Focused Acute Medicine Ultrasound (FAMUS)

Curriculum pack

DVT / peripheral vascular access module

Contents

Introduction

Focused Acute Medicine Ultrasound (FAMUS) is the ultrasound accreditation pathway developed by the Society for Acute Medicine (SAM) to support clinicians working in acute care. We now offer this accreditation through individual modules to allow clinicians more flexibility with their training, and this document outlines the pathway for the DVT / peripheral vascular access module. The curriculum is designed to support decision making for clinicians of all grades who look after the acutely unwell patient, whether at the front door or as part of an internal medicine commitment.

It is expected that this curriculum pack be read in conjunction with other available guidance on the use of ultrasound by non-radiologists:

- European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB) 'Minimum training requirements for the practice of medical ultrasound in Europe' document (available here).
- British Medical Ultrasound Society and Royal College of Radiologists joint guidance due for publication in 2023 (available through this webpage)

Administration

FAMUS accreditation is administered by the Society for Acute Medicine:

The Society for Acute Medicine Secretariat

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Candidates are recommended to register with the administrator (fee involved) once a supervisor has been identified and prior to commencing training. Upon completion of training, they should send their Assessment of Completion of Training to the administrator, who will issue a certificate and register the candidate on the FAMUS database.

In addition, the administrator will maintain a list of registered FAMUS supervisors, and of upcoming FAMUS-approved practical courses.

Training can be undertaken by any healthcare professional (or student). However, accreditation may only be awarded to those who are registered with their professional body (which includes provisional registration for Foundation Year 1 Doctors, and the managed voluntary register for Physician Associates).

Summary of module

This module utilises a 3-point compression approach to positively identify the majority of lower limb DVTs. Additionally, it will give candidates the skills to site peripheral cannulae using ultrasound guidance. It does not teach a 'rule out' approach to DVT scanning and therefore will not replace established pathways for the diagnosis of suspected DVT.

Outline of training process

Candidates will need to register with the FAMUS administrator and identify a Supervisor to oversee their training; a list of Supervisors can be found on the SAM website. They will then need to undertake the FAMUS online training modules and assessment available via the e-LFH portal (here). We recommend attendance at a FAMUS approved practical course (up to date course details available on the SAM website). The first supervised scan may be undertaken up to 3 months prior to the course date and should be undertaken within 3 months of the course completion. The training should be completed within 2 years from the date of the first supervised scan.

Upon completion of training an Assessment of Completion of Training (ACT) will be undertaken. This confirms the candidate has completed the necessary theory and practical components and is considered competent by their Supervisor. This signed ACT should be returned to the FAMUS administrator and once details are confirmed, they will issue a certificate confirming completion of training. FAMUS accreditation will last for 3 years at which point an up-to-date logbook or confirmation of regular ongoing experience should be submitted to the FAMUS administrator to ensure ongoing accreditation.

Governance

Scope of practice and reporting

Point of care ultrasound is a form of diagnostic ultrasound which aims to answer specific physiological and anatomical questions at the bedside to aid clinical management. It does not aim to provide fine anatomical detail and as such should not be regarded as an alternative to departmental ultrasound where indicated. In a similar vein, the reports generated from a POCUS scan should be limited to the questions being answered and not seek to provide information beyond the scope of the candidate's competency (for example, we would discourage comments such as "the venous system was normal"), as that falls outside the learning objectives set out here.

Although candidates will become familiar with what grossly 'normal' and 'abnormal' looks like in relation to vascular ultrasound, FAMUS accreditation does not aim to teach the competence to judge these structures to be normal. If an abnormality is found or suspected that cannot be fully characterised with POCUS, we recommend departmental imaging is requested and these findings used to enhance your understanding. Significant abnormalities should always be re-confirmed with appropriate departmental imaging or radiology review.

Machine specifications and quality assurance

FAMUS does not intend to mandate the minimum standards for the hardware required to undertake point of care imaging. However, it is imperative that hardware procurement, maintenance and quality assurance takes place as part of a locally agreed Trust policy. Further guidance on this is available through the above EFSUMB / BMUS resources.

Maintaining competency and CPD

Once a candidate has accredited it is incumbent on them to maintain their skills through regular clinical practice and continuing professional development/continuing medical education (CPD/CME). This may include mentoring or supervision of candidates but should also involve regular practice of the skills determined within the curriculum. If a significant period elapses without regular exposure to point of care ultrasound the candidate would be expected to ensure their skills remain up to date before undertaking further independent practice.

As is best practice for many practical competencies, practitioners should maintain an up to date (anonymised) logbook of all scans undertaken and mentored or supervised; a template logbook is available from the SAM website if required.

FAMUS accreditation will last for three years, at which point practitioners will be asked to confirm ongoing regular scanning in order to maintain their accreditation. This will require as a minimum 10 DVT scans performed or mentored/supervised on average per year as well as regular ultrasound guided vascular access.

We would recommend that for the first six months of practice post accreditation a clear audit plan is in place to consolidate the learning from the accreditation process. Beyond this, regular audit as part of the clinician's appraisal process should be undertaken according to local guidance.

PACS integration

Accredited practitioners should aim to upload all images to the hospital picture archiving and communication (PACS) system with written reports where possible. This will help the undertaking of regular audit and review of clinical practice in conjunction with local radiology departments or accredited peers. The PACS records of images and reports may well be suitable to use as an alternative to a standalone logbook. We do not recommend training scans are uploaded to PACS or reports placed on the clinical record unless findings agreed contemporaneously with an accredited practitioner.

Confidentiality and Data Protection

As with all clinical data, patient identifiable information should not be removed from your Trust. Any completed report sheets must be anonymised for administrative purposes but should be linked to images on the ultrasound machine to enable the candidate and Supervisor/Mentor to review the report and images together. For example, the anonymised report may be labelled DVT1, DVT2, DVT3 to reflect the first, second and third DVT scans and the stored images may similarly bear the same label to allow cross-referencing. The ACT for submission to the FAMUS administrator should contain no patient identifiable information.

Supervisors and mentors

The candidate will have to identify a Supervisor at the outset of their accreditation to oversee their training, and a database of approved Supervisors is available via the FAMUS section of the SAM website. The roles of the Supervisor and Mentor are summarised below:

Supervisors

- Help coordinate and provide overview of a candidates learning and experience
- Provide advice for candidates on where additional or specialist experience can be obtained
- May undertake supervised scans, review unsupervised scans and must perform ACTs
- Ensure a candidate has demonstrated competence prior to sign off for each module
- Provide advice for mentors

A supervisor will be a practitioner of any grade who can demonstrate competence and experience across the whole module, both theory and practical components. They will often be an Acute Medical Consultant or Specialist, or Radiologist, sonographer or vascular technician. As a guide, FAMUS accreditation for more than one year with regular scanning and ideally teaching experience would usually suffice to become a FAMUS supervisor. Supervisors must apply to the FAMUS administrator and be registered on the database before undertaking the training of FAMUS candidates – details of how to do this are available on the website.

Mentors

- Provide direct supervision of candidate's scans in early training (supervised practice)
- Will review images from unsupervised scans (mentored practice)
- Cannot sign off ACTs (these must be done by a Supervisor)

A mentor must be competent in performing the scan they intend to oversee and can be any grade clinician. Appropriate level of experience for mentors includes (but not exclusively) radiologists, FAMUS accredited practitioners, and sonographers. Suitability for an individual to act as a mentor should be determined locally by the candidate's supervisor; if necessary this decision could be guided by the FAMUS committee.

Detailed outline of training pathway and syllabus

This module gives the candidate competence to assess the lower limb for presence of a deep vein thrombosis, using a protocolised 3-point approach. Additionally, candidates will gain the skills to site a peripheral cannula under ultrasound guidance. We do not teach a rule-out approach, and so a FAMUS DVT scan cannot fully replace established diagnostic DVT pathways. These skills will be of value in any unwell patient requiring intravenous access, and in those with suspected DVT or PE in whom a rapid positive diagnosis would alter management.

The theory module will outline the basis of the generation of ultrasound images and artefacts, and how the user can achieve and optimise these images for diagnostic purposes. It will cover the governance of the use of ultrasound (particularly of POCUS) and of storing images and generating reports, and where POCUS fits in to traditional diagnostic and examination pathways.

The competencies will be learnt in a three-stage approach (theory, supervised and mentored practice) as outlined overleaf. There is a single core pathology to identify in the DVT / peripheral vascular access module, and the indicative number of scans and time to achieve this is outlined below. Additionally, candidates will need to demonstrate competence in performing peripheral vascular access under ultrasound guidance. Although FAMUS is intended to be a competency-based rather than a time- or number-based accreditation, it is recognised that a minimum amount of experience in each pathology will be beneficial.

Directly supervised	Mentored scans	Minimum training time
5 scans	5 further scans **Minimum 5 supervised or mentored (depending on candidate experience) US guided peripheral vascular cannulation**	1 month from first supervised scan

Table 1: Indicative minimum numbers of scans and training time for the DVT / peripheral vascular access module

Pathology	Indicative minimum number seen
DVT	1

Table 2: Indicative minimum numbers of pathologies to be seen during training process to ensure competence

By the end of this module candidates will be expected to be able to identify these pathologies and be comfortable with the sonographic features which may reasonably rule them in and/or out. They will also learn the limitations of the focused approach, and how this form of imaging fits in with established imaging modalities.

Knowledge skill and behaviour framework

Both DVT/peripheral vascular access and theoretical modules have been mapped to a knowledge, skills and behaviour (KSB) framework, and linked to the GMC's Good Medical Practice guidance. This forms a comprehensive assessment framework for the candidate and assessor to follow. These curriculum maps can be found within appendices 2 and 4 and use the following keys:

Assessment tool	Key
E-Learning ('FAMUS' module on e-learning for health)	E
FAMUS approved course	C
Supervised / Mentored practice	S
Assessment of completion of training (ACT)	A

Table 1: Assessment descriptors for use with KSB framework

Domains of Good Medical Practice	
Domain	**Descriptors**
1	Knowledge, skills and performance
2	Safety and quality
3	Communication, partnership and teamwork
4	Maintaining trust

Table 2: GMC Good Medical Practice Domains for use with KSB framework

3 stage approach to learning each area of practice

1st stage: Theoretical component

Theoretical training will consist of completion of the FAMUS e-learning modules and usually attendance at a FAMUS-approved practical course (available here). If a course is not attended as part of the accreditation, the candidate will have to demonstrate the theoretical knowledge throughout their supervised and mentored practice, and this knowledge confirmed by their Supervisor at the time of sign-off of the ACT.

2nd stage: Supervised practice

It is recommended that the first scans undertaken during the accreditation process (whether on a course or prior) be as part of supervised practice. These scans are directly overseen by a supervisor or mentor to ensure the basic technique is sound and that appropriate images can be acquired. Each scan should be reported using the anonymised reporting sheet (see appendix). Once the minimum number of directly supervised scans has been undertaken *and* appropriate competency demonstrated, the mentor/supervisor may sign the candidate off as suitable for mentored practice. In some circumstances, it may be appropriate for candidates to undertake some mentored scans before their supervised scans have been completed – this should be discussed on an individual basis with the mentor / supervisor.

3rd stage: Mentored practice

The third stage of practice allows the candidate to increase their experience and build a logbook of cases and pathologies. Scans will be undertaken without direct supervision, and for each scan a report sheet should be completed, and images captured to reflect the entirety of the scan. The report and images will then be reviewed by the mentor or supervisor at a later date, and this process may well be done remotely. Each mentored scan and report *must be reviewed and countersigned* by the mentor or supervisor and there should be general agreement as to the findings demonstrated.

Please note, the candidate at this point may not write their report in the clinical notes/PACS systems and clinical decisions should not be undertaken based on these scans.

Once the candidate has completed their mentored practice, are competent at identifying the core pathologies and have the requisite theoretical knowledge they should proceed to undertake the ACT.

Assessment of Completion of Training (ACT)

The ACT allows a summative assessment of the competence of the candidate on completion of a module (see appendix 5). It is a structured assessment of examination of each system, and includes a witnessed scan being undertaken and a review of the logbook/report sheets to ensure all pathologies have been imaged. It also entails a review of the theoretical component of training. The ACT must be completed by a supervisor in the DVT/peripheral vascular access module. Once the ACT has been signed, the candidate may image (and report) DVT scans independently within the scope of practice outlined here. The ACT should be sent to the FAMUS administrator, and this will then be registered on the database and a certificate to confirm completion of training will be issued.

Prior ultrasound experience

There will be some candidates who have prior ultrasound experience, either formal or experiential. It may be possible for some of this experience to count towards the training numbers and times indicated above; those with ultrasound experience are likely to be familiar with many theoretical aspects of ultrasound. These candidates must still undertake the full number of directly supervised scans and this time can be used to

gauge the candidate's level of competence. Shortening of training time or numbers should be determined on an individual basis at the discretion of the Supervisor, and it is the responsibility of the Supervisor to ensure the candidate demonstrates competence in all aspects of the module. In all instances, the FAMUS e-learning module should be completed.

Normal scans

The recognition of normal anatomy is arguably more important than being able to successfully identify pathology. Knowing something doesn't 'look normal' may point the candidate to an alternative diagnosis outside of the core pathologies listed here. We strongly recommend scanning patients who may have normal sonographic appearances as part of your accreditation process, and these can form part of your logbook of training.

Ultrasound simulators

There is an increasing availability of high-quality ultrasound simulators from a variety of manufacturers. Simulated scans can form part of your logbook, as long as they are undertaken as supervised scans which highlight pathology. We do not recommend the use of simulators for your logbook of normal scans, although they may well form part of a practical course or be used to teach technique during your training. We do not recommend the use of simulators for the assessment of completion of training (ACT), and recommend no more than 2 simulated scans in your logbook.

Extended skills and pathology recognition

During accreditation in FAMUS the candidate is likely to come across pathologies and structures which are outside the learning objectives. With time, these will become more familiar and candidates may feel able to comment on certain pathologies or structures seen. A list of the most common examples of these within the DVT/peripheral vascular access module is shown below. If abnormalities are suspected or identified that sit outside the core FAMUS curriculum we recommend referral for further imaging/assessment, and reflection on these cases once further imaging is undertaken to enhance your learning.

DVT pathology
Subcutaneous oedema
Superficial thrombophlebitis
Baker's cyst
Abnormal venous anatomy
Inguinal lymphadenopathy
Arterial calcification

Theoretical syllabus

(adapted from Royal College of Radiologists guidelines)

Physics and instrumentation

• The basic components of an ultrasound system
• Types of transducer and the production of ultrasound, with an emphasis on operator controlled variables
• Use of ultrasound controls
• An understanding of the frequencies used in medical ultrasound and the effect on image quality and penetration
• The interaction of ultrasound with tissue including biological effects
• The basic principles of 2D and M mode ultrasound
• The basic principle of Doppler ultrasound including spectral, colour flow and power Doppler
• Understanding of hyperechoic, hypo-echoic and anechoic and how it relates to tissues, structures and formation of the image
• Sonographic appearance of tissues, muscle, blood vessels, nerves, tendons, etc.
• The safety of ultrasound and of ultrasound contrast agents
• The recognition and explanation of common artefacts
• Image and report recording systems

Ultrasound techniques

• Patient information and preparation
• Indications for examinations
• Relevance of ultrasound to other imaging modalities
• The influence of ultrasound results on the need for other imaging
• Scanning techniques including the use of spectral, power and colour Doppler

Administration

• Image recording
• Image storing and filing
• Image reporting and storing
• Medico-legal aspects—outlining the responsibility to practise within specific levels of competence and the requirements for training
• Consent
• Understanding of sterility, health and safety and machine cleaning
• The value and role of departmental protocols
• The resource implications of ultrasound use

Theoretical knowledge – KSB framework

Physics of ultrasound and machine set-up

	Knowledge	**Assessment**	**GMP**
1	Properties of sound wave: amplitude, frequency, wavelength, propagation velocity	E, C	1
2	Frequency range of sound waves used in diagnostic imaging	E, C	1
3	Speed of sound in different media	E, C	1
4	Behaviour of sound waves at interfaces between media	E, C	1
5	Generation of ultrasound waves: the piezo-electric effect	E, C	1
6	Design of the ultrasound transducer	E, C	1
7	Structure of the ultrasound beam	E, C	1
8	Principles of attenuation, scattering and reverberation	E, C	1
9	Understands B-mode and M-mode and their uses	E, C	1
10	Understands the principles of the Doppler effect and colour Doppler	E, C	1
	Skills	**Assessment**	
1	Cleans probe & machine adequately before & after scan	S, A	1, 2
2	Selects appropriate ultrasound transducer	E, C, S, A	1, 2
3	Chooses appropriate pre-made settings for selected scan	C, S, A	1, 2
4	Uses conductive gel to aid transmission of ultrasound waves	E, C, S, A	1, 2
5	Correctly adjusts depth, gain and focus position	E, C, S, A	1, 2
6	Identifies common artefacts	E, C, S, A	1, 2
7	Uses colour Doppler to identify blood vessels	E, C, S	1, 2
	Behaviours	**Assessment**	
1	Shows awareness of key components. Handles probes with care	S, A	1, 2
2	Aware of battery lifetime and keeps machine charged when not using	S	1, 2

Theoretical knowledge – KSB framework

Image acquisition, patient safety & clinical governance

	Knowledge	**Assessment**	**GMP**
1	Understands probe orientation & movements in relation to screen	E, C, S	1, 2
2	Knows how to position patient for optimum image acquisition	E, C, S, A	1, 2
3	Understands indication for scan and appropriateness for POCUS vs formal scan	E, C, S, A	1, 2, 3
4	Knows local protocols for image storage	S, A	1, 2, 4
5	Understands relevance of data confidentiality act with regards to images produced	E, C, S, A	1, 2, 4
6	Aware of own limitations and when to seek expert help	E, C, S, A	1, 2, 3, 4
	Skills	**Assessment**	
1	Optimises image for best possible quality	C, S	1, 2
2	Knows how to freeze images for capture and acquire clips	S, A	1, 2
3	Knows how to label images	S, A	1, 2
4	Knows how to use measurement callipers	S, A	1, 2
5	Knows how to conclude scan and save acquired images	S, A	1, 2, 4
6	Anonymises data prior to exporting media to external storage device	S, A	1, 2, 4
7	Completes scan within appropriate timescale	S, A	1, 2
8	Able to report scans concisely and appropriately, making clear the limitations of point-of-care ultrasound	C, S, A	1, 2, 3, 4
	Behaviours	**Assessment**	
1	Gains consent when able to	C, S, A	1, 2, 3, 4
2	Maintains good communication with patient during scan and gives clear instructions	C, S, A	1, 2,3, 4
3	Does not cause patient discomfort	C, S, A	1, 2, 4
4	Maintains patient's dignity	C, S, A	1, 2, 4

Focused Acute Medicine Ultrasound (FAMUS)

Reporting sheet – 'rule in' DVT

Candidate name: Date:

Patient identifier:

Image quality: Good Adequate Poor

RIGHT LEG			LEFT LEG		
Examined?	Yes □	No □	**Examined?**	Yes □	No □
'Mickey Mouse' sign (CFA, CFV, SFJ) visualised?	Yes □	No □	**'Mickey Mouse' sign (CFA, CFV, SFJ) visualised?**	Yes □	No □
Common Femoral Vein (CFV) Compressible?	Yes □	No □	**Common Femoral Vein (CFV)** Compressible?	Yes □	No □
Superficial Femoral Vein (SFV) Compressible?	Yes □	No □	**Superficial Femoral Vein (SFV)** Compressible?	Yes □	No □
Popliteal vein trifurcation visualised?	Yes □	No □	**Popliteal vein trifurcation visualised?**	Yes □	No □
Popliteal Vein (PV) Compressible?	Yes □	No □	**Popliteal Vein (PV)** Compressible?	Yes □	No □
Deep vein thrombosis confirmed? Yes ☐ No ☐					

Comments/further details and conclusion of the scan:
e.g. site of DVT if confirmed
alternative pathologies seen

Candidate reflection on scan (optional)
e.g how did the scan affect management

Mentor/Supervisor comments:

Signed (candidate):

Signed to confirm above findings (mentor/supervisor):

Initial to confirm candidate suitable to commence mentored practice (only required once):
(minimum 5 supervised scans)

Is a Departmental scan required? Yes □ No □ Requested? Yes □ No □

Once completed candidate must maintain logbook of countersigned report sheets. Please remember not to remove patient confidential information from Trust property

‘Rule in’ DVT scan – KSB framework

	Knowledge	**Assessment**	**GMP**
1	Understands concept of a ‘rule-in’ DVT scan vs a ‘rule-out’ departmental scan.	C, S, A	1
2	Demonstrates anatomical knowledge of peripheral vessels and their appearance on ultrasound	C, S, A	1
3	Understands the theory behind performing the 3-point lower limb scan and the anatomical structures found within each point.	C, S, A	1
	Skills	**Assessment**	
	Able to show/recognise the following:		
1	The CFA, CFV & SFJ in the groin crease (i.e ‘Mickey Mouse sign)	C, S, A	1
2	The SFV in the mid-thigh level and recognises anatomical variants	C, S, A	1
3	The popliteal trifurcation	C, S, A	1
4	The POPA and POPV at the knee crease and recognises anatomical variants	C, S	1
5	Able to instruct patient to change position to optimise views	C, S, A	1
6	Demonstrates appropriate compression technique at the 3 designated points	C, S, A	1
7	Shows ability to perform sequential vein compression in between the designated points to increase sensitivity	C, S, A	1
	Pathology	**Assessment**	
	Has seen and diagnosed the following:		
1	Deep vein thrombosis	C, S	1

Peripheral vascular cannulation – KSB framework

	Knowledge	**Assessment**	**GMP**
1	Understands the indications for ultrasound-guided peripheral vascular cannulation	C, S	1
3	Knows the sonographic differences between arteries and veins	C, S	1, 2
4	Selects suitable probe and anatomical sites for cannulation	C, S	1, 2
5	Understands the theory behind 'in-plane' and 'out-of-plane' techniques and their relevant advantages & disadvantages	C, S	1, 2, 3
6	Understands the rationale for using real-time visualisation of needle-tip	C, S	1,2, 4
	Skills	**Assessment**	
	Able to:		
1	Demonstrate competence using 'in-plane' technique	C, S	1
2	Demonstrate competence using 'out-of-plane' technique	C, S	1
3	Visualise a needle-tip in real-time whilst advancing	C, S	1
4	Able to troubleshoot and modify technique to proceed with cannulation	C, S	1, 2
5	If using Seldinger technique, able to demonstrate wire in required vessel	C, S	1
6	Use local anaesthetic safely and adequately if suitable	C, S	1, 2, 4
7	Secure vascular cannulas with appropriate dressings	C, S	1, 2

Assessment of Completion of Training – DVT/peripheral vascular access

Candidate name: Date:

Supervisor name (PRINTED): SAM membership no:

Professional registration number (GMC, NMC, MVR-PA etc):

Pre-procedure preparation	
	Initials
Appropriate approach and manner	
Consents patients and explains risks and indications	
Checks patient's name badge; enters details into machine	
Comfortable and ergonomic positioning of patient and machine	
Scanning	
Correct probe selection and frequency	
Optimisation of machine settings	
Correctly identifies CFV, SFV and femoral artery including 'mickey mouse sign'	
Identifies popliteal vein including point of trifurcation	
Uses compression where required	
Can correctly identify arteries and veins when questioned	
Can appropriately locate site for peripheral vascular cannulation	
Storage, documentation and interpretation	
Saves cines and pictures for each area as appropriate	
Reports results to patient where indicated	
Identifies need for further imaging and limitations of scan	
Cleans equipment and shuts down machine as appropriate	
Logbook and pathology review	
At least 5 supervised and (indicative) further 5 mentored DVT scans completed	
Positive DVT scan undertaken with images captured	
Minimum of 5 successful US guided peripheral vascular cannulations undertaken (supervised or mentored)	
e-LFH module completed?	
Theoretical training complete (e-LFH module +- course attendance +- demonstrated throughout training)	
DVT /peripheral vascular access Assessment of Completion of Training complete?	
Comments (if applicable):	

Signed (candidate):

Signed (supervisor):

Once completed return to FAMUS administrator, Society for Acute Medicine Secretariat, Hazeltonhead Farm, Mearnskirk, Glasgow G77 6RS, or scan and e-mail famus@acutemedicine.org.uk