The role and efficacy of simulation in pre-registration education and training of diagnostic radiographers.

A simulation model for pre-registration diagnostic radiography education and training.

January 2025

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The role and efficacy of simulation in pre-registration education and training of diagnostic radiographers.

This output has been developed through an externally CoR-commissioned project with funding received from NHSE. This work marks the initial stages of the College of Radiographers' scoping regarding simulation in diagnostic radiography pre-registration education. As outlined in the report recommendations, the College recommends that further research be undertaken to understand and evidence the effectiveness of simulation in radiography education. The CoR will update its policy and guidance accordingly as the evidence base grows.

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Contents

1.0 Executive summary

The conversation around the use of simulation-based education (SBE) within diagnostic radiography education and training has shifted from *should it be used* to *how we use it effectively*. SBE is embedded across diagnostic radiography education in the UK to support learners in developing fundamental skills to prepare them for practice placement and scaffold the development of more complex skills throughout their training alongside traditional learning experiences. Some educators, within practice or university settings, are further along the journey of creating high fidelity simulations within learning models which promote rich learning experiences and enhance practice. Others are still developing their simulation-based education practice and identifying gaps in their knowledge and experience. There are a range of simulation modalities in use, though sustainability in terms of resource is a factor. Whilst barriers to delivering SBE are acknowledged there is an impetuous to overcome them due to the value placed on the learning experiences for students in the context of the challenges faced in the practice placement learning environment.

61 priority areas for the use of simulation-based education have been identified across the 4 themes of imaging practice, collaborative person-centred care, safe and effective practice, and professional skills and attributes. The report includes a mapping document of these areas to professional standards to support development of simulation activities, and a template to map these to learning outcomes. Defining the learning outcomes is integral to simulation design, though there may be various activities which will support their achievement, creating flexibility with approach and resource used for educators, however authenticity is key. The use of simulation-based education should be threaded throughout training and increase in complexity, and encourage demonstration of high order domains of cognitive, psychomotor and affective learning. However, SBE accessibility is imperative to ensure barriers to engagement and learning are minimised. A simulation model of *preparation, pre-brief, facilitation, de-brief and evaluation* should be used to support deliver of high quality SBE. The report includes templates to support implementation of this model, using the findings of the project to highlight the important aspects within every phase.

Educators should be encouraged to disseminate the impact of their simulation-based education to add to the community of practice around SBE and further enhance its quality. Robust methods of evaluating the learning gain should move away from students' perceptions, confidence, and enjoyment to metrics around knowledge, skills and attributes.

The recommendations of this report include support for 120 hours of SBE, used in adjunct to practice placements, in areas of practice across the 4 themes of imaging practice, collaborative person-centred care, safe and effective practice, professional skills and attributes. The use of a simulation model of *preparation, pre-brief, facilitation, de-brief and evaluation.* The creation of a community of practice to further develop quality SBE across diagnostic pre-registration education and training. Additionally, future work is recommended to pilot and evaluate the simulation model templates, explore the role of SBE in assessment and further research the learning gain and sustainability of SBE.

2.0 Background

Simulation based education (SBE) has had a long-standing role in supporting the training and development of health care professionals. It is seen as a vehicle to support transformation, enhance role satisfaction, improve quality and safety of services and patient outcomes[1]. In 2013 The World Health Organization[2] gave strong recommendations for the use of simulation methods by institutions in the education of health professionals as a means to respond to the global healthcare workforce crisis[3], despite acknowledging the evidence at the time was moderate. Across NHS Education, national strategies and frameworks have been introduced to embed high quality simulation-based education to ensure the development and training of safe, effective high-quality healthcare workforce[1,4-7]. The Health and Care Professions Council (HCPC) support the use of simulation where it can be meaningfully applied to deliver a quality practice-based learning experience[8].

The prevalence of simulation-based education within pre-registration diagnostic radiography education has increased particularly over the last decade, evident through the growing volume of international literature[9-54], and is widely adopted within UK education[55]. Factors for embedding SBE include the growing pedagogy, increase in availability and capability of simulation and immersive technologies, and growth in the number of learners and placement capacity constraints. Across the literature a number of key findings are summarised.

Area of the curriculum

Most commonly simulation-based education is used for aspects of undertaking and evaluating imaging examinations within projectional radiography[10,18,20,21,23-25,31,32,34,36-38,40,45-47,50,55], mobile radiography[33,40,44], computed tomography (CT)[26-28,40,52], and magnetic resonance imaging (MRI)[17,40]. Patient centred care for the elderly or those with complex needs[12,13,51], communication skills[9,35], patient safety[43], radiation protection[36,42], teamwork and interprofessional education[15,23,33,44] are also areas of practice in which SBE is used to support pre-registration education and training. Simulation based education ranges from addressing fundamental skills to exposing students to experiences they may never encounter during their pre-registration training, such as imaging burns patients[51] or multiprofessional trauma scenarios[15], to prepare them for future practice.

Types of simulation and modalities

Simulation activities utilise a variety of methods and technology, sometimes in combination, including physical imaging equipment[18,21,25,27,34,40,45-48,50,55]; anthropomorphic phantoms, patient simulators and manikins[10,15,18,21,24,25,27,28,30,33,43,45,50,55]; experts by experience or actors[9,11,23,30,34,44,45,50,53]; simulation/empathy suits[12]; moulage[51]; role play[31,40,41]; computer simulation or virtual radiography (3D immersive and desktop applications)[10,17,18,24,26-29,31,32,36-40,42,45-48,50,55]; and augmented reality[36]. High fidelity simulated environments, and authentic scenarios are used to contextualise the simulation activities and support the development of skills, knowledge and behaviours relevant for practice.

Simulation models

The use and type of simulation models incorporated in SBE is less well described in the literature, despite frameworks advocating principles of preparing, pre-briefing, simulation activity, debriefing/ reflecting, and evaluation in developing quality simulation activities[57,58]. Preparation for the use of technology ahead of simulation activities is supported through practicing with the use of technology or supporting instruction manuals. Facilitation occurred in most simulations, though some of the virtual radiography simulations were undertaken with the learner using the software on their own and receiving system feedback. It is unclear why debriefing[9,11,23,30,33,35,40,43,51,55] is described more frequently in the literature than pre-briefing[9,11,27,35,36,40,43], though this may be because the debrief

usually occurs within the simulation session and is part of the intervention being evaluated within the research.

Measuring the impact of SBE

The literature demonstrates there are several ways in which the impact of SBE is evaluated. Comparative cohort studies compare the impact of one group of learners undergoing SBE while the other groups receive no intervention or undertake practice placement. Pre and post simulation test scores or learner surveys are used to determine if confidence, knowledge, preparedness, or attitudes, or perceptions of those things, change following SBE. Most found an increase in competence after SBE intervention/s in relation to empathy, attitudes to patients, preparedness, confidence, knowledge, and technical skill. In some, there was no significant difference in performance to undertaking practice placement. Some methods of evaluation are more subjective, or the outcome measure i.e. confidence, is not a direct indication of learning gain, thus there is opportunity to increase the objectivity of assessing the learning gain. In addition, it would be useful to determine whether this translates into performance within clinical practice.

3.0 Scope and purpose

Following the Society of Radiographers publication on '*The use of simulation in enhancing pre-registration education and training of therapeutic radiographers'* (SoR, 2022), this project looks at the use of simulation to support diagnostic radiography pre-registration education. The aim of the project was to identify the role of simulation in pre-registration diagnostic radiography training and determine the efficacy of simulation on learning gain, with the following objectives:

• Gain insight into current simulation provision within pre-registration diagnostic radiography programmes

• Establish consensus opinion on the priority areas for simulation in the pre-registration education and training of diagnostic radiographers.

• Assess the efficacy of simulation as a learning model and an understanding of learning gain or not.

• Provide a simulation model, including key components of briefing and debriefing, and a template to improve mapping of simulation activities to learning outcomes within pre-registration diagnostic programmes.

• Encourage continual evaluation and dissemination of simulation activities to enhance the current evidence base.

4.0 Methods

A range of methods were employed in a multi-stage approach, outlined below to achieve the project aims and objectives. Ethical approval for this study has been granted by the Vice Chair of the Humanities, Social and Health Sciences Research Ethics Panel at the University of Bradford (EC28333).

4.1 Literature review

A literature review was undertaking to ascertain the current use of simulation-based education (SBE) within pre-registration diagnostic radiography education and training globally, and to identify the:

- areas of the curriculum or learning outcomes that simulation-based education was used to support;
- models used for SBE;
- type of simulation activity and resources or technology used to deliver it;
- method of evaluating the efficacy of SBE;
- impact on the learning gain.

The literature review supported the development of the survey, Delphi and template for the focus group analysis.

4.2 Survey of current simulation provision

A UK wide online survey was undertaken of pre-registration diagnostic radiography education and training (BSc, MSc and degree apprenticeships [DA]) using multiple choice, multi-option and free text questions, distributed through professional and programme lead networks, emails and social media. The questions sought to establish current use and models of SBE adopted, including location and purpose of SBE, areas of the curriculum or learning outcomes aligned to SBE, assessment of learning gain and evaluation methods, barriers to SBE implementation, and the number of practice placement hours substituted by or awarded to SBE within programmes. Responses came from 18 academic educators with regards to 15 pre-registration programmes (13 BSc and 2 MSc) across England, Scotland, Wales and Northern Ireland, and two Practice Educators (1 BSc and 1 DA) (Table 1).

4.3 Delphi

A Delphi approach via an online survey tool was used to establish a consensus of opinion over three survey rounds of stakeholders from across the UK. Five members of the University of Bradford Experts by Experience group (a term which has replaced service users) collaborated on the development of the Delphi round 1 questions, all of whom have experience of being involved with diagnostic radiography SBE. Round one of the Delphi survey sought qualitative free text responses to 6 questions to establish: priority areas for SBE adoption within the curricula, important considerations in SBE design, an appropriate SBE model, timing of SBE activity within the programme, appropriate evaluation methods of SBE effectiveness, and any additional considerations regarding the use of SBE. Two further rounds sought consensus from 91 items constructed through analysis of the responses to round 1 on the priority areas within the curriculum for the use of SBE (72 items), and the timing of SBE activity within the programme across (19 items). Consensus was defined as ≥75% agreement. 42 respondents took part in round 1, which included academics and directors of simulation across 13 different universities in England, Wales and Northern Ireland, practice educators, regional practice education facilitator, diagnostic radiography students and experts by experience (Table 1). The response rate in subsequent rounds was 61.9% and 52.3%.

4.4 Focus groups

A cross section of stakeholders (6 academics from 6 different universities within England, Wales and Northern Ireland, 1 practice educator, 1 clinical radiographer, 1 student (Table1)) from the Delphi participated in two online focus groups to explore: the reasons for identifying the areas of the curriculum as priority for the use of SBE within the Delphi, the expected learning outcomes and the types of activity which would support their achievement, and how these might be scaffolded across a programme. In addition, opinions were sought about how a tool might support educators to design and deliver SBE aligned to learning outcomes and using a robust simulation model, and the evaluation of the learning gain. Template analysis of the transcripts was undertaken, with the template developed through the literature review, survey and Delphi findings.

Table 1: Participants across the project

Role	Number of participants				
	Survey	Delphi			Focus group
		Round 1	Round 2	Round 3	
Academic	18	17	12	13	6
Practice educator	2	14	9	6	1
Diagnostic radiography student	N/A	5	3	2	1
Expert by Experience	N/A	2	0	0	-
Other	N/A	4	2	1	1
Total number of respondents	20	42	26	22	9

4.5 Simulation model

Data from the survey, Delphi and focus groups informed the proposed model for simulation and the important elements within it. From this, templates to facilitate implementation of this model were developed. Three members of the University of Bradford Experts by Experience group who had been involved in the Delphi, reviewed and suggested additions to the templates. Three UG diagnostic radiography students at the University of Bradford also gave their feedback.

4.6 Limitations

This project ran simultaneously alongside other workstreams funded by NHSE, launching in May 2024, targeting the same stakeholders. Survey fatigue in relation to these workstreams is recognised which may have impacted on participant response and engagement. Overall, across the project, representatives from 23 different universities across England, Scotland, Wales and Northern Ireland participated.

5.0 Findings

The findings from the survey outline how SBE is currently used within UK pre-registration diagnostic radiography education. Additional insights and examples of current practice were given through the Delphi and focus group participants. The Delphi and focus groups identified a consensus for the priority areas in which simulation could be used to enhance practice education and achievement of learning outcomes aligned to professional standards. In addition, the barriers and important considerations for the structuring of SBE within a curriculum, design of simulation activities using a framework to align with learning outcomes, and methods of evaluation were detailed through the survey, Delphi and focus group findings.

5.1 Extent of provision of SBE

All respondents in the survey indicated simulation-based education is used within the education and training of pre-registration diagnostic radiography students. SBE predominately takes place within the education providers campus, though additionally some respondents report SBE delivery occurs within the practice placement setting, online and less frequently remotely. Respondents typically deliver 200 hours of SBE or less. Survey opinion on what was deemed an appropriate number of SBE hours to support pre-registration diagnostic radiography education and training was varied (from 5 to 300 hours). Non-standardisation of clinical practice hours was stated as a challenge in being able to quantify this for some, with some suggestions that 10% equivalent of the practice hours is appropriate. The number of appropriate hours per week or year was referred to, also indicating the notion that SBE should occur frequently throughout a programme. Using the findings but

acknowledging the difficulties in interpreting it, 120 hours of SBE across is recommended as appropriate.

5.2 Barriers to, and considerations for, implementing and delivering SBE

Across the survey, Delphi and focus groups considerations and barriers for delivering SBE were detailed. To embed and deliver SBE, the need for institutional support and buy-in from faculty and students was highlighted. Some educators highlighted the journey they were on to further develop and embed quality, high fidelity simulated learning experiences across the curriculum. The need to consider the accessibility and inclusivity of SBE to ensure all learners can engage with an activity that may constitute a significant part of their programme was raised. Sustainability and scalability were raised as an issue due to the cost of and user access to technology, cohort sizes, and the staff resources needed to develop and deliver SBE. Whether achievement of learning outcomes could be supported via appropriate alternative, less expensive, low fidelity simulation activities was a consideration. Practicalities and logistics include timetabling and availability of appropriate staff and spaces. Limited staff expertise in using newer simulation technologies, and limited knowledge of the range of technologies available to precure and utilise for SBE was identified as a gap.

5.3 Purpose of SBE

The survey, Delphi and focus groups identified the purpose of utilising SBE includes the development of professional skills, knowledge and behaviours, with the ability to scaffold learning in complexity across a programme. Simulation sessions were felt to facilitate students' application of multiple skills at one time, such as patient care, radiation protection, communication, teamwork and leadership skills.

SBE is used to front load skills to prepare learners for the practice learning environment, building students confidence prior to the initial practice placement and across practice. An important reason for the use of SBE was that it provided a safe learning space, with the ability to make mistakes, and incorporates the opportunity for debrief and reflection: elements which enhance learning but may be difficult or not possible to undertake in the real practice learning environment. Practice placement capacity, increased student numbers, access to and the ability to meet new the HCPC Standards of Proficiency[59] within areas such as CT and MRI, more equitable learning experiences and ensuring exposure to specific experiences, were reasons SBE was utilised. SBE was also used to facilitate interprofessional learning, peer to peer feedback, and formative, summative and practice assessments.

5.4 Areas of curriculum

Synonymous with the literature, the survey indicated SBE is used extensively across UK education for communication and patient centred care, image acquisition and image evaluation, and interprofessional working. Additional areas of the curriculum for the use of SBE include mandatory training (basic life support and manual handling), quality assurance, clinical governance and research, radiation protection and MR safety, clinical decision making, patient assessment, cannulation, infection control, supporting learners and leadership. For some educators, developing high fidelity simulations or creating the business case to obtain simulation technology was an ongoing process to support education delivery within a programme.

The Delphi identified consensus (>75% consensus) on the priority areas of the curriculum for the use of SBE over three survey rounds across 61 items. These were confirmed and explored further through the follow up focus groups to inform the alignment with professional standards (Appendix 1), and then grouped into 4 main categories:

1. Imaging practice
    - Generic
    - Radiographic Imaging
    - Theatre Imaging
    - CT
    - MRI pathology
2. Collaborative person-centred care
3. Safe and effective practice
4. Professional skills and attributes

The Delphi and the focus groups demonstrated that these areas of curriculum mapped to skills, knowledge and professional behaviour development in both routine, and complex clinical scenarios, examples of which were contrast reactions, or major trauma events. As well as technical skills, there was also a focus on interactions with people and experiencing reacting to situations. The consideration of when to address those areas of the curriculum within a simulation is determined by the order of complexity (also see section 5.5). This starts with a focus on developing a level specific skill (i.e., a radiographic examination, or communicating with a patient), moving to applying a combination of skills, then increasing the complexity of the scenario in which a multitude of skills will need to be implemented.

5.5 Timing of simulation activities

The Delphi demonstrated agreement (>75% consensus) across 17 items regarding the integration and timing of SBE delivery within the curriculum. These are summarised as the following principles:

- The early introduction and regular use of SBE across the curriculum to support learning.
- Related underpinning theory delivered prior to SBE to facilitate consolidation of learning within simulation activities.
- SBE should be integrated with other learning activities in the curriculum and aligned to support level specific skills and intended learning outcomes.
- The use of SBE to scaffold learning and increase the complexity of skills used in SBE throughout the curriculum.
- SBE is appropriate prior to the first and subsequent placements to prepare students for related practice experiences, and after to consolidate practice-based education.
- SBE content and timing planned in liaison with clinical placement sites (to support the above).
- SBE used as an adjunct to clinical placement.

5.6 Design of simulated learning activities

Clear aims, learning outcomes and alignment to support learners to meet professional standards were stated as important in the relevance and design of simulated learning activities. Cognitive overload was something to be cautious of, and so focussing on a smaller number of learning outcomes was deemed to lead to better outcomes for student learning. The authenticity and realistic nature of scenarios to ensure simulations replicated practice were identified as important for fidelity. It was suggested this could be achieved through liaison with clinical staff and co-production of lived experiences with service users. Fidelity did not come just from the environment, equipment and personnel involved, but from the senses it provoked.

The design of simulation activities was also directed by the existing faculty resources, technologies, and other types of health professional courses delivered with the education institution, or healthcare professional available in situ. Activities to facilitate decision making, prioritization, and critical thinking were described as examples where technologies or less intensive resources were needed, such paper-based activities and escape rooms.

5.7 Modalities of simulation

Education providers have invested in a range of imaging equipment, resources and simulation technologies to give them the capability to deliver a variety of simulated experiences. These predominately facilitate imaging examinations and patient interactions and include live imaging equipment, anthropomorphic phantoms, image viewing stations, virtual radiography, simulated patients and patient simulators. Some faculty facilities used for simulations were shared with other healthcare professional programmes. Whilst some modalities and equipment have been established within the curriculum for some time, this is now in some cases complimented with newer simulation and immersive technologies such as virtual radiography and computer simulators, particularly CT and MRI, given the 2023 changes to the HCPC Standards of Proficiency[59]. Decisions around what simulation modality and technologies to invest in linked back to the purpose of SBE, sustainability and scalability.

The simulated clinical or imaging environment, or the suites where simulation modalities or immersive technologies were employed was an important consideration of simulation-based education, demonstrating the need for consideration around appropriate campus spaces and their availability and impact on fidelity, where SBE is not delivered in situ. It was indicated that the same simulated environment and/or technology could be used in simulations to achieve different learning outcomes, for example undertaking a radiograph, or patient communication skills in the context of a radiographic examination.

5.8 Model of simulation

The model or framework for simulation was explored through the survey, Delphi and focus groups. The majority of those delivering SBE use a model of pre-brief and debrief or feedback to underpin the simulation activity, and there was recognition by some regarding a lack of awareness about simulation models. More guidance on how to implement a model based on published standards to support quality simulation-based education was deemed helpful. Other stakeholders demonstrated knowledge and the use of published standards, such as Healthcare Simulation Standards of Best Practice[57] and the Association for Simulated Practice in Healthcare (ASPiH) Standards 2023 for Simulation-Based Practice[58]. These standards include guidance for preparation, pre-briefing, facilitation, debriefing and evaluation.

The findings of the project demonstrated the following elements were important in a simulation model:

Preparation

Many considerations were outlined in the project findings for the preparation of simulations. These include resources, appropriate campus spaces, staff availability and training and co-production (see sections 5.2 and 5.6). Additional considerations raised were risk assessments, and securing the psychological and physical safety of participants and those involved in delivering simulations. Anticipating impact on wellbeing and putting strategies and resources in place to support participants was also highlighted, something those facilitating sessions should be prepared for. It was stated ethical considerations may need to be made around the type of activity and the use of experts by experience (service users). The use of an equality, diversity and inclusion (EDI) simulation tool was

advocated to support development and facilitation of appropriate stimulation activities. Training was identified as important for simulated patients/ experts by experience, as was the preparation of students for the use of SBE within their curriculum, along with training and support for the digital technologies ahead of use within the simulation activities. Alignment with the other learning and teaching strategies was a key factor to ensure that students had the relevant underpinning knowledge for simulation activities (see section 5.5).

Pre-brief

The project identified that a clear purpose for the simulation activity, defined learning outcomes, instructions for the activity (e.g. assigning roles), and ground rules were important elements within the pre-brief. Pre-brief was found to take a range of formats which include a lecture, PowerPoint presentation, verbal instructions, sometimes in advance of the simulation activity or as part of it, or both.

Facilitation

Important aspects for facilitating simulations that were identified included the creation of a safe, non-judgemental learning space, allowing mistakes to happen (not jeopardising safety) and problem solving to occur, rather than the facilitator providing solutions.

De-brief

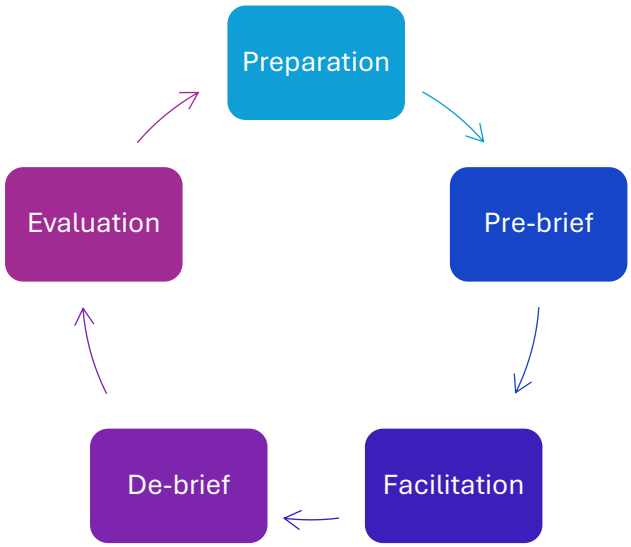
Across the survey, Delphi and focus group, there was a focus on the debrief, and its importance highlighted in exploring events, reactions, facilitating reflection, providing feedback on what went well or could be improved, and consolidating learning against the learning outcomes. Some educators stated using models to structure the format of the debrief for simulation activities, such as PEARLS[60], Diamond[61] and Health Education Improvement Wales's triangular approach (Principles, Structure and Strategies)[62]. Debriefs predominately took the format of group discussions, though written reflections were sometimes used in addition.

Evaluation

Student feedback was frequently referred to in the evaluation of SBE: What worked well or could be improved; the perceived value of SBE in supporting learning, achieving the learning outcomes or preparing them for practice placement; additional areas where SBE could support their practice; and ease of use of technology. Staff evaluation of sessions and gauging the achievement of learning outcomes through facilitation is perceived as valuable in reviewing, refining and developing simulations.

Consequently, Figure 1 represents the model of simulation advocated. Templates to facilitate implementation of this model were developed, using the findings of the project outlined in this section (see Appendix 3).

Figure 1: Proposed model for simulation-based education through project findings



5.9 Methods of evaluating the learning gain

The survey identified a variety of methods are used, often in conjunction, to evaluate the learning gain from SBE. Most commonly anecdotal evidence is used, as well as tests/ assessments, programme QA data, students' surveys on confidence or clinical acumen, and clinical practice assessment documentation. Additionally, the use of written student reflections, feedback and self-assessment, and feedback from clinical staff, and research is reported to be used as a means of gauging the learning gain.

The Delphi and focus groups reported similar practices were used to evaluate the learning gain. In addition, when asked how the learning gain from SBE should be evaluated, responses included:

- Pre and post SBE student surveys of confidence and knowledge
- Performance comparison of control group versus those you additionally undergo SBE
- Longitudinal studies
- Assessments (practical, formative/summative assessments)
- Evaluation/feedback from clinical staff
- Student feedback
- Student attainment

The focus group identified that metrics for assessment of the learning gain should move away from student confidence and enjoyment and self-reported methods, to include more objective assessment of knowledge and skills. A cost benefit analysis of the learning gain of SBE over existing learning, teaching and placement activity was also proposed.

6.0 Conclusions

Simulation based education is embedded within UK pre-registration diagnostic radiography education and training to varying degrees. However, educators are at different stages of developing their simulation-based education practice, and there are opportunities for development and knowledge transfer through collaboration and professional forums. A model of *preparation, pre-brief, facilitation, de-brief and evaluation* is advocated underpinned by the Association for Simulated Practice in Healthcare (ASPiH) Standards 2023 for Simulation-Based Practice[58]. Support for implementing this model may be facilitated by the templates created within this project (Appendix 3). SBE is deemed a valuable adjunct to other learning and teaching strategies and practice placements, to scaffold learning appropriately throughout a programme. The use of SBE supports development of a variety of skills, knowledge and behaviours but predominately those related to imaging practice and people-based skills. The consensus priority areas for the use of SBE mostly mirror those currently in use and focus around 4 themes: imaging practice, collaborative person-centred care, safe and effective practice and professional skills and attributes. Simulation activities in these areas can support the development of fundamental and more complex skills through authentic scenarios, either routine or less common, aligned to HCPC and professional standards (Appendix 1). Whilst 120 hours of SBE across a programme is felt to be appropriate, resources can be a barrier to SBE, and sustainability remains a concern. This may impact on the amount and in which priority areas of the curriculum SBE can be delivered. Use of medium and low fidelity simulation may be appropriate for some learning outcomes and reduce some of the financial barriers. There is scope for further research to be undertaken with robust methods, to evaluate the learning gain from SBE, and the findings disseminated. The use of simulation for assessment was reported, but was not within the scope of this project, so further exploration of this area is advocated.

7.0 Recommendations

The following recommendations have been informed by the findings of the project.

1. Simulation-based education should focus across 4 key themes: imaging practice; collaborative person-centred care; safe and effective practice; professional skills and attributes. The professional standards mapped to each area of practice within these themes should be used to identify appropriate learning outcomes for simulations, from which activity design and modality selection can align (Appendix 1 & 2).
2. Simulation-based education should be used as adjunct to clinical placement. 120 hours of SBE across a programme is considered appropriate, but mandates on delivering this should be avoided given the recognised barriers which may limit the use of SBE for some education providers.
3. A model of *preparation, pre-brief, facilitation, de-brief and evaluation* should be employed, underpinned by the use of the Association for Simulated Practice in Healthcare (ASPiH) Standards 2023 for Simulation-Based Practice[58] to promote high quality SBE. The templates created to support implementation of this model (Appendix 3) should be piloted and evaluated.
4. Creation of a community of practice to further develop SBE across diagnostic pre-registration education and training. This could be facilitated by Society of Radiographers Simulation Special Interest Group, through membership of the European Federation of Radiographer Societies, practice educator networks, workshops and webinars.

5. Further research to be undertaken, to include a cost benefit analysis to evaluate the sustainability of SBE, robust objective measurements of the learning gain, transferability to practice and longitudinal studies.
6. As it was outside the scope of this project, further work to look at the role of SBE in assessment would be advantageous.

8.0 Dissemination Strategy

The outputs from this project will be disseminated through the availability of the report on the SCoR website, publication of the research in peer reviewed journals, and presentation at national conference. Educators engaged in SBE research are encouraged to disseminate their findings through internationally recognised professional journals and conferences.

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Appendix 1: Priority areas of curriculum for SBE

The table below indicates the consensus areas of the curriculum for which SBE could be used. Professional standards have been mapped to each area. This mapping document can support educators to develop learning outcomes related to one or a combination of curriculum areas, from which appropriate simulation activities can be designed.

* HCPC SoP - Health and Care Professions Council. Standards of Proficiency: Radiographers (2023) Health and Care Professions Council.
HCPC SoC - Health and Care Professions Council. Standards of Conduct, Performance and Ethics (2024) Health and Care Professions Council.
CoR ECF - The College of Radiographers. Education and Career Framework for the Radiography Workforce (4th Ed) (2022) The College of Radiographers.
IfATE KSBs – Institute for Apprenticeships and Technical Education. Standard for Diagnositc Radiographer Level 6 (2023) Institute for Apprenticeships and Technical Education.

	Mapped standards*			
Consensus items within curriculum	**HCPC SoP**	**HCPC SoC**	**CoR ECF**	**IfATE KSBs**
1. Imaging Practice				
Generic				
1.1 Justification of imaging requests	8.15, 12.9, 13.16, 13.23	6.1	6.1, 6.3, 6.7, 7.2, 7.9,7.10	K43, K49, K56, K57, S11, S13, S19, S83
1.2 Image production principles	12.11		6.1,6.6, 6.11, 6.13, 6.15, 7.2	K45, K46
1.3 Exposure parameter manipulation and effects	12.11, 13.19, 13.31		6.6, 6.11, 6.13, 6.15, 7.2	K45, S91
1.4 Image quality	13.31		6.10, 6.11, 7.2	K45, S91
1.5 Use of image related & support systems technology	7.7, 12.15, 13.19, 13.33		3.31, 6.8, 6.10, 6.12, 7.2	K49, S33, S39, S93
Radiographic imaging				
1.6 Patient positioning for radiographic examinations	12.1, 13.21, 13.22		7.5	K37, S81, S82
1.7 Palpation of landmarks for accurate radiographic examinations and centering	12.1,13.22		3.3, 7.5, 8.1, 8.4	K37
1.8 Accurate beam centering for radiographic examinations	12.1, 13.19		7.5, 7.7, 8.4	S79

1.9 Routine projectional radiography examinations	13.16, 13.19, 13.25, 13.31		6.6, 6.8, 7.2, 7.7	S79, S81, S85
1.10 Less common projectional radiography examinations	13.16, 13.19, 13.25, 13.26, 13.31		6.6, 6.8, 7.2, 7.7	S58, S79, S81, S85
1.11 Complex projectional radiography examinations/ adaptation of technique	13.1, 13.18, 13.19, 13.21, 13.28, 13.31		6.6, 6.8, 7.2, 7.6, 7.7, 7.8	S58, S78, S79, S81, S85, S88
1.12 Manoeuvring mobile xray equipment	13.19		6.8, 7.1	S79
1.13 Mobile radiographic imaging	13.19, 13.21, 13.29, 13.31		6.6, 6.7, 6.8, 7.1, 7.2	S58, S79, S81, S89
1.14 Radiographic image evaluation	12.1, 12.16, 12.24, 12.26, 12.27, 13.17, 13.39, 13.40		6.4, 7.2, 8.1, 8.2, 8.3, 8.5, 8.6	K37, K55, K56, K57, S58, S59, S77, S99, S100
Theatre fluoroscopic imaging				
1.15 Manoeuvring mobile image intensifier equipment	13.19		6.8 7.1	S79
1.16 Theatre radiography	13.19, 13.29, 13.30, 13.34		6.6, 6.7, 6.8, 7.1,7.2	S58, S79, S89, S90, S94
Computed tomography (CT)				
1.17 Positioning for CT examinations	12.1, 13.21, 13.22		7.5, 8.1, 8.4	S82
1.18 CT scan techniques and protocols	12.1, 13.35		7.2, 7.5, 7.11	S81
1.19 CT anatomy	12.1, 12.16, 12.27		7.2, 8.1, 8.2	K37, K57, S59
1.20 CT pathology	12.1, 12.16, 12.27		8.3	K37, K57, S59, S100
MRI				
1.21 MRI pathology	12.1, 12.16, 12.27		8.3	K57, S59, S100
2. Collaborative person-centred care				
2.1 Patient centred care	2.6, 2.9, 5.1, 7.11, 13.13, 13.27	1.1, 1.2, 1.3, 1.10,	1.1, 1.2, 1.4, 1.5, 1.7, 3.37, 7.4, 7.8	K6, S6, S8, S10 S73, S87
2.2 Patient interactions	2.5, 2.6, 7.4, 7.8, 8.17	1.1, 1.2, 1.3, 1.5	1.3, 1.5, 2.10, 7.3	S7, S8, S24, S34, S36, S40, S42, S47, S74, B3
2.3 Effective patient communication, addressing needs & modification	7.1, 7.3, 7.5, 7.6, 12.24	2.1, 2.2, 2.3, 2.4, 2.5	2.1, 2.2, 2.3, 2.5, 2.6	K21, K22, K23, K55, S29, S30, S31, S32, S34

2.4 Diverse patient needs	5.1, 5.8	1.5	1.3, 1.6, 7.8	K28, S23, S25
2.5 Clinical assessment of patients	12.14, 13.4, 13.14		7.9, 7.12	K48, S66, S67, S74
2.6 Recognise and respond to a deteriorating patient	12.21, 13.7		3.6, 7.4, 7.12,	S60, S69
2.7 Informed consent	2.7, 7.4, 7.8	1.4, 2.2, 2.3	3.3, 6.5	K4, K5, K23, K43, S9, S31
2.8 Patient perspectives/ experiences	5.8		1.2, 1.6, 1.7	
2.9 Patient pathways through imaging	7.10, 11.5, 13.16		7.2, 7.9, 8.7	K38, K49, S35
2.10 Multiprofessional team working	7.1, 8.1, 8.2, 8.3, 8.4	2.6, 2.7, 2.8	2.9, 3.1, 4.1, 4.2, 4.4, 5.12	K24, K25, K38, S29, S40, S41
2.11 Dealing with conflict	7.1, 7.3, 8.5	2.1	2.2, 3.28, 3.29	S42
3. Safe & effective practice				
3.1 Quality assurance of imaging equipment	11.4, 11.6, 11.7, 13.20		3.8, 6.5, 6.9, 7.2	K8, K34, K35, S11, S54
3.2 Dose optimisation	12.8, 12.9, 13.31	6.1	6.8, 6.11, 7.2	K8, S11, S13, S58
3.3 Radiation dosimetry and dose calculation	12.13, 13.24		6.5, 7.2	K8, K47, S11, S13, S84
3.4 Radiation protection and safety	2.11, 12.12	6.1	6.1, 6.2, 6.5, 6.16, 6.17, 7.2	K8, K45, S11, S13, S58
3.5 Moving & handling	14.6		3.15	K62, S105
3.6 Basic life support	14.8		3.15	S60, S107
3.7 Safety checklists e.g. MRI, contrast agent contraindications	12.18, 14.7	6.1	3.5, 7.2	K51, K52, S106
3.8 Safeguarding	2.3, 6.3	5.2, 7.1, 7.3	3.2, 3.15, 3.32	K2, K17, S28
3.9 Human factors	2.9, 11.3, 11.8	6.1, 8.1	3.11, 6.5	
3.10 Clinical environment	14.1, 14.2, 14.3, 14.4, 14.5		3.15, 6.1, 6.2, 6.7	K60, K61, K63, S11, S13, S101, S102, S104, S106
3.11 Sterile environments	14.1, 14.4, 14.9		3.15	K60, K61, K63, S101, S102, S103, S104, S106
3.12 Theatre environment	14.1, 14.2, 14.3, 14.4, 14.5		6.7, 7.13	K60, K61, S11, S13, S101, S102, S103, S104, S106
3.13 Ward environment	14.1, 14.2, 14.3, 14.4, 14.5		6.7, 7.13	K60, K61, S11, S13, S101, S102, S103, S104, S106

4. Professional behaviours, attributes and skills				
4.1 Responding to emergency incidents	13.18	3.1	3.9,	S2, S14, S18, S78, B1
4.2 Working under pressure and managing stress	1.2, 3.1	6.3	3.19, 3.29, 3.30	K9, K10, S2, S14, B1
4.3 Managing workflow	1.2, 4.5, 8.9	3.1		S2
4.4 Delivering and interpreting information	7.7, 8.15, 13.2, 13.3, 13.15		2.1,2.6	K29, S17, S33, S50, S64, S65, S75, S76
4.5 Decision making	4.1, 4.2, 4.3, 12.17		3.19, 3.26, 3.27, 5.3	K50 S16, S17, S18, S22
4.6 Critical thinking	4.7		5.3	S70
4.7 Problem solving	4.6		5.3	S21, S22
4.8 Research methods	13.8, 13.9, 13.10	3.4	5.4, 5.8, 5.9	K58, K59, S56, S70
4.9 Professional behaviours	2.1, 2.4, 4.1, 4.5, 5.3, 8.3, 8.10	1.9, 2.1, 9.1	3.19, 3.28, 3.30, 3.35	K3, S1, S4, S15, S16, S20, S45, B4, B5
4.10 Empathy	5.8		1.7	B1, B3
4.11Values based practice	5.3	1.6	3.19	S7, S24
4.12 Equality, diversity and inclusion	2.10, 5.2, 5.7	1.5, 1.6, 3.5	1.3, 3.2	K7, K8, K12, K13, K14, K15
4.13 Resilience	1.2, 3.2		3.29	K9, S2, B1
4.14 Professional confidence	1.1	2.6, 3.1	3.19	B2
4.15 Raising concerns/ freedom to speak up	6.3, 14.1	6.1, 6.2, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6	3.33, 4.3	B5
4.16 Reflective practice	10.1		3.23	K32, B6

Appendix 2: Learning outcome mapping template

This template below can be used in conjunction with the table in Appendix 1 to define learning outcomes for a simulation session which aligns with one or more area of curriculum and the associated standards. The template has been populated with an example simulation activity for learners towards the beginning of their programme.

Simulation session: Learning outcome mapping template				
Area/s of the Curriculum:	Associated Standards			
	HCPC SoP	HCPC SoC	CoR ECF	IfATE KSBs
1.6 Patient positioning for radiographic examinations	12.1, 13.21, 13.22		7.5	K37, S81, S82
1.7 Palpation of landmarks for accurate radiographic examinations and centering	12.1,13.22		3.3, 7.5, 8.1, 8.4	K37
1.8 Accurate beam centering for radiographic examinations	12.1, 13.19		7.5, 7.7, 8.4	S79
1.9 Routine projectional radiography examinations	13.16, 13.19, 13.25, 13.31		6.6, 6.8, 7.2, 7.7	S79, S81, S85
Learning outcome/s for the session:				
• Accurately positioning the service user and xray tube for a routine PA erect projection of the chest				
Simulation activity				
Role play a standard radiographic examination of the chest (PA erect) on a compliant service in the campus x-ray suite.				

Appendix 3

A simulation model for pre-registration diagnostic radiography education and training

This work was commissioned and funded by NHS England.
This project is part of a commissioned programme of work led by the Society of Radiographers.

January 2025

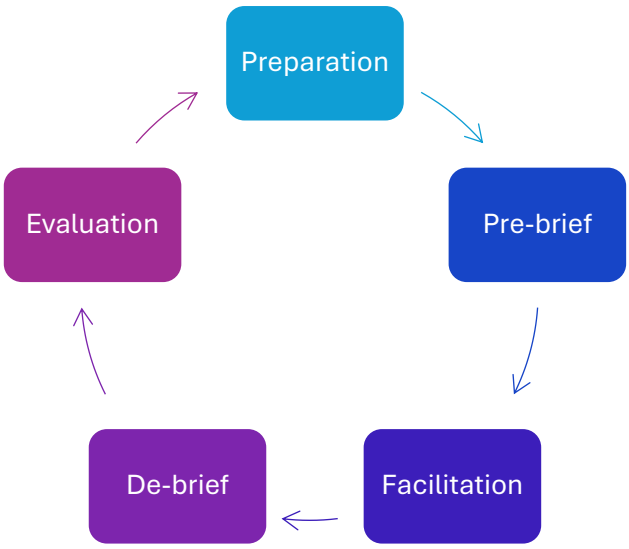
Contents

Introduction

The project 'The role and efficacy of simulation in pre-registration education and training of diagnostic radiographers' was undertaken by a team from The University of Bradford. One of the aims of the project was to determine a model for simulation-based education. A recommendation of the project is to adopt a model of *preparation, pre-brief, facilitation, de-brief and evaluation* (Figure 1), underpinned by ASPiH Standards for Simulation-Based Practice[1], and the development of resources to facilitate this (project report: section 7.0).

Using the findings of the project (project report: sections 5.2, 5.5, 5.6 & 5.8), and additional published tools, templates have been developed to guide and facilitate the implementation of this simulation model (Figure 1.)

Figure 1: Model for simulation-based education



A. Faculty preparation template

This template will support faculty in the preparing a simulation activity. See Appendix 1 in the project report for the priority areas of the curriculum as determined by the project.

Session title:
Purpose of the session:
[Give an outline of the aims of the simulation activity]
Learning outcome/s for the session:
[State what learning outcomes the learner is expected to achieve in the simulation]
What underpinning knowledge will the learner need prior to the simulation, and how will this be facilitated?
[State learning and teaching activity/activities planned prior to simulation and what relevant content they will address]
Which module or area of the programme does this session align to?
[State how this simulation relates to wider learning i.e. a module, the year, or a placement]
What activity & modality will be used to facilitate the achievement of the learning outcomes?
[Consider what type of simulation will best align with achievement of the learning outcomes and consider the fidelity (realism) of the experience. For example, role play in a campus imaging suite with simulated patients; virtual reality suite etc.]
What additional resources/ consumables will be needed?
[State what supporting resources or consumables that you need to develop, order or book out for the session such as an imaging request from a referrer, cannulas, gloves, patient simulators etc.]

Checklist	Y/N
Has the activity been co-produced/ had input from appropriate stakeholder/s (e.g. service users, clinical staff, faculty members of other disciplines)?	
Have equality, diversity and inclusion principles (EDI) been imbedded?	
Is a risk assessment needed for the activity? (for example: use of sharps, moving & handling activity, simulated blood products, number of facilitators needed etc.). If so, has it been completed and shared with simulation faculty involved?	
Do the simulation technicians and faculty staff involved have the appropriate expertise and training for the planned simulation and are available? (i.e., subject specific knowledge, trained in the use of modality/resources, EDI training, policy for raising concerns about unprofessional behaviour or staff interventions during a simulation, maintaining ground rules to promote psychological safety etc.)	
Has an appropriate room been booked (for desired fidelity and ensuring safe participation)?	
Has the equipment been checked, booked, and set up time beforehand factored in?	
Have any additional resources for the session been made/ organised?	
Has the activity been piloted or amended using previous learner/facilitator feedback?	
Have plans been put in place for students who may need time out? Is there support or sign posting to support/resources should the nature of the simulation activity be triggering for anyone delivering or participating?	
Have the learners had training in the use of the equipment/technology to be used in the simulation? (i.e. x-ray suite, or virtual reality headsets, computer simulators)	
Have the learners completed the learning & teaching activities for the underpinning knowledge that will be applied in the simulation?	
Have participants had a pre-brief for the simulation appropriate to their role?	
• Learners have received the pre-brief prior to simulation (section B)	
• Facilitators (including a copy of the student pre-brief and intended learning outcomes, debrief model to use)	
• Experts by Experience (service users)/ patient actors (pre-brief including context and learning outcomes of the simulation, a chance to ask questions, and orientation to simulated environment if appropriate- all ahead of the simulation day)	
Is the debrief prepared and have the faculty/service users facilitating the debrief been briefed? This includes preparation of any resources that will be used to facilitate the debrief or that leaners will be signposted to after the simulation e.g. reflection proforma)?	

B. Learner pre-brief template

Information for the learner in advance of the simulation/ reiteration at beginning of simulation

Learner pre-brief for simulation
Session title:
[State the name of the simulation activity]
Purpose of the session:
[Give an outline of the aims of the simulation activity]
Learning outcomes for the session:
[State what learning outcomes the learner is expected to achieve in the simulation]
The simulation aligns with the following module, area of the programme or placement:
[State how this simulation relates to wider learning i.e. a module, the year, or a placement]
Description of simulation activity:
[What do the learners need to know about the simulation so they can effectively participate in the simulation? E.g. description of the scenario or order of events; or the roles leaners will play in roleplay etc.]
Signpost the pre- learning that should have been completed before undertaking the simulation:
[State what other learning should have taken place i.e. lectures, directed study. State the skills training that learner should have had prior to simulation i.e., orientation to x-ray suite, instruction is use of immersive virtual radiography etc.]

State what is the learner expected to wear or bring to the simulation (if applicable):
[State if the leaner needs to wear their clinical uniform (clean and professionally presented), and radiation badge for example, or bring any resources i.e., laptop etc.]
Ground rules for simulation and debrief:
[State what is expected of simulation participants (i.e., professionalism and expected behaviours, respect, valuing the contributions of others, confidentiality) and sign post them to any relevant procedures (i.e., raising concerns, local rules etc.)].

C. Facilitation guide

The guidance below indicates things to do and consider as a facilitator before, during and at the end of the simulation.

Facilitation of simulation
Before
Confirm all participants have been pre-briefed and are ready to begin the activity.
Clearly signal when the activity has commenced.
During
Observe – learners should lead the scenario. Note non-participation.
Allow learners to work through the scenario without intervention and allow them to make mistakes.
Intervene only when necessary for physical or psychological safety, or in the case of behaviour that is disruptive to the activity, according to pre-determined intervention protocol. [See preparation/pre-brief template]
Use the Observation Template below to help you identify relevant actions or behaviours to your learning outcomes. You may wish to take notes to guide the debrief or evaluation of the simulation.
After
Clearly signal when the activity has concluded.
Commence debrief (see section D).

Use the facilitation observation template below to make notes during the simulation that can aid the debrief and support the evaluation of the simulation activity.

Facilitator observation template

Simulation facilitator observation template	
Things to look out for:	Optional notes to facilitate debrief or evaluation:
Successes *Technical proficiency, communication, safe practice, collaboration, problem solving*	
Challenges *Missed opportunities, difficulties encountered, barriers to success*	
Decisions made *What? Who by? When?*	
Reactions observed	
Outcomes *Intended? Positive? Negative?*	

D. Debrief template

Debrief for simulation	
Before the debrief	
Restate the simulation's learning outcomes.	
Restate the ground rules and expectations.	
Have your chosen debrief model to hand. Feel able to deviate from your model as necessary. [See suggested debrief models below]	*Debrief model:*
Have any Observation notes made during the activity to hand. [See template in section C)	
Prepare additional material such as video playback or feedback from other involved parties e.g. Experts by Experience, unless they are involved in the debrief. You may find it helpful to display the learning outcomes, ground rules or debrief model on a screen.	*Material to use in debrief:*

During the debrief – follow the "LINES"	
L	**Listen** – you should guide the debrief conversations but make sure the learners are doing most of the talking.
I	**Invite** – give Experts by Experience, actors, observers and other involved parties an opportunity to have their say.
N	**Notice**, ask and prompt – learners may talk about something you want to delve into further, or you may need to draw out more critical insight during the analysis phase.
E	**Encourage Engagement** – ensure all learners have had an opportunity to join the conversation.
S	**Summarise** – paraphrase and recap to ensure understand and confirm take-home messages.

After the debrief
Provide support or signposting if required.
Seek support for yourself if required.
Complete a self-evaluation. [See section E]

Debrief models

The Diamond and the PEARL models were those found to be used by some educators in the project, though the alternative models below may also be useful to facilitate debriefs.

- "The Diamond": a structure for simulation debrief [2]
- The PEARLS Healthcare Debriefing Tool[3]
- SHARP: Promoting performance debriefing [4]
- TeamGAINS: a tool for structured debriefings for simulation-based team trainings[5]
- The 3D Model of Debriefing: Defusing, Discovering, and Deepening[6]

Additional debrief tips

- A debrief is about facilitating reflection and discovery, towards action. Your priority should be to listen and guide learners through the debrief model, rather than give feedback or teach learners the "right" way to do something.
- Some neurodivergent learners' reflective abilities differ from neurotypical learners, for instance some neurodivergent people have difficulties understanding their feelings (alexithymia) or have differences in how they process information, so be prepared to offer more guidance in a debrief[7,8].
- Consider whether you need to conduct a separate debrief with actors or Experts by Experience. This may be helpful if they are not involved in the learners debrief, if you want their feedback on the activity itself, or as a psychological safety measure where a scenario may have the potential to cause distress.

E. Evaluation template

Evaluation of the simulation is important to ensure learners meet the learner outcomes and identify if any improvements or amendments could be made before facilitating the simulation again, for example to increase fidelity, or for more effective de-briefing to ensure a deeper learning experience. Notes in the facilitator observation template (section C) can assist in that evaluation, and feedback points may have been raised in the debrief by learners, or other participants in the simulation such as Experts by Experience, which can be. There are also a number of tools available to support evaluation of the simulation debrief, which impacts on the how conducive SBE is for learning:

- Objective Structured Assessment of Debriefing (OSAD): Improving quality of debriefing[4]
- Debriefing Assessment for Simulation in Healthcare (DASH)[9,10]

These can be collated below to support evaluation of the simulation and inform changes or actions for the next time the simulation is delivered.

Evaluation of the simulation
Feedback from facilitator
[*Were there any barriers/difficulties to success and achievement of the learning outcomes? Feedback comments on what worked well and what could be improved]*
Feedback from Experts by Experience / patient actors/ staff actors (if applicable)
[Note any feedback comments from these participants on how they were prepared for their role, what went well, or any suggestions for improvement]
Feedback from learners
[Note any feedback comments from these participants on how they were prepared for their role, what went well, or any suggestions for improvement]
Evaluation of debrief
[If the OSAD or DASH tools have been used, summarise the comments and scores.]

Overall evaluation & actions
[Taking into account the evaluation comments and score above, give some overview evaluation comments and state any actions for future iterations of the simulation or additional simulations needed]

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The role and efficacy of simulation in pre-registration education and training of diagnostic radiographers.

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Appendix 1 Standards mapping for the priority areas for SBE (full text)

These were identified in the project 'The role and efficacy of simulation in pre-registration education and training of diagnostic radiographers'[1] and mapped to professional standards.*

* HCPC SoP - Health and Care Professions Council. Standards of Proficiency: Radiographers (2023) Health and Care Professions Council.
HCPC SoC - Health and Care Professions Council. Standards of Conduct, Performance and Ethics (2024) Health and Care Professions Council.
CoR ECF - The College of Radiographers. Education and Career Framework for the Radiography Workforce (4th Ed) (2022) The College of Radiographers.
IfATE KSBs – Institute for Apprenticeships and Technical Education. Standard for Diagnositc Radiographer Level 6 (2023) Institute for Apprenticeships and Technical Education.

Mapped standards*			
HCPC SOPs	HCPC SoCs	SCoR ECF	IAfTE KSBs
1 Imaging Practice: Generic			
1.1 Justification of imaging requests			
8.15 understand, interpret and act upon information from other healthcare professionals and service users, in order to maximise health gain whilst minimising risks to the service user (such as from radiation dose) 12.9 understand the concept of risk vs benefit with regards to ionising radiation and non-ionising radiation, acknowledging this will differ depending on modality, and communicate this with service users, taking into consideration service user judgement 13.16 interrogate and process data and information gathered accurately in order to conduct the procedures most appropriate to the service user's needs 13.23 authorise and plan appropriate diagnostic imaging examinations	6.1 You must take all reasonable steps to reduce the risk of harm to service users, carers and colleagues, as far as possible	6.1 Fundamental concepts of the science of ionising radiation imaging: radiation production; radiation protection; and statutory obligations relating to ionising radiations as required by Schedule 3 IR(ME)R relevant to medical exposures and scope of practice 6.3 Demonstrate autonomous practice, for example, knowing when an exposure is not justified, and it is therefore not lawful to proceed because either: a) the clinical details provided by the referrer do not fall within authorisation guidelines issued by the IR(ME)R practitioner; b) the patient reveals additional information that means the exposure may no longer be justified or may need to be re-justified; or c) the IR(ME)R practitioner is not identified, 6.7 Application of legislation and regulations governing the use of ionising radiations,	K43: The concept of risk vs benefit with regards to ionising radiation and non-ionising radiation, acknowledging this will differ depending on modality, and communicate this with service users, taking into consideration service user judgement., K49 The capability, applications and range of equipment used in their profession., K56 The signs and symptoms of disease and trauma that result in referral for diagnostic imaging procedures and their image appearances, K57 The structure and function of the human body in health, disease and trauma, as well as common pathologies and mechanisms of disease and trauma, including the:– musculoskeletal system– soft tissue organs– regional and cross-sectional anatomy of the head, neck, limbs, thorax, pelvis and abdomen– the cardiovascular, respiratory, genitourinary, gastrointestinal and neuroendocrine

		7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training), 7.9 Patient presentation, symptoms and clinical indications to ensure appropriate justification and optimisation of the exposure 7.10 Understand the role of an IR(ME)R operator with particular reference to the difference between justification of an exposure (practitioner duty holder role) and authorisation (operator role) under guidelines issued by the practitioner duty holder	systems. S11 Apply legislation, policies and guidance relevant to own profession and scope of practice. S13 Practise in accordance with current legislation governing the use of ionising and non-ionising radiation for medical and other purposes. S19 Make and receive appropriate referrals, where necessary, S83 Manage records and all other information in accordance with applicable legislation, protocols and guidelines
1.2 Image production principles			
12.11 understand and apply the principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection		6.1 Fundamental concepts of the science of ionising radiation imaging: radiation production; radiation protection; and statutory obligations relating to ionising radiations as required by Schedule 3 IR(ME)R relevant to medical exposures and scope of practice, 6.6 Principles, components and operation of medical imaging equipment, including computed radiography, digital radiography, fluoroscopy, mobile, mammography and dual-energy X-ray absorptiometry, computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, radionuclide imaging and positron emission tomography (PET), 6.11 Knowledge of the interactions of exposure factors and technological algorithms for optimising exposure and image quality across a range of imaging modalities, 6.13 Physical principles of matter, atomic structure, radioactivity, electricity, magnetism and sound, 6.15 Primary sources of ionising radiation, interactions of photons with matter and	K45: The principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection. K46: The physical and scientific principles on which image formation using ionising and non-ionising radiation is based.

		relationship to image quality and radiation dose, 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training)	
1.3 Exposure parameter manipulation and effects			
12.11 understand and apply the principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection 13.19 operate radiotherapy or diagnostic imaging equipment safely and accurately relevant to their profession 13.31 adjust ionising radiation exposures and image recording parameters to achieve required image quality at optimal dose for children and adults		6.6 Principles, components and operation of medical imaging equipment, including computed radiography, digital radiography, fluoroscopy, mobile, mammography and dual-energy X-ray absorptiometry, computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, radionuclide imaging and positron emission tomography (PET), 6.11 Knowledge of the interactions of exposure factors and technological algorithms for optimising exposure and image quality across a range of imaging modalities, 6.13 Physical principles of matter, atomic structure, radioactivity, electricity, magnetism and sound, 6.15 Primary sources of ionising radiation, interactions of photons with matter and relationship to image quality and radiation dose, 6.15 Scatter radiation and its relation to image quality and radiation dose , 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training)	K45: The principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection. S91 Adjust ionising radiation exposures and image recording parameters to achieve required image quality at optimal dose for children and adults
1.4 Image quality			
13.31 adjust ionising radiation exposures and image recording parameters to achieve required image quality at optimal dose for children and adults		6.10 Principles of digital imaging, picture archiving and communication systems (PACS), image acquisition, processing, storage, retrieval, transfer and manipulation,	K45: The principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection. S91 Adjust ionising radiation exposures and

		6.11 Knowledge of the interactions of exposure factors and technological algorithms for optimising exposure and image quality across a range of imaging modalities, 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training)	image recording parameters to achieve required image quality at optimal dose for children and adults
1.5 Use of image related & support systems technology			
7.7 use information, communication and digital technologies appropriate to their practice 12.15 understand the capability, applications and range of equipment used in their profession 13.19 operate radiotherapy or diagnostic imaging equipment safely and accurately relevant to their profession 13.33 use to best effect the processing and related technology supporting imaging systems		3.31 Digital literacy - NHS allied health professionals digital competency framework and associated digital literacy skills as appropriate to the role of the radiographer, 6.8 Safe and competent operation of a broad range of imaging and/or treatment equipment and understanding the regulatory requirement for additional training for new and unfamiliar equipment, 6.10 Principles of digital imaging, picture archiving and communication systems (PACS), image acquisition, processing, storage, retrieval, transfer and manipulation, 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training)	K49 The capability, applications and range of equipment used in their profession. S33 Use information, communication and digital technologies appropriate to own practice, S39 Use digital record keeping tools, where required, S93 Use to best effect the processing and related technology supporting imaging systems
Imaging Practice: Radiographic imaging			
1.6 Patient positioning for radiographic examinations			
12.1 understand the structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession 13.22 position and immobilise service users correctly for safe and accurate procedures 13.21 select and explain the rationale for radiographic techniques and immobilisation procedures appropriate to the service user's physical and disease management requirements		7.5 Radiographic skills and patient positioning techniques from neonate to elderly	K37 The structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession, S81 Select and explain the rationale for radiographic techniques and immobilisation procedures appropriate to the service user's physical and disease management requirements, S82 Position and immobilise service users correctly for safe and accurate procedures

1.7 Palpation of landmarks for accurate radiographic examinations and centering			
12.1 understand the structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession 13.22 position and immobilise service users correctly for safe and accurate procedures		3.3 Ethical and legal principles of professional practice: informed consent, confidentiality, record-keeping, data protection and fitness to practise, 7.5 Radiographic skills and patient positioning techniques from neonate to elderly, 8.1 Anatomy of the human body, including disease processes from fetal life to old age, 8.4 Surface anatomy and radiographic terminology	K37 The structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession.
1.8 Accurate beam centering for radiographic examinations			
12.1 understand the structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession 13.19 operate radiotherapy or diagnostic imaging equipment safely and accurately relevant to their profession		7.5 Radiographic skills and patient positioning techniques from neonate to elderly, 7.7 Undertake radiographic techniques on a wide variety of service users at various stages in their life, 8.4 Surface anatomy and radiographic terminology	S79 Operate diagnostic imaging equipment safely and accurately
1.9 Routine projectional radiography examinations			
13.16 interrogate and process data and information gathered accurately in order to conduct the procedures most appropriate to the service user's needs 13.19 operate radiotherapy or diagnostic imaging equipment safely and accurately relevant to their profession 13.25 perform a broad range of standard imaging techniques, including examinations requiring contrast agents for relevant modalities across a variety of diagnostic or screening care pathways 13.31 adjust ionising radiation exposures and image recording parameters to achieve required image quality at optimal dose for children and adults		6.6 Principles, components and operation of medical imaging equipment, including computed radiography, digital radiography, fluoroscopy, mobile, mammography and dual-energy X-ray absorptiometry, computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, radionuclide imaging and positron emission tomography (PET), 6.8 Safe and competent operation of a broad range of imaging and/or treatment equipment and understanding the regulatory requirement for additional training for new and unfamiliar equipment, 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training),	S79 Operate diagnostic imaging equipment safely and accurately, S81 Select and explain the rationale for radiographic techniques and immobilisation procedures appropriate to the service user's physical and disease management requirements, S85 Perform a broad range of standard imaging techniques, including examinations requiring contrast agents for relevant modalities across a variety of diagnostic or screening care pathways

		7.7 Undertake radiographic techniques on a wide variety of service users at various stages in their life	
1.10 Less common projectional radiography examinations			
13.16 interrogate and process data and information gathered accurately in order to conduct the procedures most appropriate to the service user's needs 13.19 operate radiotherapy or diagnostic imaging equipment safely and accurately relevant to their profession 13.25 perform a broad range of standard imaging techniques, including examinations requiring contrast agents for relevant modalities across a variety of diagnostic or screening care pathways 13.26 assist with a range of more complex diagnostic imaging techniques and interventional procedures providing radiographic support to the service user and other members of the multidisciplinary team 13.31 adjust ionising radiation exposures and image recording parameters to achieve required image quality at optimal dose for children and adults		6.6 Principles, components and operation of medical imaging equipment, including computed radiography, digital radiography, fluoroscopy, mobile, mammography and dual-energy X-ray absorptiometry, computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, radionuclide imaging and positron emission tomography (PET), 6.8 Safe and competent operation of a broad range of imaging and/or treatment equipment and understanding the regulatory requirement for additional training for new and unfamiliar equipment, 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training), 7.7 Undertake radiographic techniques on a wide variety of service users at various stages in their life	S58 Apply the principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection, S79 Operate diagnostic imaging equipment safely and accurately, S81 Select and explain the rationale for radiographic techniques and immobilisation procedures appropriate to the service user's physical and disease management requirements, S85 Perform a broad range of standard imaging techniques, including examinations requiring contrast agents for relevant modalities across a variety of diagnostic or screening care pathways
1.11 Complex projectional radiography examinations/ adaptation of technique			
13.16 interrogate and process data and information gathered accurately in order to conduct the procedures most appropriate to the service user's needs 13.18 manage complex and unpredictable situations including the ability to adapt planned procedures		6.6 Principles, components and operation of medical imaging equipment, including computed radiography, digital radiography, fluoroscopy, mobile, mammography and dual-energy X-ray absorptiometry, computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, radionuclide	S58 Apply the principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection, S78 Manage complex and unpredictable situations including the ability to adapt planned procedures,

13.19 operate radiotherapy or diagnostic imaging equipment safely and accurately relevant to their profession 13.21 select and explain the rationale for radiographic techniques and immobilisation procedures appropriate to the service user's physical and disease management requirements 13.28 perform a range of imaging examinations where the service user's individual characteristics require examinations to be carried out using nonstandard techniques 13.31 adjust ionising radiation exposures and image recording parameters to achieve required image quality at optimal dose for children and adults		imaging and positron emission tomography (PET), 6.8 Safe and competent operation of a broad range of imaging and/or treatment equipment and understanding the regulatory requirement for additional training for new and unfamiliar equipment, 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training), 7.6 Adapt imaging procedures, including the specific care required for the imaging of children, 7.7 Undertake radiographic techniques on a wide variety of service users at various stages in their life , 7.8 Understand the individual care needs of service users and be able to adapt diagnostic imaging techniques accordingly	S79 Operate diagnostic imaging equipment safely and accurately, S81 Select and explain the rationale for radiographic techniques and immobilisation procedures appropriate to the service user's physical and disease management requirements, S85 Perform a broad range of standard imaging techniques, including examinations requiring contrast agents for relevant modalities across a variety of diagnostic or screening care pathways, S88 Perform a range of imaging examinations where the service user's individual characteristics require examinations to be carried out using nonstandard techniques
1.12 Manoeuvring mobile xray equipment			
13.19 operate radiotherapy or diagnostic imaging equipment safely and accurately relevant to their profession		6.8 Safe and competent operation of a broad range of imaging and/or treatment equipment and understanding the regulatory requirement for additional training for new and unfamiliar equipment, 7.1 Demonstrate competence in all commonly performed medical imaging procedures and the operation of medical imaging equipment within own scope of practice This includes, as a minimum, the range of medical imaging equipment and commonly carried out radiographic procedures required by the HCPC Standards of Proficiency for Radiographers	S79 Operate diagnostic imaging equipment safely and accurately,
1.13 Mobile radiographic imaging			

13.19 operate radiotherapy or diagnostic imaging equipment safely and accurately relevant to their profession 13.21 select and explain the rationale for radiographic techniques and immobilisation procedures appropriate to the service user's physical and disease management requirements 13.29 perform a range of techniques using mobile imaging equipment outside of a dedicated imaging room 13.31 adjust ionising radiation exposures and image recording parameters to achieve required image quality at optimal dose for children and adults		6.6 Principles, components and operation of medical imaging equipment, including computed radiography, digital radiography, fluoroscopy, mobile, mammography and dual-energy X-ray absorptiometry, computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, radionuclide imaging and positron emission tomography (PET), 6.7 Application of legislation and regulations governing the use of ionising radiations, 6.8 Safe and competent operation of a broad range of imaging and/or treatment equipment and understanding the regulatory requirement for additional training for new and unfamiliar equipment, 7.1 Demonstrate competence in all commonly performed medical imaging procedures and the operation of medical imaging equipment within own scope of practice This includes, as a minimum, the range of medical imaging equipment and commonly carried out radiographic procedures required by the HCPC Standards of Proficiency for Radiographers, 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training)	S58 Apply the principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection, S79 Operate diagnostic imaging equipment safely and accurately, S81 Select and explain the rationale for radiographic techniques and immobilisation procedures appropriate to the service user's physical and disease management requirements, S89 Perform a range of techniques using mobile imaging equipment outside of a dedicated imaging room
1.14 Radiographic image evaluation			
12.1 understand the structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession 12.16 distinguish between normal and abnormal appearances on images 12.24 understand the different communication needs, anatomy and disease processes and their manifestation in children 12.26 understand the signs and symptoms of disease and trauma that result in referral for		6.4 Know the difference between the need for re-justification and the ability to make autonomous decisions to undertake repeat exposures for technical reasons, 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training), 8.1 Anatomy of the human body, including disease processes from fetal life to old age, 8.2 Recognise normal and normal variants on radiographic/medical images, 8.3 Recognise	K37 The structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession., K55: The different communication needs, anatomy and disease processes and their manifestation in children. K56: The signs and symptoms of disease and trauma that result in referral for diagnostic imaging procedures and their image appearances. ,

diagnostic imaging procedures, and their image appearances 12.27 understand the structure and function of the human body in health, disease and trauma, as well as common pathologies and mechanisms of disease and trauma, including the: - musculoskeletal system; - soft tissue organs; regional and cross-sectional anatomy of the head, neck, limbs, thorax, pelvis and abdomen; and - cardiovascular, respiratory, genito-urinary, gastro-intestinal and neuro-endocrine systems 13.17 appraise image information for clinical manifestations and technical accuracy, and take further action as required 13.39 critically analyse clinical images for technical quality and suggest improvement if required 13.40 distinguish disease trauma and urgent and unexpected findings as they manifest on diagnostic images, and take direct and timely action to assist the referrer		abnormal or pathological findings on radiographic/medical images, 8.5 Fracture classification, healing of fractures and pathology of musculoskeletal system , 8.6 Image evaluation to include the factors affecting the diagnostic quality of images	K57 The structure and function of the human body in health, disease and trauma, as well as common pathologies and mechanisms of disease and trauma, including the:– musculoskeletal system– soft tissue organs– regional and cross-sectional anatomy of the head, neck, limbs, thorax, pelvis and abdomen– the cardiovascular, respiratory, genitourinary, gastrointestinal and neuroendocrine systems., S58 Apply the principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection, S59 Distinguish between normal and abnormal appearances on images, S77 Appraise image information for clinical manifestations and technical accuracy, and take further action as required, S99 Critically analyse clinical images for technical quality and suggest improvement if required S100 Distinguish disease trauma and urgent and unexpected findings as they manifest on diagnostic images and take direct and timely action to assist the referrer
Imaging Practice: Theatre fluoroscopic imaging			
1.15 Manoeuvring mobile image intensifier equipment			
13.19 operate radiotherapy or diagnostic imaging equipment safely and accurately relevant to their profession		6.8 Safe and competent operation of a broad range of imaging and/or treatment equipment and understanding the regulatory requirement for additional training for new and unfamiliar equipment, 7.1 Demonstrate competence in all commonly performed medical imaging procedures and the operation of medical imaging equipment within own scope of practice This includes, as a minimum, the range of medical imaging	S79 Operate diagnostic imaging equipment safely and accurately,

		equipment and commonly carried out radiographic procedures required by the HCPC Standards of Proficiency for Radiographers	
1.16 Theatre radiography			
13.19 operate radiotherapy or diagnostic imaging equipment safely and accurately relevant to their profession 13.29 perform a range of techniques using mobile imaging equipment outside of a dedicated imaging room 13.30 manage and assist with imaging techniques performed on anaesthetised or unconscious patients 13.34 manage and assist with fluoroscopic diagnostic and interventional procedures, including those that are complex and involve the use of contrast agents		6.6 Principles, components and operation of medical imaging equipment, including computed radiography, digital radiography, fluoroscopy, mobile, mammography and dual-energy X-ray absorptiometry, computed tomography (CT), magnetic resonance imaging (MRI), ultrasound, radionuclide imaging and positron emission tomography (PET), 6.7 Application of legislation and regulations governing the use of ionising radiations, 6.8 Safe and competent operation of a broad range of imaging and/or treatment equipment and understanding the regulatory requirement for additional training for new and unfamiliar equipment, 7.1 Demonstrate competence in all commonly performed medical imaging procedures and the operation of medical imaging equipment within own scope of practice This includes, as a minimum, the range of medical imaging equipment and commonly carried out radiographic procedures required by the HCPC Standards of Proficiency for Radiographers, 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training)	S58 Apply the principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection, S79 Operate diagnostic imaging equipment safely and accurately, S89: Perform a range of techniques using mobile imaging equipment outside of a dedicated imaging room S90: Manage and assist with imaging techniques performed on anaesthetised or unconscious individuals, S94 Manage and assist with fluoroscopic diagnostic and interventional procedures, including those that are complex and involve the use of contrast agents
Imaging Practice: CT			
1.17 Positioning for CT examinations			

12.1 understand the structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession 13.22 position and immobilise service users correctly for safe and accurate procedures 13.21 select and explain the rationale for radiographic techniques and immobilisation procedures appropriate to the service user's physical and disease management requirements		7.5 Radiographic skills and patient positioning techniques from neonate to elderly, 8.1 Anatomy of the human body, including disease processes from fetal life to old age, 8.4 Surface anatomy and radiographic terminology	S82 Position and immobilise service users correctly for safe and accurate procedures
1.18 CT scan techniques and protocols			
12.1 understand the structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession 13.35 perform a broad range of computed tomographic (CT) examinations, including standard head CT examinations, and assist with CT examinations of the spine, chest and abdomen in acute trauma, and to contribute effectively to other CT studies		7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training), 7.5 Radiographic skills and patient positioning techniques from neonate to elderly, 7.11 Patient presentation, symptoms, clinical indications and selection of the correct imaging protocol in relation to optimisation of the exposure	S81 Select and explain the rationale for radiographic techniques and immobilisation procedures appropriate to the service user's physical and disease management requirements
1.19 CT anatomy			
12.1 understand the structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession 12.16 distinguish between normal and abnormal appearances on images 12.27 understand the structure and function of the human body in health, disease and trauma, as well as common pathologies and mechanisms of disease and trauma, including the: - musculoskeletal system; - soft tissue organs; regional and cross-sectional anatomy of the head, neck, limbs, thorax, pelvis and abdomen; and - cardiovascular, respiratory, genito-urinary, gastro-intestinal and neuro-endocrine systems		7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training), 8.1 Anatomy of the human body, including disease processes from fetal life to old age, 8.2 Recognise normal and normal variants on radiographic/medical images	K37 The structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession. K57 The structure and function of the human body in health, disease and trauma, as well as common pathologies and mechanisms of disease and trauma, including the:– musculoskeletal system– soft tissue organs– regional and cross-sectional anatomy of the head, neck, limbs, thorax, pelvis and abdomen– the cardiovascular, respiratory, genitourinary, gastrointestinal and neuroendocrine systems., S59 Distinguish between normal and abnormal appearances on images

1.20 CT pathology			
12.1 understand the structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession 12.16 distinguish between normal and abnormal appearances on images 12.27 understand the structure and function of the human body in health, disease and trauma, as well as common pathologies and mechanisms of disease and trauma, including the: - musculoskeletal system; - soft tissue organs; regional and cross-sectional anatomy of the head, neck, limbs, thorax, pelvis and abdomen; and - cardiovascular, respiratory, genito-urinary, gastro-intestinal and neuro-endocrine systems		8.3 Recognise abnormal or pathological findings on radiographic/medical images	K37 The structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession. K57 The structure and function of the human body in health, disease and trauma, as well as common pathologies and mechanisms of disease and trauma, including the:– musculoskeletal system– soft tissue organs– regional and cross-sectional anatomy of the head, neck, limbs, thorax, pelvis and abdomen– the cardiovascular, respiratory, genitourinary, gastrointestinal and neuroendocrine systems., S59 Distinguish between normal and abnormal appearances on images, S100 Distinguish disease trauma and urgent and unexpected findings as they manifest on diagnostic images and take direct and timely action to assist the referrer
Imaging Practice: MRI			
1.21 MRI pathology			
12.1 understand the structure and function of the human body, together with knowledge of physical and mental health, disease, disorder and dysfunction relevant to their profession 12.16 distinguish between normal and abnormal appearances on images 12.27 understand the structure and function of the human body in health, disease and trauma, as well as common pathologies and mechanisms of disease and trauma, including the: - musculoskeletal system; - soft tissue organs; regional and cross-sectional anatomy of the head, neck, limbs, thorax, pelvis and		8.3 Recognise abnormal or pathological findings on radiographic/medical images	K57 The structure and function of the human body in health, disease and trauma, as well as common pathologies and mechanisms of disease and trauma, including the:– musculoskeletal system– soft tissue organs– regional and cross-sectional anatomy of the head, neck, limbs, thorax, pelvis and abdomen– the cardiovascular, respiratory, genitourinary, gastrointestinal and neuroendocrine systems., S59 Distinguish between normal and abnormal appearances on

abdomen; and - cardiovascular, respiratory, genito-urinary, gastro-intestinal and neuro-endocrine systems			images, S100 Distinguish disease trauma and urgent and unexpected findings as they manifest on diagnostic images and take direct and timely action to assist the referrer
2 Collaborative person centred care			
2.1 Patient centred care			
2.6 recognise that relationships with service users, carers and others should be based on mutual respect and trust, maintaining high standards of care in all circumstances 2.9 understand the scope of a professional duty of care, and exercise that duty 5.1 respond appropriately to the needs of all groups and individuals in practice, recognising that this can be affected by difference of any kind including, but not limited to, protected characteristics, intersectional experiences and cultural differences 7.11 provide appropriate information and support for service users throughout their diagnostic imaging examinations 13.13 assess, monitor and care for the service user across the pathway of care relevant to their profession 13.27 provide appropriate care for the range of service users and their carers before, during and after imaging examinations, minimally invasive interventional procedures and contrast agent examinations	1.1 You must treat service users and carers as individuals, respecting their privacy and dignity. 1.2 You must work in partnership with service users and carers, involving them, where appropriate, in decisions about the care, treatment or other services to be provided. 1.3 You must empower and enable service users, where appropriate, to play a part in maintaining their own health and wellbeing and support them so they can make informed decisions. 1.10 You must use appropriate methods of communication to provide care and other services related to your practice.	1.1 Principles of patient and service user care, 1.2 Psychosocial models of patient care and being able to recognise and respond to physical, psychological, and social needs of patients, service users and carers, 1.4 Person-centred care, 1.5 Models of partnership working with patients, enablers and barriers to working collaboratively, 1.7 Empathy and compassion in practice, 3.37 Understand the importance of individualised care and advise on procedural side effects using the evidence base, 7.4 Assess patient wellbeing and condition throughout; prior to, during and after imaging, 7.8 Understand the individual care needs of service users and be able to adapt diagnostic imaging techniques accordingly	K6 The scope of a professional duty of care., S6 Promote and protect the service user's interests at all times., S8 Recognise that relationships with service users, carers and others should be based on mutual respect and trust, and maintain high standards of care in all circumstances., S10 Exercise a duty of care. S73 Assess, monitor and care for the service user across the pathway of care relevant to their profession, S87 Provide appropriate care for the range of service users and their carers before, during and after imaging examinations, minimally invasive interventional procedures and contrast agent examinations
2.2 Patient interactions			

2.5 respect and uphold the rights, dignity, values, and autonomy of service users, including their role in the assessment, diagnostic and/or therapeutic process 2.6 recognise that relationships with service users, carers and others should be based on mutual respect and trust, maintaining high standards of care in all circumstances 7.4 work with service users and/or their carers to facilitate the service user's preferred role in decision-making, and provide service users and carers with the information they may need where appropriate 7.8 understand the need to provide service users or people acting on their behalf with the information necessary, in accessible formats, to enable them to make informed decisions 8.17 understand the need to engage service users and carers in planning and evaluating their diagnostic imaging and interventional procedures	1.1 You must treat service users and carers as individuals, respecting their privacy and dignity. 1.2 You must work in partnership with service users and carers, involving them, where appropriate, in decisions about the care, treatment or other services to be provided. 1.3 You must empower and enable service users, where appropriate, to play a part in maintaining their own health and wellbeing and support them so they can make informed decisions. 1.5 You must treat people fairly and be aware of the potential impact that your personal values, biases and beliefs may have on the care, treatment or other services that you provide to service users and carers, and in your interactions with colleagues.	1.3 Sensitive, non-discriminatory and inclusive practice, 1.5 Models of partnership working with patients, enablers and barriers to working collaboratively, 1.7 Empathy and compassion in practice, 2.10 Maintain appropriate boundaries with patients and service users keeping these relationships professional, 7.3 Identify the correct patient before every action and interaction	S7: Respect and uphold the rights, dignity, values, and autonomy of service users, including own role in the assessment, diagnostic, treatment and/or therapeutic process. S8: Recognise that relationships with service users, carers and others should be based on mutual respect and trust, and maintain high standards of care in all circumstances, S24: Recognise the potential impact of own values, beliefs and personal biases, which may be unconscious, on practice and take personal action to ensure all service users and carers are treated appropriately with respect and dignity., S34: Formulate and provide information and support for service users about their treatment and / or imaging process and procedures, with regular reappraisal of their information needs as appropriate, S36: Provide appropriate information and support for service users throughout their diagnostic imaging examinations, S40: Work in partnership with service users, carers, colleagues and others, S42: Identify anxiety and stress in service users, carers and colleagues, adapting own practice and providing support where appropriate, S47: Demonstrate awareness of the need to empower service users to participate in the decision-making processes related to their profession, S74: Undertake and record a thorough, sensitive and detailed clinical assessment, selecting and using appropriate techniques and equipment, B3 Demonstrate emotional intelligence
2.3 Effective patient communication, addressing needs & modification			

7.1 use effective and appropriate verbal and non-verbal skills to communicate with service users, carers, colleagues and others 7.3 understand the characteristics and consequences of verbal and non-verbal communication and recognise how these can be affected by difference of any kind, including, but not limited to, protected characteristics,3 intersectional experiences and cultural differences 7.5 modify their own means of communication to address the individual communication needs and preferences of service users and carers, and remove any barriers to communication where possible 7.6 understand the need to support the communication needs of service users and carers, such as through the use of an appropriate interpreter 12.24 understand the different communication needs, anatomy and disease processes and their manifestation in children	2.1 You must be polite and considerate. 2.2 You must listen to service users and carers and take account of their needs and wishes. 2.3 You must give service users and carers the information they want or need, in a way they can understand. 2.4 You must make sure that all practicable steps are taken to meet service users' and carers' language and communication needs. 2.5 You must use all forms of communication responsibly when communicating with service users and carers.	2.1 Professional communication – written, verbal, non-verbal and presentation, 2.2 Interpersonal, interprofessional and intraprofessional communication, 2.3 Communicating with patients and carers, including those with additional needs additional needs, 2.5 Communication in context: patients, carers, other health and social care professionals, 2.6 Information and support for patients and their carers and/or families	K21: The characteristics and consequences of verbal and non-verbal communication and recognise how these can be affected by difference of any kind including, but not limited to, protected characteristics, intersectional experiences and cultural differences. K22: The need to support the communication needs of service users and carers, such as through the use of an appropriate interpreter. K23: The need to provide service users or people acting on own behalf with the information necessary in accessible formats to enable them to make informed decisions., K55: The different communication needs, anatomy and disease processes and their manifestation in children., S29: Use effective and appropriate verbal and non-verbal skills to communicate with service users, carers, colleagues and others S30: Communicate in English to the required standard for the profession S31: Work with service users and / or own carers to facilitate the service user's preferred role in decision-making, and provide service users and carers with the information they may need where appropriate S32: Modify own means of communication to address the individual communication needs and preferences of service users and carers, and remove any barriers to communication where possible S34: Formulate and provide information and support for service users about their treatment and / or imaging process and procedures, with regular reappraisal of their information needs as appropriate
2.4 Diverse patient needs			

5.1 respond appropriately to the needs of all groups and individuals in practice, recognising that this can be affected by difference of any kind including, but not limited to, protected characteristics, intersectional experiences and cultural differences 5.8 understand the emotions, behaviours and psychosocial needs of people undergoing radiotherapy or diagnostic imaging, as well as that of their families and carers	1.5 You must treat people fairly and be aware of the potential impact that your personal values, biases and beliefs may have on the care, treatment or other services that you provide to service users and carers, and in your interactions with colleagues.	1.3 Sensitive, non-discriminatory and inclusive practice, 1.6 Theories and concepts of health and illness, 7.8 Understand the individual care needs of service users and be able to adapt diagnostic imaging techniques accordingly	K28: The need to engage service users and carers in planning and evaluating diagnostics, and therapeutic interventions to meet own needs and goals, S23: Respond appropriately to the needs of all different groups and individuals in practice, recognising this can be affected by difference of any kind including, but not limited to, protected characteristics, intersectional experiences and cultural differences, S25 Make and support reasonable adjustments in own and others' practice.
2.5 Clinical assessment of patients			
12.14 understand the theoretical basis underpinning service user assessment prior to and during their procedure 13.4 select and use appropriate assessment techniques and equipment 13.14 undertake and record a thorough, sensitive and detailed clinical assessment, selecting and using appropriate techniques and equipment		7.9 Patient presentation, symptoms and clinical indications to ensure appropriate justification and optimisation of the exposure 7.12 Assessment, monitoring and care of the patient before, during and after examination, including recognition of the deteriorating patient and appropriate actions to preserve life	K48: The theoretical basis underpinning service user assessment prior to and during their procedure, S66: Select and use appropriate assessment techniques and equipment S67: Undertake and record a thorough, sensitive, and detailed assessment, S74: Undertake and record a thorough, sensitive and detailed clinical assessment, selecting and using appropriate techniques and equipment
2.6 Recognise and respond to a deteriorating patient			
12.21 recognise and respond to adverse or abnormal reactions to medications used in relation to their profession 13.7 conduct appropriate assessment or monitoring procedures, treatment, therapy or other actions safely and effectively		3.6 Identifying and responding to an anaphylactic event, 7.4 Assess patient wellbeing and condition throughout; prior to, during and after imaging, 7.12 Assessment, monitoring and care of the patient before, during and after examination, including recognition of the deteriorating patient and appropriate actions to preserve life	S60: Recognise and respond to adverse or abnormal reactions to medications used in relation to their profession, S69: Conduct appropriate assessment or monitoring procedures, treatment, therapy or other actions safely and effectively
2.7 Informed consent			

2.7 understand the importance of and be able to obtain valid consent, which is voluntary and informed, has due regard to capacity, is proportionate to the circumstances and is appropriately documented 7.4 work with service users and/or their carers to facilitate the service user's preferred role in decision-making, and provide service users and carers with the information they may need where appropriate 7.8 understand the need to provide service users or people acting on their behalf with the information necessary, in accessible formats, to enable them to make informed decisions	1.4 You must make sure that you have valid consent, which is voluntary and informed, from service users who have capacity to make the decision or other appropriate authority before you provide care, treatment or other services. 2.2 You must listen to service users and carers and take account of their needs and wishes. 2.3 You must give service users and carers the information they want or need, in a way they can understand.	3.3 Ethical and legal principles of professional practice: informed consent, confidentiality, record-keeping, data protection and fitness to practise, 6.5 Be able to follow the employer's procedures relating to Schedule 2.(1)(i) IR(ME)R and have the knowledge and confidence to provide adequate information relating to the benefits and risks of the exposure (follow employer's procedures and protocols)	K4: The importance of valid consent. K5: The importance of capacity in the context of delivering care and treatment., K23 The need to provide service users or people acting on own behalf with the information necessary in accessible formats to enable them to make informed decisions., K43: The concept of risk vs benefit with regards to ionising radiation and non-ionising radiation, acknowledging this will differ depending on modality, and communicate this with service users, taking into consideration service user judgement., S9: Obtain valid consent, which is voluntary and informed, has due regard to capacity, is proportionate to the circumstances and is appropriately documented, S31: Work with service users and / or own carers to facilitate the service user's preferred role in decision-making, and provide service users and carers with the information they may need where appropriate
2.8 Patient perspectives/ experiences			
5.8 understand the emotions, behaviours and psychosocial needs of people undergoing radiotherapy or diagnostic imaging, as well as that of their families and carers		1.2 Psychosocial models of patient care and being able to recognise and respond to physical, psychological, and social needs of patients, service users and carers, 1.6 Theories and concepts of health and illness, 1.7 Empathy and compassion in practice	
2.9 Patient pathways through imaging			

7.10 advise other healthcare professionals about the relevance and application of imaging modalities to the service user's needs 11.5 evaluate care plans or intervention plans using recognised and appropriate outcome measures, in conjunction with the service user where possible, and revise the plans as necessary 13.16 interrogate and process data and information gathered accurately in order to conduct the procedures most appropriate to the service user's needs		7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training), 7.9 Patient presentation, symptoms and clinical indications to ensure appropriate justification and optimisation of the exposure, 8.7 Understand the impact of treatments on disease pathways	K38 Recognise the roles of other professions and services in health and social care and understand how they may relate to the role of radiographer, K49 The capability, applications and range of equipment used in their profession, S35 Advise other healthcare professionals about the relevance and application of imaging modalities to the service user's needs
2.10 Multiprofessional team working			
7.1 use effective and appropriate verbal and non-verbal skills to communicate with service users, carers, colleagues and others 8.1 work in partnership with service users, carers, colleagues and others 8.2 recognise the principles and practices of other health and care professionals and systems and how they interact with their profession 8.3 understand the need to build and sustain professional relationships as both an autonomous practitioner and collaboratively as a member of a team 8.4 contribute effectively to work undertaken as part of a multidisciplinary team	2.6 You must work in partnership with colleagues, sharing your skills, knowledge and experience where appropriate, for the benefit of service users and carers. 2.7 You must share relevant information, where appropriate, with colleagues involved in the care, treatment or other services provided to a service user. 2.8 You must treat your colleagues in a professional manner showing them respect and consideration.	2.9 Awareness of multidisciplinary team meetings and the role they play in patient and service user care, 3.1 Demonstrate the ability to understand and work within a given scope of practice, 4.1 Support and develop an inclusive culture, 4.2 Work collaboratively, 4.4 Interprofessional working: principles and practice, benefits and challenges, 5.12 Ability to engage with peers and colleagues across the range of academic and clinical settings used in imaging and/or radiotherapy education and training	K24 The principles and practices of other health and care professionals and systems and how they interact with own profession, K25 The need to build and sustain professional relationships as both an autonomous practitioner and collaboratively as a member of a team, K38 Recognise the roles of other professions and services in health and social care and understand how they may relate to the role of radiographer, S29 Use effective and appropriate verbal and non-verbal skills to communicate with service users, carers, colleagues and others, S40 Work in partnership with service users, carers, colleagues and others, S41 Contribute effectively to work undertaken as part of a multi-disciplinary team
2.11 Dealing with conflict			

7.1 use effective and appropriate verbal and non-verbal skills to communicate with service users, carers, colleagues and others 7.3 understand the characteristics and consequences of verbal and non-verbal communication and recognise how these can be affected by difference of any kind, including, but not limited to, protected characteristics,** intersectional experiences and cultural differences 8.5 identify anxiety and stress in service users, carers and colleagues, adapting their practice and providing support where appropriate	2.1 You must be polite and considerate.	2.2 Interpersonal, interprofessional and intraprofessional communication, 3.28 The importance of self and self-awareness in developing and managing relationships, 3.29 Emotional intelligence, resilience and motivation	S42 Identify anxiety and stress in service users, carers and colleagues, adapting own practice and providing support where appropriate
3 **Safe & effective practice**			
3.1 Quality assurance of imaging equipment			
11.4 participate in quality management, including quality control, quality assurance, clinical governance and the use of appropriate outcome measures 11.6 recognise the value of gathering and using data for quality assurance and improvement programmes 11.7 understand the principles and regulatory requirements for quality control and quality assurance as they apply to their profession 13.20 check that equipment is functioning accurately and within the specifications, and to take appropriate action in the case of faulty functioning and operation		3.8 Perform routine quality assurance (QA) checks on equipment and report any malfunction, breakdown or faults, 6.5 Be able to follow the employer's procedures relating to Schedule 2.(1)(i) IR(ME)R and have the knowledge and confidence to provide adequate information relating to the benefits and risks of the exposure (follow employer's procedures and protocols), 6.9 Quality control measures and quality assurance (QA) frameworks, QA tests and implementation, 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training)	K8 The legislative, policy, ethical and research frameworks that underpin, inform and influence the practice of diagnostic radiography, K34 The value of gathering and using data for quality assurance and improvement programmes, K35 The principles and regulatory requirements for quality control and quality assurance as they apply to their profession, S11 Apply legislation, policies and guidance relevant to own profession and scope of practice, S54 Participate in quality management, including quality control, quality assurance, clinical governance and the use of appropriate outcome measures
3.2 Dose optimisation			
12.8 understand the radiobiological principles on which the practice of radiography is based 12.9 understand the concept of risk vs benefit with regards to ionising radiation and non-	6.1 You must take all reasonable steps to reduce the risk of harm to service users, carers and colleagues, as far as possible	6.8 Safe and competent operation of a broad range of imaging and/or treatment equipment and understanding the regulatory requirement for additional training for new and unfamiliar equipment, 6.11 Knowledge of	K8 The legislative, policy, ethical and research frameworks that underpin, inform and influence the practice of diagnostic radiography,

ionising radiation, acknowledging this will differ depending on modality, and communicate this with service users, taking into consideration service user judgement 13.31 adjust ionising radiation exposures and image recording parameters to achieve required image quality at optimal dose for children and adults		the interactions of exposure factors and technological algorithms for optimising exposure and image quality across a range of imaging modalities, 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training)	S11 Apply legislation, policies and guidance relevant to own profession and scope of practice, S13: Practise in accordance with current legislation governing the use of ionising and non-ionising radiation for medical and other purposes, S58: Apply the principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection
3.3 Radiation dosimetry and dose calculation			
12.13 understand radiation dosimetry and the principles of dose calculation 13.24 calculate radiation doses and exposures and record and understand the significance of radiation dose		6.5 Be able to follow the employer's procedures relating to Schedule 2.(1)(i) IR(ME)R and have the knowledge and confidence to provide adequate information relating to the benefits and risks of the exposure (follow employer's procedures and protocols), 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training)	K8 The legislative, policy, ethical and research frameworks that underpin, inform and influence the practice of diagnostic radiography, K47 Radiation dosimetry and the principles of dose calculation S11 Apply legislation, policies and guidance relevant to own profession and scope of practice, S13: Practise in accordance with current legislation governing the use of ionising and non-ionising radiation for medical and other purposes, S84: Calculate radiation doses and exposures and record and understand the significance of radiation dose
3.4 Radiation protection and safety			
2.12 practise in accordance with current legislation governing the use of ionising and non-ionising radiation for medical and other purposes 12.11 understand and apply the principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection	6.1 You must take all reasonable steps to reduce the risk of harm to service users, carers and colleagues, as far as possible	6.1 Fundamental concepts of the science of ionising radiation imaging: radiation production; radiation protection; and statutory obligations relating to ionising radiations as required by Schedule 3 IR(ME)R relevant to medical exposures and scope of practice , 6.2 Fundamental concepts of occupational and public radiation protection and statutory obligations relating to ionising radiations as required by the Ionising	K8 The legislative, policy, ethical and research frameworks that underpin, inform and influence the practice of diagnostic radiography, K45 The principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection,

		Radiations Regulations (IRR) 2017 , 6.5 Be able to follow the employer's procedures relating to Schedule 2.(1)(i) IR(ME)R and have the knowledge and confidence to provide adequate information relating to the benefits and risks of the exposure (follow employer's procedures and protocols), 6.16 Scatter radiation and its relation to image quality and radiation dose, 6.17 The evidence base informing the reasoned decision for limiting use of patient contact shielding (e.g. gonad shielding) from standard practice, 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training)	S11 Apply legislation, policies and guidance relevant to own profession and scope of practice, S13: Practise in accordance with current legislation governing the use of ionising and non-ionising radiation for medical and other purposes, S58: Apply the principles of ionising radiation production, interaction with matter, beam modification, administration of radionuclides and radiation protection
3.5 Moving & handling			
14.6 understand and apply appropriate moving and handling techniques		3.15 Mandatory skills training: infection prevention and control; fire training; information governance; cardiopulmonary resuscitation (basic life support), moving and handling; safeguarding	K62 Appropriate moving and handling techniques, S105 Apply appropriate moving and handling techniques
3.6 Basic life support			
14.8 use basic life-support techniques and be able to deal with clinical emergencies		3.15 Mandatory skills training: infection prevention and control; fire training; information governance; cardiopulmonary resuscitation (basic life support), moving and handling; safeguarding	S60 Recognise and respond to adverse or abnormal reactions to medications used in relation to their profession, S107 Use basic life support techniques and deal with clinical emergencies
3.7 Safety checklists eg MRI, contrast agent contraindications			
12.18 know the pharmacology of drugs used in their profession 14.7 ensure the physical safety of all individuals in the imaging/therapeutic work environment, especially with regard to radiation safety and high-strength magnetic fields	6.1 You must take all reasonable steps to reduce the risk of harm to service users, carers and colleagues, as far as possible	3.5 Knowledge of contrast agent types, contraindications, correct administration and adverse reactions , 7.2 Meet the appropriate requirements for diagnostic radiology of IR(ME)R Schedule 3 (adequate training)	K51 The pharmacology of drugs used in their profession, K52 The legislation, principles and methods for the safe and effective administration of drugs used in their profession, S106 Ensure the physical safety of all individuals in the imaging/ therapeutic work environment, especially with regard to radiation safety and high-strength magnetic fields

3.8 Safeguarding			
2.3 understand the importance of safeguarding by actively looking for signs of abuse, demonstrating understanding of relevant safeguarding processes and engaging in these processes where necessary 6.3 recognise and respond in a timely manner to situations where it is necessary to share information to safeguard service users, carers and/or the wider public	5.2 You must only disclose confidential information if: - you have permission; - the law allows this; - it is in the service user's best interests; or - it is in the public interest, such as if it is necessary to protect public safety or prevent harm to other people. 7.1 You must report any concerns about the safety or wellbeing of service users promptly and appropriately. 7.3 You must take appropriate action if you have concerns about the safety or wellbeing of children or vulnerable adults.	3.2 Legislation, policy and ethical frameworks that underpin, inform and influence the practice of radiographers, including in relation to caring for children and vulnerable adults, 3.15 Mandatory skills training: infection prevention and control; fire training; information governance; cardiopulmonary resuscitation (basic life support), moving and handling; safeguarding, 3.32 Definitions and indicators of all forms of abuse, including neglect, and the role of the radiographer in safeguarding	K2 The importance of safeguarding, recognising signs of abuse and the relevant safeguarding processes, K17 When disclosure of confidential information may be required, S28 Respond in a timely manner to situations where it is necessary to share information to safeguard service users, carers and/or the wider public and recognise situations where it is necessary to share information to safeguard service users, carers and/or the wider public
3.9 Human factors			
2.9 understand the scope of a professional duty of care, and exercise that duty 11.3 monitor and systematically evaluate the quality of practice, and maintain an effective quality management and quality assurance process working towards continual improvement 11.8 understand the quality improvement processes in place relevant to their profession	6.1 You must take all reasonable steps to reduce the risk of harm to service users, carers and colleagues, as far as possible, 8.1	3.11 Understand the importance of identifying, reporting and investigating incidents, including errors and near misses, 6.5 Be able to follow the employer's procedures relating to Schedule 2.(1)(i) IR(ME)R and have the knowledge and confidence to provide adequate information relating to the benefits and risks of the exposure (follow employer's procedures and protocols)	
3.10 Clinical environment			

14.1 understand the need to maintain the safety of themself and others, including service users, carers and colleagues 14.2 demonstrate awareness of relevant health and safety legislation and comply with all local operational procedures and policies 14.3 work safely, including being able to select appropriate hazard control and risk management, reduction or elimination techniques, in a safe manner and in accordance with health and safety legislation 14.4 select appropriate personal protective equipment and use it correctly 14.5 establish safe environments for practice, which appropriately manage risk		3.15 Mandatory skills training: infection prevention and control; fire training; information governance; cardiopulmonary resuscitation (basic life support), moving and handling; safeguarding, 6.1 Fundamental concepts of the science of ionising radiation imaging: radiation production; radiation protection; and statutory obligations relating to ionising radiations as required by Schedule 3 IR(ME)R relevant to medical exposures and scope of practice 6.2 Fundamental concepts of occupational and public radiation protection and statutory obligations relating to ionising radiations as required by the Ionising Radiations Regulations (IRR) 2017 6.7 Application of legislation and regulations governing the use of ionising radiations	K60 The need to maintain the safety of themselves and others, including service users, carers and colleagues, K61 Relevant health and safety legislation and local operational procedures and policies, K63 The correct principles and applications of disinfectants, methods for sterilisation and decontamination, and for dealing with waste and spillages correctly, S11 Apply legislation, policies and guidance relevant to own profession and scope of practice, S13 Practise in accordance with current legislation governing the use of ionising and non-ionising radiation for medical and other purposes, S101 Demonstrate awareness of relevant health and safety legislation and comply with all local operational procedures and policies, S102 Work safely, including being able to select appropriate hazard control and risk management, reduction or elimination techniques in a safe manner and in accordance with health and safety legislation, S104 Establish safe environments for practice, which appropriately manages risk, S106 Ensure the physical safety of all individuals in the imaging/ therapeutic work environment, especially with regard to radiation safety and high-strength magnetic fields
3.11 Sterile environments			

14.1 understand the need to maintain the safety of themself and others, including service users, carers and colleagues 14.4 select appropriate personal protective equipment and use it correctly 14.9 know the correct principles and applications of disinfectants, methods for sterilisation and decontamination, and for dealing with waste and spillages correctly		3.15 Mandatory skills training: infection prevention and control; fire training; information governance; cardiopulmonary resuscitation (basic life support), moving and handling; safeguarding	K60 The need to maintain the safety of themselves and others, including service users, carers and colleagues, K61 Relevant health and safety legislation and local operational procedures and policies, K63 The correct principles and applications of disinfectants, methods for sterilisation and decontamination, and for dealing with waste and spillages correctly, S101 Demonstrate awareness of relevant health and safety legislation and comply with all local operational procedures and policies, S102 Work safely, including being able to select appropriate hazard control and risk management, reduction or elimination techniques in a safe manner and in accordance with health and safety legislation, S103 Select appropriate personal protective equipment and use it correctly, S104 Establish safe environments for practice, which appropriately manages risk, S106 Ensure the physical safety of all individuals in the imaging/ therapeutic work environment, especially with regard to radiation safety and high-strength magnetic fields
3.12 Theatre environment			
14.1 understand the need to maintain the safety of themself and others, including service users, carers and colleagues 14.2 demonstrate awareness of relevant health and safety legislation and comply with all local operational procedures and policies 14.3 work safely, including being able to select appropriate hazard control and risk management, reduction or elimination techniques, in a safe manner and in accordance with health and safety legislation 14.4 select appropriate personal protective equipment and use it correctly		6.7 Application of legislation and regulations governing the use of ionising radiations, 7.13 Image-guided procedures and management of controlled and supervised areas	K60 The need to maintain the safety of themselves and others, including service users, carers and colleagues, K61 Relevant health and safety legislation and local operational procedures and policies, S11 Apply legislation, policies and guidance relevant to own profession and scope of practice, S13 Practise in accordance with current legislation governing the use of ionising and non-ionising radiation for medical and other purposes,

14.5 establish safe environments for practice, which appropriately manage risk			S101 Demonstrate awareness of relevant health and safety legislation and comply with all local operational procedures and policies, S102: Work safely, including being able to select appropriate hazard control and risk management, reduction or elimination techniques in a safe manner and in accordance with health and safety legislation, S103: Select appropriate personal protective equipment and use it correctly, S104: Establish safe environments for practice, which appropriately manages risk, S106 Ensure the physical safety of all individuals in the imaging/ therapeutic work environment, especially with regard to radiation safety and high-strength magnetic fields
3.13 Ward environment			
14.1 understand the need to maintain the safety of themself and others, including service users, carers and colleagues 14.2 demonstrate awareness of relevant health and safety legislation and comply with all local operational procedures and policies 14.3 work safely, including being able to select appropriate hazard control and risk management, reduction or elimination techniques, in a safe manner and in accordance with health and safety legislation 14.4 select appropriate personal protective equipment and use it correctly 14.5 establish safe environments for practice, which appropriately manage risk		6.7 Application of legislation and regulations governing the use of ionising radiations, 7.13 Image-guided procedures and management of controlled and supervised areas	K60: The need to maintain the safety of themselves and others, including service users, carers and colleagues, K61: Relevant health and safety legislation and local operational procedures and policies, S11 Apply legislation, policies and guidance relevant to own profession and scope of practice, S13 Practise in accordance with current legislation governing the use of ionising and non-ionising radiation for medical and other purposes, S101: Demonstrate awareness of relevant health and safety legislation and comply with all local operational procedures and policies S102: Work safely, including being able to select appropriate hazard control and risk management, reduction or elimination techniques in a safe manner and in accordance with health and safety legislation S103: Select appropriate personal protective

			equipment and use it correctly S104: Establish safe environments for practice, which appropriately manages risk S106: Ensure the physical safety of all individuals in the imaging/ therapeutic work environment, especially with regard to radiation safety and high-strength magnetic fields
4 Professional behaviours, attributes and skills			
4.1 Responding to emergency incidents			
13.18 manage complex and unpredictable situations including the ability to adapt planned procedures	3.1 You must only practise in the areas where you have the appropriate knowledge, skills and experience to meet the needs of a service user safely and effectively.	3.9 Understand and, when necessary, initiate emergency procedures	S2 Recognise the need to manage own workload and resources safely and effectively, including managing the emotional burden that comes with working in a pressured environment, S14 Identify own anxiety and stress and recognise the potential impact on own practice, S18 Make reasoned decisions to initiate, continue, modify or cease treatment or the use of techniques or procedures, and record the decisions and reasoning appropriately, S78 Manage complex and unpredictable situations including the ability to adapt planned procedures,

			B1 Demonstrate a calm demeanour with empathy, compassion and underpinning emotional resilience to manage day-to-day pressures in unpredictable, emergency and distressing situations, e.g. individuals in cardiac arrest, suffering life changing injuries and/or disease diagnosis
4.2 Working under pressure and managing stress			
1.2 recognise the need to manage their own workload and resources safely and effectively, including managing the emotional burden that comes with working in a pressured environment 3.1 identify anxiety and stress in themselves and recognise the potential impact on their practice	6.3 You must take responsibility for assessing whether changes to your physical and/or mental health will detrimentally impact your ability to practise safely and effectively. If you are unsure about your ability to do so, ask an appropriate health and care professional to make an assessment on your behalf.	3.19 The role and scope of practice of the radiographer; professional behaviour and values; conduct; attitude; accountability, attributes and dispositions, 3.29 Emotional intelligence, resilience and motivation, 3.30 Awareness of own health and the impact of this on own fitness to practise	K9: The importance of own mental and physical health and wellbeing strategies in maintaining fitness to practise. K10: How to take appropriate action if own health may affect own ability to practise safely and effectively, including seeking help and support when necessary, S2 Recognise the need to manage own workload and resources safely and effectively, including managing the emotional burden that comes with working in a pressured environment, S14 Identify own anxiety and stress and recognise the potential impact on own practice, B1 Demonstrate a calm demeanour with empathy, compassion and underpinning emotional resilience to manage day-to-day pressures in unpredictable, emergency and distressing situations, e.g. individuals in cardiac arrest, suffering life changing injuries and/or disease diagnosis
4.3 Managing workflow			
1.2 recognise the need to manage their own workload and resources safely and effectively, including managing the emotional burden that comes with working in a pressured environment 4.5 exercise personal initiative 8.9 demonstrate leadership behaviours appropriate to their practice	3.1 You must only practise in the areas where you have the appropriate knowledge, skills and experience to meet the needs of a service user safely and effectively.		S2 Recognise the need to manage own workload and resources safely and effectively, including managing the emotional burden that comes with working in a pressured environment

4.4 Delivering and interpreting information			
7.7 use information, communication and digital technologies appropriate to their practice 8.15 understand, interpret and act upon information from other healthcare professionals and service users, in order to maximise health gain whilst minimising risks to the service user (such as from radiation dose) 13.2 gather appropriate information 13.3 analyse and critically evaluate the information collected 13.15 use physical, graphical, verbal and electronic methods to collect and analyse information from a range of relevant sources, including service 20 users' clinical history, diagnostic images and reports, pathological tests and results, dose recording and treatment verification systems		2.1 Professional communication – written, verbal, non-verbal and presentation, 2.6 Information and support for patients and their carers and/or families	K29 Information from other healthcare professionals and service users, in order to maximise health gain whilst minimising risks to the service user, such as from radiation dose, S17 Use own skills, knowledge and experience, and the information available, to make informed decisions and/or take action where necessary, S33 Use information, communication and digital technologies appropriate to own practice, S50 Interpret and act upon information from other healthcare professionals and service users, in order to maximise health gain whilst minimising risks to the service user (such as from radiation dose), S64: Gather appropriate information S65: Analyse and critically evaluate the information collected, S75: Use physical, graphical, verbal and electronic methods to collect and analyse information from a range of relevant sources including service user's clinical history, diagnostic images and reports, pathological tests and results, dose recording and treatment verification systems S76: Interrogate and process data and information gathered accurately in order to conduct the procedures most appropriate to the service user's needs
4.5 Decision making			

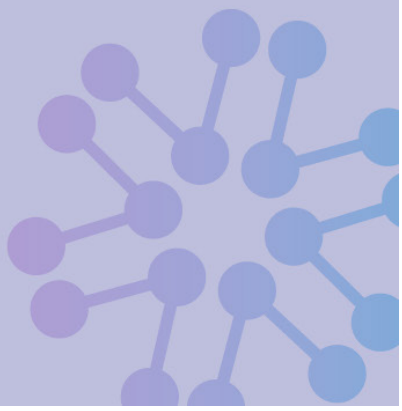
4.1 recognise that they are personally responsible for, and must be able to justify, their decisions and actions 4.2 use their skills, knowledge and experience, and the information available to them, to make informed decisions and/or take action where necessary 4.3 make reasoned decisions to initiate, continue, modify or cease treatment, or the use of techniques or procedures, and record the decisions and reasoning appropriately 12.17 know the concepts and principles involved in the practice of their profession and how these inform and direct clinical judgement and decision-making		3.19 The role and scope of practice of the radiographer; professional behaviour and values; conduct; attitude; accountability, attributes and dispositions, 3.26 Theories of judgement and decision-making in radiographic practice, 3.27 Accountability, responsibility and assessment of risk in relation to the role of the radiographer, 5.3 Critical thinking, making informed decisions/judgements and problem-solving skills	K50 The concepts and principles involved in the practice of their profession and how these inform and direct clinical judgement and decision making S16: Recognise that they are personally responsible for, and must be able to, justify their decisions and actions, S17 Use own skills, knowledge and experience, and the information available, to make informed decisions and/or take action where necessary, S18 Make reasoned decisions to initiate, continue, modify or cease treatment or the use of techniques or procedures, and record the decisions and reasoning appropriately, S22 Use research, reasoning and problem-solving skills when determining appropriate actions
4.6 Critical thinking			
4.7 use research, reasoning and problem-solving skills when determining appropriate actions		5.3 Critical thinking, making informed decisions/judgements and problem-solving skills	S70 Critically evaluate research and other evidence to inform own practice
4.7 Problem solving			
4.6 demonstrate a logical and systematic approach to problem-solving		5.3 Critical thinking, making informed decisions/judgements and problem-solving skills	S21: Demonstrate a logical and systematic approach to problem solving. S22: Use research, reasoning and problem-solving skills when determining appropriate actions.
4.8 Research methods			
13.8 recognise a range of research methodologies relevant to their role 13.9 recognise the value of research to the critical evaluation of practice 13.10 critically evaluate research and other evidence to inform their own practice	3.4 You must keep your knowledge and skills up to date and relevant to your scope of practice through continuing professional development.	5.4 Critical appraisal of the research evidence applicable to imaging and/or radiotherapy practice, 5.8 Hierarchies of evidence and how these underpin evidence-based practice in imaging and/or radiotherapy, 5.9 Selection and interpretation of evidence for imaging and/or radiotherapy practice	K58: A range of research methodologies relevant to own role, K59: The value of research to the critical evaluation of practice, S56 Demonstrate awareness of the principles and applications of scientific enquiry, including the evaluation of treatment efficacy and the research process,

			S70 Critically evaluate research and other evidence to inform own practice
4.9 Professional behaviours			
2.1 maintain high standards of personal and professional conduct 2.4 understand what is required of them by the Health and Care Professions Council, including, but not limited to, the standards of conduct, performance and ethics 4.1 recognise that they are personally responsible for, and must be able to justify, their decisions and actions 4.5 exercise personal initiative 5.3 recognise the potential impact of their own values, beliefs and personal biases (which may be unconscious) on practice and take personal action to ensure all service users and carers are treated appropriately with respect and dignity 8.3 understand the need to build and sustain professional relationships as both an autonomous practitioner and collaboratively as a member of a team 8.10 act as a role model for other	1.9 You must take action to set and maintain appropriate professional boundaries with service users, carers and colleagues., 2.1 You must be polite and considerate. 9.1 You must make sure that your conduct justifies the public's trust and confidence in you and your profession.	3.19 The role and scope of practice of the radiographer; professional behaviour and values; conduct; attitude; accountability, attributes and dispositions, 3.28 The importance of self and self-awareness in developing and managing relationships, 3.30 Awareness of own health and the impact of this on own fitness to practise, 3.35 Demonstrate a commitment to the profession, patient care and the health of the community	K3 What is required of them by the Health and Care Professions Council, including but not limited to the standards of conduct, performance and ethics, S1 Identify the limits of own practice and when to seek advice or refer to another professional or service, S4 Maintain high standards of personal and professional conduct, S15 Develop and adopt clear strategies for physical and mental self-care and self-awareness, to maintain a high standard of professional effectiveness and a safe working environment, S16 Recognise that they are personally responsible for, and must be able to, justify their decisions and actions, S20 Exercise personal initiative, S45 Act as a role model for others, B4 Act with professionalism, honesty, integrity and respect in all interactions. Maintain good character as outlined in their professional Code of Conduct and not bring their profession or organisation into disrepute, B5 Reflect on own impact on others, take responsibility and be accountable for own actions. Sensitively challenge others and raise issues when appropriate,
4.10 Empathy			
5.8 understand the emotions, behaviours and psychosocial needs of people undergoing radiotherapy or diagnostic imaging, as well as that of their families and carers		1.7 Empathy and compassion in practice	B1 Demonstrate a calm demeanour with empathy, compassion and underpinning emotional resilience to manage day-to-day pressures in unpredictable, emergency and distressing situations, e.g. individuals in

			cardiac arrest, suffering life changing injuries and/or disease diagnosis, B3 Demonstrate emotional intelligence
4.11 Values based practice			
5.3 recognise the potential impact of their own values, beliefs and personal biases (which may be unconscious) on practice and take personal action to ensure all service users and carers are treated appropriately with respect and dignity	1.6 You must take action to ensure that your personal values, biases and beliefs do not lead you to discriminate against service users, carers or colleagues. Your personal values, biases and beliefs must not detrimentally impact the care, treatment or other services that you provide.	3.19 The role and scope of practice of the radiographer; professional behaviour and values; conduct; attitude; accountability, attributes and dispositions	S7 Respect and uphold the rights, dignity, values, and autonomy of service users, including own role in the assessment, diagnostic, treatment and/or therapeutic process, S24: Recognise the potential impact of own values, beliefs and personal biases, which may be unconscious, on practice and take personal action to ensure all service users and carers are treated appropriately with respect and dignity.
4.12 Equality, diversity and inclusion			
2.10 understand and apply legislation, policies and guidance relevant to their profession and scope of practice 5.2 understand equality legislation and apply it to their practice 5.7 recognise that regard to equality, diversity and inclusion needs to be embedded in the application of all HCPC standards, across all areas of practice	1.5 You must treat people fairly and be aware of the potential impact that your personal values, biases and beliefs may have on the care, treatment or other services that you provide to service users and carers, and in your interactions with colleagues. 1.6 You must take action to ensure that your personal values, biases and beliefs do not lead you to discriminate against service users, carers or colleagues. Your personal values, biases and beliefs must not detrimentally impact the care, treatment or other services that you provide. 3.5 You must keep up to date with and follow the law, our guidance and other requirements relevant to your practice.	1.3 Sensitive, non-discriminatory and inclusive practice, 3.2 Legislation, policy and ethical frameworks that underpin, inform and influence the practice of radiographers, including in relation to caring for children and vulnerable adults	K7: Legislation, policies and guidance relevant to own profession and scope of practice. K8: The legislative, policy, ethical and research frameworks that underpin, inform and influence the practice of diagnostic radiography. K12: Equality legislation and how to apply it to own practice. K13: The duty to make reasonable adjustments in practice. K14: The characteristics and consequences of barriers to inclusion, including for socially isolated groups. K15: That regard to equality, diversity and inclusion needs to be embedded in the application of all HCPC standards and across all areas of practice.
4.13 Resilience			

1.2 recognise the need to manage their own workload and resources safely and effectively, including managing the emotional burden that comes with working in a pressured environment 3.2 understand the importance of their own mental and physical health and wellbeing strategies in maintaining fitness to practise		3.29 Emotional intelligence, resilience and motivation	K9 The importance of own mental and physical health and wellbeing strategies in maintaining fitness to practise., S2 Recognise the need to manage own workload and resources safely and effectively, including managing the emotional burden that comes with working in a pressured environment, B1 Demonstrate a calm demeanour with empathy, compassion and underpinning emotional resilience to manage day-to-day pressures in unpredictable, emergency and distressing situations, e.g. individuals in cardiac arrest, suffering life changing injuries and/or disease diagnosis
4.14 Professional confidence			
1.1 identify the limits of their practice and when to seek advice or refer to another professional or service	2.6 You must work in partnership with colleagues, sharing your skills, knowledge and experience where appropriate, for the benefit of service users and carers. 3.1 You must only practise in the areas where you have the appropriate knowledge, skills and experience to meet the needs of a service user safely and effectively.	3.19 The role and scope of practice of the radiographer; professional behaviour and values; conduct; attitude; accountability, attributes and dispositions	B2 Confident, flexible and adaptable within own scope of practice
4.15 Raising concerns/ freedom to speak up			

6.3 recognise and respond in a timely manner to situations where it is necessary to share information to safeguard service users, carers and/or the wider public 14.1 understand the need to maintain the safety of themself and others, including service users, carers and colleagues	6.1 You must take all reasonable steps to reduce the risk of harm to service users, carers and colleagues, as far as possible, 6.2 You must not do anything, or allow someone else to do anything, which could put the health or safety of a service user, carer or colleague at unacceptable risk., 7.1 You must report any concerns about the safety or wellbeing of service users promptly and appropriately. 7.2 You must support and encourage others to report concerns and not prevent anyone from raising concerns. 7.3 You must take appropriate action if you have concerns about the safety or wellbeing of children or vulnerable adults. 7.4 You must make sure that the safety and wellbeing of service users always comes before any professional or other loyalties. 7.5 You must raise concerns regarding colleagues if you witness bullying, harassment or intimidation of a service user, carer or another colleague. This should be done following the relevant procedures within your practice or organisation and maintaining the safety of all involved. 7.6 You must follow up concerns you have reported and, if necessary, escalate them.	3.33 Have the courage to speak out and highlight shortfalls in service delivery though appropriate channels and to escalate if necessary, 4.3 Support others to raise concerns openly, providing reassurance and/or escalating further when patient safety is at risk	B5 Reflect on own impact on others, take responsibility and be accountable for own actions. Sensitively challenge others and raise issues when appropriate
4.16 Reflective practice			
10.1 understand the value of reflective practice and the need to record the outcome of such reflection to support continuous improvement		3.23 Reflective practice, models of reflection, learning and clinical supervision	K32 The value of reflective practice and the need to record the outcome of such reflection to support continuous improvement, B6 Actively reflect on own practice and accept and respond to constructive criticism. Be proactive in implementing improvements in order to improve service delivery and patient care



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