

Ultrasound education and practice standards for radiographers

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Introduction

This document provides recommendations for the standards of practice for Radiographers performing ultrasound examinations. It sets out guidance to support the clinical work of radiographers and the principal goal is to provide recommended guidelines for ultrasound education and clinical activity, within the national legal framework of the country radiographers are working in.

Ultrasound is a real-time procedure widely used in healthcare for various purposes, including screening, diagnosis, follow-up/monitoring, guiding interventional procedures and treatment of a broad range of conditions and pathologies.

According to the most recent European Federation of Radiographer Societies (EFRS) surveys, ultrasound practice by radiographers and other non-medical practitioners varies across and within European countries (1). The EFRS aims to harmonise the Knowledge, Skills, Autonomy and Responsibility (KSAR) for ultrasound practice, providing best practice guidance to support the national societies and educational institutions to support not only entry level education and daily clinical practice but also continuing professional development (CPD).

This document should not be seen as an isolated tool but to be embedded in a multidisciplinary approach, including supportive team-working with medical colleagues to co-develop programmes of education, provide clear clinical protocols, develop report writing skills and standards to up-skill existing radiographers/sonographers, monitor standards of education and clinical practice, pursue legislative reform to enable this service development and identify clear lines of responsibility (2).

This KSAR framework has been developed to support not only those countries looking to implement ultrasound education, training and skills' assessment for non-medical practitioners, but also to ensure the harmonised scope of practice across Europe.

Procedure

This is the first edition of this framework, drafted by the EFRS Ultrasound Working Group, composed of ultrasound experts from different European countries.

Purpose of this document

This document provides a benchmark for what the EFRS recognise as the entry level for radiographers entering ultrasound practice across Europe. It is intended as a reference for professional bodies, educational institutions, employers and regulators.

The framework supports the safe and context-sensitive development of ultrasound practice, acknowledging that scope of practice, professional autonomy and implementation pathways vary across and within countries and healthcare systems. Recommendations should therefore be applied in alignment with national legislation, local governance structures and multidisciplinary collaboration. Rather than prescribing a uniform model of practice, the framework offers adaptable guidance that enables sustainable service development while maintaining patient safety, professional accountability and interprofessional respect.

Scope of this Framework

This framework defines the minimum knowledge, skills, autonomy and responsibility (KSAR) expected of a qualified radiographer starting out in ultrasound practice. It establishes a baseline for entry-level practice and does not attempt to describe the full range of ultrasound roles undertaken by radiographers across Europe.

Interpretations of entry level practise may differ between countries due to variations in education, regulation and healthcare systems. For this reason, the framework should be used as a benchmark that supports the safe introduction of radiographers to ultrasound practice, while allowing implementation to be adapted to national requirements and workforce needs.

Where appropriate, supervised clinical practice and competency assessment may support the transition to independent practice, in accordance with national educational and regulatory frameworks. Competence should be demonstrated through assessment of theoretical knowledge and supervised clinical performance.

The framework also supports countries where radiographer ultrasound practice is emerging. Some KSAR described may currently be considered extended or advanced practice in certain contexts. In such cases, the framework should guide the gradual development, formal recognition and governance of these competencies, rather than imply immediate implementation. Its purpose is to provide a common European benchmark that assists professional bodies, higher educational institutions, employers and regulators in planning safe, evidence informed and context-appropriate development of ultrasound practice.

Background information

Education and role of the radiographer in Europe

The education and the role of radiographers in ultrasound show great differences between EFRS countries. In some countries radiographers are recognised as an important part of the ultrasound team. However, in other countries, the lack of legislation and/or support from medical professionals and limited/no specific education and training programmes are the main barriers to radiographers performing ultrasound (1,2). The EFRS ultrasound surveys show that in Europe there are different types of ultrasound education. The EFRS survey in 2019 showed that amongst radiographers practising ultrasound, the majority have an educational qualification at level 7 of the European Qualification Framework (EQF) in ultrasound. The remaining were educated in ultrasound as part of a postgraduate radiography programme, or completed radiography undergraduate programmes (level 6; Bachelor's degree) containing elements of ultrasound. A few undertook a short or focused ultrasound course, an EQF level 6 ultrasound qualification, or had no formal course qualification (1, 3).

Harmonisation (including certification and standardisation) of radiographer education and qualification frameworks in Europe

"There are a number of barriers to radiographers performing ultrasound examinations, commonly related to limited access to focused education and training, scope of practice constraints due to" the national legislation and departments' leadership barriers (2,3). To ensure the continued advancement of ultrasound practice, it is essential that new, "high-quality ultrasound-specific educational programmes" are developed in line with existing frameworks and programmes. This will not only maintain continuity but also fine-tune and enhance the quality of education in this critical area. Collaboration between countries and institutions is strongly encouraged, as it will foster the sharing of expertise, resources, and best practices, ultimately benefiting students and professionals alike. Through collaboration between countries and institutions, ultrasound education can continue to evolve to meet the highest standards of clinical practice while responding to the evolving needs of healthcare systems across Europe and beyond.

"Interprofessional learning with medical colleagues could potentially help to break down some of the barriers to implementation of a new service in countries" where radiography ultrasound practice is not embedded (2,4).

The harmonisation of the education and role of the radiographer in ultrasound in Europe is one of the aims not only of the EFRS but also of the National Societies. The framework described below, could be a guide for those countries who still have challenges in implementing the role of the radiographers in ultrasound. The level of educational programmes remain a national responsibility and the role depends upon hospital and service policies.

Countries should take proactive measures to ensure that proper requirements are in place for defining enhanced and advanced practice in ultrasound. This includes establishing clear criteria for the minimum number and variety of examinations that practitioners must complete before being deemed qualified for independent practice. These measures will ensure that ultrasound professionals not only possess a broad and deep understanding of the technology and professional issues but also demonstrate the practical experience necessary to deliver high-quality, person-centered care.

Ultrasound simulation may be used within the development of a programme of learning and to monitor student progress and competency development. It should not replace the need for hands-on experience and competency assessment in real clinical situations on patients covering a wide range of clinical presentations and pathologies.

By standardising these requirements, countries can promote consistency in enhanced and advanced practice, fostering better outcomes and greater confidence in the use of ultrasound across healthcare settings.

References

- (1) Pedersen MRV, Kraus B, Santos R, Harrison G. Radiographers' individual perspectives on sonography - A survey of European Federation of Radiographer Societies (EFRS). *Radiography*. 2022;28(1):31–8. Available from: <https://doi.org/10.1016/j.radi.2021.07.018>
- (2) Harrison G, Kraus B., Martins Dos Santos R, Noij-Rijkes S, Pedersen MRV. The role of radiographers in ultrasound: A survey of the national societies within the European Federation of Radiographer Societies (EFRS). *Radiography*, 2021;27(3):761-767. ISSN 1078-8174 Available from: <https://doi.org/10.1016/j.radi.2021.02.003>
- (3) Harrison, G, Martins dos Santos, R, Kraus, B, Pedersen, M.R.V. Radiographers in ultrasound: Motivation and role expansion. *Radiography*, 2021;27(4): 1185-1191. Available from: <https://doi.org/10.1016/j.radi.2021.07.003>
- (4) Kraus B, Harrison G, Santos R, Vils Pedersen MR. Ultrasound education across European Federation of Radiographers Societies (EFRS) countries: Similarities and differences. *Radiography (Lond)*. 2024;30(3):715-722. Available from: <https://doi.org/10.1016/j.radi.2024.01.024>

Core Learning Outcomes

Knowledge, Skills, Autonomy and Responsibility (KSAR)

The following tables define learning outcomes as statements describing what a radiographer is expected to know, understand, and be able to do upon completion of a learning process, expressed in terms of Knowledge, Skills, Autonomy and Responsibility (KSAR).

These outcomes are expressed in terms of Knowledge, Skills, Autonomy and Responsibility (KSAR), which should be understood as follows:

Knowledge means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the European Qualifications Framework knowledge is described as theoretical or factual.

Skills means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualifications Framework skills is described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).

Autonomy and Responsibility mean the proven ability to use knowledge, skills and personal social and/or methodological abilities, in work or study situations and in professional and personal development. In the context of the European Qualifications Framework competence is described in terms of responsibility and autonomy.

In this context, radiographers working in ultrasound are expected to apply their competences by ensuring that findings are documented accurately and integrated into the wider diagnostic pathway, always within the scope defined by the national legal framework and in line with their interprofessional responsibilities as part of a multidisciplinary team.

Core Knowledge	Core Skills	Core Autonomy and Responsibility
Physics and principles of ultrasound		
K1. Core ultrasound physics: generation, propagation, interaction, and common artifacts K2. Advanced imaging techniques (e.g. Doppler, elastography, 3D, contrast, harmonics, micro-bubbles) and their impact on accuracy and safety K3. Determinants of image optimisation: settings, calibration, parameters affecting image quality and measurement accuracy, and appraisal of diagnostic quality	S1. Operate ultrasound and related devices including simulation equipment safely, effectively, and efficiently S2. Adjust equipment settings to optimise image quality while applying 'as low as reasonably achievable' (ALARA) principle and minimising mechanical and thermal indices [MI/TI] S3. Evaluate and appraise diagnostic ultrasound images for acceptability and quality S4. Apply critical thinking to optimise imaging examinations and diagnostic decision-making S5. Generate and manipulate ultrasound equipment to produce optimal real-time images S6. Follow protocols for each scan type, documenting and storing images appropriately. Co-create protocols, where appropriate	AR1. C1. Perform ultrasound examinations tailored to the patient's clinical history, utilising the appropriate equipment safely and competently AR2. Stay updated on advances in ultrasound technology, including AI, machine learning and quality management AR3. Be able to take note of new developments; apply and implement new protocols to support the safe use of new technologies and procedures AR4. Function in an independent, methodical and evidence-based manner. Prepare for and carry out ultrasound examinations or procedures, and assess real-time and static images in terms of quality, carry out a systematic analysis of the ultrasound appearances leading to initial interpretation and decision-making diagnosis. Complete examination and undertake all required post-examination tasks

Core Knowledge	Core Skills	Core Autonomy and Responsibility
Safety and Risk		
K4. Ultrasound hazards, safety indices, legislation, guidance and professional responsibilities in justification and optimisation K5. Ergonomics, occupational risks, infection prevention and control, and work-related injury risk reduction; K6. Faults, malfunctions, equipment standards, and quality assurance (QA)/ quality control (QC), including legislation, guidelines, test equipment and methodologies, programme design and implementation and reporting K7. Clinical risk management, including risks of over-detection, over-diagnosis, and over-treatment K8. Scope of practice (SoP), limitations of that SoP and when to refer, and response to medical emergencies requiring imaging K9. Risk-benefit principles for both non-ionising and ionising radiation across the entire patient imaging pathway K10. Principles of basic and advanced life support, including the physiology of cardiac arrest, the chain of survival, and current international resuscitation guidelines	S7. Implement procedures that protect staff, patients, and the public from hazards associated with ultrasound use S8. Apply infection control measures, including probe decontamination and adherence to guidance and manufacturer's instructions S9. Conduct routine checks on equipment and use test phantoms to measure image quality parameters (e.g. resolution, uniformity) S10. Identify, troubleshoot, record and report technical problems or malfunctions S11. Perform, record, analyse, and report QA/QC activities in line with standards S12. Apply safe approaches to occupational risks, ergonomics, and health and safety S13. Apply clinical risk management approaches in daily practice S14. Perform cardio-pulmonary resuscitation (CPR) and basic life support, including automated external defibrillator (AED) use, within professional responsibilities	AR5. Assume responsibility for safe ultrasound practice, including equipment, maintenance, troubleshooting, and optimization, in line with current standards and regulations AR6. Coordinate and maintain safety for all during examinations/treatments AR7. Provide evidence-based advice and, when necessary, defer inappropriate referrals that might impact patient safety or, delay appropriate examination(s) AR8. Ensure accuracy and currency in quality assurance/control testing, calibration, and documentation, with attention to safety protocols AR9. Competently analyse quality control data, identifying trends, and addressing performance issues proactively AR10. Develop individual responsibility for the use of appropriate methods to reduce all risks and hazards which may affect self, patients, staff and the public AR11. Autonomously recognise cardiac arrest, initiate resuscitation procedures promptly, and coordinate with the multidisciplinary team to ensure continuity of care AR12. Accept personal accountability for professional actions, including recognising scope of practice limits and when to seek appropriate guidance

Core Knowledge	Core Skills	Core Autonomy and Responsibility
Anatomy, Physiology & Pathology		
K11. Normal anatomy across the lifespan, including knowledge of anatomical variants K12. Physiology relevant to ultrasound examinations and embryological developments K13. Pathological processes, trauma, and their ultrasound appearances K14. Clinical signs, symptoms, and management of incidental findings and a range of relevant pathology K15. Identification and management of incidental findings	S15. Recognise and describe normal and abnormal anatomical appearances and anatomical variants S16. Evaluate normal and abnormal physiology in dynamic examinations S17. Recognise and describe pathology, disease, and trauma processes and associated clinical signs and symptoms S18. Apply anatomical, aetiology, epidemiology and disease progression knowledge to ultrasound techniques during examinations or interventions S19. Apply critical evidence-based evaluation skills when identifying incidental findings	AR13. Develop skills to retain and deepen understanding of anatomical, physiological and pathological processes AR14. Demonstrate competence in interpreting clinical information and managing requests to inform examination and treatments, while integrating previous imaging studies and current clinical findings AR15. Recognise the limitations of ultrasound in some circumstances and appreciate when appearances may be indeterminate or misleading AR16. Competently handle indeterminate appearances safely and appropriately
Technology & Innovation		
K16. Simulation equipment, IT systems, archiving, teleradiology, and digital infrastructure K17. Artificial intelligence (AI) and deep learning applications, with associated ethical, legal, and moral responsibilities K18. Specialist imaging techniques and their role in patient pathways	S20. Operate medical ultrasound and simulation equipment effectively S21. Use healthcare information technology (IT) systems for data processing, storage, retrieval, and manipulation S22. Recognise AI/deep learning applications and judge when to rely on them versus expert input S23. Generate innovative solutions to clinical or technical problems	AR17. Contribute to professional development by initiating and implementing quality management and innovation initiatives AR18. Demonstrate the ability to adapt to new developments and innovations in ultrasound practice, including artificial intelligence, while understanding their capabilities and limitations and maintaining professional accountability for all clinical decisions AR19. Engage in multidisciplinary collaboration to evaluate, improve, and maintain the quality of professional practice, while continually updating knowledge to ensure the effective implementation of current guidelines and integration of relevant clinical evidence

Core Knowledge	Core Skills	Core Autonomy and Responsibility
Patient Care & Communication		
K19. Holistic patient care: physical, social, cultural, psychological needs, including paediatric and family contexts. K20. Consent, confidentiality, and communication of risks, benefits, and limitations K21. Equity, diversity, inclusion, and cultural competence in patient care K22. Communication theory and strategies: verbal, non-verbal, written, and the delivery of unexpected findings K23. Public information and education about ultrasound risks and benefits	S24. Assess patients holistically, including history, previous investigations, and clinical examination, where relevant S25. Perform positive patient identity checks and treat patients with dignity and respect S26. Obtain informed consent and maintain confidentiality S27. Communicate clearly and inclusively with patients, carers, staff, and the public S28. Explain risks, benefits, and limitations to support informed decision-making S29. Deliver ultrasound findings in clear written reports/proformas, in accordance with the practitioner's scope of practice and competence, national legislation and local governance arrangements; advise on medically significant findings identified during the examination to the appropriate medical personnel responsible for the patient's care. S30. Adapt care to diverse patient needs and challenge discriminatory behaviours S31. Promote health strategies appropriately within scope of practice and legislative frameworks	AR20. Undertake examinations in the best interest of the patient, and with regard to the expected outcome; including administration and archiving of the examination data AR21. Competently report incidents or near misses at an appropriate level AR22. Effectively manage complex cases by applying clear strategies when diagnostic images cannot be obtained and when confronted with uncertain or unexpected ultrasound findings, including recognising the need for and appropriately seeking a second opinion AR23. Maintain the balance between technical, clinical, and psychosocial aspects of examinations and treatments, applying sound decision-making throughout the process AR24. Inform, encourage, advise, and support patients before, during, and after examinations or treatments, tailoring care to individual needs AR25. Promote equitable, inclusive, and respectful practice with responsibility and autonomy, treating all patients and colleagues with dignity and respect, while contributing to a positive and supportive healthcare environment AR26. Communicate unexpected ultrasound findings to patients, carers, or expectant parents in a clear, effective, and non-judgemental manner, while explaining the diagnostic limitations and uncertainties of ultrasound and providing appropriate support and guidance

Core Knowledge	Core Skills	Core Autonomy and Responsibility
Professionalism & Development		
K24. Ethical theories, decision-making, and inter-professional collaboration. K25. Professionalism, role modelling, and recognising limits of competence K26. Teaching, mentoring, coaching, feedback, and report writing K27. Audit, research, evidence-based practice, and reflective processes K28. Continuing professional development and competence maintenance K29. Leadership theory and application in ultrasound practice	S32. Exhibit professional attitudes and behaviour as part of a multidisciplinary team S33. Identify situations beyond personal competence and seek guidance/referral S34. Act reflectively, adhering to codes of ethics, conduct, behaviour, and legal frameworks S35. Critically reflect on and evaluate personal practice S36. Plan and organise professional activity, manage change, and pursue development opportunities S37. Work efficiently to deliver high-quality, patient-focused services within timeframes S38. Demonstrate leadership, management, and teamworking skills S39. Educate colleagues and the public about ultrasound risks, benefits, and limitations S40. Engage in continuing professional development (CPD) and lifelong learning S41. Audit personal skills and set objectives through self-evaluation	AR27. Plan and manage workloads responsibly and efficiently, demonstrating integrity, adherence to codes of ethics, and maintaining high professional standards both in clinical practice and private life AR28. Apply an ethical approach in all interactions, showing respect, commitment, and support to patients, carers, and colleagues AR29. Work autonomously and within teams to contribute evidence-based, considered input across multidisciplinary, interdisciplinary, and multicultural contexts, while remaining within the scope of professional practice AR30. Follow appropriate advice, contribute to team development, and support conflict resolution to foster effective collaboration and a positive working environment AR31. Use and integrate relevant national and international scientific insights, theories, concepts and research results in their own professional actions especially when taking decisions about patient care

Core Knowledge	Core Skills	Core Autonomy and Responsibility
Research & Evidence		
K30. The research cycle from hypothesis generation to ethical approval, statistical analysis and dissemination of findings K31. Research evidence on the environmental impact of ultrasound practice K32. National and international clinical ultrasound guidelines and their application to support evidence-based patient care	S42. Use databases to undertake literature searches and critically appraise published works S43. Collect, interpret, and analyse data for audit and research S44. Apply principles of evidence-based practice and research methodology S45. Use statistical skills to analyse data S46. Disseminate findings from research S47. Apply resource-efficient strategies into ultrasound service provision	AR32. Contribute to professional development by initiating and implementing quality management and innovation initiatives AR33. Demonstrate the ability to adapt to new developments and innovations in ultrasound practice, including artificial intelligence, while understanding their capabilities and limitations and maintaining professional accountability for all clinical decisions AR34. Engage in multidisciplinary collaboration to evaluate, improve, and maintain the quality of professional practice, while continually updating knowledge to ensure the effective implementation of current guidelines and integration of relevant clinical evidence

Conclusion

This framework provides a common European benchmark for ultrasound education and practice. Its purpose is not to replace national legislation or professional regulation but to support harmonisation, facilitate workforce development and promote high-quality, safe and person-centred ultrasound practice across Europe.



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