Radiographer Preliminary Clinical Evaluation

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Executive summary

The Society of Radiographers (SoR) is the UK professional body and trade union for the diagnostic imaging and radiotherapy workforce, with approximately 32,000 members. The SoR shapes policy and standards, pioneers new ways of working and ensures safe and fair workplaces.

The SoR is advocating that when imaging services cannot provide an immediate definitive clinical report for a patient receiving clinical imaging in the emergency department, then providing a diagnostic radiographer preliminary clinical evaluation (PCE) acts as a 'safety net' approach to support referrers that minimises potential risks to patients and services. This guidance sets out the background, justification and evidence for radiographer PCE and proposes a toolkit for local service implementation.

An immediate definitive clinical report (generated by a reporting radiographer or radiologist) remains the preferred gold standard of care. When this cannot be achieved, a diagnostic radiographer PCE at the time of imaging may act as a safety net by reducing the potential for referrer interpretation errors. A PCE is therefore intended for use when referrers are viewing radiographs in the absence of a definitive clinical report.

Due to the current design of services and pathways, the escalation of significant clinical findings for cases of cross-sectional imaging studies is preferable to PCE. Radiographers should escalate urgent or unexpected findings in any modality where there is not a PCE process in place, as per Health and Care Professions Council (HCPC) standards of proficiency for radiographers 13.7 and 13.40 [(1)].

Most PCE systems have been implemented to support referrers within emergency departments (EDs), but PCE has immense potential to support referrers and services across healthcare settings, including community diagnostic centres (CDCs), urgent and primary care, same-day emergency care, and walk-in and ambulant care centres. PCE should be used in situations where an immediate radiographer comment could prevent referrer interpretation error and will also support time-sensitive care.

Healthcare organisations may seek to implement or extend radiographer PCE systems according to local circumstances. A training needs analysis should be conducted by an identified PCE lead working in partnership with service managers to define and action a strategic framework for implementation. For example, this could be done by a consultant radiographer in collaboration with reporting radiographers working at advanced levels of practice. In England, this work may be led at imaging network level and include consultation with regional imaging academies about training requirements.

There is a strong and established evidence base (see *Appendix 1*) demonstrating that well-structured and resourced radiographer PCE systems, implemented with regular training and education, audit and feedback mechanisms, can be safe and effective. There is currently little empirical evidence of the direct effect of PCE on patient outcomes. PCE service evaluation and research should seek to build the evidence base about effects and improvements to patient outcomes.

Glossary	
Care Quality Commission (CQC):	Independent regulator of health and social care in England
Clinical reporting:	Provision of a definitive diagnostic report on a radiological imaging examination, within clear governance procedures, by an individual who has successfully completed a recognised training and education programme (typically a reporting radiographer or radiologist)
College of Radiographers (CoR):	Develops medical imaging and radiotherapy practice, and promotes study and research into radiography and public awareness of the profession
Health and Care Professions Council (HCPC):	Regulator of 15 health and care professions in the UK, including radiography
Healthcare Safety Investigation Branch (HSIB):	Part of NHS England formerly responsible for investigating patient safety concerns and applying lessons learned to NHS improvement; since 2023 the Health Services Safety Investigations Body (HSSIB) has held this role
NHS Resolution:	Provides expertise to the NHS on resolving concerns and disputes fairly and sharing learning for improvement
Parliamentary and Health Services Ombudsman (PHSO):	Independently investigates complaints about UK government departments, other public organisations and the NHS
Preliminary clinical evaluation (PCE):	An informed comment on imaging appearances made by a radiographer at the time of image acquisition, communicated in unambiguous text form to the referrer
Radiographer abnormality detection system (RADS):	A system in which a radiographer flags images they consider to be abnormal (commonly referred to as a 'red dot' system)

Reporting radiographers:	Radiographers who have undertaken College of Radiographers-approved postgraduate education and training, gained skills and passed examinations that enable them to provide a definitive clinical report. For a minority of reporting radiographers who work in emerging fields, training may be in-house due to lack of specific applied courses. In those cases, the person's employer must provide written permission and acknowledgement of the practice. Reporting radiographer arrangements should be covered in the individual's job description and include provision of a named mentor (expert in that area), sufficient training and education, multidisciplinary team approaches to learning and regular audit of practice against local standards
Royal College of Emergency Medicine (RCEM):	Sets and monitors standards of care in emergency departments and advises on policy relating to emergency medicine
Royal College of Radiologists (RCR):	Leading professional membership body for clinical radiologists and clinical oncologists
Society of Radiographers (SoR):	UK professional body for the diagnostic imaging and radiotherapy workforce that shapes policy and standards and pioneers new ways of working

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Background

The impact that diagnostic radiographers can have on the care, diagnosis and treatment of patients is immense, yet sometimes not realised to its full potential [2]. A 2021 Parliamentary and Health Services Ombudsman (PHSO) report identified that radiographers' skills are not always fully utilised [3]. The roles and skills of diagnostic radiographers are vital to lead and manage diagnostic radiography services for patients, families and carers. A 2020 review led by Professor Sir Mike Richards recommended that healthcare organisations in England work together at team, NHS trust and imaging network levels to deliver changes in the diagnostics workforce, with a particular emphasis on driving skill mix initiatives [4]. Radiographer preliminary clinical evaluation (PCE) offers an opportunity to leverage the knowledge and experience of diagnostic radiographers with respect to immediate identification of normal and abnormal imaging examinations.

Introduction: reducing diagnostic errors

During the period 2022–23, imaging services in England undertook 43.4 million imaging examinations [5]. Clinical imaging is provided on a 24-hour basis to time-critical services, including intensive care units, neonatal intensive care units, emergency theatres and emergency departments (EDs).

Definitive clinical reports for the resulting images are provided by members of imaging teams that include reporting radiographers and radiologists. Definitive clinical reports may be immediate ('hot report') or provided hours, days or, in extreme circumstances, months after the patient has left the imaging department ('cold report').

In many clinical situations the immediate identification of imaging abnormalities is essential for patient care:

- A review of repeated cases of complaint and litigation in EDs, conducted by NHS Resolution in 2022, identified that some form of immediate clinical comment from clinical imaging services, provided at the time of the imaging examination, has a positive effect on patient morbidity and mortality [6,7].
- National Institute for Health and Care Excellence (NICE) standards for reporting plain radiograph images (NG38) require a definitive written report of ED radiographs of suspected fractures before the patient is discharged from ED [8].
- The Academy of Medical Royal Colleges asserts that it is essential that all abnormalities demonstrated on imaging are highlighted in a timely manner with escalation of time-critical findings [9].

The Care Quality Commission (CQC) recommends that the Royal College of Radiologists (RCR), SoR and the College of Radiographers (CoR) ensure that clear frameworks are developed to support NHS trusts in managing turnaround times for clinical reports safely [10]. SoR regards the provision of an immediate, definitive clinical (hot) report to be the most efficient and effective approach to make optimum use of reporting radiographers' and radiologists' skills. However, it is recognised that in the current climate services may not be in a financial or staffing position to immediately achieve full 24-hour definitive clinical (hot) reporting. This results in a demonstrable inequality in the provision of services, depending on the time of day that a person receives imaging and their physical location.

There is the potential for employing artificial intelligence (AI)-derived computer algorithms to assist with the identification of abnormalities, including fractures, and to augment decision-making for skeletal imaging in the future. However, the implementation of AI systems in clinical practice is not yet at a stage of full technology evaluation, and any recommendation for their routine use in clinical practice will need to be in line with a demonstrable evidence base. As the evidence base develops, the guidance in this document will need to be reviewed to ensure the best use of staff skills and innovation for patient outcomes and experience.

Preliminary clinical evaluation – a radiographer safety net

Radiographer abnormality detection systems (RADS), including 'red dot' systems, have enabled radiographers to make significant contributions to diagnosis in ED for at least 30 years. It is noted, however, that red dot type systems are ambiguous, can mask the presence of more than one abnormality and no longer sit comfortably in current clinical governance processes.

In contrast, radiographer preliminary clinical evaluation (PCE) describes the practice of radiographers assessing imaging appearances, making informed clinical judgements and decisions, and communicating these in unambiguous written form to referrers.

Until national standards for radiological reporting times [11] can be fully achieved in local services, expansion of the skill mix by using radiographer PCE offers an immediate alternative form of comment and support for imaging referrers and patients. SoR advocates that, where an immediate and definitive (hot) report is not currently achievable within the financial and staffing climate, it is prudent to expand the radiographer skill mix with the implementation of radiographer PCE at healthcare organisations. PCE is a relatively low-cost and achievable 'safety net' approach that will provide a stopgap solution to support timely care and offer a valuable safety net to mitigate risk and improve patient safety.

Additional benefits of providing a PCE service

PCE service provision aims to reduce missed fracture rates in ED, thereby improving patient experience and reducing litigation.

Providing a PCE service also has benefits for the clinical imaging department. Radiographers who are interpreting images have an enhanced understanding of why patient positioning is important, which improves overall image quality in local departments and increases radiographers' job satisfaction.

Radiographer PCE may also:

- enable radiographers to implement, utilise and maintain image evaluation and comment capabilities and skills following their Health and Care Professions Council (HCPC) registration
- enable radiographers, post-registration, to continue to demonstrate competence in line with HCPC radiographer standards of proficiency 12.6, 12.26, 13.17 and 13.40 [(1)]
- enable services that are ethically and morally just, with equity for all patients regardless of the healthcare service location or time of day
- reduce litigation costs to healthcare organisations and NHS Resolution.

There is, however, little empirical evidence regarding the direct impact of radiographer PCE on patient outcomes. PCE service evaluation and research should aim to provide direct evidence of how it affects patient outcomes, including socio-economic factors.

Historically, efforts have focused on the provision of PCE for patients referred from ED, but PCE has immense potential to support referrers and services throughout the healthcare system, including community diagnostic centres (CDCs), urgent and primary care, same-day emergency care, and walk-in and ambulant care centres. PCE may be particularly useful to referrers if there is emergency downtime of the picture archiving communication system (PACS), when definitive reporting cannot take place but PCE potentially could.

In cross-sectional imaging, where a clinical report may not be available immediately, the emphasis should be on the escalation of critical and significant clinical findings rather than PCE. Radiographers working in computed tomography (CT) or magnetic resonance imaging (MRI) should be trained and educated to recognise clinically urgent findings and follow local written escalation procedures.

Diagnostic radiographer PCE capability

The SoR *Scope of Practice* statement for radiographers encompasses all tasks "which the radiographer is educated and competent to perform", considering legislation, the extent of available education and development, and opportunity [12]. In the context of PCE, diagnostic radiographers' scope of practice is bounded by the requirements of their employer and the extent of their knowledge, skills and competence. At initial registration, HCPC standards [1] and the CoR Education and Career Framework [13] expect that in clinical practice diagnostic radiographers should differentiate between normal and abnormal anatomy within a range of planar and cross-sectional imaging modalities and apply this knowledge to clinical decision-making.

Diagnostic radiographers must practise PCE within an agreed and defined scope of practice, which should be set out clearly in their employer's protocols. The Ionising Radiation (Medical Exposure) Regulations 2017 (IR(ME)R 2017) and Ionising Radiation (Medical Exposure) Regulations (Northern Ireland) 2018 (IR(ME)R 2018 NI) [14] define evaluations as "interpretation of the outcome and implications of, and of the information resulting from, an exposure". When considering IR(ME)R duty holder roles, it should be clear that radiographers performing PCE are assisting in the clinical evaluation process rather than making the evaluation. Radiographers will have theoretical knowledge at practitioner entry level (initial HCPC registration) and will need to develop practical experience over time.

International radiographers who have not trained in the UK may require support from mentors during the induction and preceptorship periods, depending on the individual's level of training and experience of performing PCE prior to employment in the UK.

It is essential that radiographers understand and practise PCE within their capabilities, seeking assistance from their multidisciplinary clinical reporting team (of reporting radiographers and radiologists) when necessary. Clinical supervision with input and feedback is essential to provide support and reassurance for multidisciplinary skill mix working.

In cases where there is a discrepancy between PCE and a definitive report that may significantly influence patient care, then timely feedback, informing both the radiographer and the referring clinician, is essential. The mechanism and procedures to do so should be agreed locally.

There is a strong and established evidence base (see Appendix 1) demonstrating that well-structured and resourced radiographer PCE systems, implemented with regular training and education, audit and feedback mechanisms, can be safe and effective.

UK higher education institutions examine and offer assurance of graduates' competence to employ PCE skills at initial registration. It is an HCPC requirement that for initial UK registration all diagnostic radiographers must:

- understand the signs and symptoms of disease and trauma that result in referral for diagnostic imaging procedures, and their image appearances (proficiency standard 12.26) [1]
- appraise image information for clinical manifestations and technical accuracy, and take further action as required (proficiency standard 13.17) [1]

The HCPC requires radiographers to undertake continuing professional development (CPD) relevant to their practice to maintain registration [15]. Randomly selected radiographers are called for HCPC audit every two years, providing assurance that standards are maintained. Additional requirements may be set by employers at the employee's annual development review. The individual's annual development plan can be used to support their implementation of PCE and any objectives associated with PCE learning needs.

Alongside the employing service's provision of training and education to maintain or develop PCE knowledge and skills, radiographers employed in the NHS can access elearning for healthcare (elfh) and the associated Clinical Imaging e-learning programme.

Areas to consider prior to implementation

Local implementation will need to consider the following, and ensure that governance policy and procedures provide clear answers, roles and responsibilities for imaging staff relating to:

- indemnity insurance – the employer will provide clearly documented acknowledgement of roles and associated legal cover for staff undertaking PCE. HCPC registrants are required to have a professional indemnity arrangement in place as a condition of their registration [16]. SoR manages the core provision of professional indemnity insurance for its full members as a member benefit [17]
- mechanisms to manage bank and agency staff who may not have received recent PCE training or updates
- specification and availability of image monitors required for PCE – for example, additional PACS workstations may be required
- any specific viewing conditions required for PCE

- any unexpected costs (or savings) from implementing PCE that might be put into a business case
- clear communication channels for radiologists/reporting radiographers to feed back learning points for PCE discrepancies identified at the time of definitive reporting
- methods to share learning locally and nationally in terms of barriers or facilitators identified when implementing PCE, the nature of any resistance and strategies to mitigate this, or lessons learned when implementing new systems or working processes.

PCE implementation toolkit

Approach to service development

Healthcare organisations may seek to either implement or extend radiographer PCE services, depending on the services that are currently provided. Processes for initial consultation, ongoing discussion, agreement, consensus with respect to operating procedures and review of protocols and schemes of work should be defined.

Stakeholders should at least include radiographers, radiologists, referrers and digital systems experts, with partnership working alongside patient advisory groups where these have been formed. Leads with responsibility for overseeing PCE should be identified. These leads should perform a training needs analysis and work in partnership with service managers to define and action a strategic framework for diagnostic radiographers and associated workforce development. This work might be at an imaging network level and include consultation with PCE leads and regional imaging academies in England or the equivalent in the devolved countries.

In the absence of a definitive clinical report, PACS industry providers are encouraged to offer an option to provide a free-text PCE that appears on screen each time a study is opened in PACS/ patient information systems. When a definitive clinical report is available that supersedes the PCE, it should no longer be activated on uploading images. Absence of a PCE comment in that scenario has the potential to offer an additional visual notification that a definitive clinical report is available.

Radiographers should be allocated the time, and access to appropriate learning resources, to undertake CPD and to develop, maintain and enhance their skills. Ideally, this should be agreed at the planning stage of PCE services and be included in the individual's job plan. See, for example, NHS England e-job planning guidance.

Individual radiographer self-directed CPD has a role to play in supporting the introduction of PCE services but is insufficient on its own. A culture of learning, with full ownership of the process by all relevant stakeholders, will help to ensure motivation and success. This requires a regular service review in which all stakeholders are involved. A process of monthly audit of PCE should be established that enables ongoing assurance of these services and action planning that follows up any issues that might emerge.

Clinical governance

PCE systems that are set within a proactive clinical governance framework deliver consistent, high-quality outcomes. Clinical governance processes include:

- a clearly defined framework for regular clinical supervision
- agreed schemes of work and protocols that guide the anticipated range of circumstances
- a continuing education and development plan
- monthly audits and reviews of audit outcomes at multidisciplinary team meetings and overviews that follow the RCR's standards for radiology events and learning meetings, in which a constructive 'no blame' culture exists
- periodic review of outcome standards (e.g. true and false positives and negatives, accuracy of written evaluations, satisfaction of referrers, satisfaction of patients, patient outcomes)
- subsequent revision of schemes of work, protocols and ongoing education and training plans
- clear lines of responsibility and accountability for delivering the service effectively
- acknowledgement in local governance documents that PCE is not a substitute for formal final evaluation due to its potentially limiting factors, including the availability of reporting standard review monitors, time and staff education and training.

Quality standards for imaging [18] include a quality statement on image reporting policy, which requires demonstration that there is a reporting policy in use that has outcome measures including

standards for PCE. Outcome standards for PCE are expected to be agreed locally in consultation with the PCE lead and stakeholders.

Training governance

Training packages should be devised with local agreement and should cover the basics of abnormality detection specific to the anatomical areas included in the PCE. For example, practice educators may support and sustain monthly PCE training with teaching from reporting radiographer teams and use of e-learning for online health modules.

An image interpretation test is recommended to ensure staff can meet accuracy expectations prior to participation. The test should aim to have a 70:30 ratio of negative:positive cases with a suggested pass mark of 90%. The types of positive case in the test bank should be reflective of local clinical workload and of the anatomical areas and clinical conditions covered by the PCE.

Regular training sessions should be provided; it is recommended that monthly PCE training covers common critical and significant findings. Ideally, radiographers who participate in the PCE system should attend a refresher session every six months, followed by a retest, to ensure accuracy is maintained. Local performance management strategies should be used to support any radiographers who are performing suboptimally.

Regular monthly audit of the PCE system practice overall is recommended to ensure standards are maintained and to assess for recurring trends or themes that can be addressed in future training sessions.

Preceptorship/return to work

Newly qualified radiographers, those returning to work following an extended period of absence and people moving into relevant roles if PCE was not previously, or recently, in their scope of practice should receive developmental support over an extended period within the context of a structured preceptorship or return to work programme. The programme should enable individuals to demonstrate competence and support their confidence in undertaking PCE work.

Pausing a PCE service

It is an HCPC regulatory standard of proficiency for diagnostic radiographers to differentiate between normal and abnormal images. Radiographers must take the time necessary to critique all images, checking for abnormality as part of that normal critique. A carefully thought-out and streamlined process and procedures for PCE should not add significant time to those duties.

There may be occasions when the participating radiographer finds it impossible to provide a PCE – for example, where a considered judgement cannot be made. There may also be times when staff and skills shortages mean that the PCE service has to be paused, but this should be the exception. Robust communication of a pause to the service is essential in each instance and should include communication with referrers and the organisation's leadership/management team.

Opting out of a PCE service

An ad hoc PCE service is likely to be confusing to referring practitioners and will not provide radiographers with the ongoing confidence needed for such a scheme to be successful. Opting out of providing a PCE service should therefore be discouraged. However, there may be legitimate times when this is necessary, either on an individual basis or as a department. Examples may include, but are not limited to, the following:

- newly employed radiographers who may lack the skill and/or confidence to provide an accurate PCE. A training plan should be embedded in the individual's preceptorship programme, with a definite timescale to support them
- at times of extreme workload, such as during major incidents. But the value of a well-trained workforce to assist referrers with PCE at such times is invaluable in the absence of a 'hot' reporting service.

Radiographers may occasionally find it challenging to perform PCE immediately post-processing, particularly in scenarios such as lone working and high workload. It is not recommended that services be paused due to time pressures, rather that sufficient skill mix is always available.

To reiterate, it is not recommended that PCE is implemented in an ad hoc manner due to the potential for confusion about levels of service provision. For that reason, there should be a robust mechanism of communication and procedures to follow when a PCE service is paused.

Summary approach to development and governance		
PCE service development	**Name of person/s responsible**	**Date for next review or mark with * if not applicable**
Initial consultation with all stakeholders including referrers		
Establish partnerships with referring services in the planning and implementation of PCE. Partners have shared ownership of the PCE project		
Discuss and plan appropriate methods for evaluation of PCE service		
Amend job descriptions to embed as a job requirement. This requires formal agreement from employing healthcare organisation, including scope of practice		
Allocate radiographers time to access learning resources so they can undertake appropriate CPD and develop, maintain and enhance their PCE skills. Ideally, this should be agreed at the planning stage of these services		
Identify leads with responsibility for overseeing PCE		
Leads should perform a training needs analysis and work in partnership with service managers to define and action a strategic framework for diagnostic radiographers and associated workforce development		
Document and outline agreement/consensus on operating procedures		
Facilitate regular ongoing discussion with stakeholders		
Establish a process of monthly PCE audit to enable ongoing assurance of PCE services. Include action planning with follow-up of issues that might emerge		
Timely feedback, informing both the radiographer and the referring clinician, is essential when there is discrepancy between PCE and a definitive report that may significantly influence patient care. The mechanism and procedures to do this should be agreed locally with stakeholders		

Summary approach to development and governance		
PCE service development	**Name of person/s responsible**	**Date for next review or mark with * if not applicable**
The use of abbreviations in PCE could potentially introduce risk, such as misinterpreting abbreviations or use of inappropriate abbreviations. It may be worth proposing locally agreed abbreviations with clear definitions to mitigate this		
Review protocols and schemes of work		
Revisit scope of practice and consider extending service if required		
Clinical governance	**Name of person/s responsible**	**Date for next review or mark with * if not applicable**
A clearly defined and regular clinical supervision framework		
Agreed schemes of work and protocols that guide the anticipated range of circumstances/ current service provision		
A continuing education and development plan		
Monthly audits, with review of audit outcomes at multidisciplinary team meetings		
An approach to error review that follows the ethos of a constructive 'no blame' learning culture		
Periodic review of outcome standards, including true and false positives and negatives, accuracy of written evaluations, satisfaction of referrers, satisfaction of patients and patient outcomes		
Systems for ongoing review of schemes of work, protocols, and education and training plans		
Clear lines of responsibility and accountability for delivering the service effectively		

PCE communication

A digital pro forma system is recommended, developed in accordance with local clinical need and IT/radiology systems capability. For this reason, radiology informatics/digital systems experts should be stakeholders in the development or expansion of PCE services. A digital pro forma integrated into the healthcare organisation's existing PACS, visible on all viewing platforms, is the ideal scenario. This should notify the referrer that there is PCE available when they review the image(s).

Where digital integration is not possible, a paper pro forma could potentially be used, but this is not ideal (see example PCE pro forma below). PCE must be readily available to the referrer. This means that the pro forma should be completed by the radiographer immediately following image review and examination post-processing.

PCE pro forma

The primary aim of the PCE pro forma communication, whether digital or paper, should be to record the following:

1. Whether PCE has taken place
2. Whether any abnormalities have been identified
3. The nature of any abnormalities identified
4. The location(s) of these abnormalities.

Examples of completed entries on the pro forma might include:

"Transverse fracture distal radius and ulna"
"Oblique fracture medial end of clavicle"
"Comminuted fracture distal phalanx of index finger"
"Normal – no fracture"
"No PCE has taken place"

Bullet points and short comments are preferred by referrers [19]. Providing brief and accurate comments should mean there is no increased burden on workflow and radiographers do not need protracted additional training to complete the form. For example, adding more information – such as displacement or angulation – would require training to fully understand and include these specific concepts. This risks the PCE becoming burdensome for the radiographer, and could also mean they do not feel confident about commenting in some scenarios. As a result the radiographer might not engage with the system, the PCE could potentially be inaccurate or it could become

onerous, either providing the referrer with too much information or being confused with the definitive report.

The secondary aims of the PCE communication should be to:

1. Provide the name, role and contact telephone number of the person(s) completing the PCE
2. Provide a disclaimer to remind the referrer that the PCE comment does not represent a definitive report.

Both points 1) and 2) may be automatically populated if using a digital system.

Example PCE pro forma	
Patient identifiers (name, hospital number etc)	
Has PCE taken place?	Yes/No
PCE	[Leave blank for free text comment] e.g. "No abnormality detected" "Oblique fracture distal phalanx index finger"
Name of radiographer completing PCE	
Radiographer's contact number **[This section may not be necessary in radiology departments where there is a central point of contact for ED practitioners]**	
The above comment is designed to be an aid to the referring practitioner. ***It does not constitute a formal definitive report*** and should not be considered as such. The comment does not absolve the referrer from reviewing the image(s) themselves and formulating their own diagnosis, with an associated onward management plan.	

Areas of particular focus

Some UK radiology departments may have already achieved 24-hour hot reporting provision. For those that have not, it is pressing that they develop 'safety net' radiographer PCE services. For radiology departments that do have hot reporting, PCE should be performed whenever this is unavailable.

A phased approach, with priority areas for implementation, is advised for services at an early stage of developing PCE provision. Priority areas include those mentioned in this guidance alongside any areas of local concern.

The SoR suggests two areas to focus on initially for general radiography. At the time of writing, a national project is being developed to improve safety through radiographer-led nasogastric (NG) tube interpretation. When this is achieved in service, radiographer-led NG tube interpretations will supersede the NG tube PCE guidance given here.

1. **PCE of NG tube radiographs:** In December 2020 the Healthcare Safety Investigation Branch (HSIB) published its investigation report Placement of nasogastric tubes. One of the safety recommendations this made was that the RCR and British Society of Gastrointestinal and Abdominal Radiology (BSGAR), working with Health Education England and the Society and College of Radiographers (SCoR), develop and publish a national standardised competency-based training programme for x-ray interpretation to confirm NG tube placement.

   Work is ongoing to establish the training and skills development needed for radiographers to provide immediate image interpretation and identification of misplaced NG tubes, allowing prompt action and minimising harm to patients in healthcare organisations.

   The HSIB report noted that radiographers will form an essential cornerstone of focus through professional development with dedicated education and training in NG tube image acquisition and interpretation.

   It is good practice for the radiographer who completes the PCE to immediately inform the referrer/clinician caring for that patient of any abnormality. Immediate escalation of findings facilitates a review of pain relief and initiation of the appropriate patient pathway.

   Supporting resources:

   Radiographer workforce role expansion to improve patient safety related to nasogastric tube placement for feeding in adults, *Clinical Radiology* (2017)

   Acceptability of a new practice development for radiographers focussed on reducing 'never events' related to nasogastric feeding tubes in adult patients, *Radiology* (2019)

   elfh Nasogastric tube placement: Using chest radiographs to identify nasogastric tube placement

2. **PCE of hip injury or disease in older people who attend the ED:** The NHS Resolution 2022 review of clinical negligence claims in EDs in England suggests high-priority areas on which to focus. The review notes that limb fractures were the most missed in ED, particularly in the

lower limb, and the hip was the single most common fracture site to be missed [7]. Missed hip fractures are major injuries with significant associated morbidity and mortality.

NHS Resolution recommends that, on a national level, the relevant royal colleges and professional bodies should continue to work together to prioritise accurate diagnosis of hip fractures, given the associated morbidity and mortality, the known risks for older people and the challenges in diagnosis of occult fractures. On a local level, the recommendation is that providers should prioritise this patient group, highlighting the potential for misdiagnosis and the associated risks of this as well as the human and financial risks associated with clinical negligence litigation.

The SoR therefore recommends that, in the absence of an immediate definitive radiologist or reporting radiographer report or advice, radiographer PCE for hip injury in older people should be an area of focus. Radiographer PCE for hip injury or disease in older people who attend the ED may be of benefit to the referrer and older people, their families and carers, and may be used to support the ED referrer in deciding whether to refer for cross-sectional imaging to improve safety and prevent harm.

Supporting e-learning resources:

elearning for healthcare (elfh)
Clinical Imaging e-learning programme

When a PCE positively identifies any unexpected hip fracture, it is good practice for the radiographer who completed the PCE to immediately inform the referrer/clinician caring for that patient. Immediate escalation of the findings facilitates a review of pain relief and initiation of the appropriate patient pathway.

Conclusion

Across the UK, radiographer PCE has been implemented sporadically and with mixed design and scope. This will naturally be reflected in both the design of individual services and the confidence of staff to provide PCE services in busy and pressured environments. However, the informal nature of such systems and the often optional approach to PCE taken to date are inconsistent with delivering reliable outcomes for patients and referrers.

Considering the current design of services and pathways, the escalation of significant clinical findings on cross-sectional imaging studies is preferable to PCE. PCE is intended for use when

referrers are viewing images in the absence of a definitive clinical report. PCE does potentially have a role to play in cross-sectional imaging, but this is an area that requires further study and investigation. The immediate escalation of significant clinical findings, in line with local policy, is advised for cross-sectional imaging.

Services should consider the best approach to implement PCE for their local needs, considering local cultures and influences, and develop strategies in collaboration with all stakeholders involved in the relevant patient pathways.

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Appendix 1

Radiographer PCE: evidence summary of study titles and conclusions, 2018–2023

Study	Conclusion and implications for practice
Lidgett, T., Pittock, L., Piper, K. and Woznitza, N. (2023) A pilot study to assess radiographer preliminary clinical evaluation (PCE) introduced for emergency department adult appendicular X-ray examinations: Comparison of trained and untrained radiographers. *Radiography*, Volume 29, Issue 2, 307–312.	Local PCE training was associated with more frequent PCE participation but did not appear to influence PCE accuracy. The accuracy results suggest that radiographers are well equipped to provide PCE comments for adult appendicular x-ray examinations. Local PCE training is likely to be important for consistent PCE scheme participation. Both experienced and recently qualified radiographers appear well equipped to provide accurate PCE for adult appendicular trauma x-ray examinations.
Harcus, J.W. and Stevens, B.J. (2023) Radiographer abnormality flagging systems in the UK – A preliminary updated assessment of practice. *Radiography,* Volume *29*, Issue 1, 234–239.	There appears to be quite minimal change in practices in the UK compared with 2008. There does appear to be some increase in the use of flagging systems generally and a higher proportion of PCE compared with red dot systems, but the use of education and audit does not necessarily show much development in the past 15 years. Significant conclusions cannot be drawn due to limited sample size; however, the assessment may support further study and consideration in relation to implementation and, potentially, standardisation of abnormality detection systems may be justified.
Stevens, B.J. and Thompson, J.D. (2022) The efficacy of preliminary clinical evaluation for emergency department chest radiographs with trauma presentations in pre- and post-training situations. *Radiography*, Volume 28, Issue 4, 1122–1126.	Improvements in performance were evident for most participants' abnormality localisations and PCE scores following the training intervention. The study highlighted areas of chest x-ray PCE that may require further training, detecting superimposed or subtle abnormalities. This study provides additional support for the development of PCE systems in more areas of imaging practice.
Verrier, W., Pittock, L.J., Bodoceanu, M. and Piper, K. (2022) Accuracy of radiographer preliminary clinical evaluation of skeletal trauma radiographs, in clinical practice at a district general hospital. *Radiography*, Volume 28, Issue 2, 312–318.	Radiographers without specific training were able to provide red dot (RD) systems and PCE to a high standard. Radiographers interpreted positive findings more accurately using PCE than RD, and positive findings on appendicular cases were interpreted more accurately than those on axial cases. This study supports local PCE implementation, contributes to the wider evidence base to justify transition towards PCE and identifies the necessity for local axial image interpretation training.

Study	Conclusion and implications for practice
Alexander-Bates, I., Neep, M.J., Davis, B. and Starkey, D. (2021) An analysis of radiographer preliminary image evaluation–A focus on common false negatives. *Journal of Medical Radiation Sciences*, Volume 68, Issue 3, 237–244.	This study demonstrated the most common false negative radiographer preliminary image evaluations (PIEs) were within the upper and lower distal extremities. Specifically, the phalanges and examinations demonstrating multiple injuries reported high levels of misinterpretation. The misinterpretation in multi-injury examinations could be attributed to 'subsequent search miss' (SSM) error. These results highlight areas of emphasis and focus for image interpretation education.
Del Gante, E., Kumar, M., McEntee, M., Sng, L.H., Yi Tan, C.Y., Yeo, C.W.K., Sim, W.Y. and Ekpo, E. (2021) Accuracy of radiographer comment following a two-month experiential and blended learning in appendicular skeleton X-ray interpretation: The Singapore experience. *Radiography*, Volume 27, Issue 1, 43–47.	Radiographers who received blended and experiential learning in radiographer abnormality detection systems provided accurate diagnostic comments on plain emergency appendicular skeleton radiographs. A combined blended and experiential learning experience can equip radiographers to provide diagnostic opinion on plain appendicular skeleton radiographs.
Keyte, E., Roe, G., Jeanes, A. and Kraft, J.K. (2021) Immediate chest radiograph interpretation by radiographers improves patient safety related to nasogastric feeding tube placement in children. *Pediatric Radiology*, Volume 51, Issue 9, 1621–1625.	Nasogastric tube check radiographs in children can be reported accurately by radiographers trained in their interpretation and the results promptly communicated to clinical staff, improving safety in relation to nasogastric tube placement in children.
Shepherd, J., Lourida, I. and Meertens, R.M. (2022) Radiographer-led discharge for emergency care patients, requiring projection radiography of minor musculoskeletal injuries: a scoping review. *BMC Emergency Medicine*, Volume 22, article 70.	This study involved a small number of radiographer-led discharge (RLD) active radiographers, likely to be motivated individuals. However, RLD has potential for generalisability, with protocol variations evident but all producing similar positive outcomes. Understanding radiography and ED culture could enable facilitators for RLD to use it more sustainably in the future. Cost-effectiveness studies, action research within EDs and cluster randomised controlled trials with process evaluation are needed to fully understand the potential for RLD. The cost-effectiveness of RLD may provide financial support for training radiographers and increasing their salary, with the potential future benefit of reduction in ED workload. RLD implementation would require an interprofessional approach achieved by understanding ED staff and patient perspectives and ensuring these views are central to RLD implementation.

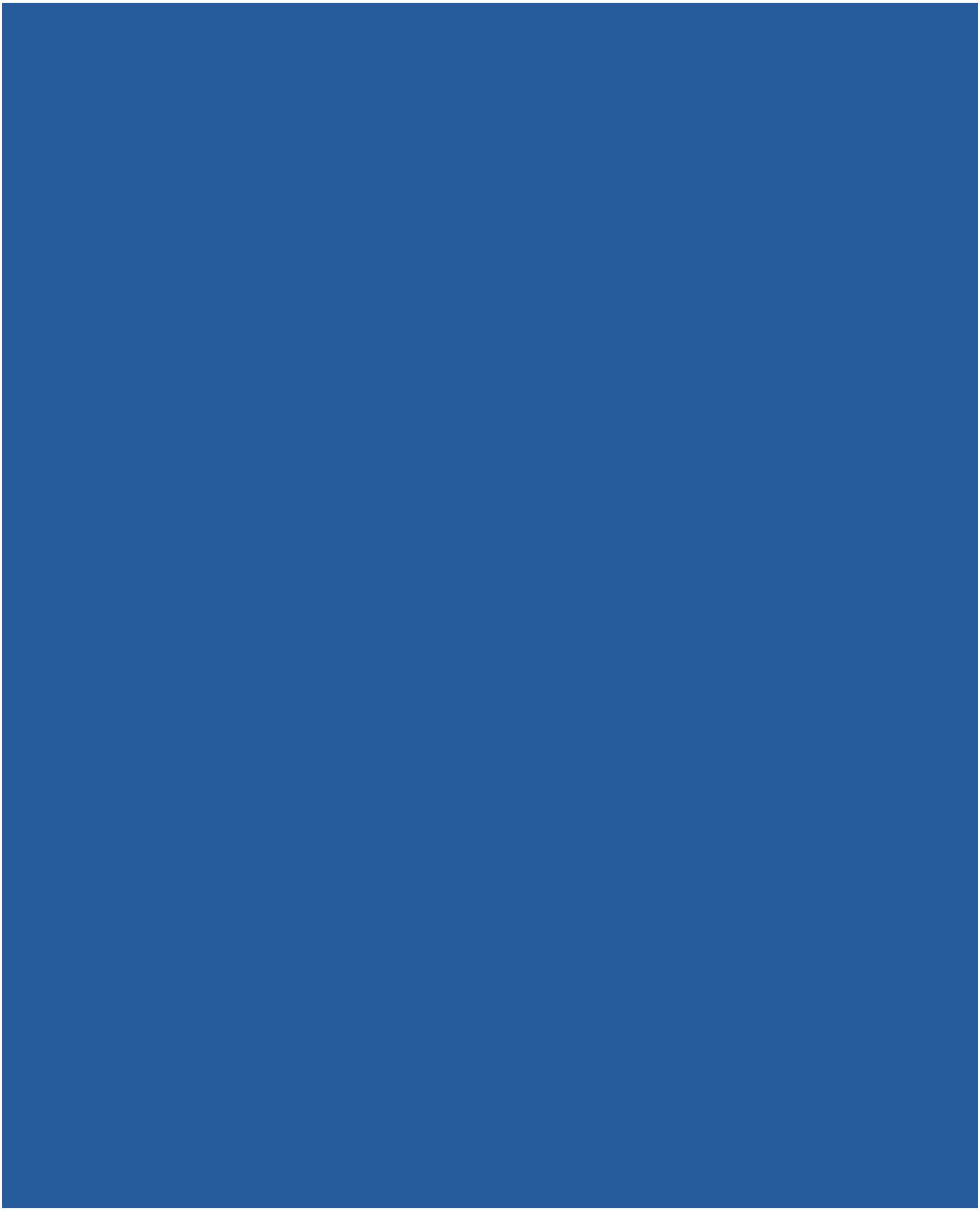
Study	Conclusion and implications for practice
Harcus, J.W. and Stevens, B.J. (2021) What information is required in a preliminary clinical evaluation? A service evaluation. *Radiography*, Volume 27, Issue 4, 1033–1037.	PCE content should accommodate the preferences of ED referrers. This study's findings suggest clinicians want information about what the abnormality is (i.e. the type of injury), where it is (more specific than simply which bone) and if displacement is present. These findings add to the current knowledge base and provide support to the local department when implementing the PCE system.
Stevens, B.J. (2022) Radiograph report style preferences of referrers at a district general hospital in the West Midlands, England, UK. *Radiography*, Volume 28, Issue 2, 296–303.	The most preferred report style for skeletal and chest x-ray reports is short sentences in a bullet point format. These findings add to the current knowledge base and provide different report style options. Tailoring report styles could optimise service users' experience, depending on clinical variables, and might improve reporting workflow. Potential differences in style preferences may exist between community and hospital referrers. Consequently, focused research regarding the report style preferences of GPs is recommended as an area for further research.
Stevens, B.J. (2020) An analysis of the structure and brevity of preliminary clinical evaluations describing traumatic abnormalities on extremity x-ray images. *Radiography*, Volume 26, Issue 4, 302–307.	Participants used too many words in their PCE comments, with reduced descriptive content that did not match the reading level of the gold standard. Areas for suggested improvement in practice include introduction of a comment-forming model with additional education. These findings provide an interesting addition to the growing PCE knowledge base. Dedicated training prior to implementation and participation, to standardise comment structure, could improve the effectiveness of the PCE system.
Whitaker, S. and Cox, W.A.S. (2020) An investigation to ascertain whether or not time pressure influences the accuracy of final year student radiographers in abnormality detection when interpreting conventional appendicular trauma radiographs: A pilot study. *Radiography*, Volume 26, Issue 3, e140–145.	The results demonstrated no statistical significance. However, it is recommended that a similar study is conducted using sufficient reporting practitioners to enable direct parallels to be drawn with statistical significance. The results signify the importance for imaging departments of managing the number of staff and their workload. Subsequently, this aims to ensure reporting practitioners work at their optimum stress level for efficient work performance.
Woznitza, N., Nair, A. and Hare, S.S. (2020) COVID-19: a case series to support radiographer preliminary clinical evaluation. *Radiography*, Volume 26, Issue 3, e186–188.	This case report series presents a summary of key findings frequently associated with COVID-19 that is intended to assist radiographer PCE.

Study	Conclusion and implications for practice
Harris, L., Starkey, D. and Woodward, A. (2020) Current reported barriers to radiographer commenting implementation: A systematic review. In European Congress of Radiology 2020.	Current research into radiographer preliminary image evaluation (PIE) barriers has involved interviewing radiographers for their opinions. This has identified several barriers, including fears of legal repercussions, unknown radiographer accuracy levels, lack of radiographer confidence, lack of time to complete comments and educational issues. As radiographers make up the only group that has been interviewed, it is possible that there are other barriers that have not been identified in current literature. It is recommended that future research investigates the opinions of other health professional groups involved in the implementation process, as this may reveal additional barriers that can then be investigated. Most of the research found that has investigated commenting barriers has focused on accuracy, with limited published research currently available that has investigated the areas of radiographer confidence, time required to provide a comment and legal requirements around PIE. It is suggested therefore that further research into these areas could help overcome these barriers, resulting in improvements to PIE implementation.
Murphy, A., Ekpo, E., Steffens, T. and Neep, M.J. (2019) Radiographic image interpretation by Australian radiographers: a systematic review. *Journal of Medical Radiation Sciences*, Volume 66, Issue 4, 269–283.	A total of 926 studies were screened for relevance and 19 articles met the inclusion criteria. The 19 articles consisted of 11 cohort studies, seven cross-sectional surveys and one randomised control trial. Studies exploring radiographers' image interpretation performance used a variety of methodological designs, with accuracy, sensitivity and specificity values ranging from 57% to 98%, 45% to 98% and 68% to 98%, respectively. Primary barriers to radiographic image evaluation by radiographers included a lack of accessible educational resources and of support from both radiologists and radiographers. Australian radiographers can undertake preliminary image evaluation (PIE); however, educational, and clinical support barriers limit implementation. Access to targeted education and a clear definition of the radiographer's image evaluation role may drive a wider acceptance of radiographer image evaluation in Australia.

Study	Conclusion and implications for practice
Stevens, B.J. and Thompson, J.D. (2020) The value of preliminary clinical evaluation for decision making in injuries of the hand and wrist. *International Emergency Nursing*, Volume 48, 100775.	This study shows that PCE provision can positively impact on management decisions by emergency nurse practitioners (ENPs) and emergency-care advanced clinical practitioners (EC-ACPs), improve abnormality localisation accuracy and increase interpretive confidence. It can also help reduce false negative diagnoses. In view of its findings, the introduction of formal image interpretation for ENPs and EC-ACPs as a mandatory requirement will enhance the service provided by non-medical referrers. This in turn will increase the efficacy of the PCE system. Therefore, EDs and radiographers should work together to ensure a robust PCE system exists for when a 'hot reporting' service is not available.
Lockwood, P. and Pittock, L. (2019) Multi-professional image interpretation: Performance in preliminary clinical evaluation of appendicular radiographs. *Radiography*, Volume 25, Issue 4, e95–107.	This study found image interpretation and commentary of appendicular radiographs in an academic environment by a multiprofessional sample were to a high standard. Further work is recommended on a larger sample.
Rimes, S.J., Knapp, K.M., Meertens, R.M. and Fox, D.L. (2019) Computed tomography colonography: Radiographer independent preliminary clinical evaluation for intraluminal pathology. *Radiography*, Volume 25, Issue 4, 359–364.	From a database of 1,815 studies acquired over three years, and representing work done in a clinical environment, this study indicates the potential for trained radiographers to provide PCE of intraluminal pathology.
Williams, I., Baird, M., Pearce, B. and Schneider, M. (2019) Improvement of radiographer commenting accuracy of the appendicular skeleton following a short course in plain radiography image interpretation: A pilot study. *Journal of Medical Radiation Sciences*, Volume 66, Issue 1, 14–19.	Participants achieved significant improvements in commenting accuracy on plain radiography of the appendicular skeleton after completion of the two course modules. However, continuous application and ongoing professional development are essential to maintain and develop the skills acquired.
van de Venter, R. and ten Ham-Baloyi, W. (2019) Image interpretation by radiographers in South Africa: A systematic review. *Radiography*, Volume 25, Issue 2, 178–185.	The findings of this South Africa-focused review are comparable to the international literature. Formal image interpretation by radiographers can significantly contribute to clinical practice regarding patient management. Policymakers should develop appropriate educational programmes and start discussing the role boundaries of radiographers who take up this role in the clinical environment.

Study	Conclusion and implications for practice
Denham, G. (2019) Strategies for successful implementation of preliminary image evaluation. *Journal of Medical Radiation Sciences*, Volume 66, Issue 3, 218.	In recent times, Logan Hospital in Queensland has set the standard for radiographers to fulfil full scope of practice with the implementation of a formalised preliminary image evaluation (PIE) system. This paper cites the study by Brown, Neep, Pozzias and McPhail, *Reducing risk in the emergency department: a 12-month prospective longitudinal study of radiographer preliminary image evaluations* (see below), as an outstanding example of high-quality research being conducted within the radiography profession to provide evidence of the benefits of a formalised PIE system in Australia. This evidence will enable the Australian Society of Medical Imaging and Radiation Therapy (ASMIRT) PIE Steering Committee to develop a robust PIE credentialing system in Australia that can withstand external scrutiny.
Brown, C., Neep, M.J., Pozzias, E. and McPhail, S.M. (2019) Reducing risk in the emergency department: a 12-month prospective longitudinal study of radiographer preliminary image evaluations. *Journal of Medical Radiation Sciences*, Volume 66, Issue 3, 154–162.	This study demonstrated that the participating radiographers provided a consistent preliminary image evaluation (PIE) service while maintaining high diagnostic accuracy. This form of image interpretation can complement an emergency referrer's diagnosis when a radiologist's report is unavailable at the time of patient treatment. PIE promotes a reliable enhancement of the radiographer's role with the multidisciplinary team.
Bradbury, C., Britton, I., Lille, K. and Wright-White, H. (2019) Abdominal radiograph preliminary clinical evaluation image test bank project. *Radiography*, Volume 25, Issue 3, 250–254.	Participants in this study showed good sensitivity in recognising prominent findings on abdominal radiographs. This sensitivity is, however, reduced when assessing less obvious radiographic appearances, illustrating areas where additional training would be beneficial. The study provides evidence towards the consideration of an expansion of current practice regarding the implementation of a scheme of abdominal radiograph PCE. Further research with a larger cohort of participants and a lower abnormal case prevalence would be beneficial to the limited research base.
Stevens, B.J. and White, N. (2018) Newly qualified radiographers' perceptions of their abnormality detection abilities and the associated training they received at undergraduate level. *Radiography*, Volume 24, Issue 3, 219–223.	While participants considered 'red dot' training at university and on placement suitable, their views on PCE training were more variable. The study found PCE training at university positively influences confidence in describing abnormalities but commenting training on placement is recognised as an area for improvement. A larger study is suggested to gain further understanding of any issues hindering widespread PCE implementation.

Study	Conclusion and implications for practice
Stevens, B.J. and Thompson, J.D. (2018) The impact of focused training on abnormality detection and provision of accurate preliminary clinical evaluation in newly qualified radiographers. *Radiography*, Volume 24, Issue 1, 47–51.	An eight-week training programme had a positive impact on participants' ability to localise and accurately describe fractures. Implementation of abnormality detection training should be considered during preceptorship periods. Due to the small sample size, it is inappropriate to suggest these findings are representative of all graduate radiographers.
Murphy, A. and Neep, M. (2018) An investigation into the use of radiographer abnormality detection systems by Queensland public hospitals. *Journal of Medical Radiation Sciences*, Volume 65, Issue 2, 80–85.	This study found an infrequent use of RADS in Queensland public hospitals. This finding is an opportunity for medical imaging professionals to enhance communication between the facets of a multidisciplinary emergency team via the implementation of RADS complemented by a radiographer commenting system.
Rachuba, S., Knapp, K., Ashton, L. and Pitt, M. (2018) Streamlining pathways for minor injuries in emergency departments through radiographer-led discharge. *Operations Research for Health Care*, Volume 19, 44–56.	This study modelled patient pathways through an ED at a hospital in South West England using process mapping, interviews with ED staff and discrete event simulation (DES). The DES model enabled comparison of the current practice at the hospital with scenarios using radiographer-led discharge of patients directly after imaging and assessment of the reduction in patients' length of stay in ED. The study quantified trade-offs between the provision of radiographer-led discharge and its effects (i.e. reduction in waiting times and ED workload). The study discusses how this decision support tool can be used to support understanding among patients and members of staff.



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