# Focused Acute Medicine Ultrasound (FAMUS)




# Curriculum pack

# US Assisted lumbar puncture module




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# Introduction

Completion of this module is intended to give the candidate competence to perform ultrasound assisted lumbar puncture (US assisted LP). The procedure is not for real time ultrasound LP guidance, but aids with identifying anatomical landmarks to enable increased success in carrying out a LP. The knowledge and skillset will be of value in all patients requiring a lumbar puncture but more so in those with increased BMI.

**This module is to be used only by those already clinically independent in carrying out lumbar punctures**. Ultrasound guidance is a tool to support successful lumbar puncture, but the clinician performing the lumbar puncture retains responsibility for safe procedural technique regardless of ultrasound guidance.

**Please note this module does not cover the following**

- Indications and contraindication of carrying out a lumbar puncture
- Consent procedure of a lumbar puncture
- Complications of a lumbar puncture
- What equipment is required to carry out a lumbar puncture
- How to carry out a lumbar puncture with technique of needle insertion
- What to measure and collect when carrying out a lumbar puncture
- How to interpret lumbar puncture results and management of such results
- After care of patients following a lumbar puncture

# Administration

FAMUS accreditation is administered by the Society for Acute Medicine:

The Society for Acute Medicine Secretariat

Hazeltonhead Farm

Mearnskirk

Glasgow

G77 6RS

+44 (0)141 639 8123

famus@acutemedicine.org.uk

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.

# 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 lumbar puncture 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

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 role of the Supervisor summarised below:

- Co-ordinate and provide overview of a candidates learning and experience
- Provide advice for candidates on where additional or specialist experience can be obtained
- 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 or sonographer. 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.

# Detailed outline of training pathway and syllabus

The FAMUS e-LFH module (ultrasound basics) covers the theory of the generation of ultrasound images, ultrasound artefacts and how the user can achieve and optimise these images for diagnostic purposes. It will also cover where point of care ultrasound (POCUS) fits in to traditional diagnostic and examination pathways.

Additionally, there is an US assisted LP video practical which must be viewed prior to starting practical training (available here).

The US assisted LP competency will be learnt in a two-stage approach (theory and supervised) 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 US assisted LP will be influenced by prior ultrasound experience.

The indicative number of procedures suggested to achieve competence is outlined below and discussed further in Appendix 4.

| **Directly supervised site marking** |
| --- |
| **10** US assisted lumbar puncture site markings with at least one patient that undergoes a successful lumbar puncture*<br><br>Any patient (*including those who may not require a LP*) can be utilised for the US assisted LP site markings procedure, but must include a spectrum of body habitus.<br><br>**Can include 2 on 2 different simulated manikins.* |

By the end of this module candidates will be expected to demonstrate by using US the anatomical landmarks that are pertinent to LP in a wide variety of patients. They will be able to demonstrate awareness of underlying POCUS principles, knowledge and understanding of anatomical structures and ultrasonographic differentiation and nuances. This will be assessed by their supervisor using the Assessment of Completion of Training (ACT; Appendix 3)

## Knowledge skill and behaviour framework

The US assisted LP 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<br>('FAMUS' module on e-learning for health) | E |
| FAMUS approved course | C |
| Supervised 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

# 2 stage approach to learning each area of practice

## 1st stage: Theoretical component

Theoretical training will consist of completion of the FAMUS e-LFH module (ultrasound basics), watching the US Assisted LP video 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 practice, and this knowledge be confirmed by their Supervisor at the time of sign-off of the ACT.

## 2nd stage: Supervised practice

It is recommended that 10 US assisted LP with site markings are carried out under direct supervision. These procedures are directly overseen by a Supervisor to ensure the sonographic and procedural technique is sound. These US assisted LP must occur on a wide range of patients to appreciate the range and difference of body habitus and the challenges they may pose if undergoing a LP. Two of these LP assisted US can occur on two different simulated manikins. At least one US assisted LP should go onto have a successful lumbar puncture. **Note** this LP is not completed with real-time US guidance and the supervisor does not need to be present for the procedure. All responsibility for safe LP technique rests with the clinician undertaking the procedure, regardless of US site marking.

Once the minimum number of directly supervised procedures has been undertaken and appropriate competency demonstrated, the Supervisor may sign the candidate off.

## 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 Supervisor. Once the ACT has been signed, the candidate is considered competent to perform US assisted LP independently. 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 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 module should be completed.

## US LP simulators

Simulated US assisted LP of varying fidelity can be used for practice for US assisted LP. Although repeated practice of the US assisted LP on a US LP simulator can help with the learning of technique, no more than two of the candidate's 'directly supervised' scans should be performed in this way. These two must also occur on two different simulated manikins.

# Theoretical knowledge - KSB Framework

| | **Knowledge** | **Assessment** | **GMP** |
|---|---|---|---|
| | Understands the advantages and indications of the use of ultrasound as a tool over traditional landmark technique | E,C, S | 1,2,3,4 |
| | Demonstrates awareness of the pitfalls by the traditional landmark technique for LP | E,C | 1,2 |
| | Appreciates US is a tool to assist a successful LP | E,C | 1,2,3,4 |
| | Demonstrates understanding of the anatomy of the lumbar spine | E,C,S | 1 |
| | Understands the importance of patient position and the US differences in the sitting position and left lateral position | E,C,S | 1 |
| | Demonstrates knowledge on the use of appropriate probe in US assisted LP | E,C,S,A | 1,2 |
| | Demonstrates knowledge on sonoanatomy and appearance of sacrum with probe in the longitudinal position | E,C,S,A | 1,2,3 |
| | Demonstrates knowledge on sonoanatomy of the median and para median US views with US in longitudinal position, and aware of what the intrathecal space looks like in this position | E,C,S,A | 1 |
| | Appreciates the spinous and interspinous view with the probe in the transverse position | E,C,S,A | 1 |
| | Appreciates the intrathecal space and interspinous ligament in the interspinous view with probe in the transverse position | E,C, S,A | 1 |
| | **Skills** | | |
| | Positions patient appropriately for a successful US assisted LP | C,S,A | 1, 2,3,4 |
| | Demonstrates optimisation of US for assisted LP | C,S,A | 1,2 |
| | Appreciates the intrathecal space and interspinous ligament in the interspinous view with probe in the transverse position | E,C, S,A | 1 |
| | Demonstrates Sacrum, L5-S1, L4-L5 or L3-L4 using median images and paramedian images with probe in longitudinal position | C,S,A | 1,2 |
| | Demonstrates intra thecal space and marks space with probe in longitudinal position | C,S,A | 1,2 |
| | Demonstrates the spinous view and interspinous view with probe in the transverse position and locates the intrathecal space and interspinous ligament | C,S,A | 1,2 |
| | Marks the appropriate space for LP needle insertion | C,S,A | 1,2 |
| | Able to trouble shoot and modify images appropriately | C,S,A | 1,2,3,4 |
| | **Behaviour** | | |
| | Demonstrates appropriate patient interaction, explanation and reassurance throughout | S,A | 1,2,3,4 |

# Reporting sheet – US Assisted lumbar puncture

Candidate name: Date:

Patient identifier:

Image quality: Good Adequate Poor

| US Assisted LP | | |
|---|---|---|
| **Equipment prepared and set up ergonomically?** | Yes □ | No □ |
| **Images optimised appropriately (using appropriate probe)** | Yes □ | No □ |
| **Demonstrates Sacrum, L5-S1, L4-L5 or L3-L4 using median images and paramedian images with probe in longitudinal position** | Yes □ | No □ |
| **Demonstrates intrathecal space and marks space with probe in longitudinal position** | Yes □ | No □ |
| **Demonstrates the spinous view and interspinous view with probe in the transverse position and locates the intrathecal space and interspinous ligament** | Yes □ | No □ |
| **Marks the appropriate space for LP needle insertion** | Yes □ | No □ |
| | | |
| Comments/further details (if required) | | |
| Candidate reflection on scan (optional) | | |
| Supervisor comments: | | |

Signed (candidate):

Signed to confirm above findings (Supervisor):

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

# Assessment of Completion of Training – US Assisted lumbar puncture

Candidate name: Date:

Supervisor name (PRINTED):

| Pre-procedure preparation | |
|---|---|
| | **Initials** |
| Explanation to patient of the US procedure | |
| Appropriate positioning of patient | |
| Ergonomic positioning of kit, machine and patient | |
| **Scanning** | |
| Correct probe selection and image optimisation | |
| Demonstration of appropriate lumbar spine anatomy via US in both longitudinal and transverse views | |
| Demonstration of the interspinous ligament and intrathecal space in both longitudinal and transverse views | |
| Marks the appropriate space for LP needle insertion | |
| **Logbook and pathology review** | |
| 10 directly supervised ultrasound site marks, including one which subsequently undergoes successful LP | |
| **e-LFH module completed (including training video viewed)** | |
| **Local course attended (or alternative training process)** | |
| **US assisted LP Assessment of Completion of Training complete** | |
| **Comments (including deviations from training process if applicable):** | |

Signed (candidate):

Signed (supervisor):

Once completed return to FAMUS administrator via e-mail famus@acutemedicine.org.uk

# US Assisted LP

The Society of Hospital Medicine have published a statement in which they recommend that ultrasound guidance should be used for site selection for adult lumbar punctures [1]. Ultrasound aids with site selection, measurement of subarachnoid space depth and can reduce the number of needle attempts. This is particularly useful in patients with a raised BMI or have otherwise difficult to palpate landmarks. This in turn reduces pain, reduces readmissions with post LP headaches and this cost effective and a better patient journey. This technique is gaining popularity within obstetric anaesthesia to identify midline spinal landmarks and measure expected depths for epidural and subarachnoid spaces.

Varying studies have shown failure rates often landmark technique can be up to 19% and is higher in those with a BMI>35 [2].

A meta-analysis of 12 studies found several advantages of US assisted LP compared for traditional landmark technique of LP [3].

- Improved likelihood of success (NNT 11)
- Fewer needle passes (2.07 Versus 2.66)
- Shorter time to completion (7 versus 8 minutes)
- Lower incidence of traumatic LPs (10.7% versus 26.5%)
- Diminished pain (3.75 versus 6.31 on patient reported pain score)

Numerous studies show that the landmark technique even when used by the most experienced clinicians such as anaesthetists is unreliable with clinicians often identifying a higher space.

US assisted LP is easy to learn with studies suggesting that even after a brief training session, clinicians can reliably and rapidly obtain high quality images [4].

For the specialty of acute internal medicine where approximately 20% of the acute medical take are neurological conditions and the procedure of LP is common, a successful LP can result in life saving treatment, decreased length of stay and a better patient journey within our Acute medical units.

# References


1. Soni NJ, Franco-Sadud R, Kobaidze K, Schnobrich D, Salame G, Lenchus J, Kalidindi V, Mader MJ, Haro EK, Dancel R, Cho J, Grikis L; SHM Point-of-care Ultrasound Task Force; Lucas BP. Recommendations on the Use of Ultrasound Guidance for Adult Lumbar Puncture: A Position Statement of the Society of Hospital Medicine. J Hosp Med. 2019 Oct 1;14(10):591-601. doi: 10.12788/jhm.3197. Epub 2019 Jun 10. PMID: 31251163; PMCID: PMC6817310.

2. Edwards C, Leira EC, Gonzalez-Alegre P. Residency training: a failed lumbar puncture is more about obesity than lack of ability. Neurology 2015; 84:e69–e72.

3. Shu L, Huang J, Liu JC. Efficacy of ultrasound guidance for lumbar punctures: a systematic review and meta-analysis of randomised controlled trials. Postgraduate Medical Journal 2021; 97:40-47

4. Ferre RM, Sweeney TW. Emergency physicians can easily obtain ultrasound images of anatomical landmarks relevant to lumbar puncture. Am J Emerg Med 2007:25:291- 6.