EUROPEAN FEDERATION OF RADIOGRAPHER SOCIETIES

EFRS White Paper on the Future of the Profession

Radiographer Education, Research, and Practice (RERP): 2021-2031

> The role of the European Federation of Radiographer Societies is to **represent, promote and develop** the profession of radiography in Europe, within the whole range of medical imaging, nuclear medicine, and radiotherapy and moreover everything that is directly or indirectly related or beneficial to this role, everything in the broadest meaning

OUR FUTURE

Radiographers' contributions to medical imaging, nuclear medicine, and radiotherapy are limited only by their own expectations and ambitions, and law in the country in which they are practising.

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ACKNOWLEDGEMENTS

Steering Group

Jonathan McNulty, Charlotte Beardmore and Graciano Paulo, formed the EFRS Steering Group for this project, supported by Audrey Paterson. The EFRS is grateful to them all.

International Expert Group

The EFRS extends very warm thanks to the members of the international expert group shown below, and to their colleagues in their own and other countries who provided them with information and assistance as they worked to develop the original set of statements. Their work and the original statements formed the critical foundation to this document: Amanda Bolderston (Canada), Berit Møller Christensen (Sweden), Melissa Jacobski (USA), Karen Knapp (UK), Donna Newman (USA / ISRRT), Michael Ong (Singapore), Heidi Probst (UK), Louise Rainford (Ireland), Adam Westerink (Australia), Imelda Williams (Australia / South Africa), Francis Zarb (Malta).

Survey Participants

All EFRS member organisations were invited to participate in the survey, and the EFRS extends its thanks to all those that responded. Without their support, this work could not have been completed.

Review Group

Towards the end of the work, the EFRS invited several individuals who are acknowledged experts in their fields to review the statements, and is grateful to Ana Geão (Portugal), Karen Knapp (UK), Heidi Probst (UK), Louise Rainford (Ireland), Anastasia Sarchosoglou (Greece), and Francis Zarb (Malta) for providing constructive comments and criticisms. This document has benefited from their work.

Organisations Consulted

In the final stage of this work, the EFRS invited key stakeholders to an online summit to share their views on the future of the radiographer profession. EFRS is grateful to the following organisations for participating in the summit:

- International Society of Radiographers and Radiological Technologists (ISRRT)
- European Association of Nuclear Medicine (EANM)
- European Federation of Organisations for Medical Physics (EFOMP)
- European Society of Radiology (ESR)
- European Society for Therapeutic Radiology and Oncology (ESTRO)
- Heads of the European Radiological Protection Competent Authorities (HERCA)
- International Atomic Energy Agency (IAEA)

OVERVIEW FROM THE EFRS PRESIDENT / BOARD

The role of the European Federation of Radiographer Societies (EFRS) is: "*to represent, promote and develop the profession of radiography in Europe, within the whole range of medical imaging, nuclear medicine, and radiotherapy and moreover everything that is directly or indirectly related or beneficial to this role, everything in the broadest meaning*". The Federation currently represents over 105,000 Radiographers from 45 European Societies and over 8,500 student radiographers from 66 Educational Institutions from across Europe.

As part of the strategic plan for 2019-2021, the EFRS Executive Board prioritised a programme of work to research and explore the future role and requirements for the profession over the next 10-15 years, recognising the rapidly changing nature of medical imaging, nuclear medicine, and radiotherapy services; the goal being to publish a White Paper with a set of consensus statements, in order to support the development of the profession across Europe.

To achieve this goal, the EFRS executive board commissioned an external consultant to lead the work with a small project team. A Delphi research methodology was selected initially and, to ensure expert perspectives into the work, an invitation was extended to a select international group of radiography experts, from across the breadth of practice of the profession.

The research was considered under the headings 'Education', 'Research' and 'Practice', and consensus statements developed and refined for each of these sections of practice. This was followed with a 'Summit' in early 2021 where we were pleased to invite key stakeholders from Europe and International organisations to share their views on the future of our profession, and the future developments of medical imaging, nuclear medicine, and radiotherapy services. The EFRS was particularly pleased to hear the voice of our patients, and we welcomed the important perspectives from the ESR Patient Advisory Group, together with the EANM; EFOMP; ESR; ESTRO; HERCA; IAEA and ISRRT. These perspectives were considered during the final revision of these statements on the future.

The outcomes from this work are now published in this 'White Paper'. Initially, we are promoting the White Paper to our National Societies and Educational Institutions to support their work at national level to develop the practice of the radiographer profession across medical imaging, nuclear medicine, and radiotherapy over the next 10-15 years.

The EFRS executive board commits to promoting this work to all stakeholders through publication, and in measuring the impact of this work over the coming years.

SETTING THE SCENE

The latest developments in technology and medical imaging devices have changed the way patient care is delivered, contributing to increased efficiency in healthcare services, and providing more effective and less invasive procedures for patients.

Medical imaging is at the heart of modern healthcare and will become even more relevant in the near future, due to the emergence of newer disruptive technologies such as artificial intelligence, as well as changing population demographics and disease burden. This calls for reinforcement of the importance of updating and maintaining the knowledge and skills of radiographers throughout their professional life. Bearing that in mind, there is an urgent need to bring together professional societies and universities to establish an international strategic research agenda for radiography, as an instrument to develop the profession, anticipating the impact of new technological advancements in the radiographers' field of knowledge.

Radiographers must acknowledge that patient safety in the widest meaning and communication skills are the main pillars of the profession and developing them is strategic for the future of the profession. This requirement is achieved through the tool of research to renew, promote, and consolidate radiography education and radiographers as highly qualified health professionals that are the interface between the patient and technology in medical imaging, nuclear medicine, and radiotherapy.

Radiographer education institutions must be proactive, by constantly reflecting the evolution of healthcare systems and the consequent change of their national paradigm in delivering healthcare. They must adapt the education model to the technological (r)evolution taking place.

Newly qualified radiographers must be professionals prepared to continue learning and to act as champions of change, serving citizens and contributing to the development of society through research.

To make this possible Professional Societies must encourage radiographer education institutions to include research activities in the education syllabus for radiographers, as education is the only way to develop the professional field of knowledge and to rebuild, revolutionise and reinvent the radiographer profession.

- Frenk J et al (2010). The Lancet Commissions: Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. The Lancet, 376(9756): 1923-58.
- The Society and College of Radiographers. The Scope of Practice 2013. SCoR: London.
- World Health Organization (2013). Transforming and scaling up health professionals' education and training. WHO: Geneva.

DEVELOPING THE EFRS WHITE PAPER

In 2019, the EFRS invited a small group of acknowledged expert radiographers from across the globe to contribute to developing this White Paper. Initially, they were asked to draft statements that described expectations and ambitions related to radiographers' education, research, and practice. The statements they produced were analysed to produce a total of 216 short statements which were entered into an on-line survey tool. An invitation to complete the survey was sent to 448 leading radiography educators, researchers, and practitioners from across Europe and associated with the EFRS, and to the international expert group. Survey participants were asked to consider each statement and decide whether they agreed, agreed somewhat, neither agreed nor disagreed, disagreed somewhat, or disagreed with it. Responses were received from 157 respondents although not all respondents responded to all statements.

Detailed analysis of the responses, together with review of the analysis by the international expert group, enabled the 216 statements to be stratified into three levels of importance relative to inclusion in the White Paper (primary, secondary, tertiary), and identified a small number to be omitted. The stratified statements were used to draft the three main sections of this White Paper, education, research, and practice. Subsequently, a small group of six individuals representing medical imaging, nuclear medicine, and radiotherapy, across education, research, and practice, was asked to critically appraise the drafted statements.

An online summit was then held where external stakeholders were asked to give their views on the future of the radiographer profession. The statements were finalised in the light of the views expressed at the stakeholder conference and submitted for final consideration to EFRS member organisations. Their views were incorporated in the final statements on education, research, and practice in this White Paper.

Alongside the White Paper, the EFRS is also publishing the detailed research process underpinning this document in the *Radiography* Journal.

STATEMENTS FOR EDUCATION

Expectations and Ambitions

1. The education of radiographers in the period to 2031 will enhance the role of radiographers as leading experts in medical imaging, nuclear medicine, and radiotherapy science and practice.

2. Education will prepare graduates for professional practice by encompassing the spectrum of current and emerging imaging and/or treatment modalities and technologies, and evolving developments in radiographers' practice. Such education will be at EQF Level 6 (Bachelor's degree level).

3. It will focus on the fundamental importance of their role as the human interface between patients and technology, on the care and safety of patients, including radiation safety and protection, and on the need for effective interprofessional team working to properly support patients. The important skills of communication, critical thinking, teamwork, and ethical standards and practice will be included, and individual radiographers will understand their legal responsibilities at all times.

4. Curricula will be developed collaboratively with patients, the public and professional radiographer societies, will be consistent with relevant national legislation, and will reflect developments in technology and practice as they occur.

5. Learning 'how to learn' will be essential. Education will encourage positive attitudes to life-long learning and develop individuals' capabilities so that they are able to apply, adapt and synthesis new knowledge from experience.

6. Technology will play an increasingly sophisticated role in learning and development at all levels, including virtual reality, simulation, and online education and communication tools.

7. Education will need to develop the profession's knowledge of its underpinning science, technology and mathematics at all levels so that radiographers are able to maximise the benefits of digital technologies, augmented and artificial intelligence systems, and robotics.

8. New and emerging imaging and/or treatment applications including personalised medicine, genomics, theranostics, molecular, hybrid, and fusion technologies will be covered, and horizon scanning for emerging technologies relevant to professional practice will be important.

9. The development of highly skilled clinical radiographers requires both clinical and academic radiographers to be at the forefront of clinical practice, leading advanced and/or specialist practice, and undertaking research to further develop the evidence base for practice. Close collaboration between clinical and academic departments is essential, enabling clinical radiographers to fulfil their important roles in student education and training and engage in research alongside their clinical roles, and academic radiographers to sustain and continue to develop their clinical and research roles. Qualification as educators will become important for both clinical and academic radiographers.

10. Postgraduate education is vital to support the rapid development of radiographers, and all radiographers should expect to add to their initial qualifications to support their evolving practice, including specialisation and subspecialisation.

11. Doctoral level education and development relevant to radiographers' clinical, academic, and professional practice will be enabled and supported, growing considerably the number of radiographers educated to this level across Europe.

12. The current decade places additional demands on clinical and academic radiographers in leadership roles. It is expected that by 2031 they will hold, or be in the process of gaining, a relevant PhD or an equivalent qualification. By 2031, it is expected that Heads of Academic Radiography Departments on appointment to their posts will hold a relevant PhD or equivalent, and Radiographic Heads of Clinical Services will hold a relevant MBA or equivalent.

13. At the qualifying level, programmes will need to focus strongly on the underpinning physical science of all imaging and treatment modalities, their associated biological effects, necessary protection measures, and risks relative to benefits. Anatomical, physiological, pathological, and pharmacological sciences will also be necessary, as will sociology and psychology to support effective and compassionate individual patient care in an increasingly diverse population. Effective care for all patients throughout imaging and treatment procedures will also be essential and will include relevant nursing care and observations.

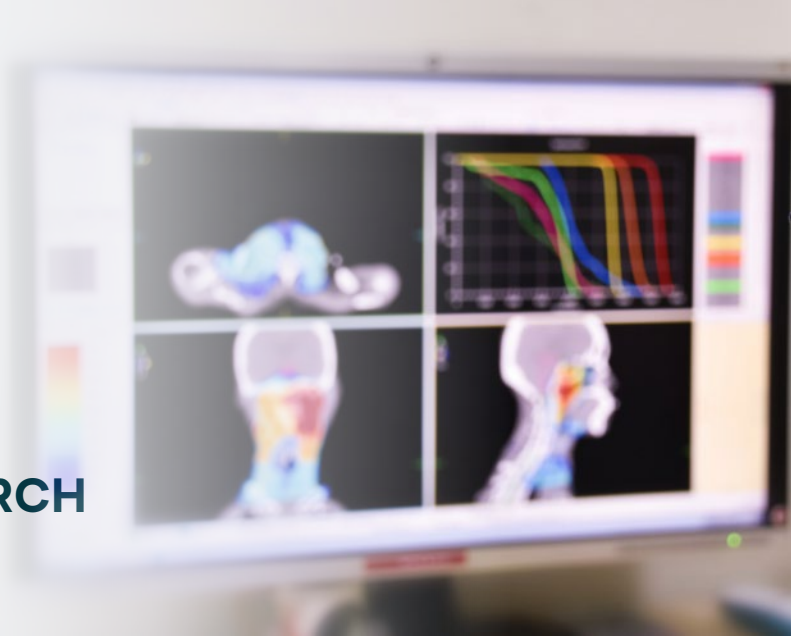
14. Clinical practice across the imaging and treatment modalities will be fundamental to all qualifying level programmes and will need to be dynamic to encompass rapidly changing technologies and new imaging examinations, interventions, and treatments.

15. Programmes will need to ensure that radiographers understand the legal and professional frameworks within which they practise, and their individual legal and professional obligations, duties, and constraints. Similarly, programmes will need to introduce the research, teaching, and management skills that radiographers will require during their careers.

16. Postgraduate education programmes will provide the vital underpinning for the ever-increasing diversity of radiographers' roles, and the increasing demand for them to take on new roles and responsibilities, to specialise in particular fields of practice and become advanced and consultant practitioners, to take leadership roles in education, in management, and in research and development.

17. Within individual postgraduate programmes, it will be necessary to further develop knowledge, understanding, and application of the science of medical imaging, nuclear medicine, and radiotherapy, and of the underpinning sciences.

18. The range and scope of postgraduate programmes will increase considerably over the decade and developing and maintaining relevant curricula will be both important and challenging.



STATEMENTS FOR RESEARCH

Expectations and Ambitions

1. Research, like education, is fundamental to development of the professional field of knowledge of radiographers and to their effective practice, as well as to the patients and communities they serve. By 2031, research will be part of the scope of practice of all clinical radiographers as critical users of research findings, as contributors to research teams, or as leaders of research projects.

2. By 2031, research will be a cornerstone of the culture of clinical departments and higher education centres across Europe as radiographers take charge of evaluating and developing their practice and the contributions they make to the health and well-being of patients, communities, and the public. In this context, master's level and doctoral studies are fundamental.

3. By 2031, patients will be partners in radiographic research, ensuring that research priorities, projects, designs and methods reflect their views, and that resulting innovations reflect their values.

4. Outcomes of research will be critically appraised and published in a timely manner. Findings will be widely disseminated and communicated using a wide range of publications and media, including social media to support rapid implementation in practice when appropriate. Researchers, educationalists, managers, and clinical practitioners will be expected to implement relevant findings and to further appraise their effectiveness in practice.

5. Higher education centres bear a particular responsibility for research in the profession. All institutions educating radiographers will be contributing to or leading research relevant to radiographic practice and its impacts and outcomes.

6. Clinical and higher education centres working collaboratively will develop and grow strong PhD/Doctoral and post-doctoral expertise across the radiographer profession.

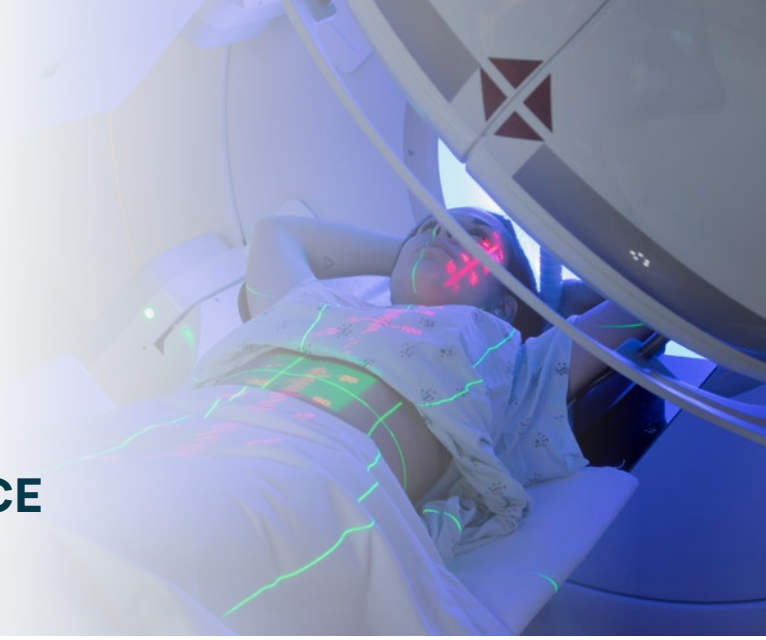
7. Partnerships and collaborations with other professions, organisations, patient and patient institutions, and the public will enhance the profession's research capability and capacity, and further develop its research expertise.

8. There will be no boundaries to the profession's research. The highest priority will be given to research where potential outcomes are likely to provide positive value for the quality of care delivered to patients and the public, taking account of their values and preferences to improve diagnoses or treatments, minimise or eliminate radiation dose, or otherwise improve care and benefits relative to risks. Research is also necessary to continue to develop the science of medical imaging, nuclear medicine, and radiotherapy.

9. New technologies and techniques, including automation, artificial and augmented intelligence, and robotics will also be a feature of the profession's research, with radiographers undertaking research to examine critically the impact of these on the safety and quality of care of patients, and the value they offer to the public. Research radiographers will become integral to research, development and evaluation teams employed in healthcare engineering and manufacturing organisations.

10. Increasingly, large research projects will be led by research radiographers, and multi-centre research projects designed to impact directly on practice will be initiated and led by research radiographers.

11. By the end of the decade, a strategic Europe-wide/international radiographic research agenda will have been established, focused on patients' values, and needs, anticipated and new technological and practice advancements associated with the profession and the populations it serves.



STATEMENTS FOR PRACTICE

Expectations and Ambitions

1. The fundamental role of radiographers is to use ionising and non-ionising radiation in the delivery of imaging, interventions, and treatment procedures within an individual patient's pathway of care. Each procedure must be optimised to maximise benefit and minimise risk to the patient and the public. Core to this is the effective management of radiation protection and other risks to patients, carers, self, staff, and the public, and the maintenance of a positive safety culture at all times.

2. Increasingly, radiographers will be expected to justify every exposure and ensure that examinations, interventions, and treatments are tailored to each patient, taking account of clinical indications, pathologies identified or suspected, and co-morbidities.

3. Optimisation and justification of examinations and treatments will require radiographers to assess patients, taking relevant clinical histories and carrying out related clinical examinations, and interpreting these carefully to question and justify examinations or treatments requested. Each examination or treatment undertaken must be appropriate to the individual patient.

4. Radiographers are required to practise in accordance with the principles of professional ethics and evidence-based practice. Integral to their fundamental role, they must ensure that patients are properly identified, prepared, and cared for before, during and after each examination or treatment episode, and that their patients and carers understand who is examining or treating them. Empathy, compassion, and effective communication should be evident at all times, recognising and respecting individuals' particular needs, values and rights when carrying out medical imaging examinations and/or treatments. Proper account must be taken of people with special needs, whether physical, mental, or emotional, and patients who fear their condition is serious, has worsened, relapsed, or recurred must be supported. All interactions with patients must demonstrate inclusivity and equality and recognise and respect diversity.

5. Frequently, radiographers are the only health care professional that patients will meet and interact with during medical imaging, nuclear medicine, or radiotherapy. It is vital, therefore, that radiographers are always the advocate of patients, listening to them carefully, and speaking out for them when necessary. Radiographers are also expected to ensure that people in their care, especially vulnerable people, are appropriately protected and supported, including escalating concerns about individuals at risk or potential risk of harm.

6. The nature of radiographers' interactions with patients enables them to provide public health advice and interventions as part of their practice, for example on radiation safety, smoking cessation, infection prevention and control, vaccinations, and health screening programmes.

7. The decade through to 2031 will be one in which healthcare technology will change rapidly, and automation will gradually supplement or replace some of the processes undertaken currently by radiographers. Augmented and artificial intelligence, and robotic systems will also become increasingly important in the delivery of medical imaging, nuclear medicine, and radiotherapy services. Radiographers will need to be critical of and responsive to the adoption of these new disruptive technologies and the resultant changes to their practice, and will need to understand them fully, intervening when appropriate to ensure specific needs of individual patients are met.

8. Critical to the delivery of safe, efficient medical imaging, nuclear medicine, and radiotherapy services is clinical governance. All radiographers must play their part in effective governance at least at the level of quality assurance checks on the equipment they use routinely, undertaking quality improvement projects, and participating in obtaining and maintaining relevant external quality standards recognition. Radiographers may carry responsibilities for evaluating quality assurance checks and invoking action to prevent the use of unsafe equipment, and some will hold leadership roles in quality recognition and clinical governance systems.

9. Radiographers already work collaboratively in multi-professional health and care teams. Increasingly, they will work with radiologists, radiation oncologists, nuclear medicine physicians, medical physicists, and others as mutually respectful and complementary professions to benefit patients' experiences, diagnoses, treatments, and care. Over the decade, the boundaries amongst the professions will reduce. Critically, radiographers will need to prove the value they bring to the teams they work with, to the patients' continuing care, and to healthcare more generally. At advanced and consultant levels, radiographers will be working across and beyond the profession's traditional boundaries, collaborating nationally and internationally to sustain and enhance best practice.

10. Radiographers will be expected to continue to develop and add to their clinical skills during the decade. By 2031 some skills will have become standard practice, for example: undertaking intravenous cannulation and injections; giving intra-muscular injections; taking and recording the standard clinical observations of heart and respiratory rates, blood pressure, body temperature, and oxygen saturation level, and using these to recognise and respond effectively to patients whose conditions may be deteriorating.

11. A further expectation is that radiographers will be able to identify abnormalities and pathologies in the imaging examinations they carry out and to recognise and manage the side and after effects of treatments given. All radiographers should be able to act according to their findings and ensure that patients receive appropriate intervention or support, including emergency or urgent treatment where necessary. As part of this, they may also need to discuss normal and adverse findings with their patients and communicate such findings effectively to referring or treating medical staff.

12. As the 2020s progress, population changes will continue, including marked growth in the number of very elderly patients, increased numbers of very large patients, more people diagnosed and living with and beyond cancer, and improved survival of very premature infants. New diseases and previously unrecognised conditions will emerge, as will new treatments for previously untreatable conditions. These factors will lead to an ever-expanding range of healthcare services with increased demand for medical imaging, nuclear medicine, and radiotherapy services. Radiographers will be at the forefront of delivering such services and their scope of practice will evolve over the decade as they adapt, modify, and develop their practice to deliver a broadened range of medical imaging, nuclear medicine, and radiotherapy services.

13. Point of care medical imaging examinations and treatments using a range of portable/mobile imaging systems will become progressively more significant in the management of seriously compromised patients in emergency departments, intensive care facilities, high dependency units, operating rooms, and in the community. Again, radiographers will be at the forefront of delivering such services.

14. Some radiographers will be involved in the development of new imaging and treatment technologies together with new applications and medical devices to improve differential diagnoses or treatment accuracy or delivery. As change and development takes effect, radiographers will continue to take leading roles in ensuring the safe integration of new technologies into practice, and enabling individual patients, other staff, and the public to understand benefit relative to risk in relation to examinations or treatments.

15. The clinical, technological and workload demands on radiographers in the current decade will mean they will need assistance from a trained support workforce. This will mean that they will need to delegate or transfer some elements of their roles to support staff, or to automation where appropriate.

16. Increasingly, radiographers will need to become specialist or advanced practitioners, for example becoming anatomical and physiological systems specialists able to work across multiple imaging, imaging and treatment, or treatment modalities. Some will specialise in particular patient groups such as paediatric patients or the very elderly. Others will develop specialist expertise in identified fields of practice such as breast or prostate cancer, neurology, trauma, orthopaedics, or bone densitometry, working across current professional boundaries with related specialist medical, nursing, and other groups of professional staff. By 2031, advanced practice will include assessment and interpretation of the outcomes of imaging carried out, and treatment given.

17. Continuing professional development and relevant postgraduate education will be essential for all radiographers in the decade ahead. They will need to maintain and enhance their clinical competencies, develop their critical thinking, and research skills further, as well as their capabilities. They will also need to become self-directed, reflective life-long learners to ensure they keep abreast of continuously changing health care and health care delivery environments. Effective use of online continuing professional development and communication tools will be a vital underpinning for their career-long learning.

18. Radiographers seeking career progression, intending to practise at advanced or consultant level, planning to specialise in a particular field of practice, or seeking to lead service delivery must recognise that postgraduate education and qualifications are essential. Such education and qualifications must relate to the nature and level of their practice and may include relevant postgraduate modules, certificates or diplomas, masters, or doctoral level degrees. Advanced practitioners will require at least a master's degree, and consultant practitioners a doctorate degree to provide the training needed for their future research work. Radiographers aiming to become service leaders will need equivalent professional, leadership and business postgraduate qualifications.

19. Clinical departments will need to become active learning departments, and radiographers will need to train, teach, mentor, support and supervise students and other learners in the workplace. This will include practice supervision for postgraduate students enrolled on speciality, sub-speciality and advanced practice clinical development and education programmes. Increasingly, the skills needed to provide effective learning support for learners at all levels will require radiographers to gain and use practice educator qualifications. Increasingly, too, clinical departments will promote clinical academic career pathways to support their practice development, learning and research needs.

20. The current decade will demand that all radiographers become research aware, able to produce an extensive essay or research dissertation and capable of implementing the outcomes of relevant research into their practice. Increasingly, the importance of clinical research radiographers will be recognised and, by 2031, a research culture will be fully embedded in all medical imaging, nuclear medicine, and radiotherapy departments. Best practice, optimisation of the whole imaging or treatment process, resource and staff management will become core research themes and dissemination of research findings will be routine, requiring radiographers to present their work in person or virtually, orally, and digitally, as posters, or in writing to different audiences, including the public.

21. Delivering high quality, effective and efficient medical imaging, nuclear medicine, and radiotherapy services in the decade ahead requires radiographers with excellent professional leadership and management skills, able to develop staff and use resources to maximise benefits to patients and healthcare services. As new models of diagnoses and treatments emerge in the coming years, they will be at the forefront in advising on, introducing, and leading such changes.

22. Overall, the decade ahead demands that radiographers at all levels and in all roles are flexible and innovative, able to problem solve, challenge current practices, exercise leadership and take on new roles that improve imaging, interventional and treatment services. Their roles will become increasingly diverse, and they will be able to make much greater use of their clinical and associated skills to support and enhance care pathways efficiently and effectively, optimising the care they provide.

NEXT STEPS: PROMOTION AND ADOPTION ACROSS EUROPE

While these statements may disappoint some who feel that they have already achieved some of these points in their educational programmes, in their research, and in their professional practice; for others, many of these statements may seem very ambitious from where they currently find themselves. With this in mind, the EFRS will engage with our members over the coming years with a view to advancing these expectations and ambitions for our profession as widely as possible.

The EFRS will be asking our members, our national societies, and educational institutions, to review and reflect on these statements and to disseminate them to their members, staff, and students.

The EFRS aims to identify key actions arising from the RERP Project and to embed these into the EFRS long-term strategic plan and our annual activity plans so that, with our members, we can drive our profession forward toward 2031.

CONCLUSION

Our ambitions and expectations for the future align with aspects of advanced practice, new roles, setting standards, building evidence, and promoting our profession.

Radiographers' contributions to medical imaging, nuclear medicine, and radiotherapy are limited only by their own expectations and ambitions, and law in the country in which they are practising.

We must ensure all radiographers and students are prepared for the future. Together let us 'Reinvent, rebuild and revolutionise Radiography'.

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