pneumothorax (B mode and M mode)
- Absence of lung sliding, B lines and lung pulse
- Presence of lung point

Medical practitioners - Performance of ultrasound guided thoracocentesis and knowledge of the pros and cons of direct vs indirect approach

Nurses and Allied Healthcare Professionals - Description of ultrasound guided thoracocentesis

Ultrasound guided vascular access

Generic competencies

- Identification of vein and artery in transverse and longitudinal scan
- Differentiating arteries and veins with 2D ultrasound and Doppler
- Identification of common anatomical variations
- Identification of common pathology (thrombus)
- Undertaking ultrasound guided cannulation in real time maintaining sterility
- Identification of needle tip with transverse and longitudinal views
- Identification of guide wire within vessel

Real time use of ultrasound to guide cannulation of following vessels

- Internal jugular vein
- Femoral vessels: vein and artery
- Peripheral veins and arteries (including PICC/mid lines)

(Although ultrasound guided axillary/subclavian cannulation is recommended this is not considered a core competency)

Abdominal ultrasound

Performance of systematic examination of the abdomen in the RUQ, LUQ and pelvis (FAST scan zones), kidneys, RIF/LIF (ascites), pelvis (bladder, prostate/cervix)

Recognition of ultrasound appearances of the following structures:

- Diaphragms, liver, spleen, kidneys
- Bowel and stomach
- Bladder, prostate/cervix

Detection of intra-abdominal free fluid

- Assessment of bleeding
- Assessment of ascites
- Distinguishing between abdominal and pleural fluid

Recognition that a FAST scan is a 'rule in' not a 'rule out' for bleeding (false negatives). A CT scan is needed to rule out bleeding

Detection of hydronephrosis

- Recognition of normal vs hydronephrotic kidney
- Distinguishing between mild, moderate and severe hydronephrosis

Bladder assessment

- Recognition of full bladder
- Differentiate full bladder from pelvic fluid and ascites



Paracentesis

- Medical practitioners - Demonstrates US guided paracentesis
- Nurses and Allied Healthcare Professionals - Description of ultrasound guided paracentesis

Vascular ultrasound (DVT)

Identification of:

- Common femoral vein and artery in inguinal crease
- Junction of common femoral and saphenous veins
- Junction of common femoral and deep femoral veins
- Popliteal vein and artery in popliteal fossa
- Trifurcation of popliteal vein

Distinguishes veins from arteries

Demonstration of:

- Compression test in inguinal region, compressing every 1 cm from 2 cm proximal from junction of common femoral and saphenous veins to junction of common femoral and deep femoral veins, continuing compression of vein down to mid thigh.
- Compression test at popliteal fossa, compressing every 1 cm from the distal 2cm of the popliteal vein to its trifurcation
- Use of colour Doppler to distinguish vein from artery, identify phasic venous flow with respiration and augmentation of venous flow with calf compression