Focused Acute Medicine Ultrasound (FAMUS)



Curriculum pack

Peripheral vascular access module



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Introduction

Completion of this module is intended to give the candidate competence to perform ultrasound guided peripheral access (USPA). This knowledge and skills will be of value in the difficult intravenous access (DIVA) patient. This pathway is to be used as a framework for training in ultrasound guided vascular access and permission is granted to modify it to suit local training requirements, as long as the original data source is referenced (FAMUS peripheral vascular access module).

This module is to be used only by those already competent in achieving peripheral vascular access without ultrasound guidance.

Governance

FAMUS accreditation provides a framework for demonstrating competence in defined areas of point-of-care ultrasound (POCUS). Clinicians remain responsible for ensuring that their use of POCUS in clinical practice is within their ongoing competence, consistent with applicable professional standards and guidance, and undertaken within the clinical governance and scope-of-practice arrangements of the organisation in which they practise

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.

Maintaining competency and CPD

Once a candidate has become competent it is incumbent on them to maintain their skills through regular clinical practice and continuing professional development/continuing medical education (CPD/CME). In due course this may include supervision of candidates but should also involve regular practice of the skills determined within this curriculum pack. 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 procedures undertaken and subsequently supervised; a template logbook is available from the SAM website if required.

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

It is not considered necessary for images for peripheral vascular access to be permanently recorded and / or archived on the organisation picture archiving and communication system (PACS), unless significant or unexpected findings are noted. In this case, a formal report would be expected to accompany these images to ensure a suitable method for audit and quality assurance can be undertaken. 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 (if required as above) to enable the candidate and Supervisor to review the report and images together. The Assessment of Completion of Training should contain no patient identifiable information.

Supervisors

Supervision of training should be undertaken by healthcare professionals who have the knowledge and experience to teach these competencies. This will be determined locally and a local register should be maintained of suitable Supervisors. Supervisors do not require approval or registration with FAMUS, and the governance of the training process and Supervisor pool sits with the local organisation rather than the FAMUS team or Society for Acute Medicine.

There should be a lead clinician for peripheral vascular access training who oversees the local training processes including approving the register of Supervisors.

Detailed outline of training pathway and syllabus

The FAMUS e-LFH modules (ultrasound basics and vascular access) cover the theory of the generation of ultrasound images, ultrasound artefacts, how the user can achieve and optimise these images for diagnostic purposes and the theory of ultrasound guided vascular access. It will also cover where point of care ultrasound (POCUS) fits in to traditional diagnostic and examination pathways. These modules should be completed by all candidates looking to gain accreditation.

The USPA competency will be learnt in a three-stage approach (theory, supervised and mentored practice) as outlined below.

This module is intended to be a competency-based rather than a time- or number-based accreditation. It is recognised that achieving competence in USPA will be influenced by prior cannulation and ultrasound experience.

The indicative number of procedures suggested to achieve competence is outlined below and discussed further in Appendix 4. It is expected that these USPA procedures will be successful. Unsuccessful supervised USPA should be reflected on but would not typically count towards the numbers outlined.

Supervision of this module can be determined locally by clinicians competent in teaching ultrasound guided vascular access. A local register should be kept of healthcare professionals suitable to act as Supervisors.

Directly Supervised	Mentored Scans
3 USPA cannulations **Can include 1 simulated procedure using combination of in vivo scanning and a sim-arm cannulation.*	A minimum of **2** mentored USPA cannulations to be completed. **Mentored USPA can be performed with indirect supervision and subsequent reflection on the procedure with Supervisor* ***Indicative number for less experienced practitioners 5-10 USPA cannulations*

By the end of this module candidates will be expected to be able demonstrate effective and safe technique for USPA. They will be able to demonstrate awareness of underlying POCUS principles, knowledge of vessel health and understanding of anatomical structures and ultrasonographic differentiation. This will be assessed by their Supervisor using the Assessment of Completion of Training (ACT; Appendix 3)

Knowledge skill and behaviour framework

The peripheral vascular access module has 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. This curriculum map can be found below in Appendix 1.

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 module (Ultrasound basics – available here) and, usually, attendance at a local practical course. If a course is not attended as part of the accreditation, the candidate must demonstrate the theoretical knowledge throughout their supervised and mentored practice, and this knowledge be confirmed by their Supervisor at the time of sign-off of the ACT.

FAMUS have created teaching videos which may be freely used as part of the teaching and training process:

Vascular access theory: https://youtu.be/VHtsJ4hOD70

Vascular access practical: https://youtu.be/7SCnjdd4JBM

2nd stage: Supervised practice

It is recommended that the first USPA are carried out under direct supervision. These procedures are directly overseen by a Supervisor to ensure the sonographic and procedural technique is sound. Three directly supervised procedures should be undertaken and a reporting sheet completed (Appendix 2). At least two USPA cannulations should be completed entirely in vivo. One directly supervised procedure can be completed on a sim arm however this should be accompanied by the scanning of a real arm for the purposes of arterio-venous differentiation and assessment of appropriate cannulation points.

Once the minimum number of directly supervised procedures has been undertaken and appropriate competency demonstrated, the Supervisor may sign the candidate off as suitable for mentored practice. In some circumstances, it may be appropriate for candidates to undertake some mentored procedures before their directly supervised procedures have been completed. This should be discussed on an individual basis with their Supervisor.

3rd stage: Mentored practice

The third stage of practice allows the candidate to increase their experience and can be completed with indirect supervision / mentoring. Indirect supervision should entail the cannulation being performed with a Supervisor in suitable proximity for troubleshooting. The procedure should be reflected upon by the candidate and Supervisor after completion.

Each indirectly supervised procedure should be reviewed and outcomes logged with the Supervisor. Once the candidate has completed their mentored practice, are competent at USPA 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 the module (see Appendix 3). It entails a review of the theoretical component of training in addition to a review of logbook; the ACT must be completed by an appropriate local Supervisor. Once the ACT has been signed, the candidate is considered competent to perform USPA independently and a local record of competence should be maintained within the organisation.

Prior ultrasound experience

There will be some candidates who have prior ultrasound experience or are skilled proceduralists. It may be possible for some of this experience to count towards the achievement of competence. These candidates should still undertake the full number of directly supervised scans to allow the Supervisor to gauge the candidate's level of competence. A reduction of the numbers of procedures to achieve competence 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. Any reduction should be justified in the ACT form comments section.

In all instances, the relevant FAMUS e-learning modules should be completed.

Vascular access simulators

Simulated vascular access 'arms' of varying fidelity are often used to practice USPA. Whilst a prosthetic arm can enable teaching of the cannulation procedure, it should be ensured that this is accompanied by in-vivo arterio-venous differentiation if it is to constitute a directly supervised procedure. Although repeated practice of the cannulation procedure on a prosthetic arm can help with the learning of technique, no more than one of the candidate's 'directly supervised' scans should be performed in this way.

Aseptic technique

Aseptic technique during cannulation is important whether utilising ultrasound guidance or not. Local organisation training and protocols should be followed to ensure appropriate sterility during cannulation. When utilising ultrasound, this will usually involve appropriate sterile sheaths for the ultrasound probe, and the use of single use sterile ultrasound gel prior to and during the procedure.

Theoretical knowledge - KSB Framework

	Knowledge	**Assessment**	**GMP**
	Recognises the DIVA (Difficult intravenous access) patient[1]	E,C,A	1,3
	Awareness of alternative vascular access devices, limitations of USPA and when to consider alternative approach	E,C,A	1,2,3,4
	Knowledge of upper arm vascular anatomy	E,C,S	1
	Selects suitable probe for vascular ultrasound.	E,C,S	1
	Understands how to differentiate between arteries and veins sonographically	E,C,S,A	1,2
	Identifies suitable site for cannulation	C,S	1,2
	Understands the theory behind 'in-plane' and 'out-of-plane' techniques and their relevant advantages & disadvantages	E,C	1
	Understands the rationale for using real-time visualisation of needle-tip	E,C	1
	Principles of aseptic technique using USS including need for sterile cover	C,S	1,2,4
	Aware of the complications of USS cannulation including gel brucellosis and arterial puncture.	E,C,A	1,2,4
	Aware of use of in-plane technique as a method of confirming placement	E,C,S	1,2
	Skills		
	Appropriate optimisation of USS for vascular access	C,S	1
	Differentiation of veins – arteries in vivo	C,S	1
	Identification of appropriate cannulation point	C,S	1
	Appropriate preparation of site, ANTT, and probe cover	C,S,	1,2
	Demonstrate competence using out-of-plane technique	C,S	1
	Visualise needle-tip in real-time whilst advancing	C,S	1
	Able to troubleshoot and modify technique to proceed with cannulation	C,S	1

1 DIVA Scale as a Predictive Tool for Prospective Identification of Adult Patients at Risk of a Difficult Intravenous Access: A Multicenter Validation Study" *Journal of Clinical Medicine* 8, no. 2: 144.

Reporting sheet – peripheral vascular access

Candidate name: Date:

Patient identifier:

Image quality: Good Adequate Poor

Peripheral vascular access					
Site of cannulation	ACF □	Upper arm □	Forearm □	Pedal □	Other (details)

Equipment prepared and set up ergonomically?	Yes □	No □
Image optimised appropriately (using linear probe)	Yes □	No □
Artery – vein differentiation in 2D transverse view	Yes □	No □
Appropriate cannulation site identified	Yes □	No □
Aseptic technique utilised	Yes □	No □
Dynamic needle tip positioning demonstrated in plane / out of plane / oblique view	Yes □	No □
Successful cannulation	Yes □	No □

Comments/further details (if required)
Candidate reflection on scan (optional)
Supervisor comments:

Signed (candidate):

Signed to confirm above findings (Supervisor):

Initial to confirm candidate suitable to commence mentored practice (only required once):
(minimum 2 supervised scans)

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

Appendix 3

Assessment of Completion of Training – peripheral vascular access

Candidate name: Date:

Supervisor name (PRINTED):

Pre-procedure preparation	
	Initials
Identification of the DIVA (difficult intravenous access) patient	
Appropriate knowledge of risks and complications	
Ergonomic positioning of kit, machine and patient	
Scanning	
Correct probe selection and image optimisation	
Differentiation between arteries and veins and appropriate identification of site for USPA	
Procedure	
Appropriate ANTT technique	
Demonstrates appropriate approach with dynamic needle tip positioning	
Logbook and pathology review	
At least 2 directly supervised UGPA (can include one on simulated arm)	
Minimum of 3 further indirectly supervised, or 'mentored' UGPC	
e-LFH modules completed?	
Local course attended (or alternative training process)	
Peripheral vascular access Assessment of Completion of Training complete?	
Comments (including deviations from training process if applicable):	

Signed (candidate):

Signed (supervisor):

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Appendix 4

Defining and achieving competence in USPA

USPA provides practitioners with a powerful tool in improving the speed and efficiency of achieving peripheral access (Tran et al, 2021). Evidence demonstrates that USPA competence is achievable irrespective of previous experience or seniority (Hoskins, 2023) and is not a competence confined only to doctors (Oliveira and Lawrence, 2016).

Stolz (Stolz et al, 2016) defined competence at USPA as achieving an in-vivo success rate of > 70%. This success rate was identified as being a significant improvement over standard landmark-based technique (64%) in studies of DIVA patients. Whilst this definition has been adopted in parts of educational literature; for the purposes of FAMUS, competence will be based on demonstrating sound technique in the context of supervised learning within a KSB framework. The FAMUS USPA reporting sheet adapts and simplifies Primdahl's peripheral ultrasound guided access rating scale (Primdahl et al,2018) which is a validated tool for assessing proficiency of USPA.

The majority of USPA teaching involves a mix of didactic and simulation methods (Hoskins et al, 2023) with many involving an online element predominantly for ultrasound theory as in the FAMUS modules. Although most teaching programs mandate the supervision of initial in-vivo procedures, there is significant variety in the number required. Whilst FAMUS is a skill rather than numbers-driven competence, it is reasonable to identify a minimum number of supervised procedures from a governance perspective and for the benefit of patient safety.

One meta-analysis identifies a range of three to upwards of thirty supervised procedures to achieve competency, with a median number of 5 supervised procedures (Hoskins, 2023). Another (Loon, 2019) identified 10 procedures as the typical number. There is variety in terms of the type of supervision (direct or indirect); the use of simulated or phantom arms; and the teaching of in plane as well as out of plane technique. Of note, Mishra et al demonstrate no superiority between these techniques in terms of success or complication (Mishra, 2023). Whilst mandating a high number of supervised procedures can have value, we must also consider that the more arduous the training, the less likely candidates are to complete the competency and the less the uptake might be. We recognise that USPA is increasingly practiced in the NHS, but currently with limited oversight or training governance. As such, the mandated minimum directly and indirectly supervised procedures provides a pragmatic structure upon which a Supervisor's assessment of competence can be based.

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