



Musculoskeletal Ultrasound in Professional Practice (SE709)

Clinical Skills Learning Documentation

Index:

Welcome	3
NHS Constitution Values	3
The University Values	4
Regulation of Sonography and Impact on Professional Practice	4
Introduction to Pathway	9
Learning Outcomes for the Module	12
Rational for Clinical Skills Learning	13
Role of Clinical Mentor	14
Support for the Clinical Mentor	15
Support for the Student	17
Workplace Induction	17
Module Assessment	18
What is Clinical Competency?	25
Submission Guidance	30
Resources	31
Contact Information	33
Appendices:	34
Practice Mentorship Agreement	35
Learning Contract	37
Anatomical Areas Imaged in Musculoskeletal Ultrasound	39

This document is to provide students and clinical mentors of SE709 with guidance to support the development of musculoskeletal ultrasound education.

Welcome to Clinical Mentors:

Thank you for agreeing to act as a mentor for someone who is undertaking a course at the University of Essex.

This guide is intended to provide you with some useful tips to assist you and your student and help them get the most out of this course. If after reading this guide you still require further information or need advice about a student you are supervising please contact me,

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SE709 – Musculoskeletal Ultrasound in Professional Practice

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The NHS Constitution Values

The School of Sport, Rehabilitation and Exercise Sciences (SRES) is committed to embedding the NHS Constitution values (which are reflected in the University values) and behaviour into all we do. There is recognition that not all students and staff will work within the NHS, however these values are applicable to many areas of work and activities.

The aspiration for those within SRES to involve students, patients, service users, carers and NHS /non NHS professionals in the delivery of all programmes should be the norm. All staff within HHS will demonstrate respect for persons; property and life choices and students are expected to do the same. All staff have a commitment to excellence in education and teaching which invites and acts on student and our partners' feedback. We expect high levels of professionalism from staff and students at all times.

The full NHS England Constitution can be viewed at:

<https://www.gov.uk/government/publications/the-nhs-constitution-for-england>

The University Values

The new university strategy requires that the stated behaviours and values of the university are exhibited throughout your course – these values are similar to the guiding NHS constitution values.

In pursuing teaching, research and support of students within SRES the activity, behaviours and decision making of all members of the academic community are underpinned by clear expectations. These values and behaviours make it clear that the academic community have a responsibility to:

- Aspire to excellence in teaching and research
- Maintain integrity, honesty and openness working within ethical bounds
- Exercise Academic freedom
- Maintain and strengthen the student community
- Demonstrate inclusivity, equal opportunity, respect and dignity.
- Innovate to meet the challenges of a rapidly changing world.
- Maintain a global outlook and ensure that we draw on a rich diversity of perspectives
- Work in mutually beneficial partnerships which are based on trust and respect.
- Be accountable for decisions made and provide transparency in all.

The full Strategy can be viewed at:

<http://www.essex.ac.uk/about/strategy/documents/strategic-plan.pdf>

Regulation of Sonography and Impact on Professional Practice:

Sonography benefits and suffers from the limited regulation associated with it. The relative lack of regulation can be viewed as a challenge to patient safety and it has been argued that standards cannot be set or monitored without regulation. Opportunities have emerged from the lack of direct regulation which may have enabled practice advancement for all interested practitioners including clinicians from a non-radiology or radiographer background.

It is imperative that patients are protected from inappropriate and poor practice. For this reason, some key principles have been highlighted below that should underpin good professional practice.

Society and College of Radiographers and British Medical Ultrasound Society

(Guidelines for Professional Ultrasound Practice, December 2015)

- ⌚ ultrasound practitioners should be aware that they are legally accountable for their professional actions, including the reporting of ultrasound examinations, in all circumstances.
- ⌚ the report is a public document and part of the patient's medical record, together with any images, and/or video recordings which may accompany it.
- ⌚ the patient consents to an ultrasound examination that he or she has the right to expect will be delivered and reported by a competent ultrasound practitioner.
- ⌚ a competent ultrasound practitioner is one who works to the standards defined by the guidelines of his or her place of work, the code of conduct of his or her professional body, the guidelines of that and other relevant bodies and of the regulatory body where appropriate.
- ⌚ the standard of care provided by a competent ultrasound practitioner is that which the majority of similar individuals would provide and/or which a significant body of similar individuals would provide in similar and contemporaneous circumstances.
- ⌚ images that accompany an ultrasound examination carried out by a competent ultrasound practitioner evidence the assumption that the necessary standard of care has been delivered
- ⌚ all images must be capable of being attributed to the correct examination and should include the patient identifier(s), examination date and time.
- ⌚ nationally published requirements for the storage of images must be followed

While undertaking any ultrasound examination and working in accordance with locally agreed practice ultrasound practitioners should:

- ⌚ obtain sufficient verbal and/or written information from the referring clinician to undertake correctly the examination requested
- ⌚ obtain informed consent from the patient or their representative being mindful of his/her capacity to understand

- ⌚ explain and discuss the findings with the patient within local guidelines
- ⌚ interpret and communicate the findings appropriately and in a timely fashion to the referring clinician
- ⌚ ensure appropriate arrangements have been made for further care before the conclusion of the examination as necessary.

The following points should be considered for all ultrasound examinations:

- ⌚ the clinical details provided are sufficient to carry out the examination requested and the correct examination has been requested
- ⌚ relevant information is available from the case notes, previous investigations and other sources
- ⌚ the role of the ultrasound examination is understood in the clinical context for the patient
- ⌚ a systematic scanning approach is adopted that can be modified as required
- ⌚ requirements and recommendations should the examination be incomplete
- ⌚ the need to extend the ultrasound examination, and/or proceed to additional imaging techniques where necessary in accordance with locally agreed protocol

Referral guidelines for Musculoskeletal Ultrasound:

Introduction:

Many musculoskeletal pathologies are diagnosed successfully by good clinical examination. Imaging should be reserved for those in whom examination is equivocal or in some cases, when treatment for an expected pathology has failed. Incidental pathology is common and may not be the current cause of symptoms – clinical correlation is always required. As equipment and training improve, more structures and pathologies are identified using ultrasound so this list may vary between imaging departments as there may be individual ultrasound practitioners locally with a special interest in a specific field which will increase their scope of practice. Important Notes:

There should be a definite / clear clinical diagnosis / question on the request.

US is a good diagnostic modality if specific question is to be answered. It is not good for “for fishing.”

Specific request examples that can be rejected would include: Knee, foot, ankle pain? Cause, Knee injury? ACL tear, Chest pain? cause , Back pain? nerve pain or thigh or leg

Principles from Consortium for the Accreditation of Sonographic Education (applicable to all students):

(Published 2015)

1. Reporting should not be separated from scanning
2. Scanning is a ‘dynamic’ investigation in which the acquisition of suitable images and assessment of them is entirely operator-dependent at the time of the scan.
Deficiencies in acquisition cannot be rectified by involving a more skilled practitioner at a later stage. Assessment and interpretation of saved images is recognised as sub-optimal practice although, as with all image interpretation, dual reporting can be helpful in increasing specificity
3. The risk of patient harm and consequent litigation against any healthcare organisation providing a poor quality service is very high and therefore the need for competence at the point of scanning is paramount
4. Workforce modelling and the development of innovative training routes to meet the demand for sonography services should demonstrate increased efficiency of provision and effectiveness in delivery of diagnosis and treatment to patients.

Principles from the Health and Care Professions Council (applicable to most but not all potential students):
(Updated 28/5/13)

The key standards of proficiency for radiographers and physiotherapists are identical:

Registrants must:

1. be able to practise safely and effectively within their scope of practice
2. be able to practise within the legal and ethical boundaries of their profession
3. be able to maintain fitness to practise
4. be able to practise as an autonomous professional, exercising their own professional judgement
5. be aware of the impact of culture, equality, and diversity on practice
6. be able to practise in a non-discriminatory manner
7. understand the importance of and be able to maintain confidentiality
8. be able to communicate effectively
9. be able to work appropriately with others
10. be able to maintain records appropriately
11. be able to reflect on and review practice
12. be able to assure the quality of their practice
13. understand the key concepts of the knowledge base relevant to their profession
14. be able to draw on appropriate knowledge and skills to inform practice
15. understand the need to establish and maintain a safe practice environment

Introduction to Pathway:

The University of Essex has designed a postgraduate pathway that aims to provide high quality education to health care practitioners in this modality. This module, 'Musculoskeletal Ultrasound in Professional Practice' is a component of awards in Musculoskeletal Ultrasound Imaging, (Postgraduate Certificate, Postgraduate Diploma and MSc). The pathways have been summarised below:

Musculoskeletal Ultrasound Imaging – Pathway Process (including Mapping of Theoretical and Clinical Learning Content)

Key - Table content shaded to reflect learning content and aims:

Focus on theoretical material
Theoretical content plus scanning requirements
Focus on clinical skills learning and experience

Postgraduate Certificate – Musculoskeletal Ultrasound Imaging

Module	Credit rating
Technical Considerations in ultrasound imaging (SE708)	15 credits
Introduction to MSK US (SE715)	15 credits
MSK US in Professional Practice (SE709)	30 credits

Postgraduate Diploma – Musculoskeletal Ultrasound Imaging

Module	Credit rating
Technical Considerations in ultrasound imaging (SE708)	15 credits
Introduction to MSK US (SE715)	15 credits
MSK US in Professional Practice (SE709)	30 credits
Postgraduate Research Methods (HS945) OR Research Design and Critical Appraisal (HS900) and Data Collection, Analysis and Interpretation (HS908) OR Research Design and Critical Appraisal (HS900) and Statistical Analysis (HS927)	30 credits
Work based learning (SE731) OR MSK Ultrasound Guided Injections (SE710) OR Soft Tissue and Joint Injection Therapy (SE714) AND Skill Extension for MSK Injection Practitioners: Ultrasound Guidance (SE718)	30 credits
Clinical Skills Experience – scanning record	No weighting

MSc – Musculoskeletal Ultrasound Imaging

Module	Credit rating
Technical Considerations in ultrasound imaging (SE708)	15 credits
Introduction to MSK US (SE715)	15 credits
MSK US in Professional Practice (SE709)	30 credits
Postgraduate Research Methods (HS945) OR Research Design and Critical Appraisal (HS900) and Data Collection, Analysis and Interpretation (HS908) OR Research Design and Critical Appraisal (HS900) and Statistical Analysis (HS927)	30 credits
Work based learning (SE731) OR MSK Ultrasound Guided Injections (SE710) OR Soft Tissue and Joint Injection Therapy (SE714) AND Skill Extension for MSK Injection Practitioners: Ultrasound Guidance (SE718)	30 credits
Clinical Skills Experience – scanning record	No weighting
Dissertation (HS730)	60 credits
Clinical Skills Experience – scanning record	No weighting

The potential clinical role of this modality is extensive; varying between professionals and work environments. Students who have an interest in this pathway typically include sonographers, experienced physiotherapists, rheumatologists and general practitioners with a special interest in musculoskeletal medicine.

Students enrolled on The University of Essex's 'Musculoskeletal Ultrasound in Professional Practice' module need support to fulfil a mentored practice requirement. This module is designed to develop students' knowledge, practical use and clinical application of musculoskeletal ultrasound. Students on this module will have already experienced face to face teaching that will have provided them with knowledge and some practical experience of musculoskeletal scanning protocols. The content and assessment strategy for this module are outlined below. A central element of the learning and assessment strategy is clinical skills development. Students must engage with mentored practice to enable them to gain experience in the clinical environment, this includes exposure to an appropriate patient case load and support from a suitably qualified mentor.

Learning Outcomes for the Module:

This module enables students to meet the following learning outcomes:

1. Critically appraise and utilise all information from various sources to determine the most appropriate musculoskeletal ultrasound examination
2. Analyse the needs of the patient in order to perform all aspects of the musculoskeletal ultrasound examination safely and competently
3. Competently carry out musculoskeletal ultrasound examinations according to the evidence base
4. Critically evaluate the musculoskeletal ultrasound findings and where necessary arrange, advise or undertake further investigations appropriate to local policies and practices
5. Actively demonstrate proficiency in reporting musculoskeletal ultrasound examinations to reflect the clinical question raised
6. Communicate clearly and effectively with clients, patients, carers and other healthcare professionals appropriately
7. Critically reflect on personal and professional practice in order to challenge, develop and maintain standards in the field of musculoskeletal ultrasound imaging.

Rationale for Clinical Skills Learning

The value of a mentor when learning clinical skills is enormous; it is expected that students will respect this clinical skills learning opportunity to maximise their learning and will take responsibility for the independent learning that is required in this module.

Students have academic support from the university to assist them with coursework and have access to a large volume of material that should guide them with their practical learning. It is expected that students will access clinical mentors to guide them in relevant practice, policy or processes within the field of musculoskeletal ultrasound in order for them to meet the requirements of this module.

The duration of each supervised session and their frequency should be agreed between the student and mentor but this module should ideally be completed within 1 year. The duration of the module depends on the frequency and duration of the supervised scanning and other factors including the student's skill level and previous experience. The module leader is happy to discuss issues as they arise and offer support when required, mentors are encouraged to make contact with the module lead whenever necessary.

Students are reminded that the Consortium for the Accreditation of Sonographic Education advises 14 hours of scanning per week for the duration of a clinical practice module. Students should aim to achieve this but it is acknowledged that very few services complete this number of hours of MSK service provision in a week. Students may seek additional mentoring opportunities to enhance their scanning; diversity of professional environments and varied techniques employed by other clinicians beyond their nominated mentor can add significant value.

Students will need to practice their scanning techniques independently as well as use support in the work place / mentoring environment to complete the module's clinical learning requirements and assessment. It is recommended that students optimise their network of colleagues and peers in the field of musculoskeletal

ultrasound imaging, previous students who have been able to meet up in small groups to practice and discuss learning have progressed extremely well.

Role of Clinical Mentor

- ❑ The student and mentor both need to sign the Practice Mentorship Agreement to enable the student to register on this module, (copy enclosed at end of this document).
- ❑ Negotiate and clarify with the student how the mentoring role will be fulfilled to take account of respective commitments, best learning opportunities and other local considerations.
- ❑ Assist the student in assessing their learning needs in relation to musculoskeletal ultrasound in the practice setting.
- ❑ Plan with the student the ways in which the identified learning needs can be met, document this in the learning contract and implement the plan. This may include shadowing the mentor, other clinicians, demonstration, discussion, observing the student, answering their questions, guiding and supporting them, pointing them to guidelines, protocols and other human or material resources.
- ❑ Facilitate learning through critical thinking and reflection allowing for the development and integration of theory and practice
- ❑ Allow time for the student to carry out scanning protocols and provide feedback regarding their progress.
- ❑ Assess the student's developing scanning competence and provide feedback regarding their progress
- ❑ Provide the Module Lead with information regarding the student's progress including any concerns related to their competence, attitude or motivation. Complete the summative assessment documentation and make recommendations regarding further support required.

The mentored clinical skills learning process should enable clinical competency to be evaluated. Documentation in relation to competency and other feedback received from the mentors should guide learning and give students a strong indication of their progress and ability.

Support for the Clinical Mentor:

When a student approaches you to be a potential clinical skills mentor, the course team must clarify you are suitably qualified – we will request a very brief summary of your musculoskeletal ultrasound experience for this, (the Consortium for the Accreditation of Sonographic Education offers the following advice; *'It is advisable that the clinical supervisor/mentor has a minimum of two years current clinical experience. An enthusiasm and ability to teach are essential qualities of a good clinical supervisor/mentor, which, coupled with knowledge and expertise are as important as the length of experience'*, (CASE Handbook 2015).

Prior to the placement a member of the university team will communicate you via phone or e-mail to clarify the requirements of the placement. We do not routinely hold clinical mentor training days as previous experience has found that mentors are unable to attend and the course team is extremely keen to minimise barriers. It is however important that clinical mentors are informed regarding the module's requirements and have access to support. The module lead can be contacted at any time, contact details are provided at the end of this document.

This module's clinical skills documentation is deliberately brief, (students and mentors are not typically interested in educational philosophy!). We have tried to keep it simple and easy to navigate.

Clinical education monitoring:

- A member of the course team will communicate with the clinical mentor before the placement starts.
- The module lead is available for contact at any stage during the placement. Details are at the end of the document.
- During the mentored practice, the course team will be in contact with the mentor and the student to monitor progress, answer any questions and assist if issues need resolving.

- If a student is struggling with the course requirements, the course leader may be able to offer support and advice. Mature students often have complex lives to manage, if complications arise it is helpful if students communicate their concerns.
- If a student is not progressing as anticipated and is not demonstrating the ability to acquire clinical competency, the course leader should be contacted so that options are discussed. The students on this module are all registered healthcare professionals and high levels of professionalism are expected. If there are any professional concerns, please contact the module leader to discuss them. In the event of concerns that a student may not be suitable for engagement in the relevant profession, the University's Fitness to Practice Procedure shall be invoked.
- A date for the summative assessments should be set in a timely way to ensure the External Assessor can attend one of them. If the university's External Assessor is not available, we have a number of contacts around the country who will be able to fulfil this role. We will ensure the appointed External Assessor is appropriately prepared for the summative assessment.
- At the end of the mentored practice, the clinical mentor ensures the documentation for four summative assessments has been completed, this is returned to the university by the student
- The student will be asked to complete an evaluation of their clinical skills learning experience.

When students are arranging their clinical supervision, they need to ensure that the mentor is able to offer mentorship in a suitable clinical department which should be able to provide:

- 🕒 A wide range of examinations relevant to the area of clinical practice
- 🕒 Protected, supervised hands-on scanning time
- 🕒 A supportive learning environment
- 🕒 A clinical learning experience supported by evidence-based protocols and adhering to national recommendations where these exist.

Support for the Student:

Mentored clinical work should provide a fantastic opportunity for learning, whilst being observed and mentored can feel demanding, please try to focus on your goal of developing competence with musculoskeletal ultrasound.

Please assist your mentor by following all local protocols and ensure you can provide them with the documentation that must be completed.

Please stay in touch with the course lead during the placement. If there are any concerns or questions, consult the course documentation and e-mail the course lead if required. The course lead will want to hear from you during the module to discuss your progress.

Work Place Induction

It is the student's responsibility to organise and agree start and finish times for scanning sessions with the mentor and the frequency of the sessions. The student must ensure they arrive promptly and present themselves professionally. Prior to commencing the mentorship period, it would be wise to clarify the mentor's expectations of background knowledge and ability.

It is the mentor's responsibility to complete work place induction in line with local policies. This may include:

- Orientation of the student to the placement and department.
- Service philosophy and context.
- Any service organisational or system issues that the student will need to understand.
- Specify the background knowledge that the student should have prior to starting the mentored learning.

Module Assessment:

This module is equivalent to 30 credits at Level 7 learning. This means it can be combined with other modules for a final award, e.g. Post-Graduate Certificate, Post-Graduate Diploma or MSc Musculoskeletal Ultrasound Imaging.

To pass this module, the student must complete and pass all the following elements that have been designed to assess the learning outcomes:

- Summative practical assessment – students need to do 4 of these.
- Log-book
- Coursework – linking theory to professional practice.

The summative practical assessment involves the clinical mentor, the other assessment components will be completed independently by the student and submitted to the university.

Summative Practical Assessments:

The 4 summative practical assessments will involve the scanning process for 4 different patients, each presenting with different anatomical scanning requests.

One of the summative practical assessments will be of a shoulder patient.

The 4 practical assessments should take place together, on the same day at the convenience of the clinical mentor, student and External Assessor.

At least one of these summative practical assessments will be attended by an External Assessor.

The examinations during the practice based learning are marked as a pass / fail. A failed practice based learning examination cannot be compensated.

Students and mentors need to discuss the preparation for the summative practical examinations. Students must complete one formative practical assessment prior to the summative practical assessment with the attendance of the External Assessor.

This must be documented and any concerns identified should be raised with the module leader.

Record of Summative Practical Assessment:**4 Assessments to be completed on the same day****1 Assessment to be attended by External Assessor from University****4 Assessments should reflect anatomical and pathological diversity.****1 Assessment must be of a shoulder patient****Student name:****Assessment venue:****Date of Assessment:**

To achieve a pass in each section, the student must perform at the standard required for independent practice. **A pass mark in all sections is required.**

Pass: P Fail: F

	Assessment number			
	1	2	3	4
Preparation for Scan				
Critical appraisal and correct interpretation of the request				
Use of all available relevant information including patient history				
Preparation of the scan environment				
Technical competence				
Selection and use of equipment				
Safe scanning practice				
Scanning technique				
Patient Care and Communication				
Correct patient identification				
Confirmation of patient history				
Analysis of and response to patient needs throughout the examination				
Valid consent obtained				

Clear and effective communication with the patient, carers and other healthcare professionals.				
Scan interpretation and reporting				
Correct interpretation of the scan findings				
Evaluation of the scan				
Report writing				
Informing the patient and further follow up				
Overall Performance:				
				PASS / FAIL
Clinical Mentor:				
External Assessor:				
In event of FAIL:				
Reason for fail:				
Clinical Mentor:				
External Assessor:				

Log-book

The submitted log-book will provide evidence of the learning experience through documented critical incidents and scanning practice. Students should document scanning and it is advised that all scans are recorded, (copy the record of learning table as required).

The 'Notes and critical incidents' column should include very brief significant details e.g.:

- ⌚ Unsupervised / Mentor Supervision: Minimal / Moderate / High
- ⌚ Clinical question / reason for scan / anatomical area scanned
- ⌚ Specific technical issues / considerations / mentor feedback
- ⌚ Imaging findings – establishing relevance
- ⌚ Role of scan in patient's pathway / recommendations following scanning

The log book requirements per patient should not be time consuming, it is intended that they reflect your scanning experience and provide a form of evidence. **The entries into this column should be concise; note form or bullet points are expected.** The log book does not have to be supported by evidence that requires referencing.

All scans should be recorded whilst undertaking this module, this may include some unsupervised as well as mentored scans. The log-book should reflect a journey of increasing competence and confidence as the student approaches their summative assessment.

It is not possible to state a number of hours of mentored scanning or a number of patients that are required for a student to be prepared for the summative assessments. The factors that influence this include:

- ⌚ Access to a diverse patient caseload (anatomically and pathologically)
- ⌚ Access to support and practice
- ⌚ Student's rate of learning
- ⌚ Style of mentorship offered

Logbook records of scanning practice are required for the entire duration of each student's registration period. The logbook that accompanies the module Musculoskeletal Ultrasound in Professional Practice should include **a very brief record** of every scan; the minimum number of supervised unassisted scans is 250.

The log-book must evidence scanning of anatomical and pathological diversity. A list of anatomical structures typically scanned with musculoskeletal ultrasound is included in the appendix of this document. The table below lists the minimum requirements to be included in the log-book for each anatomical region. The shoulder region has a high number of scans required as it is an area where ultrasound imaging is regularly the imaging modality of choice. Other anatomical areas may present less frequently to the scanning clinician but minimum numbers have been outlined below. These minimum numbers can include articular and / or soft-tissue imaging as indicated by patients' clinical presentation.

Anatomical region	Minimum number of scans	Minimum number requiring full report
Shoulder	40	4
Elbow	10	1
Wrist and hand	10	1
Hip	10	1
Knee	10	1
Ankle and foot	10	1
Lumps and bumps	5	1

Please provide full reports for a minimum of 10 anatomical regions scanned (as indicated above) as you would expect to receive if you were the referring clinician e.g. physiotherapist, GP or consultant.

Log-book Record of Learning

Student number:		
Date of scan	Patient number:	Notes and critical incidents <i>(Use the subheadings to guide content, for each patient. Paste these subheadings in for subsequent patients)</i>
xx.xx.xxxx	1	<p>Unsupervised / Mentor Supervision: Minimal / Moderate / High</p> <p><i>(Delete as appropriate whether independently scanned or with your mentor, and the level of supervision required)</i></p> <p>Clinical question / reason for scan / anatomical area scanned: <i>(Please note in bold anatomical region at the top of this section)</i></p> <p>Specific technical issues / considerations / mentor feedback: <i>(This may be patient habitus / pathology & adaptations required or suggestions / recommendations / advice from mentor etc.)</i></p> <p>Imaging findings – establishing relevance: <i>(Add full report here in the 10 cases identified, as per the guidance)</i></p> <p>Role of scan in patient's pathway / recommendations following scanning: <i>(This may include identification of the next step in the patient's pathway, recommendation for further imaging / investigations, change in management)</i></p>
	2	
	3	

Coursework – linking theory to professional practice

Technical, professional and clinical issues will be reviewed and supported by evidence based discussion that was relevant to the imaging process. 15 scans, each with a word limit of 350 words. Students are provided with additional guidance on this module's university intranet page.

Coursework must be passed to a minimum of 50%.

What is Clinical Competency?

The evaluation of clinical competency is incredibly complex and every professional will have different opinions. For the purposes of this module, clinical mentors and students should be guided by the learning outcomes and the guidance at the beginning of this handbook that summarises regulation of sonography and impact on professional practice.

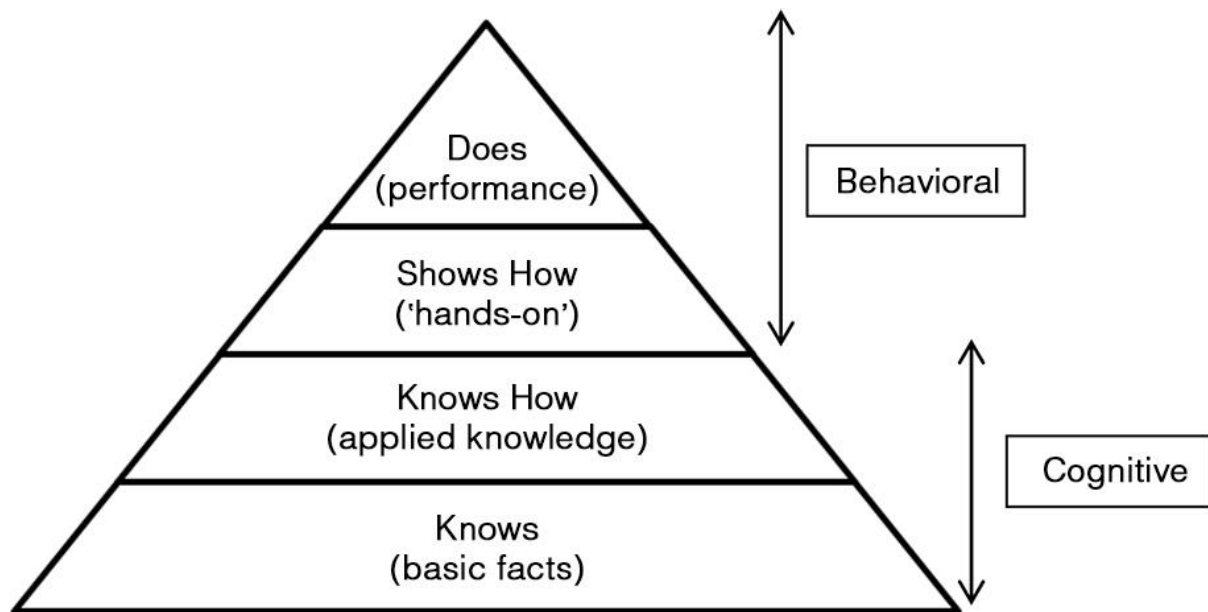
The requirement to scan in the work place as part of a learning and assessment experience addresses the reality that students:

- Need to be able to demonstrate professionalism with colleagues and patients
- Perform the technical elements of sonographic examinations on patients in pain and with mobility restrictions
- Respond to unexpected situations in the clinical environment in an appropriate manner.

This model of assessing clinical competency has been based one proposed some years ago by Miller, (1990).

This framework was presented as a pyramid with four divisions, the bottom level represents the knowledge that a professional would require in order for them to perform a task. In the field of musculoskeletal ultrasound, the knowledge required includes musculoskeletal anatomy and medicine alongside technical operation of ultrasound systems.

Pyramid of Skills Required for Competent Clinical Practice, (Miller 1990)



Above the base layer of knowledge, Miller presented the next layer in the pyramid of 'competence' as the professional's knowledge related to how a skill should be performed. The musculoskeletal ultrasound practitioner needs the ability to conduct scans following protocols or focused scans as indicated. This knowledge of how to perform the skill is not a purely a technical task, it includes the ability to interpret the investigation's output and understand its role in a management pathway. Miller emphasised that knowledge had to be accompanied by judgement (the 'knows how' level in the pyramid) for a professional to demonstrate competence.

Miller suggested that assessment procedures that only explore the bottom two tiers of his pyramid do not fully assess the clinician's performance. Professional performance depends on health care professionals to demonstrate the skills in the two upper tiers of the pyramid, these have been classified as 'shows how' and 'does'. Assessment in the clinical environment involving patients provides opportunities to replicate the components of these upper two tiers, incorporating the realities of clinical reasoning and unpredictable challenges found in the work place.

The university team acknowledges many skills must be integrated to establish competence. The framework for learning ultrasonography proposed by Crofts, (2015) categorises some of these skills and has been included below for reference. This framework provides guidance for students and mentors to evaluate stages of learning. Students may commence their mentoring experience with a spread of skill levels, for example they may have stage 3 level for use of equipment controls but only stage 1 level for image interpretation. It is hoped that students and mentors will be able to witness a progression through the stages. The university team places significant emphasis on professional communication skills and regards these as fundamental to competent sonography practice, Croft's framework provides a useful breakdown to the components of communication that can be evaluated.

A framework for guiding learning in ultrasound scanning

Croft G (2015) *Ultrasound* 23(1):6-10

Skills	Stage 1	Stage 2	Stage 3	Stage 4
Communication				
Beginning of the scan	Communication with the patient to obtain a brief medical history	Communication with the patient to obtain a brief medical history	Communication with the patient to obtain a detailed medical history	Communication with the patient to obtain a detailed medical history.
During the scan	Nil to minimal to communication during the scan	Minimal communication during the scan	Frequent communication involving standard phrases, during the scan	Frequent communication that follows a line of enquiry in relation to patient history and emergent findings.
End of the scan	Minimal communication with the patient	Minimal communication with the patient. Some use of standard phrases, but these are used inconsistently	Communication with the patient to provide feedback using standard phrases	Communication with the patient to provide feedback in relation to patient history and scan findings.
Navigation				
	Disorganised scanning performance; distinct and discontinuous probe movements	Organised scanning performance; continuous probe movements	Automatised scanning performance; smooth, continuous integrated probe movements	Automatised scanning performance; smooth, continuous integrated probe movements.
	Frequent observation of hand/probe whilst scanning	Infrequent observation of hand/probe whilst scanning	Adaptation of technique inconsistently applied in difficult cases	Adaptation of technique consistently applied in difficult cases
Use of equipment controls	Inconsistent use of equipment controls. Scanning discontinued when changing the controls	Inconsistent integration of equipment controls within the scan procedure	Consistent integration of equipment controls within the scan procedure	Consistent integration of equipment controls within the scan procedure

Image Interpretation	Identification of large structures	Identification of large structures	Identification of large structures	Identification of large structures
	Use of large structures to guide scanning technique	Identification of some detail in the image	Identification of normal anatomical features as an integral part of the scan procedure	Identification of normal and abnormal anatomical features as an integral part of the scan procedure
Learning Processes	Stage 1	Stage 2	Stage 3	Stage 4
Observation of expert practice	Observation is used to gain an understanding of the whole scan procedure	Observation of probe movement and measurements to reinforce knowledge	Observation used only in difficult or abnormal cases and where adaptation of technique may be required	Observation used to confirm outcomes of the scan
Feedback on performance	Preference for working with same practitioner; this ensures consistency in style and timing of feedback during and after the scan	Preference for working with same practitioner; this ensures consistency in style and timing of feedback during and after the scan	Preference for starting the scan, followed by feedback after completing the procedure Starts to take the lead in feedback on scan findings	Preference for completing the scan before taking the lead on discussing the findings with the practitioner
Random practise	Preference for practising on static structures, and easy cooperative patients	Preference for practising on similar patient types, and easy cooperative patients	Preference for practising on a wide range of patients Practises refining precise probe movements	Preference for frequent practise to maintain and enhance motor skills

Miller G (1990) 'The Assessment of Clinical Skills /Competence / Performance'
Academic Medicine **65** (9):S63-S67

Submission of coursework for assessment

Electronically- using the on line system: FASER

All completed documents should be put into one folder which should have the student identification number as the folder title for uploading to FASER which can be accessed via the link below. Students will need their student username and password to log in: <https://www.essex.ac.uk/e-learning/tools/faser>

If there are any technical difficulties please contact helpdesk@essex.ac.uk

As a Hard Copy- by post to:

Ian Mounteney,
Deputy School Manager
School of Sport, Rehabilitation and Exercise Sciences
University of Essex
Wivenhoe Park
Colchester
CO4 3SQ

Resources:

Materials to support this module include information on the module's Moodle site. The reading list includes many links to e-books and relevant journals and has been included below. There is also an additional learning resource available where films of musculoskeletal ultrasound scanning protocols including instructions and synchronous annotated images are available. Students have reported favourably on this resource and used these films to assist them when practising independently or with peers. Note, many hospitals' firewalls will prevent these films opening on site, students have downloaded them onto a mobile device to overcome this difficulty.

Reading List:

Bianchi S. & Martinoli C. (2007) *Ultrasound of the Musculoskeletal System*. Springer. Berlin. [Online book](#)

Bradley M. & O'Donnell P. (2010) *Atlas of Musculoskeletal Ultrasound Anatomy* 2nd Edition. University Press. Cambridge [Online book](#)

Jacobson J. (2012) *Fundamentals of Musculoskeletal Ultrasound* (2nd Edition). Saunders. Philadelphia [Online book](#)

Moore R. (2010) *Musculoskeletal Ultrasound of the Extremities*. Createspace [513.7080585 MOO](#)

O'Neill J.M.D. (Ed) (2008) *Musculoskeletal Ultrasound: Anatomy and Technique*. Springer. New York [Online book](#)

Silvestri E. , Muda A., Sconfienza L.M. (2011) *Normal Ultrasound Anatomy of the Musculoskeletal System: A Practical Guide*. Springer. Milan [Online book](#)

Wakefield R.J. & Maria-Antonietta D'Agostino M.-A. (2010) *Essential Applications of Musculoskeletal Ultrasound in Rheumatology*. Saunders. Philadelphia. [Online book](#)

Ultrasound [Online journal](#)

Manual Therapy [Online journal](#)

Radiology

Rheumatology [Online journal](#)

Rheumatology and Physical Medicine

Rheumatology International [Online journal](#)

Journal of Ultrasound:

http://encore.essex.ac.uk/iii/encore/record/C_Rb1874069_Sjournal%20of%20ultrasound_Orightresult_U_X8?lang=eng&suite=cobalt

Journal of Clinical Ultrasound:

http://encore.essex.ac.uk/iii/encore/record/C_Rb1723693_Sultrasound_Ff%3Afacetcollections%3A1%3A1%3Ae-journals%3A%3A_P0%2C2_Orightresult_U_X6?lang=eng&suite=cobalt

Contact Information:

The university team will maintain communication with both the student and the clinical mentor throughout the module to monitor progress and answer queries. When planning for summative assessments commences, these will need to be organised alongside the External Assessor. It is wise to aim to set a date for the summative assessment attended by the External Assessor at least 3 months in advance.

We hope you find this an interesting and rewarding process. Please feel free to contact the module lead (skingg@essex.ac.uk) if you need further information or advice. This email inbox is regularly monitored and in the event of absence, instructions for alternative contacts will be available.

The Deputy School Manager is also available for contact:

Ian Mounteney

imount@essex.ac.uk

Email contact is generally the most efficient but in emergencies Ian Mounteney can be contacted by telephone:

01206 873348

Thank you in advance for the time and support you have given students that are undertaking their module with us.

We wish you every success.

Appendix:

- **Practice Mentorship Agreement**
- **Learning Contract**
- **Anatomical Areas Imaged in Musculoskeletal Ultrasound**

Module code SE709 - Musculoskeletal Ultrasound in Professional Practice / title:				
Academic supervisor details	Name: Sue Innes	Designation: Senior lecturer	Location: SRES, Colchester campus	Contact Details: T: 01206 873835 E: inness@essex.ac.uk
External assessor details:	Sarah-Jane King	Lecturer	SRES, Colchester campus	E: skingg@essex.ac.uk
Clinical Mentor details	Name:	Designation:	Location:	Contact Details: T: E:
Date of Agreement				
Student Name				

For Practice supervisors;

By signing this agreement you are confirming that you are suitably qualified and experienced in musculoskeletal ultrasound. The suitability and availability of mentors in musculoskeletal ultrasound cannot be defined by one specific qualification or membership of a professional body.

Appropriate mentors would currently be working in a field of practice that incorporates the regular use of musculoskeletal ultrasound and have completed appropriate post-registration training e.g. radiologist, rheumatologist, sonographer, physiotherapist. It is advisable that the clinical supervisor/mentor has a minimum of two years current clinical experience. An enthusiasm and ability to teach are essential

qualities of a good clinical supervisor/mentor, which, coupled with knowledge and expertise are as important as the length of experience.

For Clinical Mentor;

By signing this agreement you are confirming that you will;

1. Provide supervision whilst the named student is undertaking the named module. The student may have limited previous experience of this field of clinical practice. It may therefore be appropriate that they are given the opportunity to observe a scanning protocol on at least one occasion before being asked to undertake the practice under supervision themselves.
2. Review the named student's work in accordance with relevant clinical benchmark standards and evidence based practice.
3. Report any concerns regarding the student's ability and professional or academic standards to the academic supervisor. It remains the academic supervisor's responsibility to escalate concerns regarding academic and professional suitability standards according with university policy. It remains the practice and academic supervisors' responsibility to escalate any concerns regarding the student's professional practice standards to the relevant authority (e.g. The employer, the professional regulatory body).

For students;

By signing this agreement you are confirming that:

You agree to the person named above to act as your mentor for SE709 – Musculoskeletal Ultrasound in Professional Ultrasound.

You will act in accordance with university standards, guidance and policy regarding your studies and assessments.

You will act with due regard to clinical practice benchmark standards and professional rules, regulations and standards.

You will report any concerns you have about your ability to perform the competences required for this module to your academic supervisor. You retain the right to refuse to participate in an intervention if you believe you do not possess the necessary knowledge, skill or experience. Achievement of the competences required for this module are time limited and therefore you should seek advice if you are unable to complete the necessary assessments in the normal time frame set for the module. (Further guidance on this can be obtained from your academic supervisor).

For further information about this Practice Agreement, or the module named above please contact Sue Innes. Please retain a copy of this agreement for your records.

Clinical mentor signature	
Student signature	
Line manager name & signature (if applicable)	

Learning Contract for Musculoskeletal Ultrasound in Professional Practice

The student and the mentor need to discuss their plan to ensure the learning outcomes of the module are met. This plan needs to be briefly documented to ensure all those involved have had the opportunity to identify and agree training needs and any issues that could impact the students' progression.

The learning outcomes are listed below for easy reference.

The student should complete the learning contract following discussion with the mentor. Please contact the university module lead with any queries if required and then forward the learning contract to the module lead within 6 weeks of starting the module. The module lead will review the contract, communicate with the student and mentor as required and then sign the contract.

Module's Learning Outcomes:

1. Critically appraise and utilise all information from various sources to determine the most appropriate musculoskeletal ultrasound examination
2. Analyse the needs of the patient in order to perform all aspects of the musculoskeletal ultrasound examination safely and competently
3. Competently carry out musculoskeletal ultrasound examinations according to the evidence base
4. Critically evaluate the musculoskeletal ultrasound findings and where necessary arrange, advise or undertake further investigations appropriate to local policies and practices
5. Actively demonstrate proficiency in reporting musculoskeletal ultrasound examinations to reflect the clinical question raised
6. Communicate clearly and effectively with clients, patients, carers and other healthcare professionals appropriately
7. Critically reflect on personal and professional practice in order to challenge, develop and maintain standards in the field of musculoskeletal ultrasound imaging.

Musculoskeletal Ultrasound in Professional Practice: Learning Contract

Student name:	
Learning need identified: E.g: <ul style="list-style-type: none"> • image interpretation of tendinopathy / anisotropy management • familiarisation with scanning protocol of medial ankle • evaluation of relevance of image findings, what is relevant pathology • documentation of imaging 	Plan to address learning need:
Student signature:	Date
Mentor signature:	Date
Module lead signature:	Date

Anatomical Areas Typically Imaged in Musculoskeletal Ultrasound

It is impossible to produce a precise list of anatomical areas and pathologies that should be scanned and it is acknowledged that the mentor is not always able to control the clinic's case load. It is however important that students experience a range of anatomical and pathological cases, students may want to access a number of clinical environments to maximise this range as the case load will vary significantly from one clinic to another, for instance rheumatology when compared to a sports physician's clinic. A list of typical musculoskeletal features in each anatomical region that are routinely examined with ultrasound imaging follows, please use this guide to monitor the anatomical diversity experienced.

Shoulder

- Biceps tendon
- Dynamic evaluation of biceps subluxation
- Subscapularis
- Infraspinatus
- Supraspinatus, (transverse and longitudinal)
- Dynamic rotator cuff evaluation
- Supraspinatus notch
- Posterior glenohumeral joint
- Spinoglenoid notch
- Acromioclavicular joint.

Elbow

Anterior:

- Anterior humeroradial joint
- Radial fossa
- Anterior humeroulnar joint
- Coronoid fossa
- Brachial artery and vein
- Biceps tendon

- Annular recess of neck of radius in pronation / supination
- Brachioradialis muscle
- Brachialis muscle
- Pronator teres
- Radial nerve
- Median nerve

Lateral:

- Lateral epicondyle and attachment of common extensor tendon
- Lateral humeroradial joint
- Lateral collateral ligament
- Attachment of brachioradialis
- Attachment of extensor carpi radialis longus
- Radial nerve course via lateral elbow and supinator.

Medial:

- Medial epicondyle
- Common flexor tendon
- Ulna collateral ligament
- Ulna nerve
- Triceps tendon
- Dynamic stress views of ulna collateral ligament

Posterior:

- Posterior joint space
- Triceps tendon
- Olecranon process
- Olecranon bursa

Wrist and Hand

Anterior:

- Transverse and longitudinal images from volar wrist crease to the thenar muscles

Carpal tunnel:

- Flexor retinaculum
- Median nerve
- Flexor pollicis longus tendon
- Flexor digitorum profundus and superficialis tendons
- Palmaris longus tendon
- Flexor carpi radialis longus tendon
- Ulna nerve and ulna artery in Guyon's canal
- Flexor carpi ulnaris tendon
- Flexor tendons course proximally into the forearm as indicated.
- Carpal joints as clinically indicated

Medial:

- Extensor carpi ulnaris tendon
- Triangular fibrocartilage complex
- Joints as clinically indicated

Posterior:

- Tendons to the six dorsal compartments
- Dorsal scapholunate ligament
- Extensor tendons course proximally into the forearm.
- Joints as clinically relevant
- Superficial radial nerve

Hip

Anterior:

- Femoral head and neck.
- Joint capsule and joint effusion
- Anterior labrum
- Iliopsoas tendon and bursa
- Femoral vessels and nerve
- Sartorius and rectus femoris muscles
- Lateral cutaneous nerve

Lateral:

- Gluteus medius
- Gluteus minimus
- Tensor fascia lata and iliotibial band
- Gluteus maximus and greater trochanteric bursa

Medial:

- Adductor muscles
- Distal iliopsoas tendon
- Pubic bone and symphysis
- Distal rectus abdominis insertion

Posterior:

- Glutei muscles
- Hamstring muscles
- Ischial tuberosity
- Sciatic nerve

Knee

Anterior:

- Quadriceps tendon
- Suprapatellar, medial and lateral patellofemoral joint recesses
- Medial and lateral patellar retinaculum
- Patella and prepatella bursa
- Patella tendon
- Superficial infrapatella bursa
- Deep infrapatella bursa
- Tibial tubercle
- Vastus medialis and medial retinaculum
- Vastus lateralis and lateral retinaculum
- Distal femoral cartilage
- Distal ACL insertion

Medial:

- MCL/ tibial collateral ligament
- Pes anserinus tendons and bursa
- Medial meniscus
- Medial patella retinaculum, (e.g. with valgus stress testing)

Lateral:

- Lateral collateral ligament
- Iliotibial band and bursa
- Lateral meniscus
- Biceps femoris tendon
- Common peroneal nerve
- Popliteus tendon
- Lateral patella retinaculum
- Proximal tibiofibular joint.

Posterior:

- Popliteal fossa
- Semimembranosus
- Medial gastrocnemius muscle and tendon
- Popliteal artery and vein
- Sciatic, tibial and common fibular nerves
- Posterior horns of both meniscus.
- PCL.

Ankle and Foot

Anterior:

- Tibialis anterior
- Extensor hallucis longus
- Extensor digitorum longus
- Peroneus tertius
- Deep peroneal nerve and dorsalis pedis artery
- Anterior joint recess
- Anterior joint capsule
- Anterior tibiofibular ligament

Medial

- Tibialis posterior
- Flexor digitorum longus
- Flexor hallucis longus
- Deltoid ligament
- Posterior tibial nerve
- Medial and lateral plantar nerves

- Tibial artery and veins

Lateral

- Peroneus brevis
- Peroneus longus
- Superior peroneal retinaculum
- Anterior talofibular ligament
- Calcaneofibular ligament
- Posterior talofibular ligament
- Sural nerve

Posterior

- Achilles tendon
- Plantaris tendon
- Retrocalcaneal bursa
- Achilles bursa

Inferior

- Plantar fascia
- Plantar fat pad

Foot, dorsum:

- Metatarsals
- Metatarsophalangeal joints
- Interphalangeal joints.
- Intermetatarsal structures

Lumps and bumps:

- Ganglions
- Ganglion cysts
- Tumour
- Haematoma
- Hernia
- Muscle hernia