

Focused ultrasound training standards

Board of the Faculty of Clinical Radiology
The Royal College of Radiologists

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Foreword

The Royal College of Radiologists (RCR) wishes to ensure that patients have access to high-quality ultrasound imaging in a timely fashion that facilitates the appropriate management of their care.

Although the traditional model of clinicians referring patients to an ultrasound service provided by radiologists and trained ultrasonographers remains the main route of diagnostic practice, there are times when the patient may be best served by a more direct approach.

This is particularly true in the emergency situation but also as an aid to some focused treatments. In this situation, it is essential that the clinician using ultrasound has appropriate training tailored to their specific needs.

This document has been produced to address the training needs in a number of the more common areas where this practice has developed. By adopting the recommendations in this document, those involved in ultrasound training can ensure that wherever ultrasound is performed, the patient receives the best possible service.

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1 Introduction

High-quality ultrasound services are provided by properly trained and committed practitioners using appropriate quality ultrasound equipment. In the UK, radiologists and sonographic practitioners have traditionally provided such a service from centralised departments of clinical radiology where equipment and manpower can be used cost effectively.

However, there are increasing demands for ultrasound services to include direct access to facilitate immediate clinical decisions in areas such as 'one-stop' clinics and in the emergency departments.

Medical specialists other than radiologists are increasingly wishing to undertake ultrasound examinations on patients referred to them for their clinical opinion as a direct extension of their clinical examination. This may take place in the out-patient department, on the wards, and in the assessment of emergency patients. Clinicians are also using ultrasound to assist in practical procedures such as central line insertion. British and European training boards have incorporated ultrasound experience into clinical training and accreditation where appropriate.

In 2005, the RCR published its *Ultrasound Training Recommendations for Medical and Surgical Specialties*, which has now been updated and will remain the source recommendation for all medical and surgical specialties who wish to use ultrasound to the same level as a trained radiologist within their specialty.¹

Since its publication, there have been developments in ultrasound technology, which have made ultrasound accessible and affordable in wards, outpatient clinics and GP surgeries. The use of ultrasound in these areas has also changed. Its use is more targeted to specific questions such as, 'Is there fluid or not?' and 'How do I best access it for drainage?' The use of ultrasound to guide procedures such as drainage of pleural effusion is associated with a lower complication rate and a lower failure rate. Ultrasound is also being widely used to guide access to vascular structures such as to insert venous and arterial lines.

In countries outside the UK, the 'bedside ultrasound' has become part of undergraduate training for examination of the heart and for questions such as 'Is the spleen enlarged?'

Training in focused or targeted ultrasound is patchy and has led to the development of other training curricula, some of which are reasonable and others not. This document is aimed at training in targeted ultrasound to be used to answer a specific clinical question or to be used to perform ultrasound-guided procedures. It is essential that *all* ultrasound examinations that may have any influence on patient management are performed by individuals who are competent to provide an accurate examination and assessment.

Radiologists have the skills, experience and commitment to provide guidelines for training of medical non-radiologists and hence positively influence the quality of service provided. The RCR believes that this approach – of interdisciplinary co-operation – serves best the interests of patients.

Training of medical non-radiologists should be adequately funded and planned so that there is minimal adverse impact on the service provided to patients and the ability of clinical radiology departments to train and maintain the skills of clinical radiologists and sonographic practitioners.

This document makes recommendations for ultrasound training in the following areas:

- Ultrasound-guided drainage of pleural effusions
- Ultrasound-guided suprapubic bladder catheterisation
- Ultrasound-guided vascular cannulation
- Ultrasound-guided liver biopsies
- Ultrasound-guided drainage of ascites.

2 Aims and principles

The medical use of ultrasound remains highly operator-dependent in spite of advances in technology, and the interests of the patient are best served by the provision of an ultrasound service which offers the maximum clinical benefit and optimal use of resources; that is, with appropriately trained personnel using equipment of appropriate quality.

All those who provide an ultrasound service are ethically and legally vulnerable if they have not been adequately trained. National Health Service (NHS) trusts and health boards in the UK, which provide professional indemnity to practitioners, are unlikely to be able to mount any defence to an action brought against an untrained practitioner. Similarly, the professional defence organisations are unlikely to be successful in mounting a defence against a claim for negligence should an error of diagnosis be made by an untrained practitioner of ultrasound. Advisory guidelines for training in ultrasound provided by the RCR will establish the principles to allow appropriate bodies to provide professional indemnity by setting out training and continuing professional development (CPD) requirements. Trusts, purchasing commissioners and patients should be aware of the requirements for training and maintenance of skills through satisfactory audit and CPD.

An appropriate level of training in ultrasound is one that allows for the provision of a safe and effective ultrasound service. Departments of clinical radiology would normally provide this service, but it would be expected that other medical practitioners would deliver only those aspects of ultrasound particularly relevant to their clinical practice. Nonetheless, the training for medical non-radiologists should be to the same standard as those for radiologists, albeit restricted to the relevant and particular area of their clinical expertise. Whereas radiological training provides for the practice of ultrasound across a broad range of medical and surgical specialties, NHS trusts and health boards, purchasing commissioners and patients should be aware of the differences in the comparative depth and breadth of training, and hence ultrasound skills, between trained radiologists and trained medical non-radiologists.

The European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB) has proposed minimal training requirements for the practice of medical ultrasound in Europe.² These are supported by the RCR and the British Medical Ultrasound Society.

Training should include a theoretical component, and a number of procedures should be observed and a number performed under supervision until the trainee is considered competent:

- To perform the examinations safely and accurately
- To recognise and differentiate normal anatomy and pathology
- To diagnose common abnormalities within the area of focused training
- To recognise when a referral for a second opinion is indicated
- To understand the relationship between ultrasound imaging and other diagnostic imaging techniques.

The training of medical non-radiologists should foster relationships between radiological and non-radiological medical practitioners so that mutual support continues beyond the initial training period. Ideally a radiologist would continue to act as a mentor for a medical non-radiologist undertaking ultrasound after their training is completed. In addition, regular multidisciplinary meetings should continue to ensure an integrated approach to any further imaging that may be required.

A system for recording the results of any ultrasound examination in the patient's record is mandatory. The permanent recording of appropriate images is desirable for the purposes of correlative imaging, future comparison and audit. The preferred option is through the hospital radiology information system (RIS)/picture archive and communications systems (PACS) equipment, enabling other clinicians to access the images and report.

The requirement to deliver training for medical non-radiologists must acknowledge the time commitment of the trainer and trainee, the provision of funding, the content and practicability of the syllabus, and the availability of trainers and training courses. It is essential that there should be no significant adverse effects on trainees in radiology and sonography. It must be recognised that training requires additional time, space and equipment. Training should be properly costed and funded.

Training should be given in departments which have a multidisciplinary (medical, surgical, radiological and so on) philosophy; an adequate throughput of work; a radiologist or Level 2/3 competent sonographic practitioner with experience and an interest in training in the module required; appropriate equipment; and an active audit process. The role of sonographic practitioners in delivering some or all of this modular training should be formally recognised and agreed.

Regular assessment should take place during the training period. It must be recognised that not all trainees have the aptitude to undertake ultrasound scanning and that some, despite undergoing training, may not acquire the

appropriate skills ever to practise independently. At the end of a period of training, a 'competency assessment' form should be completed for each trainee, which will determine the area or areas in which they can practise independently. The responsibility to be adequately trained and to maintain those skills lies with the individual practising ultrasound. An assessment of competence is a reflection on the position at the time the assessment is undertaken and no more. If sonographic practitioners are involved with competence assessment, they should be fully supported in this respect by a responsible radiologist experienced in ultrasound or other Level 2/3 ultrasound trained medical practitioner.

Following training, regular and relevant continuing professional development (CPD) should be undertaken and documented. It is the responsibility of the practitioner to ensure that their practical skills are maintained by ensuring that regular ultrasound sessions are undertaken and that there is an adequate range of pathology seen in their ultrasound practice.

3 Training recommendations

Training should consist of both theoretical and practical syllabuses.

3.1 Theoretical training

Preliminary theoretical training should cover the physics of ultrasound, levels and sophistication of equipment, image recording, reporting, artefacts and the relevance of other imaging modalities to ultrasound. This element of training may be best delivered by linking with some of the excellent courses run by university departments, accredited by the Consortium for the Accreditation of Sonographic Education (CASE).

The Radiology-integrated Training Initiative (R-ITI), a free resource to all NHS professionals, includes eight sections on theoretical principles.

The theoretical syllabus is set out in Appendix 1.

3.2 Practical training

A syllabus for each area of ultrasound specialisation has been developed incorporating theoretical training on anatomy and pathology and a practical syllabus listing conditions which should be included in the experience of the trainee (Appendices 1–6).

Practical experience should be gained under the guidance of a named supervisor trained in ultrasound within a training department. In the context of advice from the RCR, this would normally be in a department of clinical radiology. There may be some areas of ultrasound practice which are not covered by these modules. Where required, training modules based on similar principles should be developed for any area of ultrasound practice not covered in this publication.

The syllabuses set out in Appendices 2–6 include a competency assessment sheet for training. This should be completed during the course of training as it will help to determine in which areas(s) the trainee can practise independently.

The requirements for training are as follows:

- Different trainees will acquire the necessary skills at different rates and the endpoint of the training programme should be judged by an assessment of practical competence.
- Examinations should encompass the full range of pathological conditions listed in the syllabuses.
- A logbook listing the number and type of examinations undertaken by the trainee themselves should be kept.
- An illustrated logbook of specific normal and abnormal findings may be appropriate for some syllabuses.
- Training should usually be supervised by a Level 2/3 practitioner. In certain circumstances, it may be appropriate to delegate some or most of this supervision to a Level 1 practitioner with at least two years' experience of Level 1 practice.¹

4 Continuing professional development

Continuing professional development (CPD) should be undertaken which incorporates elements of ultrasound practice. This should be incorporated into the annual appraisal and revalidation process.

The audit process should be independent and the format should be in line with RCR recommendations (see Clinical Radiology AuditLive³). Evidence of audit should be available to commissioners of service if required.

The individual should keep up to date with the relevant literature and techniques.

The individual should attend regular multidisciplinary meetings and have an ultrasound mentor.

Regular audit of the individual's ultrasound practice should be undertaken to demonstrate that the indications, performance and diagnostic quality of the service are all satisfactory.

5 Consent, pre-procedural and post-procedural care

Practitioners learning to perform procedures under ultrasound control will need to train to perform these procedures, which includes information on patient consent, pre-procedural preparation and post-procedure care. This training is not covered in this document.

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References

1. The Royal College of Radiologists. *Ultrasound training recommendations for medical and surgical specialties, Second edition*. London: The Royal College of Radiologists, 2012.
2. European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB). *Minimum training requirements for the practice of medical ultrasound in Europe*. www.efsumb.org/guidelines/2009-04-14apx1.pdf (last accessed 23/11/12)
3. Clinical Radiology AuditLive www.rcr.ac.uk/crauditlive

Appendix 1. Recommended theory syllabus

This basic theoretical training is a prerequisite to any practical training in ultrasound.

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 safety of ultrasound and of ultrasound contrast agents
- The basic principles of real-time and Doppler ultrasound including colour flow and power Doppler
- The recognition and explanation of common artefacts
- Image 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 Doppler and colour Doppler

Administration

- Image and report recording
- Image and report storing and filing (PACS/RIS)
- Image reporting
- Medico-legal aspects – outlining the responsibility to practise within specific levels of competence and the requirements for training
- Consent
- The value and role of departmental protocols
- The resource implications of ultrasound use

Appendix 2. Ultrasound-guided drainage of pleural effusions

The curriculum is intended for clinicians who perform ultrasound-guided drainage of pleural effusions and will be performing these procedures unsupervised.

Trainees are expected to be doctors experienced in managing patients with chest disease and are likely to have undertaken pleural effusion drainage without ultrasound guidance previously.

Level 1. Knowledge base

- Physics and technology, ultrasound techniques and administration (see Appendix 1)
- Sectional and ultrasonic anatomy
 - Right and left hemidiaphragms
 - Heart
 - Liver and spleen
 - Rib and intercostal spaces
- Pathology in relation to ultrasound
 - Pleural effusion
 - Pleural thickening
 - Consolidated lung
 - Paralysed hemidiaphragm
 - Pericardial effusion

Training and practice

Training should be supervised either by someone who has obtained at least Level 2 competence in thoracic ultrasound or by a Level 1 practitioner with at least two years' experience of Level 1 practice.¹

Trainees should attend an appropriate theoretical course and should read appropriate textbooks and literature.

Practical training should include:

- Observing 20 thoracic ultrasound examinations
- Performing 20 examinations on normal patients
- Performing 20 ultrasound examinations on patients with pleural effusions
- Performing 20 thoracocenteses or drain placements using both guided and non-guided techniques.

The numbers suggested will vary depending how quickly competencies are achieved.

Examinations should encompass the full range of pathological conditions listed above.

A logbook listing the types of examinations and procedures undertaken should be kept.

Trainees should recognise abnormalities which need referral to a more experienced ultrasonologist and/or for further investigation.

Trainees should know their own limitations and when to ask for help.

During the course of training, the competency assessment sheet should be completed as this will determine if the trainee can practise independently.

Competencies to be acquired

- Recognition of normal anatomy of pleura and diaphragm
- Identification of the heart, liver and spleen
- Pleural effusion recognition, including the different echogenic patterns
- Pleural thickening and its differentiation from fluid using colour flow Doppler if appropriate
- Consolidated lung and its differentiation from effusion
- Estimation of depth of effusion and its measurement
- Guided thoracocentesis and drain placement

Maintenance of skills

Having been assessed as competent to practise, there will be a need for CPD and maintenance of practical skills. Regular performance of this technique is required to maintain skill levels. If the procedure has not been performed for some time or has been infrequent, further training and assessment of competency will be required. This may involve further performance under trained supervision or completion of the course again.

Practitioners should attend regular meetings such as multidisciplinary team meetings (MDTMs), departmental meetings and mortality/morbidity meetings as these may be relevant to the area of practice.

Practitioners should have a named 'ultrasound mentor'.

Practitioners should audit their practice. A system for recording the results of any ultrasound examination in the patient's record is mandatory. The permanent recording of appropriate images is desirable for the purposes of correlative imaging, future comparison and audit. The preferred option is through the hospital RIS/PACS equipment, enabling other clinicians to access the images and report.

Practitioners should

- Include ultrasound in their ongoing CPD
- Keep up to date with relevant literature

Appendix 2. Ultrasound-guided drainage of pleural effusions: training competency assessment sheet

Core knowledge base — Level 1		Trainee:		Trainer:	
	Trainer signature	Date		Trainer signature	Date
Physics and technology			Administration		
Practical instrumentation/use of ultrasound controls			Sectional and ultrasonic anatomy		
Ultrasound techniques			Pathology in relation to ultrasound		
RIS/PACS					
Competencies/skills to be acquired — Level 1					
To be competent to perform/diagnose the following:					
	Trainer signature	Date		Trainer signature	Date
Normal anatomy of pleura and diaphragm			Consolidated lung and its differentiation from effusion		
Identification of heart, liver and spleen			Estimation of depth of effusion and its measurement		
Pleural effusion and different echogenic patterns			Guided thoracocentesis and drain placement		
Pleural thickening and its differentiation from fluid			Know when to refer to a more expert ultrasonologist		

Appendix 3. Ultrasound-guided suprapubic bladder catheterisation

The curriculum is intended for clinicians who perform ultrasound-guided suprapubic bladder catheterisation and will performing these procedures unsupervised.

Trainees are expected to be doctors experienced in managing patients requiring bladder catheterisation and are likely to have undertaken bladder catheterisation without ultrasound guidance previously.

Knowledge base

- Physics and technology, ultrasound techniques and administration (see Appendix 1)
- Sectional and ultrasonic anatomy
 - Ureters
 - Bladder
 - Prostate
 - Other pelvic structures (uterus, ovaries, vessels, bowel)
- Pathology in relation to ultrasound
 - Ureters: dilatation, obstruction
 - Bladder: tumours, diverticula, wall thickening, calculi, volume estimation
 - Prostate

Training and practice

Training should be supervised either by someone who has obtained at least Level 2 competence in urinary tract ultrasound or by a Level 1 practitioner with at least two years' experience of Level 1 practice.¹

Trainees should attend an appropriate theoretical course and should read appropriate textbooks and literature.

Practical training should include:

- Observing 20 pelvic ultrasound examinations
- Performing 20 examinations on normal patients
- Performing 20 suprapubic catheterisations of the bladder.

The numbers suggested will vary depending how quickly competencies are achieved.

Examinations should encompass the full range of pathological conditions listed above.

A logbook listing the types of examinations and procedures undertaken should be kept.

Trainees should recognise abnormalities which need referral to a more experienced ultrasonologist and/or for further investigation.

Trainees should know own limitations and when to ask for help.

During the course of training, the competency assessment sheet should be completed as this will determine if the trainee can practise independently.

Competencies to be acquired

To be able to:

- Perform a thorough ultrasound examination of the bladder in different planes
- Recognise normal ultrasonic anatomy of the bladder and common normal variants
- Measure bladder volume
- Recognise and diagnose bladder diverticula
- Recognise and assess bladder tumours
- Recognise bladder calculi
- Recognise dilated ureters
- Recognise uterus and ovaries
- Differentiate a bladder from a cystic mass, pelvic collection and free pelvic fluid
- Perform guided suprapubic catheterisation of the bladder

Maintenance of skills

Having been assessed as competent to practise, there will be a need for CPD and maintenance of practical skills. Regular performance of this technique is required to maintain skill levels. If the procedure has not been performed for some time or has been infrequent, further training and assessment of competency will be required. This may involve further performance under trained supervision or completion of the course again.

Practitioners should attend regular meetings such as MDTMs, departmental meetings and mortality/morbidity meetings as these may be relevant to the area of practice.

Practitioners should have a named 'ultrasound mentor'.

Practitioners should audit their practice. A system for recording the results of any ultrasound examination in the patient's record is mandatory. The permanent recording of appropriate images is desirable for the purposes of correlative imaging, future comparison and audit. The preferred option is through the hospital RIS/PACS equipment enabling other clinicians to access the images and report.

Practitioners should:

- Include ultrasound in their ongoing CPD
- Keep up to date with relevant literature.

Appendix 3. Ultrasound suprapubic bladder catheterisation: training competency assessment sheet

Core knowledge base — Level 1		Trainee:		Trainer:	
	Trainer signature	Date		Trainer signature	Date
Physics and technology			Administration		
Practical instrumentation/use of ultrasound controls			Sectional and ultrasonic anatomy		
Ultrasound techniques			Pathology in relation to ultrasound		
Use of the local RIS and PACS system					
Competencies/skills to be acquired — Level 1					
To be competent to perform/diagnose the following:					
	Trainer signature	Date		Trainer signature	Date
Bladder			Other		
<ul style="list-style-type: none"> ▪ Ultrasound examination in different planes ▪ Ultrasonic anatomy and common normal variants 			<ul style="list-style-type: none"> ▪ To be able to recognise: <ul style="list-style-type: none"> – Normal uterus and ovaries – Gynaecological masses and pelvic collections/free fluid – Use ultrasound in the performing guided – Suprapubic bladder catheterisation 		
<ul style="list-style-type: none"> ▪ Bladder volume ▪ Diverticula ▪ Tumours ▪ Calculi ▪ Use colour Doppler to assess ureteric jets ▪ Normal anatomy of pleura and diaphragm 			<ul style="list-style-type: none"> ▪ Know when to refer to a more expert ultrasonologist 		
Prostate					
<ul style="list-style-type: none"> ▪ Ultrasonic anatomy and common normal variants 					

Appendix 4. Ultrasound-guided vascular cannulation

This curriculum is intended for clinicians who perform ultrasound-guided vascular cannulation and will be performing these procedures unsupervised.

Trainees are expected to be doctors already trained to perform vascular cannulation.

Knowledge base

- Physics and technology, ultrasound techniques and administration (see Appendix 1)
- Sectional and ultrasonic anatomy
 - Neck
 - Axillary/subclavian veins
 - Arm (basilic vein)
 - Groin/femoral triangle
 - Differentiate between arteries, veins and nerves
 - Recognise venous valves
- Pathology in relation to ultrasound
 - Venous disease; eg, patency, occlusion, deep venous thrombosis, pseudoaneurysm and arteriovenous (AV) fistula
 - Knowledge of techniques to augment the size of veins in different anatomical locations
- Basic knowledge of Doppler ultrasound principles

Training and practice

Training should be supervised either by someone who has obtained at least Level 2 competence in critical care ultrasound themselves, or by a Level 1 practitioner with at least two years' experience of Level 1 practice.¹

Trainees should attend an appropriate theoretical course and should be familiar with the published literature.

Practical training should include:

- Observing 20 ultrasound-guided vascular cannulations of all the intended sites of practice in which competency is to be acquired
- Performing 20 ultrasound scans on patients planned for vascular cannulation
- Performing 20 ultrasound-guided vascular cannulations.

The numbers suggested will vary depending on how quickly competencies are achieved.

Examinations should encompass the full range of common pathological conditions listed above and training cases should be used for uncommon pathology such as AV fistula and pseudoaneurysm.

A logbook listing the types of examinations undertaken should be kept.

Trainee should recognise abnormalities which need referral to a more experienced ultrasonologist and/or for further investigation.

Trainees should know own limitations and when to ask for help.

During the course of training, the competency assessment sheet should be completed as this will determine if the trainee can practise independently.

Competencies to be acquired

To be able to:

- Recognise normal anatomy
- Assess veins for patency and vascular access
- Recognise deep vein thrombosis and occlusion
- Differentiate veins, arteries and nerves
- Use ultrasound guidance for venous puncture, guide wire insertion and cannulation

Maintenance of skills

Having been assessed as competent to practise, there will be a need for CPD and maintenance of practical skills. Regular performance of this technique is required to maintain skill levels. If the procedure has not been performed

for some time or has been infrequent, further training and assessment of competency will be required. This may involve further performance under trained supervision or completion of the course again.

Practitioners should attend regular meetings such as MDTMs, departmental meetings and mortality/morbidity meetings as these may be relevant to the area of practice.

Practitioners should have a named 'ultrasound mentor'.

Practitioners should audit their practice. A system for recording the results of any ultrasound examination in the patient's record is mandatory. The permanent recording of appropriate images is desirable for the purposes of correlative imaging, future comparison and audit. The preferred option is through the hospital RIS/PACS equipment enabling other clinicians to access the images and report.

Practitioners should:

- Include ultrasound in their ongoing CPD
- Keep up to date with relevant literature.

Appendix 4. Ultrasound-guided vascular cannulation: training competency assessment sheet

Core knowledge base — Level 1		Trainee:		Trainer:	
	Trainer signature	Date		Trainer signature	Date
Physics and technology			Administration		
Practical instrumentation/use of ultrasound controls			Sectional and ultrasonic anatomy		
Ultrasound techniques			Pathology in relation to ultrasound		
RIS/PACS					
Competencies/skills to be acquired — Level 1					
To be competent to perform/diagnose the following:					
	Trainer signature	Date		Trainer signature	Date
Normal anatomy in different planes			Differentiation of arteries, veins and nerves		
Identification of common normal variants.			Assess veins for patency and vascular access		
Recognise all the above mentioned pathology			Satisfactory vascular cannulation		
Be able to use Colour flow Doppler			Know when to refer to a more expert ultrasonologist		

Appendix 5. Ultrasound training for percutaneous non-targeted liver biopsy

The curriculum is intended for clinicians who perform percutaneous liver biopsies using ultrasound guidance and will performing these procedures unsupervised.

Trainees are expected to be doctors experienced in managing patients with liver disease and are likely to have undertaken liver biopsies without ultrasound guidance previously.

Knowledge base

- Physics and technology, ultrasound techniques and administration (see Appendix 1)
- Sectional and ultrasonic anatomy
 - Liver and gallbladder, particularly normal variants
 - Upper abdominal organs, chest wall and pleura
 - Pathology in relation to ultrasound
 - Normal and abnormal liver parenchyma
 - Cirrhosis and portal hypertension
 - Liver vasculature on Doppler
 - Liver primary or secondary malignancy
 - Liver abscess
 - Ascites and knowledge of when this is a contraindication to biopsy
- Ability to select the most appropriate site including use of Doppler, and the avoidance of other structures including (but not limited to) bowel, pleura and intercostal vessels

Training and practice

Training should be supervised either by someone who has obtained at least Level 2 competence in thoracic ultrasound or by a Level 1 practitioner with at least two years' experience of Level 1 practice.¹

Trainees should attend an appropriate theoretical course and should read appropriate textbooks and literature.

Practical training should include:

- Observing 20 abdominal ultrasound examinations
- Performing 20 examinations on normal patients
- Performing 20 ultrasound examinations on patients with upper abdominal pathology
- Performing 20 liver biopsies using ultrasound guidance.

The numbers suggested will vary depending how quickly competencies are achieved.

Examinations should encompass the full range of pathological conditions listed above.

A logbook listing the types of examinations and procedures undertaken should be kept.

Trainees should recognise abnormalities which need referral to a more experienced ultrasonologist and/or for further investigation.

Trainees should know own limitations and when to ask for help.

During the course of training, the competency assessment sheet should be completed as this will determine if the trainee can practise independently.

Competencies to be acquired

- Recognise normal anatomy
- Recognition of normal and abnormal liver parenchyma
- Recognition of cirrhosis and portal hypertension
- Ability to assess liver vasculature on Doppler
- Recognition of liver primary or secondary malignancy
- Recognition of infection such as liver abscess
- Recognise and quantify ascites
- Perform liver biopsies using ultrasound control

Maintenance of skills

Having been assessed as competent to practise, there will be a need for CPD and maintenance of practical skills. Regular performance of this technique is required to maintain skill levels. If the procedure has not been performed for some time or has been infrequent, further training and assessment of competency will be required. This may involve further performance under trained supervision or completion of the course again.

Practitioners should attend regular meetings such as MDTMs, departmental meetings and mortality/morbidity meetings as these may be relevant to the area of practice.

Practitioners should have a named 'ultrasound mentor'.

Practitioners should audit their practice. A system for recording the results of any ultrasound examination in the patient's record is mandatory. The permanent recording of appropriate images is desirable for the purposes of correlative imaging, future comparison and audit. The preferred option is through the hospital RIS/PACS equipment enabling other clinicians to access the images and report.

Practitioners should:

- Include ultrasound in their ongoing CPD
- Keep up to date with relevant literature.

Appendix 5. Ultrasound-guided percutaneous non-targeted liver biopsy – training competency assessment sheet

Core knowledge base — Level 1		Trainee:		Trainer:	
	Trainer signature	Date		Trainer signature	Date
Physics and technology			Administration		
Practical instrumentation/use of ultrasound controls			Sectional and ultrasonic anatomy		
Ultrasound techniques			Pathology in relation to ultrasound		
RIS/PACS					
Competencies/skills to be acquired — Level 1					
To be competent to perform/diagnose the following:					
	Trainer signature	Date		Trainer signature	Date
Liver: Normal anatomy in different planes and identification of common normal variants			Understand the preoperative preparation and postoperative care required when performing liver biopsies		
Recognise			Perform ultrasound-guided liver biopsies		
– Cirrhosis			Know when to refer to a more expert ultrasonologist		
– Portal hypertension					
– Primary and secondary malignancy					
– Abscess					
Be able to use Colour flow Doppler to assess liver vasculature					
Recognise position and state of diaphragm and pleura					

Appendix 6. Ultrasound training for drainage of ascites

The curriculum is intended for clinicians who perform ultrasound-guided drainage of ascites and will performing these procedures unsupervised.

Trainees are expected to be doctors experienced in managing patients with ascites and are likely to have undertaken ascitic fluid tap without ultrasound guidance previously.

Knowledge base

- Physics and technology, ultrasound techniques and administration (see Appendix 1)
- Sectional and ultrasonic anatomy
 - Abdomen, detailed understanding of the intestinal, mesenteric, peritoneal, omental , vascular and retroperitoneal anatomy
- Pathology in relation to ultrasound abdomen
 - An understanding of disease processes which affect the peritoneal cavity and causes of ascites
 - An understanding of pathways of spread of intraperitoneal and retroperitoneal disease
 - Recognise loculations and walled off collections
 - Recognise ultrasound mimics of ascites including distended bladder, large ovarian cyst and small bowel obstruction
 - Recognise associated abnormalities such as peritoneal nodularity and omental deposits
- Basic knowledge of Doppler ultrasound principles

Training and practice

Training should be supervised either by someone who has obtained at least Level 2 competence in thoracic ultrasound or by a Level 1 practitioner with at least two years' experience of Level 1 practice.¹

Trainees should attend an appropriate theoretical course and should read appropriate textbooks and literature.

Practical training should include:

- Observing 20 abdominal ultrasound examinations
- Performing 20 examinations on normal patients
- Performing 20 examinations on patients with ascites
- Performing 20 drain placements using both guided and non-guided techniques.

The numbers suggested will vary depending how quickly competencies are achieved.

Examinations should encompass the full range of pathological conditions listed above.

A logbook listing the types of examinations and procedures undertaken should be kept.

Trainees should recognise abnormalities which need referral to a more experienced ultrasonologist and/or for further investigation.

Trainees should know their own limitations and when to ask for help.

During the course of training, the competency assessment sheet should be completed as this will determine if the trainee can practise independently.

Competencies to be acquired

- Recognise normal anatomy
- Recognise limitations of technique and own knowledge base
- Fluid collections: recognise different types of fluid and if loculated or walled off
- Identify and assess abdominal and pelvic fluid collections
- Differentiate subphrenic from pleural fluid
- Understand other causes of abdominal distension; eg, small bowel dilation, bladder distension and large ovarian masses
- Ultrasound-guided drainages and drain placements

Maintenance of skills

Having been assessed as competent to practise, there will be a need for CPD and maintenance of practical skills. Regular performance of this technique is required to maintain skill levels. If the procedure has not been performed

for some time or has been infrequent, further training and assessment of competency will be required. This may involve further performance under trained supervision or completion of the course again.

Practitioners should attend regular meetings such as MDTMs, departmental meetings and mortality/morbidity meetings as these may be relevant to the area of practice.

Practitioners should have a named 'ultrasound mentor'.

Practitioners should audit their practice. A system for recording the results of any ultrasound examination in the patient's record is mandatory. The permanent recording of appropriate images is desirable for the purposes of correlative imaging, future comparison and audit. The preferred option is through the hospital RIS/PACS equipment enabling other clinicians to access the images and report.

Practitioners should:

- Include ultrasound in their ongoing CPD
- Keep up to date with relevant literature.

Appendix 6. Ultrasound-guided drainage of ascites – training competency assessment sheet

Core knowledge base – Level 1		Trainee:		Trainer:	
	Trainer signature	Date		Trainer signature	Date
Physics and technology			Administration		
Practical instrumentation/use of ultrasound controls			Sectional and ultrasonic anatomy		
Ultrasound techniques			Pathology in relation to ultrasound		
RIS/PACS					
Competencies/skills to be acquired – Level 1					
To be competent to perform/diagnose the following:					
	Trainer signature	Date		Trainer signature	Date
Ultrasound of abdomen and pelvis in different planes			Pleural effusions and subphrenic collections		
Identification of common normal variants			Use ultrasound guidance in drainage of ascites		
Recognise all the above mentioned pathology			Bladder distension, ovarian masses and small bowel distension		
Fluid collections in the abdomen and pelvis. Walled off and loculated collections			Know when to refer to a more expert ultrasonologist		

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