Diagnostic Radiography Clinical Assessment Tool (DRAD CAT) Standardisation Project: Findings of the modified-Delphi consensus study.

This work was commissioned and funded by NHS England.

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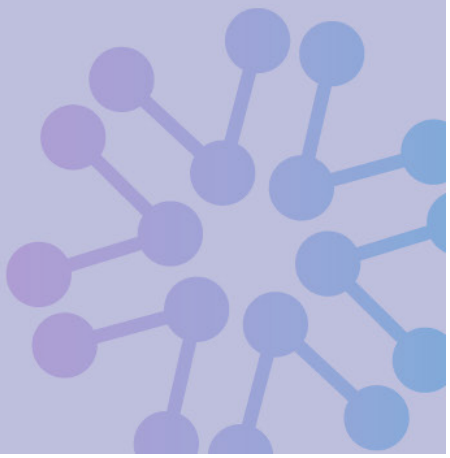
This output has been developed through an externally CoR-commissioned project with funding received from NHSE. This work marks the initial stages of the College of Radiographers' scoping regarding standardised clinical assessment. As outlined in the report recommendations, the College recommends that further research be undertaken to understand and evidence the effectiveness of this tool, including a pilot and evaluation phase. The CoR does not yet endorse use of this tool however, policy and guidance will be updated accordingly as the evidence base grows.



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NHS PB ERC Project 1.4

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Diagnostic Radiography Clinical Assessment Tool (DRAD CAT) Standardisation Project

Findings of the modified-Delphi consensus study

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Introduction

In 2021 colleagues from across the Midlands region established the Diagnostic Radiography Workforce Action group with the support of Health Education England (Midlands). The group was composed of education providers, radiology service managers, clinical colleagues involved in pre-registration student radiographer education, and representatives from NHS England. One of the key recommendations to emerge from the action group was the standardisation of the clinical assessment requirements for pre-registration diagnostic radiography education across the region. A literature review and scoping exercise (stage 1) was undertaken in 2022, as the first step towards a consistent approach to clinical assessment processes for both education and placement providers in the region. A Delphi study (stage 2) using an expert panel was carried out in 2023 to reach consensus on the contents of a standardised regional portfolio.

In 2024, the Society of Radiographers (SoR) commissioned this project, building upon the Midlands projects, with a view to developing a national standardised clinical assessment tool (CAT) for pre-registration diagnostic radiography education. A full systematic review and scoping review were conducted in phase one of this project. The systematic review synthesised international evidence from allied health professions, nursing, midwifery, and medicine to understand what could be learnt to support the standardisation of clinical assessment in pre-registration education for diagnostic radiography. The systematic review found there was a considerable amount to learn from the processes, methods and evaluations of standardisation attempts across other professions.

The objective of the scoping review was to compare current clinical assessment tools in UK pre-registration diagnostic radiography education and provide recommendations for a national standardised clinical assessment tool. The scoping review found evidence that elements of standardisation already existed for clinical placement in some current CATs (e.g. induction checklists, mandatory training, roles and responsibilities, sickness/absence policy, attendance, and a reflective component). However, there were other elements of the current tools that required further discussion and standardisation. These areas included use of continuous assessment, the consistent use of marking rubrics and associated wording, standardised feedback formats, the selection of competencies and assessments to be included (and their associated wording), and the introduction of tripartite-style reviews for all pre-registration diagnostic radiography programmes.

Both the systematic and scoping reviews concluded that a modified-Delphi consensus process including national stakeholders, with support from a research steering group, should be carried out as the next phase in the development of a standardised CAT for diagnostic radiography. The objective was to widely consult key stakeholders to reach consensus on the content and wording of a new, standardised CAT. Prior to the commencement of the modified-Delphi, the research team carried out a mapping exercise which is explained in detail in the next section to inform which clinical competencies and assessments to include in the draft standardised tool.

Mapping Exercise

To ensure compliance with relevant professional and educational standards, a comprehensive mapping process was undertaken during the development of the DRAD CAT. Key standards included in the mapping were, the Health and Care Professions Council (HCPC) Standards of Proficiency (SoP) (2023) and Standards of Conduct (2024), the College of Radiographers' Education and Career Framework (2022), and the Diagnostic Radiography Apprenticeship knowledge, skills, and behaviours (KSBs) outlined by the Institute for Apprenticeships and Technical Education (iFATE, 2023). These standards provided a baseline for aligning the new tool with well-established and new, updated requirements for the profession.

The mapping process involved a detailed examination of each standard, identifying common themes/domains across the documents, to ensure a holistic and integrated approach. These were categorised under three primary headings: academic, professional behaviours, and clinical competencies. To facilitate clarity and consistency, each standard was colour-coded according to its respective category. Within these categories, further thematic analysis was conducted to identify specific areas of focus, ensuring that the CAT reflected the breadth and depth of competencies required for pre-registration diagnostic radiography education. Table 1 lists the themes identified for the professional behaviours and clinical competency domains only.

Table 1: Professional behaviours and clinical competency themes.

Themes/Domains	
Clinical Competencies	**Professional Behaviours**
Informed consent	Safe and effective practice
Safety of self, service user, carers, and colleagues	Professional conduct
Record keeping & confidentiality	Person centred care
Radiation protection	Legislation, policies and guidance
Contrast and IV	Radiation, QA, high-strength magnetic fields
Image evaluation	Wellbeing
Person centred care	Confidentiality
Technique / Examination (axial, appendicular and CXR) - (standard technique)	Communication
CT	Interprofessional
MRI	Continuing Professional Development (CPD)
Technique / Examination (axial, appendicular and CXR) - (adapted technique)	Leadership
Technique / Examination (fluoroscopy / theatre / interventional)	
Imaging related digital technology	
Technique / Examination - mobiles	
Assist with Ultrasound	
Assist with Nuclear Medicine	

Methods

Study design

A Delphi consensus study was selected for the standardisation process, consisting of a multistage survey method where individual opinions were sought and combined to reach a group consensus (Beiderbeck et al. 2021). One benefit of using the Delphi method was that it was not linked to a specific ontological position or epistemological approach and could be implemented across both quantitative and qualitative research (St. John-Matthews et al., 2017). This project adopted a *modified*-Delphi approach, which built upon the outcomes of the earlier scoping and systematic review stages and involved consultation with a research steering group to guide the study process (Nasa et al. 2021). To mitigate the risk of bias, the steering group was made up of a range of stakeholders, including learners, academics, clinical partners and researchers (Appendix A). Communications concerning the modified-Delphi study and recruitment of the expert panel were extensive to ensure this process reflected representation from current learners, academics, and clinical partners from across the UK.

As members of the steering group would not be acting as participants in the Delphi process, they piloted the first round of the modified-Delphi survey. Prior to the commencement of each round, the survey questions were submitted for ethical approval via the University of Derby ethics committee (ethical approval number: ETH2425-0298). The steering group set the level of consensus for the study at 70% as guided by the systematic review and previous literature (Molyneux et al., 2023; Perez-Chada et al., 2021). The steering group met before and between each round of the study to review the results. The research team, informed by the steering group, prepared a summary of each previous round to report back to participants at the start of each subsequent round.

Data collection

Prior to the commencement of the study, the research team identified communication channels which could be used to circulate the study invitation. These included the Society & College of Radiographers mailing list and social media accounts, and research team members social media accounts. In addition, several Imaging Networks and Imaging Academies in England, several HEI's in the UK, and clinical staff working in NHS Trusts in the UK, were able to share information about the study via email and posters in staff rooms and communal areas. This encouraged a range of participants in a wide variety of roles to contact the research team and register their interest in participating.

Due to the nature of a modified-Delphi, it was important to ensure that detailed and thorough recruitment took place in the initial stages of the project, as only those who completed round one would be eligible to take part in subsequent rounds. The importance of taking part in all three rounds was communicated to participants at the recruitment stage.

Before taking part in round one, a participant information sheet (PIS) was provided outlining the rationale for the study, details about expected input (time), information regarding consent, statements regarding confidentiality and anonymity (using a unique identifier) and their right

to withdraw. All participants gave informed consent via the online survey at the beginning of each round and provided an email address to opt-in to the next round. No deceptive methods were used. Researchers stored the list of participants who completed each round on a secure OneDrive separate to their survey data and contacted them via email with a link to subsequent rounds. Email reminders were sent to all participants before the closure of each survey, with an opportunity to ask any questions. A debriefing sheet was sent to all participants at the end of the final round, alongside a summary report of the results.

Each round was created using Microsoft Office Forms™, which allowed the research team to build a survey with the level of sophistication required for a modified-Delphi study. A unique web address that linked to the survey was included within the email invitation sent to participants. The use of anonymous online surveys ensured reliability, as participants were able to complete it at a convenient time, hopefully encouraging participation in all three rounds. The anonymous and asynchronous completion of the surveys minimised any issues around power and authority, as the research team were not able to identify participants.

Participants were asked a set of demographic questions at the start of the first round, this allowed the researchers to describe the sample when reporting the data. These included questions concerning years of experience in diagnostic radiography, role in the discipline, whether they assessed learners, and general geographic location (based on the SoR's regional committees and national council). Consensus questions were asked using a 4-point Likert Scale (strongly agree, agree, disagree, strongly disagree), which has been shown to produce stable results in Delphi studies (Atkins et al, 2005). A full set of questions from each round is included in Appendix B, C and D.

Free text entry boxes were provided throughout each round to allow participants to comment on relevant questions. Qualitative data analysis was based upon Braun and Clarke's (2017) six-step thematic analysis process. Features of the MS Forms software allowed the research team to create descriptive statistics to report demographic information from the participants and highlight the level of consensus.

Results

Round One

Participants

116 participants signed up to participate in round one, 110 completed the survey with 101 providing a contact email to participate in round two. Of those who participated, 69 currently supervised learners. The demographics of the round one participants are shown in Table 2.

Table 2: Participant demographics from round one

	Respondents n = 110
Role	
Student or apprentice radiographer	13
Clinical Manager	9
Practice Educator	29
Clinical Radiographer	19
Academic	31

Other*	9
Location	
Scotland	4
Wales	4
England: Eastern	7
England: Midlands	33
England: London	2
England: Northwest	8
England: Northern	4
England: Southeast	10
England: Southwest	21
England: Yorkshire and North Trent	17
Course	
Apprentice on a BSc	5
BSc	5
MSc-pre reg	3
Apprentice on MSc-pre reg	1
Years Experience	
Under 1 year	5
1-5 years	17
6-10 years	22
11-15 years	22
16+ years	44

*Other: Clinical manager & Academic (2 employers); Practice Placement Manager; Patient Safety Partner; Practice Educator & Clinical Manager; Educator Lead; Masters student of Medical Imaging Technology; Radiology Clinical Tutor; Academic & Clinical Manager; Clinical Liaison & Advanced Practitioner.

Part 1: Underlying Principles of DRAD CAT

In round one we invited participants to comment on 10 underlying principles for the proposed standardised diagnostic radiography clinical assessment tool (DRAD CAT) which had been derived from the systematic review and scoping review stages of the project (Table 3).

Table 3: Underlying Principles for DRAD CAT

Underlying Principles for DRAD CAT
• DRAD CAT has been designed to take a holistic approach to the clinical education and assessment of pre-registration diagnostic radiography learners. Therefore, there is an equal emphasis on professional behaviours and clinical competencies. • DRAD CAT has been designed to be used as a continuous assessment of clinical competency and professional behaviour over the duration of the learner's programme of study. • DRAD CAT has been designed with the recognition that learners develop clinical competency and professional behaviours at different speeds, depending on their prior knowledge and skills. • DRAD CAT has been designed to enable flexibility within clinical placement learning. Learners are supported to learning in a range of different clinical environments, as well as Imaging departments. This will also benefit placement providers, by supporting more flexibility within learner rotas. • DRAD CAT has been designed to have a strong emphasis on reflective practice and regular self-assessment of progress. • DRAD CAT uses a mixture of formative and summative assessment methods to measure learner's progress. Formative assessment includes self-assessment, clinical competencies, professional behaviours, observed practice and feedback

from others (peers, service users and carers). Summative assessment is via the integrated review process.
- DRAD CAT incorporates an integrated review process for each placement, including an initial objective setting meeting (formative), mid-point review (formative) and end of placement review (summative). The summative is informed by all elements of formative assessment and acts as a progression gateway to the next stage of clinical education.
- DRAD CAT includes an additional formative assessment for learners in their final placement, a one-day observation of practice.
- DRAD CAT incorporates a feedback and grading system which recognises learner's achievements and makes recommendations for areas of development.
- DRAD CAT has been mapped to the HCPC Standards of Proficiency (2023), the HCPC Standards of Conduct (2024), the 4th edition of College of Radiographers Education & Career Framework (2022) and the Knowledge, Skills and Behaviours of the Apprenticeship Standard for Diagnostic Radiography (2023).

Participants in round one were generally very supportive of the underlying principles, with no significant issues identified. Participants indicated that they liked the holistic approach to clinical assessment outlined by the principles and felt that it would ensure inclusivity for all learners. Participants appeared to appreciate the support that this holistic approach would offer for differing learning needs, the development of skills at different speeds, ensuring equity rather than equality, and supporting learners who were neurodivergent. There were positive comments about how the principles could support widening participation, flexible working practices and [learners'] ownership of learning. The emphasis on reflective practice seemed to be very well received, with most participants clearly understanding the rationale for this. There were some comments about the use and/or value of peer/patient/carer feedback, which the research team will consider.

Participants in round one requested more detail about some of the underlying principles, particularly the impact on clinical staff time for the integrated review process, the use of the one-day assessment as a gateway, and the level of competency which would need to be demonstrated at the end of each placement. There were also comments from participants about the need for clinical assessor training to ensure quality and consistency of feedback and/or grading of assessments. The research team were confident that these questions and clarifications could be picked up as part of the clinical assessor training. It had been identified by the research team that comprehensive standardised clinical assessor training would be essential to the successful rollout of DRAD CAT, and this is therefore a recommendation of this report.

Part 2: Elements of Assessment Included in DRAD CAT

In round one, the research team proposed various elements for inclusion in the DRAD CAT. These elements were guided by the scoping review conducted by the research team and were based upon the mapping exercise undertaken by the research team. The suggested elements were professional behaviours; clinical competencies; reflections and self-

assessment; observations of practice; and feedback from others. Consensus rates for each are outlined in Table 4.

Table 4: Consensus reached in round one for the proposed draft elements

	Strongly Agree	Agree	Disagree	Strongly Disagree	Consensus
Professional behaviours	82.7%	16.4%	0.9%	0%	99.1%
Clinical competencies	88.2%	10%	1.8%	0%	98.2%
Reflections and self-Assessment	51.8%	41.8%	5.5%	0.9%	93.6%
Observations of practice	60.9%	27.3%	8.2%	3.6%	88.2%
Feedback from others	65.5%	25.5%	9.1%	0%	91%

As each element of assessment proposed reached a consensus the steering group agreed that no further questions about the inclusion of these elements were required.

Part 3: The Integrated Review Process

The research team proposed an integrated review process for the DRAD CAT in round one, which involved an initial, a mid-point and a final review meeting between the learner and the practice educator or clinical assessor. The full example of the review process provided to participants is presented in Appendix E. This reached consensus in round one, with 88.2% of participants either strongly agreeing or agreeing with the process (see Table 5).

Table 5: Consensus reached in round one for the integrated review process

Strongly Agree	Agree	Disagree	Strongly Disagree	Consensus
40.9%	47.3%	10.9%	0.9%	88.2%

Some suggestions were made for minor adjustments to wording. Many participants stated that the process was supportive and/or necessary, and that they liked the standardised approach. Further feedback indicated that participants felt the review process would help to highlight concerns earlier and had the potential to reduce issues with ‘failing to fail.’

Participants also liked that the review process would help monitor the learners’ progress. However, many participants did express concerns about the time involved to undertake the reviews, and the impact on clinical staff workload. Some participants also raised an important point, that not all sites have a practice educator or education team, and those that do, some are recruited on a fixed term basis.

Several suggestions were offered to mitigate these concerns, which were to have an academic member of staff involved in the review, and to take a tripartite approach, with more meetings taking place for struggling learners. Finally, it was highlighted that some sites may

struggle to complete the initial review within the first week, especially the sites with large numbers of learners from different HEIs. As consensus was reached, a summary of findings, with no further questions, was incorporated into round two.

Part 4: Draft Clinical Competency Domains

Participants in round one agreed or strongly agreed with the inclusion of the suggested clinical competencies in the DRAD CAT, with all domains reaching consensus (see Table 6).

Table 6: Consensus for the draft clinical competency domains

	Strongly Agree	Agree	Disagree	Strongly Disagree	Consensus
1. Informed Consent	45.5%	51.8%	2.7%	0%	97.3%
2. Safety of self, service users, carers, and colleagues	53.6%	45.5%	0.9%	0%	99.1%
3. Record keeping and confidentiality	60%	40%	0%	0%	100%
4. Radiation protection	53.6%	34.5%	10%	1.8%	88.1%
5. Use of imaging related digital technology and supporting systems	50%	40%	10%	0%	90%
6. Safe use of contrast media and IV cannulation skills	42.7%	43.6%	10.9%	2.7%	86.3%
7. Image evaluation and escalation of concerns	61.8%	35.5%	2.7%	0%	97.3%
8. Projection Radiography (axial, appendicular and chest – standard techniques)	55.5%	31.8%	10.9%	1.8%	87.3%
9. Projection Radiography (axial, appendicular and chest – adapted techniques)	50.9%	37.3%	10.9%	0.9%	88.25
10. Technique/examination (fluoroscopy, theatre and interventional)	40.9%	42.7%	15.5%	0.9%	83.6%
11. Projection Radiography (mobiles)	47.3%	38.2%	13.6%	0.9%	85.5%
12. CT – Head, body, spine	44.5%	39.1%	15.5%	0.9%	83.6%
13. MRI – Brain, spine, extremity	43.6%	40%	14.5%	1.8%	83.6%
14. Assist with Ultrasound examinations	48.2%	40%	9.1%	2.7%	88.2%
15. Assist with Radionuclide examinations	41.8%	45.5%	11.8%	0.9%	87.3%

There were several suggestions to refine the wording of some of these domains, and therefore questions related to this were included in round two. There were also some issues

highlighted with regards to the expectation that learners would be able to act as chaperones for intimate examinations in ultrasound. A specific question related to this was included in round two.

Participants were concerned about the term ‘skill’ being used within the title of domain six (as shown in Table 6). Comments from participants indicated that this was because learners would not be able to administer IV contrast or undertake cannulation until qualified. Therefore, participants asked for *"skills"* to be removed from the title and be replaced with “*within the student’s scope of practice,"* which was presented in round two.

In round one, the domain “*Image Evaluation and Escalation of Concerns"* was collated. Based on feedback from round one, we proposed splitting this domain into two parts in round two as follows:

> 7A: *“Ability to appraise images for quality, technical acceptability and accuracy and suggest improvements if required".*
>
> 7B: *“Ability to take appropriate action to escalate concerns if unexpected findings are identified".*

In addition, participants also expressed that the *‘Fluoroscopy, Theatre, and Interventional’* domain needed to be separated due its complexity. Based on this feedback, we proposed splitting this in round two as follows:

> 10A: *“Ability to assist in a range of Interventional and Fluoroscopy Procedures, including anaesthetised or unconscious patients"*
>
> 10B: *“Ability to perform a range of examinations within a Theatre environment, including anaesthetised or unconscious patients".*

Participants highlighted in round one that abdominal imaging (AXR) needed to be added to the domains eight and nine (as shown in Table 6); therefore, the abdomen was added to these competencies for round two. There were requests for more granular detail, setting out clear expectations for learners to achieve, and links to local rules, policy and legislation. As already identified in the underlying principles, clarification on expectations would need to be part of standardised clinical assessor training, alongside a glossary of terms to ensure consistent understanding of the terminology used in the DRAD CAT.

There were several comments highlighting issues with access to specific imaging modalities at specific placement sites. However, as the DRAD CAT has been designed to be used for the duration of a learner’s programme, this should be addressed by rotation between placement sites. It was also highlighted that mammography, DXA, forensic, paediatric, dental imaging were not specifically named within the current clinical competency domains. To address this, specific questions were asked about these areas of practice in round two.

Finally, several participants highlighted the possibility of using simulation to achieve some clinical competency domains. No further questions were asked about this as there is a separate Society and College of Radiographers commissioned project looking at the role of simulation.

Part 5: Draft Professional Behaviours Domains

Participants were asked to what extent they agreed or disagreed with each of the draft Professional Behaviours domains and results are shown in Table 7. The findings from each domain are summarised below.

Table 7: Consensus reached on the professional behaviour domains from round one

	Strongly Agree	Agree	Disagree	Strongly Disagree	Consensus
Safe and effective practice	57.3%	40%	2.7%	0%	97.3%
Professional conduct	59.1%	38.2%	2.7%	0%	97.3%
Person-centred care	59.1%	35.5%	5.5%	0%	94.6%
Wellbeing of self and others	50.9%	47.2%	5.5%	0.9%	98.1%
Communication skills	59.1%	35.5%	4.5%	0.9%	94.6%
Interprofessional relationships	58.2%	39.1%	2.7%	0%	97.3%
Leadership qualities	48.2%	40.9%	10.9%	0%	89.1%
Continuing Professional Development (CPD)	57.3%	36.4%	5.5%	0.9%	93.7%

Comments made by participants in the free text boxes of this part of the survey were thematically analysed and considered by the research team and summarised below.

Safe and Effective Practice

There were several comments on the need for consistent demonstration of this domain beyond assessment to ensure application to practice. As such, the word *'consistently'* was added into the description. Participants highlighted the need for the learner to be aware of their own limitations to meet this domain. This was addressed by the inclusion of the phrase *'within scope of practice.'* There was some concern about the breadth of this domain, and therefore the feasibility of assessing it. The research team have noted this needs to be addressed within clinical assessor training.

Professional Conduct

Participants focused on the need for learners to take responsibility for their professional conduct. There were requests for clarification of broad concepts with measurable assessment parameters that provide examples. Participants made recommendations for the addition of concepts such as civility, emotional intelligence, and stronger environmental association/wellbeing. The research team felt these were important points which should be covered in clinical assessor training to ensure assessors were well prepared to gauge learners' performance in this domain.

Person-Centred Care

Participants highlighted the importance of person-centred care, including respect for values, beliefs, preferences, and 'making every contact count.' There were some helpful suggestions made relating to including aspects of cultural competency, protected characteristics, and holistic patient care. These suggestions should be fed into the clinical assessor training package.

Wellbeing of Self and Others

There was emphasis on the need for education and clarity surrounding the role of radiographers in public health initiatives to ensure learners could be fairly assessed on this domain. Some participants suggested a separation between personal health management and public health promotion. However, as the new AHP Public Health Strategy for 2025-2030 has just been published, the research team felt that clear links to this strategy in clinical assessor training should provide the clarification required. Participants highlighted the importance of addressing mental health, individual support systems, and recognising when unfit to work. These should also be fed into clinical assessor training.

Communication

Participants were supportive of this domain and had relatively few suggestions for changes, including rewording *'tailor'* to *'adapt'* to support the HCPC SoPs. There were requests for examples to illustrate how this domain would apply to patients, carers, staff and visitors. It was suggested that use of social media was included in this professional behaviour to align with the HCPC SoPs, which the research team have actioned, alongside examples to illustrate how this domain be assessed in clinical assessor training.

Interprofessional Relationships

Participants requested examples to help assessors understand the expectations for this domain, including scenarios. This request will be fed into clinical assessor training. There were also comments suggesting a more detailed and structured approach to assessing interprofessional collaboration, including feedback from multiple team members. DRAD CAT will include a template for feedback on interprofessional learning opportunities, to allow learners to include these experiences such as attending a Multi-Disciplinary Team meeting, spending time in the Emergency Department or an Orthopaedic Clinic, or spending time in a ward area.

Leadership Qualities

Some participants were concerned about the equal opportunities for learners to evidence leadership within their placements. Participants provided feedback on addressing specific areas, like teamwork, and timely communication, to ensure this domain was appropriately covered. This should be fed into clinical assessor training.

Continuing Professional Development (CPD)

Participants highlighted the importance of lifelong learning and the role of CPD in a learner's professional development. There were some helpful suggestions to revise the wording of the

definition for this domain, which the research team have actioned by including the phrase, *'new technologies, applications, practices, and innovations,'* to align with the HCPC SoPs.

Part 6: Marking Criteria Options

In round one we proposed three marking criteria for the DRAD CAT: a modified version of Benner's Novice to Expert model (Benner, 1982), a modified version of the Common Placement Assessment Form (CPAF) used in physiotherapy (Chartered Society of Physiotherapy, 2024) and a modified version of the Australian Nursing Standards Assessment Tool (Ossenberg et al. 2020). These examples were identified as best practice in the systematic review but have been slightly modified by the research team and the steering group to suit diagnostic radiography. The full examples of each proposed marking criteria provided to participants is presented in Appendix F. Round one asked which of these three marking criteria would be suitable for the DRAD CAT and the results are shown in Table 8.

Table 8: Consensus regarding the suggested marking criteria

	Strongly Agree	Agree	Disagree	Strongly Disagree	Consensus
Modified Benner	30.9%	49.1%	14.5%	5.5%	80%
Modified CPAF	19.1%	43.6%	26.4%	10.9%	62.7%
Modified ANSAT	18.2%	40.9%	31.8%	9.1%	59.1%

Comparing preferences across the different participant roles in round one, 91% of learners preferred the modified Benner. The modified ANSAT was marginally the preferred criteria from academics with 68% preference. For clinical colleagues, 88% preferred the modified Benner, alongside 82% practice educators. This shows a slight variation in preferences, albeit by small deviations, between academics and the other participant groups presented in Table 9.

Table 9: Preference for marking criteria by role

	Learners (n = 11)		Academics (n = 25)		Clinical (n = 26)		Practice Educators (n = 28)	
Modified Benner	Agree	10	Agree	16	Agree	23	Agree	23
	Disagree	1	Disagree	9	Disagree	3	Disagree	5
Modified CPAF	Agree	7	Agree	15	Agree	17	Agree	17
	Disagree	4	Disagree	10	Disagree	9	Disagree	11

Modified ANSAT	Agree	5	Agree	17	Agree	19	Agree	15
	Disagree	6	Disagree	8	Disagree	7	Disagree	13

In round one participants were asked to indicate which marking criteria would be most appropriate for each different clinical competency and each professional behaviour domains. Neither the modified CPAF nor the modified ANSAT reached consensus for any domain. The modified Benner scored highest on all but two of the domains, where the modified CPAF was marginally more popular, for assisting with Ultrasound and Radionuclide Examinations.

Summary of round one feedback on modified Benner model

80% of participants either agreed, or strongly agreed, that this model was suitable for use in the DRAD CAT, highlighting positives such as being well suited to practical skills and having fewer anchor points to aid consistency across assessors. However, some participants felt this model was not suited to the DRAD CAT. Four participants felt that the modified Benner was not suitable for assessing professional behaviours. Some participants also felt that this model would not be suitable for specific competencies (e.g. NM and U/S, IV cannulation, radiation protection or confidentiality, MRI, some CT examinations).

Seven participants highlighted that training would be needed for assessors on grade boundaries and appropriate competency "sign off" for learners. This would help reduce inconsistency/subjectivity between assessors. Participants felt that this model was useful for supporting assessor and learner understanding of feedback and felt that feedback should be "the focus of the continuous assessment".

Many participants commented on the wording of the anchor points in the modified Benner model, highlighting issues such as lack of detail. It was highlighted that the anchor points may require further expansion, as some were perceived as being too similar. Participants mentioned that the model wording should reflect the HCPC SoPs, suggesting *"proficient"* not *"competent"*. Participants also felt that differentiation was important, and that clear definitions were needed which outlined expectations for different year groups. Two participants felt that the wording around independent practice was not suitable as learners should always be supervised. Some participants felt that there were too many options to choose from. Some participants felt that this model lacked a "fail" and "not applicable" options and expressed concern around ‘failure to fail’ from assessors. One participant suggested grading needed to be HEI specific and another pointed out that the scale did not differentiate for excellence. One participant very strongly felt that the team should refrain from using grading within the DRAD CAT.

Summary of round one feedback on modified CPAF

Participants were mixed in their opinions of the modified CPAF. Some felt that having more detail was a positive, with the larger range of options supporting differentiation. Others felt that this was a good form for learners to understand their strengths and weaknesses and that the numbers were meaningful which echoed academic assignments and rewarded high achievers.

Whilst two participants commented that the modified CPAF was more suitable for professional behaviours, another participant said the opposite. One commented that percentages were not suitable and there were concerns that these criteria would not be adaptable to all assessments. There were also concerns that there could be issues between different programmes/HEIs where marking thresholds may differ (e.g. BSc and MSc).

A dozen participants felt the modified CPAF was too complicated, with too many options, that the anchor points were difficult to differentiate and that it was too subjective. One participant felt it needed the addition of a 'Not Applicable' option. Five participants pointed out that training/guidance would be needed, especially to help staff give appropriate higher grades, as very few students achieve +80%. One participant highlighted that grading could inflate attainment, whilst another felt that learners were either competent or not, and a yes/no or pass/fail was required, rather than grading. One felt that grading would not work as clinical staff need to be precise and this removes the holistic nature of marking. One participant felt that the CPAF form might be stressful for learners, whilst another asked if grades would count towards the final degree mark.

Summary of round one feedback on modified ANSAT

Some participants highlighted that the modified ANSAT was their preferred marking tool and that they felt it was easy for learners to compare their performance over time. Seven participants also felt that it was easily adaptable and simple, especially for ‘soft skills’. Five participants highlighted areas where they felt that the modified ANSAT would not be suited to the DRAD CAT; these included, professional behaviours, continuous assessment and not being appropriate for all clinical competencies.

Two participants highlighted that there would be difficulty with continuity of use across different staff members and that there would need to be staff training to highlight clear definitions across different modalities. One participant noted that they had trialled the ANSAT before and it was not suitable. Conversely, another participant said they have used it before and found it appropriate. Two participants said that they could see how the modified ANSAT could be applied to the DRAD CAT but that there were other preferrable marking criteria.

Eight participants felt that the wording of the scale was too subjective with another eight commenting that the anchor differentiation was unclear. Four participants felt that there were too many criteria, with others suggesting that it was too detailed and complex. One participant suggested the scale was too black and white, with another said the modified ANSAT was too lenient. Two participants highlighted that there was not enough guidance for learners and that there was a need to differentiate the scale across year groups. One participant said that the modified ANSAT did not distinguish between professionalism and competency.

One participant suggested that there should be a focus on feeding forward rather than feeding back. Another said that the ANSAT was for assessing learners at a singular occurrence and there needs to be a focus of continual assessment throughout their training.

There were also comments disagreeing with grading and expressed a preference for percentages.

The use of the modified Benner across competencies

In round one, we asked participants to indicate which marking criteria would be appropriate for each different clinical competency and each professional behaviour domain(s). Although the modified Benner reached consensus overall, the research team broke down each competency and professional behaviour to explore whether there was an individual consensus for each.

- For clinical competencies, results showed that the following reached consensus for the use of the modified Benner: radiation protection, use of imaging relating technology, image evaluation and escalation, technique/examination (axial, appendicular, CXR-standard techniques), technique/examination (axial, appendicular, CXR - adapted techniques), technique/examination (fluoroscopy, theatre and interventional), technique/examination (mobiles) and CT (head, body, spine).
- For professional behaviours, safe and effective practice, professional conduct, person centred care and communication skills all reached consensus using the modified Benner.

Considering these results, further exploration into the use of the modified Benner was needed in round two.

Part 7: Roles and Responsibility Descriptions

Overall, the definition of the roles and responsibilities was well received (as shown in Table 10). The full definition provided to participants is presented in Appendix G.

Table 10: Consensus of roles and responsibilities from round one

	Strongly Agree	Agree	Disagree	Strongly Disagree	Consensus
Practice Educator	42.7%	47.3%	7.3%	2.7%	90%
Clinical Assessor	43.6%	48.2%	5.5%	2.7%	91.8%
Clinical Supervisor	37.3%	56.4%	5.5%	0.9%	93.7%
Placement Link Tutor	37.3%	56.4%	4.5%	1.8%	93.7%

Consensus was achieved on the description of each role and underlying responsibilities; however, some suggestions were made by participants for further clarification. It was noted that the definition of practice educator (PE) can vary across different sites, as well as the responsibilities that they may have. It was also noted that the level of experience of the PE could be clearer. The responsibilities of this role received positive feedback, with suggestions made for additional responsibilities which had been omitted. The educational level for PE's was an area which received both positive and negative comments. Having the ability for role development into a PE was seen as a positive step for career development, along with post graduate education. There were mixed responses to the need for a PE to have College of

Radiographers accreditation, with participants noting that it can be time consuming to achieve.

Some participants noted that the clinical assessor role overlapped with the PE role, but they also acknowledged that some departments may not have a PE. Participants felt training would be essential to prepare colleagues for the role of clinical assessor. The importance of this role for supporting learners on apprenticeships was identified. The clinical supervisor role was noted to overlap with the clinical assessor role, but participants did acknowledge that a clear definition would help to standardise national expectations.

The placement link tutor definition was positively received and participants felt it was clearly important to facilitate collaboration between clinical placements and HEI's. However, it was noted that there were geographical variations for the title of this role, or that this role may not be present at all. Therefore, it was suggested that this may need some clarification as these roles may have alternative names. In the DRAD CAT, they will therefore be defined as:

Practice educator (PE) responsibilities *(Registered diagnostic radiographer is experienced in supporting clinical learning and assessment and is usually accredited by the College of Radiographers. This role may have alternative title such as clinical academic lecturer).*

Placement link tutors (PLT) responsibilities (*Registered diagnostic radiographer employed by a higher education institution. This role may sometimes be known as alternative titles such as lecturer-practitioner or placement coordinator)*

Round One Summary

The first round was well received with 110 participants across the UK providing comments and feedback on the proposed elements for inclusion in the DRAD CAT. The underlying principles were accepted by participants and no amendments to these were suggested in subsequent rounds; However, the research team did agree that further exploration of the potential role of one-day assessments would be required.

The proposed draft elements such as reflections and self-assessment, observations of practice and feedback from others all reached consensus. The integrated review process and roles and responsibilities also reached consensus. These elements were discussed with the steering group, and it was decided that no further questions about any of these elements was required in subsequent rounds.

The professional behaviour domains also reached consensus. Following discussion with the steering group, some amendments were made to the professional behaviour domains to align with the HCPC SoPs. Discussion points from round one regarding professional behaviours included the creation of a glossary of terms to capture definitions of terms to support understanding. Clinical assessor training would need to cover how these professional behaviours could be assessed and what the assessor would need to witness for the learner to be signed off.

Fifteen individual clinical competency domains were proposed for inclusion in the DRAD CAT in round one. All reached consensus, with many participants suggesting changes to the wording to align with the HCPC SoPs and to ensure there was less ambiguity for learners and assessors. There were suggestions for two domains to be split into two parts which were discussed with the steering group and subsequently taken into round two.

Finally, the research team presented several marking criteria for comment. At the end of the round the modified-Benner criteria was the most favourable but there were a range of suggestions as to how it could be further modified to ensure it was applicable to the area of diagnostic radiography education. These comments and suggestions were taken to the steering group and presented for further comment in round two.

At the end of round one, the research team met with the steering group to review the findings from the first round and review questions regarding the elements to take into round two. Aspects discussed included the use of the term *"projection radiography,"* and the differentiation between *"competency"* vs. *"proficiency,"* and *"assist"* vs. *"perform,"* with wording adaptions for clinical competency domains and aspects that reached consensus which may require further clarification from the modified-Delphi participants in round two.

At this stage in the project, the steering group opted to utilise the phrase *"projection radiography"* as it aligned with the HCPC SoPs and would standardise terminology. They also opted to follow the HCPC SoPs for wording related to *"assist"* and *"perform,"* again to ensure alignment with the standards. The steering group agreed that if consensus was reached in a particular area, with no wording amendments, these aspects would be carried forward into round two, with the option to ask for clarity required alterations.

As a result, round two consisted of questions on the clinical competency domains, marking criteria and provide a summary review of the sections from round one that reached consensus.

Round Two

Participants

68 participants signed up to participate in round two, 67 completed the survey with 64 providing a contact email to participate in round three. Of those who participated, 43 currently supervised students. The demographics of the round two participants are shown in Table 11.

Table 11: Participant demographics from round two

	Respondents n = 67
Role	
Student or apprentice radiographer	6
Clinical Manager	8
Practice Educator	22
Clinical Radiographer	10
Academic	16
Other*	5

Location	
Scotland	1
Wales	0
England: Eastern	3
England: Midlands	23
England: London	2
England: Northwest	5
England: Northern	2
England: Southeast	7
England: Southwest	12
England: Yorkshire and North Trent	12
Course	
Apprentice on a BSc	3
BSc	2
MSc-pre reg	0
Apprentice on MSc-pre reg	1
Years Experience	
Under 1 year	2
1-5 years	8
6-10 years	17
11-15 years	15
16+ years	25

* Academic/Placement Manager; Clinical Manager & Academic (2 employers); Patient Safety Partner; Practice Placement Manager; Clinical Liaison and Advanced Practitioner.

Part 1: Draft Clinical Competency Domains

There were several suggestions to refine the wording of domains six (use of contrast media and IV cannulation), seven (image evaluation and escalation), eight (projection radiography – standard techniques), ten (fluoroscopy, theatre and interventional), eleven (projection radiography – mobiles), thirteen (MRI), fourteen (Ultrasound) and fifteen (Radionuclide examinations).

These suggestions were reviewed by the steering group and the research team at the end of round one, and the wording was refined and proposed to the participants in round two. The results of these suggestions are included in Table 12.

Table 12: Consensus for the amendments to the draft clinical competency' domains

	Strongly Agree	Agree	Disagree	Strongly Disagree	Consensus	Round one
6. Safe use of contrast media and IV cannulation *(removal of skills)*	29.9%	65.7%	3%	1.5%	95.6%	86.3%
6. Safe use of contrast media and IV cannulation *(adding within the learner's scope of practice)*	41.8%	52.2%	4.5%	1.5%	93.9%	
7. Image evaluation and escalation of concerns *(splitting of competencies)*	49.3%	44.8%	3%	3%	94.1%	97.3%
8. Projection Radiography (axial, appendicular and chest – standard techniques) *(adding abdominal)*	23.9%	70.1%	4.5%	1.5%	94%	87.3%

10. Technique/examination (fluoroscopy, theatre and interventional) *(splitting of competencies)*	40.3%	56.7%	1.5%	1.5%	97%	83.6%
11. Projection Radiography (mobiles) *(updated wording)*	34.3%	55.2%	10.4%	0%	89.5%	85.5%
13. MRI – Brain, spine, extremity (*updated wording)*	32.8%	53.7%	6%	7.5%	86.5%	83.6%
14. Assist with Ultrasound examinations (*updated wording)*	29.9%	62.7%	6%	1.5%	92.6%	88.2%
15. Assist with Radionuclide examinations (*updated wording)*	25.4%	68.7%	6%	0%	94.1%	87.3%

There was a 95% consensus in favour of removing the term *"skills"* from domain six, with participants commenting that learners should not be undertaking cannulation or administering contrast. Furthermore, there was a 93.9% consensus relating to adding *"within the student's scope of practice"* however, during the analysis and after feedback from the steering group, it was decided that the term "*in line with HCPC SOPs"* would be included within this domain instead.

A 94.1% consensus was achieved in relation to spitting domain seven (Image evaluation and escalation of concerns) into two separate competencies. This was discussed with the steering group, and it was agreed that these would be split into 7a and 7b within the domain. Splitting these domains ensured that each competency was not overly complex and allowed learners to include a range of experiences within their CAT.

In relation to adding *"abdominal imaging"* to domain eight, 94% of the participants agreed with this in addition to agreement within the steering group. There was a 97% consensus in splitting up the *"Fluoroscopy, Interventional and Theatre"* domain. It was agreed with the steering group that the term *"anaesthetised / unconscious patients"* would be removed from the title; this would add greater flexibility.

Participants, with support from the steering group agreed that the term *"range"* would be removed from the title of domain eleven (Projection Radiography(mobiles)). This reached an 89.5% consensus due to most sites only undertaking portable chest x-rays. It was also agreed that the term *"outside of a designated controlled area for radiation"* would be removed from this title as a temporary controlled area is always established.

For competency thirteen, MRI, an 86.5% consensus was achieved to use the phrase "*examinations routinely performed within an MRI department as per HCPC guidance for routine MRI examinations"* rather than the domain stipulating which MRI procedures should be undertaken.

Consensus was reached (70.2%) for the addition of a domain linked to specialist projection radiography areas. Important points from participants highlighted that learners may not obtain experience in all areas (e.g., males in mammography) and that forensics would be

achieved post qualification. This was discussed with the steering group, and it was agreed that this be added as an optional domain to capture these experiences for learners (where applicable).

An amended version wording of domain fourteen was agreed by the steering group to reflect that learners should not be utilised as chaperones within ultrasound. The amended wording reached 92.6% consensus from participants.

Finally, in relation to domain fifteen, Nuclear Medicine, there was a 94.1% consensus, on the following wording: *"Ability to safely and competently assist with imaging procedures using radionuclides including PET tracers and particle emitters, across a variety of diagnostic or screening care pathways."* Concerns were raised by participants and members of the steering group that not all placement sites have access to nuclear medicine opportunities. It was decided that as Nuclear Medicine is a required component within the HCPC SoPs, that this modality must be included; however, the steering group did suggest that a short rotation of up to one week would be an acceptable amount of time within this modality.

Part 2: Marking Criteria

In round two, the research team summarised the marking criteria findings from round one. Considering feedback obtained from the previous round, the following adaptations to the modified Benner were suggested to participants:

- Adding a *"fail"* option
- Adding an N/A option
- Adding a free text comments box for qualitative feedback
- Better differentiation of anchor points (e.g. difference between *"working towards"* and *"developing"*)
- *"Developing" could be rephrased to "direct supervision and frequent direction"*
- *"Working towards"* could rephrased to *"minimal/indirect supervision/support"*
- Changing the word *"independent"* to *"competent"* or *"consistent"*

The feedback gained in round two indicated that participants supported the need for a qualitative free text comments box. There was some support for adding a *"fail"* (or "not yet met") option, with the opportunity to track how many "fails" a student had been awarded. There was emphasis on better communication between HEI's and placement providers relating to failing a learner, with the use of a *"red flag"* system being regarded *"highly effective"*. With respect to the N/A option, there were arguments in favour, because not all placement sites have access to all modalities, and arguments against. However, as all domains should be met by the end of the learners' programme of study, many felt that the N/A option would not be needed.

Regarding the suggestions for refining the wording of the modified Benner, there was support for *"consistent"* rather than *"independent"* and for using *"developing"* in the DRAD CAT. Participants preferred *"working towards"* to *"consolidating"* and wanted to move away from "*competent"* towards *"proficient"* to align with the wording in the HCPC SoPs. There were suggestions to remove the term *"supervision"* as by law, learners should always be

supervised. Finally, there was a suggestion to include *"knowledge demonstration"* and whether learners were *"heavily/minimally/not assisted"* by radiographers for examinations. Participants showed reluctance to apply grading to the modified Benner and felt the option for HEI's to apply numerical grading should be decided by each institution. All these comments and considerations were taken to the steering group for discussion.

Alternative Marking Criteria

After round one closed, the research team identified another potentially suitable marking criteria currently being piloted in Australia for diagnostic radiography clinical assessment (led by Dr Andrew Kilgour and Giulia McCorkell at RMIT University, Melbourne). This marking criteria was like Benner's model, as it supported the idea that learners move from being beginners to being "profession ready" across a continuum (examples shown in Appendix H).

The research team asked participants for general comment on this marking criteria. There were a range of comments which highlighted that this marking criteria appeared overcomplicated, too wordy and would require a lot of attention by the assessor. Participants felt that the marking criteria would take too much time to complete and that assessors would need a lot of training to use it consistently. There were comments that there was lots of jargon and that participants would prefer it written in a "lay way". Participants were not opposed to the alternative marking tool but preferred the modified Benner as it was felt it would be simpler to use.

Other comments suggested that the alternative criteria may be suited to progress review meetings and looked more "radiography specific" than Benner. It was suggested that this marking criteria may better align with overall sign-off, rather than each specific domain. Finally, there were a range of positive support for including, the *"does not demonstrate"* and feedback options. Participants felt that the continuum was extremely useful, and they liked the *"highlight concern"* section, the colours, and criteria definitions. There was support for the term *"profession ready"* and the use of a drop-down menu to reduce the need for lots of writing. Participants preferred the use of a range rather than an individual score and felt that it *"could become familiar quickly"*. Again, these comments were all collated and shared with the steering group for discussion.

Using Visuals

In 2023, the previous Delphi study conducted by the research team, concluded that there was a need to incorporate visuals at a future stage of the project. Participants were shown a graphic of smiley faces and a graphic of a coloured rubric (as shown in Appendix I). Results showed 74.6% of participants disagreed with the use of smiley faces in the DRAD CAT. Comments highlighted that this element was not suitable to the academic environment and that learners could find this potentially patronising or condescending. For the coloured rubric, 95.5% of participants agreed that this would be a suitable way to include feedback to learners about their performance. They mentioned that this format was a preferred, simplified version of the alternative (Kilgour and McCorkell) presented earlier. There were reminders from participants that there may need to be adaptions made for those learners who are colourblind.

Part 3: Summary of Round One

Each of the remaining sections of round one of the DRAD CAT were summarised for participants with the option for any concluding thoughts to be captured. Comments from participants from the second round included support for nationally defined roles and clear distinctions between them for clarity. Participants highlighted that practice educator (PE) funding cuts may have a negative impact on this [project] going forward. There was some disagreement with the PE having an alternative role of 'clinical academic lecturer' with comments such as:

> *"…this gives the false impression the PE undertakes lecturing and in some way is employed by an academic institution. Words such as 'Clinical Student Coordinator' would be more appropriate." (Practice educator, 16+ years' experience)*

There was a supportive overarching comment that the modified-Delphi was:

> *"Useful to see the ongoing progress and updates carried forward and the information provided helps to inform our comments and thoughts going forward to the next stage." (Student, 1-5 years' experience)*

Round Two Summary

Round two saw 64 participants provide comment on the elements that had been proposed by the research team. These focused mainly on clinical competency domains and the proposed marking criteria. Regarding the clinical competency domains, the suggestions from round one was presented to the participants and consensus was reached for each domain. There was a suggestion to amend the wording further, and to add a domain regarding paediatric radiography.

Participants were asked about the inclusion of an optional domain to cover additional experiences for learners such as DXA, Dentals and Mammography, but it was emphasised that this would be optional depending on availability within placement sites. Inclusion of this domain was agreed by participants.

The research team proposed an additional marking criteria that had been developed in Australia (Kilgour and McCorkell); this was accepted but not in preference to the modified Benner. Feedback from participants was reviewed and the marking criteria was further modified for round three.

At the end of round two, the research team met with the steering group to review the findings. There was further discussion about using *"proficiencies"* rather than *"competencies"* to align the DRAD CAT with the HCPC SoPs as much as possible. This was supported; therefore, *"clinical competencies"* would be referred to as *"clinical proficiencies"* going forward.

In previous rounds, participants mentioned the need for discussions around one day assessments; the steering group suggested bringing this element into round three. In relation to the proposed marking criteria, the steering group agreed with some changes highlighted by participants in round two; it was decided that amendments made to the final modified Benner, would be listed and put to the participants in round three for comment.

Round Three

Participants

64 participants opted into round three. Of these, 57 participants completed the survey. Of those who participated, 39 supervised students. The demographics of the round three participants are shown in Table 13.

Table 13: Participant demographics from round three

	Respondents n = 57
Role	
Student or apprentice radiographer	4
Clinical Manager	8
Practice Educator	17
Clinical Radiographer	9
Academic	15
Other*	4
Location	
Scotland	1
Wales	0
England: Eastern	1
England: Midlands	18
England: London	2
England: Northwest	5
England: Northern	2
England: Southeast	7
England: Southwest	10
England: Yorkshire and North Trent	11
Course	
Apprentice on a BSc	1
BSc	2
MSc-pre reg	0
Apprentice on MSc-pre reg	1
Years Experience	
Under 1 year	1
1-5 years	6
6-10 years	9
11-15 years	15
16+ years	26

* Clinical Manager & Academic (2 employers), Academic/Placement Manager, Clinical Liaison and Advanced Practitioner and Patient Safety Partner.

Part 1: Draft Clinical Proficiency Domains

In round three, participants were provided with an update for the proficiencies that had been agreed so far. They were offered proposed wording for the updated proficiency for a new domain for Paediatric Radiography:

> 16: "*Paediatric Radiography - assist with non-complex projection radiography for paediatric patients".*

There was an 82.5% consensus that this new domain should be added to the DRAD CAT. Responses suggested that the term *"non-complex"* could be subjective and therefore to standardise this proficiency, this wording should be removed. Participants also highlighted that this domain should align with the HCPC SoP 13.32, by using the term *"perform"* rather than *"assist."* Therefore, the final wording agreed was:

16: "*Paediatric Radiography - "Ability to perform projection radiography for paediatric patients."*

One practice educator (with 11-15 years' experience) responded with a comment that summarises the need for this proficiency to be included. They said:

> *"It's important that students have hands-on experience physically undertaking paediatric examinations, as they need to be able to demonstrate that they can adapt their communication skills to the appropriate level of understanding, navigate asking parents/carers to leave the controlled area or completing the appropriate carers/supporter forms under IRMER/IRR regulations, navigate asking LMP status where appropriate (and how they'd approach it differently to their adult patients), and demonstrate ability to adapt radiographic technique where paediatric patients are in pain and refusing to be positioned in the standard projections."*

Part 2: Marking Criteria

In round three, the research team summarised the findings of round two. With guidance from the steering group and after reviewing feedback from previous rounds, the research team created an updated marking criteria as shown in Appendix J. The changes made were as follows:

- Added a colour continuum bar at the top.
- Changed *"Working Towards"* to "*Strengthening."*
- Added a fifth anchor point: *"Consolidating."*
- Changed "*Competent"* to "*Profession Ready."*
- Added 25%, 50% and 75% as markers to help supervising radiographers to gauge the levels of direct supervision and direction expected at each anchor point.
- Added a qualitative feedback box to invite supervising radiographer to comment on strengths and areas for development.
- Added a way for supervising radiographer to highlight excellence in learner's attitude and effort. This would be optional.
- Added a way for supervisor to highlight/escalate concerns (this could be done on a separate page as both learners and staff have highlighted that if feedback is anonymous, supervisors are more likely to voice concerns).
- Changed "*student"* to "*learner."*

It was proposed that this marking criteria would be used for both clinical proficiency and professional behaviour domains as formative feedback throughout the learner's placements. The criteria would be reviewed by the learner and the practice educator at each integrated review meeting, where strengths and development needs would be discussed. Thorough standardised clinical assessor training will be provided on how to use the marking criteria and how each proficiency and behaviour domains link to the HCPC SoPs, HCPC SoCs, SoR ECF and KSBs.

As the DRAD CAT will use a continual assessment approach, learners may reach the different anchor points for each clinical proficiency and professional behaviour domains at

different times as they progress through their programme of study. However, they will need to have reached "*profession ready"* in all areas by the end of their final placement.

Participants were asked their opinion about these concepts. Feedback was positive, and there were comments about the criteria being clear and easy to use, not time consuming, and the preference of the coloured bar as an added visual. Participant's felt that the percentages to support assessor feedback were helpful and should promote consistency and reduce ambiguity. Participants liked that the clinical proficiencies linked to professional standards from regulatory bodies and to relevant KSBs for apprenticeship standards. There was overwhelming support for the open text box feedback option.

Comments on amendments to the suggested marking criteria included removing the star icons to allow for more space for comments. There were comments that this was *"school like"* and did not have a *"negative option."* Furthermore, participants highlighted that if the assessor left this blank, the learner may not know if it had been missed or deliberately left blank. Participants suggested separating *"strengths"* and *"areas for development"* to ensure that assessors do not solely focus on the positives. There was also a request for a box for the assessor signature and the date.

Participants highlighted that the use of percentages should not reflect time, but the level of complexity required. They also suggested that there should be boxes to tick to indicate if learners were not performing at good/excellent/outstanding, as this would ensure that there was no confusion on the part of the learner if there was no box ticked. There was also an additional comment that an option between *"yes"* and *"no"* for concerns as *"situations are not always black and white."*

It was noted that there may be some placements where certain clinical proficiencies cannot be assessed due to lack of access to specific imaging equipment, so having an option for the supervisor to select N/A or not complete for those proficiencies would be useful. Upon reflection, the research team felt that as the DRAD CAT was designed to be a rolling portfolio, that an "N/A" option would not be included as domains could be signed off at any point during the learner's programme of study and would therefore be applicable at some point.

Further comments suggested incorporating feedback from other sources such as service users and adapting the anchor points to reflect the difference between mid-point and end of placement reviews for learners.

Participants were asked to what extent they agreed or disagreed that the updated marking criteria would be suitable for assessing clinical proficiency and professional behaviour domains in the new DRAD CAT; 94.8% of participants supported the inclusion of the modified Benner proposed in this round.

Part 3: Half-Day and One-Day Assessments

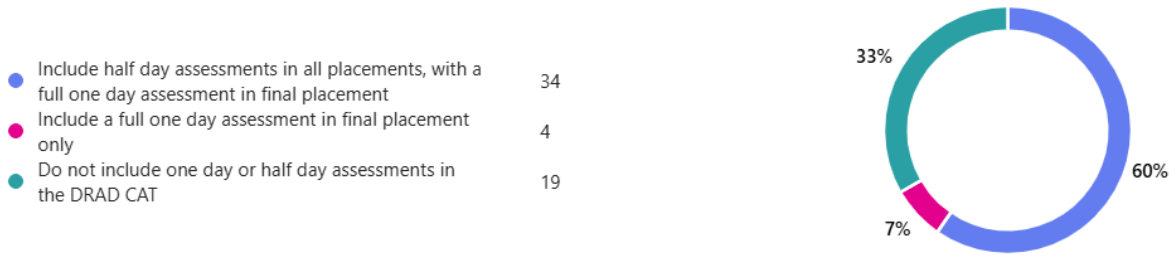
There were very split opinions in both round one and two on whether to include half-day and one-day assessments in the new tool. The draft DRAD CAT incorporated an integrated review process for each placement, including an initial objective setting meeting (formative), mid-point review (formative) and end of placement review (summative). The summative was

to be informed by all elements of formative assessment, and act as a progression gateway to the next stage of clinical education. It was also proposed in the draft DRAD CAT to include an additional summative assessment for learners in their final placement, a one-day observation of practice.

From a learner's perspective there was a lot of concern about how much would rest on these final one-day assessments, and it was noted that this would go against the underlying principle of continual assessment. From a clinical staff viewpoint there were concerns about the time and workload required to undertake one-day assessments. However, there were also positive comments about the way this type of assessment could help to identify where additional support might be needed.

In the final round, participants were asked to indicate which option they thought would work best for the standardised DRAD CAT: include half-day assessments in all placements, with a full one-day assessment in the final placement; include a full one-day assessment in the final placement only; or do not include one-day or half-day assessments in the DRAD CAT. The results are shown in Figure 1.

Figure 1: Participant's views on One Day Assessments



The data from round three showed that a consensus was not reached on whether to include half-day and one-day assessments, with only 60% of participants in agreement. Participants were also asked to provide comment on their choice. There was a range of comments, some in support of this approach and others were not. Overall, the feedback was more negative than positive.

There were several themes identified in the positive comments about one-day assessments, such as this quote from an academic commenting on the opportunity for consistency

> *"This will enable a level of consistency across student assessment." (academic, 11-15 years' experience)*

Positive comments were also received from a variety of participants about how a one-day assessment may help identify learning needs.

> *"More assessments leads to better identification of needs and also prepares the students better for their final assessment and work life." (clinical radiographer, 6-10 years' experience)*

Comments were also received in support of one-day assessments from a student/apprentice radiographer stating that:

> *"Final year is perfect as it seems to replicate all consolidated knowledge gained." (learner, 1-5 years' experience)*

When reviewing the negative comments, themes were identified around the time burden that one-day assessments would create within clinical practice, especially for placement sites where there are lots of learners. One student/apprentice radiographer noted these pressures saying:

> *"Long assessments like half and full days can be difficult to arrange and can impact on staffing issues along with suitable locations for the assessment to be conducted." (learner, 1-5 years' experience)*

Several participants commented that including a one-day or half-day assessments were in contradiction of the continual assessment process with one participant noting:

> *"If we are adopting a continuous assessment tool, then we should not be including summative assessments."* (*clinical manager / academic, 16+ years' experience)*

It was also noted that:

> "The purpose of a final day/half day assessment has not been justified, and the educational literature is not substantial enough to justify this approach." *(academic, 11-15 years' experience)*

It was also noted that a single half-day or one-day assessment was a *'false event'* which could result in pressure on the learner. However, there were comments that supported the opportunity for formative constructive feedback for learners based on an observation of practice. Comments highlighted that learning opportunities, utilising formative feedback, should be provided to support the learner's ongoing development.

When considering the systematic review findings and round three feedback, there was not enough data to support the inclusion of summative half-day or one-day assessment within the DRAD CAT. The data did support a formative observation of practice which could be undertaken between the mid-placement and end of placement review, to inform summative discussions. Observations of practice in this way could provide a comprehensive and constructive formative feedback opportunity to support the progression of the learner in their practice. A template will be developed for inclusion in the DRAD CAT for recording observations and providing feedback to learners.

Round Three Summary

The final round of the modified-Delphi was completed by 57 participants. Consensus was reached on the wording for the new clinical proficiency domain for paediatric radiography as the *"Ability to perform projection radiography for paediatric patients."* Participants agreed that the new modified marking criteria should be included in the DRAD CAT, with just a few suggestions for the research team to consider before finalisation. These included removing the star graphics and to separate the feedback box into *"strengths"* and *"development"* sections to support both positive and constructive feedback. Finally, there was no consensus reached regarding the inclusion of one-day or half-day assessments, but there was clear support for a formative observation of practice. A summary of this round and suggestions

from participants was taken to the steering group, with particular consideration given to the inclusion of one-day and half-day assessments.

Feedback from the steering group on these elements indicated total support for splitting strengths and development qualitative feedback into two separate boxes in the marking criteria. It was felt that this would encourage valuable feedback practice from assessors and reduce the natural tendency to concentrate on strengths. The steering group felt this would ensure higher quality of feedback for learners and provide context for the integrated review process.

There were mixed feelings from the steering group regarding the removal of the star icons from the marking criteria. Some felt that the stars should remain as this captures the learner's attitude, with one member highlighting that:

> *"You could have a struggling student who works hard and tries their best. Then equally, you can have a student who passes assessments but doesn't accept criticisms"*

However, others felt that the star system could be problematic for the same reasons as highlighted by feedback from round three. The research team felt that, as a compromise, the form would retain the option for assessors to comment on effort and attitude related to each specific clinical proficiency or professional behaviour domain but remove the star graphics and *"good, excellent and outstanding"* options to allow more space for free text feedback and remove ambiguity.

Regarding one-day or half-day assessments, there was again mixed feedback from the steering group whether to remove this element from the DRAD CAT. Steering group members highlighted that these types of assessment are an evaluation of a particular moment in time and can be unfair on learners who do not deal well with pressure. It was also highlighted that as learner numbers increase across placement sites, these types of assessments may become unmanageable. Support for the inclusion of one-day assessments explored the need for clinical assessment tools to support the learner's development, allowing them to demonstrate they have met the required safe standard for the public whilst acting as a progression gateway to the next/final stage of clinical education. The research team reflected upon the feedback from participants and the steering group and felt that as a compromise, half-day observations of practice would be included in the DRAD CAT as there was support for the inclusion of this type of assessment in round three, although it did not reach a consensus. These formative observations of practice would support the integrated review process and provide an opportunity for learners to receive feedback on their progress towards becoming profession ready. Guidance on observations of practice will be included in the clinical assessor training.

Overall Summary

A modified-Delphi study was required to explore the elements of assessment that would need to be incorporated into the DRAD CAT including clinical proficiencies, professional behaviours, marking criteria, integrated review processes and standardised feedback and associated wording. Feedback was collected from over 100 academics, clinical partners, and

learners across the UK, with responses from each round informing subsequent rounds. Findings were discussed with the project steering group.

Clinical Proficiencies

In the first round, a list of clinical competencies was provided, which was amended to clinical proficiencies in round three. Over the course of the three rounds, this list was amended, edited, and reviewed by the steering group and the participants to produce a final list as shown in Table 14.

Table 14: Final list of clinical proficiencies and their associated wording.

Original Clinical Competencies	Final Clinical Proficiency Domains
1. Informed Consent "Ability to obtain valid consent, which is voluntary, informed, has due regard to capacity, is proportionate to the circumstances and is appropriately documented."	
2. Safety of self, service users, carers, and colleagues "Ability to maintain a safe environment for self, service users, carers and colleagues by careful use of equipment, and adherence to health and safety policies and procedures."	
3. Record keeping and confidentiality "Ability to maintain full clear accurate records in line with relevant legislation, guidelines and protocols, particularly confidentiality."	
4. Radiation protection "Ability to ensure the safety of individuals regarding ionising radiation and high-strength magnetic fields, and to maximise the health gain for individuals from their imaging, whilst minimising the risks from exposure to ionising radiation, and complying with IRR, IR(ME)R and MHRA."	
5. Use of imaging related digital technology and supporting systems "Ability to proficiently use imaging related digital technology, such as post processing and AI, and supporting systems, such as PACS and RIS."	
6. Safe use of contrast media and IV cannulation skills "Ability to perform a range of imaging examinations which require the use of contrast media, across a range of diagnostic or screening pathways, and to recognise adverse or abnormal reactions, and respond to them appropriately."	6. Safe use of contrast media and IV cannulation in line with the HCPC SoPs: "Ability to perform a range of imaging examinations which require the use of contrast media, across a range of diagnostic or screening pathways, and to recognise adverse or abnormal reactions, and respond to them appropriately."
7. Image evaluation and escalation of concerns "Ability to appraise images for quality, technical acceptability and accuracy, suggest improvements if required, and to take appropriate action to escalate concerns if unexpected findings are identified."	7. Image evaluation and escalation of concerns: 7a "Ability to appraise images for quality, technical acceptability and accuracy and suggest improvements if required." 7b "Ability to take appropriate action to escalate concerns if unexpected findings are identified."
8. Projection Radiography (axial, appendicular, and chest imaging) "Ability to perform a broad range of standard axial and appendicular skeleton, and chest imaging techniques, across a	8. Projection Radiography (axial, appendicular, chest and abdomen – standard techniques) "Ability to perform a broad range of standard axial and appendicular skeleton, chest, and abdominal imaging techniques, across a variety of diagnostic or screening care pathways".

variety of diagnostic or screening care pathways.”	
9. Projection Radiography (axial, appendicular, chest and abdominal imaging – adapted techniques) “Ability to perform a broad range of imaging examinations where the service user’s individual characteristics require non-standard imaging techniques.”	
10. Technique/examination (fluoroscopy, theatre and interventional) “Ability to assist with a range of more complex diagnostic imaging techniques or interventional procedures, including anaesthetised or unconscious patients.”	10. Technique/examination (fluoroscopy, theatre and interventional) 10a “Ability to assist in a range of interventional and fluoroscopy procedures”. 10b “Ability to perform a range of examinations within a theatre environment.”
11. Projection Radiography (mobiles) “Ability to perform a range of imaging techniques using mobile equipment, outside of a dedicated imaging room.”	11. Projection Radiography (mobiles) "Ability to safely and proficiently perform imaging techniques using mobile (radiography) equipment"
12. CT – Head, body, spine “Ability to perform a range of CT examinations, including a standard CT head, and assist with CT examinations of the spine, chest and abdomen in acute trauma, and contribute effectively to other CT studies.”	
13. MRI – Brain, spine, extremity “Ability to ensure the physical safety of all individuals in relation to high-strength magnetic fields, and perform standard MRI examinations such as brain, spine and an extremity.”	13. MRI "Ability to assist with ensuring the physical safety of all individuals in relation to high-strength magnetic fields and competently perform examinations routinely undertaken within an MRI department as per the HCPC SoPs".
14. Assist with Ultrasound examinations “Ability to assist with ultrasound imaging procedures, including acting as a chaperone for intimate examinations, across a variety of diagnostic or screening care pathways.”	14. Assist with Ultrasound examinations “Ability to safely and competently assist with ultrasound imaging procedures across a variety of diagnostic or screening care pathways.”
15. Assist with Radionuclide examinations “Ability to assist with imaging procedures using radionuclides including PET tracers and particle emitters, across a variety of diagnostic or screening care pathways.”	15. Assist with Radionuclide examinations "Ability to safely and competently assist with imaging procedures using radionuclides including PET tracers and particle emitters, across a variety of diagnostic or screening care pathways.”
	16. Paediatric Radiography “Ability to perform projection radiography for paediatric patients.”
	17. Additional Experience (optional) *Option to include other experiences not included in other clinical proficiencies such as DXA, Mammography, Dentals and Forensic radiography.*

Professional Behaviours

Like the clinical proficiencies, a list of professional behaviours was also provided. This reached consensus in the first round with the final list of professional behaviour domains outlined in Table 15.

Table 15: Final list of Professional Behaviours to be included in the DRAD CAT

Final Professional Behaviour Domains
1. Safe & effective practice "Ability to consistently work safely and effectively within scope of practice, make reasonable adjustments as required, report concerns in a timely manner, and make informed decisions."
2. Professional conduct "Ability to maintain appropriate professional boundaries, work in a trustworthy and ethical way, act as a role model for others, and reflect on impact on self and others."
3. Person-centred care "Ability to practice inclusively, upholding the rights, dignity, values, beliefs and autonomy of individuals, and empowering people by recognising and supporting their individual needs.
4. Wellbeing of self and others "Ability to empower and enable individuals and self to manage own physical health, mental health, and wellbeing, adjust practice as required, and promote public health initiatives."
5. Communication skills "Ability to adapt all forms of verbal and non-verbal communication to individual needs, preferences and circumstances. The responsible use of social media, as per HCPC Standards of Conduct."
6. Interprofessional Relationships "Ability to work in partnership with colleagues from the multi-disciplinary team, recognising their professional knowledge and skills, and sharing relevant information where appropriate."
7. Leadership qualities "Ability to demonstrate leadership qualities and behaviours, act as a role model, support and mentor colleagues, and provide appropriate supervision."
8. Continuing Professional Development "Ability to reflect on own practice to continually improve, to keep up to date with new technologies, applications, practices and innovations, and to engage with peers and colleagues to support their development."

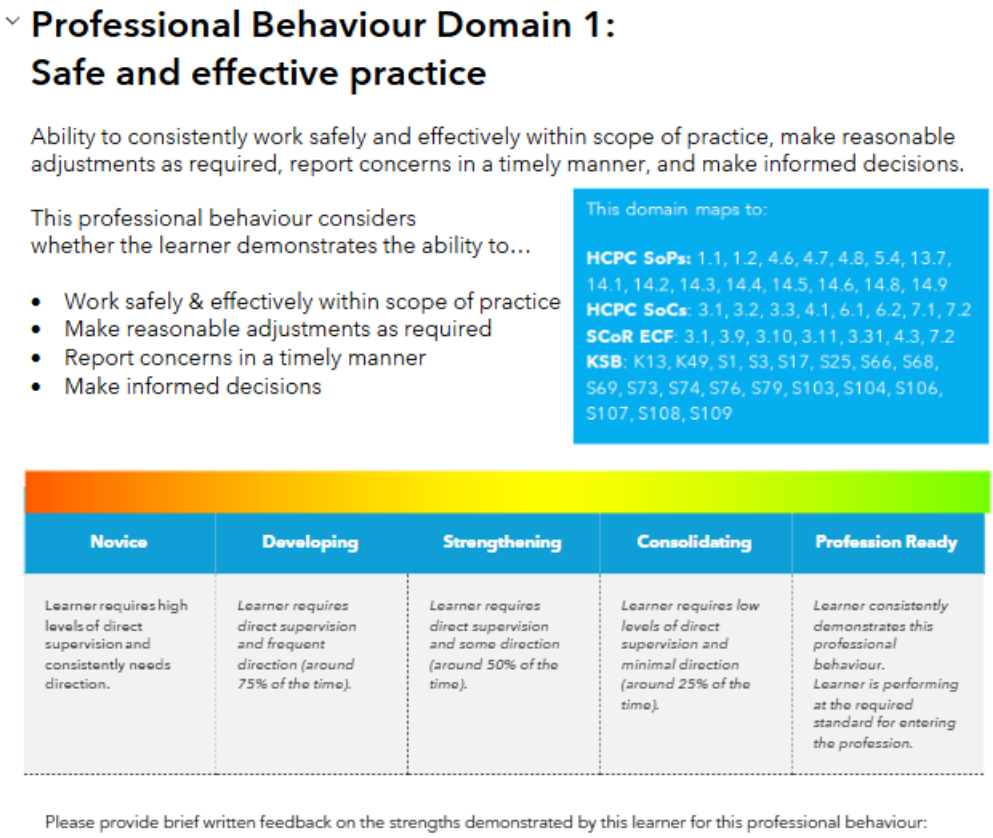
This final lists of clinical proficiencies and professional behaviour domains have been co-created by the research team, the steering group and the modified-Delphi participants. This allowed the varied roles and experience of those involved in pre-registration diagnostic radiography programmes to feed into the development of the DRAD CAT. All stakeholders have highlighted that these domains must align with the HCPC SoPs and amendments have been made to ensure this has occurred as much as possible. Clinical assessor training should support any additional comments and concerns regarding the assessment of these elements. A glossary of terms (Appendix K) has been developed to support the understanding of the terminology for all those who will be using the DRAD CAT.

Marking Criteria

In the first round, participants were presented with three different marking criteria: a modified version of Benner's Novice to Expert model (Benner, 1982), a modified version of the Common Placement Assessment Form (CPAF) used in physiotherapy (Chartered Society of Physiotherapy, 2024) and a modified version of the Australian Nursing Standards Assessment Tool (Ossenberg et al. 2020).

At the end of round one, the results showed that the modified Benner was the preferred model to explore for use in the proposed DRAD CAT. The research team found an alternative marking criteria (Kilgour and McCorkell) at this stage in the project and included it for comment in round two. This elicited mixed feedback and the research team, with support from the steering group, collated all the positive elements from the modified Benner and Kilgour and McCorkell and proposed a final marking criteria to be included. This reached a 94.8% consensus, and the final marking criteria is shown in Figure 2.

Figure 2: The proposed final marking criteria example for "*Safe and Effective Practice"*



Professional Behaviour Domain 1: Safe and effective practice

Ability to consistently work safely and effectively within scope of practice, make reasonable adjustments as required, report concerns in a timely manner, and make informed decisions.

This professional behaviour considers whether the learner demonstrates the ability to…

- Work safely & effectively within scope of practice
- Make reasonable adjustments as required
- Report concerns in a timely manner
- Make informed decisions

This domain maps to:

HCPC SoPs: 1.1, 1.2, 4.6, 4.7, 4.8, 5.4, 13.7, 14.1, 14.2, 14.3, 14.4, 14.5, 14.6, 14.8, 14.9
HCPC SoCs: 3.1, 3.2, 3.3, 4.1, 6.1, 6.2, 7.1, 7.2
SCoR ECF: 3.1, 3.9, 3.10, 3.11, 3.31, 4.3, 7.2
KSB: K13, K49, S1, S3, S17, S25, S66, S68, S69, S73, S74, S76, S79, S103, S104, S106, S107, S108, S109

Novice	Developing	Strengthening	Consolidating	Profession Ready
Learner requires high levels of direct supervision and consistently needs direction.	*Learner requires direct supervision and frequent direction (around 75% of the time).*	*Learner requires direct supervision and some direction (around 50% of the time).*	*Learner requires low levels of direct supervision and minimal direction (around 25% of the time).*	*Learner consistently demonstrates this professional behaviour. Learner is performing at the required standard for entering the profession.*

Please provide brief written feedback on the strengths demonstrated by this learner for this professional behaviour:

Other Elements of the DRAD CAT

As previously discussed, the draft underlying principles, draft elements of assessment, integrated review process and roles and responsibilities were proposed to participants in round one. These areas (except one-day assessments) reached consensus in round one and were not explored in subsequent rounds.

Participants mentioned that patient/carer and peer feedback should be included in the DRAD CAT. A template has been included for the purposes of the pilot; however, the research team feel that this element should be co-produced with patients and carers to capture the essence of what these individuals would want to include. It is recommended that this be explored during the next stage of the project.

Recommendations and Next Steps

The following recommendations, (as shown in Table 16), have been considered by the research team in relation to the implementation of the DRAD CAT.

Table 16: Recommendations for future implementation of the DRAD CAT

Recommendation	Actions required	Resources required	Who is responsible	Time frame
To develop a brand identity for DRAD CAT to ensure it stands as an independent tool	Design of a logo and brand identity for DRAD CAT	Funding to cover time of graphic designer	Research team Graphic Designer	To be in place for pilot of DRAD CAT
To develop a comprehensive clinical assessor training package to support DRAD CAT	Development of comprehensive clinical assessor training package, utilising a blend of online materials and live sessions	Funding to cover time of research team to develop training materials Funding to cover cost of platform to host training materials	Research team	To be rolled out with HEI's / clinical sites piloting DRAD CAT initially. Longer-term to be rolled out nationally to any HEI's / sites using DRAD CAT.
To create a glossary of terms for the DRAD CAT (example included in Appendix K)	Design and collate a glossary of terms	Funding to cover time of research team and learning technologist to collate this information.	Research team Learning Technologist	To be in place for pilot of DRAD CAT
To undertake a pilot and evaluation of DRAD CAT with at least 2 HEIs	Engagement of at least 2 HEIs and associated placement sites to pilot DRAD CAT for one placement	Funding to cover time of HEIs and placement sites piloting DRAD CAT Funding to cover a team of researchers to undertake an evaluation of the pilot	Research team HEIs and placement sites opting into pilot	One placement is likely to be one academic year
To develop an e-portfolio version of DRAD CAT	Development of an e-portfolio version of DRAD CAT	Funding to cover time of learning technologist to develop e-portfolio Funding to cover cost of e-learning platform	Research team Learning Technologist	Alongside pilot, to ensure any refinements made during pilot are captured

To ensure the validity of the agreed elements of the DRAD CAT, the research team propose a pilot of the tool across at least two different HEIs and across differing year groups for one placement block. The pilot should be underpinned with a robust evaluation involving learners, academics and clinical partners. This would be essential to understand how the DRAD CAT works in practice, and to collect feedback concerning their experience using the new tool. A research team would need to analyse and review the data obtained in the evaluation and propose any necessary amendments to the DRAD CAT to accommodate its real-world application to pre-registration student radiographer education. The pilot would

also support the development of a Frequently Asked Questions (FAQ) section and expansion of the glossary of terms that is recommended for inclusion for the potential national roll-out of the DRAD CAT going forward.

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Appendices

Appendix A: Steering group Members and Delphi Panellists who wished to be named

Group	Member
DRAD CAT Steering Group	Rob Asher, Advanced Practitioner, Nottingham University Hospitals
	Elaine Wilkinson, Associate Professor, University of Bradford
	Charlotte Hodges, Diagnostic Radiography and Imaging Programme Lead at Cardiff University
	Linda Williams, Lead Radiographer, North West England Imaging Training Academy
	Professor Bill Whitehead, Visiting Professor, Birmingham Newman University
	Catherine McClintick, Radiography Lecturer and Programme Lead, Queen Margaret University, Edinburgh
	Cheryl Wattam Practice Educator University Hospitals of Leicester NHS Trust
	Jessica Jacques, 3rd Year Diagnostic Radiography student, Birmingham City University
	Jennifer Little, Superintendent Radiographer – Education Lead, University Hospitals of North Midlands NHS Trust
	Eleanor Dickens, 3rd Year Diagnostic Radiography Student, Birmingham City University
Modified-Delphi Panellists	Countess of Chester NHS Foundation Trust
	Coventry University
	Frimley Health NHS Foundation Trust
	University Hospitals of Leicester NHS Trust
	University of Leicester
	South West Imaging Training Academy (SWITA)
	The Royal Wolverhampton NHS Trust
	Whittington Health NHS Trust
	University Hospitals Birmingham NHS Foundation Trust
	Birmingham City University

Appendix B: Questions asked in Round One

Part A: Demographic Questions:

1a. Are you a...?

- *Student or Apprentice Radiographer?*
- *Clinical Manager*
- *Clinical Radiographer*
- *Academic*
- *Other (please specify)*

1b. If you are a student are you...

- *Apprentice on a BSc*
- *BSc*
- *Apprentice on an MSc Pre-Reg*
- *MSc Pre-Reg*

2. How many years of experience do you have in diagnostic radiography training and practice?

- *Less than 1 year*
- *1 –5 years*
- *6-10 years*
- *11-15 years*
- *16+ years*

3. What is your region?

- *Scotland*
- *Wales*
- *Northern Ireland*
- *England: Eastern*
- *England: Midlands*
- *England: London*
- *England: Northeast*
- *England: Northern*
- *England: Southeast*
- *England: Southwest*
- *England: Yorkshire and North Trent*

4. Do you currently clinically assess students in your role?

- *Yes*
- *No*

Part 1: Underpinning Principles:

5. Do you have any comments on the underpinning principles of DRAD CAT? {Free text entry box}

Part 2: Draft Elements of Assessment

6. Do you agree or disagree with the inclusion of assessment of Professional Behaviours in DRAD CAT?

__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

7. Do you agree or disagree with the inclusion of assessment of Clinical Competencies in DRAD CAT?

__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

8. Do you agree or disagree with the inclusion of Reflections and Self-Assessment in DRAD CAT?

__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

9. Do you agree or disagree with the inclusion of this element of assessment in DRAD CAT?

__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

10. Do you agree or disagree with the inclusion of feedback from others in DRAD CAT?

__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

11. Do you agree or disagree with the proposed integrated review process?

__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

12. Do you have any comments on the review process proposed for use in DRAD CAT? {Free text entry box}

13. Do you have any further comments on any of the elements of assessment proposed for use in DRAD CAT? {Free text entry box}

Part 3: Draft Clinical Competency Domains

14. Do you AGREE or DISAGREE with the wording for ‘Informed Consent’?

__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

15. Comments: {Free text entry box}

16. Do you AGREE or DISAGREE with the wording for ‘Safety of self, service users, carers and colleagues’?

__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

17. Comments: {Free text entry box}

18. Do you AGREE or DISAGREE with the wording for ‘Record keeping and confidentiality’?

__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

19. Comments: {Free text entry box}

20. Do you AGREE or DISAGREE with the wording for ‘Radiation protection’?

__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

21. Comments: {Free text entry box}

22. Do you AGREE or DISAGREE with the wording for ‘Use of imaging related digital technology and supporting systems’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
23. Comments: {Free text entry box}

24. Do you AGREE or DISAGREE with the wording for ‘Safe use of contrast media and IV cannulation skills’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
25. Comments: {Free text entry box}

26. Do you AGREE or DISAGREE with the wording for ‘Image evaluation and escalation of concerns’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
27. Comments: {Free text entry box}

28. Do you AGREE or DISAGREE with the wording for ‘Technique/examination (axial, appendicular and CXR – standard techniques)’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
29. Comments: {Free text entry box}

30. Do you AGREE or DISAGREE with the wording for ‘Technique/examination (axial, appendicular and CXR – adapted techniques)’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
31. Comments: {Free text entry box}

32. Do you AGREE or DISAGREE with the wording for ‘Technique/examination (fluoro, *theatre and interventional)’?*
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
33. Comments: {Free text entry box}

34. Do you AGREE or DISAGREE with the wording for ‘Technique/examination (mobiles)’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
35. Comments: {Free text entry box}

36. Do you AGREE or DISAGREE with the wording for ‘CT – Head, body, spine’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
37. Comments: {Free text entry box}

38. Do you AGREE or DISAGREE with the wording for ‘MRI – Brain, spine, extremity’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
39. Comments: {Free text entry box}

40. Do you AGREE or DISAGREE with the wording for ‘Assist with Ultrasound examinations’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

41. Comments: {Free text entry box}

42. Do you AGREE or DISAGREE with the wording for ‘Assist with Radionuclide examinations’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
43. Comments: {Free text entry box}

Part 4: Draft Professional Behaviour Domains

44. Do you AGREE or DISAGREE with the wording for ‘Safe & effective practice’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
45. Comments: {Free text entry box}

46. Do you AGREE or DISAGREE with the wording for ‘Professional conduct’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
47. Comments: {Free text entry box}

48. Do you AGREE or DISAGREE with the wording for ‘Person centred care’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
49. Comments: {Free text entry box}

50. Do you AGREE or DISAGREE with the wording for ‘Wellbeing of self and others’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
51. Comments: {Free text entry box}

52. Do you AGREE or DISAGREE with the wording for ‘Communication skills’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
53. Comments: {Free text entry box}

54. Do you AGREE or DISAGREE with the wording for ‘Interprofessional relationships’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
55. Comments: {Free text entry box}

56. Do you AGREE or DISAGREE with the wording for ‘Leadership qualities’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
57. Comments: {Free text entry box}

58. Do you AGREE or DISAGREE with the wording for ‘Continuing Professional Development’?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
59. Comments: {Free text entry box}

Part 6: Marking Criteria
60. Do you AGREE or DISAGREE that the Modified Benner could be used in DRAD CAT?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

61. Please indicate which Clinical Competencies you think this marking criteria would work for?

- *Informed consent*
- *Safety of self, service user, carer, and colleagues*
- *Record keeping and confidentiality*
- *Radiation protection*
- *Use of imaging related digital technology and supporting systems*
- *Safe use of contrast media and IV cannulation skills*
- *Image evaluation and escalation of concerns*
- *Technique/examination (axial, appendicular and CXR – standard techniques)*
- *Technique/examination (axial, appendicular and CXR – adapted techniques)*
- *Technique/examination (fluoro, theatre and interventional)*
- *Technique/examination (mobiles)*
- *CT – Head, body, spine*
- *MRI – Brain, spine, extremity*
- *Assist with Ultrasound examinations*
- *Assist with Radionuclide examinations*

62. Please indicate which Professional Behaviours you think this marking criteria would work for?

- *Safe & effective practice*
- *Professional conduct*
- *Person centred care*
- *Wellbeing of self and others*
- *Communication skills*
- *Interprofessional relationships*
- *Leadership Qualities*
- *Continuing Professional Development*

63. Do you agree or disagree that the modified CPAF could be used in DRAD CAT?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

64. Please indicate which Clinical Competencies you think this marking criteria would work for?

- *Informed consent*
- *Safety of self, service user, carer, and colleagues*
- *Record keeping and confidentiality*
- *Radiation protection*
- *Use of imaging related digital technology and supporting systems*
- *Safe use of contrast media and IV cannulation skills*
- *Image evaluation and escalation of concerns*
- *Technique/examination (axial, appendicular and CXR – standard techniques)*
- *Technique/examination (axial, appendicular and CXR – adapted techniques)*

- *Technique/examination (fluoro, theatre and interventional)*
- *Technique/examination (mobiles)*
- *CT – Head, body, spine*
- *MRI – Brain, spine, extremity*
- *Assist with Ultrasound examinations*
- *Assist with Radionuclide examinations*

65. Please indicate which Professional Behaviours you think this marking criteria would work for?

- *Safe & effective practice*
- *Professional conduct*
- *Person centred care*
- *Wellbeing of self and others*
- *Communication skills*
- *Interprofessional relationships*
- *Leadership Qualities*
- *Continuing Professional Development*

66. Do you agree or disagree that this marking criteria could be used in DRAD CAT?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

67. Please indicate which Clinical Competencies you think this marking criteria would work for?

- *Informed consent*
- *Safety of self, service user, carer, and colleagues*
- *Record keeping and confidentiality*
- *Radiation protection*
- *Use of imaging related digital technology and supporting systems*
- *Safe use of contrast media and IV cannulation skills*
- *Image evaluation and escalation of concerns*
- *Technique/examination (axial, appendicular and CXR – standard techniques)*
- *Technique/examination (axial, appendicular and CXR – adapted techniques)*
- *Technique/examination (fluoro, theatre and interventional)*
- *Technique/examination (mobiles)*
- *CT – Head, body, spine*
- *MRI – Brain, spine, extremity*
- *Assist with Ultrasound examinations*
- *Assist with Radionuclide examinations*

68. Please indicate which Professional Behaviours you think this marking criteria would work for?

- *Safe & effective practice*
- *Professional conduct*
- *Person centred care*

- *Wellbeing of self and others*
- *Communication skills*
- *Interprofessional relationships*
- *Leadership Qualities*
- *Continuing Professional Development*

69. Do you have any comments about these marking criteria? {Free text entry box}

70. Are there any other marking criteria that you would like the research team to consider? {Free text entry box}

Part 7: Roles and responsibilities

71. Do you AGREE or DISAGREE the 'Practice Educator' description and responsibilities?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
72. Do you have any comments about this role? {Free text entry box}

73. Do you AGREE or DISAGREE the 'Clinical Assessor' description and responsibilities?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
74.Do you have any comments about this role? {Free text entry box}

75.Do you AGREE or DISAGREE the 'Clinical Supervisor' description and responsibilities?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
76. Do you have any comments about this role? {Free text entry box}

77. Do you AGREE or DISAGREE the 'Placement Link Tutor' description and responsibilities?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
78. Do you have any comments about this role? {Free text entry box}

79. Do you have any final overall thoughts or comments about this round of the Delphi study? If so, please note them in the box below {Free text entry box}

Appendix C: Questions asked in Round Two

Part 1: Clinical Competencies

1. Do you agree or disagree with the removal of the word "skills" from this competency title?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
2. Do you agree or disagree with the addition of "within the learner's scope of practice"?
__ Strongly Disagree __Disagree __Agree __Strongly Agree
3. Do you have any further comments or feedback on this competency? {Free text entry box}

4. Do you AGREE or DISAGREE with splitting this competency into two separate competencies?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
5. Do you have any further comments or feedback on this competency? {Free text entry box}

6. Do you agree or disagree with the updated wording for 'Projection radiography (axial, appendicular, abdominal and chest – standard techniques)'?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
7. Do you have any further comments or feedback on this competency? {Free text entry box}

8. Do you agree or disagree with the updated wording for 'Technique/examination (fluoroscopy, theatre and interventional)'?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
9. Do you have any further comments or feedback on this competency? {Free text entry box}

10. Do you AGREE or DISAGREE with the updated wording for 'Projection Radiography (mobiles)'?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
11. Do you have any further comments or feedback on this competency? {Free text entry box}

12.Do you agree or disagree with the updated wording for 'MRI – Brain, spine, extremity'?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
13. Do you have any further comments or feedback on this competency? {Free text entry box}

14. Do you agree or disagree with the updated wording for 'Assist with Ultrasound examinations'?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
15. Do you have any further comments or feedback on this competency? {Free text entry box}
16. Do you agree or disagree with the updated wording for 'Assist with Radionuclide examinations?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

17. Do you have any further comments or feedback on this competency? {Free text entry box}

18. Should an additional Clinical Competency domain/s for specialist projection radiography areas such as mammography, DXA, forensic, paediatric, dental imaging be included?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
19. Do you have any comments or feedback regarding the addition of a new competency? {Free text entry box}

20. Should a separate Clinical Competency domain for paediatric radiography be included?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
21. Do you have any comments or feedback regarding the addition of a new competency? {Free text entry box}

22. Do you have any final comments on this round of the DRAD CAT? {Free text entry box}

Part 2: Marking Criteria

23. Do you have any comments on the above, or further suggestions on how to the Modified Benner could be better adapted to fit the DRAD CAT? {Free text entry box}

24. Considering the Round One comments on the originally proposed marking criteria, and the alternative marking criteria presented above, please share any additional thoughts, opinions, and feedback below: {Free text entry box}

25. Do you agree or disagree that smiley faces should be incorporated into the DRAD CAT?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
26. Please expand on your response. {Free text entry box}

27. Do you agree or disagree that coloured rubrics should be incorporated into the DRAD CAT?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*
28. Please expand on your response. {Free text entry box}

29. Question: Do you have any final overall thoughts or comments about this round of the Delphi study? If so, please note them in the box below. {Free text entry box}

Appendix D: Questions asked in Round Three

1. Do you agree or disagree with the proposed wording for Paediatric Radiography?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

2. Do you have any further comments on the updated Clinical Proficiency domains? {Free text entry box}

3.What are your thoughts on the further changes we have made to the marking criteria? {Free text entry box}

4. Do you agree or disagree that this marking criteria is suitable to be used for assessing Clinical Proficiencies and Professional Behaviours in the new standardised DRAD CAT?
__ *Strongly Disagree* __*Disagree* __*Agree* __*Strongly Agree*

5.Please indicate below which option you think would work best for the standardised DRAD CAT:

- *Include half day assessments in all placements, with a full one-day assessment in final placement*
- *Include a full one-day assessment in final placement only*
- *Do not include one day or half day assessments in the DRAD CAT*

6. Please share a little about the choice you made. {Free text entry box}

7. Do you have any final thoughts on any aspect of the DRAD Standardised Clinical Assessment Tool? {Free text entry box}

Appendix E: Example of the Integrated Review Process provided to participants

The structure of the integrated review process has been informed by stakeholder feedback in the scoping review, best practice identified in the scoping review, and evidence from the systematic review. The review process has three stages per placement. We anticipate that a placement would usually mean the placements within one academic year. However, we appreciate the programme structures will differ, and that some programmes may utilise more than one placement site in one academic year, e.g. MSc pre-registration students. Hence the use of the term placement, to ensure flexibility.

Initial Review meeting: This review is usually be completed by a practice educator or clinical assessor from the placement setting and may also be attended by a university representative. It should take place within the first week of the placement. The student's learning and development needs should be identified, and a personal development plan negotiated. Tools such as a SWOT analysis can be helpful to identify learning and development needs. SMART goals can be useful for the personal development planning stage. The meeting should be documented using the templates provided in DRAD CAT, which all parties should sign off.

Mid-Point Review meeting: This review is usually completed by a practice educator or clinical assessor from the placement setting and may also be attended by a university representative. It should take place around half-way through the placement. Before the meeting, students should complete a self-assessment of their progress with their personal development plan, using the template provided in DRAD CAT. During the meeting, progress will be reviewed, and any further learning and development needs identified. This may require an update to the student's personal development plan. Any concerns about students' progress must be clearly communicated in the meeting and documented. The meeting should be documented using the templates provided in DRAD CAT, which all parties should sign off.

Final Review meeting: This review is usually completed by a practice educator or clinical assessor from the placement setting and may also be attended by a university representative. It should take place towards the end of the placement. Before the meeting, students should complete a self-assessment of their progress with their personal development plan, using the template provided in DRAD CAT. During the meeting, progress will be reviewed, and any further learning and development needs identified. These may need to be taken forward in the students next placement. Any concerns about students' progress must be clearly communicated in the meeting and documented. The meeting should be documented using the templates provided in DRAD CAT, which all parties should sign off.

Appendix F: Examples provided to Participants for the three suggested marking criteria

Example 1 – adapted from Benner (Nursing)
Clinical competencies

1. novice - student requires high levels of supervision and direction
2. developing - student requires supervision and direction
3. working towards - student requires minimal supervision and direction
4. competent - student is performing at the required standard for independent practice

Professional behaviours

1. novice - student requires high levels of guidance and support
2. developing - student requires supervision and direction
3. working towards – student needs minimal support and direction
4. competent - student consistently demonstrates the professional behaviours expected

Example 2 – adapted from CPAF (Physiotherapy)

- Outstanding (90-100%) Consistently achieves without support, aware of own limitations
- Exceptional (80-89%) Achieves most of the time without support, aware of own limitations
- Excellent (70-79%) Appropriately and proactively seeks support to achieve, aware of own limitations
- Very Good (60-69%) Appropriately seeks support to achieve, aware of own limitations
- Good* (50-59%) Requires some support to achieve, aware of own limitations
- Satisfactory* (40-49%) Requires support to achieve, aware of own limitations
- Fail (30-39%) Does not achieve despite feedback and support, unaware of own limitations
- Fail (0-29%) Does not achieve despite significant feedback and support, unaware of own limitations

* Please check with the learner's university to ensure that you are aware of their Pass/Fail threshold.

Example 3 – adapted from ANSAT (Nursing)

1. Expected behaviours and practices not demonstrated*
2. Expected behaviours and practices performed below the acceptable standard*
3. Expected behaviours and practices performed to a satisfactory (pass) standard
4. Expected behaviours and practices performed to a proficient standard
5. Expected behaviours and practices performed to an excellent standard
6. N/A – not assessed at this point

* a rating of 1 or 2 indicates that the pass standard has not been achieved

Appendix G: Examples of the roles and responsibilities provided to participants

Practice Educator responsibilities
(Registered diagnostic radiographer is experienced in supporting clinical learning and assessment, and is usually accredited by the College of Radiographers)

As a Practice Educator you are a registered practitioner who supports learners in the workplace at all levels of practice. You will lead and facilitate practice education with the support of clinical and academic colleagues. Practice Educators are supported in their role by the wider imaging workforce who work with students.

As a Practice Educator you are likely to hold responsibility for conducting students' integrated placement reviews. You will be required to facilitate learning opportunities for students and plan to support any reasonable adjustments a student may need to get maximum benefit from their placement. You may also confirm student's clinical competency and professional behaviours.

Clinical Assessor responsibilities
(Registered diagnostic radiographer who has completed clinical assessor training)

As a clinical assessor you have a key role in assessing and confirming the student's clinical competencies and professional behaviours. You will supervise the student, and record observations on their practice, informed by student reflections, feedback from clinical supervisors and other relevant people. You will liaise with the practice educator and/or placement link tutor regularly.

There are numerous elements of the DRAD CAT which require assessment. When assessing the student, you should take into account their knowledge, skills, behaviours, and the views of those receiving care. Comments should acknowledge those exceptional students who are exceeding expectations for their stage in practice or who have particularly commendable attitudes, behaviours, knowledge, and/or skills.

If the student is not meeting the required standards this should be highlighted as a development need. If there is a cause for concern that requires prompt action, the student's personal development plan should be reviewed and updated to address their specific needs. This may require the creation of a new SMART action plan, or an update to an existing one. In the event of a fitness for practice issue, please seek guidance from the practice educator, placement link tutor and/or senior placement management team.

Clinical Supervisor responsibilities
(Registered diagnostic radiographer or other registered health/social care professional)

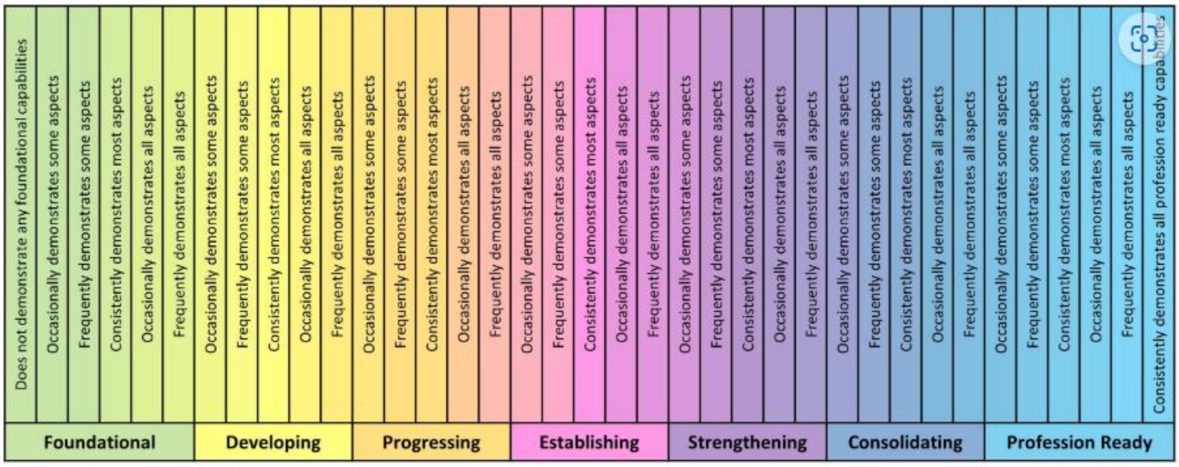
As a clinical supervisor you have an important role in supporting and guiding the student through their learning experience to ensure safe and effective learning. It is your responsibility to contribute to the student's assessment through the recording of regular feedback on their progress towards, and achievement of their competencies. Specific feedback must be provided to the practice educator on the student's progress, as required. In many placement areas students will be supported by several clinical supervisors. Some areas may adopt a team-based approach due to the nature of the experience.

Placement Link Tutors responsibilities
(Registered diagnostic radiographer employed by a higher education institution)

Placement Link Tutors are employed by a higher education institution providing pre-registration diagnostic radiography education. They will work in partnership with practice educators, clinical assessors, and clinical supervisors to evaluate student's progress. The placement link tutor will regularly communicate with the practice educators, clinical assessors, and clinical supervisors in a variety of forms.

The Placement Link Tutor is employed by the university and could be working in the university or they could be employed by the university and working in the placement environment.

Appendix H: Kilgour and McCorkell suggested alternative



4.2) Indicate the breadth and consistency of capability demonstrated for the Progressing level selected

Progressing	*In addition to the preceding capabilities:* • Is able to explain the theory/rationale underpinning an increasing number of departmental policies and procedures and applies these in most situations

Occasionally demonstrates some aspects	Frequently demonstrates some aspects	Consistently demonstrates most aspects	Occasionally demonstrates all aspects	Frequently demonstrates all aspects
○ Occasionally demonstrates some aspects	○ Frequently demonstrates some aspects	✔ Consistently demonstrates most aspects	○ Occasionally demonstrates all aspects	○ Frequently demonstrates all aspects

4.3) Provide written feedback on the strengths and development areas for this dimension of practice

Appendix I: Smiley Face and Colour Rubric Visuals Provided in Round Two

Competency	Novice	Developing	Working Towards	Competent
Informed Consent	student requires high levels of supervision and direction	student requires supervision and direction	student requires minimal supervision and direction	student is performing at the required standard for independent practice

Appendix J: Initial DRAD CAT Modified Benner Provided in Round Three

Novice	Developing	Strengthening	Consolidating	Profession Ready
Learner requires high levels of direct supervision and consistently needs direction.	*Learner requires direct supervision and frequent direction (around 75% of the time).*	*Learner requires direct supervision and some direction (around 50% of the time).*	*Learner requires low levels of direct supervision and minimal direction (around 25% of the time).*	*Learner consistently needs no direction from supervising radiographer. Learner is performing at the required standard for entering the profession.*
Please provide brief written feedback on the strengths and development areas for this learner for this competency:				
If you feel the learner has demonstrated high levels of effort and a positive attitude to learning, please indicate here: O **Good** ☆ O **Excellent** ☆☆ O **Outstanding** ☆☆☆				
Do you have any concerns around this learner's progress? **Yes** O **No** O **If yes, please comment:** *Responding "Yes" to this question will alert the member of staff responsible for learner development and support (e.g. Practice Educator) to allow for further supports to be implemented.*				

Appendix K: Draft Glossary of Terms (for Assessor Training)

Assist – to help or support someone or something.

Autonomous – learner can make informed, reasoned decisions about their own practice.

Critical thinking – learner can think in a way which questions, analyses, interprets, evaluates, and makes a judgement about what they read, hear, say, or write. It is a way of thinking that does not automatically accept that what you are reading or hearing is true. It is about gathering evidence, analysing all aspects, and reaching your own conclusions.

Competency – the skills and knowledge needed to perform a task.

Consolidating (marking criteria) – learner requires low levels of direct supervision and minimal direction (around 25% of the time).

Developing (marking criteria) – learner requires direct supervision and frequent direction (around 75% of the time).

Development Areas – areas of practice that the learner needs to improve. Once identified, development areas should be included in the learner's personal development plan, with clear SMART objectives to support the learner to improve in this area.

Domain – several professional behaviours or clinical proficiencies (as defined by the HCPC, SCoE ECR or KSB's) that are interrelated.

Formative assessment – formal or informal assessment that supports learning and attainment.

Independent – learner can work autonomously at the level required to enter the profession.

Leadership – learner can lead others or make suggestions to improve care.

Novice (marking criteria) – learner requires high levels of direct supervision and consistently needs direction.

Perform – to carry out, execute or do something in a skilled manner.

Profession Ready (marking criteria) – learner consistently needs no direction from supervising radiographer. Learner is performing at the required standard for entering the profession.

Proficiency – standard of practice required to become registered with the Health and Care Professions Council. Proficiency reflects an individual's expertise in a specific area, in this case diagnostic radiography.

Prompting – learner requires input such as use of key words, or indirect or open questioning to facilitate learning during placement.

Reflective Practice - the process of reflecting on placement experiences to describe, analyse, evaluate, and inform learning. This process may modify previous perceptions, assumptions and understanding and influence interventions and outcomes.

Strengthening (marking criteria) – learner requires direct supervision and some direction (around 50% of the time).

Summative assessment – an assessment used at a particular point in time to determine learning and attainment.

Support - learner requires explanations, guidance, and direction to facilitate learning during placement.

CoR ECF Numbering system

1	**1. Culture of care philosophy**
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
1.3	· Sensitive, non-discriminatory and **inclusive practice**
1.4	· **Person-centred care**
1.5	· **Models of partnership working with patients**, enablers and barriers to working collaboratively
1.6	· **Theories and concepts of health and illness**
1.7	· **Empathy and compassion** in practice
2	**2. Communication**
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
2.4	· **Supervision of students** and other staff, including the importance of communication in delegation
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
2.7	· How to **use all forms of communication appropriately** and responsibly, including the use of social media in a personal and professional context
2.8	· **Awareness of briefings and debriefings** and the role they play in patient and service user care, service delivery and staff well being
2.9	· Awareness of **multidisciplinary** team meetings and the role they play in patient and service user care
2.10	· **Maintain appropriate boundaries** with patients and service users keeping these relationships professional
3	**3. Professional knowledge and skills**
3.1	· Demonstrate the ability to understand and work within a given **scope of 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**
3.3	· **Ethical and legal principles of professional practice: informed consent, confidentiality, record-keeping, data protection and fitness to practise**
3.4	· **Legal mechanisms** for **medicines supply and administration** in imaging and radiotherapy, including patient group directions and the pharmacokinetics of drugs within own scope of practice
3.5	· **Knowledge of contrast** agent types, contraindications, correct administration and adverse reactions
3.6	· Identifying and responding to an **anaphylactic event**
3.7	· Intravenous **cannulation**: theory and awareness of the practical skills required
3.8	· Perform routine quality assurance (**QA**) checks on equipment and report any malfunction, breakdown or faults
3.9	· Understand and, when necessary, initiate **emergency procedures**
3.10	· **Report any accidents or injuries** using the appropriate process
3.11	· Understand the importance of identifying, reporting and investigating incidents, including errors and **near misses**
3.12	· Know how to recognise and report a **significant accidental or unintended exposure** (SAUE)
3.13	· Know how to report a clinically significant accidental or unintended exposure (**CSAUE**) and how this **links to duty of candour**
3.14	· Be aware of the requirements of the **quality management system** and contribute accordingly
3.15	· **Mandatory skills training**: infection prevention and control; fire training; information governance; cardiopulmonary resuscitation (basic life support), moving and handling; safeguarding
3.16	· Principles and practice of clinical governance
3.17	· The **organisation and management** of **health and social care services** in the UK
3.18	· Developments and trends in legislation and **health and social care policy**
3.19	· The role and **scope of practice** of the radiographer; **professional behaviour** and values; conduct; attitude; accountability, attributes and dispositions
3.20	· **Self-development**: personal organisation, time management, effective prioritisation and managing workload
3.21	· Professional and regulatory body requirements, including **fitness to practise**
3.22	· Continuing professional development and lifelong learning **CPD**

3.23	· **Reflective practice**, models of reflection, learning and clinical supervision
3.24	· Principles of **leadership and management**
3.25	· **Principles of innovation and entrepreneurship** in imaging and radiotherapy practice and service design
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
3.28	· The importance of self and **self-awareness** in developing and managing relationships
3.29	· **Emotional intelligence, resilience and motivation**
3.30	· **Awareness of own health** and the impact of this on own fitness to practise
3.31	· Digital literacy - NHS allied health professionals **digital competency framework** and associated digital literacy skills as appropriate to the role of the radiographer
3.32	· Definitions and indicators of all forms of abuse, including neglect, and the role of the radiographer in **safeguarding**
3.33	· Have the **courage to speak out** and highlight shortfalls in service delivery though appropriate channels and to escalate if necessary
3.34	· **Duty of candour** within imaging and radiotherapy services and the wider healthcare environment
3.35	· Demonstrate a **commitment to the profession**, patient care and the health of the community
3.36	· The impact of healthcare on **planetary health, the sustainability** of resources and the effects on human health within own scope of practice
3.37	· Understand the importance of **individualised care** and advise on procedural side effects using the evidence base
3.38	· Support and **promote public health** for individuals and within the community
4	**4. Teamworking**
4.1	· Support and develop an **inclusive culture**
4.2	· **Work collaboratively**
4.3	· Support others to **raise concerns** openly, providing reassurance and/or escalating further when patient safety is at risk
4.4	· **Interprofessional working**: principles and practice, benefits and challenges
5	**5. Academic and research skills**

5.1	· **Literacy and numeracy** skills of a sufficiently high level to support learning and practice
5.2	· **Digital literacy** to support learning
5.3	· **Critical thinking**, making informed decisions/judgements and problem-solving skills
5.4	· **Critical appraisal** of the research evidence applicable to imaging and/or radiotherapy practice
5.5	· Ability to search for and **access relevant literature** from a range of quality literature databases
5.6	· Skills for inquiry in **conducting audit, service evaluation** and involvement in research in health and social care
5.7	· Definitions of knowledge; **scientific and constructivist approaches** relevant to radiography and radiotherapy
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
5.10	· Skills for **reflective practice**, including appropriate use of models of reflection, as part of lifelong learning
5.11	· Ability to **engage with patients**, carers and service users for education and development
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
5.13	· **Developing teamworking skills through education and research collaborations**
6	**6. Imaging Science, technology 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
6.2	· Fundamental **concepts of occupational and public radiation protection** and statutory obligations relating to ionising radiations as required by the Ionising Radiations Regulations (IRR) 2017
6.3	• **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

6.4	· Know the difference between the need for re-justification and the ability to make autonomous decisions to undertake repeat exposures for technical reasons
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)
6.6	· 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
6.9	· Quality control measures and quality assurance (**QA**) frameworks, QA tests and implementation
6.10	· **Principles of digital imaging**, picture archiving and communication systems (PACS), image acquisition, processing, storage, retrieval, transfer and manipulation
6.11	· Knowledge of the interactions of **exposure factors** and technological algorithms for optimising exposure and image quality across a range of imaging modalities
6.12	· The use of **artificial intelligence** in radiography: benefits, challenges and opportunities
6.13	· Physical principles of **matter, atomic structure, radioactivity, electricity, magnetism and sound**
6.14	· The **electromagnetic spectrum**: heat, light and radio frequencies
6.15	· Primary sources of **ionising radiation**, interactions of photons with matter and relationship to image quality and radiation dose
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
6.18	· **New diagnostic** and therapeutic **technologies** in line with the appropriate evidence base
7	**7. Specific curriculum content: Diagnostic Radiographer**

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)
7.3	· Identify the **correct patient** before every action and interaction
7.4	· **Assess patient wellbeing** and condition throughout; prior to, during and after imaging
7.5	· Radiographic skills and **patient positioning techniques** from **neonate to elderly**
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
7.9	· **Patient presentatio**n, 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
7.11	· **Patient presentation**, symptoms, clinical indications and selection of the correct **imaging protocol** in relation to 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
7.13	· **Image-guided procedures** and management of controlled and supervised areas
7.14	· **Nasogastric tube** placement checks and appropriate actions
7.15	· **Interventional** radiography and procedures
7.16	· Basic awareness of the principles of **forensic imaging** within scope of practice
7.17	· **Preliminary clinical evaluation** of images relevant to first-post competence, and to include structure and terminology in preliminary clinical evaluation
8	**8. Anatomy, pathophysiology and radiographic image evaluation**

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 **abnormal or pathological findings** on radiographic/medical images
8.4	· **Surface anatomy and radiographic terminology**
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
8.7	· Understand the impact of treatments on **disease pathways**

Domains				
Profesional Behaviours	HCPC **SoPs**	HCPC **SoCs**	**SCoR ECF**	**IAfTE KSBs**
Safe and effective practice • Training (e.g. M&H, apply BLS), supervision and mentoring, Schedule 3 IR(ME)R (adequate training) • Keep own skills and knowledge up to date • Make reasonable adjustments using informed decisions • Appropriate imaging modalities to patient's needs • Maintain safety of themselves and others, including safe environments for practice • Widen your scope of practice, but delegate work if it is outside your scope of practice • Support and encourage others to report concerns • Understand medications (e.g. contrast) and possible reactions. • Complete more complex techniques and interventional, non-standard techniques, Fluoro, US, PET, PPE • Complete examinations on anaesthetised or unconscious individuals	1.1, 1.2, 4.6, 4.7, 4.8, 5.4, 13.7, 14.1, 14.3, 14.4, 14.5	3.1, 3.2, 3.3, 4.1, 6.2, 7.2	3.1, 3.9, 3.10, 3.11, 3.31, 4.3, 7.2	K13, K49, S1, S3, S17, S25, S60, S66, S68, S69, S73, S74, S76, S79, S83, S85, S86, S88, S89, S90, S94, S97, S98, S103, S104, S107
Professional conduct • Professional behaviour, conduct, honesty, integrity and respect • Duty of care • Personally responsible, declare issues that might create conflicts of interest and do not influence your judgement • Recognise own values, beliefs and personal biases • Maintain appropriate professional boundaries • Be polite and considerate • Use media-sharing networks and social networking sites responsibly • Be proactive in implementing improvements in order to improve service delivery and patient care	2.1, 2.4, 2.9, 2.11, 4.1, 5.3, 8.3	1.7, 1.8, 1.9, 1.11, 1.12, 2.1, 2.8, 2.10, 2.12, 7, 7.5, 7.6, 7.7, 8.1, 8.2, 8.4, 9.1, 9.2, 9.3, 9.4, 9.5, 9.6	2.1, 3.21, 3.27, 3.19, 3.20, 3.28,	S4, S8, S10, S12, S30, S45, B1, B2, B4, B5, B6

Person centred care • Safeguarding • Respect and uphold the rights, dignity, values, and autonomy • Make and receive appropriate referrals and provide appropriate care • Inclusive practice, consider the needs of all different groups, challenge barriers • Provide information and support for service users throughout their examinations, give understandable information, language and communication needs • Adapt imaging procedures, radiographic techniques, for individual care needs • Empower service users, respecting their privacy and dignity • Duty of candour, your personal values, biases and beliefs must not detrimentally impact the care	2.2, 2.3, 2.5, 2.6, 2.8, 4.3, 4.4, 5.1, 5.5, 5.6, 5.7, 5.8, 6.3, 7.11, 8.5, 8.12, 13.3, 13.13, 13.14, 13.18, 13.21, 13.22, 13.27, 13.28, 13.30, 13.31	1.1, 1.2, 1.5, 1.6, 2.3, 2.4, 2.5, 7.1, 7.3, 7.4, 8.3	1.1, 1.2, 1.3, 1.4, 1.7, 2.6, 3.32, 3.34, 3.35, 3.37, 4.1, 7.12, 7.4, 7.5, 7.6 7.7, 7.8	K2, K6, K16, K28, K31, S5, S6, S7, S23, S24, S26, S28, S31, S33, S34, S47, S81, S87, B3
Legislation, policies and guidance • Equality • Mandatory training including BLS, COSHH, information and data governance, H&S, M&H • Keep up to date with the law and guidance of practice	2.10, 2.12, 5.2, 6.2, 14.2, 14.6, 14.8, 14.9, 15.4	3.5	3.16	K7, K18, K61, K62, K63, S11, S38, S101, S102
Radiation, QA, high-strength magnetic fields • Risk vs benefit • QA, quality assurance, and faulty equipment • Maximise health gain whilst minimising risks • Understand high-strength magnetic fields • Concepts of the science of ionising radiation imaging, and the significance of radiation dose	8.15, 11.4, 13.20, 14.7	6.1	6.1	K35, K43, S13, S50, S54, S58, S80, S84
Wellbeing • Awareness of own mental and physical health and wellbeing, take appropriate action if own health affect ability • Emotional intelligence, resilience and motivation • Empower and enable service users, in maintaining their own health and wellbeing • Promotion of health and health education	3.1, 3.2, 3.3, 3.4, 7.4, 12.6, 15.3	6.3, 6.4, 1.3, 2.11,	3.29, 3.30, 3.38,	K9, K10, S14, S15, B3, B7, K64, S108
Confidentiality • Confidentiality is maintained, • Confidentiality and informed consent, • Duty of confidentiality	6.1, 6.4, 6.5			K19, K20, S27,

Communication • Professional communication, including interprofessional and intraprofessional communication • Appropriate methods and individual communication needs and preferences of service users and carers • Accessible formats to make informed decisions	4.4, 7.1, 7.2, 7.3, 7.5, 7.6, 7.7, 7.8, 7.9	1.1	2.1, 2.2, 2.3, 2.5, 2.7	K21, K22, K23, K55, S32, S41, S29, S36
Interprofessional • Work collaboratively, in partnership with colleagues • Recognise other professions and services • Advise other healthcare professionals about imaging	7.10, 8.1, 8.2, 8.3, 8.4, 8.5	2.6, 2.7, 2.9	4.2, 4.4	K38, S35
Continuing Professional Development • Reflective practice • Engage with patients, carers, service users and colleagues for education and development • New developments and trends in the science and practice of diagnostic radiography, including AI, and new technologies	4.8, 5.6, 13.1	3.4, 3.5, 3.6	2.4, 3.2, 5.11, 5.12	K11, K32, S3, S61, S62, S63, B5, B6
Leadership • Role model • Leadership qualities, behaviours and benefits • Encourage, support and mentor staff, and students including supervision	4.5, 8.9, 8.10, 8.11, 8.13	4.2	2.4	K11, K26, S43, S44, S48

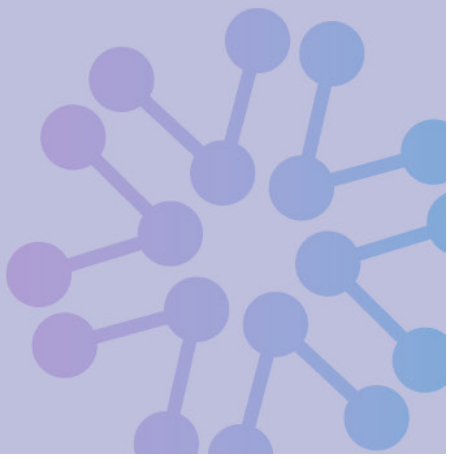
Domains				
Clinical competencies	HCPC **SoPs**	HCPC **SoCs**	**SCoR ECF**	**IAfTE KSBs**
Informed Consent • Demonstrating informed consent on a variety of different patient types • Confidentiality is maintained • Valid consent	2.7, 13.2, 13.28	1.4, 2.2		K4, K48, S9
Safety of self, service user, carers and colleagues • Responsible for their own safety when operating multiple different platforms of equipment/procedures, and that of carers, service users and colleagues	13.19		3.5, 3.6, 3.9, 3.10, 3.11, 3.15, 6.8, 7.1	K60, S18, S19, S82
Record keeping & confidentiality • Correct record keeping using a variety of platforms. Understand the importance of confidentiality inc GDPR.	9.1, 9.2, 9.3	5.1, 5.2 , 10.1, 10.2, 10.3	3.3, 7.3	S37, S65
Radiation protection • Compliance with and practice in accordance with IRR and IR(ME)R / QA / Justification / Quality Control / Clinical governance • Maximise health gain whilst minimising risks / Take all reasonable steps to reduce the risk of harm to service users, carers and colleagues / Risk vs benefit / Significance of radiation dose • Faulty equipment / Safe operating practice / Functioning accurately • High-strength magnetic fields / Concepts and principles of the science of ionising radiation imaging	2.12, 8.15, 11.4,12.11, 13.19, 13.20, 13.24, 14.7	6.1	3.12, 3.13, 3.14, 3.8, 6.1, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 7.1, 7.9, 7.11, 7.11, 7.13	K35, K43, K45,K60, S13, S50, S54, S58, S80, S84, S91, S106
Contrast media and IV cannulation • Demonstrates awareness of actions required to identify and manage contrast agent reactions • Emergency drugs and safe delivery of contrast agents • Principles of safe IV cannulation and training overview	12.21, 12.11, 13.25 13.34		3.5, 3.6, 3.7	S60, S84, S85, S94

Image evaluation • Quality assessment of images / Technically acceptable • Answers clinical questions • Image interpretation (commenting) / normal & abnormal / Common pathologies • Escalation of pathologies / NG tube position related to general radiography, CT and MRI standard projections	12.16, 13.17, 13.39 13.40		7.17, 8.2, 8.3, 8.4, 8.5 8.6, 7.14	K57, S59, S99, S100
Standard Technique / Examination (all axial, appendicular, CXR, AXR) - (standard technique)	13.4, 13.23 13.26		6.6, 7.1, 8.4	S78, S84
CT (Head, body, spine) to include contrast studies	13.4, 13.25, 13.26, 13.35		3.5, 3.7 ,6.6 8.4	S95
MRI standard examinations for placement setting	13.4,13.25, 13.26, 13.36, 14.7		3.5, 6.6, 8.4	S96
Adaptive Technique / Examination (all axial, appendicular, CXR, AXR) - (adapted technique)	13.18, 13.26, 13.28, 13.32, 13.4		7.1, 7.5, 7.6, 7.7, 7.8	S88, S92
Technique / Examination (fluoro / theatre / interventional)	13.4,13.25, 13.26, 13.30, 13.34		6.6, 6.8, 7.12, 7.15	S78, S90, S94
Use of imaging related digital technology and supporting systems • PACS / RIS • Record keeping and confidentiality	7.7, 13.4, 13.33		3.31, 6.10, 6.12	K29, S33, S61, S62, S93
Mobile Technique / Examination	13.4, 13.26, 13.29		6.1, 6.6	S89

Assisting with Ultrasound • to be able to assist with standardised US procedures • Importance of dignity and respect • Infection control	13.4, 13.25, 13.37		6.6, 8.4	S97
Assisting with Nuclear Medicine • Understand the key principles of RNI • Assist with basic procedures	13.4, 13.25, 13.38		6.6, 8.4	S98

HCPC SoP's for Diagnostic Radiography (2023)			CoR ECF	Apprenticeship Standards KSBs	
1.3	keep their skills and knowledge up to date and understand the importance of **CPD** continuing professional development throughout their career	1.5	**Models of partnership working with patients**, enablers and barriers to working collaboratively	K1	The importance of continuing professional development throughout own career
2.13	understand the legislative, policy, ethical and **research** frameworks that underpin, **inform and influence** the **practice** of radiography	1.6	**Theories and concepts of health and illness**	K5	The importance of capacity in the context of delivering care and treatment
8.6	understand the qualities, behaviours and benefits of **leadership**	2.8	**Awareness of briefings and debriefings** and the role they play in patient and service user care, service delivery and staff well being	K12	Equality legislation and how to apply it to own practice.
8.7	recognise that **leadership** is a skill all professionals can demonstrate	2.9	Awareness of **multidisciplinary** team meetings and the role they play in patient and service user care	K14	The characteristics and consequences of barriers to inclusion, including for socially isolated groups
8.8	identify their **own leadership qualities**, behaviours and approaches, taking into account the importance of equality, diversity and inclusion	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**	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.
8.14	demonstrate awareness of **roles and responsibilities** where work is delegated and demonstrate understanding of how this applies in practice	3.3	**Ethical and legal principles of professional practice: informed consent, confidentiality, record-keeping, data protection and fitness to practise**	K17	When disclosure of confidential information may be required.
8.16	understand the need to **involve service users** in **service design, service delivery, education and research**	3.4	**Legal mechanisms** for **medicines supply and administration** in imaging and radiotherapy, including patient group directions and the pharmacokinetics of drugs within own scope of practice	K24	The principles and practices of other health and care professionals and systems and how they interact with own profession.
8.17	understand the need to **engage service users** and **carers in planning** and **evaluating their diagnostic imaging** and **interventional procedures**	3.17	The **organisation and management** of **health and social care services** in the UK	K27	That leadership is a skill all professionals can demonstrate
10	**reflect on and review practice**	3.18	Developments and trends in legislation and **health and social care policy**	K30	the need to involve service users in service design, service delivery, education and research.
10.1	understand the value of **reflective practice** and the need to record the outcome of such reflection to support continuous improvement	3.22	Continuing professional development and lifelong learning **CPD**	K33	The value of multi-disciplinary reviews, case conferences and other methods of review.
10.2	recognise the **value of multi-disciplinary reviews, case conferences** and other methods of review	3.23	**Reflective practice**, models of reflection, learning and clinical supervision	K34	The value of gathering and using data for quality assurance and improvement programmes.
11.1	engage in evidence-based practice **EBP**	3.24	Principles of **leadership and management**	K36	The quality improvement processes in place relevant to their profession.
11.2	gather and use feedback and information, including **qualitative and quantitative data**, to evaluate the responses of service users to their care	3.25	**Principles of innovation and entrepreneurship** in imaging and radiotherapy practice and service design	K39	The structure and function of health and social care systems and services in the UK.
11.3	monitor and **systematically evaluate the quality of practice**, and maintain an effective quality management and quality assurance process working towards continual improvement	3.26	Theories of judgement and **decision-making** in radiographic practice	K40	The role of the diagnostic radiographer and other operators in the promotion of health and health education in relation to public health, healthy living and health screening for disease detection.
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	3.31	NHS allied health professionals **digital competency framework** and associated digital literacy skills as appropriate to the role of the radiographer	K41	The harms and benefits of population and targeted health screening.
11.6	recognise the value of **gathering and using data** for **quality assurance and improvement programme**	3.36	The impact of healthcare on **planetary health, the sustainability** of resources and the effects on human health within own scope of practice	K42	The radiobiological principles on which the practice of diagnostic radiography is based.
11.7	understand the principles and **regulatory requirements** for **quality control** and **quality assurance** as they apply to their profession	5.1	**Literacy and numeracy** skills of a sufficiently high level to support learning and practice	K46	The physical and scientific principles on which image formation using ionising and non-ionising radiation is based.Tt
11.8	understand the **quality improvement processes** in place relevant to their profession	5.2	**Digital literacy** to support learning	K47	Radiation dosimetry and the principles of dose calculation.
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	5.3	**Critical thinking**, making informed decisions/judgements and problem-solving skills	K51	The pharmacology of drugs used in their profession.
12.2	demonstrate awareness of the principles and applications of scientific enquiry, including the evaluation of treatment efficacy and the **research process**	5.4	**Critical appraisal** of the research evidence applicable to imaging and/or radiotherapy practice	K52	The legislation, principles and methods for the safe and effective administration of drugs used in their profession.
12.3	recognise the role(s) of other professions and services in health and social care and understand how they may relate to the role of radiographer	5.5	Ability to search for and **access relevant literature** from a range of quality literature databases	K53	The mechanisms for the administration of drugs, including intravenous and oral contrast agents.
12.4	understand the structure and function of health and social care systems and services in the UK	5.6	Skills for inquiry in **conducting audit, service evaluation** and involvement in research in health and social care	K54	The principles of the safe storage, transportation and disposal of medicinal products used in relation their profession.
12.5	demonstrate awareness of the philosophy and the development of the profession of radiography to inform understanding of current practice	5.7	Definitions of knowledge; **scientific and constructivist approaches** relevant to radiography and radiotherapy	K58	A range of research methodologies relevant to own role.
12.7	understand the **harms and benefits** of population and **targeted health screening**	5.8	Hierarchies of evidence and how these underpin **evidence-based practice** in imaging and/or radiotherapy	K59	The value of research to the critical evaluation of practice
12.8	understand the **radiobiological principles** on which the practice of radiography is based	5.9	Selection and interpretation of **evidence for imaging** and/or radiotherapy practice	K65	How social, economic and environmental factors, wider determinants of health, can influence a person's health and well-being.
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	5.1	Skills for **reflective practice**, including appropriate use of models of reflection, as part of lifelong learning	S22	Use research, reasoning and problem-solving skills when determining appropriate actions.

12.10	understand the philosophy and principles involved in the practice of their profession	**5.13**	**Developing teamworking skills through education and research collaborations**	**S55**	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
12.12	know the **physical and scientific principles** on which **image formation** using ionising and non-ionising radiation is based	**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	**S56**	Demonstrate awareness of the principles and applications of scientific enquiry, including the evaluation of treatment efficacy and the research process
12.13	understand **radiation dosimetry** and the principles of dose calculation	**6.1**	**Principles of digital imaging**, picture archiving and communication systems (PACS), image acquisition, processing, storage, retrieval, transfer and manipulation	**S70**	Critically evaluate research and other evidence to inform own practice
12.14	understand the theoretical basis underpinning **service user assessment prior to and during their procedure**	**6.11**	Knowledge of the interactions of **exposure factors** and technological algorithms for optimising exposure and image quality across a range of imaging modalities	**S71**	Engage service users in research as appropriate
12.15	understand the **capability**, applications and range of equipment used in their profession	**6.12**	The use of **artificial intelligence** in radiography: benefits, challenges and opportunities		
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	**6.13**	Physical principles of **matter, atomic structure, radioactivity, electricity, magnetism and sound**		
12.18	know the **pharmacology** of drugs used in their profession (Contrast examinations)	**6.14**	The **electromagnetic spectrum**: heat, light and radio frequencies		
12.19	understand the **legislation, principles and methods** for the safe and effective **administration of drugs** used in their profession (Contrast examinations)	**6.15**	Primary sources of **ionising radiation**, interactions of photons with matter and relationship to image quality and radiation dose		
12.20	understand the mechanisms for the **administration of drugs**, including intravenous and oral contrast agents (Contrast examinations)	**6.16**	**Scatter radiation** and its relation to image quality and radiation dose		
12.21	recognise and respond to **adverse or abnormal reactions** to medications used in relation to their profession (Contrast examinations)	**6.17**	The evidence base informing the reasoned decision for limiting use of patient contact shielding (e.g. **gonad shielding**) from standard practice		
12.22	understand the principles of the **safe storage, transportation and disposal of medicinal products** used in relation their profession	**6.18**	**New diagnostic** and therapeutic **technologies** in line with the appropriate evidence base		
12.23	demonstrate awareness of the current **developments and trends** in the **science and practice of radiography**	**7.1**	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		
12.24	understand the different communication needs, anatomy and disease processes and their manifestation in **children**	**7.16**	Basic awareness of the principles of **forensic imaging** within scope of practice		
12.25	demonstrate awareness of the principles of Artificial Intelligence **(AI)** and deep learning technology, and its application to practice	**8.1**	**Anatomy** of the human body, including disease processes from fetal life to old age		
12.26	understand the signs and symptoms of disease and **trauma** that result in referral for diagnostic imaging procedures and their image appearances	**8.7**	Understand the impact of treatments on **disease pathways**		
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 – the cardiovascular, respiratory, genitourinary, gastro-intestinal and neuro□endocrine systems				
13.5	undertake and record a thorough, sensitive and detailed assessment				
13.6	undertake or arrange **investigations** as appropriate				
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				
13.11	engage **service users in research** as appropriate				
13.12	formulate specific and appropriate **management plans** including the **setting of timescales**				
13.15	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				
13.16	interrogate and **process data** and information gathered accurately in order to conduct the procedures most appropriate to the service user's needs				
15.1	understand the role of their **profession in health promotion**, health education and preventing ill health				
15.2	understand how **social, economic and environmental factors** (wider determinants of health) can influence a person's health and well-being				



SoR
THE SOCIETY OF
RADIOGRAPHERS